

General Certificate of Education (Ordinary Level)

# Mathematics

(New Syllabus)

## A collection of revision Question Papers



**Department of Mathematics  
Faculty of Science & Technology  
National Institute of Education  
Sri Lanka**

2016

## **Director General's Message**

The Department of Mathematics of the National Institute of Education (NIE) adopting a variety of methodologies timely with a view to promoting mathematics education. This book entitled "A collection of revision question papers" is a result of such an exercise.

Preparation of students for the General certificate Examination (Ordinary Level) held at the end of grade 11 is a major task assigned to the school teacher. Evaluation tools suitable for this purpose is very rare. It is not a secret that most of the instruments available in the market are composed of questions that lack due validity and quality. The Department of Mathematics of the NIE has prepared this paper collection to rectify this situation and facilitate students to prepare well for the examination. This collection comprises seven valuable question papers prepared according to the syllabus, pre-tested and standardised by an item analysis. Inclusion of objectives as well as answers along with questions undoubtedly is much useful for the teachers.

I request teachers and students to make the evaluation process in mathematics a success by having access to this book.

I wish to extend my gratitude to the Asian Development Bank for the assistance given to make this available to you and also the staff of the Department of Mathematics and external scholars who provided academic contribution to make this venture a success.

Dr. (Mrs.) Jayanthi Gunasekera  
Director General  
National Institute of Education

## Foreword

When analysing any sort of work that we do in our day to day life, it is clearly seen that mathematical concepts have been used to facilitate tasks that are carried out in human society. Every member in society, big and small, unknowingly puts mathematical concepts practically into action. We observe that we have used mathematical concepts in what way say or do as well as in what we have constructed in our surroundings. Truly, mathematical concepts are indispensable for the human life.

Having understood this fact well, all the countries in the world have given a special place for mathematics in their school curricula. Though the scenario is such, we cannot be complacent about the performance shown by our students at the General Certificate of Education (Ordinary Level) Examination. In order to underpin the students' concept formation in mathematics, from 2014, the National Institute of Education has been introducing various strategies at the national level. This "Collection of pre examination question papers" has been prepared as a further step towards this end. In this undertaking, the questions are designed fully conforming to the G.C.E.(O.L.) Examination format such that the students are exposed to all experiences they are expected to have when facing an examination paper. This compilation is important for the student as well as for the teacher. I should say that giving due direction to the student to use this correctly and systematically of the teachers and other authorities.

I kindly request you to send feedback to us about the experiences you gain by using this collection timely in your schools. It will be useful for the future editions of this work.

It is my earnest expectation that taking into consideration the importance of the subject mathematics and reinforcing the mathematical concepts in students, this piece of work is effectively used in schools and bring our endeavour to fruition.

**K Ranjith Pathmasiri**  
**Director**  
**Department of Mathematics**

## Preface

In Sri Lankan schools there are wide disparities in the achievement levels in mathematics. Analysis of the results in mathematics at the General Certificate of Education ( Ordinary Level ) Examination shows that marks spread from 0% to 100%. As this reflects a dark side of the education in our country, the National Institute of Education (NIE) was entrusted with the task of changing this situation under the financial assistance of the Asian Development Bank. A target was set to raise the pass rate in mathematics to 65% in 2016. The Mathematics Department of the NIE planned various courses of action to achieve this target. Under this, the Department has already initiated and implemented a program for improving the results in mathematics at the G.C.E.( O.L.) Examination.

The following curricular materials are provided to implement this program in schools.

1. Series of student work books ( 06 books )
2. Books with diagnostic test batteries (05 books)
3. The book with 7 question papers prepared to practice students for the G.C.E. (O.L.) Examination at the end of grade 11.
4. Item bank comprising prepared question for reinforcing the facts learnt by students and to familiarize them with the examination.
5. The book containing 8 question papers to enable students to revise the content learnt at the end of grade 10 and to prepare for term tests.
6. The book containing 6 question papers to enable students to revise the content learnt at the end of grade 9 and prepare for the term test.
7. Students' work book for grade 9 students.

This book contains 7 question papers set to prepare students for the G.C.E. (O.L.) Examination at the end of grade 11. Every question paper is set in accordance with the new grade 10 and 11 syllabi implemented from 2015. They adopted the format thought to be used for the G.C.E. (O.L.) Examination from 2016.

According to that format, the mathematics question paper is composed of two papers Mathematics I and Mathematics II. Both papers have two parts, Part A and Part B. Paper I is based only on the essential learning concepts.

- In paper I, Part A consists of 25 short questions while part B has 5 structured essay type questions. Part B comprises only the themes number, measurements, sets and probability and statistics.

The percentages of objectives of learning mathematics covered by Paper I are as follows.

Knowledge and skills	50%
Communication	30%
Identifying relationships	20%

Paper II is composed of 8 structured essay questions and 4 essay type questions. Part A of paper II has 3 questions under the theme algebra where as part B of it has 03 geometry questions. Students should answer 10 questions selecting 5 questions from each part.

The percentages of the subject themes and the percentages of the aims of learning mathematics are given below.

Number	- 23%	Knowledge and skills	- 40%
Measurements	- 15%	Communication	- 20%
Algebra	- 20%	Detecting relationships	- 20%
Sets and Probability	- 10 %	Reasoning	- 10%
Geometry	- 22%	Problem solving	- 10%

Every question paper encompasses following fundamental elements.

- i. Objectives
- ii. Question paper
- iii. Answers and detailed marking scheme

Objectives, answers and the detailed marking scheme will be very useful for the teacher in schools. Stating what is expected to measure by each question and the marks awarded for it will be an additional advantage for the teachers to prepare quality questions for the process of school evaluation and awarding marks for them.

When setting the papers attention was paid to the following aspects.

- i. New mathematics syllabus for grade 10 and 11
- ii. Objectives of teaching mathematics
- iii. Authenticity

Questions were set conforming to a table of specification prepared on the grounds of the above and were standardised. Attention was paid to the following in the standardisation of questions.

- i. Preparation of questions of quality and validity
- ii. Testing the question by administering them to a small sample
- iii. Conducting an item analysis using the marks obtained by marking the students' answer scripts
- iv. Selection of items having a difficult index between 0.2 - 0.8 and discrimination index above 0.2 only for the final question paper.
- v. Revision of the items rejected by the item analysis to suit the requirements.
- vi. Comparing the copy of the question paper with the blue print, doing further amendments when necessary and making the final product

As described above, these 7 question papers have been prepared on a strong scholastic foundation. Use of these question papers will give a students a good practice for the G.C.E.(Ordinary Level ) Examination. This also paves way to prevent the harm brought about on the students by the standard papers of poor quality available in the market. Further, these papers offer an opportunity for teachers to make predictions about the students' examination results and remedy their shortcomings lastly.

We request teachers and principals to follow the following course of action when administering these question papers to students.

- i. Informing students in advance that they will be given a question paper and come prepared for it.

- ii. Giving students an opportunity to answer the paper under an examination atmosphere.
- iii. Marking students' answer scripts and awarding marks according to the detailed marking scheme.
- iv. Giving the students the marks they have scored and discussing the question paper giving due advice.
- v. Giving instructions and taking suitable action to overcome students' drawbacks.

We request to users to study these questions well and be taken in preparing questions of higher quality and validity. We are thankful if you could let us know your constructive suggestions and shortcomings of these materials for improving them at the next edition.

It is our expectation that this book will amply support our efforts to improve mathematics education in Sri Lanka where the failure of thousands of children at examinations has become a several problem.

**Project Leader**

**Project of improving G.C.E. (O.L.) Examination results.**

**Guidance :**

Dr.(Mrs.) T.A.R.J. Gunasekera  
Director General  
National Institute of Education

M.F.S.P.Jayawardhana  
Assistant Director General, Faculty of Science and Technology  
National Institute of Education

**Direction :**

K Ranjith Pathmasiri  
Director, Department of Mathematics  
National Institute of Education

**Planing and coordination :**

G.L.Krunarathne  
Senior Educationist, Department of Mathematics  
Project Leader of project of improving G.C.E. ( O.L.) Examination results

**Coordination of Tamil Medium:**

Mr. C. Sudeson  
Assistant Lecturer  
Department of Mathematics  
National Institute of Education

**Final Evaluation**

Dr. Romaine Jayewardene  
Senior Lecturer  
University of Colombo

**Internal Resource Persons:**

Mr. G.L.Karunarathne	Senior Educationist, Department of Mathematics, National Institute of Education.
Mr. G.P.H.Jagath Kumara	Senior Lecturer, Department of Mathematics, National Institute of Education.
Mrs. M.Nilmini .P. Peries	Senior Lecturer, Department of Mathematics, National Institute of Education.
Mr. S.Rajendram	Lecturer, Department of Mathematics, National Institute of Education.
Mr. C. Sudeson	Assistant Lecturer, Department of Mathematics, National Institute of Education.
Miss. K.K.V.S.Kankanamge	Assistant Lecturer, Department of Mathematics, National Institute of Education.
Mr. P. Vijai Kumar	Assistant Lecturer, Department of Mathematics, National Institute of Education.

## External Resource Persons

Mrs. W.M.B.J. Wijesekara	Retired Director (Mathematics)
Mr. J.M.L. Laxman	Retired Lecturer
Mr. D.L. Batugahage	Retired Lecturer
Mr. Samantha Lalith Thilakarathne	Retired Master Teacher
Mr. N.G.Seneviratne	Retired Master Teacher
Mr. Y.V.R. Vitharama	Retired Master Teacher
Mr. R.P.D. Jayasingha	Master Teacher, Zonal Education Office, Dehiowita.
Mr. Jayampath Lokumudali	Teacher Service, Janadhipathi Vidyalaya, Maharagama.
Mrs. G.H.S.Ranjanie de Siva	Teacher Service, Ananda Vidyalaya, Colombo 10.
Mr. M.G.K. Mapatuna	Teacher Service, B/Sri Dammananda Maha Vidyalaya, Haputale
Mrs. A.V.A. Athukorala	Teacher Service, Walihelathanna Kanishta Vidyalaya, Yatitontota.
Mr. G.U. Dilshan Kumara	Teacher Service, Gonagala Maha Vidyalaya, Ruwanwella.
Mr. M. Chandrasiri	Teacher Service, Nakkawita Kanishta Vidyalaya, Deraniyagala.
Mr. N. Ragunathan	Retired Master Teacher
Mr. M.S.M. Rafeethu	Retired Master Teacher
Mr. S. Gajendran	Teacher Service, Aththiysar Hindu Vidyalaya, Neerveli.
Mr. J.C.Peters	Teacher Service, St. Mary Vidyalaya, Batticalo
Mr. K. Ravithiran	Retired Principal



- Typesetting** : Mr. N.G.Seneviratne,  
Retired Master Teacher
- Translation in to English** : Mr. Munasingha  
Retired Senior Project Officer
- Cover** : A.D.Anusha Tharanganie,  
National Institute of Education.
- Printing Tecnology & Management** : W.M.U.Wjesooriya  
Director (Acting)  
Department of Printing & Publication  
National Institute of Education.
- Assistant Staff** : Mr. S.Hettiarachchi,  
Department of Mathematics,  
National Institute of Education.
- Mrs.K.Nelika Senani,  
Department of Mathematics,  
National Institute of Education.
- Mr.R.M. Rupasingha,  
Department of Mathematics,  
National Institute of Education.

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1.1 Objectives  
Paper I  
Part A

1. Of the numbers given, selects the numbers that do not give a whole number as the square root.
2. Finds the value of the vertex angle of an isosceles triangle when an angle opposite one of the two equal sides is given.
3. Given the area of a circular lamina in square metres, finds the area of a sector of that lamina of known central angle.
4. Solves an equation with given algebraic fractions.
5. Finds the total number of balls in a bag when the range in which the number of balls of different colours lies and the probability of a ball having a given colour are given.
6. Writes a number given in index form in logarithm form.
7. Given one requirement for a quadrilateral to be a parallelogram, writes the other requirement.
8. Finds the value of a named angle of a right-angled triangle and an angle of another triangle according to given information.
9. Simplifies an expression with algebraic fractions.
10. Given the mid point of a chord of a circle,
  - (i) writes the relationship between the chord and the line joining the centre of the circle and the mid point of the chord.
  - (ii) using that relationship, fills in the blanks of an incomplete statement.
11. Calculates the area of the curved surface of a cylinder when its height and the circumference of the base circle are given.
12. Finds the values of two unknown entries when two matrices and a relationship are given.
13. Writes the equation of a straight line with given intercept which is parallel to a given straight line.
14. Given a diagram showing a line drawn through the mid point of one side of a triangle parallel to another side, which intersects the third side, calculates the length of the given part of that line and the length of the third side using the data given.
15. Given the number of days required by a group of a people to complete a work and the number of days worked,
  - (i) finds the number of man days required to complete the remaining work.

- (ii) finds the number of days required to complete the remaining part by a given number of men.
16. Solves an inequality of the type  $ax + b \geq c$  and indicates the solution on a number line.
17. Given the diagram of a triangular prism with measurements marked on it and one of its rectangular faces, draws the other two rectangular faces with measurements.
18. Given the percentage of the tariff and the value of an item, calculates the value of the item after paying the tariff.
19. Given the diameter of a circle and a diagram of the circle with four connected points on its circumference, satisfying certain conditions  
(i) finds a named angle. (ii) finds another named angle.
20. Calculates the cosine of an angle given its sine.
21. Given a histogram representing the marks scored by a group of students, writes the number of students scoring marks within a given class interval and the number of students who appeared for the examination.
22. Given an angle as  $x$  of a cyclic quadrilateral, one side of which is the diameter of the corresponding circle, finds two other named angles in the figure in terms of  $x$ .
23. Writes a trinomial quadratic expression as a square and finds the factors of an expression which is the difference of two squares.
24. According to a given requirement, marks the location of a line using knowledge on loci.
25. Selects correct statements according to the information presented in the given Venn diagram.

Part B

1. Given how a portion of a whole is kept with self and the rest is divided among some others,  
(i) calculates the remaining part excepting the part retained by self.  
(ii) calculates the portion received by a named person.  
(iii) calculates the remaining portion after apportioning to two individuals.  
(iv) calculates the extent of the whole when the extent of a portion is given.  
(v) calculates the value of a remaining portion when the value of the part separated for self is given.

2. When a diagram of a rectangular land with a shaded right angled sector at one end is given,
- finds the length of the curved boundary of the shaded part.
  - calculates the area of the shaded part.
  - finds the area of the remaining portion of land excepting the shaded area.
  - draws with measurements on the given diagram, how a right angled-triangular portion of land which is of area a multiple of the area of the shaded region is separated out so that the breadth of the rectangle is one boundary.
3. Given the market price of a share of a company and the amount invested in it,
- finds the number of shares bought.
  - finds the annual dividend income when the annual dividend paid per share is given.
- When it is said that all the shares are sold on an occasion when the market price of a share has gone up,
- finds the capital gain.
  - indicates the total income as a percentage of the amount invested.
  - finds the income if another amount is invested under the same conditions.
4. (a)
- Describes and writes a named set using a Venn diagram drawn with elements.
  - Writes in sets notation, the shaded area of the Venn diagram.
  - Writes the number of elements in the intersection of two sets given in the Venn diagram.
- (b)
- Indicates by a point graph, the sample space that includes the information in relation to the availability of the bus type when commuting by three types of buses running in a route.
  - Writes the probability of getting buses not belonging to the same type when commuting back and forth.
5. (i) Fills in the blanks in the frequency column and the cumulative frequency column in the given table.
- (ii) Writes the class interval to which the highest frequency of the given frequency distribution belong.
- (iii) Draws the cumulative frequency curve of the given frequency distribution on the two axes given.
- (iv) Calculates the minimum amount that may have been collected from all the students in the given frequency distribution.

**Paper II**

1. Given the loan amount that has to be paid within a stipulated period of time under a given annual interest rate,
- calculates the total interest required to be paid during the given period.
  - calculates the monthly instalment with interest.
  - finds the monthly income received if the loan obtained is deposited at a given monthly interest rate.
  - point out with reasons whether by the end of the due period of the loan, the income from the deposited sum exceeds the loan obtained.

2. (a) (i) Completes an incomplete table comprising of values corresponding to the values of  $x$  satisfying a function of the type  $y = (x \pm a)(x \pm b)$  where  $a$  and  $b$  are integers.
- (ii) Using the above table, draws the graph of the function within the given range calibrating the axes according to a suitable scale.
- (b) Using the above graph,
- (i) writes the axis of symmetry of the graph.
- (ii) finds the roots of the equation  $y = 0$ .
- (iii) writes the value interval of  $x$  where  $y \leq 0$
- (c) Decides the equation of the quadratic function  $y$  of which the coefficient of  $x^2$  is 1, when the roots of the equation  $y = 0$  are given.
3. (a) (i) Develops a pair of simultaneous equations using the information given.
- (ii) Calculates the values of the two unknowns solving the pair of simultaneous equations.
- (iii) Decides how an amount of money should be handled according to given information.
- (b) (i) Solves the given quadratic equation using the formula or any other method and shows that the solution is a given expression.
- (ii) Finds the value of the positive root by substituting the given value.
4. (i) Simplifies an algebraic expression containing the square of a binomial expression.
- (ii) Factorises an expression of the type  $ax^2 + bx + c$ .
- (iii) Subtracts two algebraic fractions with unequal algebraic expressions in the denominator.
- (iv) Indicates given information by a matrix and writes its order.
5. (a) (i) Marks the given information in a diagram when the distance between a tower and a tree and the angle of elevation of the top of the tower from the top of the tree are given.
- (ii) Calculates the height of the tower to two decimal places using trigonometric tables.
- (b) Given a table containing the distance traveled by a moving object and the time taken.
- (i) draws the distance-time graph to illustrate the motion of the object.
- (ii) shows that a given relationship between the speed of the object during the first and last six seconds is true.
6. (i) Writes the modal class of a given frequency distribution.
- (ii) Decides on the truth or falsehood of the prediction made in relation to an event using the mean found.
7. (a) (i) Using the information given, writes the first three terms of a progression of numbers and decides what progression it is.
- (ii) Calculates which term of the progression a given value is.
- (ii) Explains with reasons whether a given target can be achieved.
- (b) Finds the sum of an initial number of terms of a given geometric progression.

8. In a right angled triangle, when the point at which a perpendicular drawn to the mid point of one side meets another side is given
- (i) draws a diagram to show the given information and shows that a named triangle is an isosceles triangle.
  - (ii) verifies a given rider.
9. Given a diagram with a diameter of a circle, a cyclic quadrilateral of which that diameter is a diagonal, and a tangent drawn to the circle from a terminal point of the diameter,
- (i) finds the value of the angle subtended by an arc on the centre when the value of the angle subtended by that arc on the circle is given.
  - (ii) writes correctly the relevant theorem for two angles in the same named sector in the diagram to be equal.
  - (iii) gives reasons for a given angle to have a given value.
  - (iv) presents reasons for a named triangle in the diagram to be an equilateral triangle.
  - (v) presents reasons for two lines in the given diagram to be parallel or not.
10. (i) Constructs a triangle when the lengths of two sides and the included angle of those two sides are given.
- (ii) Constructs the locus of a point equidistant from the two vertices of the triangle.
  - (iii) Constructs the circle that touches the terminal point of a side of the triangle and passes through another vertex of the triangle.
  - (iv) Measures and writes the radius of that circle.
  - (v) Marks a point that is equidistant from two vertices of the triangle and is at a given distance from the two points.
  - (vi) Given the length of a side, constructs the rhombus in which the diagonal is a named side of the constructed triangle.
11. (a) Shows that the number of spheres of given radius that can be made without wasting metal by melting the metal rod of given length and uniform cross section radius which is given in algebraic form, is equal to a given expression.
- (b) Calculates the value of an expression of type  $\frac{a^2b}{c}$  using the logarithms tables where  $a, b$  are numbers between 0 and 10 and  $c$  is less than 30, and gives the answer to two nearest decimal places.
12. (a)(i) Completes an incomplete Venn diagram with three intersecting sets using given information.
- (ii) Finds the number of elements belonging to an area in the Venn diagram described in words.
  - (iii) Calculates the number of elements belonging to a named area.
- (b)(i) Represents two events obtained from a selection test with relevant probabilities in a tree diagram.
- (ii) Finds the probability of an event represented by the tree diagram.
  - (iii) Finds the number of personnel relevant to a named event given the number of individuals facing an examination.

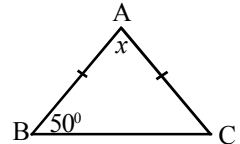
1.2 Paper  
Mathematics I - Part A

Answer all the questions in this paper itself.

1. From the following, select and write the numbers which do not give a whole number as the square root.

4, 16, 10, 9, 12

2. Find the value of  $x$  according to the data in the figure.



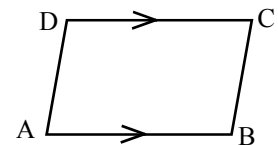
3. The area of a circular lamina is  $44 \text{ m}^2$ . What is the area of a sector cut from it with an angle of  $90^\circ$  at the centre?

4. Solve  $\frac{x+1}{5} = 2$ .

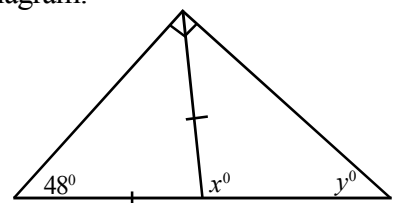
5. A bag contains between 10 and 20 identical balls of different colours including red. When a ball is randomly taken from it, its probability of being a red ball is  $\frac{3}{7}$ . How many balls were in the bag?

6.  $5^3 = 125$ . Write this in logarithm form.

7. Write a requirement for the quadrilateral shown in the diagram to be a parallelogram.



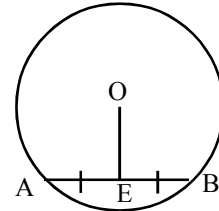
8. Find the values of  $x$  and  $y$  using the information given in the diagram.





9. Simplify  $\frac{x}{4} - y + \frac{x}{2} + 4y$ .

10. AB is a chord of the circle of centre O shown in the figure. AE = EB.  
 (i) What is the relationship between OE and AB?  
 (ii) Fill in the blank and complete the following expression.  
 $OB^2 = OE^2 + \dots\dots$

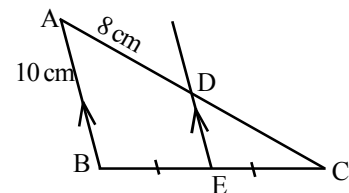


11. The circumference of the base of a right-circular cylinder is 15 cm. Its height is 10 cm. Find the area of the curved surface of the cylinder.

12.  $A = \begin{bmatrix} 2 & 5 \\ 3 & 0 \end{bmatrix}$ ,  $B = \begin{bmatrix} 1 & 3 \\ 2 & 1 \end{bmatrix}$ ,  $2A - B = \begin{bmatrix} x & 7 \\ 4 & y \end{bmatrix}$ . Find the values of x and y.

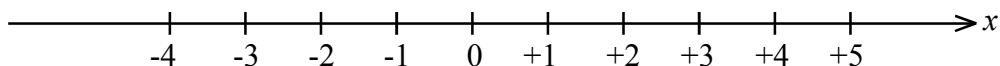
13. Write the equation of the straight line with intercept 4 which is parallel to the straight line given by  $y = 3x - 2$ .

14. In the diagram, AD = 8 cm and AB = 10 cm. As per the information given, find the lengths of the sides AC and DE.

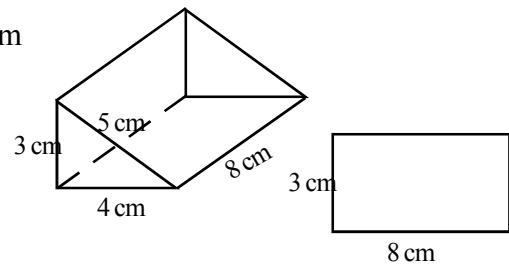


15. 10 men can complete a work in 6 days. After working for two days, two men didn't turn up for work.  
 (i) How many man days of work are left after two days?  
 (ii) How many days will be taken by 8 men to complete the rest of the work by 8 men?

16. Solve the inequality  $3x + 2 \geq 8$  and indicate the solution on the following number line.

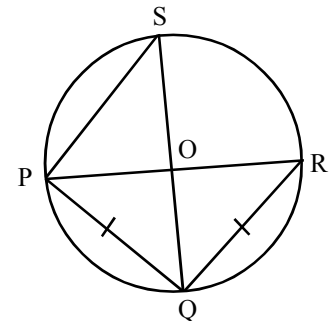


17. One rectangular face of the prism given in the diagram has been drawn. Draw with measurements, the other two rectangular faces.

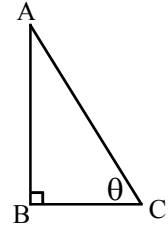


18. A 12% tariff is charged for an item. Find the value of an item worth Rs. 18 000 after paying tariff.

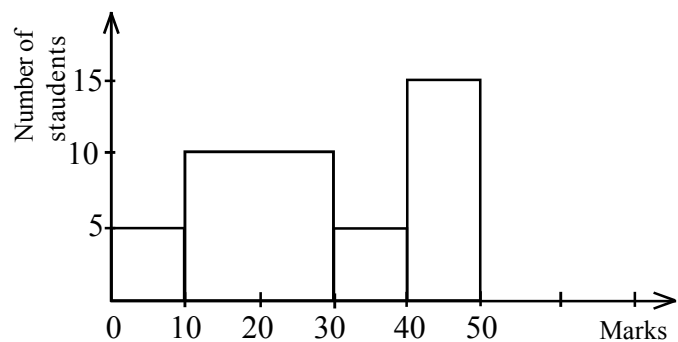
19. PR is a diameter of the circle of centre O shown in the figure. Point Q is located on the circle.  $PQ = QR$ .
- (i) What is the value of  $\hat{PQR}$  ?
- (ii) What is the value of  $\hat{PSQ}$  ?



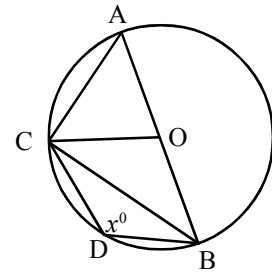
20. Find the value of  $\cos \theta$  if  $\sin \theta = \frac{12}{13}$ .



21. A histogram drawn to represent the marks scored by several students in a mathematics test is shown in the diagram.
- (i) How many students have scored marks between 10 and 30 ?
- (ii) What is the total number of students who appeared for the test?



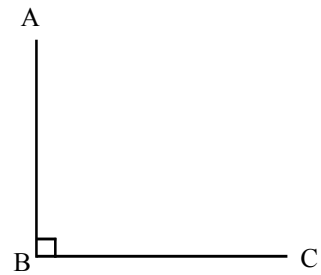
22. Points C and D are located on the circle shown in the figure where AB is a diameter. If  $\widehat{CDB} = x^\circ$ , write the magnitude of each of the following angles in terms of  $x^\circ$ .



- (i)  $\widehat{CAB}$
- (ii)  $\widehat{CBA}$

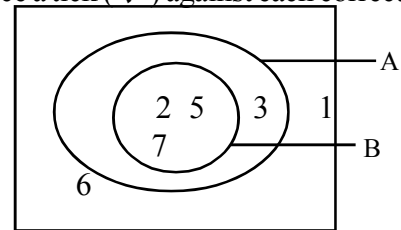
23. (i) Write the expression  $x^2 + 2ax + a^2$  as a perfect square.  
 (ii) Using it, factorise  $x^2 + 2ax + a^2 - 9$ .

24. A row of ornamental plants should be placed at an equal distance from the two walls AB and BC depicted in the figure. Using the knowledge on loci, draw in the figure how this row of plants should be placed.



25. According to the information given in the Venn diagram, place a tick (✓) against each correct statement.

$A \cap B = B$	
$A \cap B = A$	
$A \cup B = B$	
$A \cup B = A$	

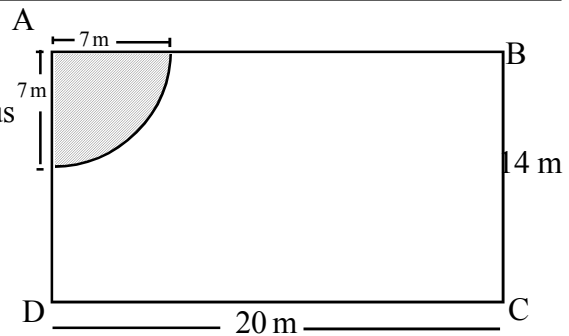


Part B

Answer all the questions in this paper itself.

1. A father reserved  $\frac{1}{5}$  th of a land for himself and divided the remaining portion among his children such that his son received  $\frac{1}{2}$  of this portion and the rest was divided equally among the three daughters.
  - (i) What fraction of the total land is the extent of land divided among the children?
  - (ii) What fraction of the total land was received by the son?
  - (iii) What fraction of the total land is left to be divided among the three daughters?
  - (iv) If one daughter received 30 ha, find the area of the total land.
  - (v) If the value of the part kept by the father was Rs. 4.5 million, what is the value of the part received by a daughter?

2. ABCD is a rectangular plot of land owned by Saman. The leafy vegetable 'gotukola' has been grown in the shaded area which is a sector of radius 7m. (Take  $\pi = \frac{22}{7}$ )



- (i) Find the length of the curved boundary of the section where gotukola has been grown.
- (ii) What is the area of the section in which gotukola has been grown?
- (iii) What is the area of the remaining part of the land where gotukola is not grown?
- (iv) Saman plans to separate out a right-angled triangular plot of land so that its area is three times the gotukola grown area. If BC is to be one of its boundaries and the other boundary is to lie on DC, sketch the plot of land that can be separated out with measurements on the diagram given.

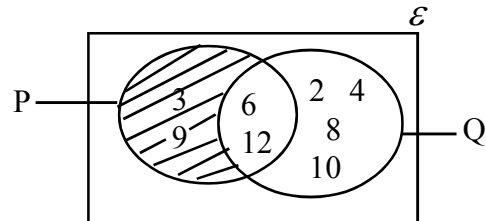
3. A man invested Rs. 50 000 to buy shares when the market price of a share of 'Lanka' company became Rs. 10.
- (i) How many shares did he buy?
  
  - (ii) If an annual dividend of Rs. 2 is paid for a share, find his annual income from dividends.

When the market price of a share of 'Lanka' company became Rs. 14 the man sells all his shares.

- (iii) Find his capital gain.
  
- (iv) If he sold all his shares for the aforesaid market price after receiving the annual dividend, indicate the sum of his dividend income and capital gain as a percentage of the invested amount.
  
- (v) If an investor receives the above dividends and capital gain, what is the total income he gets at the end of the year if Rs. 100 000 is invested?

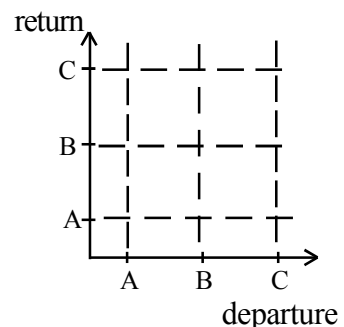
4. (a) Answer the questions asked on the Venn diagram given below.

- (i) Describe set P in words.  
 $P = \{ \dots\dots\dots \}$
  
- (ii) Indicate the shaded area in set notation.  
 .....
  
- (iii) Fill in the blank.  $n(P \cap Q) = \dots\dots\dots$



(b) A, B and C are three types of buses running on a particular route. A passenger has an equal chance of travelling in these three types of buses.

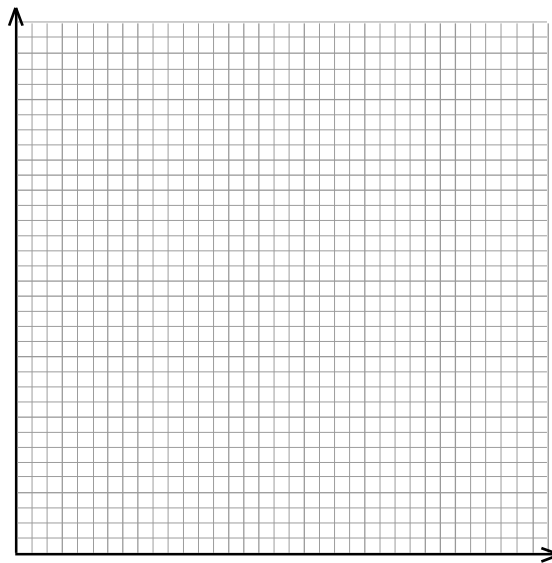
- (i) Indicate on the grid the sample space of the type of bus a man will travel on during his departure and return.
  
- (ii) Mark on the grid the event of the passenger getting buses not belonging to the same type during the departure and return journeys and find its probability.



5. Details of the donations made by grade 10 students for a pirth chanting ceremony at school are given below. ( If  $x$  belongs to the class interval  $0 - 20$ , then  $0 \leq x < 20$  .

Class interval (Donation)	Frequency (Number of students)	Cumulative frequency
0 - 20	8	8
20 - 40	12	20
40 - 60	15	.....
60 - 80	10	.....
80 - 100	.....	50

- (i) Complete the above table.
- (ii) Write the class interval to which the donation made by the highest number of students belong.
- (iii) Draw the cumulative frequency graph on the given axes.



- (iv) If money was collected like this, what is the minimum amount of money that may have been collected from all the students?

**Mathematics II**

**Three hours**

- Answer 10 questions selecting five questions from part A and five questions from part B
- Every question is worth 10 marks.
- The volume of a right circular cylinder of base radius  $r$  and height  $h$  is  $\pi r^2 h$ .
- The volume of a sphere of radius  $r$  is  $\frac{4}{3} \pi r^3$ .

**Part A**

Answer five questions only

1. A sum of Rs. 360 000 is obtained from a financial institution at an annual simple interest rate of 12% under the agreement of paying off the loan within a period of 3 years.
- (i) What is the total interest that should be paid in 3 years?
  - (ii) If the instalments are paid equally and monthly, find the monthly instalment with the interest.
  - (iii) What is the monthly income received if the loan amount is deposited in another institution at a monthly interest rate of 2%?
  - (iv) By the end of the loan period, will the income received from the deposit exceed the loan amount? Give reasons for your answer.

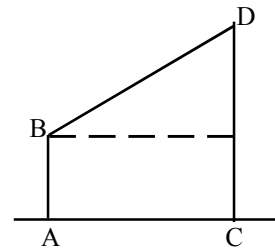
2. (a) An incomplete table which gives values of  $y$  corresponding to some of the  $x$  values of the function  $y = (x + 2)(x - 1)$  is indicated below.

$x$	- 4	-3	-2	-1	0	1	2	3
$y$	10	4	0	-2	-2	....	4	10

- (i) Complete the blank in the table.
  - (ii) Draw the graph of the function within the range given, selecting a suitable scale.
- (b) Using the graph,
- (i) write the equation of the axis of symmetry of the graph.
  - (ii) find the roots of the equation  $y = 0$ .
  - (iii) write the range of value of  $x$  where  $y \leq 0$ .
- (c) Write the equation of the quadratic function  $y$  of which the roots of the equation  $y = 0$  are -1 and 3 and the coefficient of  $x^2$  is 1.
3. (a) The price of a guava (pera) fruit is greater than the price of an orange by Rs. 15. Price of two oranges and a guava fruit is Rs. 165.
- (i) Construct a pair of simultaneous equations using this information.
  - (ii) Find separately, the price of an orange and the price of a guava fruit.
  - (iii) Sunil has Rs. 230. Find the number of each type of fruit he can buy separately without leaving any balance.

- (b) (i) Solve the quadratic equation  $3x^2 - 4x - 2 = 0$  by using the formula or by any other method and show that its roots are  $x = \frac{2 \pm \sqrt{10}}{3}$ .
- (ii) Find the value of the root  $x > 0$  taking  $\sqrt{10}$  as 3.16.
4. (a) (i) Simplify  $(x+1)^2 + 5(x+1) + 4$ .
- (ii) Factorise  $3x^2 + 11x + 10$ .
- (b) (i) Simplify  $\frac{1}{x+1} - \frac{2}{3(x-1)}$ .
- (ii) Two parcels contain wood apple and beli fruits. First parcel contains 3 wood apples and 5 beli fruits. Second parcel contains 4 wood apples and 4 beli fruits. Indicate this information by a matrix and write the order of the matrix.

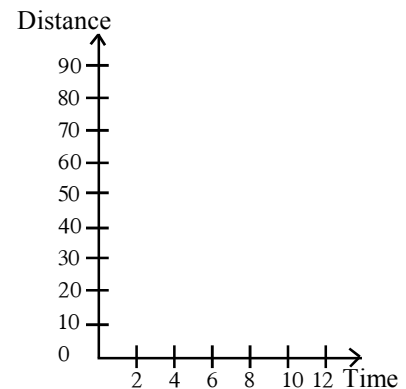
5. (a) The diagram shows a tree AB 4.5 m tall and a tower located 50 m away from it on a horizontal plane. The angle of elevation of D from B is  $42^\circ$ .
- (i) Copy the diagram and include the above information in it.
- (ii) Calculate the height of the tower correctly to two decimal places using trigonometric tables.



- (b) The following table presents the distance traveled by a moving object and the time taken for it.

Time (second)	2	4	6	8	10	12
Distance(metres)	10	20	30	50	70	90

- (i) Draw the given axes on the answer script and on it draw a distance-time graph to show the motion of the object.
- (ii) Show that the speed of the object in the final 6 seconds is twice its speed in the initial 6 seconds.



6. The following frequency distribution indicates the amount of rice sold by a sales outlet on each day during 30 days of a month.

- (i) What is the modal class of this distribution?

- (ii) As there are 2 500 kg of rice in the store, the merchant assumes that the rice is enough for the period of three months (90 days) to come. On the basis of the mean of the amount of rice sold per day, decide with reasons whether the assumption of the merchant is acceptable or not.

Amount of rice sold in a day (kg)	Number of days (f)
0 - 8	1
8 - 16	2
16 - 24	6
24 - 32	10
32 - 40	5
40 - 48	4



Part B

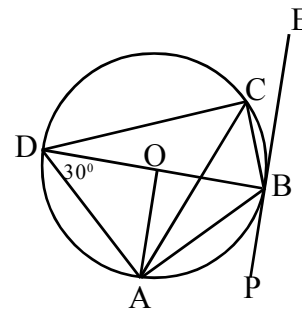
7. (a) On January 1st, Tanushi deposited Rs. 25 in her till with the idea that every month she will deposit Rs.10 more than the amount she did in the previous month.
- (i) Write the amounts of money Tanushi deposited in the first three months in the respective order. What type of progression is it?
  - (ii) In which month does Tanushi deposit Rs. 195?
  - (iii) Tanushi's target is to collect Rs. 3 000 in two years. Explain giving reasons whether Tanushi can achieve her target?

(b) Find the sum of the first 10 terms of the geometric progression 2, 4, 8, .....

8. In the triangle ADC, A is a right angle. E is the mid point of AC. The perpendicular drawn to AC at E meets DC at B.

- (i) Draw a diagram to indicate the above information and show that BAD is an isosceles triangle.
- (ii) Show that  $AC^2 + AD^2 = 4AB^2$ .

9. The tangent drawn to the circle of centre O at B is PE.

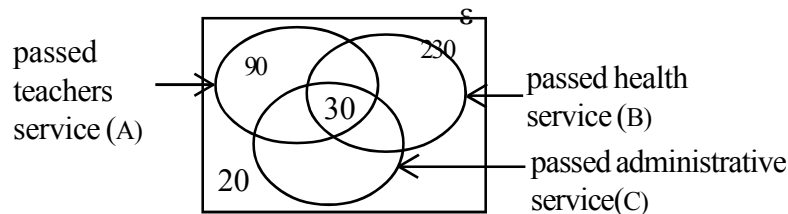


- (i) Find the value of  $\hat{AOB}$  if  $\hat{ADB} = 30^\circ$ . Give reasons.
  - (ii) Write the theorem for the equality  $\hat{ADB} = \hat{ACB}$ .
  - (iii) Give reasons for  $\hat{ABP} = 30^\circ$ .
  - (iv) Show that AOB is an equilateral triangle.
  - (v) A student says that the lines AB and DC are parallel. Explain with reasons whether you agree or not with this statement.
10. (i) Construct the triangle in which  $BC = 7.8$  cm,  $BA = 6.4$  cm and  $\hat{ABC} = 60^\circ$ .
- (ii) Construct the locus of a point equidistant from the points A and B.
  - (iii) Construct the circle which touches AC at A and passes through the point B.
  - (iv) Measure and write the radius of that circle.
  - (v) Mark point P which is 6 cm away from both points A and B.
  - (vi) Construct the rhombus whose side length is 6 cm and of which AB is a diagonal.

11.(a) Show that the number of solid spheres of radius  $2r$  that can be made by melting a 2.24 m long uniform cylindrical solid metal rod of radius  $r$  cm is  $\frac{21}{r}$ .

(b) Simplify  $\frac{(3.275)^2 \times 0.654}{26.52}$  using the logarithms table and give the answer correct to two decimal places.

12.(a) To recruit personnel to the teacher's service, health service and administrative service, an examination is held under three sections A, B, and C. The candidates should pass A for the teachers' service, B for the health service and C for the administrative service. The number who sat the examination was 460. 100 passed A and C. 90 passed B and C. 50 passed only A and B.



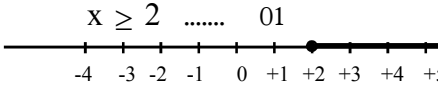
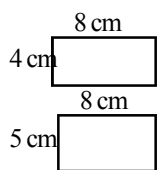
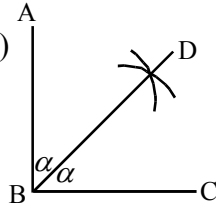
- (i) Copy the Venn diagram and complete it with the given information.
- (ii) How many have passed both the teachers' service and the health service parts?
- (iii) How many have passed only the administrative service part from the three sections?

(b) When issuing a driving licence, first a written test is held and a practical test is held for those who pass the written test. Those who qualify from both are given the licence. The probability of a candidate passing the written test is  $\frac{3}{5}$  and passing the practical test is  $\frac{3}{4}$ .

- (i) Draw a tree diagram indicating the probabilities of passing and failing the two tests.
- (ii) Find the probability of a candidate passing both the written and practical tests.
- (iii) If 500 sit the written test, how many would be expected to get the driving licence?

**1.3 Answers and the Marking Scheme**

**Mathematics - I -Part A**

- (1) 10, 12 -- ②
- (2)  $x = 180^0 - 100^0$  .... 01  
 $x = 80^0$  .... 01 -- ②
- (3)  $\frac{90}{360} \times 44$  .... 01  
 $11m^2$  .... 01 -- ②
- (4)  $x = 9$  -- ②  
 $x + 1 = 10$  .... 01
- (5) 14 -- ②
- (6)  $\log_5 125 = 3$  -- ②
- (7)  $AB = DC$  or  $AD // BC$  -- ②
- (8)  $x = 96^0$  .... 01  
 $y = 42^0$  .... 01 -- ②
- (9)  $\frac{3x}{4} + 3y$  -- ② or  
 $3\left(\frac{x}{4} + y\right)$  -- ②
- (10) (i)  $OE \perp AB$  .... 01  
(ii)  $OB^2 = OE^2 + EB^2$  .... 01 -- ②
- (11)  $15 \times 10$  .... 01  
 $150cm^2$  .... 01 -- ②
- (12)  $x = 3$  .....01  
 $y = -1$  .... 01 -- ②
- (13) Gradient 3 .... 01  
 $y = 3x + 4$  .... 01 -- ②
- (14)  $AC = 16$  cm .... 01  
 $DE = 5$  cm .... 01 -- ②
- (15)  $10 \times 6 - 10 \times 2 = 40$  .... 01  
 $\frac{40}{8} = 5$  days .... 01 -- ②
- (16)  $x \geq 2$  ..... 01  
  
Number line .... 01 -- ②
- (17)  .... 01 -- ②
- (18)  $\frac{112}{100} \times 18\ 000$  .... 01  
Rs. 20 160 .... 01 -- ②
- (19)  $\hat{PQR} = 90^0$  .... 01  
 $\hat{PSQ} = 45^0$  .... 01 -- ②
- (20)  $\cos \theta = \frac{5}{13}$  -- ②  
 $BC = 5$  cm .... 01
- (21) (i) 20 .... 01  
(ii) 45 .... 01 -- ②
- (22) (i)  $180^0 - x^0$  .... 01  
(ii)  $x^0 - 90^0$  .... 01 -- ②
- (23)  $(x + a)^2$  .... 01  
 $(x + a + 3)(x + a - 3)$  .... 01 -- ②
- (24)  -- ②
- (25) 

$A \cap B = B$	✓
$A \cap B = A$	
$A \cup B = B$	
$A \cup B = A$	✓

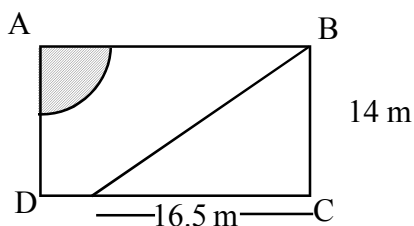
 -- ②

Mathematics - I Part B

- (1) (a) (i) Fraction of the land divided among the children  $= 1 - \frac{1}{5} = \frac{4}{5}$  ---①
- (ii) Fraction of the land received by the son  $= \frac{1}{2}$  of  $\frac{4}{5} = \frac{2}{5}$  ---①+①
- (iii) Fraction of the land received by the three daughters  $= \left(\frac{4}{5} - \frac{2}{5}\right) = \frac{2}{5}$  ---①
- (iv) Fraction of the land received by a daughter  $= \frac{1}{3}$  of  $\frac{2}{5} = \frac{2}{15}$
- $\therefore \frac{2}{15} \rightarrow 30$  ---①
- Area of the total land  $= 30 \times \frac{15}{2} = 225ha$  ---①
- (v) Value of the part received by a daughter
- $\frac{1}{5} = 4.5$  million ---①
- $\frac{1}{15} = 1.5$  million ---②
- $\frac{2}{15} = 3$  million ---① ⑩
- (2) (i) Length of the curved boundry  $= \frac{1}{4} \times 2\pi r$
- $= \frac{1}{4} \times 2 \times \frac{22}{7} \times 7m$  ---①
- $= 11m$  ---①
- (ii) Gotukola grown area  $= \frac{1}{4} \times \pi r^2$
- $= \frac{1}{4} \times \frac{22}{7} \times 7m \times 7m$  ---①
- $= 38.5m^2$  ---①
- (iii) Area of the whole land  $= 20m \times 14m = 280m^2$  ---①
- Area of the remaining part  $= 280m^2 - 38.5m^2 = 241.5m^2$  ---①
- (iv) Three times the grown area  $= 3 \times 38.5m^2 = 115.5m^2$  ---①
- Area of the triangular plot of land  $= \frac{1}{2}BC \times x$
- $\therefore \frac{1}{2}BC \times x = 115.5$

$$\frac{1}{2} \times 14 \times x = 115.5 \quad \text{--- ①}$$

$$\therefore x = 16.5 \text{ m} \quad \text{--- ①}$$



--- ①

10

(3) (i)  $\frac{50\,000}{10} = 5\,000 \quad \text{--- ②}$

(ii)  $5\,000 \times 2 = 10\,000 \quad \text{--- ①}$

(iii)  $4 \times 5\,000 = 20\,000 \quad \text{--- ①}$

(iv) Dividend income  $= 5\,000 \times 2 \text{ Rs. } 10\,000$   
 Capital gain  $= 4 \times 5\,000 = \text{Rs. } 20\,000 \quad \text{--- ①}$   
 Dividend income and capital gain  $= 10\,000 + 20\,000 \quad \text{--- ①}$   
 $= \text{Rs. } 30\,000 \quad \text{--- ①}$

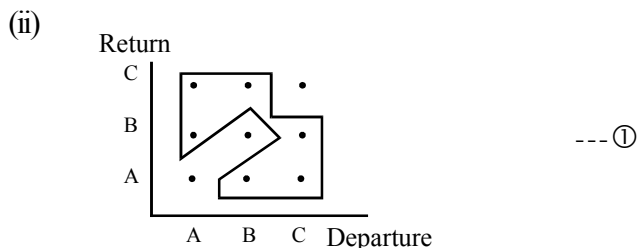
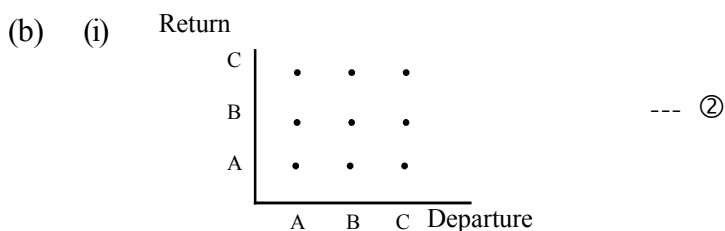
As a percentage of invested amount  $= \frac{30\,000}{50\,000} \times 100\% = 60\% \quad \text{--- ①}$

(v) Total income by investing Rs. 100 000  $= 100\,000 + 60\,000$   
 $= \text{Rs. } 160\,000 \quad \text{--- ② 10}$

(4) (a) (i)  $P = \{ \text{Multiples of 3 less than 13} \} \quad \text{--- ①}$

(ii)  $P \cap Q' \quad \text{--- ②}$

(iii)  $n(P \cap Q) = 2 \quad \text{--- ②}$



$$\frac{6}{9} \text{ or } \frac{2}{3} \quad \text{--- ② 10}$$

(5) (i)

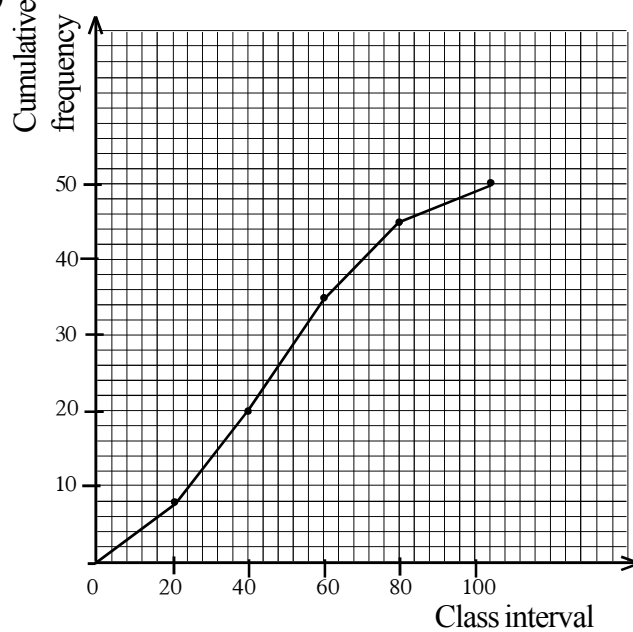
Class interval (Donation)	Frequency (Number of students)	Cumulative frequency
0 - 20	8	8
20 - 40	12	20
40 - 60	15	.....35
60 - 80	10	.....45
80 - 100	.....5	50

--- ①  
--- ①  
--- ①

(ii) 40-60

--- ①

(iii)






Axes --- ①  
Points --- ①  
Curve --- ①  
Connecting curve to 0 --- ①

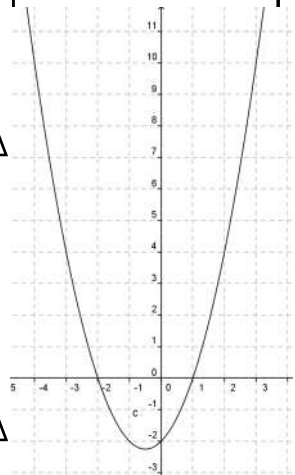
(iv)  $(0 \times 8) + (20 \times 12) + (40 \times 15) + (60 \times 10) + (80 \times 5) = 1840$

--- ②

Mathematics II

Question No.		Answer	Marks	Other
1	(i)	$360\,000 \times \frac{12}{100} \times 3$  = Rs. 129 600	1 1	(2)
	(ii)	$129\,600 + 360\,000$ = Rs.489 600  $= \frac{489\,600}{36}$ = Rs.13 600	1 1 1	(4)
	(iv)	$360\,000 \times \frac{2}{100}$  = Rs. 7 200	1 1	(2)
	(v)	$7\,200 \times 36 = 259\,200,$ $360\,000 > 259\,200$  Loan not exceeding the income	1 1	(2)
				<b>10</b>

Question No.		Answer	Marks	Other
2	(a)	(i) obtain 0	1	(1)
		(ii) Calibrating axes / Marking the points  Drawing the curve	1+1 1	(3) 
	(b)	(i) $x = -\frac{1}{2}$	1	
		(ii) $x = -2$ and $x = 1$	2	
		(iii) $-2 < x < 1$	2	(5) 
	(c)	$y = (x + 1)(x - 3)$	1	(1) 
			<b>10</b>	



**Programme of improving G.C.E (O.L.) Examination results**

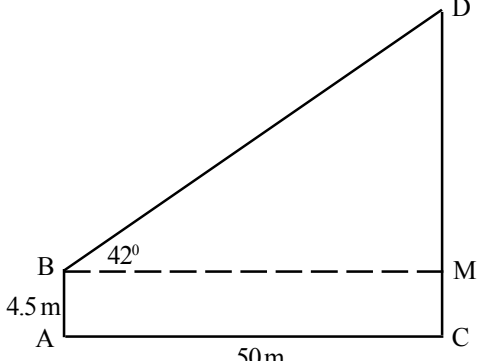
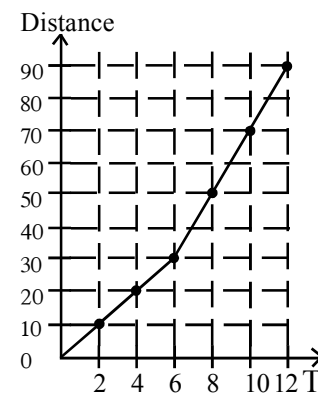
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**Mathematics Question Paper - I**

Question No.		Answer	Marks		Other
3	(a)	(i) If price of an orange is $x$ and the price of a guava fruit is $y$ $x + 15 = y$ $2x + y = 165$	2	(2)	
		(ii) $x - y = -15$ --- (i) $2x + y = 165$ --- (2) (1) + (2) $3x = 150$ $x = 50$ $y = 65$ Price of an orange = Rs 50 Price of a guava fruit = Rs. 65	1 1 1 1	(4)	
	(b)	(i) $x = \frac{4 \pm \sqrt{16 - 4 \times 3 \times -2}}{2 \times 3}$ $x = \frac{4 \pm 2\sqrt{10}}{6} = \frac{2 \pm \sqrt{10}}{3}$	1 1		
	(ii) $\frac{2 + 3.16}{3} = 1.72$	1	(3)	7 3	<b>10</b>

Question No.		Answer	Marks		Other
(4)	(a)	(i) $x^2 + 2x + 1 + 5x + 5 + 4$ $x^2 + 7x + 10$	2 1	(3)	
		(ii) $3x^2 + 11x + 10$ $(x + 2)(3x + 5)$	2	(2)	5
	(b)	(i) $\frac{3(x-1) - 2(x+1)}{(x+1)3(x-1)} = \frac{3x-3-2x-2}{(x+1)3(x-1)}$ $\frac{x-5}{3(x+1)(x-1)}$	2 1	(3)	
	(ii) $\begin{pmatrix} 3 & 5 \\ 4 & 4 \end{pmatrix}$ Order of the matrix = $2 \times 2$	1 1	(2)	5	<b>10</b>



Question No.	Answer	Marks	Other
(5) (a) (i)			
	<p>To mark 4.5 m and 50 m</p> <p>To mark the angle of elevation</p> <p>From triangle BDM</p> $\tan 42^\circ = \frac{DM}{BM}$ $0.9009 = \frac{DM}{50}$ <p>45.05</p> <p>Height of the tower = (45.05 + 4.5) = 49.55 m</p>	<p>1</p> <p>1 (2)</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	
(b) (i)			
	<p>(ii) Speed in initial 6 seconds = <math>\frac{30 - 10}{6 - 2} = \frac{20}{4} = 5 \text{ms}^{-1}</math></p> <p>Speed in final 6 seconds = <math>\frac{90 - 30}{12 - 6} = \frac{60}{6} = 10 \text{ms}^{-1}</math></p> <p>Speed in final 6 seconds is twice the speed in initial 6 seconds. (10 = 5 × 2)</p>	<p>1</p> <p>1 (2)</p> <p>1</p>	<p>(4) (6)</p> <p>(2)</p> <p>(4) (6)</p> <p>(2) <b>10</b></p>

Question No.	Answer	Marks	Other																																													
(6)	<table border="1" style="width:100%; border-collapse: collapse; margin-bottom: 10px;"> <thead> <tr> <th style="width:25%;">Amount of rice sold in a day (kg)</th> <th style="width:10%;">No. of days (f)</th> <th style="width:10%;">Mid value (x)</th> <th style="width:15%;">Deviation (d)</th> <th style="width:10%;">fd</th> </tr> </thead> <tbody> <tr><td>0 - 8</td><td>1</td><td>4</td><td>-24</td><td>-24</td></tr> <tr><td>8 - 16</td><td>2</td><td>12</td><td>-16</td><td>-32</td></tr> <tr><td>16 - 24</td><td>6</td><td>20</td><td>-8</td><td>-48</td></tr> <tr><td>24 - 32</td><td>10</td><td>28</td><td>0</td><td>0</td></tr> <tr><td>32 - 40</td><td>5</td><td>36</td><td>+8</td><td>+40</td></tr> <tr><td>40 - 48</td><td>4</td><td>44</td><td>+16</td><td>+64</td></tr> <tr><td>48 - 56</td><td>2</td><td>52</td><td>+24</td><td>+48</td></tr> <tr><td></td><td>30</td><td></td><td></td><td>-104 +152</td></tr> </tbody> </table>	Amount of rice sold in a day (kg)	No. of days (f)	Mid value (x)	Deviation (d)	fd	0 - 8	1	4	-24	-24	8 - 16	2	12	-16	-32	16 - 24	6	20	-8	-48	24 - 32	10	28	0	0	32 - 40	5	36	+8	+40	40 - 48	4	44	+16	+64	48 - 56	2	52	+24	+48		30			-104 +152		
	Amount of rice sold in a day (kg)	No. of days (f)	Mid value (x)	Deviation (d)	fd																																											
	0 - 8	1	4	-24	-24																																											
	8 - 16	2	12	-16	-32																																											
	16 - 24	6	20	-8	-48																																											
	24 - 32	10	28	0	0																																											
	32 - 40	5	36	+8	+40																																											
	40 - 48	4	44	+16	+64																																											
	48 - 56	2	52	+24	+48																																											
		30			-104 +152																																											
	$\sum fd = +48$																																															
(i)	Modal class = 24 - 32	1	①																																													
(ii)	Column of mid values	1																																														
	Column of deviations	1																																														
	Column of $fd$	1																																														
	$\sum fd = +48$	1																																														
	Mean = $28 + \frac{\sum fd}{30}$  $= 28 + \frac{48}{30}$  $= 29.6$	1																																														
	Mean = 30 kg	1	⑦																																													
(iii)	Amount expected to be sold in 90 days $= 30 \times 90 \text{ kg} = 2700 \text{ kg}$ $2700 > 2500$ His assumption is not acceptable.  2500 kg is not enough.	1	②																																													
		1	<b>10</b>																																													

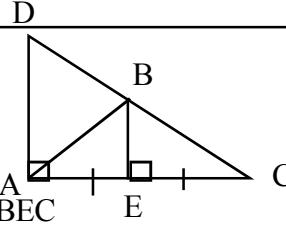


Question No.			Answer	Marks	Other	
(7)	(a)	(i)	25, 35, 45, .....arithmetic progression.	1	①	
		(ii)	$T_n = a + (n - 1)d$	1		
			$195 = 25 + (n - 1)10$			
			$170 = (n - 1) 10$			
			$n = 18$	1	②	
	(b)	(iii)	$S_n = \frac{n}{2}(2a + (n - 1)d)$	1		
			$S_{24} = \frac{24}{2}\{2 \times 25 + (24 - 1)10\}$	1		
			$= 12(50 + 230)$			
			$= 12 \times 280 = 3360$	1		
			$3000 < 3360$ Thanushi can achieve her target.	1	④	△ 7
	$S_n = \frac{a(r^n - 1)}{(r - 1)}$	1				
	$= \frac{2(2^{10} - 1)}{2 - 1}$					
	$= 2 \times 1\ 023 = 2\ 046$	2		△ 3		
					<b>10</b>	

Question No.

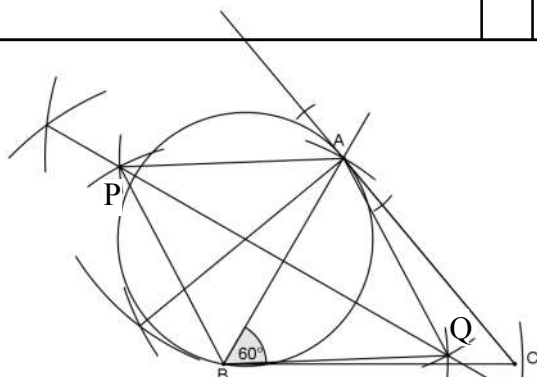
Answer

Marks

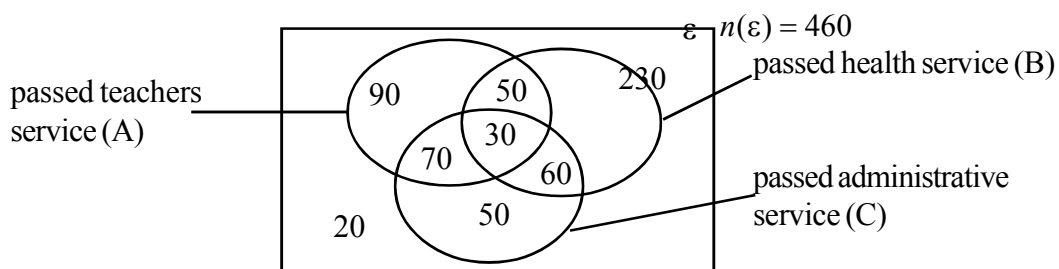
Other

<p>(8)</p>	<p>(i)</p>	 <p>In the triangles ABE and BEC  <math>AE = EC</math> (given)  <math>\hat{AEB} = \hat{BEC}</math> (given)  <math>BE = BE</math> (common)  <math>\therefore \triangle AEB = \triangle BEC</math> (S.A.S)  <math>\hat{EBA} = \hat{ECB}</math> (corresponding angles of congruent triangles)  <math>\hat{EBA} = \hat{BAD}</math> (EB//AD, alternate angle)  <math>\hat{ECB} = \hat{ADB}</math> (EB//AD, corresponding angle)  <math>\therefore \hat{BAD} = \hat{ADB}</math>  <math>\therefore BA = BD</math>  <math>\therefore \triangle BAD</math> is an isosceles triangle.</p>	<p>2</p>	<p>5</p>	<p>⑦</p>		<p><b>10</b></p>
<p>(ii)</p>		<p>Applying Pythagoras' theorem to <math>\triangle ACD</math>  <math>AC^2 + AD^2 = CD^2</math>  <math>AC^2 + AD^2 = (DB + BC)^2</math>  <math>AC^2 + AD^2 = (2BC)^2</math> (BD = BC)  <math>AC^2 + AD^2 = 4AB^2</math> (AB = BC)</p>	<p>3</p>	<p>③</p>		<p><b>10</b></p>	
Question No.	Answer	Marks			Other		
<p>(9)</p>	<p>(i) <math>\hat{AOB} = 60^\circ</math>                      (angle subtended at centre = <math>2 \times</math> angle subtended on circumference)</p> <p>(ii) Angles in the same segment of a circle are equal.</p> <p>(iii) Angle between tangent and chord is equal to the angle in the alternate segment.</p> <p>(iv) <math>\hat{OAB} = \hat{OBA} = 60^\circ</math>  <math>\therefore OA = OB = AB</math>  <math>\therefore OAB</math> is an equilateral triangle.</p> <p>(v) <math>\hat{OBA} = 60^\circ</math> (OAB is an equilateral triangle.)  <math>\hat{DCA} = 60^\circ</math> (angles of the same segment)  <math>\hat{OAB} = 60^\circ</math>  <math>\hat{DCA} \neq \hat{CAB}</math>                      DC and AB are not parallel.                      do not agree</p>	<p>1</p> <p>1</p> <p>1</p> <p>2</p> <p>2</p> <p>1</p> <p>1</p> <p>1</p>	<p>②</p> <p>①</p> <p>②</p> <p>②</p> <p>③</p>	<p>②</p> <p>①</p> <p>②</p> <p>②</p> <p>③</p>	<p><b>10</b></p>		

	(ii) Perpendicular bisector of AB	1	(1)	
	(iii) Perpendicular at A to AC	1		
	Mark the centre	1		
	Drawing the circle correctly	1	(3)	
	(iv) Radius of the circle	1	(1)	
	(v) Marking the point P	1	(1)	
	(vi) Completing the Rhombus APBQ.	1	(1)	
				<b>10</b>



Question No.	Answer	Marks	Other	
(11) (a)	Volume of the rod = $\pi r^2 h = \pi r^2 \times 224 \text{cm}^3$ = $224\pi r^2 \text{cm}^3$	2		
	Volume of a sphere = $\frac{4}{3}\pi(2r)^3$	1		
	Number of spheres made = $\frac{224\pi r^2}{\pi \cdot 8r^3} \times \frac{3}{4}$	1		
	= $\frac{28 \times 3}{r \times 4} = \frac{21}{r}$	1	(5) $\triangle 5$	
(b)	$A = \frac{(3.275)^2 \times 0.654}{26.52}$			
	$\lg A = 2 \lg 3.275 + \lg 0.654 - \lg 26.52$	1		
	= $2 \times 0.5152 + \bar{1}.8156 - 1.4235$	1		
	= $1.0304 + \bar{1}.8156 - 1.4235$	1		
	= $0.8460 - 1.4235 = \bar{1}.4225$	1		
	Antilog $\bar{1}.4225 = 0.2645$	1	(5) $\triangle 5$	
				<b>10</b>



Question No.	Answer	Marks	Other	
(12)(a)	(i) Completing the Venn diagram with details	1	①	
	(ii) Passed both teacher and health service parts = 80	2	②	
	(iii) Passed only the administrative part = 50	2	②	5 △
(b)	(i) Tree diagram with details	2	②	
	(ii) $\frac{3}{5} \times \frac{3}{4} = \frac{9}{20}$ fail written test	1	①	
	(iii) $500 \times \frac{9}{20} = 225$	2	②	5 △

10

2.1 Objectives  
Paper I

1. Given the circumference of a circle, finds the arc length of a semicircle of the same radius.
2. Identifies between which two closest whole numbers lies the square root of a number which is not a square of a whole number.
3. Factorises the given difference of two squares.
4. States a requirement for a given quadrilateral in which two opposite sides are marked as equal, to be a parallelogram.
5. Finds a task in man days given the number of men and number of days required for the task.
6. Writes with elements a set given in set generation form.
7. Given the value of one angle of a pair of angles in the same sector of a circle, writes the value of the other angle.
8. Given the coordinates of a point on a straight line drawn on a Cartesian plane and passing through the origin, writes the gradient of that line.
9. Factorises the given trinomial quadratic expression.
10. Of three triangles given with information, selects and names the pair of congruent triangles.
11. Solves an inequality of the form  $ax + b < c$ ;  $a, b, c \in \mathbb{Z}^+$  and writes the positive whole number solutions.
12. Simplifies by division two given algebraic fractions which contain algebraic terms in the denominator and the numerator.
13. Finds the radius of the base of a cylinder made from a rectangular paper of given length and width.
14. Solves a problem that includes subtraction and multiplication of fractions.
15. Writes the relationship between two given lines in a given geometrical diagram containing a diameter and a chord of a circle.
16. Indicates by a sketch the locus of a point which subtends a right angle on one side of a given straight line.
17. Finds the value of angle  $x$ , given that one angle of a right-angled triangle is  $x$  and given a diagram which contains an isosceles triangle with interior angle  $x$  within the right-angled triangle.

18. (i) Finds the volume of a prism given its cross sectional area and length.  
(ii) Calculates the length of the side of a cube whose volume is equal to the volume of the prism.
19. Given the angle subtended on a circle by an arc, calculates the angle subtended by that arc at the centre and the value of an angle contained in the triangle formed by joining the two ends of the arc and the centre.
20. Given the property value and the rates percentage of a house, calculates the annual rates charged for the house.
21. Names two types of quadrilaterals in which the diagonals bisect perpendicularly.
22. Given the probability of the germination of seeds in two seed samples, finds the probability of both the seeds germinating when a seed from each sample is taken and planted.
23. Finds the value of  $a + b$  without solving a pair of simultaneous equations given in the form  $ma + nb = c$  where  $m, n, c$  are positive integers.
24. Given the quantity of water (in litres) flowing through a tube within a given period (in minutes), calculate the rate of flow of water in litres per second.
25. (i) Using the data given, calculates the central angle of a named sector of a pie chart.  
(ii) Given the quantity represented by one sector, calculates the quantity represented by another sector.

Paper I - Part B

1. Given the amount invested to buy shares and the market price of a share,
  - (i) finds the number of shares that can be bought.
  - (ii) calculates the annual income given the annual dividend paid for a share.
  - (iii) finds by how much the income received if the amount invested to buy shares was invested in a fixed deposit under a given annual interest rate is greater than the income from dividends.
  - (iv) finds the dividend paid for a share in the second year given that the income from dividends in the second year was increased by a given percentage.
2. Given a diagram of a semi circle and a triangle contained in a rectangle and the length and breadth of the rectangle,
  - (i) finds the perimeter of the semi circle.
  - (ii) finds the area of the semi circle.
  - (iii) writes the ratio between the areas of the semi circle and the triangle and indicates it in the simplest form.
  - (iv) draws with measurements how a rectangular portion with an area equal to that of the triangle can be attached a new.



3. Given the pension gratuity of a person, the fraction of it he deposited in a bank and the amount allocated for charity,
- (i) finds the amount deposited in the bank.
  - (ii) calculates the interest he draws for two years given the compound interest rate
  - (iii) finds the amount remaining after depositing in the bank and using for charity
  - (iv) calculates the amount received by the wife given how the rest is divided between the wife and the daughter.
4. (a) Using the information given by a Venn diagram of two intersecting sets,
- (i) finds the number of elements belonging to the intersection set.
  - (ii) describes the shaded area in words.
  - (iii) writes by set notation a named portion of the Venn diagram.
- (b) Given a box containing two types of items of equal size and different colours and that one item is taken out of the box followed by taking another without replacing the first,
- (i) marks the sample space of the outcomes in the given grid given.
  - (ii) Using it, finds the probability of getting two items of the same colour.
  - (iii) Finds the probability of taking items of distinct colours with the first being of a given colour.
5. Given an incomplete histogram with unequal class intervals of the mass of a group of students ,
- (i) finds the number of students whose mass is less than a given mass.
  - (ii) writes to which class interval a given number of students belong.
  - (iii) represents in the histogram when the number of students belonging to a class interval is given.
  - (iv) finds the total number of students from whom the data were collected.
  - (v) creates the frequency polygon using the histogram.

**Paper II**  
**Part A**

1. (a) Given the loan amount, annual interest rate and the equal number of instalments and informed that the interest is calculated on the reducing balance,
- (i) finds the instalment of the loan payable monthly.
  - (ii) calculates the interest for a month unit.
  - (iii) finds the interest payable for a given number of month units.
- (b) Calculates the time taken to repay the loan given the loan amount, annual simple interest rate and the total amount repayable to settle the loan.
2. (i) Within the given range, draws the graph of a function of the form  $y = a - (x + b)^2$  where  $a$  and  $b$  are integers.
- (ii) Finds the roots of a given quadratic equation using the graph.
  - (iii) Finds a pair of suitable values for  $a$  and  $b$  when the roots of the equation  $a - (x + b)^2 = 0$  are given.

3. (a) Given the cube of a binomial expression in the form of a sum
- (i) writes the cube of another binomial expression.
  - (ii) obtains the cube of a number.
- (b)
- (i) Factorises a trinomial quadratic algebraic expression with a given common factor.
  - (ii) Subtracts two algebraic fractions with related denominators containing algebraic expressions.
4. (a) Given the base and height of a triangle as algebraic expressions,
- (i) writes an algebraic expression for the area of the triangle.
  - (ii) shows that it satisfies a quadratic equation given in terms of  $x$  when a numerical value is given for the area of that triangle.
  - (iii) shows that the roots of that equation are given expressions.
  - (iv) finds the length of a named side of the triangle.
- (b) Finds the matrix  $AB$  when two matrices  $A$  and  $B$  are given.
5. Given the diagram of a post erected on a flat, horizontal ground and the way two wires are tied to two points on the ground from the top of the post so that the post and the wires lie on the same plane,
- (i) includes the given information in the diagram.
  - (ii) when the length of the two wires and the angle between a wire and the ground are given, calculates the angle between the remaining wire and the post using the trigonometric tables.
6. Given a cumulative frequency distribution relating to the time wasted by a person who visits a site for a certain task daily during a month,
- (i) writes the class interval that includes the maximum number of days .
  - (ii) writes the maximum possible time wasted at that site.
  - (iii) calculates the mean time wasted at the site using a suitable assumed mean.
  - (iv) gives reasons as to why the time that may be expected to be wasted at the site within a certain period is greater than the given number of hours.

Part B

7. (a) (i) Given an algebraic expression for the  $n^{\text{th}}$  term of an arithmetical progression, writes the first three terms of that progression and from it finds the first term and the common difference.
- (ii) Finds which term a given value is.
  - (iii) Finds the sum of the given initial number of terms in the progression.
- (b)
- (i) Shows that the terms of a given event are in a geometric progression.
  - (ii) Finds the value of a given term using given information.
  - (iii) When the last term is given, shows that the number of terms in the progression is equal to a given number.

8. (a) Writes a named theorem.  
 (b) Proves a given rider when the following are given for a named parallelogram.
- The point of intersection of the line drawn through a vertex parallel to a diagonal, and a produced side.
  - The point of intersection of the line joining the intersection point described in above to a vertex of the parallelogram, and a side of the parallelogram.
  - The intersection point of the diagonals.
9. (i) Constructs a triangle when the lengths of two sides and an angle are given.  
 (ii) Extends a side of it and marks a point on it at a given distance.  
 (iii) Constructs the circle touching the point marked and a side of the triangle and names its centre.  
 (iii) Measures and writes the radius of that circle.  
 (iv) Writes the relationship between the two given sides and presents reasons for it.
10. (a) Given that a right circular cone of known base radius and height is immersed in water, in a cylindrical tank of known height which is half filled, writes the base radius of the tank in terms of the base radius of the cone.  
 (b) Using the logarithms table, finds the value of an expression of the type  $\frac{a^2\sqrt{b}}{c}$  to the first decimal place.
11. Given a circle of known radius and a diagram of that circle with a cyclic quadrilateral in it,
- (i) when the length of a side of that cyclic quadrilateral is given, calculates the perpendicular distance to that side from the centre.
  - (ii) when the angle subtended by an arc at the centre is given, finds the value of the angle which is subtended on the remaining part of the circle.
  - (iii) finds the angle of the quadrilateral given that two angles are equal.
  - (iv) writes the relationship between the two tangents drawn to the circle from the terminal points of a chord and the theorem on which it is based.
12. (a) Given an incomplete Venn diagram of three intersecting sets to give information about the number of students sitting an examinations with three subjects and the number of students passing one, two or three subjects from it,
- (i) includes given information in the Venn diagram.
  - (ii) finds the number of students who passed in only one named subject.
  - (iii) finds the number of students who passed in at least one of two subjects.
- (b) Given the probability of the germinating of two types of seeds
- (i) draws a tree diagram to indicate the events of germination or non-germination when two seeds randomly selected from each type are planted.  
 Using the tree diagram
  - (ii) finds the probability of the germination of both seeds.
  - (iii) finds the probability of the non-germination of both seeds.

**Programme of improving G.C.E (O.L.) Examination results**

**OL/2/32-S-1**

**Mathematics Question Paper - 2**

2.2 Paper  
Mathematics I  
Part A

Time: 2 hours

Answer all the questions in this paper itself.

---

1. The circumference of a circle is 44 cm. What is the length of the arc of a semicircle of the same radius in centimetres?
- 

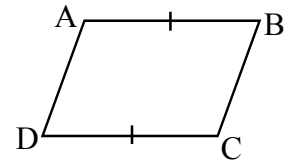
2. Between which two closest whole numbers does the value of  $\sqrt{18}$  lie?
- 

3. Complete by writing the factors in the blanks.

$$x^2 - y^2 = (\dots\dots\dots)(\dots\dots\dots)$$

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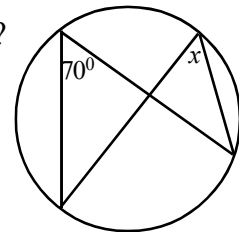
4. In the quadrilateral ABCD,  $AB = DC$ . State a requirement for it to be a parallelogram.



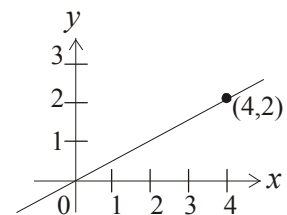
5. Four people can complete a certain work in three days. How many man days are spent for that work?
- 

6.  $A = \{x \mid 1 < x < 10, x \text{ is an odd number}\}$ . Write the set A with elements.
- 

7. What is the value of  $x$  according to the information given in the diagram?



8. Find the gradient of the straight line shown on the coordinate plane.



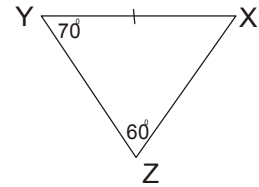
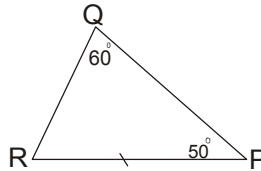
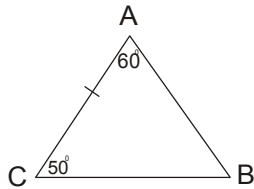
**Programme of improving G.C.E (O.L.) Examination results**

**OL/2/32-S-1**

**Mathematics Question Paper - 2**

9. Factorise  $x^2 - x - 20$ .

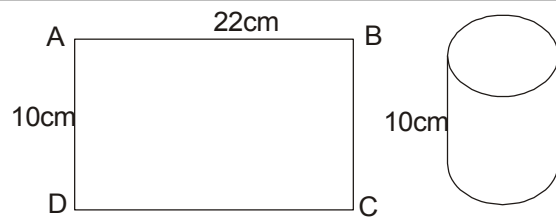
10. Of the following triangles, select and write a pair of congruent triangles.



11. Write the positive whole number solutions of the inequality  $2x + 1 < 6$ .

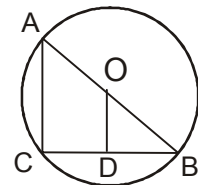
12. Simplify  $\frac{4x^2y^2}{3z} \div \frac{2xy}{9z}$

13. A cylinder is made from the rectangular paper as shown in the diagram. Find the radius of the base of the cylinder. (Take  $\pi = \frac{22}{7}$ )

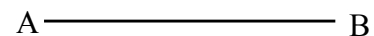


14. Of the coconuts plucked from the garden,  $\frac{1}{3}$  was reserved for domestic use and  $\frac{1}{2}$  of the rest was sold. What fraction is the amount sold of the total number of nuts?

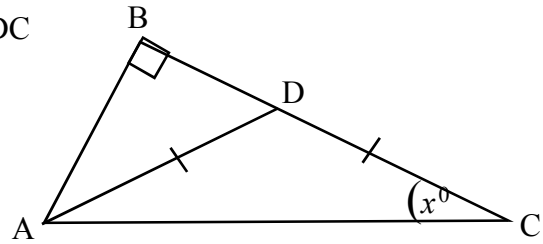
15. AB is a diameter of a circle of centre O. CB is a chord. The perpendicular drawn from O to CB is OD. Write a relationship between AC and OD.



16. AB is a straight line segment 6 cm long. If C lies on one side of AB so that  $\hat{ACB} = 90^\circ$ , sketch the locus of C.

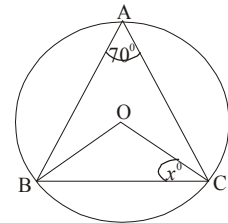


17. Of the triangle ABC,  $\hat{B}$  is a right angle.  $AD = DC$  and  $\hat{BAD} = 40^\circ$ . Find the value of  $x$ .



18. (i) Find the volume of a prism of cross sectional area  $10 \text{ cm}^2$  and length  $12.5 \text{ cm}$ .  
 (ii) Find the length of a side of a cube with the same volume.

19. The centre of the circle given in the diagram is O. Find the value of  $x$  according to the information given.



20. An urban council charges annual rates of 8%. What is the rates that should be paid per year for a house of assessed value Rs. 60 000 ?

21. Name two types of quadrilaterals in which the diagonals intersect perpendicularly.

22. For two seed samples A and B, the probability of germination is 0.8 and 0.9. Find the probability of germination of both seeds if one seed of each sample is planted.

23.  $2a + b = 4$   
 $a + 2b = 2,$

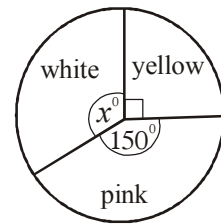
Find the value of  $a + b$  without solving this pair of simultaneous equations.

24. 300 litres of water flows through a tube in 5 minutes. What is the rate of flow of water through the tube in litres per second?

25. The figure shows a pie chart drawn to show the amount of white, yellow and pink flowers in a basket.

(i) What is the angle at the centre of the sector representing white flowers?

(ii) If there were 18 yellow flowers in the basket, how many white flowers were there?

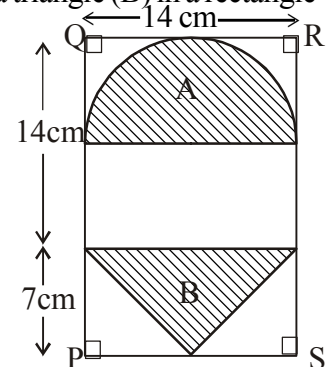


Part B

Answer the questions in this paper itself.

1. Saman invests Rs. 80 000 to buy shares in a certain company. The market price of a share is Rs.40.
  - (i) How many shares can Saman buy?
  
  - (ii) If the annual dividend paid for a share is Rs. 4, find the annual income.
  
  - (iii) If the amount used to buy shares was deposited for one year in a fixed deposit at an annual interest rate of 12%, by how much would the income be greater than that from shares?
  
  - (iv) If the dividend income in the second year was greater by 50% than the income in part (ii) above, find the annual dividend paid for a share in the second year.

2. The diagram shows a wall hanger consisting of a semicircle (A) and a triangle (B) in a rectangle PQRS. PQ = 21 cm and QR = 14 cm. (Take  $\pi = \frac{22}{7}$ )



- (i) What is the perimeter of the semicircle A?
  
- (ii) Find the area of the semicircle A.
  
- (iii) Write the ratio of the areas of parts A and B and indicate it in the simplest form.
  
- (iv) It is required to add a rectangular band which is equal in area to part B to the wall hanger. Draw with measurements in the diagram how this band can be added with PS as a margin.



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**Mathematics Question Paper - 2**

3. Sujeewa's pension gratuity is Rs. 600 000. He deposited  $\frac{2}{3}$  of it in a bank and gave Rs. 20 000 to charity.
- (i) What is the amount Sujeewa deposited in the bank?
  
  - (ii) If the bank pays compound interest of 8%, what is the interest he receives in total for the two years?
  
  - (iii) What is the amount left after depositing in the bank and giving to charity?
  
  - (iv) Having deposited in the bank and given to charity, he gave  $\frac{1}{3}$  of the remaining amount to his daughter and the rest to his wife. What is the amount of money received by the wife?

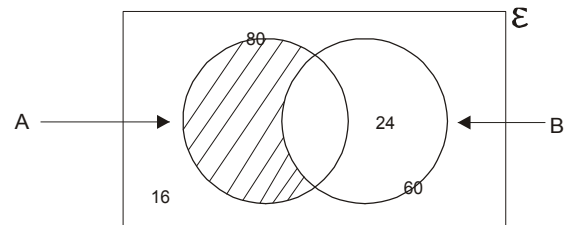
4.(a) The Venn diagram shows some information about a group of students who sat for an examination.

$\epsilon$  = {Children sitting the examination }

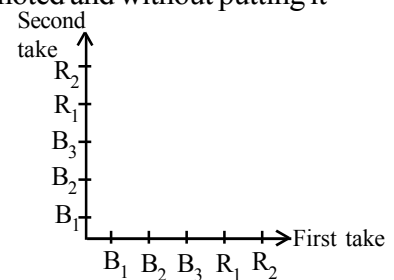
A = {Girls sitting the examination }

B = {Children passing the examination }

Answer the following using the Venn diagram.



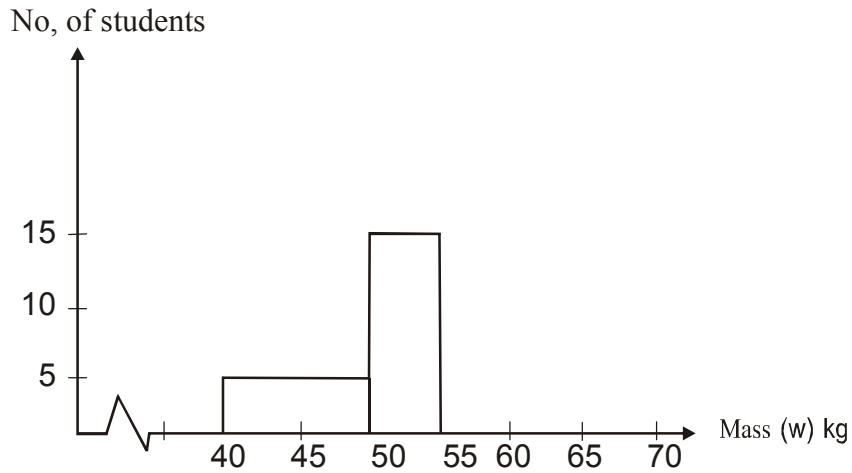
- (i) How many girls passed the examination?
  
  - (ii) Describe those who are represented by the shaded area.
  
  - (iii) Represent the shaded area by set notation.
- (b) There are five handkerchiefs in a box. Of them, three are blue and two are red. One handkerchief is taken from the box randomly, its colour is noted and without putting it back, another one is taken.
- (i) In the grid, mark the sample space showing the possible outcomes.  
(B and R represent blue and red respectively).



Using it,

- (ii) find the probability of getting handkerchiefs of the same colour on both occasions.
  
- (iii) find the probability of getting a blue one in the first take and a red one in the second take.

5. Given below is an incomplete histogram depicting the information collected on the masses of a group of students.



Using this histogram answer the following questions.

Class intervals are given as  $40 \leq w < 50$ ,  $50 \leq w < 55$  etc.

- (i) How many students are less than 50 kg in mass?
- (ii) State in which class interval there are 15 students.
- (iii) If there are 30 students in the class interval 55 - 70, indicate it in the above histogram.
- (iv) What is the total number of students from whom the data were collected?
- (v) Draw the frequency polygon on the histogram.

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**Mathematics Question Paper - 2**

**Mathematics II**

**Three hours**

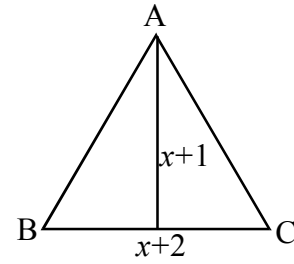
- Answer 10 questions selecting five questions from part A and five questions from part B
- Every question is worth 10 marks.
- The volume of a right circular cylinder of base radius  $r$  and height  $h$  is  $\pi r^2 h$ .
- The volume of a right circular cone of base radius  $r$  and height  $h$  is  $\frac{1}{3}\pi r^2 h$ .

**Part A**

Answer five questions only

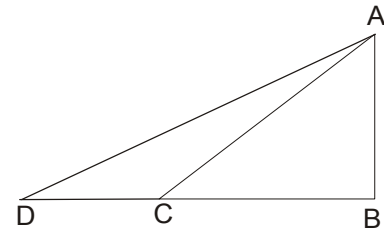
- 
1. (a) A loan of Rs. 30 000 is taken from a financial institution at an annual interest rate of 12% where the interest is calculated on the reducing balance. It was agreed that the loan amount and the interest will be paid in 15 months in equal instalments.
- (i) What is the monthly instalment of the loan payable?
  - (ii) What monthly interest is paid for the above part of the loan amount?
  - (iii) Find the total interest payable for the loan.
- (b) After what period of time does a person who takes a loan of Rs. 25 000 at a simple interest rate of 11% settle the loan by paying Rs. 33 250?
2. (i) Draw the graph of the function  $y = 2 - (x + 1)^2$  within the range  $-4 \leq x \leq 2$  and using the graph find the roots of the equation  $-x^2 - 2x + 1 = 0$ .
- (ii) If the roots of the equation  $a + (x + b)^2 = 0$  are 2 and 4, find a pair of values matching  $a$  and  $b$ .
3. (a)  $(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$
- Using this result,
- (i) expand  $(a - 1)^3$ .
  - (ii) find the value of  $105^3$ .
- (b) (i) Factorise  $6a^2x^2 - a^2x - a^2$ .
- (ii) Simplify  $\frac{2}{(a-5)^2} - \frac{3}{(5-a)}$ .

4. (a) The base BC of a triangle ABC is  $(x + 2)$  units and the height is  $(x + 1)$  units.



- (i) Write an expression containing  $x$  for the area of the triangle ABC.
  - (ii) If the area of the triangle ABC is 2 square units, show that  $x$  satisfies the quadratic equation  $x^2 + 3x - 2 = 0$ .
  - (iii) Solve the equation  $x^2 + 3x - 2 = 0$  and show that its roots are  $x = \frac{\pm\sqrt{17} - 3}{2}$ .
  - (iv) Using it, find the length of the side BC of the triangle (Assume  $\sqrt{17} = 4.12$ )
- (b)  $A = \begin{pmatrix} 2 & -1 \\ 0 & 3 \end{pmatrix}$  and  $B = \begin{pmatrix} 1 & 2 \\ 3 & 0 \end{pmatrix}$ . Find the matrix AB.

5. AB is a post erected on a flat ground. Two wires 15 m and 20 m long are drawn from the top of the post A and fixed to two points C and D on the flat ground. (The post and the wires are on the same plane).  $\hat{A}DB = 30^\circ 30'$ .



- (i) Copy the diagram given and mark the relevant data in it.
- (ii) Find the value of  $\hat{B}AC$  using trigonometric ratios.

6. Susil goes to a certain bank everyday for the banking affairs of his business. He is used to noting down the time he spends in the bank till his turn comes everyday. A table which indicates the time and the number of days he has noted for a period of 30 days in a month is given here.

Time spent(minutes)	No. of days
0 - 6	1
6 - 12	3
12 - 18	3
18 - 24	4
24 - 30	10
30 - 36	6
36 - 42	2
42 - 48	1

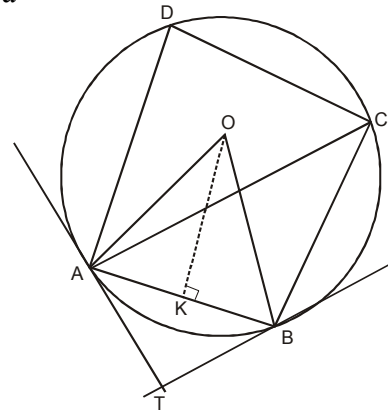
- (i) What is the class interval that shows the maximum number of days in relation to the time he has wasted in the bank?
- (ii) What could be the maximum time in minutes wasted by Susil in the bank?
- (iii) Using a suitable assumed mean, calculate the mean time he has wasted in the bank.
- (iv) Find the time he can be expected to waste in the bank during 60 days and show that it is more than 24 hours. Give reasons for your answer.

**Part B**

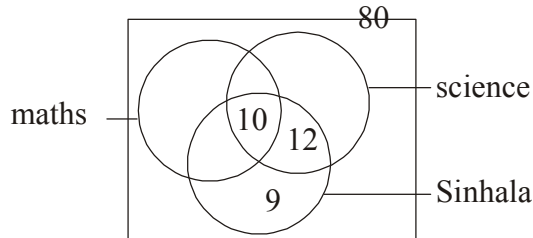
7. (a) The  $n^{\text{th}}$  term of an arithmetic progression is given by  $T_n = 7n - 1$
- (i) Write the first three terms of this progression and hence write down the first term and the common difference.
  - (ii) Find which term of this progression is 83.
  - (iii) Find the sum of the first 12 terms of this progression.
- (b) In a fireworks display, a sparkler which is lit shoots sparkles as follows.
- during the first minute - 512 sparkles;  
 during the second minute - 256 sparkles;  
 during the third minute - 128 sparkles
- (i) Show that the sparkler emits sparkles according to a geometric progression.
  - (ii) How many sparkles are shot during the seventh minute?
  - (iii) If the sparkler dies out after emitting 2 sparkles, show that it was alight for 9 minutes.
8. (a) Write the mid point theorem.  
 ABCD is a parallelogram. The line drawn through B parallel to AC meets DC produced at E. The lines AE and BC intersect at P while the lines AC and BD intersect at Q. Show that  $PQ = \frac{1}{4} DE$ .
9. Using only a ruler with a mm/cm scale and a compass,
- (i) construct a triangle ABC so that  $\hat{A} = 120^\circ$ ,  $AB = 6.6$  cm and  $BC = 6.5$  cm.
  - (ii) Produce the side CB to point X so that  $BX = 5$  cm.
  - (iii) Construct a circle so that it touches CX at X and the side AB, and name its centre O.
  - (iv) Measure and write the radius of that circle.
  - (v) What is the relationship between OB and AC? Give reasons for it.
10. (a) Exactly half of a cylindrical tank of which the radius of the bottom is  $a$  and the height is  $4r$  is filled with water. A solid cone of base radius  $r$  and height  $2r$  was carefully dipped in the water in the tank without any spillage. Then if the total volume of the water in the tank and the cone is  $\frac{26\pi r^3}{3}$ , find the base radius of the tank in terms of  $r$ :
- (b) Find the value using the logarithms tables.  $\frac{(1.475)^2 \times \sqrt{18.62}}{0.372}$   
 Give the answer to the first decimal place.

11. The diagram shows a cyclic quadrilateral ABCD inscribed in a circle of centre O and radius 17 cm.

- (i) If the length of the chord AB is 16 cm, find the perpendicular distance from O to the chord AB.
- (ii) Find  $\hat{ACB}$  if  $\hat{AOB} = 58^\circ$ .
- (iii) Find  $\hat{BAD}$  if  $\hat{AOB} = \hat{ACD}$ .
- (iv) If the lines touching the circle at points A and B meet at T, write the relationship between AT and TB and state the theorem on which it is based.



12. (a) Eighty children appeared for a mock examination in mathematics, science and Sinhala. 36 passed in maths; 48 passed in science; 11 failed in all subjects; 24 passed maths and science; 6 passed maths and Sinhala only. An incomplete Venn diagram presenting these information is given below.



- (i) Copy the Venn diagram in your answer script and include the above information.
  - (ii) How many students have passed only in science?
  - (iii) How many have passed either maths or science?
- (b) There are two types of chillies, dwarf chilli and long chilli. The probability of the germination of dwarf chilli seeds is  $\frac{3}{5}$  whereas that of long chilli seeds is  $\frac{4}{5}$ .

(i) Two seeds, one from each type, are randomly taken and sown. Draw a tree diagram that includes the events of germination or non germination of those seeds.

Using the tree diagram find the probability of

- (ii) the germination of both seeds.
- (iii) non-germination of both seeds.

**2.3 Answers and the Marking Scheme**  
Mathematics I - Part A

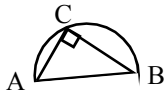
01.	22 cm	.....	02
02.	4, 5	.....	02
03.	$x^2 - y^2 = (x + y)(x - y)$	.....	02
04.	AB//DC or AB = BC	.....	02
05.	man days 12	.....	02
06.	{ 3, 5, 7, 9 }	.....	02
07.	$x = 70^0$ or $70^0$	.....	02
08.	$\frac{1}{2}$	.....	02
09.	$x^2 - 5x + 4x - 20$ $(x - 5)(x + 4)$	.....	02
10.	Triangles PQR and XYZ	.....	02
11.	$x < 2\frac{1}{2}$	.....	01
	Value of x: 1, 2	.....	01 ②
12.	$\frac{4x^2y^2}{3z} \times \frac{9z}{2xy}$	.....	01
	6xy	.....	01 ②
13.	$2\pi r = 22$ $2 \times \frac{22}{7} \times r = 22$ r = 3.5cm	.....	02 ②
14.	Part remaining = $\frac{2}{3}$	.....	01
	Part sold $\frac{2}{3} \times \frac{1}{2} = \frac{1}{3}$	.....	01 ②

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**Mathematics Question Paper - 2**

15.  $AC \parallel OD$  or  $AC = 2 OD$  ..... ②

16.  ..... ②

17.  $\hat{A}DB = 50^\circ$   
 $x = 25^\circ$  ..... ②

18. (i) Volume of the prism =  $125 \text{ cm}^2$  ..... 01  
 (ii) side of the cube = 5 cm ..... 01 ②

19.  $\hat{B}OC = 140^\circ$  ..... 01  
 $x = 20^\circ$  ..... 01

20.  $60000 \times \frac{8}{1000}$  ..... 01

Rs. 4800 ..... 01 ②

21. (i) Square ..... 01  
 (ii) Rhombus ..... 01 ②

22. Probability of both seeds germinating =  $0.8 \times 0.9$  ..... 01  
 $= 0.72$  ..... 01 ②

23.  $3a + 3b = 6$  ..... 01  
 $a + b = 2$  ..... 01 ②

24.  $300(5 \times 60)$  ..... 01  
 1 litre per second ..... 01 ②

25.  $x = 120^\circ$  ..... 01  
 24 white flowers ..... 01 ②



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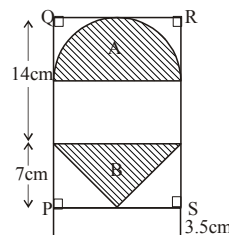
**OL/2/32-S-1**

**Mathematics Question Paper - 2**

.Mathematics - I Part -B

Question No.	Answer	Marks	Other
01.	(i) Number of shares = $\frac{80\ 000}{40} = 2\ 000$ .	2 ②	
	(ii) Annual income = $2\ 000 \times 4$ ----- = Rs. 8 000 -----	1 1 ②	
	(iii) Income from the bank = $80\ 000 \times \frac{12}{100}$ --- = Rs. 9 600 --	1 1	
	Rs. (9 600 - 8 000) = Rs. 1600 -----	1 ③	
(iv)	$\frac{4}{100} \times 150$ -----	2	
	= Rs.6.00 .....	1 ③ ⑩	

Question No.	Answer	Marks	Other
02.	(i) Radius = 7 cm	1	
	$\frac{1}{2} \times 2\pi r + 2r$		
	$\frac{1}{2} \times 2 \times \frac{22}{7} \times 7 + 2 \times 7$ ---	1	
	22 + 14 = 36 cm ---	1 ③	
(ii)	Area of part A = $\frac{1}{2} \pi r^2$ ---	1	
	$\frac{1}{2} \times \frac{22}{7} \times 7 \times 7$ --- 77 cm <sup>2</sup> ---	1 ②	
(iii)	Area of part B = $\frac{1}{2} \times 14 \times 7 = 49$ cm <sup>2</sup>	1	
	Ratio of the areas of part A to part B = 77 : 49 -- 11 : 7 --	1 ③	
(iv)	14 × x = 49 x = 3.5cm ---	1 1	
	For the diagram ---	1 ② ⑩	



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**Mathematics Question Paper - 2**

Question No.	Answer	Marks	Other
03.	(i) Amount Sujeewa deposits in the bank = Rs. $600\,000 \times \frac{2}{3}$	1	
	= Rs. 400 000	1	②
	(ii) Interest at the end of the first year = Rs. $400\,000 \times \frac{8}{100}$		
	= Rs. 32 000	1	
	Interest for the two years		
	= Rs. $32\,000 + 432\,000 \times \frac{8}{100}$	2	
	= Rs. 66 560	1	④
	(iii) Amount left = Rs. $600\,000 - 420\,000$ = Rs. 180 000	1	①
	(iv) Part received by wife = $1 - \frac{1}{3} = \frac{2}{3}$	1	
	∴ Amount received by wife = $180\,000 \times \frac{2}{3}$	1	
= Rs. 120 000	1	③	

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**Mathematics Question Paper - 2**

Question No.		Answer	Marks		Other	
4	(a)	(i) Number of girls passing the examination = $60 - 24 = 36$	2	②		
		(ii) Girls failing the examination	1	①		
		(iii) $A \cap B'$	1	① $\triangle$ 4		
	(b)	(i)		2	②	
		(ii)	$\frac{6}{20} + \frac{2}{20} = \frac{8}{20} = \frac{2}{5}$	1+1+1	③	
		(iii)	$\frac{6}{20}$	1	① $\triangle$ 6 <b>10</b>	

Question No.		Answer	Marks		Other
5	(i)	10	2	②	
	(ii)	$50 \leq w < 55$	1	①	
	(iii)		1	②	
			1		
	(iv)	55	2	② 10+15+30	
(v)	Marks at least 4 points correctly End points Completes the polygon	1 1 1	③ <b>10</b>		

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**Mathematics Question Paper - 2**

Mathematics II - Part A

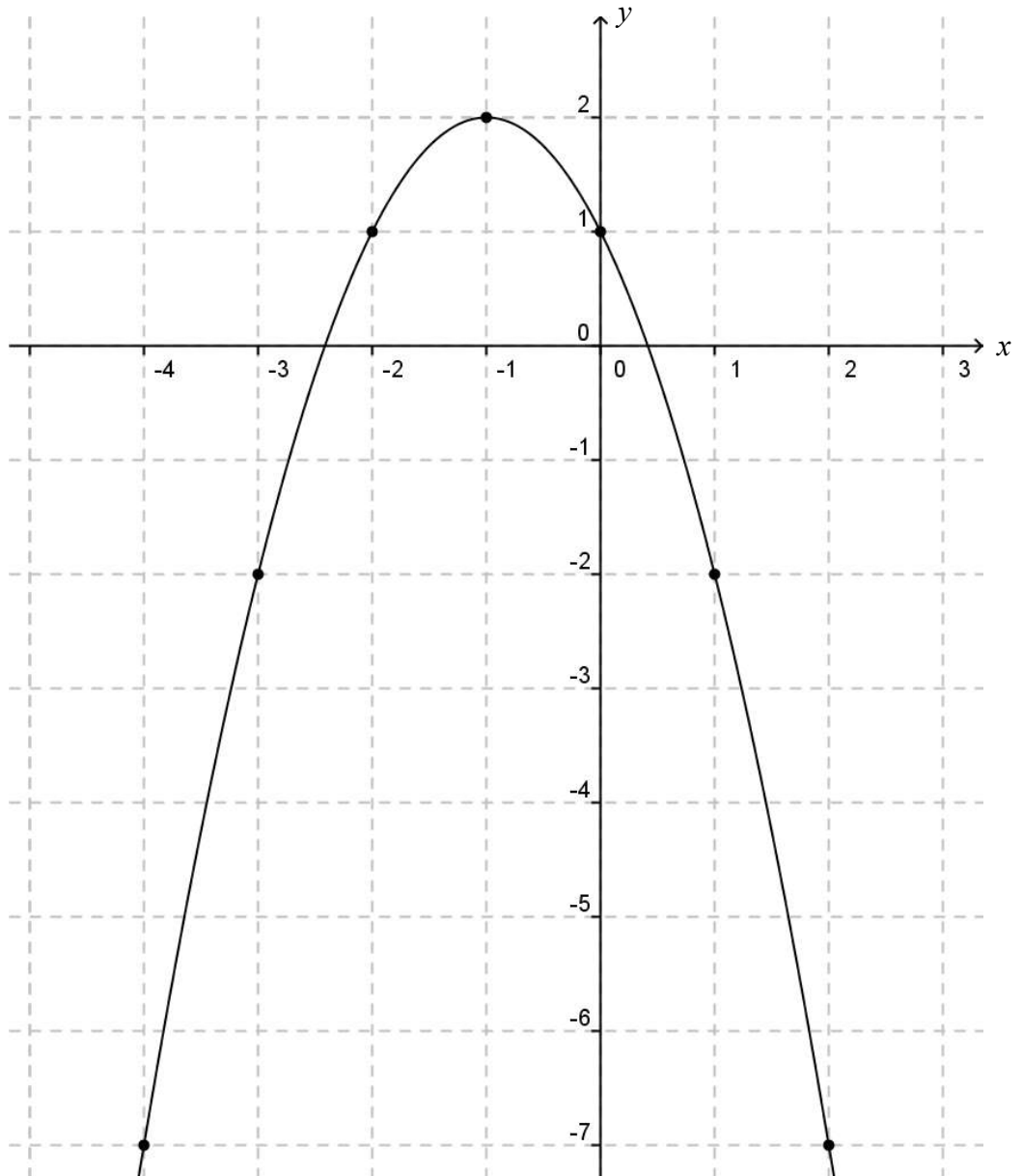
Question No.		Answer		Marks		Other	
1	(a)	(i)	Monthly instalment of the loan amount = $\frac{\text{Rs.}30\,000}{15}$	1			
			= Rs. 2 000	1	②		
		(ii)	Monthly interest for the above part of the loan amount				
			= $2000 \times \frac{12}{100} \times \frac{1}{12}$				
			= Rs.20	1	①		
		(iii)	Number of month units = $15 \times \frac{(15+1)}{2}$				
			= 120	1			
			∴ Interest paid for the loan = $120 \times 20$				
			= Rs. 2 400	1	④	△ 7	
		(b)	Total amount paid = Rs.33 250				
∴ Total interest = Rs. 33 250 - Rs. 25 000							
= Rs. 8 250	1						
Interest for a year = $\text{Rs.}25\,000 \times \frac{11}{100}$							
	= Rs.2 750	1			Or using the formula $I = \frac{\text{PTR}}{100}$		
	∴ No. of years = $\frac{8\,250}{2\,750} = 3$	1	③	△ 3	⑩		

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**Mathematics Question Paper - 2**

Question No.		Answer	Marks	Other																
2	(i)	<table border="1" style="display: inline-table; margin-bottom: 10px;"> <tr> <td>x</td><td>-4</td><td>-3</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td> </tr> <tr> <td>y</td><td>-7</td><td>-2</td><td>1</td><td>2</td><td>1</td><td>-2</td><td>7</td> </tr> </table> <p align="center">                     Calibration of axes                      Marks at least 6 points correctly                      Smooth curve  <math>x = 2.4</math> or <math>0.4</math> </p>	x	-4	-3	-2	-1	0	1	2	y	-7	-2	1	2	1	-2	7	3	
	x	-4	-3	-2	-1	0	1	2												
y	-7	-2	1	2	1	-2	7													
(ii)	$(x - 4)(x - 2) = 0$ $x^2 - 6x + 8 = 0$ $(x - 3)^2 - 1 = 0$ $a = -1, b = -3$	1+1	⑧																	
			1+1	② <b>10</b>																



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**Mathematics Question Paper - 2**

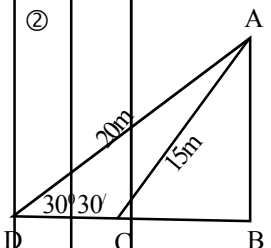
Question No.	Answer	Marks	Other	
3	(a) (i) $(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$ substituting $b = -1$ $(a-1)^3 = a^3 - 3a^2 + 3a - 1$	1	①	
	(ii) $(105)^3$ $= (100 + 5)^3$ $= 100^3 + 3 \times 100^2 \times 5 + 3 \times 100 \times 5^2 + 5^3$ $= 1000\ 000 + 150\ 000 + 7500 + 125$ $= 1\ 157\ 625$	1 1 1	③ $\triangle 4$	
	(b) (i) $6a^2x^2 - a^2x - a^2$ $= a^2(6x^2 - x - 1)$ $= a^2(6x^2 - 3x + 2x - 1)$ $= a^2\{3x(2x - 1) + 1(2x - 1)\}$ $= a^2(3x + 1)(2x - 1)$	1 1 1	③	
	(ii) $\frac{2}{(a-5)^2} - \frac{3}{(5-a)}$  $= \frac{2}{(a-5)^2} + \frac{3}{(a-5)}$  $= \frac{2+3(a-5)}{(a-5)^2}$  $= \frac{2+3a-15}{(a-5)^2}$  $= \frac{3a-13}{(a-5)^2}$	1 1 1	③ $\triangle 6$	
				<b>10</b>

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**Mathematics Question Paper - 2**

Question No.			Answer	Marks		Other
(4)	(a)	(i)	Area = $\frac{1}{2} (x+2) (x+1)$	1	①	
		(ii)	$\frac{1}{2} (x+3) (x+1) = 2$ $x^2 + 3x + 2 = 4$ $\therefore x^2 + 3x - 2 = 0$	1	②	
	(b)	(iii)	$x^2 + 3x - 2 = 0$ $x = \frac{-3 \pm \sqrt{9+8}}{2}$ $= \frac{-3 \pm \sqrt{17}}{2}$ $= \frac{\pm\sqrt{17} - 3}{2}$	1	②	
		(iv)	BC > 0 $BC = \frac{+4.12 - 3}{2}$ $= 0.56cm$ $AB = \begin{pmatrix} 2 & -1 \\ 0 & 3 \end{pmatrix} \begin{pmatrix} 1 & 2 \\ 3 & 0 \end{pmatrix}$ $= \begin{pmatrix} -1 & 4 \\ 9 & 0 \end{pmatrix}$	1	②	

Question No.			Answer	Mark		Other
(5)	(i)	Copy the diagram and mark the relevant data		2	②	
	(ii)	$\sin 30^\circ 30' = \frac{AB}{20}$ $0.5075 = \frac{AB}{20}$ $AB = 20 \times 0.5070$ $AB = 10.14m$  $\cos \hat{C}AB = \frac{AB}{AC}$ $\cos \hat{C}AB = \frac{10.14}{15}$ $= 0.6760$ $\therefore \hat{C}AB = 47^\circ 25'$		2		

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**Mathematics Question Paper - 2**

Question No.	Answer	Marks	Other																																																		
6.	(i) 24 - 30	1	①																																																		
	(ii) 48 minutes	1	①																																																		
	(iii)																																																				
	<table border="1"> <thead> <tr> <th>Time spent (minutes)</th> <th>No. of days</th> <th>Mid value</th> <th>d</th> <th>fd</th> </tr> </thead> <tbody> <tr> <td>0 - 6</td> <td>1</td> <td>3</td> <td>-24</td> <td>-24</td> </tr> <tr> <td>6 - 12</td> <td>3</td> <td>9</td> <td>-18</td> <td>-54</td> </tr> <tr> <td>12 - 18</td> <td>3</td> <td>15</td> <td>-12</td> <td>-36</td> </tr> <tr> <td>18 - 24</td> <td>4</td> <td>21</td> <td>-6</td> <td>-24</td> </tr> <tr> <td>24 - 30</td> <td>10</td> <td>27</td> <td>0</td> <td>0</td> </tr> <tr> <td>30 - 36</td> <td>6</td> <td>33</td> <td>6</td> <td>36</td> </tr> <tr> <td>36 - 42</td> <td>2</td> <td>39</td> <td>12</td> <td>24</td> </tr> <tr> <td>42 - 48</td> <td>1</td> <td>45</td> <td>18</td> <td>18</td> </tr> <tr> <td></td> <td>30</td> <td></td> <td></td> <td>-138+78=-60</td> </tr> </tbody> </table>	Time spent (minutes)	No. of days	Mid value	d	fd	0 - 6	1	3	-24	-24	6 - 12	3	9	-18	-54	12 - 18	3	15	-12	-36	18 - 24	4	21	-6	-24	24 - 30	10	27	0	0	30 - 36	6	33	6	36	36 - 42	2	39	12	24	42 - 48	1	45	18	18		30			-138+78=-60	4	Mid value -1 column d - 1 column fd - 1 $\Sigma fd$ -1
Time spent (minutes)	No. of days	Mid value	d	fd																																																	
0 - 6	1	3	-24	-24																																																	
6 - 12	3	9	-18	-54																																																	
12 - 18	3	15	-12	-36																																																	
18 - 24	4	21	-6	-24																																																	
24 - 30	10	27	0	0																																																	
30 - 36	6	33	6	36																																																	
36 - 42	2	39	12	24																																																	
42 - 48	1	45	18	18																																																	
	30			-138+78=-60																																																	
	$\text{Mean} = A + \frac{\Sigma fd}{\Sigma f}$ $= 27 + \frac{-60}{30}$ $= 25$	1																																																			
	Mean = 25 minutes	1	⑥																																																		
	(iv) Time that could be expected to be wasted in the bank during 60 days = 25 × 60 minutes = 25 hours	1																																																			
	25 > 24																																																				
	∴ more than 24 hours	1	②																																																		
			<b>10</b>																																																		



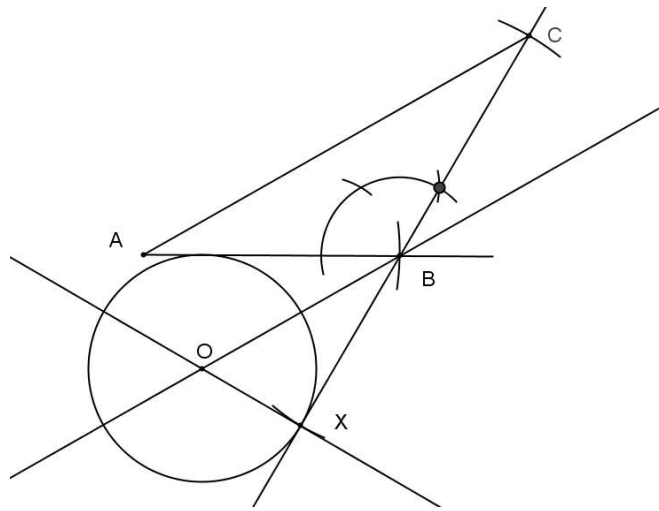
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**Mathematics Question Paper - 2**

Question No.	Answer	Marks	Other		
(7)	(a) (i)	First three terms 6, 13, 20 $a = 6 \quad d = 7$	1 1	or $T_n = 7n - 1$ $83 = 7n - 1$ ---- 1 $n = 12$ ---- 1	
		(ii)	$T_n = a + (n-1)d$ $83 = 6 + (n-1)7$ $7n = 84$ $n = 12$ $\therefore 83$ is the 12th term	1	①
	(iii)	$S_n = \frac{n}{2} \{2a + (n-1)d\}, n = 12, a = 6, d = 7$		or $S_n = \frac{n}{2}(a+l)$ $n = 12, a = 6, l = 83$	
		$S_n = \frac{12}{2} \{2 \times 6 + (12-1)7\}$	1	$S_{12} = \frac{12}{2}(6+83)$ ---- 1 $= 6 \times 89$	
		$= 6 \{12+77\}$ $= 534$	1	$= 534$ ---- 1  ⑤	
	(b) (i)	512 , 256 , 128 .... $\frac{256}{512} = \frac{1}{2}, \frac{128}{256} = \frac{1}{2}$ common ratio , so this is a geometric progression	1	①	
		(ii)	$T_n = ar^{n-1}, a = 512, r = \frac{1}{2}, n = 7$  $T_7 = 512 \times \left(\frac{1}{2}\right)^6$  $= 512 \times \frac{1}{64}$ $T_7 = 8$ $\therefore 8$ sparkles during the 7th minutes	1  1	  ②
		(iii)	$T_n = ar^{n-1}$  $2 = 512 \times \left(\frac{1}{2}\right)^{n-1}$  $\frac{2}{512} = \left(\frac{1}{2}\right)^{n-1}$  $\frac{1}{256} = \left(\frac{1}{2}\right)^{n-1}, \left(\frac{1}{2}\right)^8 = \left(\frac{1}{2}\right)^{n-1}$ $9 = n$ $\therefore$ The sparkler was alight for 9 minutes	1	② ⑤ ⑩

Question No.		Answer	Marks		Other
08.	(a)	The line joining the mid points of two sides of a triangle is parallel to the third side and is equal to half of the third side.	1	①	
	(b)	Draws the figure and marks the data.	2		
		Parallelogram ABCD	1		
		AQ = QC (diagonals bisect each other)	1		
		CE // AB, AC // BE (given)	1		
		∴ ABEC is a parallelogram	1		
		∴ CP = PB (diagonals bisect each other)	1		
		Considering triangle ABC	1		
		AB // PQ (As AQ = QC, BP = PC)	1		
	∴ $\frac{1}{2} AB = PQ$	1			
	Further more, AB = DC, AB = CE	1			
	2AB = DE	1			
	2(2PQ) = DE ( $\frac{1}{2} AB = PQ$ )	1			
	∴ 4PQ = DE	1			
	∴ $PQ = \frac{1}{4} DE$	1	⑨	<b>10</b>	
Question No.		Answer	Marks		Other
09.	(i)	AB or BC	1		
		Construction of $\hat{A}BC = 120^0$	1		
		Completes the triangle	1	③	
	(ii)	Produces the side CB and marks X	1	①	
	(iii)	Constructs perpendicular to XC at X	1		
	Angle bisector of ABX	1			
	Draws the circle, intersection point of perpendicular and bisector as the centre and radius as OX, and marks the point O	1	③		
(iv)	Radius = $2.9 \pm 0.1$ cm	1	①		
(v)	Show $\hat{O}BA = 30^0$ and $\hat{B}AC = 30^0$	1			
	OB // AC ( alternate angles are equal)	1	②	<b>10</b>	



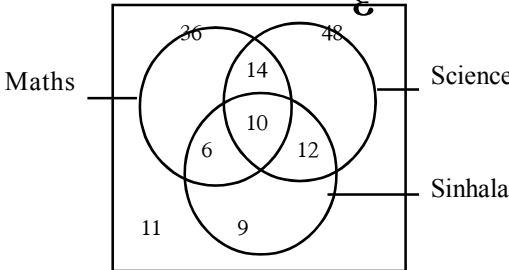
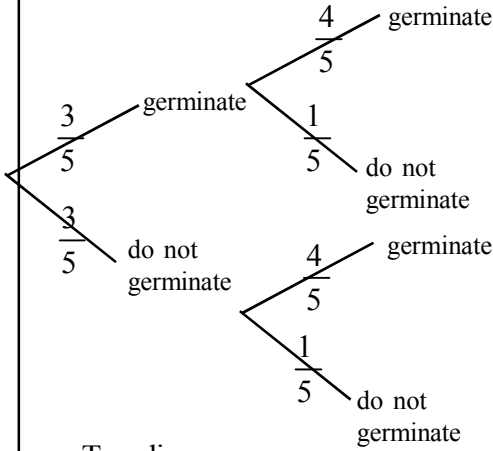
Question No.	Answer	Marks	Other	
s10	(a)	Volume of the cone = $\frac{1}{3}\pi r^2 \times 2r$	1	
		= $\frac{2}{3}\pi r^3$	1	
	As total volume = $\frac{26\pi r^3}{3}$ ,			
	Volume of water = $\frac{26\pi r^3}{3} - \frac{2\pi r^3}{3}$	1		
	= $\frac{24\pi r^3}{3} = 8\pi r^3$	1		
	As the radius of the bottom of the cylinder is a			
	$\frac{1}{2}(\pi a^2 \times 4r) = 8\pi r^3$	1		
	$a = 2r$	1	Ⓒ	
	(b) $A = \frac{(1.475)^2 \times \sqrt{18.62}}{0.372}$			
	$\lg A = 2\lg 1.475 + \frac{1}{2}\lg 18.62 - \lg 0.372$	1		
	= $2 \times 0.1688 + \frac{1}{2} \times 1.2700 - \bar{1}.5705$			
	If two log values are correct	1		
	= $0.3376 + 0.6350 - \bar{1}.5705$	1		
	= 1.4021			
	$A = 25.24$	1	Ⓓ	<b>10</b>

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**Mathematics Question Paper - 2**

Question No.	Answer	Marks	Other
11.	(i) OA = 17cm AK = 8 cm (As perpendicular from centre to chord bisects the chord)	1	
	Applying Pythagoras' theorem to right angled triangle OAK $OA^2 = AK^2 + KO^2$ $17^2 = 8^2 + KO^2$ $KO^2 = 17^2 - 8^2$ $KO^2 = 225$ KO = 15	1	③
	∴ Perpendicular distance from O to chord AB = 15cm		
	(ii) $\widehat{AOB} = 58^\circ$ $\therefore \widehat{ACB} = \frac{58^\circ}{2}$ (Angle subtended at centre is twice the angle subtended at circumference) $= 29^\circ$	1	②
(iii) $\widehat{AOB} = \widehat{ACD} = 58^\circ$ $\widehat{ACB} = 29^\circ$ $\therefore \widehat{BCD} = 58^\circ + 29^\circ = 87^\circ$ So $\widehat{BAD} = 180^\circ - 87^\circ$ (Opposite angles of a cyclic quadrilateral are supplementary) $\widehat{BAD} = 93^\circ$	1 1 1	③	
(iv) AT = BT Tangents drawn from a exterior point to a circle are equal	1 1	②	<b>10</b>

Question No.	Answer	Marks	Other
12. (a) (i)	 <p>Marks 6,14,11 in the Venn diagram 1+1+1</p>	3	③
(ii)	Students passed only in science = 12	1	①
(iii)	Students passed either maths or science = 60	1	① $\triangle 5$
(b) (i)	<p>dwarf chilli                  long chilli</p>  <p>Tree diagram</p>	2	②
(ii)	<p>Probability of germination of both chilli seeds = <math>\frac{3}{5} \times \frac{4}{5}</math></p> $= \frac{12}{25}$	1	①
(iii)	<p>Probability of non-germination of both seeds = <math>\frac{2}{5} \times \frac{1}{5}</math></p> $= \frac{2}{25}$	1	① $\triangle 5$
			⑩

3.1 Objectives  
Mathematics I- Part A

01. Finds the perimeter of a sector when its radius and the central angle are given.
02. In an isosceles triangle, when the value of one equal angle is given, finds the value of the other angle.
03. Calculates the amount received at the end of the year, given the amount deposited and the annual interest rate.
04. Finds the gradient of a straight line when the coordinates of two points on the line are given.
05. Expresses with elements the set of numbers given as a description.
06. Finds the factors of an algebraic expression of the type  $x^2+bx+c$ ;  $b, c \in \mathbb{Z}$
07. When two class intervals are given, by considering the mid value of one class interval as the assumed mean, completes the deviation column.
08. Writes the relationship between a named angle and three other named angles in a diagram comprising two triangles formed by the intersection of two straight lines.
09. Writes positive integers which suit the given inequality.
10. If the number of days required to complete half a task by a certain number of people is given, finds the number of days required to complete the remaining half of the task with two additional men.
11. If two fixed points and the distance between the points are given, illustrates in a sketch diagram the locus of a variable point at an equal distance from the two points.
12. Finds the first approximation of the square root of a whole number which is less than 100 and is not a perfect square.
13. Simplifies an expression with two algebraic expressions with related denominators.
14. Given a diagram with a line drawn through the mid point of a side of a triangle parallel to another side
  - (i) finds the length of the remaining part of the side when the length of a part of the side which that line meets is given.
  - (ii) finds the length of one parallel line segment when the length of the other parallel line segment is given.
15. Given the area of a parallelogram, calculates the area of a triangle lying between two parallel sides with a base of half the side of the parallelogram.
16. Writes the sum of two given  $2 \times 2$  matrices.

17. (i) In a given Venn diagram given, shades the area relating to a given set operation.  
(ii) Describes verbally a given area in a Venn diagram.
18. Finds the value of two named angles when one angle of a diagram with several angles contained in a circle is given.
19. Converts to index form an expression given in logarithmic form.
20. If the distance travelled by a motor car in km and its speed in kilometres per hour are given, calculates the time spent in minutes for the journey.
21. Finds the length of a diagonal of a rectangle when its length and breadth are given.
22. Calculates the volume of a right prism of triangular cross section whose area of cross section and length are given.
23. Without solving two given simultaneous equations, decides the sum of two unknowns.
24. In a right angled triangle,  
(i) indicates the sin ratio for a named angle in terms of the sides.  
(ii) writes the corresponding trigonometric ratio given a ratio between the sides of the triangle.
25. Given the vertex angle of the isosceles triangle formed by joining a point on a produced side of a cyclic quadrilateral to an adjoining vertex, finds the value of the interior opposite angle, opposite to the angle formed by producing the side.

Paper1 Part B

- (1) (a) When the annual property value and annual rates percentage are given
  - (i) calculates the annual rates.
  - (ii) finds the rates to be paid per quarter.
- (b) (i) When percentage increment of annual valuation and new annual rates percentage are given, finds the new annual assessment value.  
(ii) Calculates the percentage increment of the rates by calculating the annual rates.
- (2) (a) When the assessment on the time required and the number of people required to complete a work is given,
  - (i) based on the amount of work that can be completed by a certain number of people within a certain number of days, calculates the amount of work that can be completed within one day by a different number of people.
  - (ii) Finds the total amount of work based on that.

- (iii) Finds the number of people to be employed to complete the work before the scheduled date.
  - (b) Finds the annual income tax payable when the monthly income, the amount that is waived from income tax and the income tax percentage for the balance amount are given.
- (3) In a diagram with a rectangular land and an adjacent sector shaped portion, when the length of the rectangle, radius of the sector and the central angle are given,
- (i) finds the area of the rectangle.
  - (ii) finds the area of the sector.
  - (iii) given the cost of cementing one square unit, calculate the expenditure for cementing the floor of the sector-shaped portion.
  - (iv) separates  $\frac{1}{4}$  of total land area suitable for given purposes and draws it in the given diagram indicating its measurements.
- (4) (a) If a pie chart and the total amount represented by the pie chart are given,
- (i) calculates the quantity that is represented by a sector of which the angle subtended at the centre is given.
  - (ii) When the quantity represented by the sector is given, finds the value of the angle subtended at the centre.
- (b) When a table that includes data with grouped class intervals is given,
- (i) draws the a histogram on the axes given.
  - (ii) develops the frequency polygon based on that histogram.
- (5) When a Venn diagram that represents two intersecting sets is given,
- (a) (i) marks the given information in the Venn diagram and finds the number of elements in a given set.
  - (ii) finds the number of elements in another named set.
  - (b) (i) Indicates in a given grid the sample space of a random experiment.
  - (ii) Finds the probability of a named incident.
  - (iii) Calculates the probability in (ii) above when the two events are not dependent.



Paper II

01. Given the loan, simple interest rate and the time for settlement,
- (i) calculates the profit when the annual profit percentage is given if the above loan is invested in an enterprise.
  - (ii) finds the interest that should be paid at the end of the period allowed to settle the loan.
  - (iii) Using the profit obtained in the first year, calculates the profit that should be obtained during the second year by the business to settle the loan at the end of the year.
  - (iv) When the profit gained during the second year is given, finds the balance that should be paid to settle the loan.
02. Given the breadth of a rectangular flower bed by an algebraic symbol, the relationship between its length and breadth and the area of the flower bed, shows that the length of the bed is a given expression by constructing and solving a quadratic equation.
03. (a) (i) Writes the order of a given matrix.  
(ii) Multiplies two matrices of the order  $2 \times 2$ .  
(iii) Shows that the product of two matrices is not commutative.
- (b) (i) Derives a pair of simultaneous equations based on a given event.  
(ii) Shows that a given statement is true by solving the simultaneous equations.
04. (a) (i) Completes an incomplete table carrying values satisfying a function of the form  $y = (x - a)^2 - b$  where  $a$  and  $b$  are integers.  
(ii) Draws the graph of the function within the given interval according to a given scale.
- (b) Referring the graph drawn,
- (i) writes the coordinates of the turning point of the function.
  - (ii) writes the range of the value of  $x$  in which the function increases negatively.
  - (iii) by comparing with the coordinate of the turning point of the function drawn, writes the coordinates of the turning point of another corresponding function.
05. Based on the given measurements, writes an expression for the increase in the height of the water level in a cuboid tank container partly filled with water, in which a solid pyramid of given base length and height is immersed, simplifies it using logarithms tables and gives the answer to one decimal place correctly.
06. Given a grouped frequency distribution containing information related to the production turned out by a producer in a certain number of days during year,
- (i) writes the modal class.
  - (ii) calculates to the nearest whole number the mean of the daily production taking the mid value of a given class interval as the assumed mean.
  - (iii) shows that the monthly profit exceeds a given value when the production cost and the selling price of a unit are given.

07. (a) When a diagram and a scale related to an activity of finding the height of a flag post are given, draws a scale diagram and finds the height of the flag post to the nearest whole number.
- (b) (i) Using the data in a given diagram, finds the lengths to the nearest centimetre a named length.  
(ii) Shows that the area of a named triangle is less than a given value using that length and given measurements.
08. (a) Given the number of bricks to be laid in the first three circular tiers in a compound and the cost for laying one brick, shows that the expenditure for laying bricks in the given number of tiers exceeds a given value.
- (b) Shows that in a geometric progression in which the first three terms are given, the relationship between two named terms is a given relationship.
09. (i) Draws a circle of given radius.  
(ii) Draws a radius of the circle and marks the point at which it meets the circle.  
(iii) Constructs and names the chord located at a given distance from the centre of the circle perpendicular to that radius.  
(iv) Draws a chord of given length from one end of the above chord.  
(v) Constructs the angle bisector of the angle between the above chords and draws a cyclic quadrilateral with the point of intersection of this bisector and the circle as a vertex.
10. Sketches a diagram with given geometric data and verifies that a named quadrilateral is a parallelogram.
11. (a) In a diagram of a circle in which a perpendicularly intersecting chord and a diameter are marked,  
(i) finds the radius of the circle.  
(ii) calculates the length of a named chord.
- (b) Given a diagram of two triangles with marked data,  
(i) names the two pairs of angles that are equal.  
(ii) finds the length of a given side, given the lengths of a pair of sides of one triangle and the length of one corresponding side in the other triangle.
12. When two named kits containing identical objects are given,  
(i) draws the tree diagram relevant to taking an object from one of the kits.  
(ii) when a pair of dependent events is given, extends the tree diagram in relation to the second event.  
(iii) calculates the probability of a named event.  
(iv) calculates the probability of a named event.  
(v) calculates the probability of a named event.

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**Mathematics Question Paper - 3**

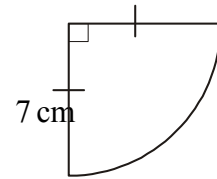
Mathematics I - Part A

Answer all the questions on this paper itself.

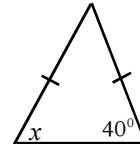
**Time: Two hours**

1. Find the perimeter of the sector given in the diagram.

(Take  $\pi = \frac{22}{7}$ )

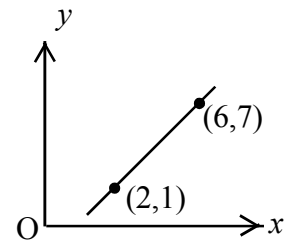


2. According to the given data find  $x$ .



3. A student deposits Rs.1000 under 8% annual simple interest. What is the interest after a year.

4. Find the gradient of the given straight line.



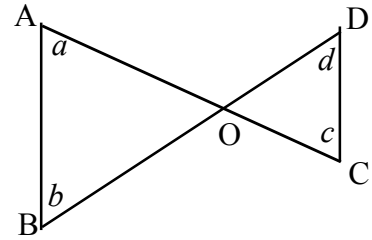
5. Write the set of positive odd numbers less than 6 with its elements.

6. Factorise  $a^2 - 7a + 10$ .

7. Considering the mid point of the 11 - 15 class interval as the assumed mean, complete the deviation column.

Class interval	Mid value	Deviation
11 - 15	13	
16 - 20	18	

8. Indicate the value of  $d$  in terms of  $a$ ,  $b$  and  $c$ .



9. Write down the positive integers that satisfy the inequality  $x + 2 < 4$ .

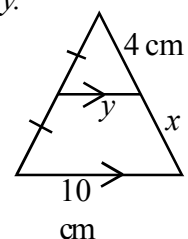
10. To complete half of the work, six men spent four days. If two more people are employed to complete the remaining part of the work, how many days it will take to complete that part of the work?

11. Points A and B are located 6 cm apart. Draw the locus of C in a sketch diagram so that  $AC = BC$ .

12. Find the square root of 15 to the first approximation.

13. Simplify  $\frac{1}{x} + \frac{2}{3x}$ .

14. According to the information given in the diagram, find the values of  $x$  and  $y$ .

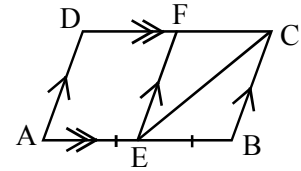


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**Mathematics Question Paper - 3**

15. If the area of the parallelogram ABCD is  $100 \text{ cm}^2$ , find the area of the triangle ECF according to the information given in the diagram.

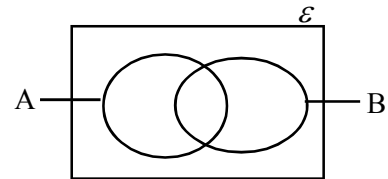


16. Simplify  $\begin{pmatrix} 2 & 3 \\ 5 & 4 \end{pmatrix} + \begin{pmatrix} 1 & 1 \\ 3 & 2 \end{pmatrix} = \begin{pmatrix} \dots & \dots \\ \dots & \dots \end{pmatrix}$

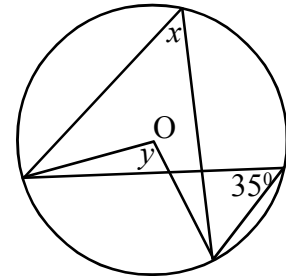
17.  $\mathcal{E} = \{\text{students in a class}\}$   
 $A = \{\text{students studying music}\}$   
 $B = \{\text{boys}\}$

In the Venn diagram given

- (i) shade the area  $A \cap B$ .
- (ii) describe the shaded area in words.



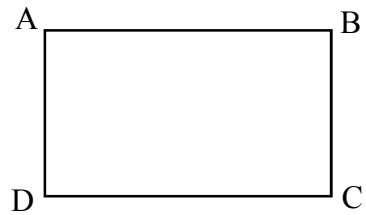
18. Centre of the circle in the diagram is 'O'.  
 Using the given data, find values for  $x$  and  $y$ .



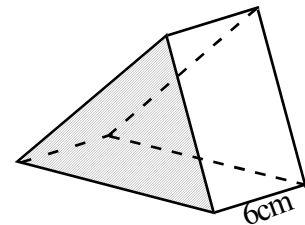
19. Write  $\log_3 81 = 4$  in index form.

20. If a car runs with a uniform speed of  $100 \text{ km/h}$ , find the time required to travel  $20 \text{ km}$  in minutes.

21. In the rectangle ABCD,  $AB = 15$  cm and  $BC = 8$  cm.  
Find the length of AC.

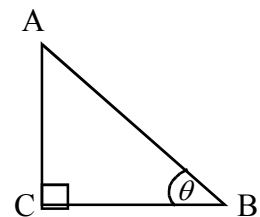


22. The figure indicates a prism with shaded cross sectional area of  $25$  cm<sup>2</sup>. If its length is  $6$  cm, find the volume of the prism.

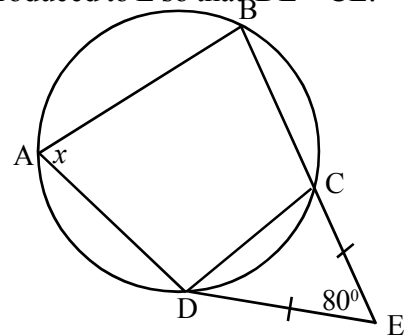


23. If  $x + 2y = 9$   
 $2x + y = 6$ , find the value of  $x + y$  without simplifying the equations.

24. As per the information given in the diagram,  
(i) write an expression for  $\sin \theta$  in terms of the sides of the triangle.  
(ii) name the trigonometric ratio that is indicated by  $\frac{AC}{BC}$ .



25. A, B, C and D are four points on the circle. Side BC is produced to E so that  $DE = CE$ .  
 $\hat{C}ED = 80^\circ$ . Find the value of  $x$ .



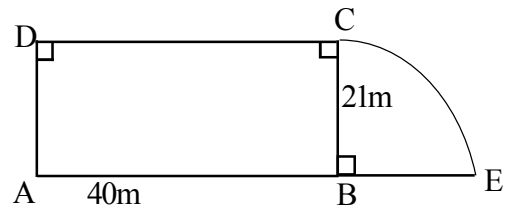
Mathematics I - Part B

Answer all the questions on this paper itself.

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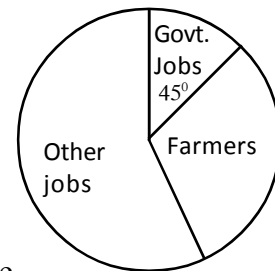
1. (a) A local authority charges 8% as rates for the properties in its area. For a property which has annual property value of Rs.25,000,
- (i) find the amount of the annual rates.
  
  - (ii) find the rates to be paid per quarter.
- (b) The next year the annual property value was increased by 20% and the rates percentage was decreased to 7%.
- (i) What is the new annual property value?
  
  - (ii) Find the percentage by which the payable rates is increased due to the change made by the local authority.
- 
2. (a) It was assessed that six days have to be spent by 50 people to lay gravel and prepare a gravel road.
- (i) If 10 people can lay gravel for 3 km within 2 days, what is the length of the road that can be completed by 50 men in one day?
  
  - (ii) What is the total length of the road?
  
  - (iii) Find the number of people to be employed to finish the work of the road 2 days before the scheduled day.
- (b) Saman's monthly income is Rs. 250 000. Rs.2 400 000 annual income is waived from income tax and a tax of 15% should be paid for the balance amount. What is the amount of annual income tax paid by Saman?

3. The diagram shows a land consisting of a rectangular part ABCD and a sector-shaped portion BEC attached to it. (Take  $\pi = \frac{22}{7}$ )



- (i) Find the area of the rectangular part ABCD.
- (ii) Find the area of the sector shaped part BEC.
- (iii) Calculate the total cost to cement the floor area of BCE, if the cost for  $1\text{m}^2$  is Rs.420.
- (iv) An 8m long portion at the middle of the boundary 'CD' is reserved for a gate. A right angled triangle shaped portion which is of  $\frac{1}{4}$  the area of the rectangle ABCD is allocated to grow banana. One boundary of that should be either AD or BC and the gate should not be obstructed. Mark that triangle shaped portion with dimensions in the above diagram.

4. (a) Information of a survey collected from 200 villagers on their livelihoods is depicted in a pie chart. According to the pie chart,

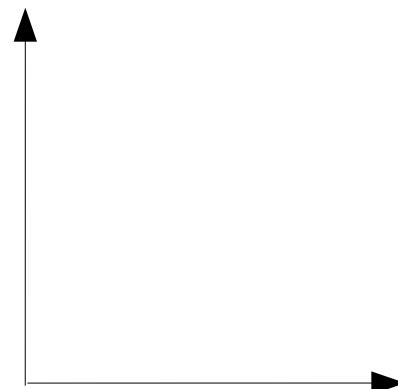


- (i) how many people are engaged in government jobs?
- (ii) If the number of farmers depicted in the pie chart is 70, find the angle subtended at the centre by the sector representing farmers.

- (b) Information on amounts of rubber latex collected by a collecting centre on daily basis is given in the below table.

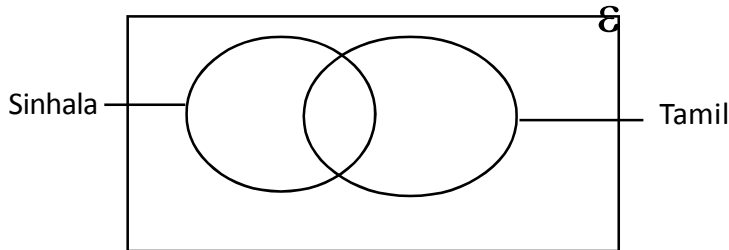
Amount of rubber latex	10 - 15	15 - 20	20 - 25	25 - 30	30 - 40
Number of days	2	5	10	9	4

- (i) Represent the information in the table as a histogram on the given Cartesian plane.
- (ii) Construct the frequency polygon based on the histogram.

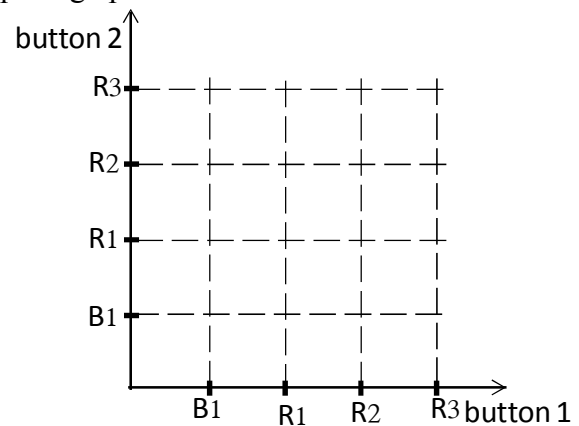




5. (a) 60 students who can work in Sinhalese and Tamil languages participate for a workshop on ethnic harmony. They can work at least in one language. Number of students who are proficient in two languages is 18 In addition, 22 students can work only in Sinhala.



- (i) Include the above information in the Venn diagram and find the number of students who can work only in Tamil.
  - (ii) Find the number of students who can work only in one language.
- (b) Four buttons of same shape and size are in a box. One of them is blue and three are red. One button is randomly taken from the box and by putting it back another button is taken out.
- (i) Show the relevant sample space by a point graph.



- (ii) Find the probability of the buttons taken out being of two different colours.
- (iii) Find the probability of the event in (ii) above, when the button taken first is an without putting into the box again and a button is taken again.

**Mathematics II**

**Three hours**

- Answer 10 questions selecting five questions from part A and five questions from part B.
- Every question is worth 10 marks.
- The volume of a right circular cylinder of, base radius  $r$  and height  $h$  is  $\pi r^2 h$ .
- The volume of a sphere of radius  $r$  is  $\frac{4}{3} \pi r^3$ .

**Part A**

Answer five questions only

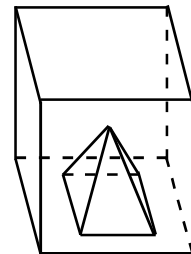
1. Kasun borrowed Rs. 25,000 at an annual simple interest rate of 12% to pay off within two years.
  - (i) Kasun invested that amount in a small business. If he earned a profit equivalent to 50% of the invested amount by the end of the first year, how much profit did he earn?
  - (ii) Find the interest he should pay in two years for the loan.
  - (iii) Kasun expects to pay off the loan with his profit in the first year and the profit he gains in the second year. To achieve that, how much profit should he gain in the second year?
  - (iv) But Kasun got only Rs. 13,500 as his second year profit. If total profit gained during two years is paid to settle the loan, what is the balance amount to be paid?
  
2. The width of a rectangular shaped flower bed is  $x$  m. The length of the flower bed is two meters greater than its width. Develop a quadratic equation in terms of  $x$  if the area of the bed is  $17 \text{ m}^2$  and show that the length of the bed is  $(3\sqrt{2} + 1)$  m.
  
3. (a)  $A = \begin{pmatrix} 2 & 3 \\ -1 & 1 \end{pmatrix}$ ,  $B = \begin{pmatrix} 1 & -2 \\ 3 & 2 \end{pmatrix}$ ; A and B are two matrices.
  - (i) What is the order of matrix A?
  - (ii) Find the product AB.
  - (iii) Find the product BA and giving reasons show whether  $BA = AB$ .
  
- (b) Grade 6 students who went to the library on the instructions of the teacher brought books to the class. Each boy brought 4 science books and each girl brought 3 science books making a total of 26. Each boy brought 2 maths books and each girl brought one maths book to make a total of 12.
  - (i) Show the above information in a pair of simultaneous equations considering that the number of girls is  $x$  and number of boys is  $y$ .
  - (ii) By solving those equations, show that the number of boys is greater than the number of girls.

4. Given below is a table of suitable values to draw the graph of the function  $y = (x - 1)^2 - 2$ .

$x$	-2	-1	0	1	2	3	4
$y$	7	.....	-1	-2	....	2	7

- (a) (i) Fill in the blanks in the table.  
 (ii) Draw the graph of the function  $y = (x - 1)^2 - 2$  taking 10 small squares as one unit of  $x$  axis and 10 as one unit of  $y$  axis.
- (b) Using the graph  
 (i) write the coordinates of the turning point.  
 (ii) find the range of  $x$  on which the function is negatively increasing.  
 (iii) write the coordinates of the turning point of the function  $y = (x - 1)^2 - 7$ .

5. A side of the base of the solid glass square pyramid is 12.35 cm. Height of it is 15 cm. This pyramid is carefully placed in a cuboid tank of 20 cm length and 16 cm width and filled with water. If the tank contained water to a certain height and the water level rose through a height of  $h$ , write an expression for  $h$  and find its value to the first decimal place using the logarithmic tables.



6. Statistics of brooms produced per day by a certain producer last year are given below.

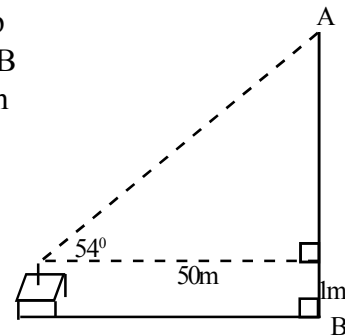
Class interval (No. of brooms)	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency (No. of days)	26	28	35	34	63	50	46	18

- (i) What is the modal class of this distribution?  
 (ii) Considering the mid value of the 40-50 class interval as the assumed mean, calculate the mean of the number of brooms produced in a day to the closest whole number.  
 (iii) Production cost of a broom is Rs.40 and he sells it at Rs.90. Show that the profit he gains within a month of 30 days exceeds Rs.60,000.00

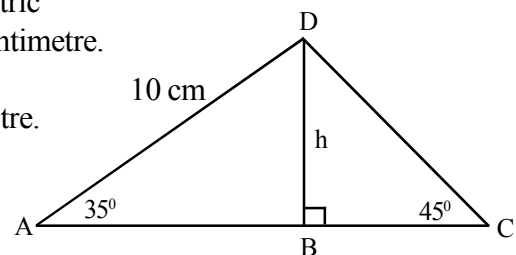
Part B

Answer five questions only.

07. (a) The sketch shows some measurements taken by a group of students involved in finding the height of a flag post AB erected on a flat land in the school yard. Draw a diagram to the scale 1 : 1 000 and from it find the height of the flag post to the nearest whole number.



- (b) (i) Based on data in the diagram and trigonometric ratios find the length of DB to the nearest centimetre.  
 (ii) Find the length of AC to the nearest centimetre.  
 (iii) Using the above values show with reasons that the area of the triangle is less than  $50 \text{ cm}^2$ .



8. (a) In a circular compound, bricks are fixed in a way that the first tier has 7, second tier has 11 and the next tier has 15. If fixing of a single brick costs Rs. 10, show that the cost for fixing bricks in 15 tiers exceeds Rs. 5 000.

- (b) If the sixth and ninth term in the progression 12, 6, 3, ... are  $T_6$  and  $T_9$  respectively, show that  $T_6 = 8T_9$ .

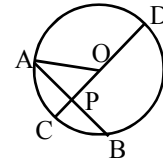
9. Using the compass and the ruler

- (i) draw a circle with 4 cm radius.
- (ii) draw any radius and mark D at the point it touches the circumference of the circle.
- (iii) draw a chord 'AB' at 2.5 cm from the centre and perpendicular to the above radius and name it AB.
- (iv) Draw chord BC so that it equals 5 cm.
- (v) Mark E on the circle at equal distance from AB and BC and complete the cyclic quadrilateral ABCE .

10. ABCD is a parallelogram where A is an obtuse angle. Side DA is produced up to E so that  $DA = AE$ . Also, EB and DC when produced meet at F. Draw a diagram including the given data and verify that ABFC is a parallelogram.

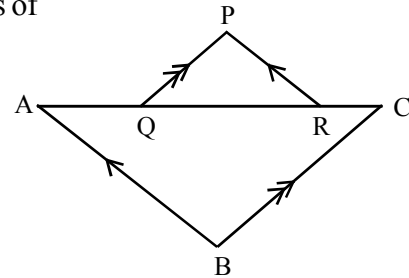
11. (a) Chord AB and diameter CD of a circle with the centre point O, intersect perpendicularly at point P. PD = 24 cm and CP = 6 cm.

- (i) What is the radius of the circle in centimetres?  
 (ii) Find the length of the chord AB.



- (b) (i) Copy the diagram given and mark the two pairs of angles which are equal.

- (ii) If AB = 18 cm, QR = 12 cm and BC = 15cm find PQ.



12. Two bags contain table tennis balls of the same shape and size. They are numbered as follows;

First bag: 5 balls marked number five, 3 balls marked number two.  
 Second bag: 2 balls marked number five, 4 balls marked number two.

- (i) Draw a tree diagram to show the probability of drawing a ball randomly from the first bag.
- (ii) A ball randomly taken out from the first bag is put into the second bag. Later a ball is taken out from the second bag as well. To indicate this, extend the tree diagram you have drawn.
- (iii) Find the probability of drawing a ball marked number 5 from the first bag and a ball marked number 2 from the second bag.
- (iv) Find the probability of drawing balls with the same number on both occasions.
- (v) Find the probability of getting at least one ball with number 2.

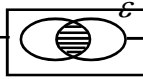
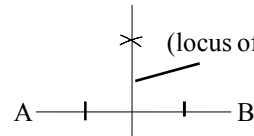
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**Mathematics Question Paper - 3**

**3.3 Answers and Marking Scheme**

**Mathematics Paper I - Part A**

Question number	Answer	Mark	Question number	Answer	Mark		
01	$\frac{1}{4} \times 2 \times \frac{22}{7} \times 7 \dots 1$ $11 + 14 = 25 \dots 1$	②	14	$x = 4\text{cm} \dots 1$ $y = 5\text{cm} \dots 1$	②		
02	$x = 40^0$	②	15.	$25\text{cm}^2$			
03	$\frac{8}{100} \times 1\ 000 \dots 1$ Rs.80 ..... 1	②	16.	$\begin{pmatrix} 3 & 4 \\ 8 & 6 \end{pmatrix}$	②		
04	$\frac{7-1}{6-2} \dots 1$ $= \frac{3}{2} \dots 1$	②	17.	i.  .....1			
05	{1, 3, 5}	②	ii. { boys studying music } ...1	②			
06	$(a-5)(a-2)$ $a^2 - 5a - 2a + 10 \dots 1$	②	18	$x = 35^0 \dots 1$ $y = 70^0 \dots 1$	②		
07	<table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>0</td></tr><tr><td>5</td></tr></table> ..... 1 ..... 1	0	5	②	19	$3^4 = 81$	②
0							
5							
08	$a + b = c + d \dots 1$ $d = a + b - c \dots 1$	②	20.	$\frac{20}{100} \text{ hours} = \frac{1}{5} \text{ hours} \dots 1$ 12 minutes ..... 1	②		
09	1 $x < 2 \dots 1$	②	21.	$AC^2 = 15^2 + 8^2 \dots 1$ $AC = 17 \dots 1$	②		
10	Work remaining = 24 man days -1 Number of days needed = 3 -1	②	22.	$25 \times 6 \dots 1$ $150 \text{ cm}^3 \dots 1$	②		
11		②	23	$3x + 3y = 15 \dots 1$ $x + y = 5 \dots 1$	②		
12	3.9	②	24.	$\sin \theta = \frac{AC}{AB} \dots 1$ $\tan \theta \dots 1$	②		
13	$\frac{3}{3x} + \frac{2}{3x} \dots 1$ $= \frac{5}{3x} \dots 1$	②	25.	$\hat{E}CD = 50^0 \dots 1$ $x = 50^0 \dots 1$	②		

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**Mathematics Question Paper - 3**

Part I - B Answers

01.	(a) (i) Annual rates	$=Rs. 25\ 000 \times \frac{8}{100}$	.....01
		$=Rs. 2\ 000$	.....01----(2)
	(ii) Rates per aquarter	$=Rs. \frac{2\ 000}{4}$	.....01
		$=Rs. 500$	.....01----(2)
	(b) (i) New annual property value	$= 25\ 000 \times \frac{20}{100} + 25\ 000$	.....01
		$=Rs. 30\ 000$	.....01----(2)
	(ii) New rates	$= 30\ 000 \times \frac{7}{100}$	.....01
		$= Rs. 2\ 100$	.....01
	Increase	$= Rs. 100$	.....01
	Percentage of the rates increase	$= \frac{100}{2\ 000} \times 100\%$	
		$= 5\%$	.....01----(4) <b>10</b>

02. (a)	(i) Diastance completed by 50 men in a day	$= \frac{3\ km}{20} \times 50 = 7\frac{1}{2}\ km$	.....02----(2)
	(ii) Total distance	$= 7\frac{1}{2}\ km \times 6$	
		$= 45\ km$	.....02----(2)
	(iii) Number of men	$= \frac{300}{4}$	.....01
		$= 75$	.....01----(2)
	(b) Annual income	$= Rs. 250\ 000 \times 12 = Rs. 3\ 000\ 000$	.....01
	Tax paying amount	$= Rs. 600\ 000$	.....01
	Income tax due	$= Rs. 600\ 000 \times \frac{15}{100}$	.....01
		$= Rs. 90\ 000$	.....01----(4) <b>10</b>

03.	(i) Area of the rectangle ABCD	$= 40m \times 21m = 840m^2$	.....02 ----(2)
	(ii) Area of the sector BCE	$= \frac{22}{7} \times \frac{21 \times 21}{4}$	.....01
		$= 346.5\ m^2$	.....01
	Expenditure for cementing	$= 346.5 \times 420$	.....01
		$= Rs. 145\ 530$	.....01----(4)

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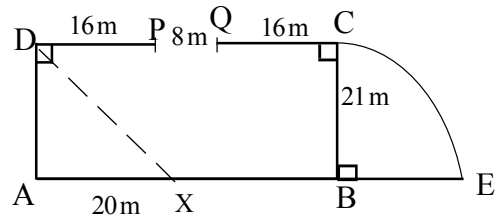
**Mathematics Question Paper - 3**

(iv) Area of  $\triangle ADX = \frac{840}{4} m^2$  .....01

$$\frac{840}{4} = \frac{1}{2} \times 21 \times AX \quad \dots\dots 01$$

$$AX = 20m \quad \dots\dots 01$$

Joining DX .....01



----- (4) **10**

04. (a)(i) Number of government employees =  $\frac{45}{360} \times 200$  .....01

$$= 25 \quad \dots\dots 01 \quad \text{--- (2)}$$

(ii) Sector angle representing farmers =  $\frac{70}{200} \times 360^\circ$  .....01

$$= 126^\circ \quad \dots\dots 01 \quad \text{--- (2)}$$

(b)(i) Calibrating axes .....01

Drawing bar corresponding to 30 -40 .....01

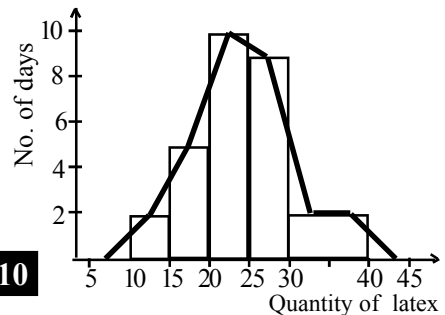
Other bars .....01 --- (3)

(ii) Joining mid points of bars .....01

Joining mid points of bar 30 -40 .....01

Joining the terminal point .....01 --- (3)

**10**



05. (a)(i) Marking 18 and 22 .....02

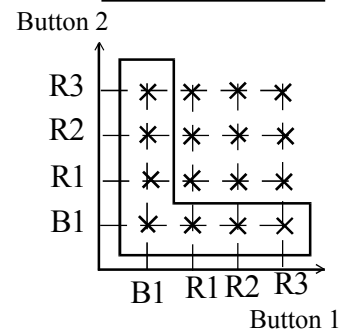
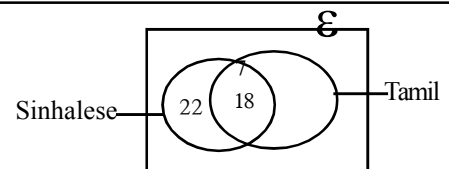
Number of students who can work only in Tamil medium =  $60 - (22 + 18) = 20$  .....02 --- (4)

(ii) Number of students who can work only in one language =  $22 + 20 = 42$  .....01+01 --- (2)

(b)(i) Marking points .....01

(ii) Probability of being of distinct colours the two buttons withdrawn =  $\frac{6}{16}$  .....01

(iii) Probability =  $\frac{6}{12}$  .....02 --- (4)   
 (For obtaining 6.....01)   
 (For obtaining 12.....01)



**10**

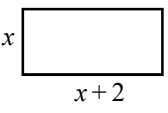


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**Mathematics Question Paper - 3**

(01)		<p>(i) Profit in the first year = Rs. <math>25\,000 \times \frac{50}{100}</math> = Rs. 12 500</p> <p>(ii) Interest to be paid after two years = Rs. <math>25\,000 \times \frac{12}{100} \times 2</math> = Rs. 6 000</p> <p>(iii) Total amount to be paid after 2 years = Rs. 31 000 Profit to be gained in the second year = Rs. 31 000 - 12 500 = Rs. 18 500</p> <p>(iii) Profit gained to settle the loan in the 2<sup>nd</sup> year = Rs. 13 500 Further amount required to settle the loan = Rs. 18 500 - 13 500 = Rs. 5000</p>	1 1 2 1 1 1 2	② ③ ③ ②		<b>10</b>

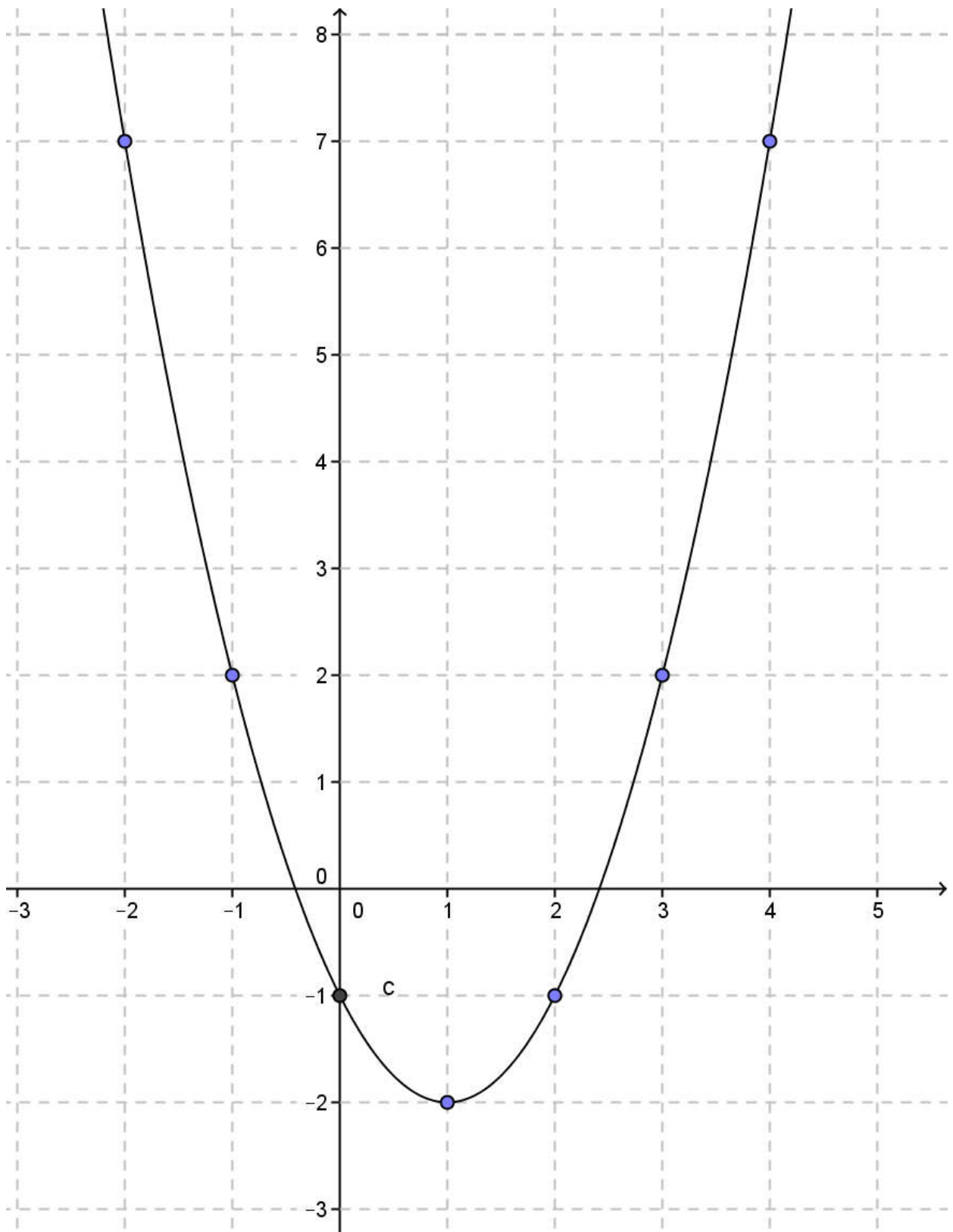
(02)		<p>Length = <math>x+2</math></p> <div style="text-align: center;">  </div> <p>Area = <math>x^2 + 2x</math> <math>x^2 + 2x = 17</math></p> <p><math>x^2 + 2x = 17</math> <math>x^2 + 2x + 1 = 17 + 1</math> <math>(x + 1)^2 = 18</math> <math>x + 1 = \pm\sqrt{18}</math> <math>x + 1 = \pm 3\sqrt{2}</math> <math>x = +3\sqrt{2} - 1</math> or <math>-3\sqrt{2} - 1</math> <math>x = -3\sqrt{2} - 1</math> Since <math>x &gt; 0</math></p> <p>Breadth of the bed = <math>3\sqrt{2} - 1</math> Length of the bed = <math>x + 2 = 3\sqrt{2} - 1 + 2</math> = <math>(3\sqrt{2} + 1)</math> m</p>	1 1 1 1 1 1 1 1 1 1			<b>10</b>

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**Mathematics Question Paper - 3**

(03)	(a)	(i)	$2 \times 2$	1	①		
		(ii)	$AB = \begin{pmatrix} 11 & 2 \\ 2 & 4 \end{pmatrix}$	1	①		
		(iii)	$BA = \begin{pmatrix} 4 & 1 \\ 4 & 11 \end{pmatrix}$  $\therefore BA \neq AB$	1  1	  ②	  △ 4	
	(b)	(i)	$3x + 4y = 26$ $x + 2y = 12$	1  1	  ②		
		(ii)	$2x + 4y = 24$ Subtraction $x = 2$ $y = 5$ Number of girls = 2 Number of boys = 5  $2 < 5$	1  1  1  1			
					④	△ 6	
						<b>10</b>	
	(04)	(a)	(i)	2, -1	2	②	
			(ii)	Marking the axes correctly	1		
				Marking at least 5 points correctly	1		
			Smooth curve	1	③	△ 5	
(b)		(i)	(1, -2)	1			
		(ii)	$1 < x < 2.5$	2			
		(iii)	(1, -7)	2	⑤	△ 5	
				<b>10</b>			



(05)	(a)	<p>Because <math>h</math> is the height to which water level rises</p> $\frac{1}{3} \times 12.35 \times 12.35 \times 15 = 20 \times 16 \times h$ $h = \frac{(12.35)^2 \times 5}{20 \times 16}$ $h = \frac{(12.35)^2}{64}$ <p><math>\lg h = 2 \lg 12.35 - \lg 64</math></p> <p><math>= 2 \times 1.0916 - 1.8062</math></p> <p><math>= 2.1832 - 1.8062</math></p> <p><math>= 0.3770</math></p> <p><math>\therefore h = \text{anti log } 0.3770</math></p> <p><math>= 2.382</math></p> <p><math>h = 2.4\text{cm}</math></p>	1					
			1					
			1					
			1					
			1	1				
			1					
			1					<b>10</b>

(06)		<table border="1" style="width:100%; border-collapse: collapse; margin-bottom: 10px;"> <thead> <tr> <th>class interval</th> <th>x</th> <th>f</th> <th>d</th> <th>fd</th> </tr> </thead> <tbody> <tr><td>0-10</td><td>5</td><td>26</td><td>-40</td><td>-1040</td></tr> <tr><td>10-20</td><td>15</td><td>28</td><td>-30</td><td>-840</td></tr> <tr><td>20-30</td><td>25</td><td>35</td><td>-20</td><td>-700</td></tr> <tr><td>30-40</td><td>35</td><td>34</td><td>-10</td><td>-340</td></tr> <tr><td>40-50</td><td>45</td><td>63</td><td>0</td><td>0</td></tr> <tr><td>50-60</td><td>55</td><td>50</td><td>10</td><td>500</td></tr> <tr><td>60-70</td><td>65</td><td>46</td><td>20</td><td>920</td></tr> <tr><td>70-80</td><td>75</td><td>18</td><td>30</td><td>540</td></tr> <tr> <td colspan="4" style="text-align: center;"><math>\sum f = 300</math></td> <td style="text-align: center;"><math>1960 - 2920</math> <math>= -960</math></td> </tr> </tbody> </table> <p>(i) 40 - 50</p> <p>(ii) Mid value column</p> <p>Deviation column</p> <p>fd column</p> <p><math>\sum fd</math></p> <p>Median = <math>A + \frac{\sum fd}{\sum f}</math></p> <p><math>= 45 - \frac{960}{300}</math></p> <p><math>= 45 - 3.2</math></p> <p><math>= 41.8</math></p> <p><math>= 42</math></p> <p>(iii) Income from selling brooms in one month = <math>42 \times 30 \times 50</math></p> <p style="text-align: right;"><math>= \text{Rs.}63\,000</math></p> <p><math>63\,000 &gt; 60\,000</math></p>	class interval	x	f	d	fd	0-10	5	26	-40	-1040	10-20	15	28	-30	-840	20-30	25	35	-20	-700	30-40	35	34	-10	-340	40-50	45	63	0	0	50-60	55	50	10	500	60-70	65	46	20	920	70-80	75	18	30	540	$\sum f = 300$				$1960 - 2920$ $= -960$	1				
class interval	x	f	d	fd																																																					
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**Programme of improving G.C.E (O.L.) Examination results**

**OL/3/32-S-1**

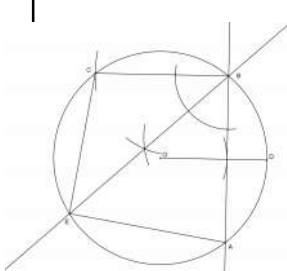
**Mathematics Question Paper - 3**

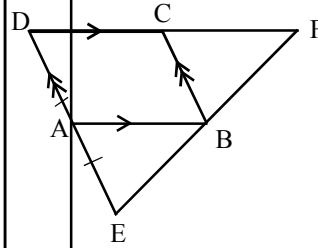
(07)	(a)	Drawing scale diagram Height = 70 m	2			
	(b)	(i) $\sin 35^\circ = \frac{h}{10}$ $h = 0.5736 \times 10$ $h = 5.736$ BD = 6m (ii) $\cos 35^\circ = \frac{AB}{10}$ $AB = 0.8192 \times 10 = 8.192 \approx 8$ $AC = 6 + 8 = 14\text{cm}$ (iii) Area of ACD = $\frac{1}{2} \times 6 \times 14$ $= 42 \text{ cm}^2$ $42 < 50$	1	③	△ 3	
(08)	(a)	$a = 7, d = 4$ $S_{15} = \frac{15}{2} \{2 \times 7 + (15 - 1) \times 4\}$ $= \frac{15}{2} \times 70$ $= 525$ Expenditure = Rs. $525 \times 10$ $= \text{Rs. } 5250$ $\therefore 5250 > 5000$	1			
	(b)	$a = 12, r = \frac{1}{2}$ $T_6 = 12 \times \left(\frac{1}{2}\right)^5 = \frac{3}{8} \quad \text{--(1)}$ $T_9 = 12 \times \left(\frac{1}{2}\right)^8 = \frac{3}{64} \quad \text{--(2)}$ $\frac{(1)}{(2)} \quad \frac{T_6}{T_9} = 8$ $T_6 = 8T_9$	1	⑤	△ 5	
			1	⑤	△ 5	<b>10</b>

**Programme of improving G.C.E (O.L.) Examination results**

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**Mathematics Question Paper - 3**


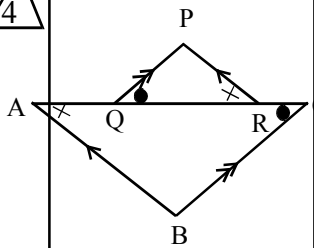

(09)	(i)	Drawing the circle	1	<div style="display: flex; align-items: center; justify-content: center;"> <div style="margin-right: 10px;">①</div> <div style="margin-right: 10px;">④</div> <div style="margin-right: 10px;">①</div> <div style="margin-right: 10px;">④</div> </div> 
	(ii)	Drawing the radius and marking 2.5 cm Constructing the perpendicular from 2.5	1 2	
		Drawing chord AB	1	
	(iii)	Drawing BC	1	
	(iv)	Constructing the bisector of angle ABC Marking point E	2 1	
	Completion of the cyclic quadrilateral	1	<b>10</b>	

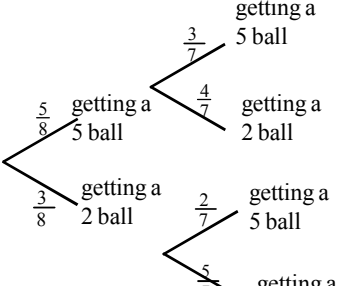
(10)		Drawing the diagram	2	
		DA=AE (Data)	1	
		DA=BC (Opposite sides of the parallelogram)	1	
		$\therefore BC=AE$		
		$\widehat{EAB} = \widehat{ABC}$ (alternate angles, EA//BC)		
		$\widehat{BCF} = \widehat{ABC}$ (alternate angles, DF//BC )	1	
		$\therefore \widehat{EAB} = \widehat{BCF}$		
		Comparing triangles EAB and BCF,		
		$\widehat{EAB} = \widehat{BCF}$ (already verified )		
		$\widehat{AEB} = \widehat{CFB}$ (corresponding angles, AB//CF)	1	
	AE=BC ( Verified)			
	$\therefore \triangle ABE \equiv \triangle BCF$ (A,A,S)	1		
	In the quadrilateral ABFC			
	AB = CF (Corresponding sides of congruent triangles)	1		
	AB // CF ( Data )	1		
	$\therefore$ ABFC is a parallelogram (A pair of opposite sides are equal and parallel)		<b>10</b>	

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Mathematics Question Paper - 3

(11)	(a)	<p>(i) Radius = <math>\frac{24+6}{2} = 15</math> cm</p> <p>(ii) OP = 15 - 6 = 9 cm</p> <p>Applying Pythagoras' theorem to triangle APO</p> $AP^2 + PO^2 = AO^2$ $AP^2 = 15^2 - 9^2$ $= 144$ $AP = 12$ cm $AB = 24$ cm	1	①		
			1			
			1			
			1			
			1	③		
	(b)	(i) Marking equal angles $\hat{P}RQ = \hat{Q}AB$ $\hat{P}QR = \hat{R}CB$	1			
			1	②		
		(ii) Showing $\Delta PQR$ and $\Delta ABC$ are similar	2			
		$\frac{18}{12} = \frac{15}{PQ}$	1			
		$PQ = \frac{12 \times 15}{18} = 10$ cm	1	④		<b>10</b>

(12)					
	(i) Drawing the tree diagram	1	①		
	(ii) Extension of the tree diagram	2	②		
	(iii) Probability of getting a 5 ball first and a 2 ball second	2	②		
	$= \frac{5}{8} \times \frac{4}{7} = \frac{20}{56}$				
	(iv) Probability of getting balls of the same type on both occasions	3	③		
	$= \frac{5}{8} \times \frac{3}{7} + \frac{3}{8} \times \frac{5}{7} = \frac{30}{56}$				
	(v) Probability of getting a 2 ball	1			
	$\frac{5}{8} \times \frac{4}{7} + \frac{3}{8} \times \frac{2}{7} + \frac{3}{8} \times \frac{5}{7}$ or $(1 - \frac{5}{8} \times \frac{3}{7})$	1	②		
	$= \frac{41}{56}$				<b>10</b>

**4.1 Objectives**

**Paper I - Part A**

01. Writes the next two terms of an arithmetic progression when several successive terms are given.
02. Finds the sine ratio of an angle when the lengths of two sides of a right angled triangle are given.
03. Factorises a trinomial expression of the type  $x^2 + bx + c$ .
04. When several data are given in a table, selects continuous data from them.
05. Given the values of two interior angles of a triangle, finds the value of the exterior angle between two produced sides of the triangle.
06. Simplifies given algebraic fractions with related denominators containing algebraic terms with one unknown.
07. Calculates the gradient of a straight line of the type  $y = mx + c$  passing through a given point.
08. Given two sets of which one is a subset of the other, writes their intersection with the elements.
09. Finds the least common multiple of two given algebraic terms.
10. Finds the values of named angles using the data given in a figure comprising two isosceles triangles.
11. Solves an inequality of the type  $ax + b \geq c$  and indicates the solution on a number line.
12. Calculates the perimeter of a compound figure with two sectors given the radius and the central angle.
13. Given the value of one angle of a figure of a circle given with a diameter and angles in the same sector, finds the value of another angle.
14. Finds the annual simple interest rate when the monthly interest for a loan is given.
15. Calculates the speed of an object when a distance-time graph depicting the motion of an object within a certain time interval is given.
16. Writes in terms of  $\pi$  and  $r$  an expression for the area of a sector given the angle at the centre and the radius as an unknown.



17. Given the frequencies separately for a group of data of four categories, finds the probability of an individual randomly selected belonging to one of them.
18. When the three sides of a triangle and a line drawn parallel to a side through the mid point of another side are given in a diagram, calculates the perimeter of a named triangle in the diagram.
19. Given a diagram of a triangle and a parallelogram situated between the same two parallel lines, finds the ratio between the areas of the triangle and the parallelogram.
20. Finds the radius of a circle when the length of the perpendicular drawn from the centre of the circle to a chord of given length is given.
21. Indicates in terms of man days, the work done by a machine in an hour, when the number of men and the number of days required to complete a task and the number of hours taken by the machine to complete the same task are given.
22. Indicates in a sketch the location of a point situated at a definite distance from two intersecting straight lines using the knowledge on loci.
23. Writes an expression written in logarithmic form in index form.
24. Given a pair of simultaneous equations with different coefficients, derives a value for the difference between the two unknowns without solving them.
25. When a diagram of a circle is given with the centre and data marked on it, finds the relationship between two named angles in it according to the data provided.

Part B

1. Having indicated the first part as a fraction and the second part as a fraction of the rest of a unit comprising of three parts,
  - (i) indicates as a fraction of the unit, the remaining part of the unit excepting its initial part.
  - (ii) writes what fraction of the total unit is another amount of the remaining part.
  - (iii) shows that the second part is three times the third part.
  - (iv) calculates and writes the amount of the complete unit given the amount of the second part as a quantity.
2. (a) Given a diagram of a pattern with four rows made by arranging cubes in rows,
  - (i) writes the number of cubes in the next two rows separately.
  - (ii) identifies the relationship between the terms in the number pattern and writes the progression to which it belongs.
  - (iii) when the number of rows of that progression is given, calculates the number of cubes in the last row.

- (b) When two terms of a geometric progression is given
- (i) finds the common ratio.
  - (ii) finds the first term.
3. Given the time required to fill a tank separately with two taps and the time required to empty that tank completely by another tap,
- (i) finds the time taken to fill half of that tank when both the inlet taps are opened.
  - (ii) calculates what amount of the tank gets filled in one hour if all the three taps are kept open.
  - (iii) finds the time taken to fill the tank if all the three taps are opened when exactly half of the tank has already been filled.
4. Given a histogram illustrating the marks obtained by a group of students for an assignment,
- (i) tabulates the number of students in each interval.
  - (ii) draws the frequency polygon on the given histogram.
  - (iii) when the sector angle corresponding to the number of students of one class interval is given for displaying this information by a pie chart, calculates the sector angles to display the other intervals.
  - (iv) finds the fraction relating to one event based on the information in the histogram.
5. (a) When a Venn diagram with a universal set and two intersecting sets is given,
- (i) finds the number of elements in a named set by indicating the given numbers of elements in two sets in the Venn diagram.
  - (ii) shades in the Venn diagram a named area that does not belong to one set.
  - (iii) finds the number of elements in another named set when the number of elements in the universal set and the number of elements in one set are given.
- (b)
- (i) Writes a formula for  $n(A \cup B)$  in terms of  $n(a), n(b), n(A \cap B)$ .
  - (ii) Finds the number of elements in  $n(A \cup B)$  by substituting given values in that formula.

1. (a) Given the value of a share, the annual dividend payable for a share and the amount invested to buy shares,
  - (i) finds the number of shares that can be bought for the amount invested.
  - (ii) calculates the income received from shares when the number of shares and the dividend paid for a share are given.
  - (iii) finds the value of shares when the income from another number of shares is given.
- (b) Given the annual compound interest percentage, the loan amount and the time taken to settle the loan,
  - (i) calculates the total amount that should be paid at the end of the stipulated period to settle the loan.
  - (ii) presents reasons for the fact that getting a loan under a given annual simple interest rate is not more profitable than getting the loan under compound interest.
2. Given a graph of a quadratic function drawn within a given interval of values of  $x$ , using the graph,
  - (i) finds the value of  $y$  for a given value of  $x$ .
  - (ii) writes the interval of values of  $x$  in which the function increases positively.
  - (iii) finds the value of  $k$  when the function takes the form  $y = k - (x + a)^2$ .
  - (iv) writes the roots of a given quadratic equation.
  - (v) writes the function when the maximum value and the coordinates of the turning point and coefficient of  $x^2$  are given.
3. (a)
  - (i) Writes the order of a given matrix.
  - (ii) Multiplies two given matrices of order  $2 \times 2$  and writes the product.
- (b) Given how two people buy two items in different quantities and the amount of money required for it,
  - (i) constructs a pair of simultaneous equations using given unknown terms.
  - (ii) finds the price of each item separately by solving those equations.
  - (iii) states giving reasons whether one can agree with the statement that 'equal quantities of the above items can be bought for a certain sum of money'
4. (a) Given the angle of elevation of a mountain top from a certain place, and the angle of elevation to view the same after walking a given distance from that place towards the mountain,
  - (i) draws a scale diagram to a given scale.
  - (ii) finds the length of the segment of the line that represents the height of the mountain in the diagram drawn.
  - (iii) calculates the true height of the mountain using it.

- (b) When a distance-time graph of two objects starting from the same point at two occasions and moving in two parallel straight lines is given,
- (i) finds the distance traveled by one object.
  - (ii) finds the speeds of the two objects separately.
  - (iii) when one object overtakes the other, shows that the ratio of the motion-time ratio of the two objects is equal to a given ratio.
5. Finds the average speed of a driver given his mean speed of driving a vehicle between two cities as an algebraic expression and also the distance between the two cities, the difference between the speeds of the two drivers and how much more time the second driver takes to complete the journey than the first.
6. Using the mean, confirms that a given statement about the extra expenditure to be borne is true, given a grouped frequency distribution of data collected on the number of units of water consumed daily, the cost to produce one unit of water and the amount charged for a unit of water.

Part B

7. (a) Given the radius of the bottom and the height of a cylinder,
- (i) indicates the area of the curved surface in terms of the radius and the height.
  - (ii) indicates its volume in terms of the radius and height.
- (b) States in terms of radius and height, the volume of a cone whose radius of the bottom and height are equal.
- (c) (i) Finds the volume of the substance used to make the above cylinder in terms of  $\pi$  and  $a$  when a relationship between the height and the radius is given.
- (ii) Calculates how many spheres of radius  $a$  can be made by melting the whole amount of the substance above.
8. Using the compass and a ruler with the cm/mm scale
- (i) constructs a circle of given radius.
  - (ii) marks a point on that circle and constructs a tangent that touches the circle at that point.
  - (iii) constructs another tangent to the circle from a point at a given distance on the tangent.
  - (iv) constructs the circle that passes through the two points at which the tangents drawn from the external point to the circle touch the circle, the external point and the centre of the circle. Measures and writes its radius.
9. Given the price of an item, initial payment, annual interest rate and the number of installments, and also that the interest is calculated on the reducing balance, calculates the value of a monthly instalment.

10. (a) Explains a given theorem by way of a diagram.
- (b) Given a diagram where the mid points of the three sides of a triangle are joined,
- shows that a named quadrilateral formed by the mid points of the sides and a vertex point is a parallelogram.
  - shows that the perimeter of the triangle is twice the perimeter of the triangle formed by joining the mid points.
  - proves that the parallelogram in (i) is a rhombus given that two sides of the triangle are equal.
11. (a) Draws a triangle so that a named angle is a right angle and writes Pythagoras' relationship in relation to that triangle.
- (b) Draws a diagram to include the information given that, in a given right angled triangle, points dividing the sides which include the right angle in the ratio 1 : 2 are located, and derives a relationship between those sides.
12. Given that from a bag containing items of equal size and shape, two items are taken out on two occasions randomly without replacement,
- displays the sample space on a grid.
  - from it, calculates the probability of an event asked.
  - given the tree diagram relevant to the first occasion, extends it for the second occasion.
  - calculates the probability of a dependent event using the tree diagram.
  - using the above tree diagram, presents reasons for the truth or falsehood of a statement made with regard to mutually exclusive events.

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**Mathematics Question Paper - 4**

**4.2 Question paper**

**Mathematics I**

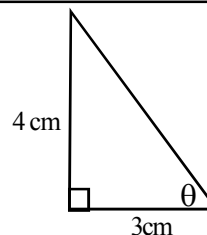
Answer all the questions on this paper itself.

**Time: Two hours**

**Part A**

1. Write the next two terms in the number pattern 7, 11, 15, .....

2. According to the measurements given in the diagram find  $\sin \theta$ .

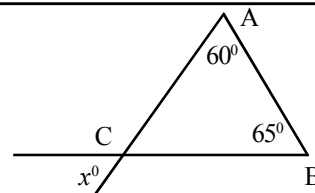


3. Factorise  $x^2 + 5x + 6$ .

4. Select continuous data from the data given in the following table and write '✓' against them.

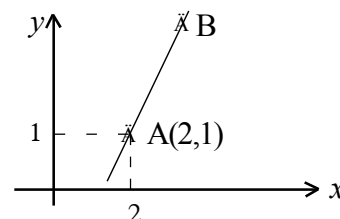
Data	Continuous
Heights of students in a class	
Number of members in a family	
Runs scored in a cricket match	
Ages of students in a class	

5. Find the value of  $x$  according to the data given in the diagram.



6. Simplify  $\frac{1}{x} - \frac{2}{3x}$ .

7. The equation of the straight line AB is given by  $y = mx - 5$ . Find the value of  $m$  according to the information given.



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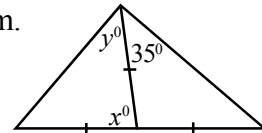
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**Mathematics Question Paper - 4**

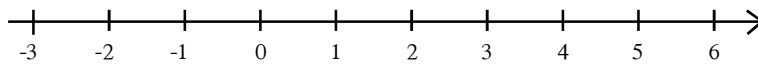
8.  $A = \{\text{integers from 1 to 10}\}$   
 $B = \{\text{multiples of 2 less than 10}\}$ . Write with elements the set  $A \cap B$ .

9. Find the least common multiple.  $4ab^2, 6a^2bc$

10. Find the values of  $x$  and  $y$  as per the information given in the diagram.

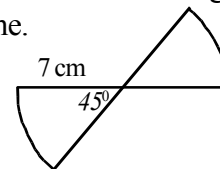


11. Indicate on the number line the solution of the inequality  $3x + 5 \geq 2$

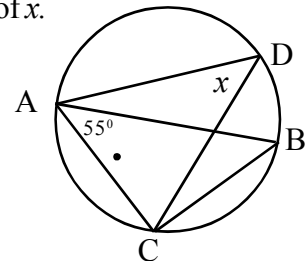


12. The diagram shows a wire frame with two sectors, each of radius 7 cm and central angle  $45^\circ$ . Find the minimum length of wire required to make the wire frame.

(take  $\pi = \frac{22}{7}$ )

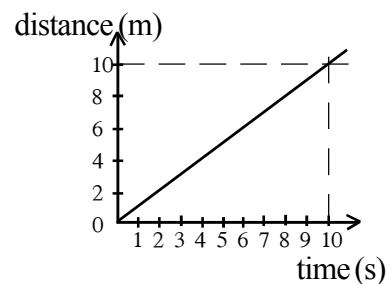


13.  $AB$  is a diameter of the given diagram.  $\hat{BAC} = 55^\circ$ . Find the value of  $x$ .

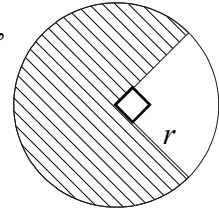


14. An interest of Rs. 5 is charged per month for a loan of Rs. 500. Find the annual simple interest rate.

15. Given in the figure is a distance -time graph that shows the motion of a moving object during 10 s. Calculate the speed of the object in  $\text{ms}^{-1}$ .



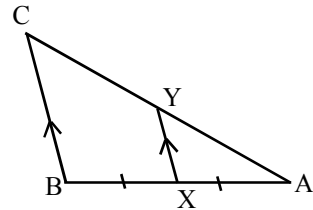
16. The diagram shows a sector of radius  $r$ . According to the information given, write an expression for the area of the shaded portion in terms of  $\pi$  and  $r$ .



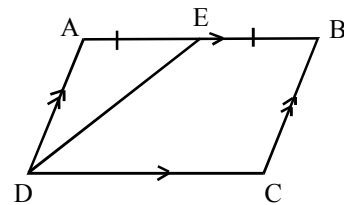
17. The following table gives the number of students in a class with the respective blood group. If a student is randomly selected, find the probability of his/her blood group being B.

Blood group	A	AB	B	O
Number of students	10	13	12	5

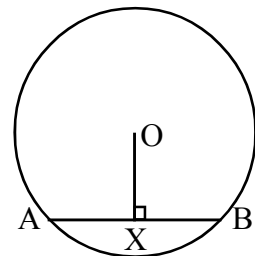
18. In the triangle ABC,  $AB = 10$  cm,  $AC = 14$  cm and  $BC = 12$  cm. If the mid point of AB is X and  $BC \parallel XY$ , find the perimeter of the triangle AXY.



19. According to the information given in the diagram, find the ratio between the area of the triangle AED and the area of the parallelogram ABCD.



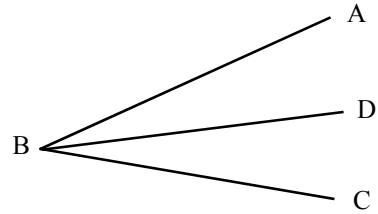
20. The perpendicular drawn from the centre O to the chord AB is OX. If  $AB = 8$  cm and  $OX = 3$  cm, find the radius of the circle.



21. A work completed by 12 men in 10 days is completed by a bulldozer in 8 hours. How much work in man days is done by the bulldozer in one hour?



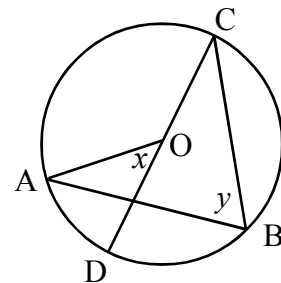
22. The bisector of  $\hat{A}BC$  is  $BD$ . Using your knowledge on loci show with the aid of a sketch how to find a point 5 cm away from both lines  $AB$  and  $BC$ .



23. If  $2 \log_2 a = b$ , write this in the form of indices making  $a$  the subject.

24. If  $3x - y = 8$  and  $x + y = 4$ , find the value of  $x - y$  without solving the equations.

25. The diagram shows a circle with centre  $O$ . According to the information given in it, build up a relationship between  $x$  and  $y$ .

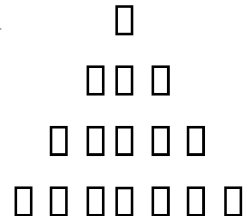


**Part B**

Answer all the questions on this paper itself

1. (a) The initial part of a certain road is surfaced with tar. The tarred portion is  $\frac{2}{7}$  of the entire road.  $\frac{3}{4}$  of the rest of the road is made with concrete. The remaining part is covered with gravel.
- (i) Find which fraction of the entire road is the non tarred part.
  - (ii) Find which fraction of the entire road is the concrete-laid part.
  - (iii) Show that the concrete-laid part is three times the gravel- covered part.
  - (iv) If the concrete-laid part is 225 m find the total length of the road.

2. (a) A student arranges empty match boxes in rows and makes structures as those shown in the diagram. There is one box in the first row, 3 boxes in the second row and 5 boxes in the third row.

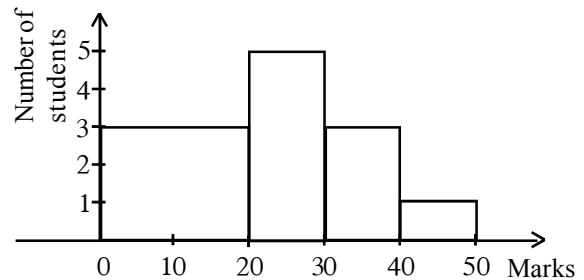


- (i) Write separately the number of match boxes in the 5th and 6th rows in a structure with six rows of boxes.
- (ii) When the number of match boxes in the respective rows are written in sequential order, to what type of progression do they belong?
- (iii) If a structure such as the above is made with 10 rows, how many boxes are in the 10<sup>th</sup> row?

- (b) The fourth term and the seventh term of a geometric progression are 40 and 320 respectively.
- (i) Find the common ratio of the geometric progression.
  - (ii) Write the first term of the progression.

3. Two taps A and B are fixed to a tank to fill water into it. When only A is opened, the tanks get filled in 8 hours. When only B is kept open, it takes 12 hours to fill the tank. When the outlet tap C is opened, the tank completely empties in 6 hours.
- (i) Find the time taken to fill half of the tank when only A and B are kept open when the tank is empty.
  - (ii) When the tank is empty, what fraction of it gets filled with water in one hour if all the three taps A, B and C are opened?
  - (iii) Find the time taken to fill the tank completely with water if all three taps were opened when the tank is exactly half-filled with water.

4. Presented here is a histogram based on the marks scored by students out of 50 for a mathematics assignment.



- (i) Complete the following table using the histogram.

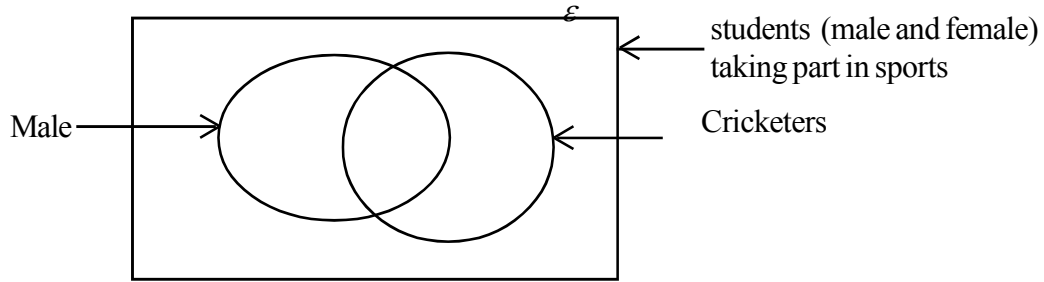
Marks	0-20	20-30	30-40	40-50
Number of students	.....	.....	.....	1

- (ii) Draw the frequency polygon on the above histogram.
- (iii) It was thought to indicate the above information in a pie chart. The angle of the sector used to represent the number of students scoring 40-50 was  $24^\circ$ . Find the angles of the other sectors representing the other intervals of marks and complete the following table.

Marks	0-20	20-30	30-40	40-50
Sector angle	.....	.....	.....	$24^\circ$

- (iv) If the students scoring above 30 marks for the assignment are considered to have achieved the expected achievement level, find what fraction of these students have reached the expected achievement level.

5. (a) The following Venn diagrams shows the information on the students taking part in sports in a school.



- (i) If the number playing cricket is 38 and the number of boys playing cricket is 18, indicate relevant information in the Venn diagram and find the number of girls playing cricket.
  - (ii) In the Venn diagram, shade the area representing the girls not playing cricket.
  - (iii) If the number of boys and girls taking part in sports is 60 and the number of girls not taking part in cricket is 10, how many boys participate in sports?
- (b) (i) Write a formula for  $n(A \cup B)$  in terms of  $n(A)$ ,  $n(B)$  and  $n(A \cap B)$ .
- (ii) Find the value of  $n(A \cup B)$  if  $n(A) = 8$ ,  $n(B) = 10$  and  $n(A \cap B) = 6$ .

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**Mathematics II**

**Three hours**

- Answer 10 questions selecting five questions from part A and five questions from part B.
- Every question is worth 10 marks.
- The volume of a right circular cylinder of, base radius  $r$  and height  $h$  is  $\pi r^2 h$ . The volume of a right circular cone of base radius  $r$  and height  $h$  is  $\frac{1}{3} \pi r^2 h$
- The volume of a sphere of radius  $r$  is  $\frac{4}{3} \pi r^3$ .

**Part A**

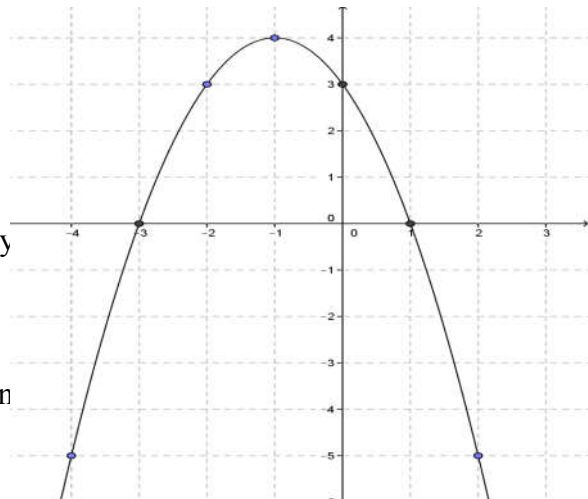
Answer five questions only

1. (a) In a company, the market price of a share is Rs.50. The company pays dividends of Rs.2 per share per year. Sarath invests Rs. 25 000 to buy shares of the company.
- (i) Find the number of shares to which Sarath is entitled.
  - (ii) What is the income of Sarath in that year from his shares?
  - (iii) If Kamal earns an income of Rs.2 500 for the shares in that company, find the investment made by Kamal in the company.
- (b) A man takes a loan of Rs. 50 000 for a period of two years at an annual compound interest rate of 10%.
- (i) Find the amount that should be paid at the end of two years to settle the loan.
  - (ii) Give reasons for the fact that taking the same loan for the same period at an annual simple interest rate of 11% is disadvantageous.

2. The figure shows the graph of a quadratic function drawn within the range  $-4 \leq x \leq 2$ .

Using the graph,

- (i) write the value of  $y$  when  $x = 0$ .
- (ii) write the interval of values of  $x$  in which the function increases positively
- (iii) find the value of  $k$  if this quadratic function takes the form  $y = k - (x+1)^2$ .
- (iv) According to the above value of  $k$ , find the roots of the equation  $k - (x+1)^2 = 0$ .



- (v) Write the function of which the coordinates of the maximum point is  $(-2,0)$  and the coefficient of  $x^2$  is 1.

3. (a) (i) Write the order of the matrix  $A = \begin{pmatrix} 2 & 1 \\ -1 & 0 \end{pmatrix}$ .
- (ii) If  $B = \begin{pmatrix} 1 & 0 \\ 2 & 1 \end{pmatrix}$  find the product  $AB$ .

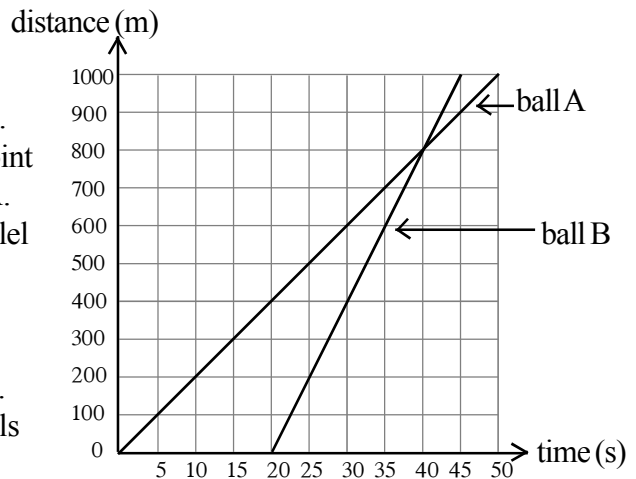
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**Mathematics Question Paper - 4**

- (b) Varuni bought 2 guava fruits and 3 naran fruits for Rs. 48. Sandali bought 4 guava fruits and two naran fruits for Rs. 64 from the same vendor.
- Construct a pair of simultaneous equations taking the price of a guava fruit as  $x$  and the price of a naran fruit as  $y$ .
  - Find separately the price of a guava fruit and of a naran fruit by solving the above equations.
  - Varuni says that an equal number of guava fruits and naran fruits can be obtained by giving Rs. 100 to the vendor. Do you agree with this? Give reasons.
4. (a) Amal sees a mountain top due east at an angle of elevation of  $30^\circ$ . When he walks 100 m towards the east Amal sees the same mountain top at an angle of elevation of  $60^\circ$ . Using a 1 : 2000 scale ,
- draw a scale diagram to indicate these information.
  - find the length of the line segment in the scale diagram representing the height of the mountain.
  - find the true height from the ground to the mountain top.

- (b) The diagram indicates a distance time graph drawn to illustrate the motion of two balls A and B used in an experiment. Both balls start motion from the same point and B starts to move 20 seconds after A. Both balls move in rectilinear paths parallel to each other.



- What is the distance in metres traveled by B in the first 5 seconds after starting to move .
  - Find the speeds of A and B balls separately.
  - Till the moment when B goes past A, show that the ratio of the times during which the balls A and B moved is 2 : 1.
- 5 The distance between the two towns X and Y is 120 km. To reach town Y from X , a driver A drives his vehicle at the average speed of  $x \text{ km h}^{-1}$ . A driver B drives his vehicle at a speed of  $20 \text{ km h}^{-1}$  less than that of A and comes to town Y from X. If B takes one hour more than A for the journey, find the average speed of A.
6. The following frequency distribution shows the information collected on the number of units of water used daily by the residents of a housing scheme.

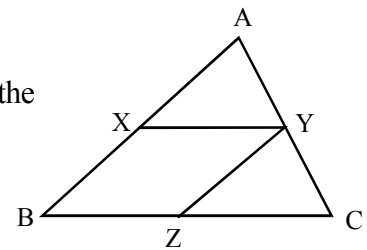
Number of units of water	20-25	25-30	30-35	35-40	40-45	45-50
Number of days	2	4	10	8	5	1

A local government authority charges Rs. 7 for a single unit of water while the supply of a unit of water costs the authority Rs. 12. The manager at the monthly meeting proclaims that it costs an extra sum of Rs. 8650 per day to supply water to 50 houses . Using the mean, substantiate the manager's statement.

**Part B**

7. (a) The radius of the base of a solid cylinder is  $2a$  and its height is  $3h$ .
- (i) Find the area of the curved surface of the cylinder in terms of  $\pi$ ,  $a$  and  $h$
  - (ii) Indicate the volume of that cylinder in terms of  $\pi$ ,  $a$  and  $h$
- (b) The radius of the base of a right circular cone is  $2a$  and its height is  $2a$ . Find its volume in terms of  $\pi$  and  $a$ .
- (c) (i) If the cylinder and the cone are made of the same material, indicate the volume of the material from which the cylinder and the cone are made in terms of  $\pi$  and  $a$  when  $h = 2a$ .
- (ii) The cylinder and the cone are melted and spheres of radius  $a$  are made without wastage. Find the number of spheres that are made.
8. (i) Draw a circle of radius 3.5 cm. Name its centre O.
- (ii) Mark a point on the circle and name it A. Construct the tangent that touches the circle at point A.
  - (iii) Mark point B on the tangent, 6 cm away from point A. Construct another tangent to the circle from point B. Name the point at which that tangent touches the circle as C.
  - (iv) Construct the circle passing through A, B, C and O. Measure and write its radius.
9. A man when buying a television set worth Rs. 40 000, first pays Rs. 10 000 in cash. He promises to pay the remaining amount by way of reducing balance under the annual interest rate of 12% within a period of 60 months in equal instalments. What is the instalment he should pay monthly?
10. (a) Explain the mid point theorem using a suitable diagram.

- (b) In the triangle ABC shown in the diagram, the mid points of the sides AB, AC and BC are X, Y and Z respectively.

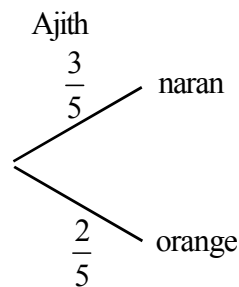


- (i) Show that XYZB is a parallelogram.
  - (ii) Show that  $AB + AC + BC = 2(XY + YZ + XZ)$ .
  - (iii) Prove that XYZB is a rhombus if  $AB = BC$ .
11. (a) Draw the right angled triangle ABC so that  $\hat{B}$  is a right angle. Write Pythagoras' theorem with respect to this triangle.
- (b) ABC is a triangle in which  $\hat{B}$  is a right angle. In it, point X is located on BA and point Y

is located on BC so that  $2BX = AX$  and  $2BY = YC$ . Draw a diagram including the above data and show that  $9(CX^2 + AY^2) = 10AC^2$ .

12. A bag contains 3 naran - flavoured toffees and 2 orange flavoured toffees of identical shape and size. Ajith took a toffee randomly from the bag and tasted it. Afterwards Kamal also took a toffee from the bag and tasted it.
- (i) Indicate the sample space on a grid.
  - (ii) Using it, calculate the probability of both getting the same flavoured toffees.

Amith had a thought of representing these information in a tree diagram. An incomplete tree diagram drawn for this is shown here.



- (iii) Copy this tree diagram in your paper and complete the rest of it.
- (iv) Using that diagram, find the probability of both getting naran flavoured toffees.
- (v) Amith says that there is a greater probability of both receiving toffees of the same flavour rather than toffees of different flavours. Give reasons to show that this statement is not true.



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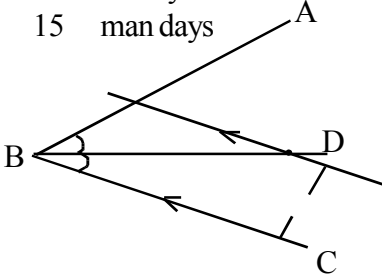
**Answers and the Marking scheme**  
Paper I - Part A

Question No.	Answer	Marks											
(1)	19, 23		②										
(2)	Length of hypotenuse 5 cm	01											
	$\sin \theta = \frac{4}{5}$	02	②										
(3)	$(x + 2)(x + 3)$		②										
(4)	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Data</th> <th></th> </tr> </thead> <tbody> <tr> <td>Heights of students in a class</td> <td align="center">√</td> </tr> <tr> <td>Ages of studentes in a class</td> <td align="center">√</td> </tr> <tr> <td>Number of family members</td> <td></td> </tr> <tr> <td>Runs scored in a cricket match</td> <td></td> </tr> </tbody> </table>	Data		Heights of students in a class	√	Ages of studentes in a class	√	Number of family members		Runs scored in a cricket match			②
Data													
Heights of students in a class	√												
Ages of studentes in a class	√												
Number of family members													
Runs scored in a cricket match													
(5)	$x = 180^{\circ} - (60^{\circ} + 65^{\circ}) = 180^{\circ} - 125^{\circ} = 55^{\circ}$	01											
	$x = 55^{\circ}$	02	②										
(6)	$= \frac{3-2}{3x}$	01											
	$\frac{1}{3x}$	02	②										
(7)	$1 = m \times 2 - 5$	01											
	$6 = 2m$												
	$m = 3$	02	②										
(8)	$A = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ , $B = \{2, 4, 6, 8\}$ For the elements of A and B	01											
	$A \cap B = \{2, 4, 6, 8\}$	02	②										
(9)	$12a^2b^2c$	02	②										
(10)	$x = 70^{\circ}$	01											
	$y = 55^{\circ}$	01	②										
(11)		02	②										
(12)	$\frac{1}{4} \left( 2 \times \frac{22}{7} \times 7 \right) + 7 \times 4$	01											
	39 cm	02	②										

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**Mathematics Question Paper - 4**

Question . No	Answers	Marks	
(13)	$\hat{CBA} = 35^{\circ}$ $x = 35^{\circ}$	01 02	②
(14)	$\frac{5 \times 12}{500} \times 100\%$ 12%	01 02	②
(15)	$\frac{10}{10} \text{ ms}^{-1}$ $1 \text{ ms}^{-1}$	01	②
(16)	$\frac{3}{4} \pi r^2$		②
(17)	$\frac{12}{40}$ or $\frac{3}{10}$		②
(18)	$AX=5 \text{ cm}, AY=7 \text{ cm}, XY=6 \text{ cm}$ Perimete of $AXY\Delta = 18 \text{ cm}$	01	②
(19)	$1 : 4$		②
(20)	$OB^2=3^2+4^2$ $OB=5 \text{ cm}$	01	②
(21)	120 man days 15 man days	01	②
(22)		01 01	②
(23)	$\lg_2 a = \frac{b}{2}$ $a = 2^{\frac{b}{2}}$	01	②
(24)	$2x - 2y = 4$ $x - y = 2$	01	②
(25)	$\hat{AOC} = 2y$ $2y + x = 180^{\circ}$	01	②

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**Mathematics Question Paper - 4**

1 - B - Answers

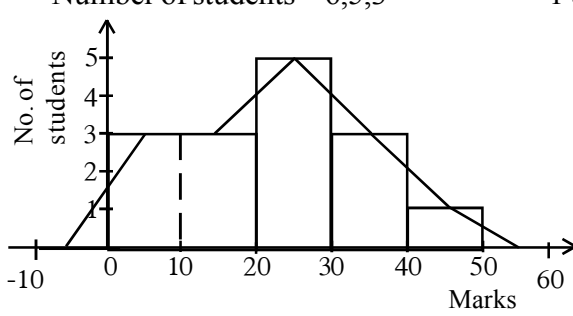
Question No.	Answers	Marks	Other			
1	(i) Part not tarred	$= 1 - \frac{2}{7}$	1			
		$= \frac{5}{7}$	1		②	
	(ii) Part laid with concrete	$= \frac{5}{7} \times \frac{3}{4}$	1		②	
		$= \frac{15}{28}$	1			
	(iii) Part covered with gravel	$= 1 - \left( \frac{2}{7} + \frac{15}{28} \right)$	1		④	
		$= \frac{5}{28}$	1			
	Concrete / gravel	$= \frac{15}{28} \div \frac{5}{28}$	1		④	
		$= 3$	1			
	(iv) $\frac{15}{28} \rightarrow 225$ m		1		②	
	Total distance of the road	$= 225 \times \frac{28}{15}$ m	1			
	$= 420$ m	1	<b>10</b>			
Question No.	Answers	Marks	Other			
2	(a) (i)	Number of boxes in row 5 = 9	1			
		Number of boxes in row 6 = 11	1		②	
	(ii)	An arithmetic progression. The difference between two successive numbers is equal	1		①	
	(iii)	$T_{10} = a + (n - 1)d$	1 + 1		②	
		$T_{10} = 1 + 9 \times 2 = 19$				
		or has obtained 19 by writing pattern			⑤	
		No. of boxes in 10 <sup>th</sup> row 19	2			
	(b) (i)	4th term in the geometric progression	$= ar^3 = 40$		1	④
		7th term in the geometric progression	$= ar^6 = 320$		1	
		$\therefore \frac{ar^6}{ar^3} = \frac{320}{40} \Rightarrow r^3 = 8$			1	
$r = \underline{\underline{2}}$			1			
(ii)	Substituting the value of r in $ar^3 = 40$		①			
$a \times 8 = 40 \Rightarrow a = \underline{\underline{5}}$		1				
			<b>10</b>			

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**Mathematics Question Paper - 4**

Question No.	Answers	Marks	Other	
3	(i) If V is the volume of the Tank			
	Volume filled in 1 hour by A = $\frac{V}{8}$	1		
	Volume filled in 1 hour by B = $\frac{V}{12}$	1		
	Volume filled in 1 hour by both taps = $\frac{V}{8} + \frac{V}{12}$			
	$= V \left( \frac{1}{8} + \frac{1}{12} \right)$	1		
	$= \frac{5V}{24}$	1		
	Time to fill half of the tank = $\frac{V}{2} \div \frac{5V}{24}$	1		
	$= \frac{24}{10}$ hours	1	⑥	$\frac{12}{5}$ hours
	(ii) Volume filled in 1 hour when all the taps are opened			
	$= \frac{V}{8} + \frac{V}{12} - \frac{V}{6}$	1		
$= \frac{V}{24}$	1	②		
(iii) Time to fill the other half = $\frac{V}{2} \div \frac{V}{24}$	1			
$= 12h$	1	②		
		<b>10</b>		

Question No.	Answers	Marks	Other
4	(a) (i) Number of students = 6,5,3	---1+1+1	③
	(ii) 		
	Connecting to two axes	2	
	Marking points	1	③
	(iii) Sector angles $144^\circ, 120^\circ, 72^\circ$	---1+1+1	③
	(iv) Percentage of students scoring above 30		
$= \frac{4}{15} \times 100\% = 26.66\%$	1	①	<b>10</b>

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**Mathematics Question Paper - 4**

Question No.		Answers	Marks	Other
5)	(a)		1 1	
	(i)	20	③	
	(ii)	Shading	①	
	(iii)	$\left[ \begin{array}{l} 10 + 20 = 30 \\ 60 - 30 = 30 \end{array} \right]$	②	△6
		∴ Number of boys participating in sports = 30		
(b)	(i)	$n(A \cup B) = n(A) + n(B) - n(A \cap B)$	②	
	(ii)	$n(A \cup B) = 8 + 10 - 6$ $n(A \cup B) = 12$	1 1	
			②	△4
				<b>10</b>

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**Mathematics Question Paper - 4**

Paper II

Question No.			Answers	Marks			Other
1	(a)	(i)	No. of Sarath's shares = $\frac{25\ 000}{50} = 500$	1	①	(b) (i) Total amount after 1 year $= \frac{110}{100} \times 50000 = 55000 - 1$ Total amount after 2 year $= \frac{110}{100} \times 55000 = 60500 - 1 - ③$	
		(ii)	Sarath's income = $2 \times 500 = \text{Rs. } 1\ 000$	1	①		
		(iii)	Value of Kamal's shares = $\frac{2\ 500}{2} \times 50$ = Rs. 62 500	1 1	②		△ 4
	(b)	(i)	Amount due = $50\ 000 \times \frac{110}{100} \times \frac{110}{100}$ = Rs. 60 500	1+1 1	③		
		(ii)	Simple interest = $50\ 000 \times \frac{11}{100} \times 2 = \text{Rs. } 11\ 000$ Amount due = Rs. 50 000 + 11 000 = Rs. 61 000 Under simple interest Rs. 500 more should be paid. The statement is false.	1 1 1	③		△ 6
							<b>10</b>

Question No.			Answers	Marks			Other
(02)		(i)	3		②	<b>10</b>	
		(ii)	$-3 < x < -1$	1+1	②		
		(iii)	$k = 4$		②		
		(iv)	Roots -3 and +1	1+1	②		
		(v)	$y = (x+2)^2$		②		

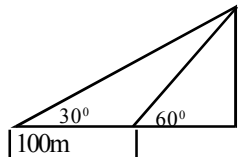
Question No.			Answers	Marks			Other
(03)	(a)	(i)	$2 \times 2$	1	①	△ 4	
		(ii)	$\begin{pmatrix} 2 \times 1 + 1 \times 2 & 2 \times 0 + 1 \times 1 \\ -1 \times 1 + 2 \times 0 & -1 \times 0 + 0 \times 1 \end{pmatrix}$	2			
			$\begin{pmatrix} 4 & 1 \\ -1 & 0 \end{pmatrix}$	1	③		

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Question No.			Answers	Marks		Other
			$2x + 3y = 48$ – ① $4x + 2y = 64$ – ② (ii) ①×2, $4x + 6y = 96$ – ③ $③ - ②, 4x + 6y - (4x + 2y) = 96 - 64$ $4y = 32$ $y = 8$ Substituting the value of y in ① $2x + (3 \times 8) = 48$ $x = 12$	1	②	
		(iii)	Amount for 5 guavas and 5 naran fruits = $8 \times 5 + 12 \times 5$ =Rs. 100  Agree.	1	③	
				1	①	△ 6 10

Question No.			Answers	Marks		Other
4	(a)	(i)	Diagram 	2	②	
		(ii)	7cm	1	①	
		(iii)	140 m	1	①	△ 4
	(b)	(i)	200m	1	①	
		(ii)	Speed of ball A = $\frac{200}{10}$ (a suitable value) = $20 \text{ ms}^{-1}$	1		
			Speed of ball B = $\frac{200}{5}$ (a suitable value) = $40 \text{ ms}^{-1}$	1		
		(iii)	40 : 20 2 : 1	1	④	
				1	①	△ 6 10

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**Mathematics Question Paper - 4**

Question No.	Answers	Marks	Other
5	Time for A $t_1 = \frac{120}{x}$	1	
	Time for B $t_2 = \frac{120}{x-20}$	1	
	②-① $t_2 - t_1 = 1$	1	
	$\frac{120}{x-20} - \frac{120}{x} = 1$	1	
	$2400 = x^2 - 20x$	1	
	$x^2 - 20x - 2400 = 0$		
	$(x-60)(x+40) = 0$	2	
	$x = 60 \quad x = -40$	2	
	$x$ cannot be negative		
	$x = 60 \text{ kmh}^{-1}$	1	

Question No.	Answers	Marks	Other																																
(06)	<table border="1"> <thead> <tr> <th>Units of water</th> <th>Mid value (x)</th> <th>Frequency (f)</th> <th><math>f \times x</math></th> </tr> </thead> <tbody> <tr><td>20-25</td><td>22.5</td><td>2</td><td>45.0</td></tr> <tr><td>25-30</td><td>27.5</td><td>4</td><td>110.0</td></tr> <tr><td>30-35</td><td>32.5</td><td>10</td><td>325.0</td></tr> <tr><td>35-40</td><td>37.5</td><td>8</td><td>300.0</td></tr> <tr><td>40-45</td><td>42.5</td><td>5</td><td>212.5</td></tr> <tr><td>45-50</td><td>47.5</td><td>1</td><td>47.5</td></tr> <tr> <td align="center" colspan="2"></td> <td align="center"><math>\sum f = 30</math></td> <td align="center"><math>\sum fx = 1040</math></td> </tr> </tbody> </table>	Units of water	Mid value (x)	Frequency (f)	$f \times x$	20-25	22.5	2	45.0	25-30	27.5	4	110.0	30-35	32.5	10	325.0	35-40	37.5	8	300.0	40-45	42.5	5	212.5	45-50	47.5	1	47.5			$\sum f = 30$	$\sum fx = 1040$		
	Units of water	Mid value (x)	Frequency (f)	$f \times x$																															
	20-25	22.5	2	45.0																															
	25-30	27.5	4	110.0																															
	30-35	32.5	10	325.0																															
	35-40	37.5	8	300.0																															
	40-45	42.5	5	212.5																															
	45-50	47.5	1	47.5																															
			$\sum f = 30$	$\sum fx = 1040$																															
	Mid value column	1																																	
	$f \times x$ column	1																																	
	$\Sigma f$	1																																	
	$\Sigma fx$	1																																	
	Mean = $\frac{\sum fx}{\sum f} = \frac{1040}{30}$	1																																	
	= 34.6	1	⑥																																
Extra cost for a unit = Rs. 12 - 7 = Rs. 5	1																																		
Extra cost for 50 houses = Rs. 5 × 34.6 × 50	1																																		
= Rs. 8650	1																																		
∴ The statement made is true.	1	④	<b>10</b>																																



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**Mathematics Question Paper - 4**

Question No.	Answers	Marks	Other
07	(a) (i) Area of the curved surface of the cylinder = $2\pi \times 2a \times 3h$ $= 12\pi ah$	1 ①	
	(ii) Volume of the cylinder = $\pi \times (2a)^2 \times 3h$ $= 12\pi a^2 h$	1 ①	2
	(b) Volume of the cone = $\frac{1}{3} \pi (2a)^2 \times 2a$ $= \frac{8}{3} \pi a^3$	1 ②	2
	(c) (i) Volume of substance in cone and cylinder $= 12\pi a^2 h + \frac{8}{3} \pi a^3$ $= \frac{4}{3} \pi a^2 (9h + 2a)$	1 1	
	Total volume when h is $2a = \frac{4}{3} \pi a^2 (9 \times 2a + 2a)$ $= \frac{80}{3} \pi a^3$	1 1 ④	
	(ii) Number of spheres that are made = $\frac{80}{3} \pi a^3 \div \frac{4}{3} \pi a^3$ $= 20$	1 1 ②	6
			<b>10</b>

Question No.	Answers	Marks	Other
08	(i) Drawing the circle	1 ①	
	(ii) Drawing the radius OA Constructing perpendicular to radius OA at A	1 2 ③	
	(iii) Marking distance AB Drawing the arc of radius BA and marking C Drawing BC	1 1 1 ③	
	(iv) Constructing perpendicular bisector of OB Drawing the circle with radius EB Measuring radius (EB = 3.5cm)	1 1 1 ③	

**10**

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**Mathematics Question Paper - 4**

Question No.	Answers	Marks	Other
9	Price of the machine = Rs.40 000	1  1 1 1 1 1 1 1 1	
	Initial payment = Rs. 10 000		
	Balance to be paid = 40 000-10 000 = Rs. 30 000		
	Payment for an instalment = $\frac{30\ 000}{60}$ = Rs. 500		
	No of month units = $\frac{60 \times (60 + 1)}{2}$ = 1830		
	Monthly interest = $500 \times \frac{12}{100} \times \frac{1}{12}$ = Rs. 5		
	Total interest = $5 \times 1830$ = Rs. 9150		
	Interest for an instalment = $\frac{9150}{60} = \text{Rs.}152.50$		
	Amount for an instalment = $500 + 152.50$ = Rs. 652.50		

Question No.	Answers	Marks	Other
10	(i) XY//BC (mid point theorem)	1  1 1 1 1 1 1 1 1	
	∴ XY//BZ		
	YZ//AB (mid point theorem)		
	∴ YZ//XB		
	∴ XYZB is a parallelogram (A quadrilateral with parallel sides is a parallelogram)		
	(ii) $XY = \frac{1}{2} BC, YZ = \frac{1}{2} AB, XZ = \frac{1}{2} AC$ (mid point theorem)		
	∴ $\frac{1}{2} AB + \frac{1}{2} AC + \frac{1}{2} BC = XY + YZ + ZB$		
	∴ $AB + AC + BC = 2(XY + YZ + ZB)$		
	(iii) AB = BC		
	$XY = \frac{1}{2} BC, YZ = \frac{1}{2} AB, XZ = \frac{1}{2} AC$ (mid point theorem)		
∴ XY = YZ			
XY = BZ, YZ = BX			
(Because opposite sides of a parallelogram are equal)			
∴ XY = YZ = BZ = BX			
∴ XYZB is a rhombus. (A parallelogram with four equal sides is a rhombus)			
		<b>10</b>	

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**Mathematics Question Paper - 4**

Question No.		Answers	Marks	Other
11	(a)	Figure 1 $AC^2 = AB^2 + BC^2$	1	
	(b)	Figure 2 $ABC_{\Delta}, ABY_{\Delta}, XBC_{\Delta}$	1	
		From right angled $\Delta CBX$ $CX^2 = BX^2 + BC^2$	1	
		From right angled $\Delta ABY$ $AY^2 = AB^2 + BY^2$	1	
		$CX^2 = BX^2 + BC^2$	1	
		$= \left(\frac{1}{3}AB\right)^2 + BC^2$	1	
		$= \frac{1}{9}AB^2 + BC^2$	1	
		$AY^2 = AB^2 + BY^2$	1	
		$= AB^2 + \left(\frac{1}{3}BC\right)^2$	1	
		$= AB^2 + \frac{1}{9}BC^2$	1	
		$CX^2 + AY^2 = \frac{1}{9}AB^2 + BC^2 + AB^2 + \frac{1}{9}BC^2$	1	
		$= \frac{10}{9}(AB^2 + BC^2)$	1	
	$9(CX^2 + AY^2) = 10(AB^2 + BC^2)$	1		
	$9(CX^2 + AY^2) = 10AC^2$	1		

Question No.		Answers	Marks	Other
12	(i)	Marking axes	1	<p align="center">Kamal</p>
		Marking points	2	
	(ii)	Probability = $\frac{8}{20} = \frac{2}{5}$	1	
	(iii)	Extension of the tree diagram	1	
		Indicating probabilities	1+1	
	(iv)	Probability = $\frac{3}{5} \times \frac{2}{4} = \frac{6}{20} = \frac{3}{10}$	1	
	(v)	Probability of getting the same flavour	1	
		$= \left(\frac{3}{5} \times \frac{2}{4}\right) + \left(\frac{2}{5} \times \frac{1}{4}\right) = \frac{2}{5}$	1	
		Probability of getting the different flavour	1	
		$= \left(\frac{3}{5} \times \frac{2}{4}\right) + \left(\frac{2}{5} \times \frac{3}{4}\right) = \frac{3}{5}$	1	
	There is greater probability of getting different flavoured toffees. $\therefore$ statement is not true. $\left(\frac{3}{5} > \frac{2}{5}\right)$	1		

**5.1 Objectives**

**Mathematics I - Part A**

01. Shades the area showing the intersection set when a Venn diagram of two intersecting sets is given.
02. Solves an inequality of the type  $ax - b > cx + b$ ;  $a, b, c \in \mathbb{Z}$ .
03. When the exterior angle formed by producing a side of a triangle and one of the two interior opposite angles are given, finds the value of the remaining angle.
04. Calculates the total number of students using a given histogram.
05. Given the value of an angle of a parallelogram, writes down its opposite angle.
06. Finds the value of the remaining element given three elements of the product of two given  $2 \times 2$  matrices.
07. Completes the steps of showing the congruence of two triangles given the figurative information.
08. Finds the initial amount when the annual interest rate, time and interest are given.
09. Given a diagram showing a line joining the mid points of two sides of a triangle, writes two relationships between that line joining the mid points and the other remaining sides.
10. Divides an algebraic fraction with an algebraic term in the denominator by another algebraic fraction with an algebraic term in the denominator.
11. Calculates the value of one angle when a pair of opposite angles of a cyclic quadrilateral are given in algebraic terms.
12. Finds the radius of a circle when the length of a chord of the circle and the perpendicular distance from the centre of the circle to the chord are given.
13. Finds the gradient of a straight line, given a diagram with the coordinates of a point on the straight line and the coordinates of the point of intersection of that line and the  $y$ -axis.
14. Finds the perimeter of a sector, given its radius and the angle.
15. Finds the number of man days required for the remaining part of a work after completion of a part of it, given the number of people and the number of days required for that work.
16. Finds the sum of unknowns without solving a pair of simultaneous equations and finding the values of the two unknowns separately.

17. Finds the value of angles given in algebraic symbols when the angle subtended by a chord of a circle at the centre and the circumference are given in algebraic symbols and one of the two angles between the lines joining the ends of the chords and the centre are given.
18. Finds the distance travelled during a certain period of time when the starting time of journey and the uniform speed are given.
19. When an angle indicated by a symbol and the lengths of the sides of a right angled triangle are given, writes the sine of that angle and the cosine of the complementary angle.
20. Given the successive terms of an arithmetic progression with an unknown, (i) finds the common difference (ii) writes the value of a certain term in terms of the unknown.
21. Writes a pair of sides equal to a side of the quadrilateral, given a quadrilateral with a diagonal and two equal angles in each of the two triangles separated by the diagonal.
22. When the sample space related to the event of tossing a fair coin twice is given in a grid, finds the probability of getting the same side on two occasions.
23. Calculates the height of a cylinder given the area of the curved surface and radius.
24. Solves a simple equation containing algebraic fractions with algebraic terms in the numerator.
25. Indicates as a power of 2, a required term of a geometric progression in which the common difference is 2 and the initial term is a power of two.

**Part B**

1. (a) When a given fraction of a sum of money is divided into equal parts, simplifies each part as a fraction of the initial sum.
- (b) Given the number of students scoring below a certain mark as a fraction, the number of students scoring above another mark as a percentage and the remaining number of students sitting a certain examination,
  - (i) writes the number of students scoring above a given mark as the simplest fraction of the total number of students.
  - (ii) writes the number of students scoring between two given marks as a fraction of the total number of students.
  - (iii) finds the total number of students in the class.
  - (iv) finds the total expenditure for awarding prizes of a certain value for a selected sector of students.

2. When a square is included in a circle of a given radius and given that the circle is divided into four equal parts
- (i) finds the angle subtended at the centre by one such part.
  - (ii) finds the area of a sector.
  - (iii) finds the area of  $\frac{1}{4}$ th the square.
  - (iv) finds the area of the section not covered by the square.
  - (v) finds the perimeter of the shaded area of a sector.
3. (a) Given the annual property value of a house and the annual rates percentage,
- (i) calculates the annual rates for the house.
  - (ii) finds the rate paid for a quarter for the house.
  - (iii) calculates the annual property value of the house given the rates paid for a quarter for another house in the same regional authority.
- (b) Calculates the price of an imported television before paying the tariff, given the tariff percentage and the price with tariff.
4. Given the probability of passing and qualifying for university admissions of students in a school sitting the Advanced Level examination,
- (i) finds the probability of failing the examination.
  - (ii) draws the tree diagram showing the passing and failing in the examination.
  - (iii) extends the tree diagram to indicate admission and non-admission to the university.
  - (iv) finds the probability of admitting to the university having passed the examination.
  - (v) finds the number entering university given the number of students appeared for the examination.
5. For a grouped frequency distribution of marks scored by a group of students
- (a) completes the cumulative frequency column.
  - (b) draws the cumulative frequency curve using it.
  - (c)
    - (i) Finds the median using the cumulative frequency curve.
    - (ii) Finds the mark that demarcates the 25% of students scoring the highest marks.
    - (iii) Calculates the percentage of students scoring less than a given mark.

**Mathematics II**

**Part A**

1. Given the annual simple interest rate,
- (i) writes the interest for Rs. 100.
  - (ii) calculates the total amount received after depositing a certain amount for a certain period of time.
  - (iii) given the interest charged for a certain period of time, finds the amount deposited.
  - (iv) given the interest charged for a certain amount, finds for which period it is.
  - (v) shows that the total amount is a given algebraic expression given the initial amount and time in algebraic symbols.

2. When an incomplete table of values is given for a function that represents the projectile motion of an object with vertical height as  $h$  and time as  $t$ ,
  - (i) finds the value of the unknown.
  - (ii) finds the height of the light house.
  - (iii) calibrates the axes correctly and draws the graph.
  - (iv) finds the maximum value of the function using the graph.
  - (v) finds the values of  $t$  corresponding to a given value of  $h$  using the graph.
  
3. (a) Solves a simple equation with algebraic fractions.  
  
(b) Given a diagram indicating in algebraic symbols the width of a road of uniform width running a round a rectangular land of known length and breadth, and the area of the road, constructs a suitable quadratic equation. Shows that the width of the road is the expression given.
  
4. Of a pair of towers drawn in a diagram, calculates the height of the taller tower given the distance between the two towers and the angles of elevation of the two towers as seen by a man.
  
5. (a) (i) Constructs a pair of simultaneous equations in two unknowns based on the information given with regard to the prices of two items.  
(ii) Finds the values of the two unknowns by solving the two equations.  
(b) Factorises a given algebraic expression.
  
6. Given that the diameters of a cylinder, cone and a sphere are equal and the perpendicular height of the cone is half the height of the cylinder,
  - (i) writes the radius of the bottom of the cylinder.
  - (ii) calculates the ratio between the volumes of the cylinder and the sphere.
  - (iii) shows that the slant height of the cone is a value given as a surd.
  - (iv) calculates the area of the curved surface of the cone using logarithms.

**Part B**

7. (a) Given the  $n^{\text{th}}$  term of an arithmetic progression in the form of an algebraic expression,
  - (i) writes the first three terms of the progression.
  - (ii) finds a given term of that progression.
  - (iii) given the value of a certain term, finds which term it is in the progression.
  - (iv) finds the sum of a given number of terms in that progression.  
(b) Finds a required term, given the first term and the common difference of a geometric progression.
  
8. Using a compass and a ruler with a cm/mm scale,
  - (i) draws a quadrilateral based on given data .
  - (ii) draws a circle which goes through three points of the quadrilateral.
  - (iii) measures and writes the radius of the circle drawn in (ii).
  - (iv) draws a tangent to the circle at a given point on it.

9. Given a grouped frequency distribution indicating the scores obtained,
- writes the class interval that includes the median.
  - calculates the true mean taking the mid point of the median class as the assumed mean.
  - based on the mean found above, predicts the total score that can be expected to be obtained in several competitions.
10. Given the number of elements related to three non disjoint sets,
- draws a Venn diagram and includes given information in it.
  - using the Venn diagram shows that the probability of an event is greater than the given percentage.
11. Given that in an isosceles triangle, a line drawn parallel to the unequal side intersects the other two sides and given two angles which are equal,
- draws a diagram including the information given.
  - shows that two named triangles are congruent.
12. When four points on a circle and the angle subtended at the centre by the arc obtained by joining two of those points are given,
- finds the value of a named angle.
  - writes the theorem which is based to find the value of the angle in (i) above.
  - writes the relationship between two named angle.
  - verifies a relationship among three angles.



**5.2 Question Paper**

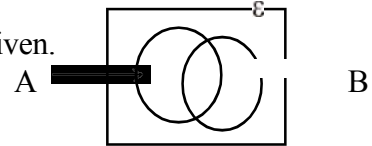
**Mathematics I**

**Time 2 hours**

Answer all the questions on this paper itself

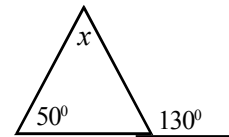
**Part A**

01. Shade the area corresponding to  $A \cap B$  in the Venn diagram given.

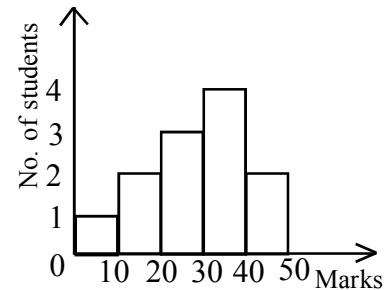


02. Solve the inequality  $2x - 1 > x + 1$ .

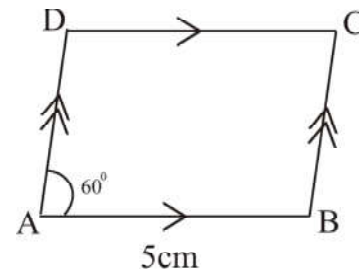
03. Find the value of  $x$  based on the information given in the diagram.



04. The histogram shows the marks scored by a group of students. What is the total number of students included in the histogram?



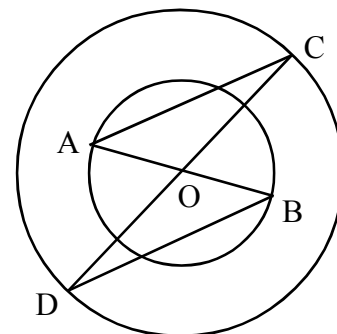
05. Write down the value for  $\hat{BCD}$  in terms of the information given in the diagram.



06. If  $\begin{pmatrix} 2 & 0 \\ -1 & 1 \end{pmatrix} \begin{pmatrix} 3 & -1 \\ 2 & 1 \end{pmatrix} = \begin{pmatrix} 6 & -2 \\ p & 2 \end{pmatrix}$  find the value of  $p$ .

07. There are two concentric circles with centre O. Fill in the blanks below to show that AOC and BOD are congruent.

- OA = .....(.....)
- $\hat{AOC}$  = .....(.....)
- OC = OD (Radius of the large circle)
- Therefore,  $\triangle AOC \cong \triangle BOD$  (S.A.S)



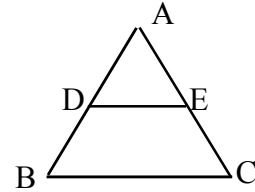
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**Mathematics Question Paper - 5**

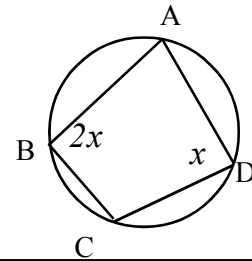
08. Asitha deposited a certain amount of money for two years in a bank which pays 10% annual simple interest and earned Rs. 4,000 as the interest. Find the amount he deposited in the bank.

09. The mid points of the sides AB and AC of the triangle ABC are D and E respectively. Write two relationships between the sides BC and DE.

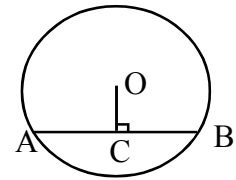


10. Simplify  $\frac{4}{3x} \div \frac{1}{6xy}$

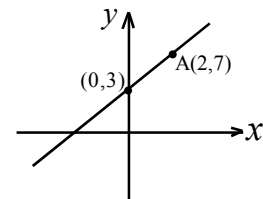
11. A, B, C and D are four points located on the same circle. Find the value of  $x$ .



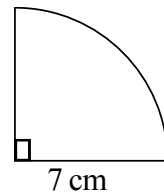
12. In the circle with centre O,  $AB = 16$  cm,  $OC = 6$  cm and  $\angle OCB = 90^\circ$ . Find the radius of the circle.



13. According to the data given, find the gradient of the straight line shown.



14. The radius of the sector shown in the diagram is 7 cm. Find the perimeter of this sector. (Take  $\pi = \frac{22}{7}$ )



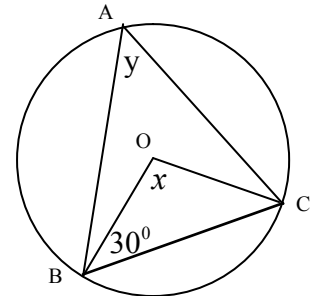
15. Six people can cut a drain in four days. Three people worked for two days. How many man days are needed for the remaining work?

16. Without finding the values  $x$  and  $y$  values separately, find the value of  $x + y$ .

$$2x + 7y = 10$$

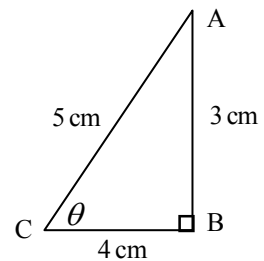
$$3x - 2y = 5$$

17. The vertices of the triangle  $ABC$  are located on the circle of centre  $O$ . If  $\widehat{OBC} = 30^\circ$ , find  $x$  and  $y$ .



18. A vehicle starting from town  $A$  at 8.00 a.m, runs with uniform speed of  $30 \text{ kmh}^{-1}$ . Find the distance travelled by the vehicle when the time is 11.00 a.m.

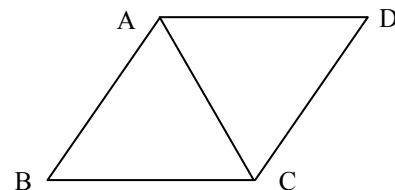
19. Using the given figure, find  $\sin \theta$  and  $\cos(90 - \theta)$ .



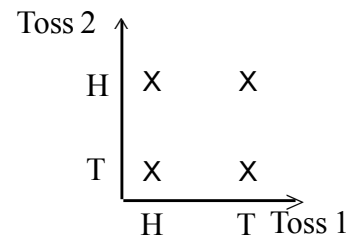
20.  $x, x + 3, x + 6, \dots$  are the first three terms of an arithmetic progression. In the progression,

- i find the common difference.
- ii. indicate the 15<sup>th</sup> term using  $x$ .

21. In the diagram  $\widehat{ABC} = \widehat{BAC}$  and  $\widehat{ACD} = \widehat{ADC}$ .  
Name two sides equal to side  $BC$ .



22. The following grid shows the sample space related to the experiment of tossing a coin twice. What is the probability of getting the same side on both occasions?



- 
23. The area of the curved surface of a cylinder of radius 7 cm is  $440 \text{ cm}^2$ . Find the height of the cylinder. (Take  $\pi = \frac{22}{7}$ )

---

24. Solve  $\frac{a}{2} - \frac{a}{3} = 1$ .

- 
25. Indicate the 18<sup>th</sup> term of the geometric progression 8, 16, 32, ..... as a power of two.

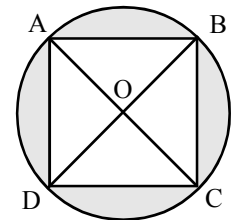
**Part B**

Answer all the questions on this paper itself.

- 01.(a) A community organisation decided to divide  $\frac{2}{3}$  of its funds equally among four social service organisations. What fraction of the initial fund is due for each organisation?
- (b)  $\frac{2}{3}$  of the students sitting a mathematics paper scored less than 40 marks. 25% of the students scored more than 75 marks. The balance is 40 students.
- i. Write the number of students who scored more than 75 marks as a fraction of the total number of students in the simplest way.
  - ii. Indicate the number of students scoring from 40 to 75 marks as a fraction of the total number of students.
  - iii. What is the total number of students who sat the paper?
  - iv. If each of  $\frac{1}{10}$  of the total students who scored high marks were given Rs.500 worth prizes, find the amount of money needed to be spent on prizes.

02. A square shaped exhibition camp was constructed on a circular plot of land of 70 m radius. The land is divided into four equal parts as shown in the diagram.

(Take  $\pi = \frac{22}{7}$ )



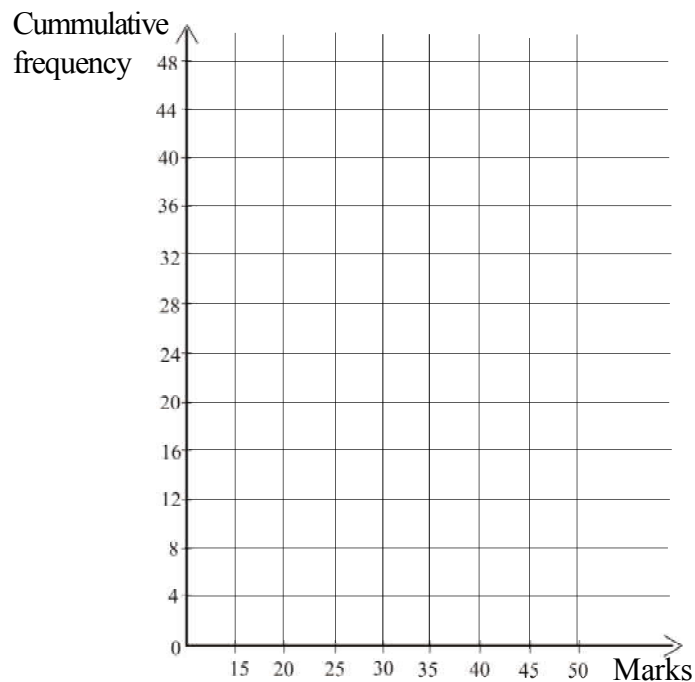
- i. What is the angle at the centre of the sector shaped plot AOB ?
- ii. Find the area of the sector shaped plot AOB.
- iii. What is the area of the triangular plot of land AOB belonging to the camp?
- iv. Find the area of the shaded part not belonging to the camp.
- iv. What is the perimeter of the shaded part of the sector AOB? (Take  $\sqrt{2} = 1.4$ )

03. (a) The annual estimated value of a house is Rs. 15 000. The urban council charges an annual rates of 8% for this property.
- (i) What is the annual rates charged for the house?
  - (ii) What is the rates is paid for a quarter?
  - (iii) If the rates charged for a quarter for another house in the same authorised area is Rs. 460, what is the annual estimated value of that house?
- (b) A tariff of 30% is charged for an imported television. The price of the television with the tariff is Rs. 65 000. What is the value of the television before imposing the tariff?
- 
04. The probability of a randomly selected student who has sat the G.C.E Advanced Level examination during a particular year, passing the examination is  $\frac{3}{5}$ . The probability of randomly selected student who has passed the examination gaining admission to a university is  $\frac{1}{5}$ .
- (i) What is the probability of a randomly selected student from those who sat the examination during a particular year failing Advanced Level examination?
  - (ii) Draw a tree diagram to represent the events of passing and failing the Advanced Level examination.
  - (iii) Extend the previous tree diagram to indicate the probabilities of a student who has passed gaining university admissions or not
  - (iv) Find the probability of a student selected at random of those who sat in particular year passing the Advanced Level Examination and gaining admission to the university .
  - (v) If 150 students appeared for the Advanced Level examination from a particular school, find the number of students who can be expected to gain admission to a university .

05' A frequency distribution of the marks awarded for an assignment is given below.

Class interval	Frequency	Cumulative frequency
15 - 20	3	3
20 - 25	5	8
25 - 30	9	
30 - 35	14	
35 - 40	8	39
40 - 45	6	45
45 - 50	3	

- a) Complete the cumulative frequency column.
- b) Draw the cumulative frequency curve on the following coordinate plane.



- c) i) Find the mean score of a student using the cumulative frequency curve.
- ii) When selecting the 25% of this group who scored the highest marks, what is the minimum score that should be obtained by a student to be selected?
- iii) Find the percentage of students who scored less than 25 marks.

**Mathematics II**

**Three hours**

- Select five questions each from both A and B and answer 10 questions.
- 10 marks are awarded to each question.
- The volume of a right circular cylinder is  $\pi r^2 h$  when the radius of the base is  $r$  and height is  $h$ .
- Volume of a sphere is  $\frac{4}{3}\pi r^3$  when its radius is  $r$ .

Part A

**Answer only five questions.**

01. A bank pays 15% simple annual interest for fixed deposits.
- (i) How much interest do you receive for Rs.100.00 ?
  - (ii) If Rs.25,000 is deposited for two years, what is the total amount you will get at the end of two years ?
  - (iii) If a certain amount of money was deposited for three years, and Rs.18,000 was received as the interest, what was the amount deposited in the bank?
  - (iv) How long will it take to get Rs.9,000 as the interest for Rs.30,000 ?
  - (v) If Rs.  $P$  is deposited for a period of ' $t$ ' year, then show that  $P\left(1 + \frac{3t}{20}\right)$  is the total amount which will be received at the end of the time period ' $t$ '.

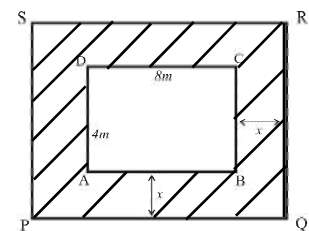
02. The motion of a stone thrown from a lighthouse to the sea is given by  $h = 2(9 + 5t - t^2)$ .  $h$  is the height from sea level to the rock and  $t$  is the time of motion of the stone.  
Given below is a table with  $h$  values relevant to  $t$  values to draw the graph of the function of  $h$ .

$t$	0	1	2	2.5	3	4	5	6	7
$h$	18	26	30	30.5	$P$	26	18	6	-10

- (i) Find the value of  $P$ .
- (ii) Find the height of the lighthouse.
- (iii) Calibrate the axes so that 10 small squares represent one unit on the  $x$  axis and 10 small squares represent five units on the  $y$  axis and draw the graph of the function  $h$ .
- (iv) Calculate the maximum height that can be reached by the stone using the graph.
- (v) Find the time the stone moved at a height of 25 m above the ground.

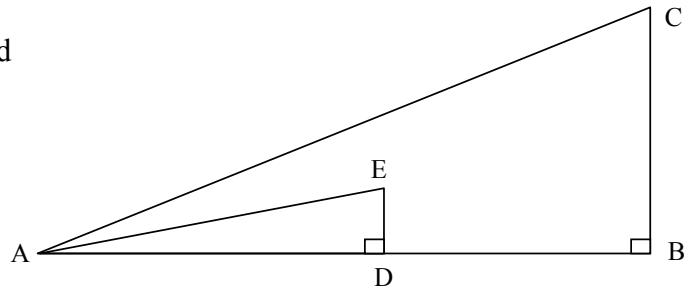
03. (a) Solve  $\frac{x^2}{x+2} + \frac{4}{x+2} = 2$ .

- (b) A flower bed ABCD 8 m long and 4 m wide is given in the diagram. The road around it is shown by the shaded portion. Area of the road is  $24 \text{ m}^2$ . Using the information given in the diagram, derive a quadratic equation and show that when it is solved, the value of  $x$  is  $(\sqrt{15} - 3) \text{ m}$ .



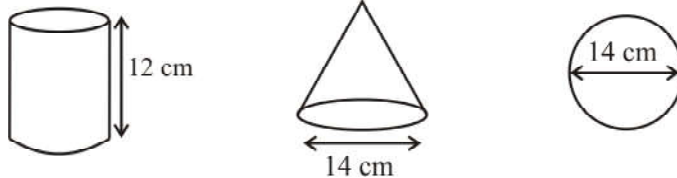


04. A man on a flat land at point A, sees the top C of a tower BC located at a point B on the same ground at an angle of elevation of  $65^\circ$ . He also sees the top of another tower 5 m high erected at a point D in between A and B at an angle of elevation of  $30^\circ$ . The horizontal distance between D and B is 25 m. Calculate the height of the tower BC using trigonometric ratios assuming that the man and the two towers are on the same plane.



05. a) The price of five oranges and seven apples is Rs. 335. Five apples can be bought for the amount spent for six oranges.
- (i) Develop a pair of simultaneous equations based on the above information considering that the price of an orange is Rs.  $x$  and the price of an apple is Rs.  $y$ .
- (ii) By solving those two simultaneous equations, find the price of an orange and the price of an apple separately.
- b) Find the factors of  $8a^3 - 50ab^2$ .

06.



The diagram shows a cylinder with a 14 cm base diameter and 12 cm height, a right circular cone, with half the height of the cylinder and with 14 cm base diameter and a sphere with 14 cm diameter.

- (i) What is the radius of the base of the cylinder?
- (ii) Show that the ratio between the volume of the cylinder and the volume of the sphere is 9:7.
- (iii) Show that the slant height of the cone is  $\sqrt{85}$  cm.
- (iv) Find the surface area of the curved surface of the cone using the logarithms tables.  
(Take  $\pi = 3.14$ )

Part - B

**Answer only five questions.**

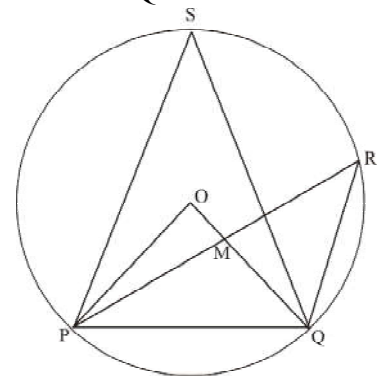
07. (a) The  $n^{\text{th}}$  term of an arithmetic progression is  $5n-3$ .
- (i) Write the first three terms of the progression.
  - (ii) Find the 10th term of the progression.
  - (iii) Which term of the progression assumes the value 57?
  - (iv) Find the sum of the first 10 terms of the progression.
- (b) If the first term of a geometric progression is 3 and the common ratio is (-2), find the 7<sup>th</sup> term.
08. Do the following constructions using the ruler and the compass only. Show the construction lines clearly.  
 In a quadrilateral ABCD,  $AB = 4 \text{ cm}$ ,  $\hat{A} = 120^\circ$  and  $AD = 5 \text{ cm}$ . Point C is equidistant from points B and D and 4 cm from E, the mid point of BD. C is located on the side opposite to that of A with respect to BD.
- (i) Construct the quadrilateral ABCD satisfying the above requirements.
  - (ii) Construct the circle which passes through points B, C and D.
  - (iii) Measure and write the radius of the circle.
  - (iv) Draw a tangent to the circle through B.
09. The table given below shows the scores of Pubudu who participated in a few cricket matches within the first nine months of the year.

Score (Class interval)	No. of matches (Frequency $f$ )
00 - 20	1
20 - 40	3
40 - 60	5
60 - 80	11
80 - 100	5
100 - 120	4
120 - 140	1

- (i) What is the class interval which includes the median?
- (ii) Considering the mid value of the class interval having the median as the assumed mean, calculate the mean score of Pubudu.
- (iii) If Pubudu were to participate in 40 matches, what would be his expected total runs scored from all 40 matches?

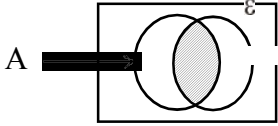

10. Given below is the information collected in a survey conducted about the language ability of workers serving in an office.
- Of them, 39 can work in Sinhala, 35 in Tamil and 25 in English.
  - The number able to work in English and Tamil only is 6.
  - The number who can work in Tamil and Sinhala is twice the number who can work in Tamil and English.
  - 11 are able to work in Sinhala and English.
  - Five can work only in Tamil.
  - All workers can work in at least one language of these three languages.
- (i) Include the above information in a Venn diagram.
- (ii) Show that the probability of a randomly selected worker being able to work in at least two languages is greater than 60%.
11. In the isosceles triangle ABC,  $AB = AC$ . Line PS drawn parallel to BC intersects AB and AC at Q and R respectively.  $\hat{P}BQ = \hat{S}CR$ .
- (i) Draw a diagram including the above information.
- (ii) Show that the triangles PBQ and RCS are congruent.

12. The points P, Q, R and S are on the circle of which the centre is O.  $\hat{P}OQ = 60^\circ$ .



- (i) Find  $\hat{P}S Q$ .
- (ii) Write the theorem used to get the above answer.
- (iii) What is the relationship between the angles  $\hat{P}S Q$  and  $\hat{P}R Q$ ? Give reasons for your answer.
- (iv) Shows that  $\hat{P}R Q = \hat{M}Q R - \hat{O}P M$ .

**Paper - I**  
**Part A**

- (1)  A  B ---- ②
2.  $2x - x > 1 + 1$  --- 1  
 $x > 2$  --- 1 ---- ②
3.  $x + 50^{\circ} = 130^{\circ}$  --- 1  
 $x = 80^{\circ}$  --- 1 ---- ②
4.  $1 + 2 + 3 + 4 + 2$  --- 1  
 12 --- 1 ---- ②
5.  $\hat{BCD} = 60^{\circ}$  ---- ②
6.  $P = -1$  --- 1
- $\begin{pmatrix} 6 & -2 \\ -1 & 2 \end{pmatrix}$  --- 1 ---- ②
7. OB (radius of the small circle) --- 1  
 $\hat{DOB}$  (vertically opposite angle) --- 1 ---- ②
8.  $\frac{4000 \times 100}{10 \times 2}$  --- 1  
 Rs. 20000 --- 1 ---- ②
9.  $DE = \frac{1}{2} BC$  --- 1  
 BC//DE --- 1 ---- ②
10.  $\frac{4}{3x} \times \frac{6xy}{1}$  --- 1  
 $8y$  --- 1 ---- ②
11.  $2x + x = 180^{\circ}$  --- 1  
 $3x = 180^{\circ}$   
 $x = 60^{\circ}$  --- 1 ---- ②
12.  $OB^2 = 6^2 + 8^2$  --- 1  
 $OB^2 = 36 + 64$   
 $OB^2 = 100$   
 $OB = 10 \text{ cm}$  --- 1 ---- ②
13. Gradient =  $\frac{7-3}{2-0}$  --- 1  
 $= \frac{4}{2} = 2$  --- 1 ---- ②

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**Mathematics Question Paper - 5**

14. Perimeter =  $7 + 7 + \frac{90}{360} \times 2 \times \frac{22}{7} \times 7$  --- 1  
 $= 14 + \frac{1}{4} \times 2 \times \frac{22}{1} \times 1$   
 $= 14 + 11$   
 $= 25 \text{ cm}$  --- 1 ---- ②
15.  $6 \times 4 = 24 \text{ man days}$  --- 1  
 work done =  $3 \times 2 = 6 \text{ man days}$   
 Remaining work =  $24 - 6 = 18 \text{ man days}$  --- 1 ---- ②
16.  $5x + 5y = 15$  --- 1  
 $x + y = 3$  --- 1 ---- ②
17.  $x = 180^\circ - (30^\circ + 30^\circ)$  --- 1  
 $x = 120^\circ$   
 $y = 60^\circ$  --- 1 ---- ②
18. Distance =  $30 \text{ kmh}^{-1} \times 3h$  --- 1  
 $= 90 \text{ km}$  --- 1 ---- ②
19.  $\sin \theta = \frac{3}{5}$  --- 1  
 $\cos(90 - \theta) = \frac{3}{5}$  --- 1 ---- ②
20. i)  $x + 3 - x = 3$  --- 1  
 ii)  $T_{15} = x + 14 \times 3$   
 $= x + 42$  --- 1 ---- ②
21.  $AC = AD$  ---- ②
22.  $\frac{2}{4} = \frac{1}{2}$  ---- ②
23.  $2 \times \frac{22}{7} \times 7 \times h = 440$  --- 1  
 $44h = 440$   
 $h = 10 \text{ cm}$  --- 1 ---- ②
24.  $\frac{a}{2} - \frac{a}{3} = 1$   
 $\frac{a}{\cancel{2}_1} \times \cancel{6}^3 - \frac{a}{\cancel{3}_1} \times \cancel{6}^2 = 1 \times 6$  --- 1  
 $3a - 2a = 6, \quad a = 6$  --- 1 ---- ②
25.  $T_{18} = 8 \times 2^{18-1}$  --- 1  
 $= 2^3 \times 2^{17} = 2^{20}$  --- 1 ---- ②

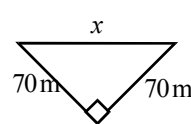
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**Mathematics Question Paper - 5**

Question No.	Answer	Marks	Other			
01.	(a)	$\frac{2}{3} \div 4$	1			
		$= \frac{2}{3} \times \frac{1}{4}$				
		$= \frac{1}{6}$	1		②	
	(b) (i)	$25\% = \frac{1}{4}$	1		①	
		(ii)	$1 - \left(\frac{2}{3} + \frac{1}{4}\right)$		1	
		$1 - \frac{11}{12}$	1			
		$\frac{1}{12}$	1		③	
	(iii)	$\frac{1}{12} \rightarrow 40$	1			
		$\frac{12}{12} \rightarrow 40 \times 12$	1			
		Number of students = 480	1		②	
(iv)	$480 \times \frac{1}{10} = 48$	1				
	$= 48 \times 500$ $= 24\ 000$	1	②			
			⑩			

Question No.	Answer	Marks	Other	
02.	(i)	$90^\circ$	1	①
	(ii)	$\frac{1}{4} \times \frac{22}{7} \times 70 \times 70$	1	
		$= 3850\text{ m}^2$	1	②
	(iii)	$\frac{1}{2} \times 70 \times 70$	1	
		$= 2450\text{ m}^2$	1	②
	(iv)	$(3850 - 2450) \times 4$	1	
		$= 1400 \times 4 = \underline{\underline{5600\text{ m}^2}}$	1	②
	(v)	Length of Arc. $= \frac{1}{4} \times 2 \times \frac{22}{7} \times 70$	1	
		$= 110\text{m}$		
		Length of chord $= 98\text{ m}$	1	
Perimeter $= 110 + 98$ $= 208\text{ m}$		1	③	
			⑩	



$x^2 = 70^2 + 70^2$   
 $x = 70\sqrt{2}$   
 $x = 70 \times 1.4$   
 $x = 98\text{ m}$

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**Mathematics Question Paper - 5**

Question No.		Answer	Marks		Other
03	(i)	$15\,000 \times \frac{8}{100}$ Rs. 1200	1		
	(ii)	$\frac{1200}{4}$ Rs. 300	1	②	
	(iii)	$\frac{460 \times 4}{8} \times 100$ Rs. 23 000	2		
	(iv)	$\frac{65\,000}{130} \times 100$ Rs. 50 000	1	③	⑩

Question No.		Answer	Marks		Other
04	(i)	$\frac{2}{5}$	1	①	
	(ii)	$\frac{3}{5}$ pass $\frac{2}{5}$ fail	2	②	
	(iii)	$\frac{3}{5}$ pass $\frac{1}{5}$ admitted $\frac{2}{5}$ fail $\frac{4}{5}$ not admitted	1		
	(iv)	$\frac{3}{5} \times \frac{1}{5} = \frac{3}{25}$	1	③	
	(v)	$150 \times \frac{3}{25}$ = 18	1	②	⑩

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**Mathematics Question Paper - 5**

Question No.		Answer	Marks			Other
05.	(a)	17, 31 , 48 for 3 correct answers - 2 for 2 correct answers - 1	2	②	△2	
	(b)	Marks the point (15,0) Marks 6 points correctly Smooth curve	1  1	  ③	  △3	
	(c)	(i)	$Q_2 = 33$	1	①	
		(ii)	38 or 39	2	②	
		(iii)	$\frac{8}{48} \times 100\%$  $\frac{100}{6} = 16.6\%$	1  1	  ②	  △5
					⑩	



**Mathematics - II  
Part A**

Question No.	Answer	Marks	Other
01	(i) Rs.15	1	①
	(ii) $\frac{15}{100} \times 25\ 000 \times 2$ $= 7\ 500$ $25\ 000 + 7\ 500 = \text{Rs.}32\ 500$	1 1	③
	(iii) $\frac{18\ 000 \times 100}{3 \times 15}$ Rs. 40 000	1 1	②
	(iv) $t = \frac{9\ 000 \times 100}{30\ 000 \times 15}$ 2 years	1 1	②
	(v) Interest for Rs.P = $\frac{15}{100} \times P \times t = \frac{3}{20} Pt$  Total amount = $P + \frac{3Pt}{20}$  Total amount = $P \left( 1 + \frac{3t}{20} \right)$	1  1	  ②
		<b>10</b>	Interest for 1 year $30\ 000 \times \frac{15}{100} = 4\ 500$ ① $\frac{9\ 000}{4\ 500} = 2$ years ①

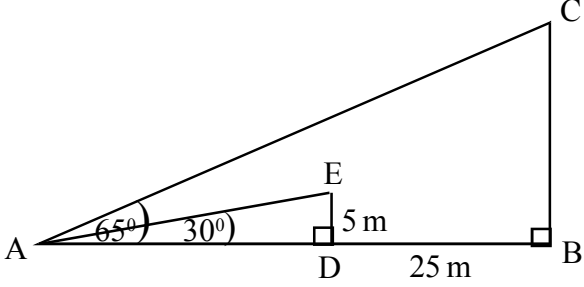
Question No.	Answer	Marks	Other
02	(i) 30	1	①
	(ii) 18m (when t = 0)	2	②
	(iii) Drawing the graph	3	③
	(iv) 30.5 m ( ± 0.1 )	2	②
	(v) $t_1 = 0.8$ seconds, $t_2 = 4.2$ seconds	2	②
		<b>10</b>	

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**Mathematics Question Paper - 5**

Question No.		Answer		Marks	Other	
(3)	(a)	$\frac{x^2}{x+2} + \frac{4}{x+2} = 2$				
		$x^2 + 4 = 2(x+2)$	1			
		$x^2 - 2x = 0$	1			
		$x(x-2) = 0$	1	③	△	
		$x = 0$ or $x = 2$				
	(b)	$(8+2x)(4+2x) - 32 = 24$	2			Area of the road - 1
		$32 + 16x + 8x + 4x^2 - 32 = 24$				Equation - 1
		$4x^2 + 24x - 24 = 0$	1			$x^2 + 6x - 6 = 0$
		$x^2 + 6x - 6 = 0$	1			$x = \frac{-6 \pm \sqrt{36 + 4 \times 1 \times 6}}{2}$
		$x^2 + 6x + 9 = 6 + 9$	1			$x = \frac{-6 \pm \sqrt{36 + 24}}{2}$
		$(x+3)^2 = 15$	1			$x = \frac{-6 \pm \sqrt{60}}{2}$
		$(x+3) = \pm\sqrt{15}$	1			$x = -3 \pm \sqrt{15}$
		$x = \pm\sqrt{15} - 3$	1			$\therefore x = (\sqrt{15} - 3) \text{ m}$
		$x = +\sqrt{15} - 3$ or $-\sqrt{15} - 3$				
Since $x > 0$		1				
$\therefore x = (\sqrt{15} - 3) \text{ m}$			⑦	△		
			⑩			

Question No.	Answer	Marks	Other
04.	 <p>Marks data on the figure</p> <p>From <math>\triangle ADE</math></p> $\tan 30^\circ = \frac{DE}{AD}$ $0.5774 = \frac{5}{AD}$ $AD = \frac{5}{0.5774}$ $AD = 8.66 \text{ m}$ $AB = 25 + 8.66 = 33.66$ <p>From <math>\triangle ABC</math></p> $\tan 65^\circ = \frac{BC}{AB}$ $2.145 = \frac{BC}{33.66}$ $BC = 2.145 \times 33.66$ $BC = 72.20 \text{ m}$ <p>Height of the tower = 72.2 m</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p style="text-align: center;"><b>10</b></p>

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**Mathematics Question Paper - 5**

Question No.			Answer	Marks			Other
05.	(a)	(i)	$5x + 7y = 335$	1			
			$6x = 5y$	1	②		
		(ii)	$\begin{cases} 25x + 35y = 1675 \\ 42x - 35y = 0 \end{cases}$	1			
			$67x = 1675$	1			
			$x = 25$	1			
			$5y = 6 \times 25$	1			
			$y = 30$	1	⑤	△	
	(b)		$8a^3 - 50ab^2$				
			$2a(4a^2 - 25b^2)$	1			
			$2a(2^2a^2 - 5^2b^2)$	1			
		$2a(2a + 5b)(2a - 5b)$	1	③	△	⑩	

Question No.			Answer	Marks			Other
06.	(i)		7 cm	1	①		
		(ii)	Ratio between the volumes of cylinder and sphere				
		$= \pi \times 7^2 \times 12 : \frac{4}{3} \times \pi \times 7^3$	1+1				
		$= 9 : 7$	1	③			
	(iii)		$l^2 = 7^2 + 6^2$	1			
			$= 49 + 36$				
			$= 85$				
			$l = \sqrt{85}$ cm	1	②		
	(iv)		Area of the curved surface ( $A$ ) = $\pi r l$				
			$= 3.14 \times 7 \times \sqrt{85}$	1			
		$\lg A = \lg 3.14 + \lg 7 + \frac{1}{2} \lg 85$					
		$\lg A = 0.4969 + 0.8451 + \frac{1.9284}{2}$	1				
		$A = \text{anti log } 2.3062$	1				
	$A = 202.4 \text{ cm}^2$	1	④	⑩			

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**Mathematics Question Paper - 5**

Question No.			Answer	Marks			Other
07.	(a)	(i)	2, 7, 12	1			
		(ii)	$T_{10} = 50 - 3$ $= 47$	1	②		
		(iii)	$5n - 3 = 57$ $5n = 60$ $n = 12$	1			
		(iv)	$S_{10} = \frac{10}{2}[2 + 47]$ $= 5 \times 49$ $= 245$	1			
	(b)		$T_n = ar^{(n-1)}$				
			$T_7 = 3 \times (-2)^{(7-1)}$	1			
			$T_7 = 3 \times (-2)^6$				
			$T_7 = 3 \times 64$	1			
			$T_7 = 192$	1	③	△	
				1	③	△	⑩

Question No.			Answer	Marks			Other
08.	(i)		Construction of AB	1			
			Construction of $120^\circ$	1			
			Construction of AD	1			
			Construction of the perpendicular bisector of BD	1			
			Construction of point C	1	⑤		
	(ii)		Obtaining the centre of the circle	1			
			Construct the circle	1	②		
	(iii)		Measures the radius	1	①		
	(iv)		Construction of tangent	2	②	△	⑩

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**Mathematics Question Paper - 5**

Question No.	Answer	Marks	Other																																								
09.	<table border="1" style="width:100%; border-collapse: collapse; margin-bottom: 10px;"> <thead> <tr> <th>class interval</th> <th>f</th> <th>x</th> <th>d</th> <th>fd</th> </tr> </thead> <tbody> <tr><td>0 - 20</td><td>1</td><td>10</td><td>- 60</td><td>-60</td></tr> <tr><td>20 - 40</td><td>3</td><td>30</td><td>- 40</td><td>-120</td></tr> <tr><td>40 - 60</td><td>5</td><td>50</td><td>- 20</td><td>-100</td></tr> <tr><td>60 - 80</td><td>11</td><td>70</td><td>0</td><td>0</td></tr> <tr><td>80 - 100</td><td>5</td><td>90</td><td>20</td><td>100</td></tr> <tr><td>100 - 120</td><td>4</td><td>110</td><td>40</td><td>160</td></tr> <tr><td>120 - 140</td><td>1</td><td>130</td><td>60</td><td>60</td></tr> </tbody> </table> <p align="right"><math>\Sigma fd = 40</math></p> <p>(i) 60-80</p> <p>(ii) column <math>x</math> column <math>d</math> column <math>fd</math></p> <p align="right"><math>\Sigma fd = 40</math></p> <p>Mean = <math>70 + \frac{40}{30}</math> = 71.33</p> <p>(iii) <math>71.33 \times 40 = \text{score } 2853.2</math> = score 2853</p>	class interval	f	x	d	fd	0 - 20	1	10	- 60	-60	20 - 40	3	30	- 40	-120	40 - 60	5	50	- 20	-100	60 - 80	11	70	0	0	80 - 100	5	90	20	100	100 - 120	4	110	40	160	120 - 140	1	130	60	60	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>2</p> <p>1</p> <p>1</p> <p>1</p>	<p>①</p> <p>⑦</p> <p>⑩</p>
class interval	f	x	d	fd																																							
0 - 20	1	10	- 60	-60																																							
20 - 40	3	30	- 40	-120																																							
40 - 60	5	50	- 20	-100																																							
60 - 80	11	70	0	0																																							
80 - 100	5	90	20	100																																							
100 - 120	4	110	40	160																																							
120 - 140	1	130	60	60																																							

Question No.	Answer	Marks	Other
10.	<p>(i)</p> <div style="display: flex; align-items: center; justify-content: center;"> <div style="margin-right: 10px;">Sinhala</div> <div style="margin-left: 10px;">Tamil</div> </div> <div style="display: flex; align-items: center; justify-content: center; margin-top: 10px;"> <div style="margin-right: 10px;">English</div> </div> <p><math>x + x + 12 + 6 + 5 = 35</math>  <math>2x = 12</math>  <math>x = 6</math></p> <p>Number who can work in all three languages = 6</p> <p>(ii)</p> <p><math>\frac{35}{58}</math> Obtain 35 obtain 58</p> <p>Percentage = <math>\frac{35}{58} \times 100\%</math> = 60.34%</p> <p><math>\therefore 60.34 &gt; 60</math></p>	<p>4</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>⑥</p> <p>④</p> <p>⑩</p>

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**Mathematics Question Paper - 5**

Question No.		Answer	Marks		Other
11.	(i)	Figure	2		
		$\hat{A}BC = \hat{A}CB$ (because $AB = AC$ )			
		$\hat{A}BC = \hat{A}QR$ (corresponding angles $BC \parallel PS$ )	1		
		$\hat{A}CB = \hat{A}RQ$ (corresponding angles $BC \parallel PS$ )	1		
		$\hat{A}QR = \hat{A}RQ$			
		$\therefore AQ = AR$	1		
		$AB = AC$ (data)			
		$AQ = AR$ (proved)			
		$AB - AQ = AC - AR$	1		
		$\therefore BQ = RC$	1		
		$\hat{P}QB = \hat{A}QR$ (vertically opposite angles)	1		
		$\hat{S}RC = \hat{A}RQ$ (vertically opposite angles)			
		$\therefore \hat{P}QB = \hat{C}RS$			
		Comparing triangles $PQB$ and $RCS$			
		$BQ = RC$ (verified)	1		
		$\hat{P}BQ = \hat{R}CS$ (data)			
		$\hat{P}QB = \hat{C}RS$ (verified)	1	<b>10</b>	
		$\triangle PQB \cong \triangle RCS$ (A.A.S)			

Question No.		Answer	Marks		Other
12.	(i)	$30^\circ$	1	①	
	(ii)	The angle subtended at the centre of a circle by an arc is equal to twice the angle subtended on the circumference by the same arc.	1	①	
	(iii)	$\hat{P}SQ = \hat{P}RQ$ (angle in the same segment of a circle are equal)	1+1	②	
	(iv)	$\hat{M}QR + \hat{P}RQ = \hat{P}MQ$ (External angle by producing side of a triangle)	1		
		$\hat{O}PM + \hat{P}OM = \hat{P}MQ$ ( „ )	1		
		$\therefore \hat{M}QR + \hat{P}RQ = \hat{O}PM + \hat{P}OM$	1		
		But $\hat{P}OM = 2\hat{P}RQ$	1		
		$\hat{M}QR + \hat{P}RQ = \hat{O}PM + 2\hat{P}RQ$	1		
		$\hat{P}RQ = \hat{M}QR - \hat{O}PM$	1	⑥	<b>10</b>

**6.1 Objectives**

**Paper I - Part A**

01. Given one of the two angles opposite the two equal sides of an isosceles triangle, calculates the vertex angle.
02. Given the probability of germination of a sample of seeds, calculates the expected number of seeds that would germinate from a stock of seeds.
03. Shades in a Venn diagram the union of two disjoint sets.
04. Given the time taken by a train running with uniform speed to travel a certain distance in hours, finds the time taken by the same train to travel a given distance with the same speed.
05. Finds the radius of a circle, given the length of a chord and the distance from the centre to the mid point of the chord.
06. Of the given triangles, identifies the pair of triangles that are congruent and writes criteria for congruence.
07. Solves an inequality of the type  $ax + b \geq 0$  and indicates the solution on the number line.
08. Given the value of one angle in a given diagram relating to a semi-circle, calculates the value of a named angle.
09. Given the coordinates of a point on a straight line passing through the origin, finds the gradient of that line.
10. Factorises an expression with three terms.
11. Given the figure of a parallelogram and the sum of its two opposite angles, finds the value of one of those angles.
12. Calculates the volume of a right prism whose cross section is a right angled triangle, when the length of the sides which include the right angle and the length of the prism are given.
13. Given the loan amount and the annual simple interest rate, finds the total amount required to settle the loan at the end of the year.
14. Given the mean and the assumed mean, calculates the mean value of the deviations.



15. Given the two sides of a right angled triangle which include the right angle in algebraic terms, writes the tangent of the named angle.
16. Given the number of days taken by a certain number of men to complete a task, finds the number of days taken by another number of men to complete the same task.
17. Calculates the perimeter of a semicircular lamina of known diameter.
18. Calculates the annual rates percentage, given the annual value of a house and the rates charged per a quarter.
19. Finds a named angle in a diagram of a triangle in which the mid points of two sides are given.
20. Subtracts two algebraic fractions with related algebraic terms in the denominator.
21. Finds the sum of two unknowns in two simultaneous equations without solving them.
22. Finds the sequential position of a given term in an arithmetic progression with given initial terms.
23. Calculates the values of two unknowns in two equal matrices of order  $2 \times 2$  with some unknowns entries.
24. When a diagram of a cyclic quadrilateral with two parallel sides and a side produced is given, finds the value of the exterior angle when the value of an angle of it is given.
25. Given a diagram of an equilateral triangle with its vertices on a circle and another triangle formed by joining two of its vertices to the centre, finds the value of the angle subtended at the centre by the chord formed between the vertices of the triangle joined to the centre.

**Part B**

1. Given two parts of a whole as fractions
  - (i) indicates the sum of those parts as fraction.
  - (ii) when the sum of the two parts is removed from the whole, indicates the remainder as a fraction of the whole.
  - (iii) indicates as a fraction of the whole, a fraction of the fraction obtained in (ii).
  - (iv) indicates the quantity of the whole when the quantity remaining after the fraction in (i) and (iii) above are removed from the whole is given..

2. Given a diagram of a cylindrical block of metal whose radius and height are marked on it,
- (i) finds the area of the curved surface of the block of metal.
  - (ii) finds the total surface area of the metal block.
  - (iii) finds the volume of the metal block.
  - (iv) finds the radius of a cylindrical metal block of given volume and of height equal to that of the former metal block.

3. (a) Given the percentage custom duty and the value of an item,

- (i) finds the custom duty.
- (ii) calculates the value after paying the duty.

- (b) Given the part of the annual income of a businessman which is exempt from tax, his annual income and the income tax percentage,

- (i) calculates the income tax relevant to a given amount.

Given the amount of income tax and the tax percentage

- (ii) calculates the corresponding income on which the tax is charged.
- (iii) calculate the total annual income.

4. (a) Given the probability of germination of a planted seed,

- (i) draws the tree diagram depicting the events of germinating or not germinating .

Given the probability of the plant developed from a germinated seed producing new seeds.

- (ii) extends the tree diagram drawn in (i) to show the events of production and non-production of seeds.
- (iii) finds the probability of a planted seed producing new seeds using the tree diagram.

- (b) Finds the probability of getting the same number in both dice when tossing two dice simultaneously in which equal numbers are written in pairs.

5. Given an incomplete table and incomplete histogram,

- (i) completes the table using the data given in the histogram.
- (ii) completes the histogram using the data given in the table.
- (iii) draws the frequency polygon using the histogram.
- (iv) finds the total number of students using the table or the histogram.
- (v) calculates the percentage of students scoring below a given mark.

**Paper II**

**Part A**

1. Given the price of an object, initial payment, number of premiums and that the interest is calculated on the reducing balance,
  - (i) calculates the total interest payable when the value of a premium is given.
  - (ii) calculates the annual interest rate.
  
2. (a) When a function is given in the form  $y = (x + a)(b - x)$ ;  $a, b \in \mathbb{Z}^+$ ,
  - (i) completes an incomplete table consisting of values of  $y$  corresponding to given values of  $x$ ,
  - (ii) decides on a suitable scale for the axes and draws the graph.

(b) Using the graph drawn,

  - (i) writes the equation of the axis of symmetry.
  - (ii) finds the maximum value of the function.
  - (iii) writes the coordinates of the turning point.

(c) Using the roots of the equation  $y = 0$ , deduces and writes the quadratic function with given roots.
  
3. (a)
  - (i) Factorises a given algebraic expression with squares.
  - (ii) Finds a named matrix when a relationship between matrices is given in the form of an equation.

(b)
  - (i) Constructs a pair of simultaneous equations according to given information on the basis that opposite sides of a rectangle are equal.
  - (ii) Writes the lengths of the named sides of the rectangle by solving those simultaneous equations.
  
4. (a) Based on given information, draws a diagram according to a given scale and calculates the relevant height.

(b) Given the angle of elevation at which the top of a post erected on a levelled ground at a given horizontal distance from a person is seen ,

  - (i) sketches the information provided.
  - (ii) calculates the height of the post.
  - (iii) given the distance walked by the person towards the post, calculates the angle of elevation of the top of the post from the person's new position.

5. Given the speed of one train by an algebraic term, the relationship between the speeds of the two trains and the distance between the two trains after a certain period of time with regard to two trains starting from the point at which two perpendicular railway lines meet,
- (i) shows that the given algebraic symbol satisfies a given quadratic equation.
  - (ii) finds the speeds of the two trains by solving that equation.
6. (a) Given the diameter of the bottom and the perpendicular height of a cone,
- (i) calculates the radius of the bottom.
  - (ii) calculates the area of the curved surface of the cone.
- (b) Using the logarithms table, finds the value of an expression of the type  $\frac{a \times b^{\frac{1}{3}}}{c^2}$  where  $a, b, c$  are numbers between 0 and 25.
7. When the first term, second term and common difference of an arithmetic progression are given which are related to an event,
- (i) shows that the sum of  $n$  terms is a given expression.
  - (ii) finds the number of terms when the sum of the terms from the first term onwards is given.
8. Given the length of the hypotenuse and a side of a right angled triangle'
- (i) constructs that triangle.
  - (ii) constructs the perpendicular bisector of a side and names the point of intersection of the perpendicular bisector and a named side.
  - (iii) constructs a circle touching a given side at a given point and passing through a given point.
  - (iv) measures and writes the radius of the circle drawn.
  - (v) constructs another tangent to the circle from an external point and writes the theorem on which the construction is based.
9. For a given grouped frequency distribution,
- (i) writes the class interval that includes the mode.
  - (ii) writes the class interval that includes the median.
  - (iii) calculates the mean of the distribution to the nearest whole number by taking the mid value of the modal class as the assumed mean.
  - (iv) shows that a given event is true using the mean.
10. (i) Displays in a Venn diagram the information given about three sets.
- (ii) Writes in set notation the relationship between two given sets.
  - (iii) Finds the number of elements in a named sets.
  - (iv) Finds the number of elements in the complement of the three sets.

11.
  - (a) States two requirements for a quadrilateral to be a parallelogram.
  - (b) When data relating to a parallelogram are given, sketches a diagram indicating the given data and shows that a given point is the mid point of a given line segment.
  
12. According to the information given in a diagram consisting of a circle with the centre marked, a chord of it and a tangent drawn at point on the circle,
  - (i) shows that a named pair of triangles is congruent.
  - (ii) shows that a given line is a tangent to the circle.
  - (iii) shows that a given quadrilateral is a cyclic quadrilateral.
  - (iv) determines the centre of the circumcircle of a given cyclic quadrilateral.

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**Mathematics Question Paper - 6**

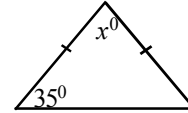
**6.2 Question Paper**

**Mathematics I - Part A**

**Time 2 hours.**

Answer all the questions on this paper itself.

1. Find the value of  $x$  according to the data given in the diagram.

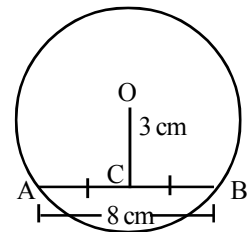


2. It is given that the probability of a seed in a sample of bean seeds germinating is 80%. What is the expected number of germinating seeds are in 200 seeds of that variety of seeds?

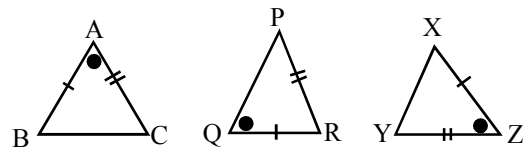
3. A and B are two disjoint sets. Shade  $A \cup B$  in a Venn diagram.

4. A train running with uniform speed takes  $\frac{1}{2}$  an hour to run 60 km. How long will it take to run 80 km?

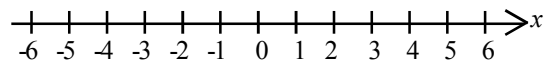
5. AB is a chord in the circle of centre O. Find the radius of the circle as per the information given.



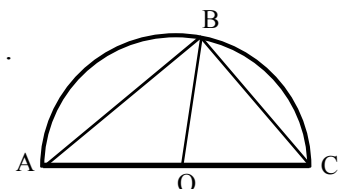
6. Of the triangles given, name the two triangles that are congruent and write the criteria for congruence. (Similar aspects are marked by identical symbols.)



7. Solve the inequality  $x + 2 \geq 5$  and indicate the solution on the number line.



8. If  $\hat{A}BO = 42^\circ$  in the semi circle of centre O, find the value of  $\hat{B}CO$ .

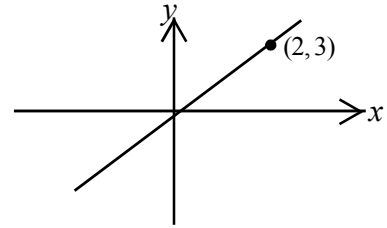


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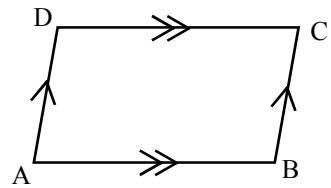
**Mathematics Question Paper - 6**

9. The diagram gives the graph of the function  $y = mx$ .  
Find the value of  $m$  using the graph.

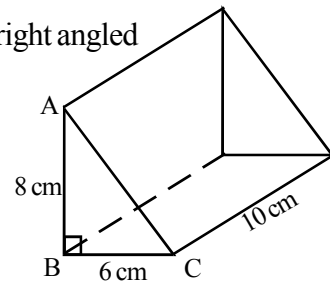


10. Factorise  $2x^2 - 9x - 5$ .

11. In the parallelogram ABCD,  $\hat{B}AD + \hat{B}CD = 104^\circ$ .  
Find the value of  $\hat{B}AD$ .



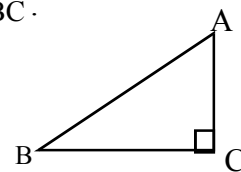
12. The length of the right prism in the figure, whose cross section is a right angled triangle is 10 cm.  $AB = 8$  cm and  $BC = 6$  cm. Find the volume of the prism.



13. Amal takes a loan of Rs. 50 000 at an annual simple interest rate of 12%. Find the total amount that Amal should pay at the end of one year to settle the loan.

14. The true mean of a distribution of numbers is 48.3. If the assumed mean is 49.5 find the mean deviation.

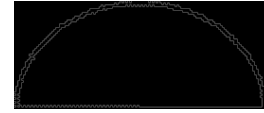
15. In the triangle ABC,  $AC = 2x$  and  $BC = 3x$ . Find the value of  $\tan \hat{A}BC$ .



16. 12 people take 6 days to complete a task. How many days will 8 people take to complete the same task?

17. Find the perimeter of the semicircular lamina shown in the diagram.

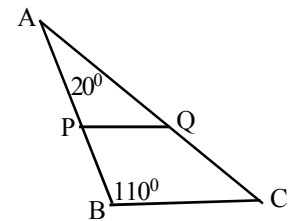
(Take  $\pi = \frac{22}{7}$  )



21 cm

18. Rates of Rs. 500 is paid for a quarter for a house valued Rs. 10 000 for an annum. Calculate the rates percentage charged.

19. In the triangle ABC, the mid point of the sides AB and AC are P and Q respectively. If  $\hat{A}BC = 110^\circ$  and  $\hat{B}AC = 20^\circ$ , find the value of  $\hat{A}QP$ .



20. Simplify  $\frac{3}{2x} - \frac{5}{8x}$ .

465

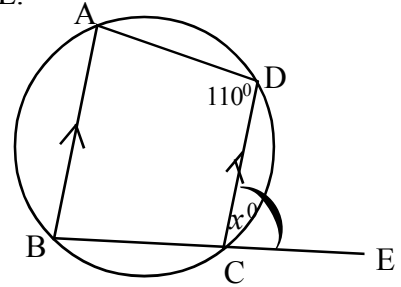
21. If  $2a - 3b = 12$  and  $a + 6b = -9$ , find the value of  $(a + b)$  without solving the equation.

22. Which term is 32 in the progression 5, 8, 11, ...

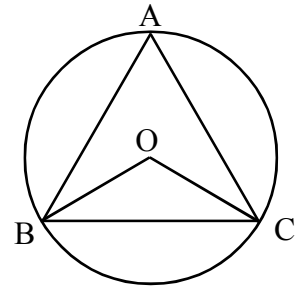


23. If  $2 \begin{bmatrix} 3 & -2 \\ -5 & x \end{bmatrix} = \begin{bmatrix} 6 & y \\ -10 & 4 \end{bmatrix}$ , find the values of  $x$  and  $y$ .

24. In the quadrilateral ABCD,  $BA \parallel CD$ . Side BC is produced to E.  
If  $\hat{ADC} = 110^\circ$ , find the value of  $x$ .



25. The vertices of the equilateral triangle are located on the circle of centre O. Find  $\hat{BOC}$ .



Part B

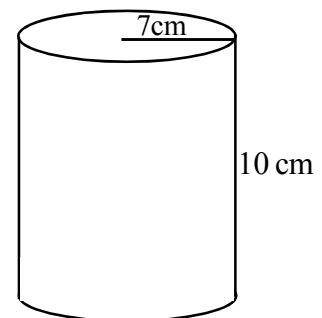
1. In a certain year, a tea exporting company exports  $\frac{2}{7}$  of their produce to Australia and  $\frac{3}{4}$  of the balance to India.
- (i) Of the total produce, what fraction is the amount of tea exported that year?
- (ii) Of the total produce, what fraction is the amount of tea left after exporting?
- (iii)  $\frac{3}{5}$  of the amount of tea left after export, was sent to the open market. Of the total produce, what fraction of tea was sent to the open market?
- (iv) The amount of tea left after sending to the open market was 25 metric tons. What is the total amount of tea produced that year in metric tons?
- 

2. The diagram shows a cylindrical metal block of radius 7 cm and height 10 cm. (Take  $\pi = \frac{22}{7}$ )

(i) Find the area of the curved surface of the metal block.

(ii) Find the area of the whole surface of the metal block.

(iii) Calculate the volume of the metal block.



(iv) Find the radius of the cylindrical metal block of volume  $6160 \text{ cm}^3$  whose height is equal to the height of the above metal block.

3. (a) 60% is charged as tariff in the import of a vehicle. Varuna imports a vehicle worth Rs. 1 200 000.
- (i) How much is the tariff that should be paid?
  - (ii) What is the value of the vehicle after paying the tariff?
- (b) The first Rs. 2 400 000 of the annual income of a businessman is exempted from income tax. An annual income tax of 15% is charged on the income exceeding this amount.
- (i) Find the tax that should be paid by a person with an annual income of 3 000 000.

A businessman has paid Rs. 165 000 as income tax.

- (ii) Find the income for which tax is paid.
- (iii) Find the annual income of the businessman.

- 
4. (a) The probability of a bean seed selected from a bean seed sample germinating is  $\frac{7}{10}$ .
- (i) Draw a tree diagram to illustrate the events of germination and non-germination of a planted seed.

The probability of a germinated plant producing beans is  $\frac{7}{8}$ .

- (ii) Extend the tree diagram in (i) above to show the events of the production and non-production of beans.
  - (iii) Using your tree diagram, find the probability of the production of beans resulting from a planted bean seed.
- (b) Find the probability of getting the same number in both dice when two fair dice numbered 1, 1, 2, 2, 3, 3 are tossed at the same time.

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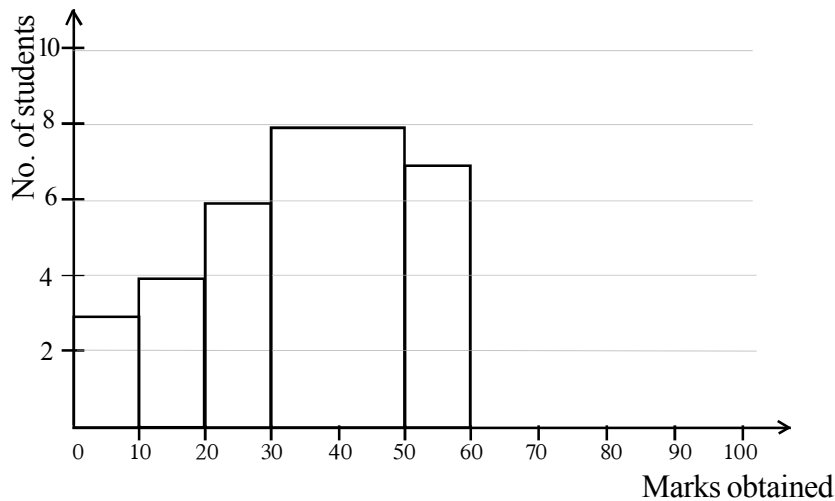
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**Mathematics Question Paper - 6**

5. An incomplete table containing marks scored by grade 11 students for a test in mathematics is given below.

Marks	Number of students
00 - 10	
10 - 20	
20 - 30	
30 - 50	
50 - 60	7
60 - 100	24

An incomplete histogram drawn to illustrate their marks is given below.



- (i) Complete the table using the histogram.
- (ii) Complete the histogram according to the data given in the table.
- (iii) Draw the frequency polygon using the completed histogram.
- (iv) Find the total number of students in the class.
- (v) If the students scoring above 60 were passed, indicate the number of failures as a percentage of the total number of students.

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**Mathematics Question Paper - 6**

**Mathematics II**

**Three hours**

- Answer 10 questions selecting five questions from part A and five questions from part B.
- Every question is worth 10 marks.
- The volume of a right circular cone of base radius  $r$  and height  $h$  is  $\frac{1}{3}\pi r^2 h$ .
- The volume of a sphere of radius  $r$  is  $\frac{4}{3}\pi r^3$ .

**Part A**

Answer **five** questions **only**

1. A laptop worth Rs.75 000 is bought by paying  $\frac{1}{3}$  its price on the agreement that the rest will be paid in 10 monthly equal installments of Rs.5 412.50. The interest is calculated on the reducing balance .

(i) What is the total interest payable?

(ii) Find the annual interest rate.

2. (a) An incomplete table is given below to draw the graph of the function  $y = (x+3)(1-x)$ .

$x$	-4	-3	-2	-1	0	1	2
$y$	-5	0	---	4	3	0	-5

(i) Find the value of  $y$  when  $x = -2$ .

(ii) Draw the graph calibrating the axes as appropriate.

(b) Using the graph,

(i) write the equation of the axis of symmetry of the graph.

(ii) find the maximum value of the function.

(iii) write the coordinates of the turning point of the function.

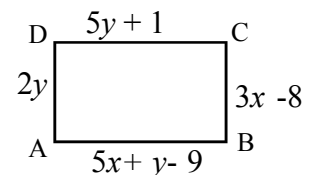
(c) Find the roots of the equation  $y=0$  and then write the quadratic function

$y = (x-a)(x-b)$ ,  $a, b \in \mathbb{Z}$  where  $y = 0$  has roots 2 and -5 .

3. (a) Factorise  $a^2 + 2ab + b^2 - c^2$ .

(b) If  $3A + \begin{pmatrix} 4 & -1 \\ -2 & 1 \end{pmatrix} = \begin{pmatrix} -2 & 2 \\ 1 & 4 \end{pmatrix}$ , find matrix A

(c) ABCD is a rectangle. The lengths of its sides are given in terms of  $x$  and  $y$  as indicated in the figure.



(i) Construct a pair of simultaneous equations, on the basis that the opposite sides of a rectangle are equal.

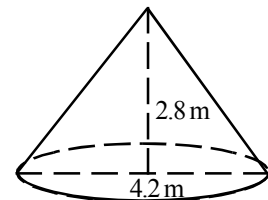
(ii) Write the lengths of the sides AB and AD of the rectangle by solving those equations.

4. (a) A man standing on a horizontal ground 75 m away from the base of a communication tower sees its top at an angle of elevation of  $30^\circ$ . Draw a scale diagram on the scale 1:1500 and find the height of the tower.
- (b) A person standing on a flat ground, sees the top of a post situated 10 m away at an angle of elevation of  $60^\circ$ . (The height of the person is neglected.)
- (i) Sketch the above information in a diagram.
- (ii) Find the height of the post.
- (iii) Find the angle of elevation at which the person sees the top of the post if he walks 4 m towards the post.
5. From a certain station, two rectilinear railway lines stretch towards the north and the west. Train A heading towards west and train B heading towards north pass the station at the same instance. The uniform speed of B is  $x \text{ km h}^{-1}$  whereas the uniform speed of A is greater by  $5 \text{ km h}^{-1}$  than that of B. When these two trains had run for 2 hours, the distance between them was 50 km. Based on this information,

- (i) show that  $x$  satisfies the quadratic equation  $x^2 + 5x - 300 = 0$ .
- (ii) solve that equation and find separately the speed of A and the speed of B.

6. (a) A tent made by a group of scouts is shown in the diagram. It has the shape of a right circular cone. The diameter of the base is 4.2 m and its perpendicular height is 2.8 m.

- (i) Find the radius of the base of the tent.
- (ii) This tent is fully covered with canvas. Find the area of the canvas used for this in square meters.



- (b) Find the value using the logarithms tables.  $\frac{23.5 \times (0.048)^{\frac{1}{3}}}{(3.824)^2}$

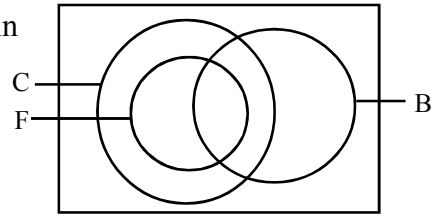
7. (a) An amateur cyclist practices by cycling along a track, the distance of one round of which is 400 m. He cycles one round on the first day, two rounds on the second day etc, increasing the number of rounds by one every successive day.
- (i) If the total distance travelled by the cyclist during  $n$  days is  $S_n$ , show that  $S_n = 200n(n + 1)$
- (ii) The trainer of this contender says that he should cycle at least 84 000 m during practice before going to the competition. Find the minimum number of days he should practice to meet this requirement.

8. In the following constructions, use a compass and a ruler with a mm/cm scale. Show the lines of construction clearly.
- (i) Construct the triangle ABC in which  $AB = 5$  cm,  $\widehat{ABC} = 90^\circ$ ,  $AC = 6.5$  cm.
- (ii) Construct the perpendicular bisector of the side BC and name the point it intersects the side AC as X.
- (iii) Construct the circle passing through point B touching the side AC at C.
- (iv) Measure and write the radius of the circle.
- (v) Construct another tangent AE to the circle from point A. Write the theorem used here.
9. Given below is the information regarding the tourists who came to a tourist hotel in year 2013.

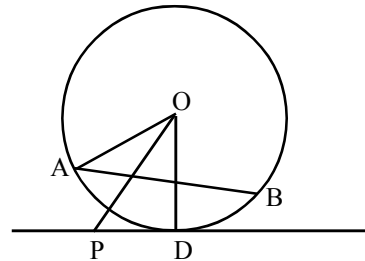
No. of tourists	51-60	61-70	71-80	81-90	91-100	101-110	111-120
No. of days	2	4	8	10	12	8	6

- (i) What is the modal class ?
- (ii) What is the class interval that includes the median?
- (iii) Taking the mid value of the modal class as the assumed mean, find the mean of the number of tourists who visited the hotel in 2013.
- (iv) If for 50 days in 2012, the mean of the daily arrival of tourists was 80, show that the arrival of tourists has increased in 2013 by 12.5% compared to 2012.

10. There are 65 members in a school sports club. Of them 40 are in the cricket (C) team, 12 are in the football (F) team and 20 are in the basketball (B) team. All members in the football team belong to the cricket team also. The number of members playing cricket and basketball but not football is 11. The number of members belonging to all the three teams is 4.



- (i) Indicate the above information in a Venn diagram and complete it.
  - (ii) Write in set notation, the relationship between the sets C and F.
  - (iii) How many members are playing only basketball?
  - (iv) How many members do not belong to any of the above three teams?
11. (a) Write two requirements to be satisfied for a quadrilateral to be a parallelogram.
- (b) Point X is located within the parallelogram ABCD. The mid point of CX is L. Line BL is produced to Y so that  $BL = LY$ . Line AY intersects DX at M. Sketch this information in a diagram and show that the mid point of DX is M.
12. AB is a chord of the circle of centre O in the figure. The tangent drawn to the point D on the circle and the bisector of the angle AOD meet at point P.

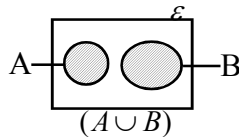
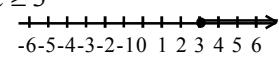


- (i) Show that  $\triangle PAO$  and  $\triangle PDO$  are congruent.
- (ii) Show that line PA is a tangent to the circle.
- (iii) Show that PAOD is a cyclic quadrilateral.
- (iv) What is the location of the centre of the circumcircle of the cyclic quadrilateral PAOD? Give reasons for your answer.



**6.3 Marking Scheme**

**Mathematics 1 - Part A**

- |  |  |
|--|--|
| <p>1. <math>x + 70 = 180^\circ</math> .... 1<br/> <math>x = 110^\circ</math> -- ②</p>  | <p>15. <math>\tan \hat{A}BC = \frac{2x}{3x}</math> ...1<br/> <math>= \frac{2}{3}</math> ....1 -- ②</p>   |
| <p>2. <math>200 \times \frac{80}{100}</math> ..... 1<br/> 160 -- ②</p>   | <p>16. <math>\frac{12 \times 6}{8}</math> ... 1<br/> <math>= 9</math> -- ②</p>   |
| <p>3.  -- ②</p>   | <p>17. <math>21 + 2 \times \frac{22}{7} \times \frac{21}{2} \times \frac{1}{2}</math> .... 1<br/> <math>= 21 + 33</math><br/> <math>= 54 \text{ cm}</math> ... 1 -- ②</p>                            |
| <p>4. <math>\frac{1}{120} \times 80</math> . ...1<br/> <math>\frac{2}{3}</math> h or 40 min ...1 -- ②</p>  | <p>18. <math>\frac{2000}{10000} \times 100\%</math> or <math>500 \times 4</math> ....1<br/> 20% .... 1 -- ②</p>  |
| <p>5. <math>\hat{B}CO = 90^\circ</math> ...1<br/> <math>OB^2 = 3^2 + 4^2</math><br/> <math>OB = 5</math> ....1 -- ②</p>  | <p>19. <math>\hat{A}PQ = 110^\circ</math> ...1<br/> <math>\hat{A}QP = 180^\circ - (110^\circ + 20^\circ)</math><br/> <math>= 180^\circ - 130^\circ</math><br/> <math>= 50^\circ</math> ...1 -- ②</p> |
| <p>6. <math>\triangle ABC \equiv \triangle XYZ</math> (S,A,S) -- ②</p>   | <p>20. <math>\frac{12 - 5}{8x}</math> ... 1<br/> <math>\frac{7}{8x}</math> ...1 -- ②</p>   |
| <p>7. <math>x \geq 3</math> ...1<br/>  ...1 -- ②</p>                                  | <p>21. <math>3a + 3b = 3</math> ... 1<br/> <math>a + b = 1</math> .... 1 -- ②</p>  |
| <p>8. <math>\hat{O}BC = 48^\circ</math> ....1<br/> <math>\hat{B}CO = \hat{O}BC</math> (OB=OC radii of the circle )<br/> <math>\hat{B}CO = 48^\circ</math> ....1 -- ②</p> | <p>22. <math>32 = 5 + (n-1) \times 3</math>.. 1<br/> <math>10 = n</math> ... 1 -- ②</p>  |
| <p>9. Gradient = <math>\frac{3}{2}</math> -- ②</p>   | <p>23. <math>y = -4</math> ... 1<br/> <math>x = 2</math> ... 1 -- ②</p>  |
| <p>10. <math>2x^2 - 10x + x - 5</math> ...1<br/> <math>(x - 5)(2x + 1)</math> -- ②</p>   | <p>24. <math>\hat{B}AD = 70^\circ</math> ...1<br/> <math>\therefore x = 70^\circ</math> ...1 -- ②</p>  |
| <p>11. <math>\hat{B}AD = \hat{B}CD</math> ...1<br/> <math>\therefore \hat{B}AD = \hat{B}CD = \frac{104}{2} = 52^\circ</math> -- ②</p>                                    | <p>25. <math>\hat{B}AC = 60^\circ</math> ...1<br/> <math>\therefore \hat{B}OC = 120^\circ</math> ...1 -- ②</p>   |
| <p>12. <math>\frac{1}{2} \times 8 \times 6 \times 10</math> ...1<br/> 240 cm<sup>3</sup> ...1 -- ②</p>   |  |
| <p>13. <math>50\,000 + 50\,000 \times \frac{12}{100}</math><br/> 50 000 + 6 000 ...1<br/> 56 000 ...1 -- ②</p>   |  |
| <p>14. <math>48.3 = 49.5 + \text{mean deviation}</math> ... 1<br/> <math>48.3 - 49.5 = \text{m.d}</math><br/> <math>-1.2 = \text{m.d}</math> -- ②</p>                    |  |

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**Mathematics Question Paper - 6**

**Part B**

Question No.		Answer	Marks	Other	
1.	(i)	$\frac{2}{7} + \left(\frac{3}{4} \text{ of } \frac{5}{7}\right)$	1		
		$= \frac{8+15}{28}$			
		$= \frac{23}{28}$	1	②	
	(ii)	$1 - \frac{23}{28}$	1		
		$= \frac{5}{28}$	1	②	
	(iii)	$\frac{5}{28} \times \frac{3}{5}$	1		
		$= \frac{3}{28}$	1	②	
	(iv)	$\frac{23}{28} + \frac{3}{28}$	1		
		$= \frac{26}{28}$	1		
		Remainder = $\frac{2}{28} = \frac{1}{14}$			
	Total = $25 \times 14$	1			
	= 350 t	1	④	10	

2.	(i)	$2 \times \frac{22}{7} \times 7 \times 10$	1		
		$440 \text{ cm}^2$	1	②	
	(ii)	$440 + \frac{22}{7} \times 7 \times 7 \times 2$	1		
		$440 + 308$ $= 748 \text{ cm}^2$	1	②	
	(iii)	$154 \times 10$	1		
		$= 1540 \text{ cm}^2$	1	②	
	(iv)	$\frac{22}{7} \times r^2 \times 10 = 6160$	1		
		$r^2 = \frac{6160 \times 7}{22 \times 10}$	1		
		$r^2 = 196$			
		$r = \sqrt{196}$	1		
	$r = 14 \text{ cm}$	1	④	10	

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**Mathematics Question Paper - 6**

3.	(a)	(i)	Tariff payable = $\frac{60}{100} \times 1\,200\,000$ = Rs. 720 000	1		
		(ii)	Value after paying tariff = Rs. 1 200 000 - 720 000 = 1 920 000	2	②	
	(b)	(i)	Income for which tax is paid = Rs. 3 000 000 - 2 400 000 = Rs. 600 000	1		
			Income tax = $600\,000 \times \frac{15}{100} = \text{Rs } 90\,000$	2	③	
		(ii)	Income for which tax is paid = $\frac{165\,000}{15} \times 100 = \text{Rs. } 1\,100\,000$	2	②	
	(iii)	Total income = Rs. 2 400 000 + 1 100 000 = Rs. 3 500 000	1	①	<b>10</b>	

4.	(a)	(i)		3	③	
		(ii)		3	③	
	(iii)	$\frac{7}{10} \times \frac{7}{8} = \frac{49}{80}$	2	②		
	(b)	$\frac{12}{36} = \frac{1}{3}$	2	②	<b>10</b>	

5.	(i)	Completing the histogram	2	②	
	(ii)	No. of students - 3, 4, 6, 16 ( if all correct -2 ) ( if 3 are correct -1)	2	②	
	(iii)	Constructing the frequency polygon	2	②	
	(iv)	60	2	②	
	(iv)	$\frac{36}{60} \times 100\% = 60\%$	1+1	②	<b>10</b>

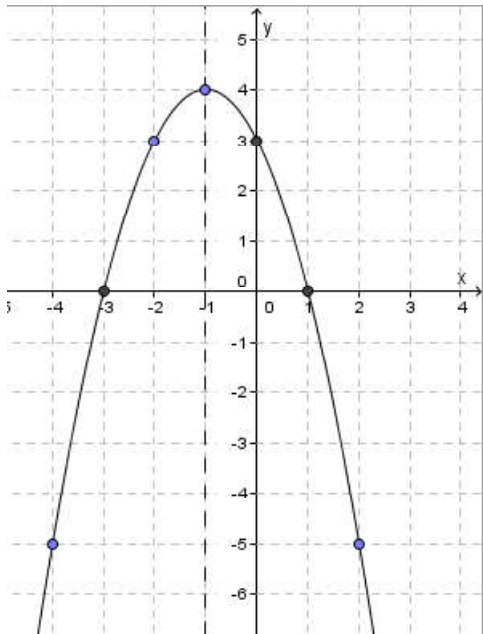
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**Mathematics Question Paper - 6**

**Paper II - Part A**

Question No.	Answer	Marks	Other	
1.	(i) Initial payment = $75\ 000 \times \frac{1}{3}$ = Rs.25 000  Monthly loan = $\frac{75\ 000 - 25\ 000}{10}$ = Rs. 5 000  Interest per instalment = $5\ 412.50 - 5\ 000.00$ = 412.50  Total interest = $412.50 \times 10$ = Rs. 4 125	1		
		1		
		1		
		1	④	
		(ii) No. of monthly units = $\frac{10(10+1)}{2} = 55$  Interest per month = $\frac{4\ 125}{55}$ = Rs. 75  Interest rate = $\frac{75}{5\ 000} \times 12 \times 100\%$ = 18%	1	
			1	
			1	
			2	
			1	⑥
				10

2.	(i) $y = 3$	1	①
	(ii) 		

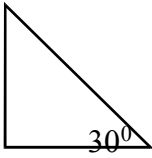
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**Mathematics Question Paper - 6**

	(ii)	If two axes are correct Marking points Drawing correct parabola	1 1 1	③	
(b)	(i)	$x = -1$	1	①	
	(ii)	Maximum value = 4 $p = 4$	1 1	②	
	(iii)	$(-1, 4)$	1	①	
(c)		Roots are $x = -3$ and $x = 1$ $y = (x - 2)(x + 5)$	1 1	②	⑩

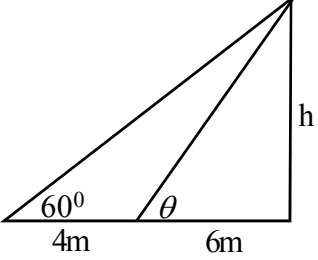
3.	(a)	$(a+b)^2 - c^2$ $= (a+b-c)(a+b+c)$	1 1	②	
	(b)	$3A = \begin{pmatrix} -6 & 3 \\ 3 & 3 \end{pmatrix}$  $A = \begin{pmatrix} -2 & 1 \\ 1 & 1 \end{pmatrix}$	1 1	②	
	(c)	$\begin{array}{r} 5x + y - 9 = 5y + 1 \\ 2 \cdot 9 \times 15 \\ 5x - 4y = 10 \end{array} \quad \text{--- (1)}$ $3x - 8 = 2y$ $3x - 2y = 8 \quad \text{--- (2)}$ $(2) \times 2 \quad 6x - 4y = 16 \quad \text{--- (3)}$ $(3) - (1) \quad x = 6$  From ② $3(6) - 2y = 8$ $-2y = -10$ $y = 5$ $AB = 5 \times 5 + 1 = 26$ $AD = 2 \times 5 = 10$	1 1 1 1 1 1 1 1	⑥	⑩

4.	(a)	 $\text{Height of the tower} = 2.9 \times 15$ $= 43.5 \text{ m}$	1 1 1	③	
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**Mathematics Question Paper - 6**

	(b)	<p>(i) Figure</p>  <p>(ii) If the height of the post is <math>h</math>, <math>\tan 60^\circ = \frac{h}{10 \text{ m}}</math>  <math>\sqrt{3} \times 10 \text{ m} = h</math>  <math>h = 1.732 \times 10 \text{ m}</math>  <math>h = 17.32 \text{ m}</math></p> <p>(iii) <math>\tan \theta = \frac{17.32 \text{ m}}{6 \text{ m}}</math>  <math>\tan \theta = 2.89</math>  <math>\theta = \tan^{-1}(2.89)</math>  <math>\theta = \underline{\underline{71^\circ}}</math></p>	1  1  1  1  1  1	①          ③	          ⑩
5.	(i)	$(2x)^2 + (2x+10)^2 = 50$ $8x^2 + 40x - 2400 = 0$ $x^2 + 5x - 300 = 0$	2 2 2	⑥	
	(ii)	$(x + 20)(x - 15) = 0$ $x = -20 \text{ or } x = 15$  Speed of B = $15 \text{ km h}^{-1}$ Speed of A = $20 \text{ km h}^{-1}$	2   1 1	    ④	    ⑩
6.	(a)	<p>(i) <math>\frac{4.2}{2} = 2.1 \text{ m}</math></p> <p>(ii) <math>l^2 = 2.1^2 + 2.8^2</math>  <math>l = \sqrt{12.25}</math>  <math>l = 3.5 \text{ m}</math></p>	1   1	①	

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		$\begin{aligned} \text{Area of canvas} &= \pi r l \\ &= \frac{22}{7} \times 2.1 \times 3.5 \\ &= 23.1 \text{ m}^2 \end{aligned}$	1		
	(b)	$\begin{aligned} \lg x &= \lg 23.5 + \frac{1}{3} \lg 0.048 - 2 \lg 3.824 \\ &= 1.3711 + \frac{1}{3} (\bar{2}.6812) - 2(0.5826) \\ &= 1.3711 + \bar{1}.5604 - 1.1652 \\ &= 0.9315 - 1.1652 \\ &= \bar{1}.7663 \\ x &= \text{anti log } \bar{1}.7663 = 0.5838 \end{aligned}$	1 1 2 1+1 1 1	③	
			1	⑥	⑩
7.	(i)	$\begin{aligned} &400, 800, 1200 \\ &a = 400, \quad d = 400 \text{ m} \\ S_n &= \frac{n}{2} [2a + (n-1)d] \\ &= \frac{n}{2} [2 \times 400 + (n-1)400] \\ &= \frac{400n}{2} [2 + n - 1] \\ &= 200n(n+1) \end{aligned}$	2 1 1 1	④	
	(ii)	$\begin{aligned} 200n(n+1) &= 84\,000 \\ n(n+1) &= 420 \\ n^2 + n - 420 &= 0 \\ (n+21)(n-20) &= 0 \\ n &= -21 \text{ or } n = 20 \\ &20 \text{ days} \end{aligned}$	1 1 1 1 1	⑥	⑩

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8.	(i)	Line AB $\hat{A}BC = 90^\circ$ AC = 6.5 cm	1 1 1	③	
	(ii)	Perpendicular bisector BC Drawing the perpendicular to AC at C	1 2	③	
	(iii)	Drawing the circle	1	①	
	(iv)	Radius = 2.8 cm	1	①	
	(v)	Constructing AE	1		
		Tangent drawn to a circle from an external point are equal in length	1	②	<b>10</b>

9.	(i)	91 - 100	1	①																																														
	(ii)	91 - 100	1	①																																														
	(iii)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>No of tourist</th> <th>Mid value</th> <th>d</th> <th>f</th> <th>fd</th> </tr> </thead> <tbody> <tr> <td>51 - 60</td> <td>55.5</td> <td>-40</td> <td>2</td> <td>- 80</td> </tr> <tr> <td>61 - 70</td> <td>65.5</td> <td>-30</td> <td>4</td> <td>-120</td> </tr> <tr> <td>71 - 80</td> <td>75.5</td> <td>-20</td> <td>8</td> <td>-160</td> </tr> <tr> <td>81 - 90</td> <td>85.5</td> <td>-10</td> <td>10</td> <td>-100</td> </tr> <tr> <td>91 - 100</td> <td>95.5</td> <td>0</td> <td>12</td> <td>0</td> </tr> <tr> <td>101-110</td> <td>105.5</td> <td>10</td> <td>8</td> <td>80</td> </tr> <tr> <td>111-120</td> <td>115.5</td> <td>20</td> <td>6</td> <td>120</td> </tr> <tr> <td colspan="3"></td> <td>50</td> <td>200 - 460</td> </tr> </tbody> </table> <p>Mid value column - 260 column d column fd Mean = <math>95.5 + \frac{-260}{50}</math> = <math>95.5 - 5.2</math> = 90.3 = 90</p>	No of tourist	Mid value	d	f	fd	51 - 60	55.5	-40	2	- 80	61 - 70	65.5	-30	4	-120	71 - 80	75.5	-20	8	-160	81 - 90	85.5	-10	10	-100	91 - 100	95.5	0	12	0	101-110	105.5	10	8	80	111-120	115.5	20	6	120				50	200 - 460	1 1 1 1 1 1 1	⑥	
	No of tourist	Mid value	d	f	fd																																													
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111-120	115.5	20	6	120																																														
			50	200 - 460																																														
(iv)	Increase = $\frac{90 - 80}{80} \times 100\%$ = 12.5%	1 1	②	<b>10</b>																																														

10	(i)	Marking 5 regions correctly	5	⑤	
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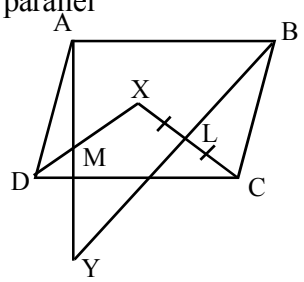
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**Mathematics Question Paper - 6**

(ii)	$F \subset C$	2	②	
(iii)	5	1	①	
(iv)	$65 - (17+8+4+11+5)$ $= 20$	1		
		1	②	10

11.	(a)	(i) Opposite sides being equal (ii) Opposite angles being equal (iii) Bisecting of diagonals (iv) A pair of opposite sides being equal and parallel	2	②	1 mark for any one of these
	(b)	Diagram $XL = LC$ (datum) $BL = LC$ (datum) $\therefore$ BXYC is a parallelogram ( $\because$ diagonals bisect each other) $BC = XY$ (opposite sides of the parallelogram BXYC) $BC = AD$ (opposite sides of the parallelogram ABCD) $\therefore AD = XY$ $AD = XY$ $AD \parallel XY$ ( $\because AD \parallel BC$ and $BC \parallel XY$ )  $\therefore$ ADYX is a parallelogram ( $\because$ pair of opposite sides are parallel and equal) $DM = MX$ (diagonals of a parallelogram bisect each other) $\therefore$ M is the midpoint of DX.	2 2 1 1 1 1 1 1		



12.	(i)	In triangles PAO, PDO $OA = OD$ (Radii) $\widehat{AOP} = \widehat{DOP}$ (Datum) $OP = OP$ (Common side) $\therefore \triangle PAO \cong \triangle PDO$ (S,A,S)	3	③	
	(ii)	$\widehat{ODP} = 90^\circ$ (Radius $\perp$ Tangent) $\widehat{PAO} = \widehat{ODP}$ Corresponding elements of congruent triangles) $\therefore \widehat{PAO} = 90^\circ$ $\therefore PA$ is a tangent.	2	②	
	(iii)	$\widehat{AOP} + \widehat{ODP} = 90^\circ + 90^\circ$ $= 180^\circ$ PAOD is a cyclic quadrilateral (Because opposite angles are supplementary)	1 1 1		③
	(iv)	$\widehat{ODP} = 90^\circ$ $\therefore OP$ is the diameter of the circle. $\therefore$ centre is the mid point of OP.	1 1	②	10

**7.1 Objectives**

**Paper I**

**Part A**

01. Calculate the amount to be paid for a quarter when the annual rate is given.
02. Solves a simple equation of the type  $\frac{1+x}{a} = b$  "  $a, b, x \in Z^+$  given.
03. Shades a named region of a Venn diagram consisting of the universal set and two intersecting sets.
04. Given the exterior angle formed by producing a side of a triangle, and one of the two interior opposite angles, finds the value of the other interior opposite angle.
05. Given the number of men and number of days to complete a work, finds the number of men required to complete the same work within a given number of days.
06. Fills in the blanks in a logarithmic expression relevant to a given expression of indices.
07. Finds the value of a named angle when a diagram with an angle subtended at the centre by an arc and the angle subtended on the remaining part of the circle by the same arc, and two equal sides are given.
08. Finds, (i) the common ratio; and (ii) the third term in a geometric progression whose first term, second term and fourth term are given.
09. Solves two simultaneous equations in which the coefficients of one variable are equal in magnitude.
10. Marks the truth or falsehood of some given statements about the congruent plane figures.
11. Calculates the value of a named angle when the value of an angle between the diagonal of a parallelogram and another side is given in a diagram where the angle between the diagonal and one side is a right angle.
12. Writes the solutions of a given quadratic equation of the form  $x(x - a) = 0$ .
13. Calculates the volume of a prism whose cross sectional area and length are given.
14. Given the angle of elevation of a certain point when observed from another point, finds the angle of depression of the first point when viewed from the second point.
15. Draws a diagram to clarify the meaning of the statement 'the line joining the mid point of a chord of a circle and the centre is perpendicular to the chord'.

16. Given the time required for a vehicle to reach its destination at a particular speed ,
  - (i) finds the distance travelled by the vehicle.
  - (ii) finds the time taken by the vehicle to travel the same distance if it travels with another speed.
17. Finds (i) the value of a named angle and (ii) the value of another named angle when two cyclic quadrilaterals in the same circle and an interior angle of one cyclic quadrilateral are given.
18. Given a diagram of a triangular plot of land, indicates in a sketch, the points located on a boundary situated at an equal distance from the other two boundaries.
19. Finds the sin ratio of a named angle when the lengths of two sides except the hypotenuse of a right angled triangle are given.
20. Given the value of one angle of a triangle drawn by joining the two points at the end of a diameter of a circle to another point on the circle , finds the other two angles.
21. Calculates the time interval at which three bells ring simultaneously given the time intervals at which each of the three bells ring in algebraic form.
22. Calculates total weight of the girls and the mean weight of all the children when the mean weight of a certain number of girls and the total weight of a certain number of boys are given.
23. Writes the equation of a straight line passing through the origin of a coordinate plane.
24. Of probable events, finds the probability of a named event when a balanced coin and a regular die with marked sides are tossed simultaneously.
25. Given the equation of a straight line of gradient -1 drawn on a coordinate plane, finds the area between the line and the axes.

**Part B**

1. (a) Given in fractions how two parts of a product are used and the rest is used for some other purpose , calculates
  - (i) the sum of the two parts used initially;
  - (ii) the remaining part used for some other purpose.  
  - (b) (i) Given the amount which is a fraction of a certain sum of money, calculates the remaining portion.
  - (ii) Calculates the total sum of money that should be paid after a specified period of time when the annual simple interest rate and the loan amount are given.
2. Given a diagram composed of a sector and a triangular section,
  - (i) calculates the arc of the sector.
  - (ii) calculates the cost of constructing a fence around the entire land excepting the gate given the expenditure per metre.

- (iii) finds the area of the sector shaped plot of land.
- (iv) decides on the larger plot comparing the area of a sector and a triangle.
- (v) finds the length and the breadth for a rectangular plot of specified area and includes it with relevant dimensions in a given diagram.
3. (a) When the import tax percentage is given,
- (i) calculates the value of the good after paying tax.
  - (ii) when a value of a good after paying tax is given, calculates the value of it before paying tax.
- (b) When the money invested in buying shares and the market price of a share is given,
- (i) finds the number of shares bought.
  - (ii) finds the total dividend income, when the dividend per share is given.
  - (iii) Explains whether the capital gain obtained by selling the shares exceeds the dividends at a time when the market share value has increased.
4. (a) Given a grid to show the sample space of two mutually exclusive incidents
- (i) indicates the sample space on the grid.
  - (ii) selects outcomes of an event from the sample space and calculates the probability of that event.
  - (iii) calculates the probability of a named event.
- (b) When a universal set and two other sets are described verbally
- (i) writes the elements of the union of the two sets.
  - (ii) writes the elements of the complement set of the intersection of two sets.
5. (a) Given a pie chart with information on a set of data with class intervals represented in 5 sectors and given the central angles of four of them in degrees and the other by an algebraic term,
- (i) finds the value of the central angle given by an algebraic term.
  - (ii) fills in the blanks in a table given when the extent represented by a sector of given angle is provided.
- (b) Displays the information given in the table by a histogram.

**Mathematics II**

**Part A**

01. (a) For a certain loan amount at a given simple interest rate,
- (i) calculates the interest to be paid for a given time period.
  - (ii) calculates the amount to be paid at the end of that period to settle the loan.
- (b) When the consideration of a share and dividends are known, finds the income and gives that as a percentage of the invested amount.
- (c) When the annual income from a fixed deposit is known, calculates the annual interest rate paid for that.
02. (a)(i) Completes a table which includes  $x$  values that satisfy an equation of the form the  $y = a + bx - x^2$  where  $a$  and  $b$  are integers.
- (ii) Calibrating axes according to a suitable scale, draws the graph within the given range based on the completed table.
- (b) From the above graph,
- (i) draws its axis of symmetry and writes its equation.
  - (ii) writes the range of values for which the function is positive.
  - (iii) writes the roots of an equation of the function.
- (c) When the roots of an equation are given, writes the corresponding quadratic function that quadratic equation.
- 03.(a) When a set of information is given by a table of two rows and two columns and another piece of information by a table of two rows and one column
- (i) represents a given set of data in a matrices and find the product of two matrices of order  $2 \times 2$  and  $2 \times 1$
  - (ii) describes the values represented by the elements of the matrix obtained by the product of the two matrices.
  - (iii) Explains with reasons whether the matrices are commutative or not.
- (b) (i) When the middle number of three consecutive numbers is  $x$  and the information on the summation of the three numbers and difference are given, develops an inequality based on the given information.
- (ii) Solves the inequality, finds the solution set
- 04.(a) Solves an equation which includes algebraic fractions and algebraic expressions in the denominator.
- (b) Finds the length of the shortest side of a triangle when its base and height are given as algebraic expressions and the area is given in square units.
- 05.(a) Given the width of a river, the bearing of rowing a boat from one point on its bank to a point on the other bank and the bearing of rowing it to another point on the initial bank,
- (i) sketches the information given.
  - (ii) finds the distance from the starting point to the point reached on the opposite bank using trigonometric ratios and hence finds the average speed given the time.

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**Mathematics Question Paper - 7**

- (b) When positions of three points are given, draws, a sketch diagram for that and calculates the distance between two points using Pythagoras theorem.
06. If a frequency distribution of time durations in which a student engaged in games of each day of a month is given,
- writes the modal class of the frequency distribution.
  - calculates the mean of the frequency distribution.
  - calculates the time duration that could be expected to be spent on games during a 90 day period.
  - Justifies a statement that indicates an idea on the time that can be saved by reducing a certain time period of play daily.

Part B

- 07.(a) Given the first, second and third terms of an arithmetic progression related to day to day life,
- finds the value of a named term of the arithmetic progression.
  - finds the total of a certain number of terms of the arithmetic progression.
  - If the total of a certain number of terms of a given arithmetic progression is given, inquires about the correctness or incorrectness of an idea expressed on that total.
08. Given that the line joining the mid points of two sides of a triangle and the line drawn parallel to a side of the triangle through the opposite vertex meet, and the angle between that line and the side of the triangle is equal to an angle of the triangle, shows that a named quadrilateral is a parallelogram and that its diagonals are equal in length.
09. Given the diagram of the diameter of a circle and a chord perpendicularly bisecting that diameter,
- gives reasons for the two parts of the chord formed by bisection being equal.
  - given the angle between the diameter and the line joining the end of the diameter and an end of the chord, finds the value of the angle between that line and the chord.
  - shows that the angle formed by joining the points at the end of the chord with one end of the diameter is bisected by the diameter.
  - shows that two triangles comprising the sections formed by the intersection of the chord and the diameter are similar.
  - when a part of a chord is given in centimetres, shows that the product of the lengths of two sides is equal to a given number.
10. Using the compass and a ruler with cm/mm scale,
- draws an isosceles obtuse triangle when the lengths of two equal sides and the included angle are given.
  - draws the bisector of a given angle and names the point that it intersects the other side.
  - draws a line which goes through a given point and is parallel to a named line.
  - if three points are given, finds the other point and draws the parallelogram.
  - identifying the characteristics of a rectangle, gives reasons to show that a given quadrilateral is a rectangle.

- 11.(a) Given that a logo is cast using a solid hemisphere and a solid right circular cone whose radius is the same as that of the hemisphere and height is twice that of the radius, shows that the volume of the logo is equal to the volume of a sphere with the same radius.
- (b) Simplifies an expression of the form of  $\frac{\sqrt[3]{a} \times b}{c^2}$  where  $a, b, c$  are in between 0 and 20 using logarithms.
- 12.(a) When a table containing information on several items is given
- fills in the blanks in a tree diagram drawn to represent two independent events.
  - according to the given information, extends the tree diagram further.
  - finds the probability of a named event using the tree diagram.
- (b) Given relevant information related to three sets
- includes relevant information in given Venn diagram.
  - solves a given problem using the Venn diagram.
  - shades a relevant area in the Venn diagram.

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**Mathematics Question Paper - 7**

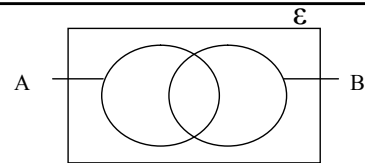
**7.2 Question paper  
Mathematics I - Part A**

Answer all the questions on this paper itself. **Time: Two hours**

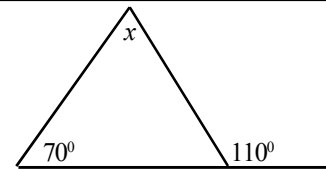
01. If the annual assessment tax rates of a house is Rs.1 600, what is the amount to be paid per quarter.

02. Solve  $\frac{1+x}{3} = 4$ .

03. Shade the region  $A' \cap B$  area in the given diagram.



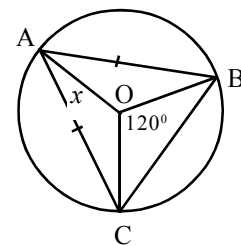
04. Find the value of  $x$ .



05. Six men completed digging a well in four days. How many men are required to dig the well in three days?

06. If  $2^3 = 8$ ,  $\log_2 \dots = \dots$ ; fill in the blanks.

07. The diagram shows a circle with centre O and a chord BC. A is a point on the circumference.  $AB=AC$  and  $\widehat{BOC} = 120^\circ$ . Find the value of  $x$ .



08. 2, 6,  $b$ , 54, ..... are four consecutive terms of a geometric progression  
 (i) Find the common ratio of the progression.  
 (ii) Find the value of  $b$ .

09. If  $a - b = 2$  and  $2a + b = 13$  find the values of  $a$  and  $b$ .



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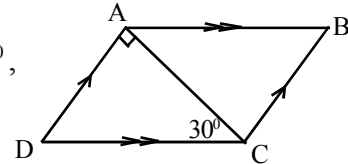
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**Mathematics Question Paper - 7**

10. Mark each correct statement with '✓' and each incorrect statement with '×'.

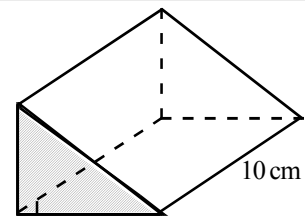
- (i) Congruent plane figures are equal in shape and size.
- (ii) All circles are congruent.
- (ii) Two right angled triangles are congruent only when the hypotenuse and a side of one triangle is equal to those of the other.


11.  $\widehat{DAC}$  is a right angle in the parallelogram ABCD. If  $\widehat{ACD} = 30^\circ$ , find the value of  $\widehat{ABC}$ .

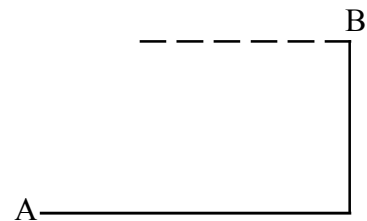


12. Solve  $x(x - 2) = 0$ .

13. The cross sectional area of the right angled right prism is  $12 \text{ cm}^2$  and its length is 10 cm. Calculate the volume of the prism.



14. The angle of elevation of point B on top of a tower is  $60^\circ$  for an observer at A. What is the angle of depression of point A for an observer at B?



15. Draw a diagram to clarify the meaning of the statement 'the line joining the mid point of a chord of a circle and the centre is perpendicular to the chord'.

16. A vehicle took an hour to travel a certain distance on the highway at a speed of  $100 \text{ km h}^{-1}$ .

- (i) Find the distance travelled by the vehicle in that hour.
- (ii) On a rainy day the vehicle travelled at a speed of  $80 \text{ km h}^{-1}$ . Calculate the time required for that journey.

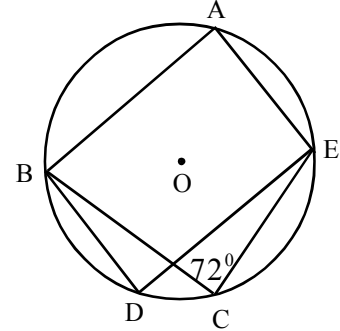
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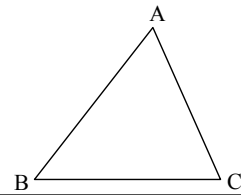
**Mathematics Question Paper - 7**

17. ABCE and ABDE are two cyclic quadrilateral with their vertices on the circle with centre O.

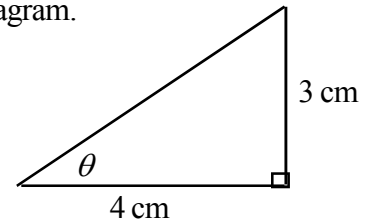
- (i) What is the value of  $\hat{BDE}$  if  $\hat{BCE} = 72^\circ$  ?
- (ii) What is the value of  $\hat{BAE}$  ?



18. The diagram shows a triangular plot. Draw a sketch and mark point X on BC, so that it is equidistant from sides AB and AC.

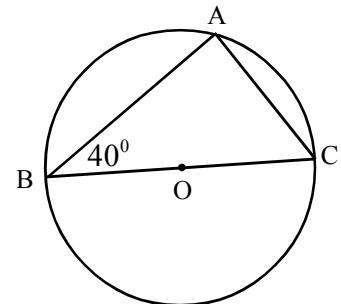


19. Find the value of  $\sin \theta$  according to the information given in the diagram.



20. Points A, B and C are on the circle with centre O.  $\hat{ABC} = 40^\circ$

- (i) Find the value of  $\hat{BAC}$ .
- (ii) Find the value of  $\hat{ACB}$ .



21. Three bells at a religious place ring at  $2a$ ,  $3a$  and  $4a$  minute intervals. After ringing all three bells ring together, how long will it take to ring together again?

22. the mean weight of four girls is 45 kg. The total weight of six boys is 300 kg.

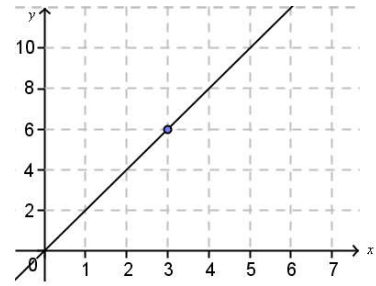
- (i) Find the total weight of the girls.
- (ii) Find the mean weight of all the children.

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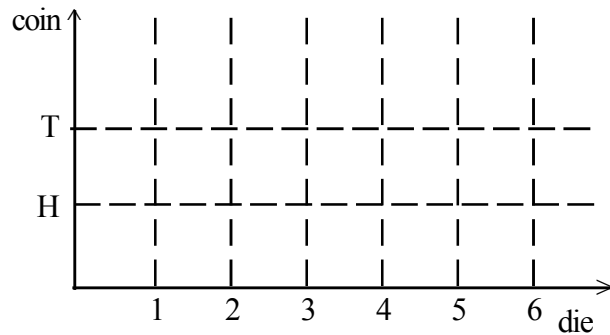
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**Mathematics Question Paper - 7**

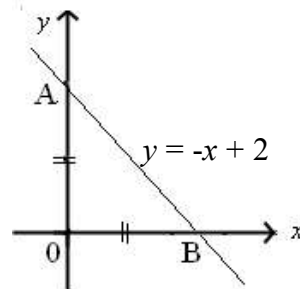
23. Write the equation of the straight line shown in the coordinate plane.



24. A balanced coin and a regular die with its sides marked as 1, 2, 3, 4, 5 and 6 are tossed simultaneously. Mark on the grid the event of head on the coin and an odd number on the die being face up



25. The equation of the line AB shown on the coordinate plane is  $y = -x + 2$ . Find the area of the triangle AOB.



Part B - Answer all the questions on this paper itself.

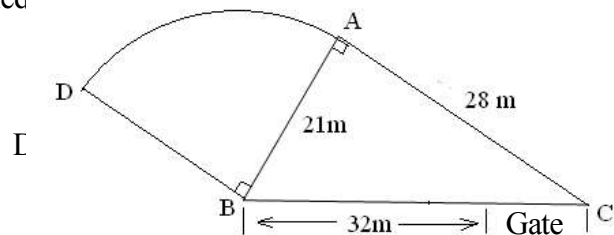
01. (a) Ranjith, an owner of a livestock farm decided to provide  $\frac{2}{5}$  of his monthly milk production to a liquid milk production company to keep,  $\frac{1}{8}$  of it for consumption and to give the balance for yoghurt production.

- (i) Of the total milk production, what was the fraction that was allocated for the liquid milk production company and for consumption?
  
- (ii) Of the total milk production what was the fraction allocated for yoghurt production?

(b) Ranjith has only Rs. 25,000 which is  $\frac{1}{3}$  of the required amount of money for yoghurt production. He borrowed the balance from a finance company at 12% simple interest rate to settle in two years.

- (i) What is the amount he borrowed?
  
- (ii) What is the total amount to be paid to settle the loan?

02. The diagram shows a model farm prepared for an exhibition. It consists of a right angled triangle shaped plot ABC and a sector shaped plot ABD. (Take  $\pi = \frac{22}{7}$ )



- (i) What is the length of the arc AD?
  
- (ii) What is the cost incurred to build a fence around the total plot of land excepting the length reserved for the gate at the rate of Rs.50 per metre?
  
- (iii) Find the area of the plot ABD.
  
- (iv) If the organizers expect to allocate a larger area for vegetable cultivation which of the two sections should be selected?
  
- (v) Within this area, a rectangular office of area  $35 \text{ m}^2$  has to be constructed so that it is boarded by parts of AB and AC. Length and width of this should be whole numbers and in metres. Draw a sketch of the office with dimensions fulfilling the above requirements.

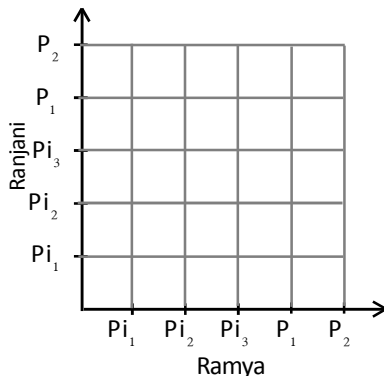
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**Mathematics Question Paper - 7**

3. (a) 30% custom duty is charged when importing a good.
- (i) What is the value of a Rs. 15 000 worth imported television after paying custom duty?
  - (ii) The price of an imported refrigerator after paying custom duty was Rs. 32 500. What was the price of it before paying the custom duty?
- (b) Kumar purchased shares of market price Rs. 10 each by investing Rs. 20 000.
- (i) How many shares did he purchase?
  - (ii) If a dividend of Rs. 1.50 is paid for a share, find the income from dividends.
  - (iii) Kumar sells all the shares when the market price of a share is Rs. 12. Explain whether the capital profit obtained from it exceeds the income from dividends.

4. (a) There are five identical beauty culture cream bottles in a box. Three of them are pink in colour and the rest are purple in colour. Without looking at the box, Ramya picked one bottle and after that Ranjani picked another bottle in the same way.



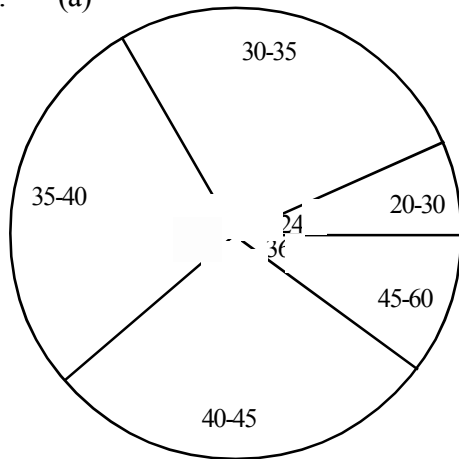
- (i) Mark all possible outcomes in the given grid.
- (ii) What is the probability of both of them getting the same coloured cream bottles
- (iii) What is the probability of Ramya getting a pink one and Ranjani getting a purple one?

- (b)  $\varepsilon = \{ \text{non negative integers less than } 10 \}$   
 $A = \{ \text{non negative integers less than } 8 \}$   
 $B = \{ \text{multiples of } 2 \text{ between } 0 \text{ and } 10 \}$

Write the following sets with elements.

- (i)  $A \cup B$
- (ii)  $(A \cap B)'$

5. (a)



This pie chart shows information on the masses in kilogrammes of children in grades 6 - 11, collected at a health clinic held in the school.

- (i) Find the value of  $x^0$ .
- (ii) If the circular sector that indicates 30 - 35 weight class represent 48 students, complete the following table based on that.

Class interval (mass in kg)	Frequency (No. of students)
20-30	...
30-35	...
35-40	...
40-45	...
45-60	...

(b) Show the information in a histogram.

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**Mathematics Question Paper - 7**

**Mathematics II**

**Three hours**

- Select five question from Part A and five questions from Part B and answer 10 questions.
- 10 marks each are given to all the questions.
- Volume of a straight circular cylinder is  $\pi r^2 h$  when the base of its radius is  $r$  and height is  $h$ .
- Volume of a sphere is  $\frac{4}{3}\pi r^3$  when its radius is  $r$ .

**Part A**

Answer only five questions.

- 01.(a) Jagath borrowed Rs.25 000 at an annual simple interest rate of 10%.
- (i) Calculate the interest to be paid after  $2\frac{1}{2}$  years.
  - (ii) What is the total amount to be paid to settle the loan?
- (b) (i) Saman invests Rs.72 000 in a company where the market price of a share is Rs.100. If the company pays Rs.4 as the annual dividend per share, find Saman's annual income as a percentage of the amount invested.
- (ii) He got to know that the income will be doubled if this Rs.72 000 is deposited in a company as a fixed deposit instead of buying shares. If that is true, what is the annual interest rate the company is paying for fixed deposits?

- 02.(a) Given below is an incomplete table with values of  $y$  relevant to a few given values of  $x$  of the function  $y = 6 + x - x^2$ .

$x$	-3	-2	-1	0	1	2	3	4
$y$	-6	0	4	6	....	4	0	-6

- (i) Find the value of  $y$  when  $x=1$ .
  - (ii) Select a suitable scale for the  $x$  axis and the  $y$  axis and draw the graph of the function based on the values in the above table.
- (b) From the graph
- (i) draw the axis of symmetry and write its equation.
  - (ii) write the interval in which the function is positive.
  - (iii) write the roots of the equation  $6 + x - x^2$ .
- (c) Write the equation roots -1 and 4 and coefficient of  $x^2$  is equal to 1.

- 03.(a) The table gives information on the fruits bought by two children.

- (i) Indicating how fruits were bought by matrix A and the price of fruits by matrix B, find AB.
- (ii) Describe how elements of the matrix AB are represented.
- (iii) Can you find BA? Give reasons for your answer.

	Apple	Orange
Thamashi	4	3
Amaya	5	2
	Fruit	Price
	Apple	20
	Orange	30

- (b)(i) The sum of three consecutive whole numbers is lesser than 30 but greater than 15. Considering the middle number as  $x$ , develop an inequality.
- (ii) Solve that inequality and write all possible values of  $x$ .

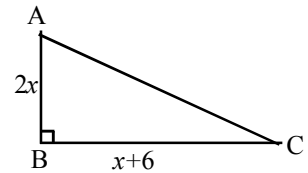
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**Mathematics Question Paper - 7**

04. (a) Solve  $\frac{3}{a-2} - \frac{2}{a+2} = \frac{1}{a}$ .

- (b) Area of triangle ABC in the figure is 10 square units. Based on the above information, find the length of the shortest side of the triangle. (Consider  $\sqrt{19} = 4.35$ )



- 05.(a) The width of a river flowing in the north-south direction is 50 m. Kumara, starting from a point A on one bank of the river rows a boat in a straight line path on a bearing of  $120^\circ$  and reaches the point B on the opposite bank. Afterwards he moves from B on a bearing of  $250^\circ$  and reaches point C on the initial bank taking 6 seconds for the journey. (Assume that the river is still)

- (i) Draw a diagram to include the above information and write the given data on it.  
 (ii) Using trigonometric tables, find the distance AB to the nearest whole number and calculate the mean speed of the boat if the distance from B to C is 56m.

- (b) Nipun walked 60 m to the east from point P and reached point Q. From there he walked 80 m towards the north and reached point R. Draw a sketch diagram to show the above information and find the distance from P to Nipun's current position.

06. A student has recorded the time he spent per day on computer games for a 30 day month. Given below is a frequency table which includes that information.

Time (Minutes)	16-24	24-32	32-40	40-48	48-56	56-64
No. of days	1	3	6	10	8	2

- (i) In which time interval was he engaged in the game for a maximum number of days?  
 (ii) Find the mean time he was engaged in the game per day to the approximate minute.  
 (iii) Find the time that can be expected to be wasted due to engagement in computer games during a 90 day school term.  
 (iv) His mother says that the time wasted can be reduced by 20 hours within this three month period by reducing the play by 15 minutes per day. Explain its correctness or incorrectness giving reasons.



Part B

Answer only five questions.

07.(a) A metal sphere is dropped vertically downward from a building for a scientific study. It travelled 5 m in the first second, 15 m in the next second and 25 m in the third second.

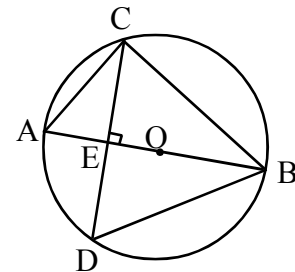
- (i) What is the distance travelled by the metal sphere during the 10<sup>th</sup> second?
- (ii) What is the total distance travelled by the metal sphere by the end of the 10<sup>th</sup> second?
- (iii) The initial height at which the sphere was released was 1120 m and the team of researchers expected the metal sphere to reach the ground within  $t$  seconds. If  $t \geq 4\sqrt{14}$ , show that their expectation is realized. (Neglect resistance of air)

(b) In a geometric progression the first term is 5 and the third term is 80. Show that there are two progressions satisfying these conditions.

08. In triangle ABC, mid points of sides AB and AC are P and Q respectively. The line PQ produced and the line drawn parallel to AB from C meet at R. If  $\hat{A}BC = \hat{A}CR$ , show that APCR is a parallelogram and that diagonals are equal in length.

09. AB is a diameter of a circle with centre O. Chord CD is drawn perpendicular to AB so that they intersect at point E.

- (i) Give reasons for the equality of the lengths of the line segments CE and DE.
- (ii) If  $\hat{C}BA = 40^\circ$ , find the value of  $\hat{B}CD$ .
- (iii) Show that  $\hat{C}BD$  is bisected by AB.
- (iv) Show that ACE and BED are equi-angular triangles.
- (v) If CE = 6 cm, show that  $AE \cdot BE = 36 \text{ cm}^2$ .



10. Using only a compass and a ruler with a cm/mm scale,

- (i) construct a triangle in which  $AB = BC = 6.6 \text{ cm}$  and  $\hat{A}BC = 120^\circ$ .
- (ii) construct the bisector of  $\hat{A}BC$  and name the point at which it intersects AC as D.
- (iii) construct a line parallel to AC through B.
- (iv) construct the parallelogram ADBP.
- (v) show that the parallelogram you constructed is a rectangle.

11.(a) A logo is cast by melting a solid, metal hemisphere of radius  $a$  and a cone of the same radius  $a$  and height  $2a$ . Assuming no metal is lost, show that the volume of the logo is equal to a volume of the sphere of radius  $a$ .

(b) Simplify using logarithms. 
$$\frac{\sqrt[3]{12.08 \times 0.72}}{5.42^2}$$

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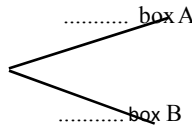
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**Mathematics Question Paper - 7**

12. (a) The table presents information on the number of red bulbs and blue bulbs in two identical boxes.

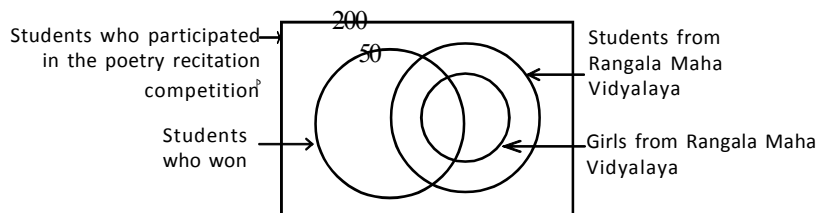
	Red	Blue
A	3	5
B	4	2

- (i) From the two boxes, one is randomly selected. An incomplete tree diagram drawn for that event is given below. Complete that tree diagram.



- (ii) If a bulb is randomly taken from the selected box, extend the tree diagram to show that event.  
 (iii) What is the probability of the bulb taken out being red.
- (b) 50 children won a poetry recitation competition in which 200 children participated. Six girls and eight boys participated from Rangala Maha Vidyalaya. Four of those girls won.

- (i) Include these information in the following Venn diagram.  
 (ii) If 43 of the winning students are not from Rangala Maha Vidyalaya, how many boys who participated from Rangala Maha Vidyalaya did not win the competition?  
 (iii) If Lal participated representing Rangala Maha Vidyalaya and won the competition, shade the area to which he belongs.



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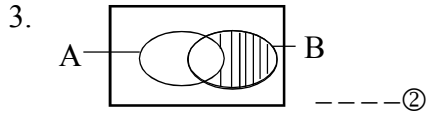
**Mathematics Question Paper - 7**

**7.3 Answers and Marking scheme**

**Mathematics II Part A**

1. Rs. 400 -----②

2.  $1 + x = 12$  -----1  
 $x = 11$   $\epsilon$  -----②



4.  $x = 110^\circ - 70^\circ$  -----1  
 $x = 40^\circ$  -----②

5.  $4 \times 6 = 24$  -----1

$\frac{24}{3} = 8$  -----②

6.  $\log_2 8 = 3$  -----②

7.  $x = 30^\circ$  -----②

8. (i) 3 -----1  
 (ii) 18 -----1 -----②

9.  $a = 5$  -----1  
 $b = 3$  -----1 -----②

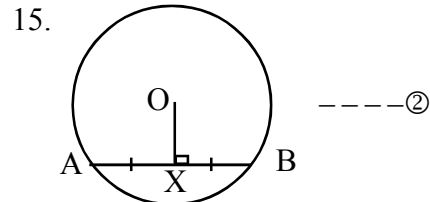
10. (i)  $\checkmark$  for two correct answers -----1  
 (ii)  $\times$   
 (iii)  $\times$  -----②

11.  $\hat{A}BC = 60^\circ$  -----②

12.  $x = 0$  or  $x = 2$  -----②

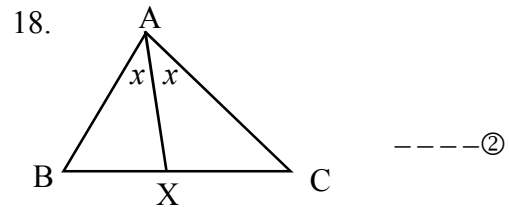
13.  $120 \text{ cm}^2$  -----②

14.  $60^\circ$  -----②



16. (i) 100 km -----1  
 (ii) 1 h 15 min -----1 -----②

17. (i)  $72^\circ$  -----1  
 (ii)  $108^\circ$  -----1 -----②



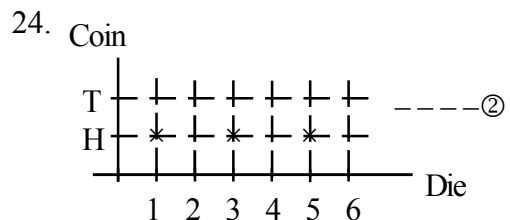
19.  $\sin \theta = \frac{3}{5}$  -----②

20. (i)  $90^\circ$  -----1  
 (ii)  $50^\circ$  -----1 -----②

21. 12 minutes -----②

22. (i) 180 kg -----1  
 (ii) 48 kg -----1 -----②

23. Gradient =  $\frac{6}{3} = 2$  -----1  
 $y = 2x$  -----②



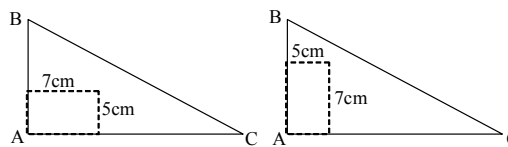
25. 2 square units -----②

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**Mathematics Question Paper - 7**

**Mathematics I - Part B**

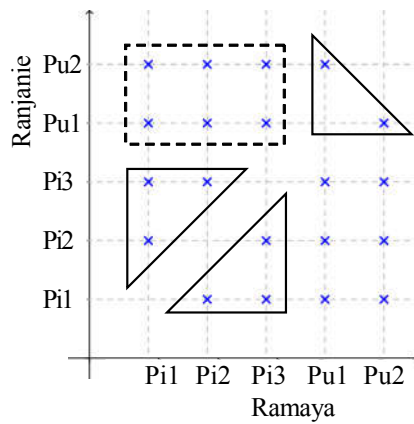
1.	(a)(i)	Fraction allocated for liquid milk and production consumption	$= \frac{2}{5} + \frac{1}{8} = \frac{16}{40} + \frac{5}{40}$	1+1			
			$= \frac{21}{40}$	1	③		
	(ii)	Fraction allocated for yoghurt production	$= \frac{19}{40}$	2	②	△ 5	
	(b)(i)	$25\ 000 \times 2 = \text{Rs. } 50\ 000$	---	1+1	2	②	
	(ii)	Total interest for 2 years	$= 50\ 000 \times \frac{12 \times 2}{100}$	2			
			$= \text{Rs. } 12\ 000$				
		Total amount payable to settle the loan	$= 50\ 000 + 12\ 000$				
			$= \text{Rs. } 62\ 000$	1	③	△ 5	<b>10</b>
<hr/>							
2.	(i)	Length of the curved boundary AD	$= 2\pi r \times \frac{\theta}{360}$	1			
			$= 2 \times \frac{22}{7} \times 21 \times \frac{90}{360}$				
			$= 33\text{m}$	1	②		
	(ii)	Length of the fence	$= 33\text{ m} + 28\text{ m} + 21\text{ m} + 32\text{ m}$	1			
			$= 114\text{ m}$	1			
		Expenditure for the fence	$= 114 \times 50 = \text{Rs. } 5\ 700$	1	③		
	(iii)	Area of the sector	$= 2 \times \frac{22}{7} \times 21 \times \frac{90}{360}$				
			$= 346.5\text{ m}^2$	1	①		
	(iv)	Area of the triangular part	$= \frac{1}{2} \times 21 \times 28 = 294\text{ m}^2$	1			
		Area of the sector > Area of the triangular part					
		Vegetable should be grown in the sector part		1	②		
	(v)						
							
		Obtaining 7 m and 5 m		1			
		marking inside the figure		1	②		<b>10</b>

3. (a) (i)  $Rs. 15\ 000 \times \frac{130}{100}$  or  $15\ 000 \times \frac{30}{100}$   
 $= Rs. 19500$
- (ii)  $Rs. \frac{32\ 500}{130} \times 100$  or  $x \times \frac{130}{100} = 32\ 500$   
 $Rs. 25\ 000$
- (b) (i) 2000  
(ii) Rs. 3000  
(iii) Capital gain = Rs. 4000  
Capital gain exceeds dividend income

1			
1	②		
1		△	
1	②	△	
2			
2			
2	⑥	△	

10

4. (a)



Receiving same coloured bottles

Ramya receiving pink, Ranjanie receiving purple

- (i) Inclusion of all points in the graph 3
- (ii) Both receiving same colour =  $\frac{8}{20}$  2
- (iii) Ramya receiving pink, Ranjanie receiving purple =  $\frac{6}{20}$  1

⑥

- (b) (i)  $A \cup B = \{0, 1, 2, 3, 4, 5, 6, 7, 8\}$
- (ii)  $(A \cap B)' = \{0, 1, 3, 5, 7, 8, 9\}$

2			
2	④		

10

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**Mathematics Question Paper - 7**

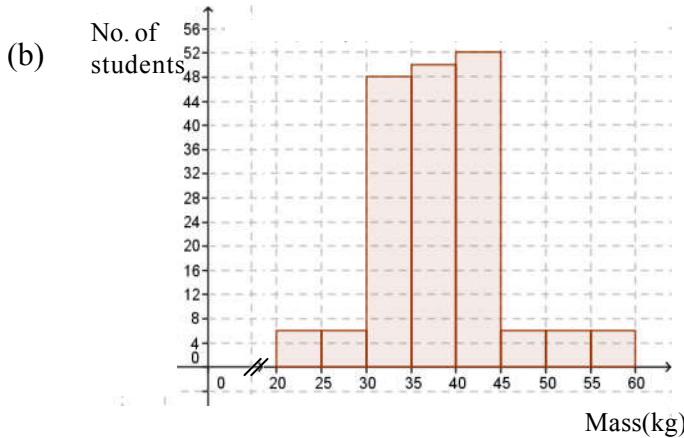
5. (i)  $360^{\circ} - (104^{\circ} + 36^{\circ} + 24^{\circ} + 96^{\circ})$

$x = 360^{\circ} - 260^{\circ}$

$x = 100^{\circ}$

(ii)

Class interval Weight(kg)	Frequency No. of students
20-30	12
30-35	48
35-40	50
40-45	52
45-60	18



Axes

20-30 column

45-60 columns

Other columns

1  
1 ②  
1  
1  
1  
1 ④  
1  
1  
1  
1 ④

**10**

**Mathematics II - Part A**

1. (a) (i) Interest payable at the end of  $2\frac{1}{2}$  years

$= 25\ 000 \times \frac{10}{100} \times 2\frac{1}{2} = \text{Rs.} 6\ 250$

(ii) Amount to be paid by Jagath =  $25\ 000 + 6\ 250 = \text{Rs } 31\ 250$

(b) (i) His number of shares =  $\frac{72\ 000}{100} = 720$

Dividend income =  $720 \times 4 = \text{Rs } 2\ 880.00$

As a percentage of investment =  $\frac{2\ 880}{72\ 000} \times 100\% = 4\%$

(ii) Fix deposit amount = 72 000

Interest =  $2\ 880 \times 2 = \text{Rs } 5\ 760.00$

Interest rate paid by the bank =  $\frac{5\ 760}{72\ 000} \times 100\% = 8\%$

1+1 ②  
2 ②  
1  
1  
2 ④  
1  
2 ②

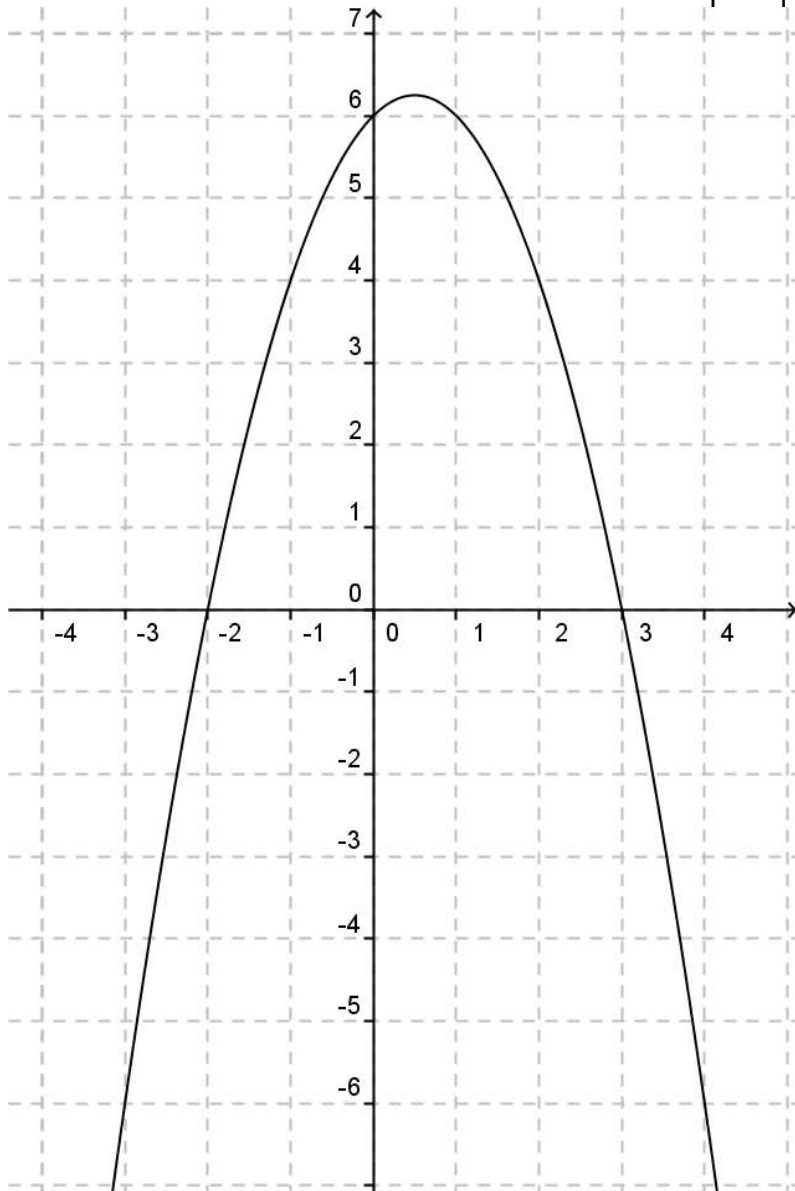
**10**

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**Mathematics Question Paper - 7**

2. (a) (i)	When $x = 1, y = 6$	1	①	
(ii)	Marking points	2		
	Drawing the curve	1	③	△ 4
(b) (i)	Drawing the axis of symmetry	1		
	$x = \frac{1}{2}$	1	②	
(ii)	$-2 < x < 3$	2	②	
(iii)	roots -2 and 3	1	①	
(iv)	$(x + 1)(x - 4) = 0$	1	①	△ 6
				<b>10</b>



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**Mathematics Question Paper - 7**

3. (a) (i)  $A = \begin{pmatrix} 4 & 3 \\ 5 & 2 \end{pmatrix}, B = \begin{pmatrix} 20 \\ 30 \end{pmatrix}, AB = \begin{pmatrix} 170 \\ 160 \end{pmatrix}$

(ii)

	Cost for fruits
Thamashi	170
Amaya	160

(iii) BA cannot be found  
No. of columns in B is not equal to the number of rows in A. So cannot be multiplied

(b) Let the three consecutive numbers be  $x - 1, x, x + 1$   
 $15 < x - 1 + x + x + 1 < 30$   
 $15 < 3x < 30$   
 $5 < x < 10$   
 Solution set  $\{6, 7, 8, 9\}$   
 $\therefore$  Possible values of  $x$  are 6, 7, 8 or 8

4

④

A න්‍යාසය ලිවීමට --1  
 B න්‍යාසය ලිවීමට --1  
 AB ගුණිතය සෙවීම -- 2

1

①

1

①

△6

1

1

1

1

④

△4

**10**

4. (a)  $\frac{3(a+2) - 2(a-2)}{(a-2)(a+2)} = \frac{1}{a}$

$a(3a+6-2a+4) = a^2 - 4$

$10a = -4$

$a = -\frac{2}{5}$

(b)  $\frac{2x(x+6)}{2} = 10$

$x(x+6) = 10$

$x^2 + 6x - 10 = 0$

$x^2 + 6x + 9 = 19$

$(x+3)^2 = 19$

$x+3 = \pm\sqrt{19}$

$x = -3 \pm \sqrt{19}$

$x = 1.35$  or  $x = -7.35$

Since  $x$  should be positive, length of the shortest side  
 $= 2x = 2 \times 1.35 = 2.70$

1

1

1

③

△3

1

1

1

1

1

1

1

⑦

△7

**10**

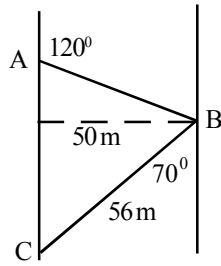


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**Mathematics Question Paper - 7**

5. (a) (i) For figure



(ii)

$$\sin 60^\circ = \frac{50}{AB}$$

$$AB = \frac{50}{0.8661}$$

$$AB = 57.736$$

$$= 58 \text{ m}$$

Total distance travelled = 58 + 56

$$= 114 \text{ m}$$

Mean speed =  $\frac{114}{6}$

$$= 19 \text{ m s}^{-1}$$

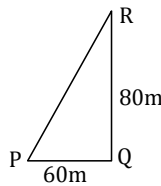
(b) For the sketch

$$PR^2 = 60^2 + 80^2$$

$$= 3600 + 6400$$

$$= 10\,000$$

$$PR = 100 \text{ m}$$



2	②		
1			
1			
1			
1			
1	⑤	⑦	
1			
1			
1	③	③	<b>10</b>

6.

Time (minutes)	No. of days <i>f</i>	Mid value <i>x</i>	Deviation <i>d</i>	<i>fd</i>
16-24	1	20	-24	-24
24-32	3	28	-16	-48
32-40	6	36	-8	-48
40-48	10	44	0	0
48-56	8	52	8	64
56-64	2	60	16	32
	30			-120+96

$$\Sigma fd = -24$$

(i) Interval playing most 40 - 48

(ii) Mid value column

Deviation column

$\Sigma fd$  column

Mean =  $A + \frac{\Sigma fd}{30}$

$$= A + \frac{(-24)}{30} = 43.2$$

Mean = 43 (to nearest minute)

1	①		
1			
1			
1			
1+1			
1	⑥		

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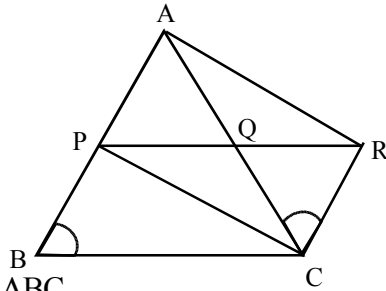
**Mathematics Question Paper - 7**

	(iii) Time for 90 days	$= \frac{43 \times 90}{60}$	1	①	
		$= 64 \frac{1}{2} \text{ h}$	1		
	(iv) Time for 90 days (with 15 min each day)	$= \frac{15 \times 90}{60}$	1		
		$= 22 \frac{1}{2} \text{ h}$	1		
	∴ Mother's statement is true		1	②	<b>10</b>
7	(i) 5, 15, 25, ... Distance confirms to an arithmetic progression		1		
		$T_n = a + (n-1)d$			
		$T_{10} = 5 + (10-1)10 = 95$			
	Distance travelled in the 10 <sup>th</sup> second = 95 m		1	②	
	(ii) $S_n = \frac{n}{2}(a+l)$		1		
		$S_{10} = \frac{10}{2}(5+95)$	1		
		$S_{10} = \frac{10}{2}(100) \quad S_{10} = 500 \text{ m}$	1	③	
	Total distance travelled by the end of the 10 <sup>th</sup> second = 500 m				
	(iii) $S_n = \frac{n}{2}[2a + (n-1)d]$				
		$1120 = \frac{t}{2}[10 + (t-1)10]$			
		$2240 = t[10 + 10t - 10]$	1		
		$2240 = 10t^2$			
		$t = \sqrt{224} = 4\sqrt{14}$			
	∴ if $t \geq 4\sqrt{14}$ the expectation is realized.		1		
(b) (i)	5, x, 80				
	Let $T_1 = 5, T_3 = 80, T_2 = x$		1	②	
	Common ratio = $\frac{80}{x} = \frac{x}{5}$				
	$x^2 = 400$				
	∴ $x = \pm 20$		1		
	As $x$ has two values, two progressions are possible		1		<b>10</b>

8

Drawing the diagram and marking all the data.

2



Considering triangle ABC

Mid point of AB is P(datum)

Mid point of AC is Q(datum)

$\therefore PQ \parallel BC$  (Mid point theorem)

$$PQ = \frac{1}{2} BC$$

$\therefore PR \parallel BC$

$AB \parallel CR$

$\therefore PB \parallel CR$

$\therefore PBCR$  is a parallelogram. (as opposite sides are parallel)

$BC = PR$  ( opposite sides of a parallelogram)

$$PQ = \frac{1}{2} BC \text{ (verified)}$$

$$\therefore PQ = \frac{1}{2} PR$$

$\therefore PQ = QR, AQ = QC$ (datum)

$\therefore APQR$  is a parallelogram (because diagonals intersect)

$\hat{A}CR = \hat{B}AC$  (alternate angles  $AB \parallel RC$ )

$\hat{A}CR = \hat{A}BC$  (datum)

$\therefore \hat{B}AC = \hat{A}BC$

$AC = BC$

(in a triangle, sides opposite equal angles are equal)

$PR = BC$  (verified)

$\therefore PR = AC$

i.e., diagonals are equal in length

1

1

1

1

1

1

1

1

10

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**Mathematics Question Paper - 7**

9.	(i) The line drawn from the centre perpendicular to a chord bisects the chord.	1	①		
	(ii) $\hat{BCD} = 50^\circ$	1	①		
	(iii) Showing AB bisects CBD				
	As $\hat{BCD} = 50^\circ$ , $\hat{ACD} = 40^\circ$	1			
	As $\hat{ACD} = 40^\circ$ , $\hat{ABD} = 40^\circ$	1			
	$\therefore \hat{ABC} = \hat{ABD} = 40^\circ$	1	③		
	$\therefore$ AB bisects CBD $\angle$				
	(iv) In $\triangle ACE$ and $\triangle BDE$				
	$\hat{CAE} = \hat{BDE}$ (angles in the same sector)	1			
	$\hat{AEC} = \hat{BED}$ (right angles)				
	$\hat{ACE} = \hat{BED}$ remaining angles of the triangles)	1	②		
	The two triangles are equi-angular				
	(v) In $\triangle ACE$ and $\triangle BDE$				
	$\frac{CE}{BE} = \frac{AE}{DE}$ (corresponding sides of equi-angular triangles)	1			
	$CE \cdot DE = AE \cdot BE$				
	$CE = DE$				
	$CE^2 = AE \cdot BE$	1			
	$CE = 6$				
	$AE \cdot BE = 36$	1	③	<b>10</b>	
10.	(i)				
		3	③	AB or BC - 1 $120^\circ$ - 1 Construction of ABC - 1	
	(ii) Bisector and marks D	1	①		
	(iii) Constructing the parallel line	2	②		
	(iv) Constructing parallelogram	1	①		
	(v) $\hat{ABD} = 60^\circ$ (BD is the bisector)	1			
	$\hat{BAD} = 30^\circ$ (ABC is an isosceles triangle)	1			
	$\therefore \hat{ADB} = 90^\circ$	1	③	<b>10</b>	
	ADBP is a rectangle.				

**Programme of improving G.C.E (O.L.) Examination results**

OL/7/32-S-1

**Mathematics Question Paper - 7**

11 (a) (i)	$\text{Volume of the cone} = \frac{1}{3} \times \pi \times a^2 \times 2a$ $= \frac{2}{3} \pi a^3$	1	①	
(ii)	$\text{Volume of the semisphere} = \frac{1}{2} \times \frac{4}{3} \pi a^3$ $= \frac{2}{3} \pi a^3$			
	$\text{Total volume of metal} = \frac{2}{3} \pi a^3 + \frac{2}{3} \pi a^3 = \frac{4}{3} \pi a^3$	1	①	
(iii)	$\text{Volume of a sphere of radius } a = \frac{4}{3} \pi a^3$	1		
	Volume of metal is equal to the volume of a sphere with radius $a$	1	②	△ 4
(b)	$A = \frac{\sqrt[3]{12.08 \times 0.72}}{5.42^2}$			
	$\lg A = \frac{1}{3} \lg 12.08 + \lg 0.72 - 2 \lg 5.42$	1		
	$\lg A = \frac{1}{3} \times 1.0720 + \bar{1}.8573 - 2 \times 0.7340$	1		
	$\lg A = 0.3573 + \bar{1}.8573 - 1.4680$	2		
	$\lg A = \bar{2}.7499$	1		
	$A = \text{Anti log } \bar{2}.7499 = 0.05622$	1	⑥	△ 6

**10**

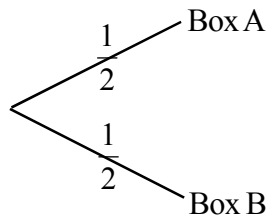
**10**

Programme of improving G.C.E (O.L.) Examination results

OL/7/32-S-1

Mathematics Question Paper - 7

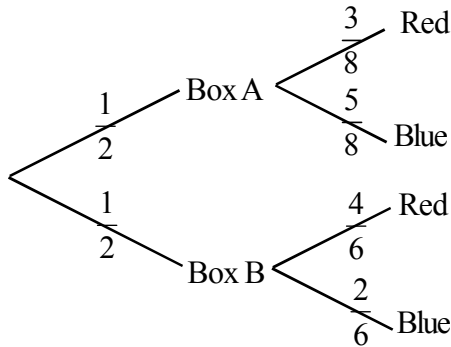
12' (i)



1

①

(ii) Extending the tree diagram



1+1

②

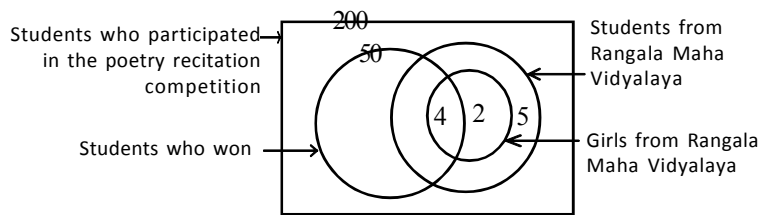
(iii) Probability of the bulb taken being red =  $\frac{3}{16} + \frac{4}{12} = \frac{25}{48}$

1+1

②

△ 5

(b) (i)



2

②

Mark 4-1  
Mark 2-1

(ii) Winning students in Rangala M.V. = 50 - 43

$$= 7$$

Winning boys in Rangala M.V. = 7 - 4 = 3

1

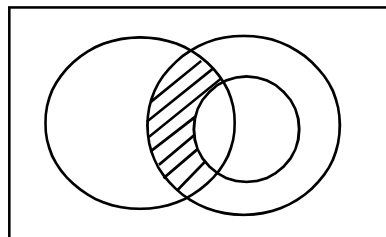
Non-winning boys in Rangala M.V. = 8 - 3

$$= 5$$

1

②

(iii) Shading the Venn Diagram



1

①

△ 5

10