MATHEMATICS

(Two hours and a half)

Answers to this Paper must be written on the paper provided separately.

*You will **not** be allowed to write during the first **15** minutes.*

This time is to be spent in reading the question paper.

The time given at the head of this Paper is the time allowed for writing the answers.

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*Attempt **all** questions from **Section A** and **any four** questions from **Section B**.*

All working, including rough work, must be clearly shown and must be done on the same sheet as the rest of the answer.

Omission of essential working will result in loss of marks.

The intended marks for questions or parts of questions are given in brackets [ ].

Mathematical tables are provided.

SECTION A (40 Marks)

*Attempt **all** questions from this Section.*

Question 1

(a) Find the value of 'x' and 'y' if: [3]

$$2\begin{bmatrix} x & 7 \\ 9 & y-5 \end{bmatrix} + \begin{bmatrix} 6 & -7 \\ 4 & 5 \end{bmatrix} = \begin{bmatrix} 10 & 7 \\ 22 & 15 \end{bmatrix}$$

(b) Sonia had a recurring deposit account in a bank and deposited ₹600 per month for 2½ years. If the rate of interest was 10% p.a., find the maturity value of this account. [3]

(c) Cards bearing numbers 2, 4, 6, 8, 10, 12, 14, 16, 18 and 20 are kept in a bag. A card is drawn at random from the bag. Find the probability of getting a card which is: [4]

(i) a prime number.

(ii) a number divisible by 4.

(iii) a number that is a multiple of 6.

(iv) an odd number.

Question 2

(a) The circumference of the base of a cylindrical vessel is 132 cm and its height is 25 cm. Find the [3]

(i) radius of the cylinder

(ii) volume of cylinder. (use $\pi = \frac{22}{7}$)

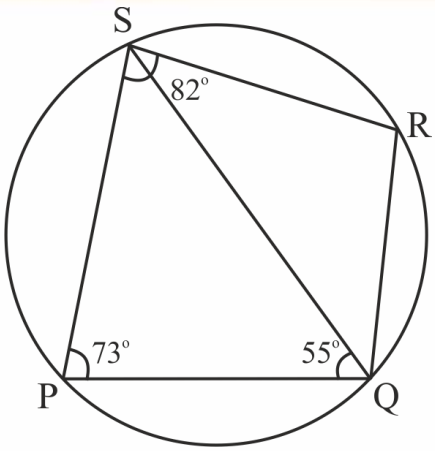
(b) If $(k - 3)$, $(2k + 1)$ and $(4k + 3)$ are three consecutive terms of an A.P., find the value of k. [3]

(c) PQRS is a cyclic quadrilateral. Given $\angle QPS = 73^o$, $\angle PQS = 55^o$ and $\angle PSR = 82^o$, calculate: [4]

(i) $\angle QRS$

(ii) $\angle RQS$

(iii) $\angle PRQ$



Question 3

(a) If $(x + 2)$ and $(x + 3)$ are factors of $x^3 + ax + b$, find the values of 'a' and 'b'. [3]

(b) Prove that $\sqrt{sec^2\theta + cosec^2\theta} = tan\theta + cot\theta$ [3]

(c) Using a graph paper draw a histogram for the given distribution showing the number of runs scored by 50 batsmen. Estimate the mode of the data: [4]

Runs scored	3000-4000	4000-5000	5000-6000	6000-7000	7000-8000	8000-9000	9000-10000
No. of batsmen	4	18	9	6	7	2	4

Question 4

(a) Solve the following inequation, write down the solution set and represent it on the real number line: [3]

$-2 + 10x \leq 13x + 10 < 24 + 10x, x \in Z$

(b) If the straight lines $3x - 5y = 7$ and $4x + ay + 9 = 0$ are perpendicular to one another, find the value of *a*. [3]

(c) Solve $x^2 + 7x = 7$ and give your answer correct to two decimal places. [4]

SECTION B (40 Marks)

*Attempt any **four** questions from this Section*

Question 5

(a) The 4^{th} term of a G.P. is 16 and the 7^{th} term is 128. Find the first term and common ratio of the series. [3]

(b) A man invests ₹22,500 in ₹50 shares available at 10% discount. If the dividend paid by the company is 12%, calculate: [3]

(i) The number of shares purchased

(ii) The annual dividend received.

(iii) The rate of return he gets on his investment. Give your answer correct to the nearest whole number.

(c) Use graph paper for this question (Take 2cm = 1unit along both *x* and *y* axis). [4]
ABCD is a quadrilateral whose vertices are A(2,2), B(2,–2), C(0,–1) and D(0,1).

(i) Reflect quadrilateral ABCD on the *y*-axis and name it as A'B'CD.

(ii) Write down the coordinates of A' and B'.

(iii) Name two points which are invariant under the above reflection.

(iv) Name the polygon A'B'CD.

Question 6

(a) Using properties of proportion, solve for *x*. Given that *x* is positive: [3]

$$\frac{2x+\sqrt{4x^2-1}}{2x-\sqrt{4x^2-1}}=4$$

(b) $If\ A=\begin{bmatrix}2 & 3\\ 5 & 7\end{bmatrix}, B=\begin{bmatrix}0 & 4\\ -1 & 7\end{bmatrix} and\ C=\begin{bmatrix}1 & 0\\ -1 & 4\end{bmatrix}$, find AC + B^2 – 10C. [3]

(c) Prove that $(1+\cot\theta\ -\ cosec\theta)(1+tan\theta+sec\theta)=2$ [4]

Question 7

(a) Find the value of *k* for which the following equation has equal roots. [3]

$$x^2+4kx+(k^2-k+2)=0$$

(b) On a map drawn to a scale of 1 : 50,000, a rectangular plot of land ABCD has the following dimensions. AB = 6cm; BC = 8cm and all angles are right angles. Find: [3]

(i) the actual length of the diagonal distance AC of the plot in km.

(ii) the actual area of the plot in sq km.

(c) A(2, 5), B(–1, 2) and C(5, 8) are the vertices of a triangle ABC, 'M' is a point on AB such that AM : MB = 1 : 2. Find the co-ordinates of 'M'. Hence find the equation of the line passing through the points C and M. [4]

Question 8

(a) ₹7500 were divided equally among a certain number of children. Had there been 20 less children, each would have received ₹100 more. Find the original number of children. [3]

(b) If the mean of the following distribution is 24, find the value of *'a'*. [3]

Marks	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Number of students	7	*a*	8	10	5

(c) Using ruler and compass only, construct a ΔABC such that BC = 5 cm and AB = 6.5 cm and ∠ABC = 120° [4]

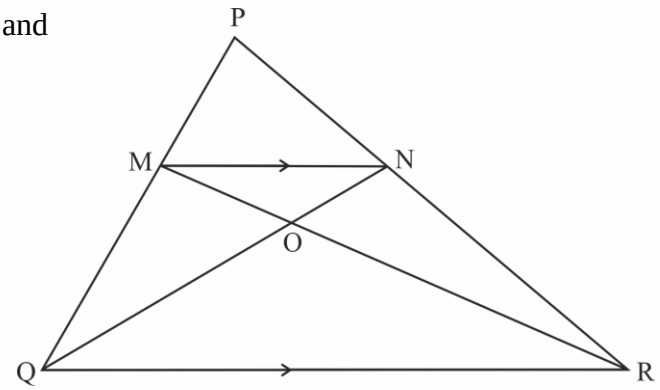
(i) Construct a circum-circle of ΔABC

(ii) Construct a cyclic quadrilateral ABCD, such that D is equidistant from AB and BC.

Question 9

(a) Priyanka has a recurring deposit account of ₹1000 per month at 10% per annum. If she gets ₹5550 as interest at the time of maturity, find the total time for which the account was held. [3]

(b) In Δ*PQR*, *MN* is parrallel to *QR* and $\frac{PM}{MQ} = \frac{2}{3}$ [3]

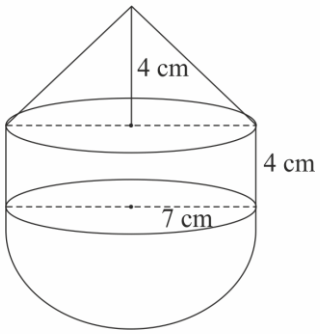


(i) Find $\frac{MN}{QR}$

(ii) Prove that Δ*OMN* and Δ*ORQ* are similar.

(iii) Find, Area of Δ*OMN* : Area of Δ*ORQ*

(c) The following figure represents a solid consisting of a right circular cylinder with a hemisphere at one end and a cone at the other. Their common radius is 7 cm. The height of the cylinder and cone are each of 4 cm. Find the volume of the solid. [4]

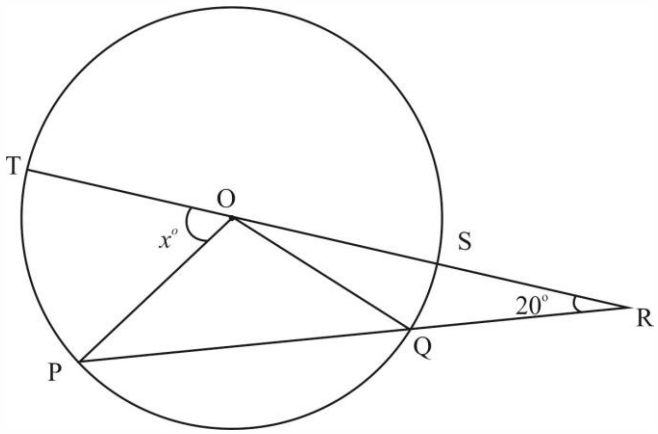


Question 10

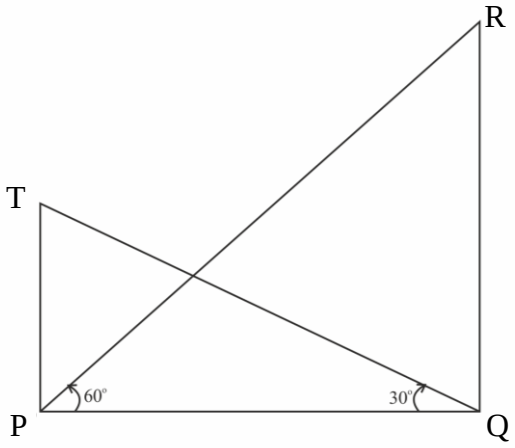
(a) Use Remainder theorem to factorize the following polynomial: [3]

$2x^3 + 3x^2 - 9x - 10$.

(b) In the figure given below 'O' is the centre of the circle. If QR = OP and ∠ORP = 20°. Find the value of 'x' giving reasons. [3]



(c) The angle of elevation from a point P of the top of a tower QR, 50m high is 60^o and that of the tower PT from a point Q is 30^o. Find the height of the tower PT, correct to the nearest metre. [4]



Question 11

(a) The 4^{th} term of an A.P. is 22 and 15^{th} term is 66. Find the first term and the common difference. Hence find the sum of the series to 8 terms. [4]

(b) Use Graph paper for this question. [6]

A survey regarding height (in cm) of 60 boys belonging to Class 10 of a school was conducted. The following data was recorded:

Height in cm	135 – 140	140 – 145	145 – 150	150 – 155	155 – 160	160 – 165	165 – 170
No. of boys	4	8	20	14	7	6	1

Taking 2cm = height of 10 cm along one axis and 2 cm = 10 boys along the other axis draw an ogive of the above distribution. Use the graph to estimate the following:

(i) the median

(ii) lower Quartile

(iii) if above 158 cm is considered as the tall boys of the class. Find the number of boys in the class who are tall.