

For 20-21

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## 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.**

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### 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  $2\frac{1}{2}$  years. If the rate of interest was 10% p.a., find the maturity value of this account. [3]

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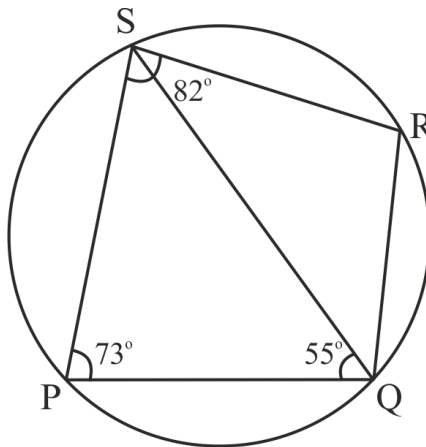
This paper consists of 7 printed pages and 1 blank page.

- (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  $\angle QPS = 73^\circ$ ,  $\angle PQS = 55^\circ$  and  $\angle PSR = 82^\circ$ , 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  $\sqrt{\sec^2\theta + \operatorname{cosec}^2\theta} = \tan\theta + \cot\theta$  [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]

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

- X (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

- X (a) The 4<sup>th</sup> term of a G.P. is 16 and the 7<sup>th</sup> term is 128. Find the first term and common ratio of the series. [3]
- X (b) A man invests ₹22,500 in ₹50 shares available at 10% discount. If the dividend paid by the company is 12%, calculate: [3]
- The number of shares purchased
  - The annual dividend received.
  - 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 = 1 unit 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  $(1 + \cot \theta - \operatorname{cosec} \theta)(1 + \tan \theta + \sec \theta) = 2$  [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	<i>a</i>	8	10	5

- (c) Using ruler and compass only construct a  $\triangle ABC$  such that  $BC = 5$  cm and  $AB = 6.5$  cm and  $\angle ABC = 120^\circ$  [4]

(i) Construct a circum-circle of  $\triangle ABC$

(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  $\triangle PQR$ ,  $MN$  is parallel to  $QR$  and [3]

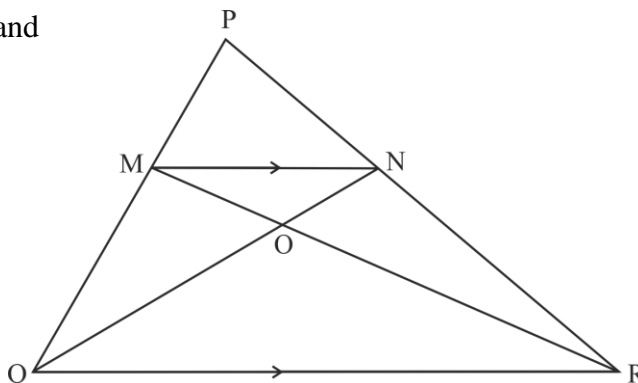
$$\frac{PM}{MQ} = \frac{2}{3}$$

(i) Find

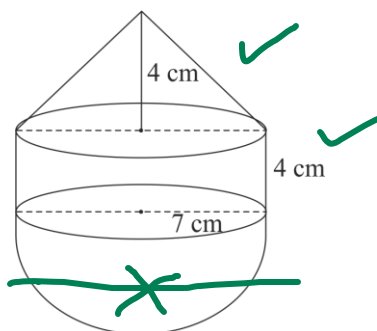
$$\frac{MN}{QR}$$

(ii) Prove that  $\triangle OMN$  and  $\triangle ORQ$  are similar.

(iii) Find, Area of  $\triangle OMN$  : Area of  $\triangle ORQ$

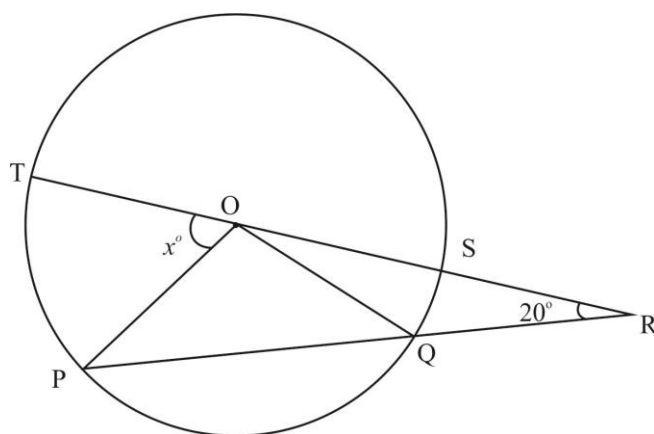


- (c) The following figure represents a solid consisting of a right circular cylinder with a hemisphere at one end and a cone at the other. Their common radius is 7 cm. The height of the cylinder and cone are each of 4 cm. Find the volume of the solid. [4]

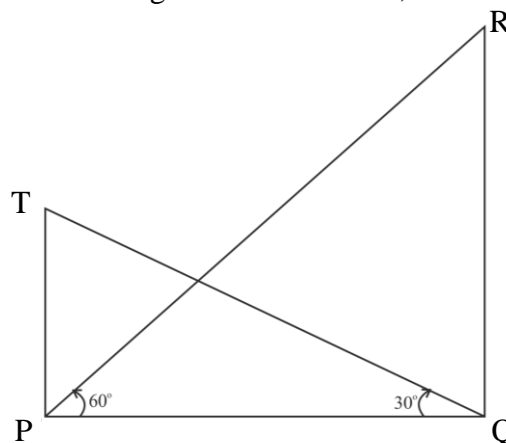


### Question 10

- (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  $\angle ORP = 20^\circ$ . 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  $60^\circ$  and that of the tower PT from a point Q is  $30^\circ$ . Find the height of the tower PT, correct to the nearest metre. [4]



### Question 11

- (a) The 4<sup>th</sup> term of an A.P. is 22 and 15<sup>th</sup> 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:

- the median
- lower Quartile
- if above 158 cm is considered as the tall boys of the class. Find the number of boys in the class who are tall.