PAPER 02/ ICSE

Class 10 - Mathematics

Time Allowed: 2 hours and 30 minutes **Maximum Marks: 80**

General Instructions:

- 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 reading the question paper.
- The time given at the head of this Paper is the time allowed for writing the answers.
- **Attempt all questions from Section A and any four questions from Section B.**
- All work, including rough work, must be clearly shown and must be done on the same sheet as the rest of the answers.
- Omission of essential work will result in a loss of marks.
- The intended marks for questions or parts of questions are given in brackets [ ]
- Mathematical tables are provided.

Section A

1. **Question 1 Choose the correct answers to the questions from the given options:** **[15]**

(a) Input GST paid by the shopkeeper to the dealer is ₹ 5000 and output GST collected by the shopkeeper from a consumer is ₹ 5,500. GST paid by the shopkeeper to the government is **[1]**

a) ₹ 5,000 b) ₹ 5,500

c) ₹ 500 d) ₹ 1,000

(b) The equation $x^2(a^2 + b^2) + 2x(ac + bd) + (c^2 + d^2) = 0$ has no real roots, if **[1]**

a) $ad \neq bc$ b) $ac \neq 2bd$

c) None of these d) $ac \neq bd$

(c) If x + 1 is a factor of $3x^3 + kx^2 + 7x + 4$, then the value of k is **[1]**

a) 14 b) 0

c) 6 d) -6

(d) If $A = \begin{bmatrix} 5 & 5 \\ 0 & 0 \end{bmatrix} \begin{bmatrix} 0 & 0 \\ 5 & 5 \end{bmatrix}$ and $A^n = \begin{bmatrix} 5^{200} & 5^{200} \\ 0 & 0 \end{bmatrix}$, then the value of n is **[1]**

a) 100 b) None of these

c) 25 d) 50

(e) If a, b, c and d are in GP, then $(a^2 + b^2 + c^2)(b^2 + c^2 + d^2)$ is equal to **[1]**

a) (ab + bc + cd)

b) $(ab + bc + cd)^2$

c) $b^2 + c^2 + d^2$

d) $a^2 + b^2 + c^2$

(f) A point M is reflected in X-axis to M'(4, -5). M'' is the image of M, when reflected in the Y-axis. The coordinates of M''' when M'' is reflected in the origin, is **[1]**

a) (-4, -5)

b) None of these

c) (4, 5)

d) (4, -5)

(g) In a $\triangle$PQR, L and M are two points on base QR, such that $\angle$LPQ = $\angle$QRP and $\angle$RPM = $\angle$RQP. Then which of the following is/are true **[1]**

i. $\triangle PQL \sim \triangle RPM$

ii. QL $\times$ RM = PL $\times$ PM

iii. PQ^2 = QR·QL

a) All of these

b) Both (i) and (iii)

c) Both (i) and (ii)

d) Both (ii) and (iii)

(h) A hollow cone of radius 6 cm and height 8 cm is vertical standing at the origin, such that the vertex of the cone is at the origin. Some pipes are hanging around the circular base of the cone, such that they touch the surface of the graph paper. Then, the total surface area of the formed by the figure will be **[1]**

a) None of these

b) 484.98 cm^2

c) 489.84 cm^2

d) 948.84 cm^2

(i) Graph the solution set of -2 < 2x - 6 or -2x + 5 $\geq$ 13, where x $\in$ R. If we shift the origin at the position 1, then the new solution set, is **[1]**

a) {x : x > 1 or x $\leq$ -5, x $\in$ R}

b) {x : x > 1 or x $\geq$ -5, x $\in$ R}

c) {x : x < 1 or x $\geq$ -5, x $\in$ R}

d) None of these

(j) The probability that the minute hand lies from 5 to 15 min in the wall clock, is **[1]**

a) $\frac{1}{6}$

b) $\frac{5}{6}$

c) $\frac{1}{5}$

d) $\frac{1}{10}$

(k) If $\begin{bmatrix} 7 & -6 \\ 8 & -7 \end{bmatrix}^{2016} = \begin{bmatrix} 7 & -6 \\ 8 & -7 \end{bmatrix}^{2018}$, then $\begin{bmatrix} 7 & -6 \\ 8 & -7 \end{bmatrix}^{2017}$ equals **[1]**

a) $\begin{bmatrix} 7 & -6 \\ 8 & -7 \end{bmatrix}^{2016} + \begin{bmatrix} 7 & -6 \\ 8 & -7 \end{bmatrix}^{2018}$

b) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

c) None of these

d) $\begin{bmatrix} 7 & -6 \\ 8 & -7 \end{bmatrix}$

(l) If G be the centroid of a $\triangle$ABC and P be any other point in the plane, then $GA^2 + GB^2 + GC^2 + 3GP^2$ is equal to **[1]**

a) $PA^2 + PC^2 - PB^2$

b) $PA^2 + PB^2 + PC^2$

c) $PB^2 + PC^2 - PA^2$

d) $PA^2 + PB^2 - PC^2$

(m) If P, Q, S and R are points on the circumference of a circle of radius r, such that PQR is an equilateral **[1]**

triangle and PS is a diameter of the circle. Then, the perimeter of the quadrilateral PQSR will be

a) $2(\sqrt{3} + 1)r$ b) $2\sqrt{3} + r$

c) 2r d) $2\sqrt{3}r$

(n) If the range of 15, 14, x, 25, 30 and 35 is 23. Then, the least possible value of x is **[1]**

a) 12 b) 8

c) 10 d) 14

(o) **Assertion (A):** Common difference of the AP -5, -1, 3, 7, ... is 4. **[1]**

Reason (R): Common difference of the AP a, a + d, a + 2d, ... is given by d = 2nd term - 1st term.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

2. **Question 2** **[12]**

(a) Ms. sharma deposits ₹100 per month in a cumulative Deposit Account for a period of 5 yr. After the end of the period, she will receive ₹7220. (Consider the interest rate to be simple). Find **[4]**

i. the rate of interest per annum.

ii. the total interest that Ms. sharma will earn.

(b) An employer reduces the number of employees in the ratio 11 : 7 and increases their wages in the ratio 10 : 13. In what ratio, the wages bill is increased or decreased? **[4]**

(c) Without using trigonometric tables evaluate $\sin^2 28^o + \sin^2 62^o + \tan^2 38^o - \cot^2 52^o + \frac{1}{4}\sec^2 30^o$. **[4]**

3. **Question 3** **[13]**

(a) The internal and external diameters of a hollow hemispherical vessel are 7cm and 14 cm, respectively. The cost of silver plating of 1 sq cm surface is ₹ 0.60. Find the total cost of silver plating the vessel all over. **[4]**

(b) Three vertices of a parallelogram ABCD taken in order are A(3, 6), B(5, 10) and C(3, 2) find: **[4]**

i. the coordinates of the fourth vertex D.

ii. length of diagonal BD.

iii. equation of side AB of the parallelogram ABCD.

(c) Use graph paper to answer this question: **[5]**

i. The point P(2, - 4) is reflected about the line x = 0 to get the image Q. Find the coordinates of Q.

ii. Point Q is reflected about the line y = 0 to get the image R. Find the coordinates of R.

iii. Name the figure PQR.

iv. Find the area of figure PQR.

Section B

Attempt any 4 questions

4. **Question 4** **[10]**

(a) Mr. Verma goes to a shop and buy a Jacket having cost ₹ 1180 (list price). The rate of GST 18%. He tells the shopkeeper to reduce the price such an extent that he has to pay ₹ 1180 inclusive of GST. Find the reduction needed in the price of the jacket. **[3]**

(b) Solve 2x - 3 = $\sqrt{2x^2 - 2x + 21}$ by factorisation method. **[3]**

(c) The mean of the following distribution is 52 and the frequency of class-interval 30-40 is f. Find f. **[4]**

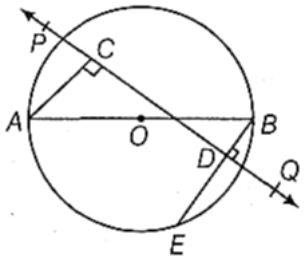
Class-interval	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency	5	3	f	7	2	6	13

Find the value of f.

5. **Question 5** **[10]**

(a) Find x and y, if $\begin{bmatrix} 2x & x \\ y & 3y \end{bmatrix} \begin{bmatrix} 3 \\ 2 \end{bmatrix} = \begin{bmatrix} 16 \\ 9 \end{bmatrix}$. **[3]**

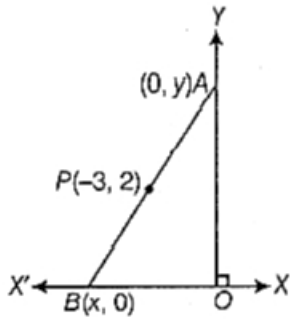
(b) In the given figure, AB is diameter of a circle with centre O. AC and BD are perpendiculars on a line PQ. BD meets the circle at E. Prove that AC = ED. **[3]**



(c) If one zero of the polynomial $2x^2 - 5x - (2k + 1)$ is twice the other, then find both the zeroes of the polynomial and the value of k. **[4]**

6. **Question 6** **[10]**

(a) P (- 3, 2) is the mid-point of the line AB as shown in the given figure. Find the coordinates of points A and B. **[3]**



(b) Prove the following identity: $[\sin A + \text{cosec } A]^2 + [\cos A + \sec A]^2 = 5 + \sec^2 A \text{ cosec}^2 A$ **[3]**

(c) If the pth, qth and rth terms of a GP are a, b and c respectively. Prove that $a^{q-r} b^{r-p} c^{p-q} = 1$. **[4]**

7. **Question 7** **[10]**

(a) A take 10 days less than the time taken by B to finish a piece of work. If both A and B together can finish the work in 12 days, find the time taken by B to finish the work. **[5]**

(b) The table show the distribution of the scores obtained by 160 shooters in a shooting competition. Use a graph sheet and draw an ogive for the distribution. **[5]**

(Take 2 cm = 10 scores on the X-axis and 2 cm = 20 shooters on the Y-axis).

Scores	Number of Shooters	c.f.
0 - 10	9	9
10 - 20	13	22
20 - 30	20	42
30 - 40	26	68
40 - 50	30	98
50 - 60	22	120

60 - 70	15	135
70 - 80	10	145
80 - 90	8	153
90 - 100	7	160

Use your graph to estimate the following

i. The median

ii. The inter quartile range.

iii. The number of shooters who obtained a score of more than 85%.

8. **Question 8** **[10]**

(a) Each of the letters of the word **AUTHORIZES** is written on identical circular discs and put in a bag. They are well shuffled. If a disc is drawn at random from the bag, what is the probability that the letter is: **[3]**

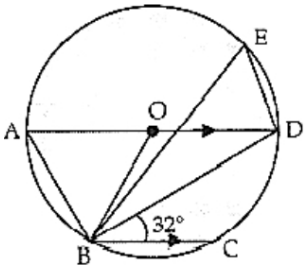
i. a vowel

ii. one of the fist 9 letters of the English alphabet which appears in the given word

iii. one of the last 9 letters of the English alphabet which appears in the given word?

(b) The curved surface area of a right circular cylinder is 660 cm^2 and base radius is 5 cm. Find its height. **[3]**

(c) In the figure given below. AD is a diameter. O is the centre of the circle. AD is parallel to BC and ∠CBD = 32°. Find: **[4]**



i. ∠OBD

ii. ∠AOB

iii. ∠BED

9. **Question 9** **[10]**

(a) In the first four examinations, each of 100 marks, Parveen got 94, 73, 72 and 84 marks. If average marks greater than or equal to 80 and less than 90 is needed in fifth examination to obtain a final grade B in a course, then what range of marks in fifth (last) examination will be required, if Parveen is receiving grade B in the course? **[3]**

(b) The following table shows the age distribution of cases of a certain disease admitted during a year in a particular hospital **[3]**

Age (in years)	Number of cases
0-10	5
10-20	8
20-30	7
30-40	12

40-50	28
50-60	20
60-70	10
70-80	10

Find the average age for which maximum case occurred.

(c) Diagonals of a trapezium PQRS intersect each other at the point O, PQ || RS and PQ = 3 RS. Find the ratio of the areas of △POQ and △ROS. **[4]**

10. **Question 10** **[10]**

(a) Find whether the numbers 6, 10, 14 and 22 are in proportion or not. If not, what must be added to each of the numbers so that they become proportional? **[3]**

(b) Draw a circle of radius 2.8 cm. From an external point P, draw tangents to the circle without using the centre of the circle. **[3]**

(c) The shadow of a vertical tower on a level ground increases by 10 m, when the altitude of the sun changes from 45^{o} to 30^{o}. Find the height of the tower correct to two decimal places. **[4]**