



ST. JOSEPH'S COLLEGE, PRAYAGRAJ

PRE-BOARD EXAMINATION 2024

MATHEMATICS

CLASS – X

TIME: 3 Hours

MM: 80

Answer 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.

Attempt all questions from Section A and attempt 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 []

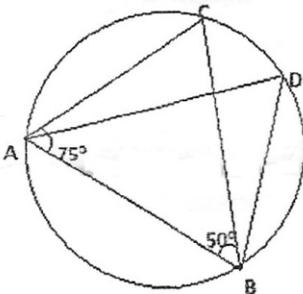
Mathematical tables are provided

SECTION – A [40 Marks]

(Attempt all questions from this Section)

Q 1) Choose the correct answers to the questions from the given option. (Do not copy the question write the correct answer only) [15]

- 1) What must be subtracted from the polynomial $x^3 + x^2 - 2x + 1$, so that the result is exactly divisible by $(x - 3)$:
(a) -31 (b) -30 (c) 30 (d) 31 (e) None of these
- 2) Reena deposited Rs 1000 per month for 12 months in a Paytm Bank's recurring deposit account. If the bank pays interest at a rate of 9% per annum, then the total amount deposited by Reena during this period is:
(a) Rs 12000 (b) Rs 20400 (c) Rs 15000 (d) Rs 18000 (e) None of these
- 3) If $\triangle ABC \sim \triangle DEF$ such that $2AB = DE$ and $BC = 8cm$ then find EF
(a) 8cm (b) 10cm (c) 16cm (d) 12cm (e) None of these
- 4) Find the value of $\angle D$



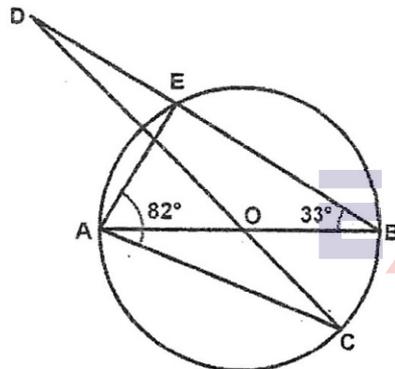
- (a) 40° (b) 45° (c) 50° (d) 55° (e) None of these
- 5) If the angle of depression of an object from a 75m high tower is 30° , then the distance of the object from the tower is
(a) $25\sqrt{3}m$ (b) $50\sqrt{3}m$ (c) $75\sqrt{3}m$ (d) 150m (e) None of these
- 6) Statement 1: If radius of sphere is double then its volume will be 8 times the original volume.
Statement 2: if we reduce the radius of sphere to half its surface area will be $\frac{1}{4}$ th times the original area.
(a) Both statements are true
(b) Statement 1 is true, but statement 2 is false.
(c) Statement 1 is false, but statement 2 is true.
(d) Both statements are false.
- 7) The value of a for which $2a, (a+10)$ and $(3a+2)$ are the three consecutive terms of an A.P is
(a) 6 (b) -6 (c) 18 (d) -18 (e) None of these



- 8) 20 tickets, on which numbers 1 to 20 are written, are mixed thoroughly and then a ticket is drawn at random out of them. What is the probability that the number on the drawn ticket is a multiple of 3 or 7?
- (a) $\frac{1}{5}$ (b) $\frac{1}{4}$
(c) $\frac{3}{4}$ (d) $\frac{2}{5}$ (e) None of these
- 9) Assertion : If A and B are square matrices of order 2, then $AB = BA$ is not always true.
Reason : Matrix multiplication is associative.
- (a) Both assertion and reason are correct and reason is the correct explanation of assertion.
(b) Both assertion and reason are correct but reason is not the correct explanation of assertion.
(c) Assertion is correct but reason is incorrect.
(d) Assertion is incorrect but reason is correct.
- 10) What is the sum of the G.P 2,6,18,.....up to 8 terms?
- (a) 3078 (b) 6560 (c) 2078 (d) 2020 (e) None of these
- 11) A retailer purchased an item for Rs 1500 from a wholesaler and sells it to a customer at 10% profit. The sales are intra-state and the rate of GST is 10%. The amount of GST paid by the customer:
- (a) Rs 15 (b) Rs 30 (c) Rs 150 (d) Rs 165 (e) None of these
- 12) Gaurav buys 1120 shares at Rs 52 per share and gets dividend Rs 1456 then rate of return is:
- (a) 1.5% (b) 5% (c) 2.5% (d) 2% (e) None of these
- 13) If the roots of equation $x^2 - 6x + k = 0$ are real and distinct, the value of k is
- (a) > -9 (b) < -9 (c) > 9 (d) < 9 (e) None of these
- 14) Points $A(x, y)$, $B(3, -2)$ and $C(4, -5)$ are collinear. The value of y in terms of x
- (a) $3x - 11$ (b) $11 - 3x$ (c) $3x - 7$ (d) $7 - 3x$ (e) None of these
- 15) Solution set of $12 - x \geq 3x - 2$, given that $x \in W$ is:
- (a) $\{0, 1, 2\}$ (b) $\{1, 2, 3\}$ (c) $\{1, 2\}$ (d) $\{0, 1, 2, 3\}$ (e) None of these

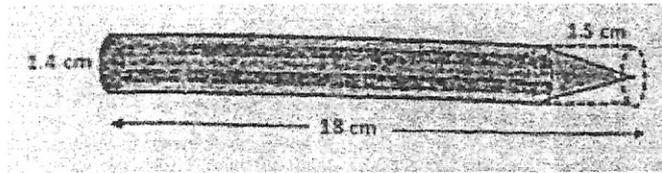
Q 2)

- 1) $x^3 + 2x^2 - 5ax - 8$ and $x^3 + ax^2 - 12x - 6$ when divided by $(x-2)$ and $(x-3)$ leaves remainder p and q respectively. If $q - p = 10$, find the value of a . [4]
- 2) Points A and B have coordinates $(7, -3)$ and $(1, 9)$, respectively. Find [4]
- (a) The slope of AB
(b) The equation of the perpendicular bisector of the line segment AB
(c) The value of p, if $(-2, p)$ lies on it.
- 3) AB and CD intersect at the centre O of the circle given in the diagram. If $\angle EBA = 33^\circ$ and $\angle EAC = 82^\circ$
Find: (a) $\angle BAE$ (b) $\angle BOC$ (c) $\angle ODB$ (d) $\angle AEB$ [4]



Q 3)

- 1) Write first five terms of the sequence given by $(\sqrt{3})^n, n \in N$ [4]
 - (a) Is the sequence an A.P or G.P?
 - (b) If the sum of its first 10 terms is $p(3 + \sqrt{3})$, find the value of p.
- 2) A specially designed thick wooden cylindrical pencil has a sharpened conical tip, as shown in the given diagram. The length and diameter of the pencil is 18 cm and 1.4 cm respectively and length of the conical tip is 1.5 cm. It has coating of alternate red and black colours. Use $\pi = \frac{22}{7}$. [4]



Find:

- (a) The volume of conical tip of the pencil.
 - (b) The cost of coating the curved surface of cylindrical part (excluding the conical part) at the rate of Rs 0.30 per cm^2 . Give your answer correct to the nearest whole number.
- 3) Use graph paper for these questions. $(4, 3)$ [5]
- (a) Plot the parallelogram OABC O(0,0), A(1,3), B(4,3), C(3,0).
 - (b) Reflect the parallelogram OABC through the origin and name the figure as OPQR.
 - (c) Reflect OABC on the x-axis and name it a OA'B'C.
 - (d) Name two points which are invariant when OABC is reflected on the X-axis.

SECTION – B [40 Marks]

(Attempt any four questions from this Section)

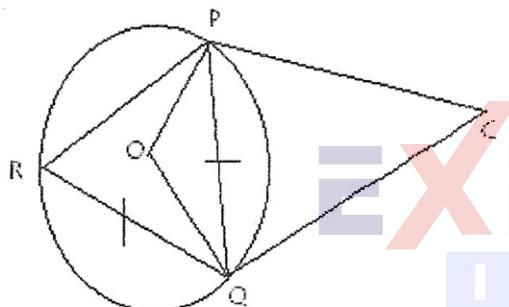
Q 4)

- 1) A company with 10000 shares of RS 100 each declares an annual dividend of 5%. Find the: [3]
 - (a) Total amount of dividend paid by company.
 - (b) Annual income of a man who has 72 shares in the company.
- 2) Solve the following inequation, write the solution set and represent it on the real number line., [3]

$$-2 \leq \frac{1}{2} - \frac{2x}{3} \leq 1\frac{5}{6}, x \in R.$$
- 3) Prove the following trigonometry identity $(\cot \theta - \operatorname{cosec} \theta)^2 = \frac{1 - \cos \theta}{1 + \cos \theta}$ [4]

Q 5)

- 1) In the given figure $PQ=RQ$, $\angle RPQ = 68^\circ$, PC and QC are tangents to the circle with centre O. Calculate the values angles with suitable reason. [3]
 - (a) $\angle QOP$
 - (b) $\angle QCP$
 - (c) $\angle PRQ$

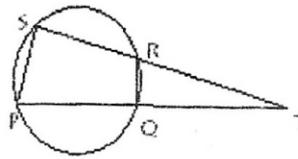


- 2) Pushpa has a recurring deposit account and deposits Rs 600 per month for 2 years. If she gets Rs 15600 at the time of maturity, find the rate of interest earned by her. [3]
- 3) The distribution below shows the number of wickets by bowlers in one-day cricket matches. Find the mean number of wickets by step deviation method. [4]

No. of wickets	0-50	50-100	100-150	150-200	200-250	250-300
No. of bowlers	7	5	16	12	2	3

Q 6)

- 1) Find the equation of the straight line perpendicular to the line $x+2y=4$, which cuts an intercept of 2 units from the positive y -axis. Hence, find the intersection point of the two lines. [3]
- 2) In the given figure, PQRS is a cyclic quadrilateral. PQ and SR produced meet at T. [3]
- (a) Prove that ΔTPS is similar to ΔTRQ .
- (b) Find the SP if $TP=18\text{cm}$, $RQ=4\text{cm}$ and $TR=6\text{cm}$.



(c) Find the area of quadrilateral PQRS if area of $\Delta PTS = 27\text{cm}^2$

- 3) The following bill shows the GST rate and the marked price of items. [4]

S. No.	Item	Market Price/Quantity	Rate of GST
1	Wheat floor	45 3kg	0%
2	Rice	150 5kg	5%
3	Detergent	220 4kg	18%

Find the total amount to be paid (including GST) for the above bill.

Q 7)

- 1) A pole 6m high is fixed on the top of a tower. The angle of elevation of the top of the pole observed from a point p on the ground 60° and the angle of depression of the point P from the top of the tower is 45° . Find the height of the tower. (Take $\sqrt{3} = 1.73$) [5]
- 2) Draw ogive for the following distribution. [5]

Monthly income in Rs	600-700	700-800	800-900	900-1000	1000-1100	1100-1200	1200-1300
No. of employees	40	68	86	120	90	40	26

Hence determine:

- (a) The median income.
- (b) The percentage of employees whose income exceeds RS1180
- (c) The lower and upper quartiles
- (d) The inter quartile range

Q 8)

- 1) A bag contains 13 red cards, 13 black cards and 13 green cards. Each set of cards are numbered 1 to 13. From these cards, a card is drawn at random. What is the probability that the card drawn is a: [3]
- (a) green card?
- (b) a card with an even number?
- (c) A red or black card with a number which is a multiple of three?
- 2) If a, b and c are in continued proportion, Prove that [3]

$$\frac{a}{b^2 \cdot c^2} + \frac{b}{c^2 \cdot a^2} + \frac{c}{a^2 \cdot b^2} = \frac{1}{a^3} + \frac{1}{b^3} + \frac{1}{c^3}$$



- 3) A famous sweet shop "Balaji Sweets" sells tinned rasgullas. The tin container is cylindrical in shape with diameter 14cm, height 16cm, and it can hold 20 spherical rasgullas of diameter 6cm and sweetened liquid such that the can is filled and then sealed. Find out how much sweetened liquid the can contains. Take $\pi=3.14$. [4]

Q 9)

- 1) The daily wages of workers in a construction unit were recorded as follows: [3]

Class Mark Wages	450	500	550	600	650	700
No. of Workers	6	12	15	17	7	13

Form a frequency distribution table with class intervals and find modal wage by plotting a Histogram.

- 2) An Arithmetic Progression (A.P.) consisting of all whole numbers which are divisible by 3 and 7. [3]

- (a) How many of these are two-digit numbers? Write them
(b) Write the sum of first 10 terms of this A.P.
(c) What will be the 15th term.

- 3) The roots of the equation $(b-c)x^2 + (c-a)x + (a-b) = 0$ are equal. Prove that $2b = a + c$, that is a, b & c are in A.P. [4]

Q 10)

- 1) A boat travels upstream from point A to point B at a speed of 10 km/h. The same boat travels downstream from point B to point A at a speed of 20 km/h. If the distance between points A and B is x km, and the total time taken for the round trip is 6 hours, Find the value of x . [3]

2) $A = \begin{bmatrix} -6 & 0 \\ 4 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 1 & 3 \end{bmatrix}$ [3]

Find matrix M , if $M = \frac{1}{2}A - 2B + 5I$, where I is identity Matrix of order 2×2

- 3) Construct a triangle ABC in which $BC = 7cm$, $AB = 4cm$ and $\angle ABC = 60^\circ$. [4]
(a) Construct the locus of points which are equidistant:
(i) From BA and BC
(ii) From B and C
(b) Mark P, the point which is equidistant from AB, BC and also equidistant from B and C.