

HALF YEARLY EXAMINATION

Class - X
Time - 3 Hours

Subject - Mathematics
Maximum Marks - 80

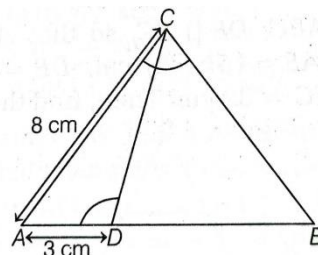
General Instructions:

Read the following instructions carefully and follow them

- (i) This question paper contains 38 questions. All questions are compulsory.
- (ii) This question paper is divided into FIVE Sections - Section A, B, C, D and E.
- (iii) In Section-A question number 1 to 18 are Multiple Choice Questions (MCQs) and question number 19 and 20 are Assertion - Reason based questions of 1 mark each.
- (iv) In Section -B question number 21 to 25 are Very Short-Answer-I (SA - I) type questions of 2 marks each
- (v) In Section - C question number 26 to 31 or Short Answer - II (SA - II) type question carrying 3 marks each
- (vi) In Section -D question number 32 to 35 is Long -Answer (LA) type questions carrying 5 marks each
- (vii) In Section -E question number 36 to 38 are case study type questions carrying 4 marks each

SECTION A

1. The product of a non-zero rational number and an irrational number is
(a) always irrational (b) always rational (c) rational or irrational (d) one
2. If the square of difference of the zeroes of the quadratic polynomial $x^2 + px + 45$ is equal to 144, then the value of p is
(a) ± 9 (b) ± 12 (c) ± 15 (d) ± 18
3. Let the hypotenuse of an isosceles right angled triangle is $7\sqrt{2}$ cm. Then the area of the circle inscribed in it, is
(a) 154 cm^2 (b) $\frac{154}{(2 + \sqrt{2})^2} \text{ cm}^2$ (c) $\frac{154}{(2 - \sqrt{2})^2} \text{ cm}^2$ (d) 145 cm^2
4. Point P divides the line segment joining R(-1, 3) and S(9, 8) in the ratio $k : 1$. If P lies on the line $x - y + 2 = 0$, then the value of k is
(a) $2/3$ (b) $1/2$ (c) $1/3$ (d) $1/4$
5. Which of the following pairs of linear equations is inconsistent
(a) $x + y = 5; 2x + 2y = 10$ (b) $x - y = 8; 3x - 3y = 16$
(c) $2x + y - 6 = 0; 4x - 2y - 4 = 0$ (d) $2x - 2y - 2 = 0; 4x - 4y - 4 = 0$
6. In the given figure, $\angle ACB = \angle CDA$, $AC = 8 \text{ cm}$ and $AD = 3 \text{ cm}$, then BD is
(a) $22/3 \text{ cm}$ (b) $26/3 \text{ cm}$
(c) $55/3 \text{ cm}$ (d) $64/3 \text{ cm}$



7. Which of the following cannot be the probability of an event?
 (a) $2/3$ (b) -1.5 (c) 15% (d) 0.7
8. For an event E, $P(E) + P(E') = x$, then the value of $x^3 - 3$, is
 (a) -2 (b) 2 (c) 1 (d) -1
9. If $\cos^2\theta + 2\sin^2\theta + 3\cos^2\theta + 4\sin^2\theta + \dots + 200$ terms $= 10025$, where θ is acute, then the value of $\sin\theta - \cos\theta$ is
 (a) $\frac{1-\sqrt{3}}{2}$ (b) $\frac{1+2\sqrt{3}}{2}$ (c) $\frac{\sqrt{3}-1}{2}$ (d) 0
10. If $\cot A = \frac{7}{8}$, then $\frac{(1+\sin A)(1-\sin A)}{(1+\cos A)(1-\cos A)}$ is
 (a) $7/8$ (b) $49/64$ (c) $1/2$ (d) None
11. An arc of a circle is of length 5π cm and the sector it bounds has an area of 20π cm², then the radius of the circle is
 (a) 4 cm (b) 8 cm (c) 12 cm (d) 16 cm
12. Length of an arc of a sector of angle P (in degrees) of a circle of radius R is
 (a) $\frac{P}{180^\circ} \times 2\pi R$ (b) $\frac{P}{180^\circ} \times \pi R$ (c) $\frac{P}{360^\circ} \times 2\pi R^2$ (d) $\frac{P}{360^\circ} \times \pi R^2$
13. The sum of the squares of three consecutive integers is 110, then the smallest positive integer is
 (a) 6 (b) 5 (c) 7 (d) 4
14. If $x = \frac{1}{\sqrt{3}}$ is a root of the equation $px^2 + (\sqrt{3} - \sqrt{2})x - 1 = 0$, then the value of $p^2 + 1$ is
 (a) $\sqrt{6}$ (b) 6 (c) 7 (d) 8
15. The values of k for which the roots of the quadratic equation $x^2 + 4x + k = 0$ are real is
 (a) $k \geq 4$ (b) $k \leq 4$ (c) $k \geq -4$ (d) $k \leq -4$
16. If S_n , the sum of first n terms of an AP is given by $S_n = 3n^2 - 4n$, then the common difference is
 (a) 3 (b) -4 (c) -1 (d) 6
17. If the 3rd and 9th term of an AP are 4 and -8 respectively, then which term of this AP is zero
 (a) 8th term (b) 5th term (c) 10th term (d) 12th term
18. The sum of integers between 100 and 200 which are not divisible by 9 is
 (a) 1683 (b) 14850 (c) 13167 (d) None of these

ASSERTION-REASON BASED QUESTIONS

In the following questions, a statement of assertion (A) is followed by a statement of Reason (R).

Choose the correct answer out of the following choices.

- (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.

19. **Assertion (A):** The equation $\sec^2\theta = \frac{4xy}{(x+y)^2}$ is only possible, when $x = y$.

Reason(R): $\sec^2\theta \geq 1$ and therefore $(x + y)^2 \leq 0$.

20. **Assertion (A):** The coordinates of the points which divide the line segment joining A(4, -1) and B (-2, -3) into three equal parts are (2, -5/3) and (0, -7/3).

Reason(R): The points which divide AB in the ratio 1 : 3 and 3 : 1 are called points of trisection of AB.

SECTION B

21. Prove that $\sqrt{8}$ is an irrational number.

OR,

The length, breadth and height of a room are 8 m 25 cm, 6 m 75 cm and 4 m 50 cm respectively. Find the length of the longest rod that can measure the three dimensions of the room exactly.

22. Prove that the equation $x^2(a^2 + b^2) + 2x(ac + bd) + (c^2 + d^2) = 0$ has no real root, if $ad \neq bc$.

OR,

If p, q, r are real and $p \neq q$, then show that the roots of the equation $(p - q)x^2 + 5(p + q)x - 2(p - q) = 0$ are real and unequal.

23. In triangle ABC, DE is parallel to BC. Find EC if $AD = 1.5$ cm, $DB = 3$ cm and $AE = 1$ cm.

24. Find the zeros of the polynomial $x^2 + \frac{1}{6}x - 2$, and verify the relation between the coefficients and the zeros of the polynomial.

25. The 17th term of an AP exceeds its 10 term by 7. Find the common difference.

SECTION C

26. In a seminar, the number of participants in Hindi, English and Mathematics are 60, 84 and 108 respectively. Find the minimum number of rooms required if in each room the same number of participants are to be seated and all of them being in the same subject.

27. If α and β are the roots of the quadratic polynomial $f(x) = kx^2 + 4x + 4$ such that $\alpha^2 + \beta^2 = 24$, find the values of k .

OR,

If α and β are the zeroes of the quadratic polynomial $p(x) = ax^2 + bx + c$, then evaluate

(i) $\alpha^4 + \beta^4$

(ii) $\frac{\alpha^2}{\beta^2} + \frac{\beta^2}{\alpha^2}$.

28. A die is thrown twice. Find the probability of getting the sum of numbers

(i) an even prime number

(ii) a number lying between 4 and 8

(iii) a perfect square.

OR,

A box contains 12 balls out of which 'x' are black. If one ball is drawn at random from the box, what is the probability that it will be a black colour? If 6 more black balls are put in the box, then the probability of drawing a black ball is now double of what it was before. Find the value of 'x'

29. In a circle of radius 21 cm, an arc subtends an angle of 60° at the centre. Find
 (i) the length of the arc.
 (ii) the area of the sector formed by the arc.
 (iii) the area of the segment formed by the corresponding chord.
30. In ΔPQR , right angled at Q, $PR + QR = 25$ cm and $PQ = 5$ cm. Determine the value of $\sin P$ and $\tan P$.
31. If $S_1 = 3, 7, 11, 15, \dots$ upto 125 terms and $S_2 = 4, 7, 10, 13, 16, \dots$ upto 125 terms, then how many terms are there in S_1 that are in S_2 ?

SECTION D

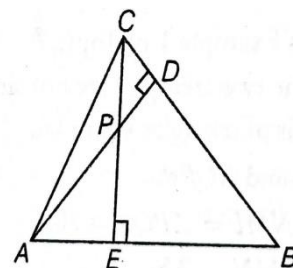
32. The sum of the digits of a two digit number is 9. Also, nine times this number is twice the number obtained by reversing the order of the digits. Find the number.

OR,

A person is walking with uniform speed and when he has completed half his journey he increased his speed 20% and arrives at his destination. Last half of his journey he completed 30 minutes earlier than first half of journey. How long was he walking the first half?

33. In the given figure, altitudes AD and CE of ΔABC intersect each other at the point P. Show that

- (i) $\Delta AEP \sim \Delta CDP$
 (ii) $\Delta AEP \sim \Delta ADB$



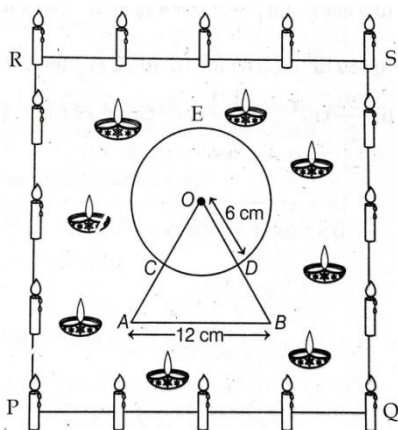
OR,

State and prove Basic Proportionality theorem.

34. Prove that: $\frac{\tan A}{1 - \cot A} + \frac{\cot A}{1 - \tan A} = 1 + \sec A \operatorname{cosec} A$
35. A cottage industry produces a certain number of pottery articles in a day. It was observed on a particular day that the cost of production of each article (in Rs.) was 3 more than twice the number of articles produced on the day. If the total cost of the production on that day was Rs 90, then find the number of articles produced and the cost of each article.

SECTION E

36. In a Diwali occasion, a colorful Rangoli is formed by using different colours, diya, candles and light etc. in a square PQRS of side 20 cm.

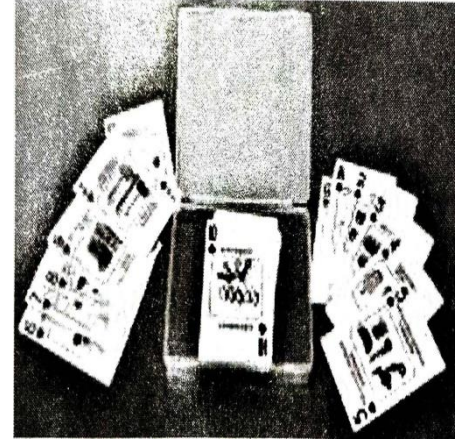


- (i) Find the area of the sector OCD, where OAB is an equilateral triangle.
- (ii) Find the area of the equilateral triangle OAB outside the circle.
- (iii) Find the area of the sector OCEDO.

OR,

Find the area of the remaining part of the square PQRS when areas of circle and equilateral triangle is excluded.

37. There are three friends and they want to play some interesting game. Firstly, they consider some cards and marked with the numbers 2 to 101 are placed in a box and mix thoroughly. One card is drawn from the box.

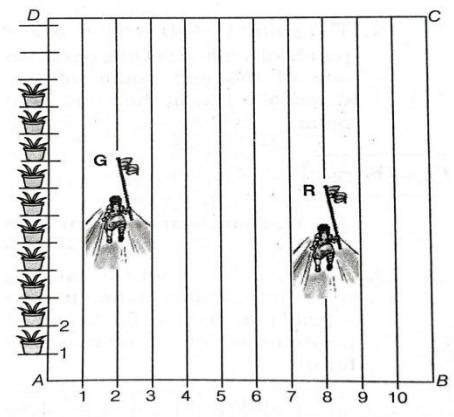


- (i) Find the probability that the drawn on the card is a number which is a perfect square.
- (ii) Find the probability that the drawn on the card is a prime number less than 50.
- (iii) Find the probability that the drawn on the card is a number which is either divisible by 2 or 3.

OR,

Find the probability that the drawn on the card is a number which is not divisible by 3 and 5.

38. In order to conduct a Sports Day activities is in your school, lines have been drawn with chalk powder at a distance of 1 m each, in a rectangular shaped ground ABCD, 100 flowerpots have been placed at distance of 1 m from each other along AD, as shown in the figure below. Niharika runs $1/4$ th the distance AD on the second line and posts a green flag. Preet runs $1/5$ th the distance AD on the 8th line and posts a red flag.



- (i) Find the position (coordinates) of the green flag and red flag.
- (ii) Find the distance between the green and the red flags.
- (iii) If Joy has to post a flag at $1/4$ distance from green flag, in the line segment joining the green and red flags, then where should he post his flag?

OR,

If Rashmi has to post a blue flag exactly halfway between the line segment joining the two flags, where should she post her flag? Also find the distance of her flag from the origin (A).