

CLASS-X
SUBJECT-MATHEMATICS

Time : 3 Hours

M.M. : 80

No. of Pages 11

No. of Qs. 38

General Instructions : Read the following instructions carefully and follow them:

1. This question paper contains 38 questions.
2. This question paper is divided into 5 Sections A, B, C, D and E.
3. In Section A, Question no. 1-18 are multiple choice questions (MCQs) and question no. 19 and 20 are Assertion-Reason based questions of 1 mark each.
4. In Section B, Question no. 21-25 are Very Short Answer (VSA)-type questions, carrying 2 marks each.
5. In Section C, Question no. 26-31 are Short Answer (SA)-type questions, carrying 3 marks each.
6. In Section D, Question no. 32-35 are Long Answer (LA)-type questions, carrying 5 marks each.
7. In Section E, Question no. 36-38 are case study based questions carrying 4 marks each with sub-parts of the value of 1, 1 and 2 marks each respectively.
8. There is no overall choice. However, an internal choice has been provided in 2 questions in Section B, 2 questions in Section C, 2 questions in Section D and 3 questions of 2 marks in Section E.
9. Draw neat and clean figures wherever required.
10. Take $\pi = \frac{22}{7}$ wherever required if not stated.
11. Use of calculators is not allowed.

SECTION-A

(Section A consist of 20 questions of 1 mark each).

1. The zeroes of the polynomial $x^2 - 3x - m(m + 3)$ are :

(A) $m, (m + 3)$

(C) $m, -(m + 3)$

(B) $-m, (m + 3)$

(D) $-m, -(m + 3)$

$$x^2 - 3x - m(m+3)$$

$$b^2 - 4ac$$

$$9x^2 - 4 \times x^2 \times -m(m+3)$$

$$5x^2 - m^2 + 3m$$

$$x^2 - 3x - m(m+3)$$

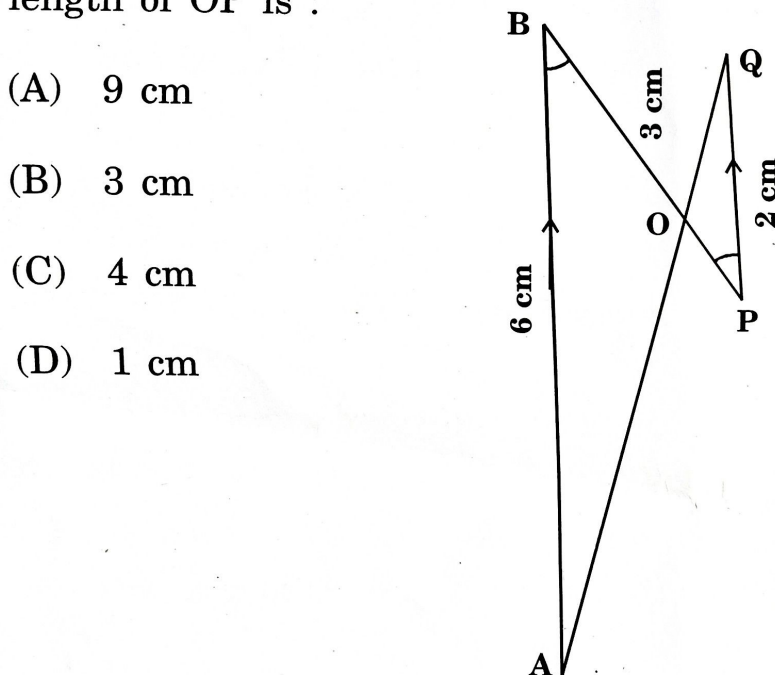
$$b^2 - 4ac$$

$$(-3)^2 - 4 \times 1 \times (-m(m+3))$$

$$9 - 4 \times (-m^2 - 3m)$$

$$9 - 4m^2 + 12m$$

2. If $3x + 4y : x + 2y = 9 : 4$, then $3x + 5y : 3x - y$ is :
- (A) $4 : 1$ (B) $1 : 4$
(C) $7 : 1$ (D) $1 : 7$
3. If one root of the quadratic equation $ax^2 + bx + c = 0$ is the reciprocal of the other, then
- (A) $b = c$ (B) $a = b$
(C) $ac = 1$ (D) $a = c$
4. In the figure, $AB \parallel PQ$. If $AB = 6$ cm, $PQ = 2$ cm and $OB = 3$ cm, then the length of OP is :



$$\frac{BO}{OP} = \frac{AO}{OQ}$$

$$PQ = QR \quad \underline{3}$$

Alternative Question for Visually Challenged Students in lieu of Q. 4

4. It is given that $\triangle ABC \sim \triangle PQR$. If AM and PN are altitudes of $\triangle ABC$ and $\triangle PQR$ respectively and $AB^2 : PQ^2 = 4 : 9$, then $AM : PN$ is equal to :
- (A) $3 : 2$ (B) $16 : 81$
(C) $4 : 9$ (D) $2 : 3$
5. The x -coordinate of a point P is thrice its y -coordinate. If P is equidistant from $Q(2, -5)$ and $R(-3, 6)$, then coordinates of P is :
- (A) $(-3, -1)$ (B) $(-6, -2)$
(C) $(12, 4)$ (D) $(9, 3)$

6. In $\triangle ABC$, it is given that $AB = 9$ cm, $BC = 6$ cm and $CA = 7.5$ cm. Also, in $\triangle DEF$, $EF = 8$ cm and $\triangle DEF \sim \triangle ABC$. Then, the perimeter of $\triangle DEF$ is :
- (A) 22.5 cm (B) 30 cm
(C) 27 cm (D) 25 cm
7. If $a = 2^3 \times 3$, $b = 2 \times 3 \times 5$, $c = 3^n \times 5$, and $\text{LCM}(a, b, c) = 2^3 \times 3^2 \times 5$, then n is :
- (A) 1 ~~(B) 2~~
(C) 3 (D) 4
8. If $x = \cos 30^\circ - \sin 30^\circ$ and $y = \tan 60^\circ - \cot 60^\circ$, then
- (A) $x = y$ (B) $x > y$
~~(C) $x < y$~~ (D) $x > 1, y < 1$
9. A bag contains red balls and black balls in the ratio 3 : 7. A ball is drawn random. The probability that the ball so drawn is black in colour is :
- (A) $\frac{3}{7}$ (B) 0.3
(C) 0.7 (D) $\frac{1}{7}$
10. The pair of linear equations $2kx + 5y = 7$, $6x - 5y = 11$ has a unique solution if :
- (A) $k \neq -3$ ~~(B) $k \neq \frac{3}{2}$~~ $2 \times \frac{3}{2}$
(C) $k = -3$ (D) $k \neq -\frac{3}{2}$

11. If the equation $(k - 1)x^2 - 2(k - 1)x + 1 = 0$ has real and equal roots, then the value(s) of k is :

- (A) 1 (B) 2
(C) Both 1 & 2 (D) 0

12. Cards bearing numbers 3 to 20 are placed in a bag and mixed thoroughly. A card is taken out of the bag at random. What is the probability that the number on the card taken out is an even number?

- (A) $\frac{9}{17}$ (B) $\frac{1}{2}$
(C) $\frac{5}{9}$ (D) $\frac{7}{18}$

13. If $\tan \theta = \frac{5}{12}$, then the value of $\frac{\sin \theta + \cos \theta}{\sin \theta - \cos \theta}$ is :

- (A) $\frac{17}{7}$ (B) $-\frac{17}{7}$
(C) $\frac{17}{13}$ (D) $-\frac{7}{13}$

$H^2 = 5^2 + 12^2$
 $H^2 = 25 + 144$
 $H^2 = 169$
 $H = 13$

$\frac{5}{13} + \frac{12}{13} = \frac{17}{13}$
 $\frac{5}{13} - \frac{12}{13} = -\frac{7}{13}$

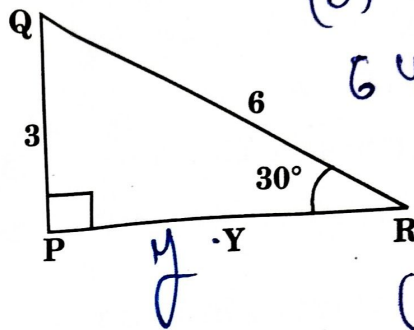
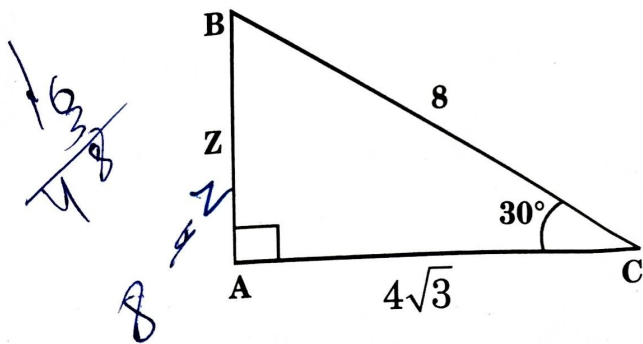
14. Three alarm clocks ring their alarms at regular intervals of 20 min., 25 min. and 30 min respectively. If they first beep together at 12 noon, they beep again for the first time at :

- (A) 4:00 pm (B) 4:30 pm
(C) 5:00 pm (D) 5:30 pm

15. A pair of dice is thrown once. The probability that the sum of the numbers appearing on top faces is at least 4, is :

- (A) $\frac{1}{11}$ (B) $\frac{10}{11}$
(C) $\frac{5}{6}$ (D) $\frac{11}{12}$

16. In $\triangle ABC$ and $\triangle PQR$, then $y + z$ is equal to :



$$(8)^2 \neq (B)^2 + (4\sqrt{3})^2$$

$$64 - 48 = (B)^2$$

$$16 = B^2$$

$$8 = B$$

$$(H)^2 = (B)^2 + (P)^2$$

$$(6)^2 = (3)^2 + (P)^2$$

$$36 - 9 = (P)^2$$

$$27 = (P)^2$$

$$\sqrt{27} = P$$

(A) $2 + \sqrt{3}$

(B) $4 + 3\sqrt{3}$

(C) $4 + \sqrt{3}$

(D) $3 + 4\sqrt{3}$

Alternative Question for Visually Challenged Students in lieu of Q. 16

16. In $\triangle ABC$ & $\triangle DEF$, $\frac{AB}{EF} = \frac{AC}{DE}$ then the two triangles will be similar if :

(A) $\angle A = \angle D$

(B) $\angle A = \angle E$

(C) $\angle B = \angle E$

(D) $\angle C = \angle F$

17. The value of $\frac{\sin^3 \theta + \cos^3 \theta}{\sin \theta + \cos \theta} + \sin \theta \cdot \cos \theta$ is :

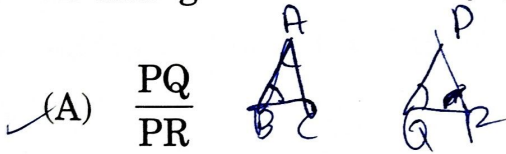
(A) 0

(B) 1

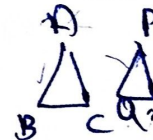
(C) $\sin^2 \theta - \cos^2 \theta$

(D) $\sin \theta - \cos \theta$

18. In triangle ABC and PQR, $\angle A = \angle Q$ and $\angle B = \angle R$ then $\frac{AB}{AC}$ is equal to :



(B) $\frac{PQ}{QR}$



(C) $\frac{QR}{QP}$

(D) $\frac{PR}{QR}$

(Assertion and Reasoning Questions)

Direction : Question numbers 19 and 20 are Assertion and Reason based questions. Two statements are given, one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer from the codes (A), (B), (C) and (D) as given below :

- (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
- (B) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
- (C) Assertion (A) is true but Reason (R) is false.
- (D) Assertion (A) is false but Reason (R) is true.

19. **Assertion (A) :** If the graph of a polynomial touches x -axis at only one point, then the polynomial cannot be a quadratic polynomial.

Reason (R) : A polynomial of degree n ($n > 1$) can have at most n zeroes.

20. **Assertion (A) :** Point P (0, 2) is the point of intersection of y -axis with the line $3x + 2y = 4$.

Reason (R) : The distance of point P (0, 2) from x -axis is 2 units.

SECTION-B

(Section B consists of 5 questions of 2 marks each).

21. If point A lies on x -axis and has abscissa $(p + q)$ and another point B lies on y -axis and has ordinate $(p - q)$, find distance between A and B.

22. (a) If the square of difference of the zeroes of the quadratic polynomial $x^2 + px + 45$ is equal to 144, then find the value of p .

OR

(b) If m and n are the zeroes of the polynomial $3x^2 + 11x - 4$, find the value of $\frac{m}{n} + \frac{n}{m}$.

23. (a) Solve for x and y :

$$99x + 101y = 499$$

$$101x + 99y = 501$$

OR

- (b) Solve the following pair of linear equations :

$$\frac{x}{a} - \frac{y}{b} = 0$$

$$ax + by = a^2 + b^2$$

24. E and F are points on the sides AB and AC respectively of a $\triangle ABC$ such that $\frac{AE}{EB} = \frac{AF}{FC} = \frac{1}{2}$. Find $\frac{BC}{EF}$.
25. If $4\cot^2 45^\circ - \sec^2 60^\circ + \sin^2 60^\circ + p = \frac{3}{4}$, then find the value of p .

SECTION-C

(Section C consists of 6 short questions of 3 marks each).

26. Using quadratic formula, solve the following :

$$(a + b)^2 x^2 + 8(a^2 - b^2)x + 16(a - b)^2 = 0$$

27. Prove that $2\sqrt{3} - 1$ is an irrational number, given that $\sqrt{3}$ is irrational.

28. Find the zeroes of the quadratic polynomial $x^2 - 2\sqrt{2}x$ and verify the relationship between the zeroes and the coefficients of the polynomial.

29. Solve the following system of equations graphically :

$$3x + 2y = 14$$

$$x - 4y = -7$$

$$\begin{array}{r} 6x + 2y = 14 \\ 6x - 24y = -42 \\ \hline 26y = 56 \\ y = \frac{56}{26} = \frac{28}{13} \end{array}$$

Also, find the points where the lines represented by the given equations intersect the x -axis.

Alternative Question for Visually Challenged Students in lieu of Q. 29

29. A two digit number is such that the sum of its digits is 11. When the digits are reversed, the resulting number increases by 27. Find the two-digit number.

30. (a) In a ΔPQR , N is a point on PR, such that $QN \perp PR$. If $PN \times NR = QN^2$, prove that $\angle PQR = 90^\circ$.

OR

- (b) Two poles of a height a metres and b metres are p metres apart. Prove that the height of the point of intersection of the lines joining the top of each pole to the foot of the opposite pole is given by $\frac{ab}{a+b}$ metres.
31. (a) If A $(-2, 1)$, B $(a, 0)$, C $(4, b)$ and D $(1, 2)$ are the vertices of a parallelogram ABCD, find the values of a and b . Hence find the lengths of its sides.

OR

- (b) Determine the ratio in which the line $2x + 3y - 30 = 0$ divides the join of A $(3, 4)$ and B $(7, 8)$ and also find the point of intersection of line and AB.

SECTION-D

(Section D consists of 4 Long questions of 5 marks each).

32. (a) A person on tour has ₹ 3600 for his daily expenses. If he exceeds his tour for 4 days, he must cut down his daily expenses by ₹ 30 per day. Find the number of days of his tour programme.

OR

- (b) If sum of the two roots of the equation $\frac{1}{x+a} + \frac{1}{x+b} = \frac{1}{c}$ is zero, then prove that product of the two roots is equal to $\frac{-(a^2 + b^2)}{2}$.

33. If P $(9a - 2, -b)$ divides the line segment joining A $(3a + 1, -3)$ and B $(8a, 5)$ in the ratio 3 : 1, find the value of a and b . Also find the coordinates of P, A, B and find the length of AB.
- $9a - 2, -b$

34. (a) If $\operatorname{cosec} \theta - \sin \theta = m$ and $\sec \theta - \cos \theta = n$,

Prove that $\left(m^2 n\right)^{\frac{2}{3}} + \left(n^2 m\right)^{\frac{2}{3}} = 1$.

OR

(b) Prove that : $\frac{\cot^3 \theta \cdot \sin^3 \theta}{(\cos \theta + \sin \theta)^2} + \frac{\tan^3 \theta \cdot \cos^3 \theta}{(\cos \theta + \sin \theta)^2} = \frac{\sec \theta \operatorname{cosec} \theta - 1}{\operatorname{cosec} \theta + \sec \theta}$

35. If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points then prove that the other two sides are divided in the same ratio.

Using the above result, solve the following problem :

XY is drawn parallel to the base QR of a ΔPQR intersecting PQ at X and PR at Y. If $PQ = 4 QX$ and $YR = 2$ cm, find PY.

SECTION-E

(Section E consists of 3 Case based questions of 4 marks each).

36. A group of friends wanted to play cards with two identical packs together. While shuffling the cards, three cards are dropped. The rest of the cards are shuffled and one card is drawn at random. Assuming that the dropped cards were a Queen of hearts, one Ten of Spades and an Ace of Clubs, answer the following questions :



- (i) Find the probability that the drawn card is a face card. (1)
- (ii) Find the probability that the drawn card is either a king or a queen. (1)
- (iii) (a) Do you think the probability of getting a Queen was higher if none of the cards were dropped? Justify your answer. (2)

OR

- (iii) (b) Find the probability that the drawn card is a Jack. Compare it with the probability when none of the cards were dropped. In which case is the probability of getting a Jack higher?

37. Aditi plantations have two rectangular fields of the same width but different lengths. They are required to plant 168 trees in the smaller field and 462 trees in the larger field. In both fields, the trees will be planted in the same number of rows but in different numbers of columns.

- (i) What is the maximum number of rows in which the trees can be planted in each of the fields? (1)
- (ii) If the trees are planted in the number of rows obtained in part (i), how many columns will each field have? (1)
- (iii) (a) If the total cost of planting trees in one column is ₹ 500, then find the cost to plant the trees in a smaller field. (2)

OR

- (iii) (b) If the total cost of planting trees in one column is ₹ 500, then find the cost to plant the trees in a larger field.

38. Ms. Jaya is the owner of a famous amusement park in Delhi NCR. The ticket charge for the park is ₹ 250 for children and ₹ 400 for adults. Generally, she does not go to the park and it is managed by the team of staff. One day, Ms.

Jaya decided to randomly check the park and went there. When she checked the cash counter, she found that 480 tickets were sold and ₹ 1,35,000 was collected.

Answer the following questions :

- (i) Let the number of children visited be x and the number of adults visited be y . Represent the given information with the correct system of equations that model the problem. $x + y = 480$ (1)
- (ii) Find the number of children who visited the park. (1)
- (iii) (a) How much amount would be collected if 300 children and 350 adults visited the park in a day. (2)

OR

- (iii) (b) In a day the total number of visitors, children and adults together is 750 and the total amount collected is ₹ 262500. What is the number of children and adults who visited the park?

□□□