HANSRAJ PUBLIC SCHOOL
SECTOR-6, PANCHKULA
CLASS-X, HALF YEARLY (2024-25)
SUBJECT- MATHEMATICS

Date- 17.09.24.
Time: 3 hours

Roll No. 33
Maximum Marks: 80

General Instructions:

1. This question Paper has 5 Sections A, B, C, D and E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub- parts of the values of 1, 1 and 2 marks each respectively.
7. All questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E
8. Draw neat figures wherever required. Take $\pi = 22/7$ wherever required if not stated.

SECTION A

Section A consists of 20 questions of 1 mark each.

Q.1. If product of 2 positive integers is 230 and H.C.F of these numbers is 23, what is their L.C.M

(a) 10 (b) 20 (c) 23 (d) 115

Q.2. If 2 lines are parallel then the pair of the equation representing these lines has:

(a) 1 solution (b) No solution (c) Infinite solution (d) Two solutions

Q.3. If 3, p, 13 are in A.P., then the value of p is

(a) 9 (b) 8 (c) 4 (d) 14

Q.4. The zeroes of the polynomial $x^2 - 3x - m(m+3)$ are

(a) m, m +3 (b) –m, m+3 (c) m, – (m + 3) (d) –m, – (m + 3)

Q.5. For what value of k, $2x+3y=4$, $(k+2)x+6y=3k+2$ will have infinitely many solutions.

(a) 1 (b) 4 (c) 5 (d) 2

Q.6. If 2 and α are zeroes of $x^2 - 3x + 2$, then the value of α is

(a) 2 (b) 3 (c) 1 (d) 5

Q.7 If $7\tan\theta = 4$, then the value of $\frac{7\sin\theta - 3\cos\theta}{7\sin\theta + 3\cos\theta}$

(a) $\frac{1}{7}$ (b) $\frac{5}{7}$ (c) $\frac{3}{7}$ (d) $\frac{1}{14}$

Q.8. If $\cos\theta = \frac{1}{2}$, $\sin\varphi = \frac{1}{2}$ then value of $\theta + \varphi$ is

(a) 30° (b) 60° (c) 90° (d) 120°

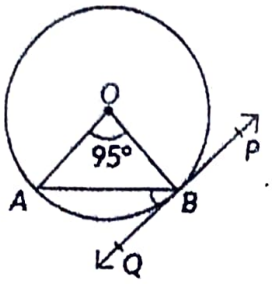
Q.9. Rohan's mother is 26 years older than him. The product of their ages 3 years from now will be 360, then Rohan's present age is:

(a) 10 years (b) 6 years (c) 7 years (d) 8 years

Q.10 If 4, x_1, x_2, x_3, 28 are in AP then x_3 =

(a) 19 (b) 23 (c) 22 (d) 21

Q.11. In the given figure, PQ is tangent to the circle centred at O. If ∠AOB = 95° then the measure of ∠ABQ will be



(a) 47.5° (b) 42.5° (c) 85° (d) 95°

Q.12. If sum of 3 terms of A.P is 15, then 2nd term out of these 3 is

(a) 3 (b) 2 (c) 5 (d) 4

Q.13. The distance between the points (0, 5) and (–5, 0) is:

(a) 5 units (b) $5\sqrt{2}$ units (c) $2\sqrt{5}$ units (d) 10 units

Q.14. The ratio in which the point (2, y) divides the line segment joining the points A (– 2, 2) and B (3, 7) is:

(a) 2 : 3 (b) 3 : 2 (c) 4 : 1 (d) 1 : 4

Q.15. The length of tangent drawn to a circle of radius 9 cm from a point 41 cm from the centre is

(a) 40 cm (b) 9 cm (c) 41 cm (d) 50 cm

Q.16. α, β are the roots of a quadratic equation such that $\alpha + \beta = 24$ and $\alpha - \beta = 8$. Then the quadratic equation having α and β as its roots is:

(a) $x^2 - 12x + 28 = 0$ (b) $x^2 - 24x + 126 = 0$

(c) $x^2 - 24x + 128 = 0$ (d) $x^2 - 24x - 128 = 0$

Q.17. If $\sin\theta + \sin^2\theta = 1$, then $\cos^2\theta + \cos^4\theta =$

(a) 2 (b) 3 (c) 4 (d) 1

Q.18. If sinA= x and cosA= y, then tanA is equal to:

(a) xy (b) x/y (c) y/x (d) 1/xy

DIRECTION: In the question number 19 and 20, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct option

Q.19 Assertion (A): $(2x - 1)^2 - 4x^2 + 5 = 0$ is not a quadratic equation
Reason (R): An equation of the form $ax^2 + bx + c = 0$, $a \neq 0$, where a, b, $c \in R$ is called a quadratic equation.

(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 and 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.

Q.20. Assertion (A): If the system of equations $2x + 3y = 7$ and $2ax + (a + b)y = 28$ has infinitely many solutions, then $2a - b = 0$.

Reason (R): The system of equations $3x - 5y = 9$ and $6x - 10y = 8$ has a unique solution.

(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 and 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.

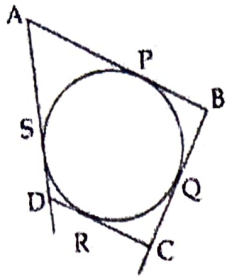
SECTION B

Section B consists of 5 questions of 2 marks each.

Q.21. Show that 12^n cannot end with the digit 0 or 5 for any natural number n.

Q.22. In the figure quadrilateral ABCD is drawn to circumscribe a circle.

Prove that AD + BC = AB + CD



Q.23. Find the point on y-axis which is equidistant from the points (5, -2) and (-3, 2).

Q.24. If the 17th term of an A.P. exceeds its 10th term by 7, find the common difference.

OR

Find how many two-digit numbers are divisible by 6.

Q.25. If $\sin\theta+\cos\theta = \sqrt{3}$, then find the value of $\sin\theta\cos\theta$.

OR

Evaluate: $2\tan^2 30° \sec^2 60° - 3\cos^2 60° \sin^2 30°$

SECTION C

Section C consists of 6 questions of 3 marks each.

Q.26. Given that $\sqrt{5}$ is irrational, prove that $3 + 2\sqrt{5}$ is irrational.

Q.27. If $\sqrt{3}\tan\theta = 1$, then find the value of $\sin^2\theta - \cos^2\theta$.

Q.28. The points A(4, 7), B (p, 3) and C(7, 3)are the vertices of a right triangle, right angled at B. Find the value of p.

OR

Find the centre of a circle passing through the points (6, −6), (3, −7) and (3 ,3).

Q.29. Prove that: $\frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta} = \tan\theta$

Q.30. The age of a man is twice the square of the age of his son. Eight years hence, the age of the man will be 4 years more than three times the age of his son. Find their present ages.

OR

The hypotenuse of a right-angled triangle is 6 cm more than twice the shortest side. If the third side is 2 cm less than the hypotenuse, find the sides of the triangle.

Q.31. Solve for x and y using elimination method:

$10x + 3y = 75$; $6x - 5y = 11$

SECTION D

Section D consists of 4 questions of 5 marks each.

Q.32. The total cost of a certain length of cloth is Rs 200. If the piece was 5 m longer and each meter of cloth costs Rs 2 less, the cost of the piece would have remained unchanged. How longer is the piece and what is its original rate per meter?

OR

Solve: $\frac{x-2}{x-3}+\frac{x-4}{x-5}=3\frac{1}{3}$ (where $x \neq 3,5$)

Q.33. Two tangents PA and PB are drawn to a circle with centre O from an external point P. Prove that $\angle APB = 2\ \angle OAB$.

OR

If the incircle of ΔABC touches the sides BC, CA and AB at P, Q and R respectively. Prove that $(AR + BP + CQ) = (AQ + BR + CP) = \frac{1}{2}(Perimeter \Delta ABC)$

Q.34. The production of TV sets in a factory increases uniformly by a fixed number every year. It produced 16000 sets in 6th year and 22600 in 9th year. Find the production during (i) first year (ii) 8th year (iii) first 6 years.

OR

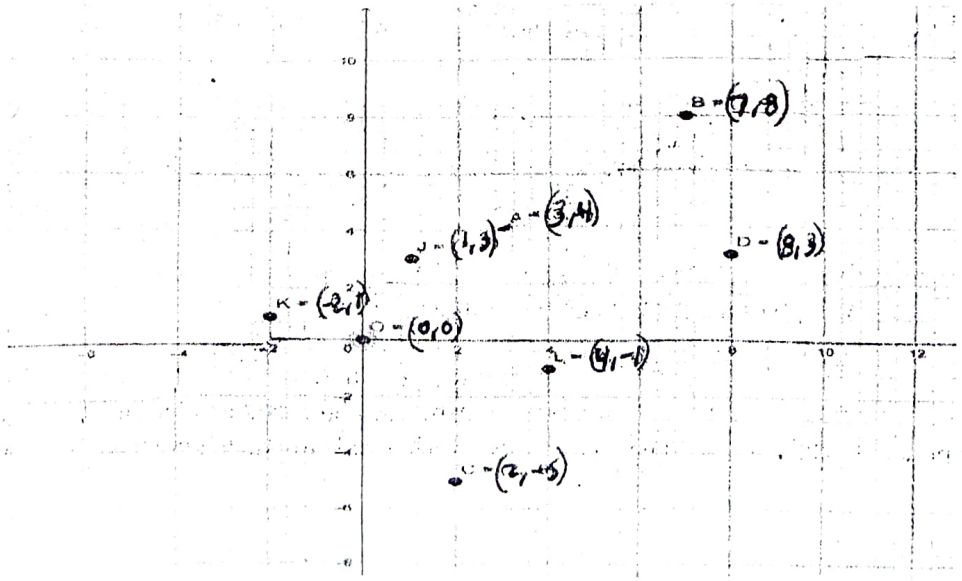
The 14th term of an AP is twice its 8th term. If its 6th term is –8 then find the sum of its first 20 terms.

Q.35. The monthly incomes of A and B are in the ratio 8 : 7 and their expenditures are in the ratio 19 : 16. If each saves ₹5000 per month, find the monthly income of each.

SECTION E

Case study-based questions are compulsory.

Q.36. A group of students is on a treasure hunt in a vast park. The park has been mapped out using a coordinate system with the park's entrance as the origin (0, 0). The treasure map provides clues in the form of coordinates.



(i) The first clue leads the students to point A(3, 4). The second clue leads them to point B(7, 8). How far did the students travel between these two points? (1)

(ii) After finding a clue at point C (2, –5) and point D (8, 3), the students suspect the treasure might be halfway between these points. Find the coordinates of the midpoint. (2)

OR

The students decide to create their own treasure hunt. They want to hide the treasure at a point equidistant from three trees located at points J (1, 3), K (–2, 1), and L (4, –1). How would they determine the coordinates of this point? (2)

(iii) How far are students from origin if they are at point L(4, –1)? (1)

Q.37. A young botanist is studying the growth pattern of a particular plant species. She observes that the plant grows a certain number of centimetres every day, following a consistent pattern.

Data:

- On the 1st day, the plant grew 2 cm.
- On the 2nd day, it grew 4 cm.
- On the 3rd day, it grew 6 cm.
- And so on.

Keeping the above situation in mind answer the following questions:

(i) If the growth pattern continues, how tall will the plant be on the 15th day? (1)

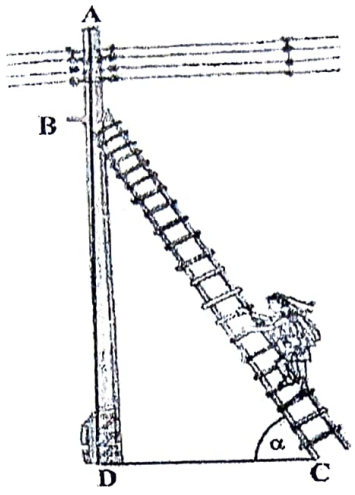
(ii) What is the total growth of the plant in the first 20 days? (1)

(iii) If the plant needs to reach a height of 120 cm to flower, on which day will it be ready to flower? (2)

OR

(iii) Due to a nutrient deficiency, the growth rate of the plant decreased by 1 cm per day starting from the 21st day. How tall will the plant be on the 30th day in this scenario? (2)

Q.38. Raj is an electrician in a village. One day power was not there in entire village and villagers called Raj to repair the fault. After thorough inspection he found an electric fault in one of the electric poles of height X m and he has to repair it. He needs to reach a point 1.3 m below the top of the pole to undertake the repair work.



Based on the above information answer the following questions.

(i) when the ladder is inclined at an angle of α such that $\sqrt{3}\tan\alpha + 2 = 5$ to the horizontal, then find the angle α? (1)

(ii) In the above situation (i), find the value of $\sin\alpha\cos\frac{\alpha}{2} - \cos\alpha\sin\frac{\alpha}{2}$. (1)

(iii) If BD = 3 cm and BC = 6 cm. Find α. (2)