

No. of Printed Pages : 10

Roll No.12.....

FAS / Mathematics / X / Half Yearly Examination / 2024-25

Time : 3 Hours]

[M.M. : 80 Marks

INSTRUCTIONS:—

- > This Question Paper has 5 Sections A–E.
- > Section A has 20 MCQs carrying 1 mark each.
- > Section B has 5 questions carrying 02 marks each.
- > Section C has 6 questions carrying 03 marks each.
- > Section D has 4 questions carrying 05 marks.
- > Section E has 3 case based integrated units of assessment (04 marks each) with subparts of the values of 1, 1 and 2 marks respectively.
- > 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.
- > Draw neat figures wherever required. Take $\pi = 22/7$ wherever required if not stated.

[SECTION–A]

[1×20=20 Marks]

1. The HCF of two consecutive positive integers is ?
(a) 0 (b) 1
(c) 4 (d) 2
2. If one zero of the quadratic polynomial $x^2 + 3x + k$ is 2. then the value of k is ?
(a) 10 (b) -10
(c) 5 (d) -5

3. The number of polynomials having zeroes -2 and 5 is:—
- (a) 1 (b) 2
(c) 3 (d) more than 3
4. If 2 and $\frac{1}{2}$ are zeroes of $px^2 + 5x + r$, then:—
- (a) $p = r = 2$ (b) $p = r = -2$
(c) $p = 2, r = -2$ (d) $p = -2, r = 2$
5. The value of k for which the system of equations $kx - y = 2$ and $6x - 2y = 3$ has a unique solution, is:—
- (a) $k = 3$ (b) $k \neq 3$
(c) $k \neq 0$ (d) $k = 0$
6. The pair of linear equations $y = 0$ and $y = -5$ has :—
- (a) one solution (b) two solutions
(c) infinitely many solutions (d) no solution
7. The value of K for which the lines $5x + 7y = 3$ and $15x + 21y = k$ coincide is—
- (a) 9 (b) 5
(c) 7 (d) 18
8. If one root of the equation $ax^2 + bx + c = 0$ is three times the other, then:—
- (a) $b^2 = 16ac$ (b) $b^2 = 3ac$
(c) $3b^2 = 16ac$ (d) $16b^2 = 3ac$
9. The quadratic equation $2x^2 - \sqrt{5}x + 1 = 0$ has:—
- (a) Two distinct real roots
(b) two equal real roots
(c) no real roots (d) more than 2 real roots.

10. The discriminant of the quadratic equation $(x + 2)^2 = 0$ is:—
- (a) -2 (b) 2
(c) 4 (d) 0
11. The sum of the first n odd natural numbers is:—
- (a) $2n$ (b) $2n + 1$
(c) n^2 (d) $n^2 - 1$
12. If the n^{th} term of an AP is $7n + 12$, then its common difference is:—
- (a) 12 (b) 5
(c) 7 (d) 19
13. If ΔABC and ΔDEF are similar such that $2AB = DE$ and $BC = 8$ cm, then $EF =$
- (a) 16 cm (b) 12 cm
(c) 8 cm (d) 4 cm
14. If ΔABC and ΔPQR are similar triangles such that $\angle A = 47^\circ$ and $\angle Q = 83^\circ$, then $\angle C =$
- (a) 50° (b) 60°
(c) 70° (d) 80°
15. The distance of the point $P(2,3)$ from the x - axis is:—
- (a) 2 (b) 3
(c) 1 (d) 5
16. If $\cos \theta = \frac{1}{2}$, then $\cos \theta - \sec \theta$ is equal to :—
- (a) $\frac{3}{2}$ (b) $-\frac{3}{2}$
(c) $\frac{\sqrt{3}}{2}$ (d) $-\frac{\sqrt{3}}{2}$

17. If $\tan A = \cot B$, then the value of $(A + B)$ is :—

- (a) 30° (b) 90°
(c) 180° (d) 45°

18. If $\sin 2A = 2 \sin A$ is true when $A =$

- (a) 0° (b) 30°
(d) 45° (d) 60°

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 :—

19. Assertion (A): If product of two numbers is 5780 and their HCF is 17, then their LCM is 340.

Reason (R): HCF is always a factor of LCM.

- (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.

20. Assertion (A): If the coordinates of the mid-points of sides AB and AC of ΔABC are D (3, 5) and E (-3, -3) respectively, then $BC = 20$ units.

Reason (R) : The line segment joining the mid-points of two sides of a triangle is parallel to the third side.

- (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]

(2×5=10 Marks)

21. A merchant has 120 litres of oil of one kind, 180 litres of another kind and 240 litres of third kind. He wants to sell the oil by filling the three kinds of oil in tins of equal capacity. What should be the greatest capacity of such a tin ?
22. Check whether 12^n can end with the digit 0 for any natural number n.
23. Find a quadratic polynomial, the sum and product of whose zeroes are $\sqrt{2}$ and $-\frac{3}{2}$ respectively.

OR

Find the zeroes of the quadratic polynomial $6x^2 - 3 - 7x$.

24. E and F are points on the sides of PQ and PR respectively of a ΔPQR . For $PE = 4$ cm, $QE = 4.5$ cm. $PF = 8$ cm and $RF = 9$ cm, state whether $EF \parallel QR$.

OR

ABCD is a trapezium in which $AB \parallel DC$ and its diagonals intersect eachother at the point O. Show that $\frac{AO}{BO} = \frac{CO}{DO}$.

25. Given $15 \cot A = 8$, find $\sin A$ and $\sec A$.

[SECTION - C]

(3×6=18 Marks)

26. Prove that $\sqrt{7}$ is irrational.
27. If α and β are the zeroes of the quadratic polynomial $f(x) = x^2 - x - 2$, find a polynomial whose zeroes are $2\alpha + 1$ and $2\beta + 1$.

28. Solve the following pair of linear equations :

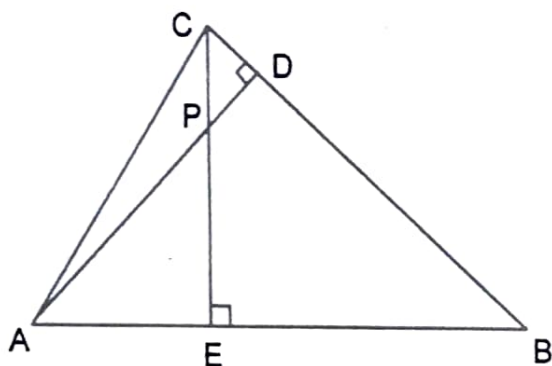
$$3x - 5y - 4 = 0 \text{ and } 9x = 2y + 7$$

29. Find two numbers whose sum is 27 and product is 182.

OR

Is the following situation possible ? If so, determine their present ages. The sum of the ages of two friends is 20 years. Four years ago, the product of their ages in years was 48.

30. In the given figure, altitudes AD and CE of $\triangle ABC$ intersect each other at the point P.



Show that:

(i) $\triangle AEP \sim \triangle CDP$

(ii) $\triangle ABD \sim \triangle CBE$

31. If $\tan(A + B) = \sqrt{3}$ and $\tan(A - B) = \frac{1}{\sqrt{3}}$; $0^\circ < A + B \leq 90^\circ$; $A > B$, find A & B.

OR

Evaluate the following :

$$\frac{5 \cos^2 60^\circ + 4 \sec^2 30^\circ - \tan^2 45^\circ}{\sin^2 30^\circ + \cos^2 30^\circ}$$

[SECTION - D]

(5×4 = 20 Marks)

32. Draw the graphs of the equations $x - y + 1 = 0$ and $3x + 2y - 12 = 0$. Determine the coordinates of the vertices of a triangle formed by these lines and the x - axis, and shade the triangular region.
33. A sum of Rs. 700 is to be used to give seven cash prizes to students of a school for their overall academic performance. If each prize is Rs. 20 less than its preceding prize, find the value of each of the prizes.

OR

If the sum of the first n terms of an AP is $4n - n^2$. what is the first term (S_1) ? What is the sum of first two terms ? What is the second term? Similarly find the 3rd, the 10th and the n^{th} terms.

34. Prove that if a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio.

OR

Sides AB and AC and median AD of a triangle ABC are respectively proportional to sides PQ and PR and median PM of another triangle PQR. Show that $\Delta ABC \sim \Delta PQR$.

35. Prove that—

$$\frac{\sin \theta - \cos \theta + 1}{\sin \theta + \cos \theta - 1} = \frac{1}{\sec \theta - \tan \theta}$$

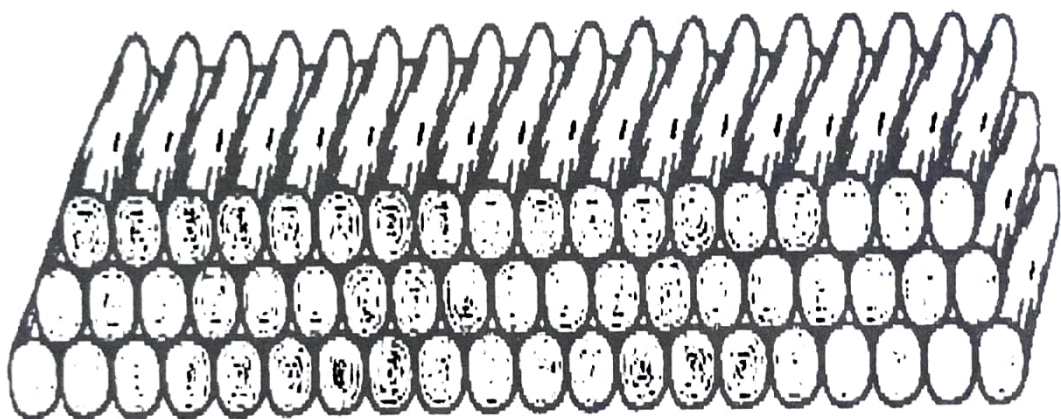
[SECTION - E]

(4×3 = 12 Marks)

Case study-based questions. All questions are compulsory.

36. Lumber is a significant natural resource that contributes jobs to the US economy. Lumber companies source their raw materials from privately-managed or government-leased forests. In order to process tree wood into

usable lumber, this raw material is transported to lumber mills, where it is cut to different sizes. Lumber is primarily used by the construction industry, though it can also be used to produce furniture, paper and pulp, and companies such as plywood. A lumber company stacks 200 logs in the following manner:



20 logs in the bottom row, 19 in the next row, 18 in the row next to it and so on as shown in the figure. Based on the above information answer the following questions: (1+1+2)

- (i) Verify that the no. of logs in each row forms an A.P.
- (ii) Find the number of rows in which 200 logs are stacked ?
- (iii) Find the number of logs in top row ?

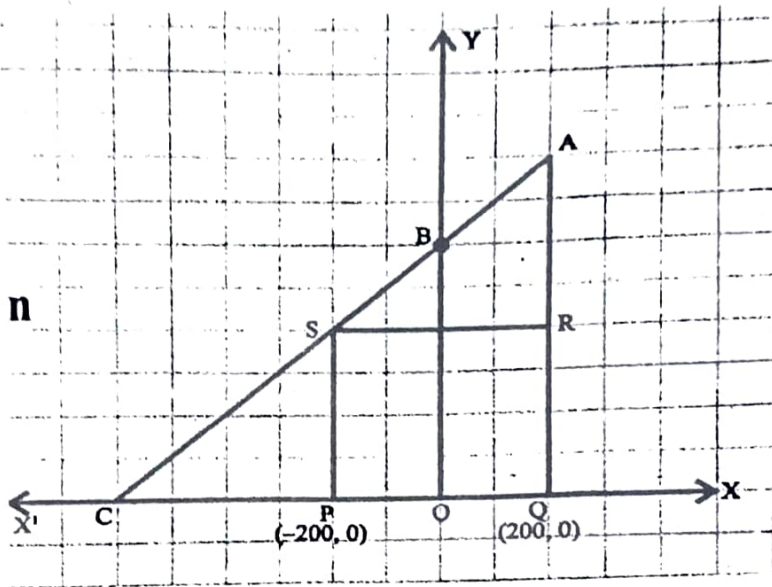
OR

Find the number of logs in middle rows?

37.

Jagdish has a field which is in the shape of a right-angled triangle AQC. He wants to leave a space in the form of a square PQRS inside the field for growing wheat and the remaining for growing vegetables (as shown in the figure). In the field, there is a pole marked as O.

[scale, x – axis : 1 unit = 100, y – axis : 1 unit = 100]



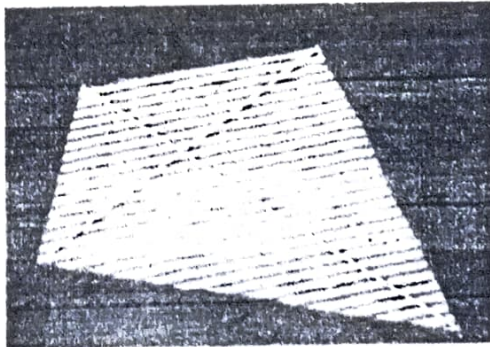
Based on the above information answer the following questions:

- (i) Taking O as origin, coordinates of P are $(-200, 0)$ and Q are $(200, 0)$. PQRS being a square, what are the coordinates of R and S?
- (ii) What is the area of square PQRS?
- (iii) What is the length of diagonal PR in square PQRS?

OR

If S divides CA in the ratio $k : 1$, what is the value of k , where point A is $(200, 800)$?

38. Rahul is studying in 10th standard. He is making a kite to fly it on ~~3 Sunday~~. Few questions came to his mind while making the kite. Give answers to his questions by looking at the figure.



Based on the above information answer the following questions:

- (i) At what angle Rahul tied the sticks to each other ?
- (ii) Which is the correct similarity criteria applicable for smaller triangles at the upper part of this kite ?
- (iii) If the sides of two similar triangles are in the ratio 4: 9. then find ratio of the corresponding medians ?

OR

If $\triangle ABC$ and $\triangle DEF$ are similar such that $AB=4\text{cm}$, $DE=6\text{ cm}$, $EF=9\text{ cm}$ and $FD=12\text{ cm}$, find the perimeter of $\triangle ABC$.