COMMON HALF YEARLY EXAMINATION - 2024

Standard X

Reg No.

MATHEMATICS

Time : 3.00 hrs Marks : 100

Part - I

I. Choose the correct answer: 14 x 1 = 14

1. If $n(A \times B) = 6$ and $A = \{1,3\}$ then $n(B)$ is
   a) 1 b) 2 c) 3 d) 6
2. $7^{4K} =$ _____ (mod 100)
   a) 1 b) 2 c) 3 d) 4
3. Given $F_1 = 1$, $F_2 = 3$ and $F_n = F_{n-1} + F_{n-2}$, then F_5 is
   a) 3 b) 5 c) 8 d) 11
4. $f(x) = (x+1)^3 - (x-1)^3$ represents a function which is
   a) linear b) cubic
   c) reciprocal d) quadratic
5. $\frac{3y-3}{y} \div \frac{7y-7}{3y^2}$ is
   a) $\frac{9y}{7}$ b) $\frac{9y^3}{(21y-21)}$ c) $\frac{21y^2-42y+21}{3y^3}$ d) $\frac{7(y^2-2y+1)}{y^2}$
6. Graph of the linear equation is a _____
   a) straight line b) circle
   c) parabola d) hyperbola
7. If A is a 2 x 3 matrix, B is a 3 x 4 matrix, how many columns does AB have _____.
   a) 3 b) 4 c) 2 d) 5
8. If in $\triangle ABC$, DE||BC, AB = 3.6 cm, AC = 2.4 cm and AD = 2.1 cm, then the length of AE is
   a) 1.4 cm b) 1.8 cm c) 1.2 cm d) 1.05 cm
9. The slope of the line joining (12,3), (4,a) is $\frac{1}{8}$, the value of 'a' is _____.
   a) 1 b) 4 c) 5 d) 2
10. A tangent is perpendicular to the radius at the
    a) centre b) point of contact
    c) infinity d) chord

11. If $a \cot\theta + b \operatorname{cosec}\theta = p$ and $b \cot\theta + a \operatorname{cosec}\theta = q$, then $p^2 - q^2$ is equal to

a) $a^2 - b^2$ b) $b^2 - a^2$ c) $a^2 + b^2$ d) $b - a$

12. The total surface area of cylinder whose radius is $\frac{1}{3}$ of its height is

a) $\frac{9\pi h^2}{8}$ sq.units b) $24\pi h^2$ sq.units

c) $\frac{8\pi h^2}{9}$ sq.units d) $\frac{56\pi h^2}{9}$ sq.units

13. The range of the first 10 prime number is

a) 9 b) 20 c) 27 d) 5

14. The average of first n natural numbers is

a) $\frac{n(n+1)}{2}$ b) $\frac{n}{2}$ c) $\frac{n+1}{2}$ d) n

Part - II

II. Answer any 10 questions. (Q.No.28 is compulsory) **10 x 2 = 20**

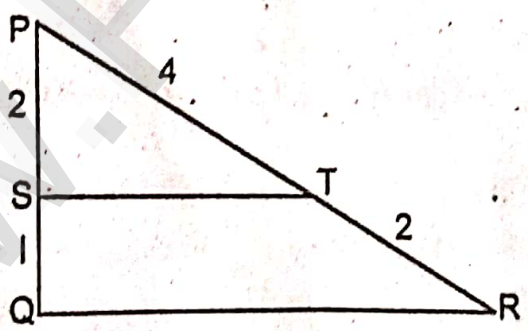
15. A relation R is given by the set $\{(x,y) / y = x + 3, x \in \{0,1,2,3,4,5\}\}$. Determine its domain and range.

16. If $f(x) = x^2 - 1$, $g(x) = x - 2$, find a if $gof(a) = 1$

17. Solve : $x^4 - 13x^2 + 42 = 0$

18. If A is of order p x q and B is order q x r, what is the order of AB and BA?

19. Show that $\Delta PST \sim \Delta PQR$



20. Find the middle terms of an A.P : 9, 15, 21, 27, ...183

21. Find A x B and A x A if A = {m, n}; B = ϕ
22. Find the slope of the line joining the points (sinθ, –cosθ) and (–sinθ, cosθ)
23. The hill in the form of a right triangle has its foot at (19, 3). The inclination of the hill to the ground is 45°. Find the equation of the hill joining the foot and top.
24. Find the angle of elevation of the top of a tower from a point on the ground, which is 30m away from the foot of a tower of height $10\sqrt{3}$ m
25. An aluminium sphere of radius 12 cm is melted to make a cylinder of radius 8 cm. Find the height of the cylinder.
26. Find the diameter of a sphere whose surface area is 154 m^2
27. Find the range and co-efficient of range of 63, 89, 98, 125, 79, 108, 117 and 68
28. Find the number of spherical lead shots, each of diameter 6 cm that can be made from a solid cuboid of lead having dimensions 24 cm x 22 cm x 12 cm

Part - III

III. Answer any 10 questions.(Q.No.42 is compulsory) **10 x 5 = 50**

29. A = {x ∈ N / 1 < x < 4}, B = {x ∈ W / 0 ≤ x < 2} and C = {x ∈ N/ x < 3} then verify that A x (B ∪ C) = (A x B) ∪ (A x C)
30. Let A = {0,1,2,3} and B = {1,3,5,7,9} be two sets. Let f : A → B be a function given by
    f(x) = 2x + 1. Represent this function
    i) by Arrow diagram
    ii) Table form
    iii) Set of ordered pair
    iv) In a graphical form
31. Find the sum of $9^3 + 10^3 + \ldots\ldots 21^3$
32. Find the values of m and n if its a perfect square:
    $x^4 - 8x^3 + mx^2 + nx + 16$
33. $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$. Show that $A^2 - 5A + 7I_2 = 0$
34. State and prove Pythagoras theorem.
35. Find the equation of the perpendicular bisector of the line joining the points A(–4, 2) and B(6, –4)
36. Find the area of quadrilateral whose vertices are at (–9,0), (–8,6), (–1,–2) and (–6,–3)

37. A man is standing on the deck of a ship, which is 40m about water level. He observes the angle of elevation of the top of a hill as 60^o and the angle of depression of the base of the hill as 30^o. Calculate the distance of the hill from the ship and the height of the hill. $(\sqrt{3} = 1.732)$
38. The radii of the circular ends of a frustrum which is 45 cm high are 28 cm and 7 cm. Find the volume of frustrum.
39. A capsule is in the shape of a cylinder with 2 hemisphere stuck to each of its ends. If the length of the entire capsule is 12 mm and the diameter of the capsule is 3 mm, how much medicine it can hold?
40. Find the co-efficient of variation of 24, 26, 33, 37, 29 and 31
41. Two dice are rolled once. Find the probability of getting an even number on the first die or the total of face sum 8.
42. 7 + 77 + 777 + ... Find the sum of this series.

Part - IV

IV. Answer all the questions. **2 x 8 = 16**

43. a) Construct a triangle similar to a given triangle LMN with its side equal to $\frac{4}{5}$ of the corresponding sides of the triangle LMN. (Scale factor $\frac{4}{5} < 1$)

(OR)

b) Draw a circle of diameter 6 cm from a point P which is 8 cm away from its centre. Draw the 2 tangents PA and PB to the circle and measure it.

44. a) Draw the graph XY = 24, X, Y > 0, Find,
    i) Y when X = 3
    ii) X when Y = 6.

(OR)

b) Draw the graph for the quadratic equation and state their nature of solutions.
$x^2 - 9x + 20 = 0$

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