CLASS : 10

Register Number

COMMON HALF YEARLY EXAMINATION, 2025-26

MATHEMATICS

Time Allowed : 3.00 Hours] [Max. Marks : 100

PART – I

I. Answer all of the following: 14x1=14

1. If there are 512 relations from a set A = {3, 4, 5} to a set B then the number of elements in B is
   a) 3 b) 2 c) 4 d) 8
2. If $f(x) = 2x^2$ and $g(x) = \frac{1}{3x}$, then fog is
   a) $\frac{3}{2x^2}$ b) $\frac{2}{3x^2}$ c) $\frac{2}{9x^2}$ d) $\frac{16}{x^2}$
3. The next term of the sequences $\frac{3}{16}, \frac{1}{8}, \frac{1}{12}, \frac{1}{18}$ ..... is
   a) $\frac{1}{24}$ b) $\frac{1}{27}$ c) $\frac{2}{3}$ d) $\frac{1}{81}$
4. Graph of Quadratic equation is a
   a) Straight line b) Circle c) Parabola d) Hyperbola
5. If A is a 2x3 matrix and B is a 3x4 matrix how many columns does AB have
   a) 3 b) 4 c) 2 d) 5
6. If in Triangles ABC and EDF , $\frac{AB}{DE} = \frac{BC}{FD}$ then they will be similar
   a) $\angle B = \angle E$ b) $\angle A = \angle D$ c) $\angle B = \angle D$ d) $\angle A = \angle F$
7. A tangent is perpendicular to the radius at the
   a) Centre b) Point of contact c) Infinity d) Chord
8. If (5,7) , (3, p) and (6, 6) are collinear, then the value of P is
   a) 3 b) 6 c) 9 d) 12
9. If the slope of the line PQ is $\frac{1}{\sqrt{3}}$ then slope of the perpendicular bisector of PQ is
   a) $\sqrt{3}$ b) $-\sqrt{3}$ c) $\frac{1}{\sqrt{3}}$ d) 0
10. $\tan\theta \cdot \operatorname{cosec}^2\theta - \tan\theta$ is equal to
    a) $\sec\theta$ b) $\cot^2\theta$ c) $\sin\theta$ d) $\cot\theta$
11. If the ratio of the height of a tower and the length of its shadow is $\sqrt{3}:1$, then the angle of elevation of the sun has measure.
    a) 45° b) 30° c) 90° d) 60°
12. The height of a right circular cone whose radius is 5cm and slant height is 13 cm will be
    a) 12 cm b) 10 cm c) 13 cm d) 5 cm
13. The standard derivation of a data is 3. It each value is multiplied by 5 then the new variance is
    a) 3 b) 15 c) 5 d) 225
14. If a letter is chosen at random from the english alphabets {a, b, c.....z} then the probability that the letter chosen consonants is
    a) $^{12}/_{13}$ b) $^{1}/_{13}$ c) $^{21}/_{26}$ d) $^{3}/_{26}$

PART - II

II. Answer any 10 questions. Question No. 28 is compulsory. 10x2=20

15. Let A = {1, 2, 3} and B = {x / x is a prime number less than 10} find A x B and B x A
16. If A = {-2, -1, 0, 1, 2} and f : A → B is an onto function defined by $f(x) = x^2 + x + 1$ then find B
17. Today is Tuesday. My uncle will come after 45 days. In which day my uncle will be coming?
18. Find the Common ratio of G.P whose 8th term is $\frac{1}{243}$ and the first term is 9.
19. Determine the nature roots $9x^2 - 24x + 16 = 0$
20. If $A = \begin{pmatrix} 0 & 4 & 9 \\ 8 & 3 & 7 \end{pmatrix}$, $B = \begin{pmatrix} 7 & 3 & 8 \\ 1 & 4 & 9 \end{pmatrix}$ find the Value of B - 5A
21. A man goes 18 m due east and then 24 m due north. Find the distance of his current position from the starting point?
22. Show that the points P(-1.5,3) , Q(6 ,-2), R(-3, 4) are collinear.
23. Prove that $\frac{\cos\theta}{1 + \sin\theta} = \sec\theta - \tan\theta$

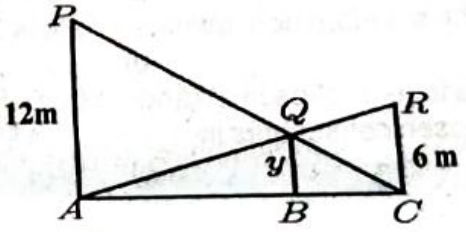
24. The slant height of a frustum of a cone is 5 cm and the radii of its ends are 4 cm and 1 cm. Find its curved surface area.
25. If the ratio of radii of two spheres is 4:7, find the ratio of their volumes.
26. Find the standard Deviation of first 21 natural numbers.
27. Two coins are tossed together What is probability of getting different faces on the coins?
28. Find the Equation of a straight line which is perpendicular to the line $3x - 7y = 12$ and passing through the point (6, 4)

PART - III

III. Answer the following any 10 questions. Q.No.42 is compulsory. **10x5=50**

29. A company has four categories of employees given by Assistants (A), Clerks (C), Managers (M) and an Executive Officer (E). The company provide ₹ 10,000, ₹ 25,000, ₹ 50,000 and ₹ 1,00,000 as salaries to the people who work in the categories A, C, M and E respectively. If A_1, A_2, A_3, A_4 and A_5 were Assistants; C_1, C_2, C_3, C_4 were Clerks; M_1, M_2, M_3 were managers and E_1, E_2 were Executive officers and if the relation R is defined by xRy, where x is the salary given to person y, express the relation R through an ordered pair and an arrow diagram.
30. If the function f : R R is defined by $f(x) = \begin{cases} 2x+7, & x<-2 \\ x^2-2, & -2 \le x < 3 \\ 3x-2, & x \ge 3 \end{cases}$

    then find the value of i) $f(4) + 2f(1)$ ii) $\frac{f(1) - 3f(4)}{f(-3)}$
31. The product of three consecutive terms of a geometric progession is 343 and their sum is $91/3$ Find the Three terms.
32. Find the sum of $10^3+11^3+12^3+\ldots\ldots\ldots\ldots+20^3$
33. The roots of the equation $x^2+6x-4 = 0$ are α, β find the Quadratic equation whose roots are α^2 and β^2
34. Find the Square root of $x^4 - 4x^3 + 8x^2 - 8x + 4$
35. If $A = \begin{pmatrix} 1 & 1 \\ -1 & 3 \end{pmatrix}$, $B = \begin{pmatrix} 1 & 2 \\ -4 & 2 \end{pmatrix}$, $C = \begin{pmatrix} -7 & 6 \\ 3 & 2 \end{pmatrix}$ verify that $A(B+C) = AB + AC$
36. let A (3, -4) , B (9, -4) , C (5, -7) and D (7, -7) show that ABCD is a Trapezium.
37. Find the equcation of a line passing through the point A (1, -4) and Perpendicular to the line joining points (2,5) and (4, 7)
38. From the top of a lighthouse, the angle of depression of two ships on the opposite sides of it are observed to be 30° and 60°. If the height of the lighthouse is h meters and the line joining the ships passes through the foot of the lighthouse, show that the distance between the ships is $\frac{4h}{\sqrt{3}}$ m.
39. The internal and external radii of a hollow hemispherical shell are 3m and 5m respectively. Find the T.S.A and C.S.A of the shell.
40. A solid circular cone of diameter 14 cm and height 8cm is melted to form a hollow sphere. It the external diameter of the sphere is 10cm, find the internal diameter.
41. A box contains cards numbered 3, 5, 7,9, ... 35, 37 A card us drawn at random from the box. Find the probability that the drawn card have either multiples of 7 or a prime number.
42. Two vertical poles of heights 12 m and 6 m are erected above a horizontal ground AC. Find the value of y.



PART - IV

IV. Answer the following. **2x8=16**

43. a) Construct a ΔPQR such tat QR = 6.5 cm $\angle P = 60°$ and the Altitude from P to QR is of length 4.5cm

    (OR)

    b) Draw a circle of diameter 6cm from a point P, which is 8 cm away from its centre. Draw the two tangents PA and PB to the circle and measure their length.
44. a) Draw the graph of $y = x^2-4x+3$ and use it to solve $x^2-6x+9=0$ **(OR)**

    b) The following tables shows the data about the number of pipes and the time taken to fill the same tank

No. of Pipes (x) :	2	3	6	9
Time taken (in min) (y) :	45	30	15	10

    Draw the graph for the above data and hence,

    i) Find the time taken to fiil the tank when five pipes are used

    ii) Find the number of pipes when the time is 9 minutes.