

**COMMON HALF YEARLY EXAMINATION-2024-25**

Time Allowed : 3.00 Hours]

**MATHEMATICS**

[Max. Marks : 100

**SECTION - I**

Answer all of the following:

14x1=14

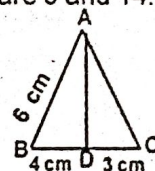
- If  $\{(a,8), (6,b)\}$  represents an identity function, then the value of  $a$  and  $b$  are respectively.  
a) (8,6)                      b) (8,8)                      c) (6,8)                      d) (6,6)
- If  $g = \{(1,1), (2,3), (3,5), (4,7)\}$  is a function given by  $g(x) = \alpha x + \beta$  then the values of  $\alpha$  and  $\beta$  are  
a) (-1,2)                      b) (2,-1)                      c) (-1,-2)                      d) (1,2)
- $\frac{1}{2}, 1, 2, 4, \dots$  in a Geometric Progression then the ratio is  
a) 2                              b)  $\frac{1}{2}$                               c) 1                              d) 4
- $7^{4x} \equiv \text{---} \pmod{100}$   
a) 1                              b) 2                              c) 3                              d) 4
- The G.C.D of  $a^m, a^{m+1}, a^{m+2}$  is  
a)  $a^m$                               b)  $a^{m+1}$                               c)  $a^{m+2}$                               d) 1
- The solution of  $(2x - 1)^2 = 9$  is equal to  
a) -1                              b) 2                              c) -1,2                              d) None of these
- If  $\triangle ABC$  is an isosceles triangle with  $\angle C = 90^\circ$  and  $AC = 5\text{cm}$ , then  $AB$  is  
a) 2.5 cm                      b) 5 cm                      c) 10 cm                      d)  $5\sqrt{2}$  cm
- Two poles of heights 6 m and 11 m stand vertically on a plane ground. If the distance between their feet is 12 m, What is the distance between their tops?  
a) 13 m                      b) 14 m                      c) 15 m                      d) 12.8 m
- If (5,7) (3,P) and (6,6) are collinear, then the value of P is  
a) 3                              b) 6                              c) 9                              d) 12
- $\tan\theta \operatorname{cosec}^2\theta - \tan\theta$  is equal to  
a)  $\sec\theta$                       b)  $\cot^2\theta$                       c)  $\sin\theta$                       d)  $\cot\theta$
- A spherical ball of radius  $r_1$  units is melted to make 8 new identical balls each of radius  $r_2$  units. Then  $r_1:r_2$  is  
a) 2:1                              b) 1:2                              c) 4:1                              d) 1:4
- If the radius of the base of a cone is tripled and the height is doubled then the volume is  
a) made 6 times                      b) made 18 times                      c) made 12 times                      d) Unchanged
- The range of the data 8,8,8,8,8,.....8 is  
a) 0                              b) 1                              c) 8                              d) 3
- If  $P(A) = 0.42$ , then  $P(\text{not } A) = ?$   
a) 0                              b) 1                              c) 0.58                              d) 0.52

**PART - II**

Answer any 10 questions. Question No. 28 is compulsory.

10x2=20

- 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.
- If  $f(x) = 3x - 2$ ,  $g(x) = 2x + k$  and if  $f \circ g = \text{gof}$ , then find the value of  $K$ .
- If  $13824 = 2^a \times 3^b$  then find  $a$  and  $b$ .
- Find the number of terms in the A.P 3,6,9,12,.....111
- Write down the quadratic equation in general form for which sum and product of the roots are 9 and 14.
- Find the excluded values of expressions.  $\frac{y}{y^2 - 25}$
- In the fig. AD is the bisector of  $\angle A$  If  $BD = 4$  cm,  $DC = 3$  cm and  $AB = 6$  cm, Find  $AC$ .
- If the points  $P(-1.5, 3)$ ,  $Q(6, -2)$ ,  $R(-3, 4)$  are collinear.



23. Find the equation of a line whose intercepts on the X and Y axes are 4, -6.
24. Prove that  $\sqrt{\frac{1 + \sin \theta}{1 - \sin \theta}} = \sec \theta + \tan \theta$
25. The curved surface area of a right circular cylinder of height 14 cm is  $88 \text{ cm}^2$ . Find the diameter of the cylinder.
26. If the ratio of radii of two spheres is 4 : 7, Find the ratio of their volumes.
27. Find the range and Co-efficient of range of the following data, 63, 89, 98, 125, 79, 108, 117, 68
28. Simplify :  $\frac{x^2}{x-y} + \frac{y^2}{y-x}$

### PART - III

Answer any 10 questions. Question No. 42 is compulsory.

10x5=50

29. Let  $A = \{x \in W / x < 2\}$ ,  $B = \{x \in N / 1 < x \leq 4\}$  and  $C = \{3, 5\}$  verify that  $A \times (B \cup C) = (A \times B) \cup (A \times C)$
30. If the function  $f: R \rightarrow R$  is defined by
- $$f(x) = \begin{cases} 2x + 7; & x < -2 \\ x^2 - 2; & -2 \leq x < 3 \\ 3x - 2; & x \geq 3 \end{cases}$$
- i)  $f(4)$                       ii)  $f(-2)$                       (iii)  $\frac{f(1) - 3f(4)}{f(-3)}$
31. Rekha has 15 square colour papers of sizes 10 cm, 11 cm, 12cm, ....., 24cm. How much area can be decorated with these colour papers?
32. If  $9x^4 + 12x^3 + 28x^2 + ax + b$  is a perfect square, Find the values of a and b.
33. If  $A = \begin{bmatrix} 5 & 2 & 9 \\ 1 & 2 & 8 \end{bmatrix}$   $B = \begin{bmatrix} 1 & 7 \\ 1 & 2 \\ 5 & -1 \end{bmatrix}$  Verify that  $(AB)^T = B^T A^T$
34. State and prove Pythagoras Theorem.
35. If vertices of a quadrilateral are at A (-5, 7), B (-4, K), c (-1, -6) and D (4, 5) and its area is 72 sq. units. Find the value of K.
36. If the vertices of a  $\triangle ABC$  are A(6, 2), B (-5, -1) and C (1, 9) then find the equation of median.
37. From the window (h meters high above the ground) of a house in a street, the angles of elevation and depression of the top and the foot of another house on the opposite side of the street are  $\theta_1$  and  $\theta_2$  respectively. Show that the height of the opposite house is  $h \left[ 1 + \frac{\cot \theta_2}{\cot \theta_1} \right]$
38. A capsule is in the shape of a cylinder with two 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?
39. A cone of height 48 cm and radius 12 cm is made up of modeling clay by a student. Another student reshapes it in the form of sphere. Find the radius of the sphere.
40. Find the co-efficient of variation of 24, 26, 33, 37, 29, 31
41. Two dice are rolled together. Find the probability of getting a doublet or sum of faces as 4.
42. Find the sum of n terms of the series  $5 + 55 + 555 + \dots$

### PART - IV

Answer all the questions.

2x8=16

43. a) Construct a triangle  $\triangle PQR$  such that  $QR = 5 \text{ cm}$ ,  $\angle P = 30^\circ$  and the altitude from P to QR is of length 4.2 cm. (OR)
- b) Draw the two tangents from a point which is 5 cm away from the centre of a diameter 6 cm. Also, measure the lengths of the tangents.
44. a) Draw the graph of  $x^2 + x - 12 = 0$  and State the nature of their solution. (OR)
- b) A bus is travelling at a uniform speed of 50 Km / hr. Draw the distance - time graph and hence find.
- i) The constant of Variation.                      ii) How far will it travel in 90 minutes?
- iii) The time required to cover a distance of 300 Km from the graph.