COMMON HALF YEARLY EXAMINATION - 2024

Standard X

Reg.No. | | | | | | |

MATHEMATICS

Time : 3.00 hrs Part – I *Marks : 100*

14 x 1 = 14

I. Choose the correct answer:

1. If the ordered pairs (a +2, 4) and (5,2a +b) are equal then (a,b) is
   a) (2, –2) b) (5,1) c) (2,3) d) (3, –2)
2. If f : A → B is a bijective function and if n(B) = 7, then n(A) is equal to
   a) 7 b) 49 c) 1 d) 14
3. If the HCF of 65 and 117 is expressible in the form of 65m –117, then the value of m is
   a) 4 b) 2 c) 1 d) 3
4. The value of $(1^3 + 2^3 + 3^3 + ... + 15^3) - (1 + 2 + 3 + ... + 15)$ is
   a) 14400 b) 14200 c) 14280 d) 14520
5. The solution of the system x + y – 3z = –6, –7y + 7z=7, 3z = 9 is
   a) x = 1,y = 2,z = 3 b) x = –1, y = 2,z = 3
   c) x = –1, y = –2, z = 3 d) x = 1, y = –2, z = 3
6. If number of columns and rows are not equal in a matrix then it is said to be a
   a) diagonal matrix b) rectangular matrix
   c) square matrix d) identity matrix
7. If ΔABC is an isosceles triangle with ∠C = 90° and AC = 5 cm, then AB is
   a) 2.5 cm b) 5 cm c) 10 cm d) $5\sqrt{2}$ cm
8. How many tangents can be drawn to the circle from an exterior point?
   a) one b) two c) infinite d) zero
9. The point of intersection of 3x – y = 4 and x + y = 8 is
   a) (5,3) b) (2,4) c) (3,5) d) (4,4)
10. 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°
11. The height of a right circular cone whose radius is 5 cm and slant height is 13 cm will be
    a) 12 cm b) 10 cm c) 13 cm d) 5 cm
12. A solid sphere of radius x cm is melted and cast into a shape of a solid cone of same radius. The height of the cone is
    a) 3x cm b) x cm c) 4x cm d) 2x cm
13. The standard deviation of a data is 3. If each value is multiplied by 5 then the new variance is
    a) 3 b) 15 c) 5 d) 225

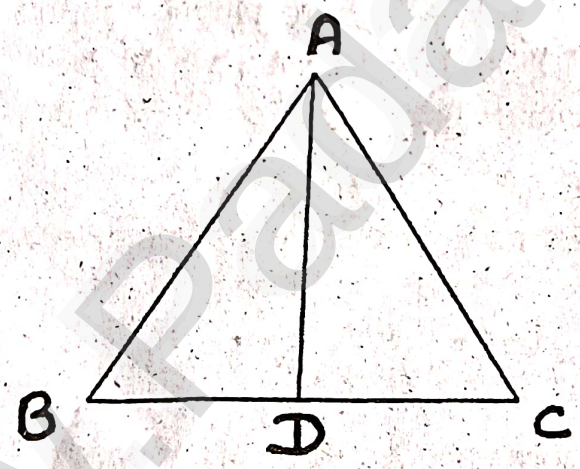
14. The probability of sure event is

a) 0 b) 1 c) 2.5 d) 3.2

Part - II

II. Answer any 10 questions. (Q.No.28 is compulsory) 10 x 2 = 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. Represent the function f = {(1,2),(2,2),(3,2),(4, 3),(5, 4)} through
    i) an arrow diagram
    ii) a table form
    iii) a graph
17. Solve : $8x \equiv 1 \pmod{11}$
18. Determine the nature of the roots for the quadratic equation $15x^2 + 11x + 2 = 0$
19. If $A = \begin{bmatrix} \sqrt{7} & -3 \\ -\sqrt{5} & 2 \\ \sqrt{3} & -5 \end{bmatrix}$, then find the transpose of –A.
20. In the Fig, AD is the bisector of ∠A. If BD =4 cm, DC=3 cm and AB = 6 cm, find AC.



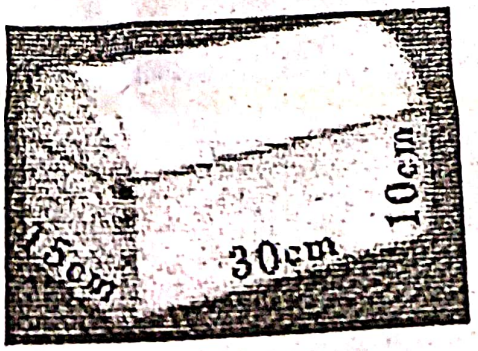
21. Show that the straight lines 2x + 3y – 8 = 0 and 4x + 6y +18 = 0 are parallel.
22. Find the area of the triangle formed by the points (–10, –4), (–8, –1) and (–3, –5)
23. Prove that $\cot\theta + \tan\theta = \sec\theta \operatorname{cosec}\theta$
24. A tower stands vertically on the ground. From a point on the ground, which is 48 m away from the foot of the tower, the angle of elevation of the top of the tower is 30°. Find the height of the tower.
25. If the circumference of a conical wooden piece is 484 cm then find its volume when its height is 105 cm.
26. Find the range and coefficient of range of the following data: 25, 67, 48, 53, 18, 39, 44.

27. A die is rolled and a coin is tossed simultaneously. Find the probability that the die shows an odd number and the coin shows a head.
28. Find the sum of $3 + 1 + 1/3 + \ldots\ldots \infty$

Part - III

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

29. $A = \{x \in W \mid x < 2\}$, $B = \{x \in N \mid 1 < x \leq 4\}$ and $C = \{3,5\}$. Verify that $A \times (B \cup C) = (A \times B) \cup (A \times C)$
30. The function 't' which maps temperature in Celsius (C) into temperature in Fahrenheit (F) is defined by t(C) = F where $F = \frac{9}{5}C + 32$. Find
    i) t(0) ii) t(28) iii) t(–10)
    iv) the value of C when t(C) = 212
    v) the temperature when the Celsius value is equal to the Farenheit value
31. In a G.P. the product of three consecutive terms is 27 and the sum of the product of two terms taken at a time is $\frac{57}{2}$. Find the three terms.
32. Rekha has 15 square colour papers of sizes 10 cm, 11 cm, 12 cm,..., 24 cm. How much area can be decorated with these colour papers?
33. $36x^4 - 60x^3 + 61x^2 - mx + n$ find the values of m and n if the polynomial is perfect square.
34. State and Prove Pythagoras Theorem.
35. Find the value of k, if the area of a quadrilateral is 28 sq.units, whose vertices are taken in the order
    (–4, –2), (–3, k), (3, –2) and (2, 3)
36. Find the equation of a straight line through the point of intersection of the lines 8x + 3y = 18, 4x + 5y = 9 and bisecting the line segment joining the points (5,–4) and (–7,6).
37. The angle of elevation of the top of a cell phone tower from the foot of a high apartment is 60° and the angle of depression of the foot of the tower from the top of the apartment is 30° . if the height of the apartment is 50 m, find the height of the cell phone tower. According to radiations control norms, the minimum height of a cell phone tower should be 120 m. State if the height of the above mentioned cell phone tower meets the radiation norms.
38. A jewel box is in the shape of a cuboid of dimensions 30 cm x 15 cm x 10 cm surmounted by a half part of a cylinder as shown in the figure. Find the volume of the box.



39. An aluminium sphere of radius 12 cm is melted to make a cylinder of radius 8 cm. Find the height of the cylinder.

40. The time taken (in minutes) to complete a homework by 8 students in a day are given by 38, 40, 47, 44, 46, 43, 49, 53. Find the coefficient of variation.

41. Three unbiased coins are tossed once. Find the probability of getting atmost 2 tails or atleast 2 heads.

42. If $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, show that $A^2 - (a + d)A = (bc - ad) I_2$

Part - IV

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

43. a) Construct a triangle similar to a given triangle PQR with its sides equal to 2/3 of the corresponding sides of the triangle POR (scale factor 2/3 < 1) .

(OR)

b) Construct a ΔPQR in which PQ = 8 cm, $\angle R = 60°$ and the median RG from R to PQis 5.8 cm. Find the length of the altitude from R to PQ.

44. a) A school announces that for a certain competitions, the cash price will be distributed for all the participants equally as show below

i) Find the constant of variation.

ii) Graph the above data and hence, find how much will each participant get if the number of participants are 12.

No. of participants (x)	2	4	6	8	10
Amount for each participants in Rs (y)	180	90	60	45	36

(OR)

b) Draw the graph of $y = x^2 + x - 2$ and hence solve $x^2 + x - 2 = 0$.

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