COMMON HALF YEARLY EXAMINATION - 2022

Standard X

Reg.No. | | | | | | |

A

MATHEMATICS

Part - I

Time : 3.00 hrs *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 The sum of the exponents of the prime factors in the prime factorization of 1729 is
a) 1 b) 2 c) 3 d) 4

4 If 6 times of 6^{th} term of an AP is equal to 7 times of 7^{th} term then the 13^{th} term of the AP is
a) 0 b) 6 c) 7 d) 13

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 Graph of a linear equation is a
a) straight line b) circle c) parabola d) hyperbola

7 A tangent is perpendicular to the radius at the
a) centre b) point of contact c) infinity d) chord

8 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

9 When proving that a quadrilateral is a parallelogram by using slopes you must find
a) the slopes of two sides b) the slopes of two pair of opposite sides
c) the lengths of all sides d) both the lengths and slopes of two sides

10. The value of $\sin^2\theta + \frac{1}{1+\tan^2\theta}$ is equal to
a) $\tan^2\theta$ b) 1 c) $\cot^2\theta$ d) 0

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. 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

13. The range of data 8, 8, 8, 8, 8, 8, ... 8 is
a) 0 b) 1 c) 8 d) 3

14. Which of the following is incorrect?
a) $P(A) > 1$ b) $0 \le P(A) \le 1$ c) $P(\phi) = 0$ d) $P(A) + P(\bar{A}) = 1$

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. Represent the function $f = \{(1,2), (2,2), (3,2), (4,3), (5,4)\}$ through
    i) an arrow diagram ii) a table form
17. 'a' and 'b' are two positive integers such that $a^b \times b^a = 800$. Find 'a' and 'b'.
18. Simplify : $\frac{4x^2y}{2z^2} \times \frac{6xz^3}{20y^4}$
19. Determine the quadratic equations, whose sum and product of roots are −9 and 20.
20. What length of ladder is needed to reach a height of 7 ft. along the wall when the base of the ladder is 4 ft from the wall? Round off your answer to the next tenth place.
21. Determine whether the set of points (a, b+c), (b, c+a) and (c, a+b) are collinear.
22. Find the equation of the line passing through the point (3, −4) and having slope $-\frac{5}{7}$.
23. Find the angle of elevation of the top of a tower from a point on the ground, which is 30 m away from the foot of a tower of height $10\sqrt{3}$ m.
24. Prove the following identity : $\frac{\cos\theta}{1+\sin\theta} = \sec\theta - \tan\theta$
25. The curved surface area of a right circular cylinder of height 14 cm is 88 cm^2. Find the diameter of the cylinder.
26. A cone of height 24 cm is made up of modeling clay. A child reshapes it in the form of a cylinder of same radius as cone. Find the height of the cylinder.
27. Find the range and co-efficient of range of the following data : 25, 67, 48, 53, 18, 39, 44
28. Solve : $5x \equiv 4 \pmod 6$

(OR)

Write the sample space for tossing three coins using tree diagram.

Part - III

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

29. Let $A = \{x \in N / 1 < x < 4\}$, $B = \{x \in W / 0 \leq x < 2\}$ and $C = \{x \in N / x < 3\}$, then verify that $A \times (B \cap C) = (A \times B) \cap (A \times C)$
30. Consider the functions f(x), g(x), h(x) as given below. Show that (fog)oh = fo(goh)
    $f(x) = x - 1$, $g(x) = 3x + 1$ and $h(x) = x^2$
31. If $P_1^{x1} \times P_2^{x2} \times P_3^{x3} \times P_4^{x4} = 113400$ where P_1, P_2, P_3, P_4 are primes in ascending order and x_1, x_2, x_3, x_4 are integers, find the value of P_1, P_2, P_3, P_4 and x_1, x_2, x_3, x_4.
32. The product of three consecutive terms of a Geometric Progression is 343 and their sum is $\frac{91}{3}$. Find the three terms.
33. If α and β are the roots of $x^2 + 7x + 10 = 0$, find the values of

    (i) $\alpha - \beta$ ii) $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$ iii) $\frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha}$

34. Find the G.C.D of the following polynomials $12(x^4 - x^3)$, $8(x^4 - 3x^3 + 2x^2)$ whose L.C.M is $24x^3 (x - 1) (x - 2)$
35. State and prove Pythagores theorem.
36. Find the value of 'k', if the area of quadrilateral is 28 sq.units, whose vertices are (-4,-2), (-3, k), (3, -2) and (2, 3)
37. A man is watching a boat speeding away from the top of a tower. The boat makes an angle of depression of 60° with man's eye when at a distance of 200 m from the tower. After 10 seconds, the angle of depression becomes 45°. What is the approximate speed of the boat (in Km/hr), assuming that it is sailing in still water? $(\sqrt{3} = 1.732)$
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 cylindrical glass with diameter 20 cm has water to a height of 9 cm. A small cylindrical metal of radius 5 cm and height 4 cm is immersed it completely. Calculate the raise of the water in the glass?
40. The marks scored by 10 students In a class test are 25, 29, 30, 33, 35, 37, 38, 40, 44, 48. Find the standard deviation.
41. Two dice are rolled together. Find the probability of getting a doublet or sum of faces as 4.
42. If $A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ and $I = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$, show that $A^2 - (a + d) A = (bc - ad) I_2$

(OR)

Find the equation of a line through the given pair of points (2, 3) and (-7, -1)

Part - IV

IV. Answer the following: **2 x 8 = 16**

43. a) Construct a ΔPQR which the base PQ = 4.5 cm, $\angle R = 35°$ and the medium from R to RG is 6 cm.

(OR)

b) Draw the two tangents from a point which is 10 cm away from the centre of a circle of radius 5 cm. Also, measure the lengths of the tangents.

44. a) The following table 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	20

Draw the graph for the above data and hence

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

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

(OR)

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

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