

MODEL HALF YEARLY EXAM-2022-23X-MATHEMATICSMARKS: 100
TIME: 3 HRS.SECTION-A14 × 1 = 14Choose the correct Answer:

- 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) $(3, -2)$
- Euclid's division lemma states that for positive integers a and b , there exist unique integers q and r such that $a = bq + r$, where r must satisfy.
 A) $1 < r < b$ (B) $0 < r < b$ (C) $0 \leq r < b$ (D) $0 < r \leq b$
- An A.P. consists of 31 terms. If its 16th term is m , then the sum of all the terms of this A.P. is.
 A) $16m$ (B) $62m$ (C) $31m$ (D) $\frac{31}{2}m$
- If $(x-6)$ is the HCF of $x^2 - 2x - 24$ and $x^2 - kx - 6$ then the value of k is
 A) 3 (B) 5 (C) 6 (D) 8
- Graph of a quadratic equation is a —
 A) parabola (B) circle (C) straight line (D) hyperbola
- Find the matrix X if $2X + \begin{bmatrix} 1 & 3 \\ 5 & 7 \end{bmatrix} = \begin{bmatrix} 5 & 7 \\ 9 & 5 \end{bmatrix}$
 A) $\begin{bmatrix} -2 & -2 \\ 2 & -1 \end{bmatrix}$ (B) $\begin{bmatrix} 2 & 2 \\ 2 & -1 \end{bmatrix}$ (C) $\begin{bmatrix} 1 & 2 \\ 2 & 2 \end{bmatrix}$ (D) $\begin{bmatrix} 2 & 1 \\ 2 & 2 \end{bmatrix}$
- In $\triangle LMN$, $\angle L = 60^\circ$, $\angle M = 50^\circ$. If $\triangle LMN \sim \triangle PQR$ then the value of $\angle R$ is
 A) 40° (B) 70° (C) 30° (D) 110°
- A tangent is perpendicular to the radius at the
 A) centre (B) point of contact (C) infinity (D) chord

9. If $(5, 7)$, $(3, p)$ and $(6, 6)$ are collinear, then the value of p is.
 A) 3 B) 6 C) 9 D) 12
10. If $(\sin \alpha + \operatorname{cosec} \alpha)^2 + (\cos \alpha + \sec \alpha)^2 = k + \tan^2 \alpha + \cot^2 \alpha$ then the value of k is.
 A) 9 B) 7 C) 5 D) 3
11. A Tower is 60m high. Its shadow is x meters shorter when the sun's altitude is 45° than when it has been 30° , then x is equal to.
 A) 41.92m B) 43.92m C) 43m D) 45.6m.
12. The ratio of the volumes of a cylinder, a cone and a sphere if each has the same diameter and same height is.
 A) 1:2:3 B) 2:1:3 C) 1:3:2 D) 3:1:2
13. Variance of first 20 natural numbers is
 A) 32.25 B) 44.25 C) 33.25 D) 30.
14. Which of the following is incorrect?
 A) $P(A) > 1$ B) $0 \leq P(A) \leq 1$ C) $P(\phi) = 0$ D) $P(A) + P(\bar{A}) = 1$.

SECTION-B

Answer the following any ten two marks

$10 \times 2 = 20$

Q.No. 28 is compulsory.

15. Let $A = \{1, 2, 3\}$ and $B = \{x \mid x \text{ is a prime number less than } 10\}$
 Find $A \times B$ and $B \times A$.
16. Find $f \circ g$ and $g \circ f$ when $f(x) = 2x + 1$.
17. 'a' and 'b' are two positive integers such that $a^b \times b^a = 800$
 Find a and b.
18. In a G.P 729, 243, 81, ... find t_7 .

19. Find the excluded value of $\frac{7P+2}{8P^2+13P+5}$
20. If $A = \begin{bmatrix} 5 & 4 & -2 \\ \frac{1}{2} & \frac{3}{4} & \sqrt{2} \\ 1 & 9 & 4 \end{bmatrix}$, $B = \begin{bmatrix} -7 & 4 & -3 \\ \frac{1}{4} & \frac{7}{2} & 3 \\ 5 & -6 & 9 \end{bmatrix}$ find $4A-3B$.
21. Find the length of the tangent drawn from a point whose distance from the centre of a circle is 5cm and radius of the circle is 3cm.
22. Find the equation of a line passing through the point (3, -4) and having slope $-\frac{5}{7}$.
23. Prove that $\sqrt{\frac{1+\cos\theta}{1-\cos\theta}} = \operatorname{cosec}\theta + \cot\theta$
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. The volume of a solid right circular cone is 11088cm^3 . If its height is 24cm then find the radius of the cone.
26. If the range and the smallest value of a set data are 36.8 and 13.4 respectively, then find the largest value.
27. Two coins are tossed together. What is the probability of getting different faces on the coins?
28. If the total surface area of a cone of radius 7cm is 704cm^2 then find height and slant height.

SECTION-C

Answer the following five marks.

$10 \times 5 = 50$

Q. No. 42 is compulsory.

29. Let $A = \{x \in \mathbb{N} \mid x < 2\}$, $B = \{x \in \mathbb{N} \mid 1 < x \leq 4\}$ and $C = \{3, 5\}$
Verify that $A \times (B \cap C) = (A \times B) \cap (A \times C)$.

30. If $f(x) = 2x+3$, $g(x) = 1-2x$ and $h(x) = 3x$.
prove that $f \circ (g \circ h) = (f \circ g) \circ h$.
31. In an A.P, sum of four consecutive terms is 28 and the sum of their squares is 276. Find the four numbers.
32. Find the sum to n terms of the series $5+55+555+\dots$.
33. Find the GCD of the polynomials x^3+x^2-x+2 and $2x^3-5x^2+5x-3$.
34. If $A = \begin{bmatrix} 1 & 1 \\ -1 & 3 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 2 \\ -4 & 2 \end{bmatrix}$, $C = \begin{bmatrix} -7 & 6 \\ 3 & 2 \end{bmatrix}$ verify that
 $A(B+C) = AB+AC$.
35. State and prove "Angle bisector Theorem".
36. D is the mid point of side BC and $AE \perp BC$. If $BC = a$, $AC = b$, $AB = c$, $ED = x$, $AD = p$ and $AE = h$ prove that
(i) $b^2 = p^2 + ax + \frac{a^2}{4}$ (ii) $c^2 = p^2 - ax + \frac{a^2}{4}$
(iii) $b^2 + c^2 = 2p^2 + \frac{a^2}{2}$.
37. let $A(3, -4)$, $B(9, -4)$, $C(5, -7)$ and $D(7, -7)$.
Show that ABCD is a trapezium.
38. If $\frac{\cos^2 \theta}{\sin \theta} = p$ and $\frac{\sin^2 \theta}{\cos \theta} = q$, then prove that
 $p^2 q^2 (p^2 + q^2 + 3) = 1$.
39. From the top of a 12m high building, the angle of elevation of the top of a cable tower is 60° and the angle of depression of its foot is 30° .
Determine the height of the tower.

40. A metallic sphere of radius 16cm is melted and recast of solids from it to small spheres each of radius 2 cm. How many small spheres can be obtained?
41. The marks scored by 10 students in a class test are 25, 29, 30, 33, 37, 38, 40, 44, 48. Find the standard deviation.
42. Two dice are rolled once. Find the probability of getting an odd number on the first die or a total of face sum 7.

SECTION-D.

$$\underline{2 \times 8 = 16}$$

Answer the following eight marks.

43. a) Construct a ΔABC such that $AB = 5.5\text{cm}$, $\angle C = 25^\circ$ and the altitude from C to AB is 4cm.
- (OR)
- b) Draw a circle of diameter 6cm from a point P. Which is 8cm away from its centre. Draw the two tangents PA and PB to the circle and measure their lengths
44. a) Draw a graph of $xy = 24$, $x, y > 0$ using the graph find (i) y when $x = 3$ and (ii) x when $y = 6$.
- (OR)
- b) Draw the graph of $y = x^2 + x - 2$ and hence solve $x^2 + x - 2 = 0$.

Question

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