

Half Yearly Model Question paper 2019-20**Subject: Mathematics****Marks: 100****Class: X****Time: 2:30hrs****I. CHOOSE THE CORRECT ANSWER:****(14 × 1 = 14)**

- 1) $A = \{a, b, p\}$, $B = \{2, 3\}$, $C = \{p, q, r, s\}$ then $n[(A \cup C) \times B] =$
 (1) 8 (2) 20 (3) 12 (4) 16
- 2) If the HCF of 65 and 117 is expressible in the form of $65m - 117$, then the value of m is
 (1) 1 (2) 2 (3) 3 (4) 4
- 3) If 6 times of 6th term of an A.P is equal to 7 times of the 7th term, then the 13th term of the A.P is
 (1) 0 (2) 6 (3) 7 (4) 1
- 4) What should be added to make $x^4 + 144$ a perfect square?
 (1) $144x^2$ (2) $12x^2$ (3) $24x^2$ (4) $32x^2$
- 5) The solution of $(2x - 1)^2 = 9$ is equal to
 (1) - 1 (2) 2 (3) - 1, 2 (4) none of these
- 6) A tangent is perpendicular to the radius at the
 (1) centre (2) point of contact (3) infinity (4) chord
- 7) In right angled triangle ABC, $\angle B = 90$ and $AD \perp BC$, then
 (1) $BD \cdot CD = BC^2$ (2) $AB \cdot AC = BC^2$ (3) $BD \cdot CD = AD^2$ (4) $AB \cdot AC = AD^2$
- 8) The area of triangle formed by the points (- 3, 5), (5, 6) and (5, - 6) is
 (1) 46 (2) 32 (3) - 32 (4) 64
- 9) If (5, 7), (3, p) and (6, 6) are collinear, then the value of p is
 (1) 3 (2) 6 (3) 9 (4) 12
- 10) $(1 + \tan\theta + \sec\theta)(1 + \cot\theta - \operatorname{cosec}\theta) =$
 (1) 0 (2) 1 (3) 2 (4) - 1
- 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
 (1) 45 (2) 30 (3) 90 (4) 60
- 12) Variance of first 20 natural numbers is
 (1) 32.25 (2) 44.25 (3) 33.25 (4) 30
- 13) If two solid hemispheres of same base radius r units are joined together along their bases, then curved surface bases of this new solid is
 (1) $4\pi r^2$ (2) $6\pi r^2$ (3) $3\pi r^2$ (4) $8\pi r^2$
- 14) Which of the following is incorrect?
 (1) $P(A) > 1$ (2) $0 \leq P(A) \leq 1$ (3) $P(\phi) = 0$ (4) $P(A) + P(\bar{A}) = 1$

II. ANSWER THE FOLLOWING: (Qn. No. 28 is compulsory)**(10 × 2 = 20)**

- 15) If $A \times B = \{(3, 2), (3, 4), (5, 2), (5, 4)\}$ then find A and B.
- 16) If $f(x) = 3x - 2$, $g(x) = 2x + k$ and if $f \circ g = g \circ f$, then find the value of k .
- 17) Solve $5x \equiv 4 \pmod{6}$.

- 18) If $3 + k$, $18 - k$ and $5k + 1$ are in A.P, then find k .
- 19) Find the excluded values of $\frac{x}{x^2+1}$
- 20) Find the square root of $4x^2 + 20x + 25$
- 21) The perimeter of two similar triangles ΔABC and ΔPQR are respectively 36cm and 24cm. If $PQ = 10$ cm, find AB .
- 22) If the points $A(-3, 9)$, $B(a, b)$ and $C(4, -5)$ are collinear and if $a + b = 1$, then find a and b .
- 23) The line r passes through the points $(-2, 2)$ and $(5, 8)$ and the line s passes through the points $(-8, 7)$ and $(-2, 0)$. Is the line r perpendicular to s ?
- 24) Prove that $\frac{\cos\theta}{1+\sin\theta} = \sec\theta - \tan\theta$
- 25) A player is sitting on the top of a tower of height 20m observes the angle of depression of a ball lying on the ground as 60° . Find the distance between the foot of the tower and the ball.
- 26) Find the standard deviation of first 21 natural numbers.
- 27) If the total surface area of a cone of radius 7cm is 704cm^2 , then find its slant height.
- 28) A and B are two events such that, $P(A) = 0.42$, $P(B) = 0.48$ and $P(A \cap B) = 0.16$. Find $P(\text{not } A)$.

III. ANSWER THE FOLLOWING: (Qn. No. 42 is compulsory)

(10 × 5 = 50)

- 29) Let $A = \{x \in \mathbb{N} \mid 1 < x < 4\}$, $B = \{x \in \mathbb{W} \mid 0 \leq x < 2\}$ and $C = \{x \in \mathbb{N} \mid x < 3\}$ then verify that $A \times (B \cap C) = (A \times B) \cap (A \times C)$.
- 30) Find x if $\text{gff}(x) = \text{fgg}(x)$, given $f(x) = 3x + 1$ and $g(x) = x + 3$.
- 31) Find the GCD of $6x^3 - 30x^2 + 60x - 48$ and $3x^3 - 12x^2 + 21x - 18$.
- 32) Show that the points $A(1, -4)$, $B(2, -3)$ and $C(4, -7)$ form a right angled triangle and check whether they satisfies Pythagoras theorem.
- 33) If $\frac{\cos\theta}{1+\sin\theta} = \frac{1}{a}$, then prove that $\frac{a^2-1}{a^2+1} = \sin\theta$
- 34) The horizontal distance between two buildings is 70m. The angle of depression of the top of the first building when seen from the top of the second building is 45° . If the height of the second building is 120 m, find the height of the first building..
- 35) The sum of three consecutive terms that are in A.P is 27 and their product is 288. Find the three terms. .
- 36) Find the sum of $15^2 + 16^2 + 17^2 + \dots + 28^2$.
- 37) If $A = \begin{pmatrix} 1 & 2 & 1 \\ 2 & -1 & 1 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & -1 \\ -1 & 4 \\ 0 & 2 \end{pmatrix}$ show that $(AB)^T = B^T A^T$.
- 38) State and Prove Baudhyana Theorem.
- 39) A cylindrical drum has a height of 20 cm and base radius of 14 cm. Find its curved surface area and the total surface area.

- 40) A right circular cylindrical container of base radius 6cm and height 15cm is full of ice cream. The ice cream is to be filled in cones of height 9cm and base radius 3cm, having a hemispherical cap. Find the number of cones needed to empty the container.
- 41) Find the mean and variance of the first n natural numbers
- 42) A card is drawn from a pack of 52 cards. Find the probability of getting a king or a heart or a red card.

IV. ANSWER THE FOLLOWING:**(2 × 8 = 16)**

- 43) a) There are 12 pieces of five, ten and twenty rupee currencies whose total value is Rs.105. When first 2 sorts are interchanged in their numbers its value will be increased by Rs.20. Find the number of currencies in each sort. **(Or)**
- b) Draw the graph of $y = x^2 + 4x + 3$ and hence find the roots of $x^2 + x + 1 = 0$.
- 44) a) A vertical stick of length 6cm casts a shadow 400cm long on the ground and at the same time a tower casts a shadow 28cm long. Using similarity, find the height of the tower. **(Or)**
- b) Construct a triangle ΔPQR such that $QR = 5\text{cm}$, $\angle P = 30^\circ$ and the altitude from P to QR is of length 4.2cm?

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