SUN TUITION CENTER - VILLUPURAM

PUBLIC MODEL EXAM -2023

Standard 10

Time Allowed : 3 Hours | Mathematics | Maximum Marks : 100

PART - I (Marks : 14)

Note : i) Answer all the questions $14 \times 1 = 14$

ii) Choose the most suitable answer from the given four alternatives and write the option code with the corresponding answer.

1) $A = \{a, b, p\}, B = \{2, 3\}, C = \{p, q, r, s\}$ then $n[(A \cup C) \times B]$ is

a) 8 b) 20 c) 12 d) 16

2) If $A = 2^{65}$ and $B = 2^{64} + 2^{63} + 2^{62} \ldots + 2^{0}$ ....ch of the following is true?

a) B is 2^{64} more than A b) A and B are equal

c) B is larger than A by 1 d) A is larger than B by 1

3) Which of the following should be added to make $x^4 + 64$ a perfect square

a) $4x^2$ b) $16x^2$ c) $8x^2$ d) $-8x^2$

4) If ΔABC is an isosceles triangle with $\angle C = 90°$ and $AC = 5$ cm, then AB is

a) 2.5 cm b) 5 cm c) 10 cm d) $5\sqrt{2}$ cm

5) When proving that a quadrilateral is a trapezium, it is necessary to show

a) Two sides are parallel. b) Two parallel and two non-parallel sides.

c) Opposite sides are parallel. d) All sides are of equal length.

6) $(\sin\alpha + \operatorname{cosec}\alpha)^2 + (\cos\alpha + \sec\alpha)^2 = k + \tan^2\alpha + \cot^2\alpha$, then the value of k is equal to

a) 9 b) 7 c) 5 d) 3

7) The total surface area of a cylinder whose radius is $\frac{1}{3}$ of its height is

a) $\frac{9\pi h^2}{8}$ sq. units b) $24\pi h^2$ sq. units c) $\frac{8\pi h^2}{9}$ sq. units d) $\frac{56\pi h^2}{9}$ sq. units

8) Which of the following is not a measure of dispersion?

a) Range b) Standard deviation c) Arithmetic mean d) Variance

9) Find the matrix x if $2X + \begin{pmatrix} 1 & 3 \\ 5 & 7 \end{pmatrix} = \begin{pmatrix} 5 & 7 \\ 9 & 5 \end{pmatrix}$

a) $\begin{pmatrix} -2 & -2 \\ 2 & -1 \end{pmatrix}$ b) $\begin{pmatrix} 2 & 2 \\ 2 & -1 \end{pmatrix}$ c) $\begin{pmatrix} 1 & 2 \\ 2 & 2 \end{pmatrix}$ d) $\begin{pmatrix} 2 & 1 \\ 2 & 2 \end{pmatrix}$

10) If $f : A \to B$ is a bijective function and if $n(B) = 7$, then $n(A)$ is equal to

a) 7 b) 49 c) 1 d) 14

11) The number of points of intersection of the quadratic polynomial $x^2 + 4x + 4$ with the X axis is

a) 0 b) 1 c) 0 or 1 d) 2

12) The electric pole subtends an angle of 30° at a point on the same level as its foot. At a second point 'b' metres above the first, the depression of the foot of the pole is 60°. The height of the pole (in metres) is equal to

a) $\sqrt{3}\,b$ b) $\frac{b}{3}$ c) $\frac{b}{2}$ d) $\frac{b}{\sqrt{3}}$

13) The least number that is divisible by all the numbers from 1 to 10 (both inclusive) is

a) 2025 b) 5220 c) 5025 d) 2520

14) A purse contains 10 notes of ₹2000, 15 notes of ₹500, and 25 notes of ₹200. One note is drawn at random. What is the probability that the note is either a ₹500 note or ₹200 note?

a) $\frac{1}{5}$ b) $\frac{3}{10}$ c) $\frac{2}{3}$ d) $\frac{4}{5}$

PART - II (Marks : 20)

Answer any TEN questions. **Question No. 28 is compulsory. Each questions carries 2 marks.** $10 \times 2 = 20$

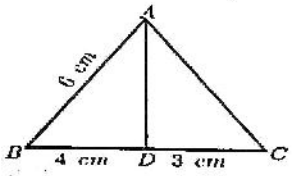
15) If $f(x) = x^2 - 1$, $g(x) = x - 2$ find a, if $g \circ f(a) = 1$.

16) $a_n = \begin{cases} n(n+3)\,; n \in N & \text{is odd} \\ n^2 + 1\,; n \in N & \text{is even} \end{cases}$

Find the eleventh and eighteenth terms.

17) Find the zeroes of the expression $x^4 - 13x^2 + 42$

18) In the Fig. AD is the bisector of $\angle A$. If BD = 4 cm, DC = 3 cm and AB = 6 cm, find AC.



19) The volumes of two cones of same base radius are 3600 cm³ and 5040 cm³. Find the ratio of heights.

20) The standard deviation and mean of a data are 6.5 and 12.5 respectively. Find the coefficient of variation.

21) What is the probability that a leap year selected at random will contain 53 Saturdays.

22) 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.

23) If $1 + 2 + 3 + \ldots\ \ldots + n = 666$ then find n.

24) If a matrix has 18 elements, what are the possible orders it can have? What if it has 6 elements?

25) Find the LCM and HCF of 408 and 170 by applying the fundamental theorem of arithmetic.

26) Find the intercepts made by the line $3x - 2y - 6 = 0$ on the coordinate axes.

27) Prove that $\frac{\sin A}{1+\cos A} = \frac{1-\cos A}{\sin A}$

28) Let A = {1, 2, 3} and B = { x | x is a prime number less than 10}. Find $A \times B$ and $B \times A$.

PART - III (Marks : 50)

Answer any TEN questions. **Question No. 42 is compulsory. Each questions carries 5 marks.** $10 \times 5 = 50$

29) 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

30) If the function f is defined by $f(x) = \begin{cases} x+2 & ; \quad x > 1 \\ 2 & ; -1 \le x \le 1 \\ x-1 & ; -3 < x < -1 \end{cases}$

find the values of i) $f(3)$ ii) $f(0)$ iii) $f(-1.5)$ iv) $f(2) + f(-2)$

31) Find the sum to n terms of the series $5 + 55 + 555 + \ldots \ldots$

32) If $9x^4 - 12x^3 + 28x^2 + ax + b$ is a perfect square, find the values of a and b.

33) Show that in a triangle, the medians are concurrent.

34) 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).

35) As observed from the top of a 60 m high lighthouse from the sea level, the angles of depression of two ships are 28° and 45°. If one ship is exactly behind the other on the same side of the lighthouse, find the distance between the two ships. (tan 28°=0.5317)

36) A container open at the top is in the form of a frustum of a cone of height 16 cm with radii of its lower and upper ends are 8 cm and 20 cm respectively. Find the cost of milk which can completely fill a container at the rate of ₹ 40 per litre.

37) A card is drawn from a pack of 52 cards. Find the probability of getting a king or a heart or a red card.

38) The data in the adjacent table depicts the length of a person forehand and their corresponding height. Based on this data, a student finds a relationship between the height (y) and the forehand length(x) as y = ax + b, where a, b are constants.
i) Check if this relation is a function.
ii) Find a and b. iii) Find the height of a person whose forehand length is 40 cm. iv) Find the length of forehand of a person if the height is 53.3 inches.

Length 'x' of forehand (in cm)	Height 'y' (in inches)
35	56
45	65
50	69.5
55	74

39) In an A.P., sum of four consecutive terms is 28 and the sum of their squares is 276. Find the four numbers.

40) If $A = \begin{pmatrix} 3 & 1 \\ -1 & 2 \end{pmatrix}$ show that $A^2 - 5A + 7I_2 = 0$.

41) Find the equation of a straight line passing through the point P$(-5, 2)$ and parallel to the line joining the points Q$(3, -2)$ and R$(-5, 4)$

42) Find the mean and variance of the first n natural numbers.

PART - IV (Marks : 16)

Answer both questions . Each questions carries 8 marks. $2 \times 8 = 16$

43) a) Draw a tangent to the circle from the point P having radius 3.6 cm, and centre at O. Point P is at a distance 7.2 cm from the centre .

(OR)

b) Construct a triangle similar to a given triangle PQR with its sides equal to $\frac{7}{3}$ of the corresponding sides of the triangle PQR (scale factor $\frac{7}{3} > 1$).

44) a) Draw the graph of $y = x^2 + 4x + 3$ and hence find the roots of $x^2 + x + 1 = 0$

(OR)

b) Graph the following linear function $y = \frac{1}{2}x$. Identify the constant of variation and verify it with the graph. Also i) find y when $x = 9$
ii) find x when $y = 7.5$

****