

MAYILADUTHURAI DISTRICT

MATHEMATICS - MODEL EXAM - FEB - 2023

10th Standard

Maths

Date : 20-Mar-23

Reg.No. :

Draw a diagram if required

Rough work if any should be done at the bottom of the answer sheet

Exam Time : 03:00:00 Hrs

Total Marks : 100

14 x 1 = 14

I) Answer all the questions

Choose the correct answer

All the questions carry equal marks

1) If $A = \{1, 2\}$, $B = \{1, 2, 3, 4\}$, $C = \{5, 6\}$ and $D = \{5, 6, 7, 8\}$ then state which of the following statement is true..

(a) $(A \times C) \subset (B \times D)$ (b) $(B \times D) \subset (A \times C)$ (c) $(A \times B) \subset (A \times D)$ (d) $(D \times A) \subset (B \times A)$

2) 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

3) The first term of an arithmetic progression is unity and the common difference is 4. Which of the following will be a term of this A.P.

(a) 4551 (b) 10091 (c) 7881 (d) 13531

4) $\frac{3y-3}{y} \div \frac{7y-7}{3y^2}$ is

(a) $\frac{9y}{7}$ (b) $\frac{9y^2}{(21y-21)}$ (c) $\frac{21y^2-42y+21}{3y^2}$ (d) $\frac{7(y^2-2y+1)}{y^2}$

5) The square root of $\frac{256x^8y^4z^{10}}{25x^6y^6z^6}$ is equal to

(a) $\frac{16}{5} \left| \frac{x^2z^4}{y^2} \right|$ (b) $16 \left| \frac{y^2}{x^2z^4} \right|$ (c) $\frac{16}{5} \left| \frac{y}{xz^2} \right|$ (d) $\frac{16}{5} \left| \frac{xz^2}{y} \right|$

6) If in $\triangle ABC$, $DE \parallel BC$, $AB = 3.6$ cm, $AC = 2.4$ cm and $AD = 2.1$ cm then the length of AE is

(a) 1.4 cm (b) 1.8 cm (c) 1.2 cm (d) 1.05 cm

7) How many tangents can be drawn to the circle from an exterior point?

(a) one (b) two (c) infinite (d) zero

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) The equation of a line passing through the origin and perpendicular to the line $7x - 3y + 4 = 0$ is

- (a) $7x - 3y + 4 = 0$ (b) $3x - 7y + 4 = 0$ (c) $3x + 7y = 0$ (d) $7x - 3y = 0$

10) 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) $\frac{b}{\sqrt{3}}$

11) The height and radius of the cone of which the frustum is a part are h_1 units and r_1 units respectively. Height of the frustum is h_2 units and radius of the smaller base is r_2 units. If $h_2 : h_1 = 1:2$ then $r_2 : r_1$ is

- (a) 1:3 (b) 1:2 (c) 2:1 (d) 3:1

12) The probability a red marble selected at random from a jar containing p red, q blue and r green marbles is

- (a) $\frac{q}{p+q+r}$ (b) $\frac{p}{p+q+r}$ (c) $\frac{p+q}{p+q+r}$ (d) $\frac{p+r}{p+q+r}$

13) If $f(x) = \frac{1}{x}$, and $g(x) = \frac{1}{x^3}$ then $f \circ g \circ (y)$, is:

- (a) $\frac{1}{y^8}$ (b) $\frac{1}{y^6}$ (c) $\frac{1}{y^4}$ (d) $\frac{1}{y^3}$

14) The ratio of the volumes of two spheres is 8 : 27. If r and R are the radii of sphere respectively, Then $(R - r) : r$ is _____

- (a) 1:2 (b) 1:3 (c) 2:3 (d) 4:9

II) Answer any 10 questions

10 x 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) Solve $8x \equiv 1 \pmod{11}$

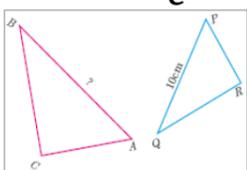
17) Which term of an A.P. 16,11,6,1, ... is 54?

18) If $A = \begin{bmatrix} 5 & 2 & 2 \\ -\sqrt{17} & 0 & 7 \\ 8 & 3 & 1 \end{bmatrix}$ then verify $(A^T)^T = A$

19) Write each of the following expression in terms of $\alpha + \beta$ and $\alpha\beta$.

$$\frac{1}{\alpha^2\beta} + \frac{1}{\beta^2\alpha}$$

20) The perimeters of two similar triangles ABC and PQR are respectively 36 cm and 24 cm. If PQ = 10 cm, find AB



21) A man goes 18 m due east and then 24 m due north. Find the distance of his current position from the starting point?

22) What is the slope of a line whose inclination is 30° ?

23) prove that $\frac{\sin A}{1+\cos A} = \frac{1-\cos A}{\sin A}$

24) The radius of a conical tent is 7 m and the height is 24 m. Calculate the length of the canvas used to make the tent if the width of the rectangular canvas is 4 m?

25) If the total surface area of a cone of radius 7cm is 704 cm^2 , then find its slant height.

26) The range of a set of data is 13.67 and the largest value is 70.08. Find the smallest value

27) If $f(x) = 2x - 3$ and $f(x) = x$ then find x

28) Find the equation of the straight line parallel to x - axis and passing through the mid-point of the line segment joining (1, -5) and (4, 2)

II) Answer any 10 questions

10 x 5 = 50

Q. No. 42 is compulsory

29) Consider the functions $f(x)$, $g(x)$, $h(x)$ as given below. Show that $(f \circ g) \circ h = f \circ (g \circ h)$ in each case.

$$f(x) = x^2, g(x) = 2x \text{ and } h(x) = x + 4$$

30) Let $A =$ The set of all natural numbers less than 8, $B =$ The set of all prime numbers less than 8, $C =$ The set of even prime number. Verify that $A \times (B - C) = (A \times B) - (A \times C)$

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

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?

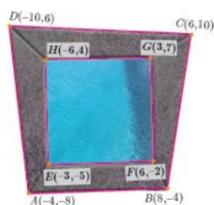
33) Find the GCD of each pair of the following polynomials

$$12(x^4 - x^3), 8(x^4 - 3x^3 + 2x^2) \text{ whose LCM is } 24x^3(x - 1)(x - 2)$$

34) If $A = \begin{bmatrix} 1 & 2 & 1 \\ 2 & -1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -1 \\ -1 & 4 \\ 0 & 2 \end{bmatrix}$ show that $(AB)^T = B^T A^T$

35) 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.

36) In the figure, the quadrilateral swimming pool shown is surrounded by concrete patio. Find the area of the patio.

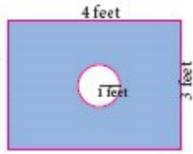


37) From the top of a tower 50 m high, the angles of depression of the top and bottom of a tree are observed to be 30° and 45° respectively. Find the height of the tree. ($\sqrt{3} = 1.732$)

38) A vessel is in the form of a hemispherical bowl mounted by a hollow cylinder. The diameter is 14 cm and the height of the vessel is 13 cm. Find the capacity of the vessel.

39) 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.

40) Some boys are playing a game, in which the stone thrown by them landing in a circular region (given in the figure) is considered as win and landing other than the circular region is considered as loss. What is the probability to win the game?



41) Prove that the Square of a hypateneous of a right angle triangle is equat to the sum of other two sides

42) Find the square root of the expression $\frac{x^2}{y^2} - \frac{10x}{y} + 27 - \frac{10y}{x} + \frac{y^2}{x^2}$

IV) Answer all the questions

2 x 8 = 16

43) a) Discuss the nature of solutions of the following quadratic equations.

$$x^2 + 2x + 5 = 0$$

(OR)

b) Nishanth is the winner in a Marathon race of 12 km distance. He ran at the uniform speed of 12 km/hr and reached the destination in 1 hour. He was followed by Aradhana, Ponmozhi, Jeyanth, Sathya and Swetha with their respective speed of 6 km/hr, 4 km/hr, 3 km/hr and 2 km/hr. And, they covered the distance in 2 hrs, 3 hrs, 4 hrs and 6 hours respectively. Draw the speed-time graph and use it to find the time taken to Kaushik with his speed of 2 4 km/hr.

44) a) Draw a triangle ABC of base BC = 8 cm, $\angle A = 60^\circ$ and the bisector of $\angle A$ meets BC at D such that BD = 6 cm.

(OR)

b) 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.
