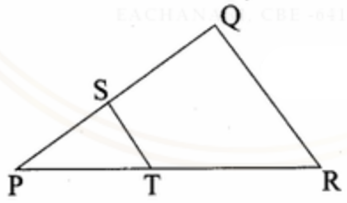
Subject : Mathematics
Class : X std

Sree Ayyappa Tuition Centre
Eachanari, Coimbatore - 641021
Centum Coaching Question Paper - 01

Time : 3 Hrs
Marks: 100

I. Choose the most suitable answers: 14 X 1 = 14

1. If {(a, 8),(6, b)}represents an identity function, then the value of a and b are :
   (1) (8, 6) (2) (8, 8) (3) (6, 8) (4) (6, 6)
2. If f = { (6, 3), (8, 9), (5, 3), (-1, 6) }, then the pre-images of 3 are
   (1) 5 and-1 (2) 6 and 8 (3) 8 and-1 (4) 6 and 5
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?
   (1) 4551 (2) 10091 (3) 7881 (4) 13531
4. Which one of the following is not true?
   (1) A sequence is a real valued function defined on N.
   (2) Every function represents a sequence.
   (3) A sequence may have infinitely many terms.
   (4) A sequence may have a finite number of terms.
5. If the number of columns and rows are not equal in a matrix then it is said to be a
   (1) diagonal matrix (2) rectangular matrix (3) square matrix (4) identity matrix
6. Which of the following is correct.
   (i) Every polynomial has finite number of multiples
   (ii) LCM of two polynomials of degree "2" may be a constant
   (iii) HCF of 2 polynomials may be a constant
   (iv) Degree of HCF of two polynomials is always less than degree of L.C.M.
   (1) (i) and (iii) (2) (iii) and (iv) (3) (iii) only (4) (iv) only
7. In ΔLMN, $L = 60°$, $M = 50°$. If $\Delta LMN \sim \Delta PQR$ then the value of R is:
   (1) 40° (2) 70° (3) 30° (4) 110°
8. In a given figure ST || QR, PS = 2 cm and SQ = 3 cm. Then the ratio of the area of ΔPQR to the area of ΔPST is:



   (1) 25 : 4 (2) 25 : 7 (3) 25 : 11 (4) 25 : 13
9. A man walks near a wall, such that the distance between him and the wall is 10 units. Consider the wall to be the Y axis. The path travelled by the man is:
   (1) x = 10 (2) y = 10 (3) x = 0 (4) y = 0
10. If A is a point on the Y axis whose ordinate is 8 and B is a point on the X axis whose abscissae is 5 then the equation of the line AB is :
   (1) 8x + 5y = 40 (2) 8x – 5y = 40 (3) x = 8 (4) y = 5
11. $(1 + \tan\theta + \sec\theta)(1 + \cot\theta - \operatorname{cosec}\theta)$ is equal to :
   (1) 0 (2) 1 (3) 2 (4) -1
12. A man is 28.5 m away from a tower. His eye level above the ground is 1.5 m. The angle of elevation of the tower from his eyes is 45°. Then the height of the tower is:
   (1) 30 m (2) 27.5 m (3) 28.5 m (4) 27 m
13. Variance of first 20 natural numbers is _____
   (1) 32.25 (2) 44.25 (3) 33.25 (4) 30

14. Let A and B be any two events and S be the corresponding sample space. Then P ($\bar{A}$ B) = _____
(1) P(B) – P(A B) (2) P(A B) – P(B) (3) P(S) (4) P[(A B)']

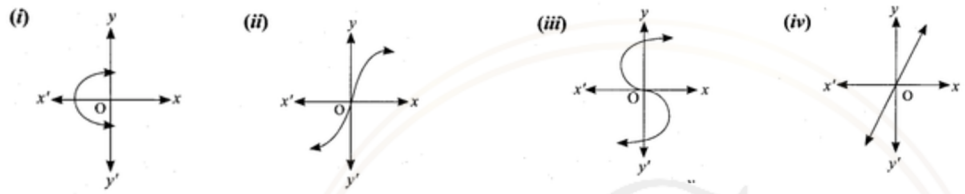
II. Answer any ten questions. Q. No. 28 is compulsory. **10 X 2 = 20**

15. Discuss the nature of solutions of the following system of equation:
$x + 2y - z = 6, -3x - 2y + 5z = -12, x - 2z = 3$

16. Find the value x and y.
$$\begin{pmatrix} x+y & 2 \\ 5+z & xy \end{pmatrix} = \begin{pmatrix} 6 & 2 \\ 5 & 8 \end{pmatrix}$$

17. A square piece of material, 24 cm on a side, by cutting equal squares from the corners and turning up the sides as shown. Express the volume V of the box as a function of x.

18. Determine whether the graph given below represent functions. Give reason for your answers concerning each graph



19. Today is Tuesday. My uncle will come after 45 days. In which day my uncle will be coming?

20. Find 8th and 15th term of the sequence whose nth term is given by :
$$\begin{cases} \frac{n^2-1}{n+3}, & n \text{ is even}, n \in N \\ \frac{n^2}{2n+1}; & n \text{ is odd}, n \in N \end{cases}$$

21. Vertices of given triangles are taken in order and their areas are provided aside. In each case, find the value of 'p'.

S.No.	Vertices	Area (sq.units)
(i)	(0, 0), (p, 8), (6, 2)	20
(ii)	(p, p), (5, 6), (5, –2)	32

22. The hill in the form of a right triangle has its foot at (19,3). The inclination of the hill to the ground is 45°. Find the equation of the hill joining the foot and top.

23. Prove the following identity :
$$\frac{\sin A - \sin B}{\cos A + \cos B} + \frac{\cos A - \cos B}{\sin A + \sin B} = 0$$

24. From the top of the tower 60 m high the anles of depression the top and bottom of a vertical lamp post are observed be 38° and 60° respectively. Find the height of the lamp post. (tan 38° = 0.7813)

25. A 14 m deep well with inner diameter 10 m is dug and the earth taken out is evenly spread all around the well to form an embankment of width 5 m. Find the height of the embankment.

26. If the mean and coefficient of variation of a data are 15 and 48 respectively, then find the value of standard deviation.

27. At a fete, cards bearing numbers 1 to 1000, one number on one card are put in a box. Each player selects one card at random and that card is not replaced. If the selected card has a perfect square number greater than 500, the player wins a prize. What is the probability that
(i) the first player wins a prize
(ii) the second player wins a prize if the first has won?

28. A girl wishes to prepare birthday caps in the form of right circular cones for her birthday party, using a sheet of paper whose area is 5720 cm sq., how many caps can be made with radius 5 cm and height 12 cm.

III. Answer any ten questions. Q. No. 42 is compulsory. **10 X 5 = 50**

29. State and prove Basic Proportionality Theorm.
30. A garden measuring 12m by 16m is to have a pedestrian pathway that is meters wide installed all the way around so that it increases the total area to 285 m sq. What is the width of the pathway?
31. Find the equation of a straight line joining the point of intersection of $3x + y + 2 = 0$ and $x - 2y - 4 = 0$ to the point of intersection of $7x - 3y = -12$ and $2y = x + 3$.
32. The angle of elevation of the top of a cell phone tower from the foot of a high apartment is 60° and the angle of depression of the foot of the tower from the top of the apartment is 30° . If the height of the apartment is 50 m, find the height of the cell phone tower. According to radiations control norms, the minimum height of a cell phone tower should be 120 m. State if the height of the above mentioned cell phone tower meets the radiation norms.
33. Seenu's house has an overhead tank in the shape of a cylinder. This is filled by pumping water from a sump (underground tank) which is in the shape of a cuboid. The sump has dimensions 2 m × 1.5 m × 1 m. The overhead tank has its radius of 60 cm and height 105 cm. Find the volume of the water left in the sump after the overhead tank has been completely filled with water from the sump which has been full, initially.
34. Raghu wish to buy a laptop. He can buy it by paying ₹40,000 cash or by giving it in 10 installments as ₹4800 in the first month, ₹4750 in the second month, ₹4700 in the third month and so on. If he pays the money in this fashion, find
    (i) total amount paid in 10 installments.
    (ii) how much extra amount that he has to pay than the cost?
35. Kumar writes a letter to four of his friends. He asks each one of them to copy the letter and mail to four different persons with the instruction that they continue the process similarly. Assuming that the process is unaltered and it costs ₹2 to mail ong letter, find the amount spent on postage when 8th set of letters is mailed.
36. Two farmers Senthil and Ravi cultivates three varieties of grains namely rice, wheat and ragi. If the sale (in ₹) of three varieties of grains by both the farmers in the month of April is given by the matrix.

	April sale in ₹			
	rice	wheat	ragi	
A =	500	1000	1500	Sudhakar
	2500	1500	500	Ravi

and the May month sale (in ₹) is exactly twice as that of the April month sale for each variety.
    i) What is the average sales of the months April and May?
    ii) If the sales continue to increase in the same way in the successive months, what will be sales in the month of August?
37. Two unbiased dice are rolled once. Find the probability of getting
    (i) a doublet (equal numbers on both dice)
    (ii) the product as a prime number
    (iii) the sum as a prime number
    (iv) the sum as 1
38. A triangular shaped glass with vertices at A(-5, -4), B(l, 6) and C(7, -4) has to be painted. If one bucket of paint covers 6 square feet, how many buckets of paint will be required to paint the whole glass, if only one coat of paint is applied.

39. Write the domain of the following real functions.

(i) $f(x) = \frac{2x+1}{x-9}$

(ii) $p(x) = \frac{-5}{4x^2+1}$

(iii) $g(x) = \sqrt{x-2}$ (iv) $h(x) = x + 6$

40. A function f: [-5, 9] R is defined as follows:

$$f(x) = \begin{cases} 6x+1 & \text{if } -5 \le x < 2 \\ 5x^2-1 & \text{if } 2 \le x < 6 \\ 3x-4 & \text{if } 6 \le x \le 9 \end{cases}$$

Find (i) $f(-3)+f(2)$ (ii) $f(7)-f(1)$

(iii) $2f(4)+f(8)$ (iv) $\frac{2f(-2)-f(6)}{f(4)+f(-2)}$

41. Nathan, an engineering student was asked to make a model shaped like a cylinder with two cones attached at its two ends. The diameter of the model is 3 cm and its length is 12 cm. If each cone has a height of 2 cm, find the volume of the model that Nathan made.

42. You are downloading a song. The percenty (in decimal form) of mega bytes remaining to get downloaded in x seconds is given by $y = -0.1x + 1$.

i) graph the equation.

ii) find the total MB of the song.

iii) after how many seconds will 75% of the song gets downloaded?

iv) after how many seconds the song will be downloaded completely?

IV. Answer all the questions : 2 X 8 = 16

43. A) Draw a circle of radius 4.5 cm. Take a point on the circle. Draw the tangent at that point using the alternate segment theorem.

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) Draw the graph of y = x2 + 3x + 2 and use it to solve x2 + 2x + 1 = 0.

Or

B) A company initially started with 40 workers to complete the work by 150 days. Later, it decided to fasten up the work increasing the number of workers as shown below:

No. of Workers (x)	40	50	60	75
No. of Days (y)	150	120	100	80

(i) Graph the above data and identify the type of variation.

(ii) From the graph, find the number of days required to complete the work if the company decided to opt for 120 workers?

(iii) If the work has to be completed by 30 days, how many workers are required?

ZZZ END