

HALF YEARLY EXAMINATION - 2023

STANDARD - X

Reg. No.

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Time : 3.00 Hrs]

MATHEMATICS

[Marks : 100

PART - A

Note : (i) Answer ALL the 14 questions.

14 X 1 = 14

(ii) Choose the correct answer and write the answer from four options.

1. If $f(x) = 2x^2$ and $g(x) = \frac{1}{3x}$, then $f \circ g$ is

a) $\frac{3}{2x^2}$

b) $\frac{2}{3x^2}$

c) $\frac{2}{9x^2}$

d) $\frac{1}{6x^2}$

2. Given $F_1 = 1$, $F_2 = 3$ and $F_n = F_{n-1} + F_{n-2}$ then F_5 is

a) 3

b) 5

c) 8

d) 11

3. If the sequence t_1, t_2, t_3, \dots are in A.P. then the sequence $t_6, t_{12}, t_{18}, \dots$ is

a) a Geometric Progression

b) an Arithmetic Progression

c) neither an Arithmetic Progression nor a Geometric Progression

d) a constant sequence

4. The G.C.D. of $(x^3 + 1)$ and $(x^4 - 1)$ is

a) $x^3 - 1$

b) $x^3 + 1$

c) $x + 1$

d) $x - 1$

5. If A is a 2×3 matrix and B is a 3×4 matrix, how many columns does AB have

a) 3

b) 4

c) 2

d) 5

6. In a $\triangle ABC$, AD is the bisector of $\angle BAC$. If $AB = 8$ cm, $BD = 6$ cm and $DC = 3$ cm.The length of the side AC is

a) 6 cm

b) 4 cm

c) 3 cm

d) 8 cm

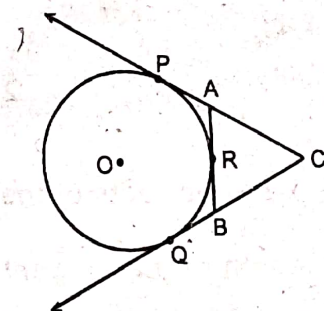
7. In figure CP and CQ are tangents to a circle with centre at O . ARB is another tangent touching the circle at R . If $CP = 11$ cm and $BC = 7$ cm, then the length of BR is

a) 6 cm

b) 5 cm

c) 8 cm

d) 4 cm

8. The straight line given by the equation $x = 11$ isa) parallel to X axisb) parallel to Y axis

c) passing through the origin

d) passing through the point $(0, 11)$

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23. Prove the identity: $\frac{1 - \tan^2 \theta}{\cot^2 \theta - 1} = \tan^2 \theta$.
24. The curved surface area of a right circular cylinder of height 14 cm is 88 cm^2 . Find the diameter of the cylinder.
25. 4 persons live in a conical tent whose slant height is 19 m. If each person require 22 m^2 of the floor area, then find the radius of the tent.
26. What is the probability that a leap year selected at random will contain 53 Saturdays.
27. What is the probability that a number selected from the numbers 1, 2, 3, ... 15 is a multiple of 4?
28. A tower stands vertically on the ground. From a point on the ground, which is 48 m away from the foot of the tower, the angle of elevation of the top of the tower is 30° . Find the height of the tower.

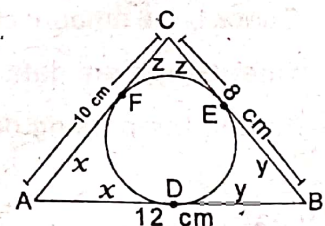
PART - C

Note : (i) Answer 10 questions.

10 X 5 = 50

(ii) Question No. 42 is compulsory.

29. 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 $A \times (B - C) = (A \times B) - (A \times C)$.
30. Find x if $\text{gff}(x) = \text{fgg}(x)$, given $f(x) = 3x + 1$ and $g(x) = x + 3$.
31. The product of three consecutive terms of a Geometric Progression is 343 and their sum is $\frac{91}{3}$. Find the three terms.
32. A man saved ₹ 16,500 in ten years. In each year after the first he saved ₹ 100 more than he did in the preceding year. How much did he save in the first year?
33. Solve the following system of linear equations in three variables $3x - 2y + z = 2$, $2x + 3y - z = 5$, $x + y + z = 6$.
34. A circle is inscribed in $\triangle ABC$ having sides 8 cm, 10 cm and 12 cm as shown in figure, find AD, BE and CF.



35. Without using Pythagoras theorem, show that the points (1, -4), (2, -3) and (4, -7) form a right angled triangle.
36. Find the equation of the perpendicular bisector of the line segment joining the points A (1, 1) and B (2, 3).
37. Prove the identity: $\sec^6 \theta = \tan^6 \theta + 3 \tan^2 \theta \sec^2 \theta + 1$.
38. The radius and height of a cylinder are in the ratio 5:7 and its curved surface area is 5500 sq.cm . Find its radius and height.

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39. If the radii of the circular ends of a frustum which is 45 cm high are 28 cm and 7 cm, find the volume of the frustum.
40. Find the variance and standard deviation of the wages of 9 workers given below:
₹ 310, ₹ 290, ₹ 320, ₹ 280, ₹ 300, ₹ 290, ₹ 320, ₹ 310, ₹ 280.
41. Two unbiased dice are rolled once. Find the probability of getting.
- a doublet (equal numbers on both dice)
 - the product as a prime number
 - the sum as a prime number
42. If $A = \begin{pmatrix} 3 & 1 \\ -1 & 2 \end{pmatrix}$ show that $A^2 - 5A + 7I_2 = 0$.

PART - D

Note : Answer BOTH the questions:

2 X 8 = 16

43. a) Construct a triangle similar to a given triangle LMN with its sides equal to $\frac{4}{5}$ of the corresponding sides of the triangle LMN (scale factor $\frac{4}{5} < 1$).

(OR)

- b) Construct a $\triangle PQR$ such that $QR = 6.5$ cm, $\angle P = 60^\circ$ and the altitude from P to QR is of length 4.5 cm.
44. a) A two wheeler parking zone near bus stand charges as below.

Time (in hours) (x)	4	8	12	24
Amount ₹ (y)	60	120	180	360

Check if the amount charged are in direct variation or in inverse variation to the parking time. Graph the data. Also (i) find the amount to be paid when parking time is 6 hr; (ii) find the parking duration when the amount paid is ₹150.

(OR)

- b) Draw the graph of $y = 2x^2$ and hence solve $2x^2 - x - 6 = 0$.

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