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Standard X

Reg.No.:

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MATHEMATICS

Time: 3.00 hrs.

Part - I

Marks: 100

I. Choose the most appropriate answer and write the option code and the corresponding answer. 14 x 1 = 14

- If the ordered pairs $(a+2, 4)$ and $(5, 2a+b)$ are equal then (a,b) is
 - $(2,-2)$
 - $(5,1)$
 - $(2,3)$
 - $(3,-2)$
- Let $n(A) = m$ and $n(B) = n$, then the total number of non-empty relations that can be defined from A to B is
 - m^n
 - n^m
 - $2^{mn}-1$
 - $2mn$
- If $A = 2^{65}$ and $B = 2^{64} + 2^{63} + 2^{62} + \dots + 2^0$ which of the following is true?
 - B is 2^{64} more than A
 - A and B are equal
 - B is larger than A by 1
 - A is larger than B by 1
- If $1 + 2 + 3 + \dots + n = p$, then $1^3 + 2^3 + 3^3 + \dots + n^3$ is
 - p^3
 - $\frac{p(p+1)}{2}$
 - $(p+1)^3$
 - p^2
- If $(x-6)$ is the HCF of $x^2 - 5x - 24$ and $x^2 - kx - 6$ then the value of k is
 - 3
 - 5
 - 6
 - 8
- $y^2 + \frac{1}{y^2}$ is not equal to
 - $\frac{y^4 + 1}{y^2}$
 - $\left(y + \frac{1}{y}\right)^2$
 - $\left(y - \frac{1}{y}\right)^2 + 2$
 - $\left(y + \frac{1}{y}\right)^2 - 2$
- If A is a 2×3 matrix and B is a 3×4 matrix, then how many rows does AB has
 - 3
 - 4
 - 2
 - 5
- In $\triangle LMN$, $\angle L = 60^\circ$, $\angle M = 50^\circ$. If $\triangle LMN \sim \triangle PQR$, then the value of $\angle R$ is
 - 40°
 - 70°
 - 30°
 - 110°
- The straight line given by the equation $x = 11$ is
 - parallel to x-axis
 - parallel to y-axis
 - passing through the origin
 - passing through the point $(0,11)$
- The slope of the line which is perpendicular to line joining the points $(0,0)$ and $(-8,8)$ is
 - 1
 - 1
 - $\frac{1}{3}$
 -

11. Two persons are standing x meters apart from each other and the height of the first person is double that of the other. If from the mid-point of the line joining their feet and observer finds the angular elevation of their tops to be complementary, then the height of the shorter person (in metres) is
- a) $\sqrt{2}x$ b) $\frac{x}{2\sqrt{2}}$ c) $\frac{x}{\sqrt{2}}$ d) $2x$
12. If the radius of one sphere is half the radius of the another sphere, then the ratio of their volumes is
- a) 1 : 8 b) 2 : 1 c) 1 : 2 d) 8 : 1
13. The curved surface area of a right circular cone of height 15 cm and base diameter 16 cm is
- a) $60\pi \text{ cm}^2$ b) $68\pi \text{ cm}^2$ c) $120\pi \text{ cm}^2$ d) $136\pi \text{ cm}^2$
14. The mean of 100 observations is 40 and their standard deviation is 3. The sum of squares of all observations is
- a) 40000 b) 160900 c) 160000 d) 30000

Part - II

II. Answer any 10 questions. (Q.No.28 is compulsory)

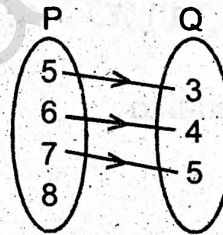
10 x 2 = 20

15. The arrow diagram shows a relationship between the sets P and Q. Write the relation in

(i) Set builder form

(ii) Roster form

(iii) What is the domain and range of R.



16. If the ordered pairs $(x^3 - 3x, y^2 + 4y)$ and $(-2, 5)$ are equal then find x .
17. If 'a' and 'b' are two positive integers such that $a^b \times b^a = 800$. Find 'a' and 'b'.
18. Find the 19th term of an A.P $-11, -15, -19, \dots$

19. Simplify : $\frac{4x^2y}{2z^2} \times \frac{6xz^3}{20y^4}$

20. The length of the tangent to a circle from a point P which is 25 cm away from the centre is 24 cm. What is the radius of the circle?
21. Find the equation of a line whose intercepts on x and y axes are given as 4 and -6 respectively.
22. The line through the points $(-2, a)$ and $(9, 3)$ has slope $-\frac{1}{2}$. Find the value of a.

23. Prove the identity $\frac{\cos \theta}{1 + \sin \theta} = \sec \theta - \tan \theta$

24. 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.
25. The volume of a solid right circular cone is 11088 cm^3 . If its height is 24 cm, then find the radius of the cone.
26. Find the standard deviation of first 21 natural numbers.
27. A flower is selected at random from a basket containing 80 yellow, 70 red and 50 white flowers. Find the probability of selecting a yellow or red flower?
28. Simplify : $\frac{x^3}{x-2} + \frac{8}{2-x}$

Part - III

III. Answer any 10 questions. (Q.No.42 is compulsory)

10 x 5 = 50

29. Let f be a function $f: \mathbb{N} \rightarrow \mathbb{N}$ be defined by $f(x) = 3x + 2$, $x \in \mathbb{N}$ (i) Find the images of 1, 2, 3 (ii) Find the pre-images of 29, 53 (iii) Identify the type of function.
30. If $f(x) = 2x + 3$, $g(x) = 1 - 2x$ and $h(x) = 3x$, prove that $f \circ (g \circ h) = (f \circ g) \circ h$.
31. Find the sum to n terms of the series : $0.4 + 0.44 + 0.444 + \dots$ to n terms
32. Rekha has 15 square colour papers of sizes 10cm, 11 cm, 12 cm 24 cm. How much area can be decorated with these colour papers?
33. Simplify : $\frac{1}{x^2 + 5x + 6} + \frac{1}{x^2 - 3x + 2} - \frac{1}{x^2 - 8x + 15}$
34. The roots of the equation $2x^2 - 7x + 5 = 0$ are α and β . Without solving for the roots find (i) $\frac{1}{\alpha} + \frac{1}{\beta}$ (ii) $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$
35. Given that $A = \begin{pmatrix} 1 & 3 \\ 5 & -1 \end{pmatrix}$, $B = \begin{pmatrix} 1 & -1 & 2 \\ 3 & 5 & 2 \end{pmatrix}$, $C = \begin{pmatrix} 1 & 3 & 2 \\ -4 & 1 & 3 \end{pmatrix}$,
verify that $A(B + C) = AB + AC$
36. State and prove Angle Bisector Theorem.
37. Find the equation of the perpendicular bisector of the line joining the points (3,4) and (-1,2)
38. You are downloading a song. The percent y (in decimal form) of mega bytes remaining to get downloaded in x seconds is given by $y = -0.1x + 1$.
i) Find the total MB of the song
ii) After how many seconds will 75% of the song gets downloaded?
iii) After how many seconds the song will be downloaded completely?
39. Two ships are sailing in the sea on either sides of a lighthouse. The angle of elevation of the top of the lighthouse as observed from the ships are 30° and 45° respectively. If the lighthouse is 200 m high, find the distance between the two ships. ($\sqrt{3} = 1.732$)

40. An aluminium sphere of radius 12 cm is melted to make cylinder of radius 8 cm. Find the height of the cylinder.
41. The marks scored by 10 students in a class test for 25, 29, 30, 33, 35, 37, 38, 40, 44, 48. Find the standard deviation.
42. If two dice are rolled, then find the probability of getting the product of face values 6 or the difference of face values is 5.

Part - IV**IV. Answer all the questions.**

$2 \times 8 = 16$

43. a) Construct a triangle similar to a given triangle PQR with its sides equal to $\frac{7}{4}$ of the corresponding sides of the triangle PQR. (Scale factor $\frac{7}{4} > 1$)

(OR)

- b) Construct a ΔPQR in which $PQ = 8$ cm, $\angle R = 60^\circ$ and the median RG from R to PQ is 5.8 cm. Find the length of the altitude from R to PQ .
44. a) A company initially started with 40 workers to complete the work by 150 days. Later it decided to faster up the work increasing the number of workers as shown below.

Number of workers (x)	40	50	60	75
Number 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 decides to opt for 120 workers?
- iii) If the work has to be completed by 200 days, how many workers are required?

(OR)

- b) Discuss the nature of solutions of the quadratic equation using graph

$x^2 - 9 = 0$
