HALF YEARLY EXAMINATION -2024

10 Std **MATHEMATICS** Reg No. [ ]

Time : 3.00 HR MARKS: 100

Instructions:

- Write clearly and legibly without mistakes and overwriting utilising the maximum time allotted for the exam
- Answers should be in your own style without changing the main core concept.
- Use only black or blue ink pen to write the exam.
- Draw clear diagrams wherever necessary.

PART - I

i) Answer all the questions: **14x1=14**

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

1. $A = \{a,b,q\}$, $B = \{2,3\}$, $C = \{p,q,r,s\}$ then $n[(AUC)xB)$ is _____

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

2. $f(x) = (x+1)^3 - (x-1)^3$ represents a function which is _____

   a) linear b) cubic c) reciprocal d) quadratic

3. $7^{4k} \equiv$ .....(mod 100)

   a) 1 b) 2 c) 3 d) 4

4. The next term of the sequence $\frac{3}{16}, \frac{1}{8}, \frac{1}{12}, \frac{1}{18}$ ..... is

   a) $\frac{1}{24}$ b) $\frac{1}{27}$ c) $\frac{2}{3}$ d) $\frac{1}{81}$

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5. 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) $-8x^2$

6. Transpose of a column matrix is _____

   a) unit matrix b) diagonal matrix c) column matrix d) row matrix

7. If Δ ABC is an isoceles 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

8. The two tangents from an external points P to a circle with centre at O are PA and PB If $\angle APB = 70$ then the value of $\angle AOB$ is _____

   a) 100^0 b) 110^0 c) 120^0 d) 130^0

9. The point of intersection of $3x - y = 4$ and $x+y = 8$ is _____

a) (5,3) b) (2,4) c) (3,5) d) (4,4)

10. If the ratio of the height of a tower and the length of its shadow is $\sqrt{3} : 1$, then the angle of elevation of the sun has measure _____

a) 45^0 b) 30^0 c) 90^0 d) 60^0

11. The slant height of a right circular cone whose radius is 5 cm and height is 12 cm will be _____

a) 12 cm b) 10 cm c) 13 cm d) 5 cm

12. A frustum of a right circular cone is of height 16 cm with radii of its ends as 8 cm and 20 cm. Then, the volume of the frustum is _____

a) 3328π cm^3 b) 3228π cm^3 c) 3240π cm^3 d) 3340π cm^3

13. Variance of first 20 natural numbers is _____

a) 32.25 b) 44.25 c) 33.25 d) 30

14. The set of all possible outcomes is called _____

a) event b) sample space c) sample point d) probability

PART - II

II Answer any 10 questions (Q.No:28 is compulsory). **10x2=20**

15. If AxB = {(3,2), (3,4), (5,2), (5,4)} then find A and B.

16. If $f(x) = 2x-k$, $g(x) = 4x+5$ and fog = gof, then find the value of k.

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

18. Find the LCM of the following $5x - 10$, $5x^2 - 20$.

19. Determine the nature of roots for the following quadratic equation $2x - 2x + 9 = 0$.

20. If $A = \begin{pmatrix} 5 & 2 & 2 \\ -\sqrt{17} & 0.7 & \frac{5}{2} \\ 8 & 3 & 1 \end{pmatrix}$ then verify $(A^T)^T = A$.

21. A tangent ST to a circle touches it at B. AB is a chord such that $\angle ABT = 65^0$. Find $\angle AOB$, where "O" is the centre of the circle.

22. Find the slope of a line joining the given points (-6,1) and (-3,2).

23. Find the angle of elevation of the top of a tower from a point on the ground, which is 30 m away from the foot of a tower of height $10\sqrt{3}$ m.

24. A cylindrical drum has a height of 20 cm and base raidus of 14 cm. Find its curved surface area.

25. If the ratio of radii of two spheres is 4 : 7, find the ratio of their volumes.

26. Find the range and coefficient of range of the following data : 25,67,48,53,18,39,44.

27. Two coins are tossed together. What is the probability of getting different faces on the coins?

28. Prove that $sec^2\theta + cosec^2\theta = sec^2\theta\ cosec^2\theta$

PART - III

III Answer any 10 questions (Q.No:42 is compulsory). 10x5=50

29. Let A = { $x \in w / x < 2$}, B = { $x \in$ N $1 < x \leq 4$} and C = {3,5}. Verify that A x(BnC) = (AxB) n(AxC).

30. Let f : A $\rightarrow$ B be a function defined by f(x) = $\frac{x}{2} - 1$, where A = {2,4,6,10,12} B = {0,1,2,4,5,9}. Represent f by (i) set of ordered pairs (ii) a table
(iii) an arrow diagram (iv) a graph.

31. Find the sum to n terms of the series
5 + 55 + 555 + ...

32. The sum of three consecutive terms that are in A.P is 27 and their product is 288. Find the three terms.

33. If $9x^4 + 12x^3 + 28x^2 + ax + b$ is a perfect square. Find the values of a and b.

34. State and prove Angle Bisector Theorm.

35. If A = $\begin{pmatrix} 5 & 2 & 9 \\ 1 & 2 & 8 \end{pmatrix}$ B = $\begin{pmatrix} 1 & 7 \\ 1 & 2 \\ 5 & 1 \end{pmatrix}$ Verify that $(AB)^T = B^T A^T$

36. Find the equation of a line which passes through (5,7) and makes intercepts on the axes equal in magnitude but opposite in sign.

37. If $\frac{\cos\alpha}{\cos\beta}=m$ and $\frac{\cos\alpha}{\sin\beta}=n$ then prove that $(m^2 + n^2)\cos^2\beta = n^2$.

38. 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.

39. A conical flask is full of water. The flask has base, radius r units and height h units the water poured into a cylindrical flask of base raidus xr units. Find the height of water in the cylindrical flask.

40. Find the mean and variance of the first n natural numbers.

41. Two dice are rolled together, Find the probability of getting a doublet or sum of faces as 4.

42. P and Q are the midpoints of the sides CA and CB respectively of a Δ ABC, right angled at C. Prove that $4(AQ^2 + BP^2) = 5\,A\,B^2$.

PART - IV

IV Answer all the questions. **2x8=16**

43. Draw the two tangents from a point which is 10 cm away from the centre of a circle of raidus 5 cm. Also, measure the lenghts of the tangents.

[OR]

Constract a Δ PQR which the base PQ = 4.5 cm $\angle R=35^0$ and the median RG from R to PQ is 6 cm.

44. Draw the graph of $y = x^2 - 4x + 3$ and use it to solve $x^2 - 6x + 9 = 0$

[OR]

Graph the following linear function $y=\frac{1}{2}x$, Identify the constant of variation and verifty it with the graph.

Also i) find y when x=9. ii) find x when y =7.5.