

Mathematics

Class 11

Time:- 3 hrs

Max. Marks. 100

General instruction :-

- 1) All questions are compulsory.
- 2) The question paper consists of 29 questions divided into three sections A, B and C. Section A - 10 questions - 1 mark each.
Section B - 12 questions - 4 marks each and Section C - 7 questions - 6 marks each.

Section - A

1. Give an example of three sets A, B, C such that $A \cap B = A \cap C$ but $B \neq C$.
2. Evaluate :- $\sqrt{-25} \times \sqrt{-49}$
3. Show graphically in a two-dimensional plane.
 $y - 1 < 0$
4. If ${}^m P_4 = 20 \times {}^m P_2$, find m.
5. Find three numbers in A.P. whose sum is 24.
6. Find the value of $\cot C - 135^\circ$
7. Find the equation of a circle, the end points of one of whose diameters are A(2, -3) and B(-3, 5).
8. Find the length of major and minor axes of the ellipse
 $4x^2 + y^2 = 100$

9. Find the coordinates of the point which divides the join of

The points $P(5, 4, 2)$ and $Q(-1, -2, 4)$ is the ratio 2:3.

10. Evaluate $\lim_{x \rightarrow a} \left\{ \frac{x^{12} - a^{12}}{x - a} \right\}$

Section - B

11. Two dice are tossed together. Find the probability of getting a doublet or a total of 6.

12. Find the mean deviation about the median for the data given below:

11, 3, 8, 7, 5, 14, 10, 2, 9

13. Differentiate the following with respect to x .

$$\frac{1}{(x^2 - x + 3)^3}$$

or

$$\frac{e^{2x} + x^3}{\cos 2x}$$

14. Find derivative from the first principle $\tan^2 x$

15. If origin is the centroid of triangle ABC with vertices $A(a, 1, 3)$, $B(-2, b, -5)$ and $C(4, 7, c)$. Find the values of a, b, c .

16. Find the equation of the hyperbola whose vertices are $(0, \pm 3)$ and the foci are $(0, \pm 5)$

17. Transform the equation $2x^2 + y^2 - 4x + 4y = 0$ to parallel axes when the origin is shifted to the point $(1, -2)$.

18. If $A + B + C = \pi$, prove that

$$\cos^2 \frac{A}{2} + \cos^2 \frac{B}{2} - \cos^2 \frac{C}{2} = 2 \cos \frac{A}{2} \cos \frac{B}{2} \sin \frac{C}{2}$$

19. Prove

$$\cos x \cos 2x \cos 4x \cos 8x = \frac{\sin 16x}{16 \sin x}$$

20. Find the sum of the series :-

$$3 \times 8 + 6 \times 11 + 9 \times 14 + \dots \text{ to } n \text{ terms.}$$

21. Using the binomial theorem, expand $[(x+y)^5 + (x-y)^5]$ and hence find the value of $[(\sqrt{2}+1)^5 + (\sqrt{2}-1)^5]$.

22. Let a and b be arbitrary real numbers. Using the principle of mathematical induction, prove that $(ab)^n = a^n b^n$ for all $n \in \mathbb{N}$.

Section - C

23. Evaluate :-
i) $\sqrt{-i}$
ii) $\sqrt{4+3\sqrt{-20}} + \sqrt{4-3\sqrt{-20}}$

24. A furniture dealer deals in only two items - tables and chairs. He has Rs 15000 to invest and a space at most 60 pieces. A table costs him Rs 750 and a chair Rs 150. Formulate the data in the form of inequations and draw a graph representing the solution of these inequations.

25. If the ratio between the sums of n terms of two A.P is $(7n+1) : (4n+27)$, find the ratio of their 13th terms.

26. Evaluate

$$i) \lim_{x \rightarrow a} \frac{\sqrt{a+2x} - \sqrt{3x}}{\sqrt{3a+x} - 2\sqrt{x}}$$

$$ii) \lim_{x \rightarrow 0} \frac{(\csc x - \cot x)}{x}$$

27. The variance of 15 observations is 6. If each observation is increased by 8, find the S.D. of the resulting observations.

28. A natural number is chosen at random from among the first 500. What is the probability that the number so chosen is divisible by 3 or 5?

29. In how many ways can m books on m subjects be arranged in a cupboard so that no two books on particular subjects are together?