

Unsolved Paper-4

Class 11, Mathematics

Time: 3 hours

Max. Marks 100

General Instructions

1. All questions are compulsory.
 2. Use of calculator is not permitted. However you may use log table, if required.
 3. Q.No. 1 to 12 are of very short answer type questions, carrying 1 mark each.
 4. Q.No.13 to 28 carries 4 marks each.
 5. Q.No. 29 to 32 carries 6 marks each.
-

1. For all sets A, B and C, show that $(A - B) \cap (C - B) = A - (B \cup C)$
2. Given $A = \{1, 2, 3, 4, 5\}$, $S = \{(x, y) : x \in A, y \in A\}$. Find the ordered pairs which satisfy the conditions given below: $x + y = 5$
3. Given $R = \{(x, y) : x, y \in W, x^2 + y^2 = 25\}$. Find the domain and Range of R.
4. Number of solutions of the equation $\tan x + \sec x = 2 \cos x$ lying in the interval $[0, 2\pi]$ is?
5. If A lies in the second quadrant and $3 \tan A + 4 = 0$, then the value of $2 \cot A - 5 \cos A + \sin A$ is equal to?
6. Let z_1 and z_2 be two complex numbers such that $z_1 + iz_2 = 0$ and $\arg(z_1 z_2) = \pi$. Then find $\arg(z_1)$.
7. A five digit number divisible by 3 is to be formed using the numbers 0, 1, 2, 3, 4 and 5 without repetitions. The total number of ways this can be done is?
8. Show that the point A (1, -1, 3), B (2, -4, 5) and (5, -13, 11) are collinear.
9. Differentiate the functions w. r. to x : $(2x - 7)^2 (3x + 5)^3$
10. Differentiate the functions w. r. to x : $\frac{x^4 + x^3 + x^2 + x}{x}$
11. One of the four persons John, Rita, Aslam or Gurpreet will be promoted next month. Consequently the sample space consists of four elementary outcomes
 $S = \{\text{John promoted, Rita promoted, Aslam promoted, Gurpreet promoted}\}$
You are told that the chances of John's promotion is same as that of Gurpreet, Rita's chances of promotion are twice as likely as Johns. Aslam's chances are four times that of John.

- (a) Determine P (John promoted)
P (Rita promoted)
P (Aslam promoted)
P (Gurpreet promoted)

(b) If $A = \{\text{John promoted or Gurpreet promoted}\}$, find $P(A)$.

12. An ordinary deck of cards contains 52 cards divided into four suits. The red suits are diamonds and hearts and black suits are clubs and spades. The cards J, Q, and K are called face cards. Suppose we pick one card from the deck at random.

- (a) What is the sample space of the experiment?
(b) What is the event that the chosen card is a black face card?

13. For all sets A and B, Prove that: $(A \cup B) - A = A - B$

14. Find the domain & range of the following function given by $f(x) = \frac{1}{\sqrt{x+|x|}}$

15. Solve $2 \tan^2 x + \sec^2 x = 2$

16. Prove by using PMI $1 + 2 + 2^2 + \dots + 2^n = 2^{n+1} - 1$ for all natural numbers n.

17. If z and w are two complex numbers such that $|zw| = 1$ and $\arg(z) - \arg(w) = \frac{\pi}{2}$, then show that $\bar{z}w = -i$.

18. A solution of 9% acid is to be diluted by adding 3% acid solution to it. The resulting mixture is to be more than 5% but less than 7% acid. If there is 460 litres of the 9% solution, how many litres of 3% solution will have to be added?

19. Find the number of permutations of n distinct things taken r together, in which 3 particular things must occur together.

20. Find the number of different words that can be formed from the letters of the word 'TRIANGLE' so that no vowels are together.

21. If the coefficient of second, third and fourth terms in the expansion of $(1 + x)^{2n}$ are in A.P. Show that $2n^2 - 9n + 7 = 0$.

22. We know the sum of the interior angles of a triangle is 180° . Show that the sums of the interior angles of polygons with 3, 4, 5, 6, ... sides form an arithmetic progression. Find the sum of the interior angles for a 21 sided polygon.

23. Find the equation of the line which passes through the point $(-4, 3)$ and the portion of the line intercepted between the axes is divided internally in the ratio $5 : 3$ by this point.
24. Find the length of the line-segment joining the vertex of the parabola $y^2 = 4ax$ and a point on the parabola where the line-segment makes an angle θ to the x-axis.
25. If the origin is the centroid of a triangle ABC having vertices A $(a, 1, 3)$, B $(-2, b, -5)$ and C $(4, 7, c)$, find the values of a, b, c.
26. Evaluate: $\lim_{x \rightarrow \frac{\pi}{4}} \frac{\tan^3 x - \tan x}{\cos\left(x + \frac{\pi}{4}\right)}$
27. Check the validity of the following statement.
(i) $p : 125$ is divisible by 5 and 7.
(ii) $q : 131$ is a multiple of 3 or 11.
28. A card is drawn from a deck of 52 cards. Find the probability of getting a king or a heart or a red card.
29. In a survey of 200 students of a school, it was found that 120 study Mathematics, 90 study Physics and 70 study Chemistry, 40 study Mathematics and Physics, 30 study Physics and Chemistry, 50 study Chemistry and Mathematics and 20 none of these subjects. Find the number of students who study all the three subjects.
30. If θ lies in the first quadrant and $\cos\theta = 8/17$, then find the value of $\cos(30^\circ + \theta) + \cos(45^\circ - \theta) + \cos(120^\circ - \theta)$.
31. If A is the arithmetic mean and G_1, G_2 be two geometric means between any two numbers, then prove that $2A = \frac{G_1^2}{G_2} + \frac{G_2^2}{G_1}$
32. The weights of coffee in 70 jars is shown in the following table.

Weight	Frequency
200-201	13
201-202	27
202-203	18
203-204	10
204-205	1
205-206	1