CBSE Board
Class XI Mathematics
Sample Paper – 5

Time: 3 hrs   **Total Marks: 100**

General Instructions:
1. All questions are compulsory.
2. The question paper consist of 29 questions.
3. Questions 1 – 4 in Section A are very short answer type questions carrying 1 mark each.
4. Questions 5 – 12 in Section B are short-answer type questions carrying 2 mark each.
5. Questions 13 – 23 in Section C are long-answer I type questions carrying 4 mark each.
6. Questions 24 – 29 in Section D are long-answer type II questions carrying 6 mark each.

SECTION – A

1. In $\triangle ABC$, if a = 2, b = 3 and $\sin A = \dfrac{2}{3}$, find m $\angle$ B.

2. Find the value of $\left(\dfrac{1}{i}\right)^{25}$

OR

Express the (1 + i)(1 + 2i) in the standard form of a + bi.

3. Write the given statement in the form "If- then", and state what are the component statements p and q.
If I have the money, i will buy an i-phone.

4. The figure below gives a relation. Write it in the roster form.
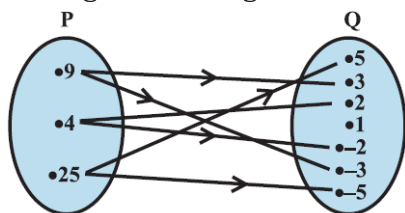
SECTION – B

5. If P and Q are two sets such that P has 40 elements, P $\cup$ Q has 60 elements and P $\cap$ Q has 10 elements, how many elements does Q have?

6. Find the equation of the circle, the co-ordinates of the end points of whose diameter are (-1, 2) and (4, -3).

7. What is the number of ways in which a set of 5 cards can be chosen out of a deck of 52 cards, if each set of 5 cards has exactly one ace?

OR

A die is thrown. Find the probability of getting
1. a prime number
2. a number more than 6

8. Prove that $\cos 5x = 16 \cos^5 x - 20 \cos^3 x + 5 \cos x$

9. In how many ways 6 different beads can be arranged on a thread to form a necklace?

OR

If $\dfrac{1}{9!} + \dfrac{1}{10!} = \dfrac{x}{11!}$, find x.

10. Find an infinite GP whose first term is 1 and each term is the sum of all the terms which follow it.

11. Find the values of' k' for which $-\dfrac{2}{7}, k, -\dfrac{7}{2}$ are in G.P. Find the common ratio/s of the G.P.

OR

Find the sum of 7 terms of the G.P. 3, 6, 12,...

12. If $1 + \dfrac{(1+2)}{2} + \dfrac{(1+2+3)}{3} + ...$ to n terms is S, then find S.

SECTION – C

13. Evaluate: $\left| \dfrac{1+i}{1-i} - \dfrac{1-i}{1+i} \right|$

OR

If (a + ib) (c + id) (e + if) (g + ih) = A + iB,

then find the value of $A^2 + B^2$

14. Solve the given quadratic equation: $9x^2 - 12x + 20 = 0$

15. Find the co-efficient of x^5 in the expansion of the product $(1 + 2x)^6 (1 - x)^7$

16. Show that: tan 3x tan 2x tan x = tan 3x – tan 2 x – tan x

17. Prove that: $\dfrac{\sec 8A - 1}{\sec 4A - 1} = \dfrac{\tan 8A}{\tan 2A}$

OR

Prove that: a(sin B – sin C)+ b(sin C – sin A)+ c(sin A – sin B) = 0.

18. Let A = {a, e, i, o, u} and B = {a, i, k, u}. Find A – B and B – A. Are the two sets A – B and B –A (i) equal (ii) mutually disjoint. Justify your answer.

19. Show that $\sqrt{2 + \sqrt{2 + \sqrt{2 + 2\cos 8\theta}}} = 2\cos\theta, \, 0 < \theta < \dfrac{\pi}{8}$

20. Draw the graph of f(x) $\begin{cases} 3-x, x > 1 \\ 1, \quad x = 1 \\ 2x, \quad x < 1 \end{cases}$ and find the range of f .

OR

Draw the graph of f(x) $\begin{cases} 1, \quad x \geq 1 \\ x \quad -1 < x < 1 \\ -1, \quad x \leq -1 \end{cases}$ `˜ ᵈ the range of f .

21. Let A = {a, b, c, d} and B = {p, q, r}. Write an example of onto and into function from A to B. Does there exist a one-one function from A to B. Justify your answer.

22. Prove that $\cos^2 x + \cos^2(x + \dfrac{\pi}{3}) + \cos^2(x - \dfrac{\pi}{3}) = \dfrac{3}{2}$

23. The mean of 8, 6, 7, 5, x and 4 is 7. Find (i) the value of x (ii) the mean if each observation was multiplied by 3 (iii) the mean deviation about the median for the original data

SECTION – D

24. When two dice are thrown simultaneously, find the probability that neither a doublet nor a total of 10 will appear.

OR

The probability that a student will receive A, B, C and D grade are 0.4, 0.35, 0.15 and 0.10 respectively. Find the probability that a student will receive
1. B or C grade
2. At most C grade

25. Using mathematical induction prove the following:

$$\frac{1}{1.2.3}+\frac{1}{2.3.4}+\frac{1}{3.4.5}+........+\frac{1}{n(n+1)(n+2)}=\frac{n(n+3)}{4(n+1)(n+2)}$$

26. (i) A box contains 10 red marbles, 20 blue marbles and 30 green marbles. 5 marbles are drawn from the box, what is the probability that

(a) all will be blue? (b) at least one will be green?

(ii) A die has two faces each with number '1', three faces each with number '2' and one face with number '3'. If die is rolled once, determine

(a) P(2)   (b) P(1 or 3)   (c) P(not 3)

27. Find the derivative of

(i) sin(x + 1) by the abinitio method

(ii) $\dfrac{x}{1+\tan x}$

OR

Evaluate the limits of the following two functions of x:

(i) $\displaystyle\lim_{x\to 0}\left[\frac{x-2}{x^2-x}-\frac{1}{x^3-3x^2+2x}\right]$

(ii) $\displaystyle\lim_{x\to 0}\frac{\sin 4x}{\sin 2x}$

28. Find the length of the perpendicular drawn from the points,

$(\sqrt{a^2-b^2},0)$ and $(-\sqrt{a^2-b^2},0)$ to the line $\dfrac{x}{a}\cos\theta+\dfrac{y}{b}\sin\theta=1$

Show that their product is b².

29. Solve the inequalities and represent the solution graphically

$5(2x-7)-3(2x+3)\leq 0; \ 2x+19\leq 6x+47$ and $7\leq\dfrac{(3x+11)}{2}\leq 11$

OR

How many litres of water will have to be added to 1125 litres of a 45% solution of acid so that the resulting mixture will contain more than 25% but less than 30% acid content?