# CBSE Board
# Class XI Mathematics
# Sample Paper – 3

**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 ΔABC, a = 18, b = 24 and c = 30 and $m\angle C = 90^o$, find sin A.

**2.** If f(x) is a linear function of x. f: Z →Z, f(x) = a x + b. Find a and b if { (1,3) , (-1, -7 ) , (2, 8) (-2 , -12 )} ∈f.

**3.** Find the domain of the function $f(x) = \dfrac{x^2 - 4}{x^2 - 8x + 12}$

**4.** With p: It is cloudy and q: Sun is shining and the usual meanings of the symbols: ⇒, ⇔, ~, ∧, ∨, express the statement below symbolically.

'It is not true that it is cloudy if and only if the Sun is not shining.'

**OR**

Write negation of the : Every living person is not 150 years old.

## SECTION – B

**5.** What are the real numbers 'x' and 'y', if (x - iy) (3 + 5i) is the conjugate of (-1 - 3i)

**OR**

Find modulus of (3 + 4i)(4 + i).

**6.** A pendulum, 36 cm long, oscillates through an angle of 10 degrees. Find the length of the path described by its extremity.

**OR**

The area of sector is 5.024 $cm^2$ and its angle is 36˚. Find the radius. ($\pi$ = 3.14)

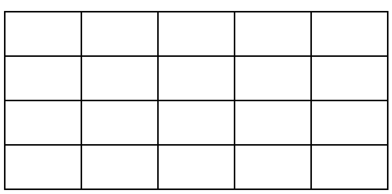
**7.** Find the sum of 19 terms of A.P. whose nth term is 2n+1.

**8.** Find the LCM of 4!, 5! and 6!

**OR**

Express $\frac{1}{(2+i)^2}$ in the standard form of a + ib.

**9.** Find the total number of rectangles in the given figure



**10.** Find the sum of the given sequence uptill the $n^{th}$ term:
1.2 + 2. 3 + 3. 4 +...

**11.** In a group of 400 people, 250 can speak Hindi and 200 can speak English. Everyone can speak atleast one language. How many people can speak both Hindi and English?

**12.** If $\Sigma n = 210$, then find $\Sigma n^2$.

**SECTION – C**

**13.** An equilateral triangle is inscribed in the parabola $y^2 = 4ax$, where one vertex of the triangle is at the vertex of the parabola. Find the length of the side of the triangle.

**14.** Prove that: (cos3x – cosx) cosx + (sin3x + sinx) sinx = 0

**OR**

Simplify the expression: sin7x + sinx + sin3x + sin5x

**15.** If the sum of an infinite geometric series is 15 and the sum of the squares of these terms is 45, find the series.

**16.** Let A = {a, b, c}, B = {c, d} and C = {d, e, f }. Find

(i) $A \times (B \cap C)$ (ii) $(A \times B) \cap (A \times C)$

(iii) $A \times (B \cup C)$ (iv) $(A \times B) \cup (A \times C)$

**17.** If $f : R \to R;\ f(x) = \dfrac{x^2}{x^2+1}$. What is the range of f?

**18.** What is the number of ways of choosing 4 cards from a pack of 52 playing cards? In how many of these

(i) four cards are of the same suit

(ii) four cards belong to four different suits

(iii) are face cards

(iv) two are red cards and two are black cards

**19.** Evaluate: $(99)^5$ using the Binomial theorem

**OR**

Find the ratio of the co-efficient of $x^2$ and $x^3$ in the binomial expansion $(3 + ax)^9$

**20.** If $x - iy = \sqrt{\dfrac{a-ib}{c-id}}$, find $\left(x^2+y^2\right)^2$.

**OR**

Let $z_1 = 2 - i$ and $z_2 = -2 + i$, then find

(i) $\mathrm{Re}\left[\dfrac{z_1 z_2}{\overline{z_1}}\right]$ (ii) $\mathrm{Im}\left[\dfrac{1}{z_1 \overline{z_2}}\right]$

**21.** Find the roots of the equation $3x^2 - 4x + \dfrac{10}{7} = 0$

**22.** Find the domain and range of the function : $f(x) = \dfrac{1}{2 - \sin 3x}$

**23.** Plot the given linear in equations and shade the region which is common to the solution of all inequations $x \geq 0$, $y \geq 0$, $5x + 3y \leq 500$; $x \leq 70$ and $y \leq 125$.

## SECTION – D

**24.** The scores of two batsmen A and B, in ten innings during a certain season are given below, Find which batsman is more consistent in scoring.

| A | B |
|---|---|
| 32 | 19 |
| 28 | 31 |
| 47 | 48 |
| 63 | 53 |
| 71 | 67 |
| 39 | 90 |
| 10 | 10 |
| 60 | 62 |
| 96 | 40 |
| 14 | 80 |

**OR**

The mean and variance of 7 observations are 8 and 16 respectively. If 5 of the observations are 2, 4, 10, 12, 14, find the remaining two observations.

**25.** From the digits 0, 1, 3, 5 and 7, how many 4 digit numbers greater than 5000 can be formed? What is the probability that the number formed is divisible by 5, if

(i) the digits are repeated

(ii) the digits are not repeated

**26.** If $x \in Q_3$ and $\cos x = -\frac{1}{3}$, then show that $\sin\frac{x}{2} = \pm\sqrt{\frac{2}{3}}$.

**OR**

If $\tan\left(\frac{\pi}{4}+\frac{\theta}{2}\right) = \tan^3\left(\frac{\pi}{4}+\frac{\alpha}{2}\right)$ prove that $\sin\theta = \frac{3\sin\alpha + \sin^3\alpha}{1+3\sin^2\alpha}$

**27.** (i) Find the derivative of the given function using the first principle:

$$f(x) = \cos\left(x - \frac{\pi}{16}\right)$$

(ii) Evaluate: $\lim_{x\to\frac{\pi}{2}} \frac{5^{\cos x} - 1}{\frac{\pi}{2} - x}, x \neq \frac{\pi}{2}$.

**28.** If three lines whose equations are $y = m_1x + c_1$, $y = m_2x + c_2$ and $y = m_3x + c_3$ are concurrent, then find (i) the condition of concurrence of the three lines(ii) the point of concurrence.

**OR**

A beam is supported at its ends by supports which are 14 cm apart. Since the load is concentrated at its centre, there is a deflection of 5 cm at the centre and the deflected beam is in the shape of a parabola. How far from the centre is the deflection of 2 cm?

**29.** Prove by using the principle of mathematical induction that $(x^{2n} - y^{2n})$ is divisible by $(x + y)$.