

CBSE – Class X Mathematics Sample Question Paper (Set 1)

Time: 3 Hours

Maximum Marks: 80

Section A – Multiple Choice Questions ($1 \times 20 = 20$ marks)

Note: Questions 11–20 in the original document appear to be duplicates of questions 1–10. The paper below presents the unique 20 questions as typically structured in CBSE exams.

1. The zero of the polynomial $x^2 - 9$ is:
(a) 3 (b) -3 (c) 0 (d) Both (a) and (b)
2. The value of $\sin 60^\circ$ is:
(a) $\frac{1}{2}$ (b) $\frac{\sqrt{3}}{2}$ (c) $\frac{\sqrt{2}}{2}$ (d) $\sqrt{3}$
3. The HCF of 12 and 18 is:
(a) 2 (b) 3 (c) 6 (d) 9
4. The pair of linear equations $2x + y = 4$, $4x + 2y = 8$ has:
(a) one solution (b) no solution (c) infinitely many solutions (d) two solutions
5. The distance between (0, 0) and (3, 4) is:
(a) 4 (b) 5 (c) 6 (d) 7
6. The value of $\tan 45^\circ$ is:
(a) 0 (b) 1 (c) $\sqrt{3}$ (d) $\frac{1}{\sqrt{3}}$
7. The roots of $x^2 - 4x + 4 = 0$ are:
(a) 2, 2 (b) -2, -2 (c) 4, 1 (d) 0, 4
8. The ratio in which (2, 2) divides the line joining (0, 0) and (4, 4) is:
(a) 1:1 (b) 2:1 (c) 1:2 (d) 3:1
9. The curved surface area of a sphere is:
(a) $4\pi r$ (b) $2\pi r^2$ (c) $4\pi r^2$ (d) πr^2
10. If $A = \{1, 2, 3\}$, then $n(A) =$
(a) 0 (b) 1 (c) 2 (d) 3
11. The LCM of 12 and 18 is:
(a) 24 (b) 36 (c) 48 (d) 72
12. The value of $\cos 30^\circ$ is:
(a) $\frac{1}{2}$ (b) $\frac{\sqrt{3}}{2}$ (c) $\frac{\sqrt{2}}{2}$ (d) $\sqrt{3}$
13. The discriminant of $x^2 - 4x + 4 = 0$ is:
(a) 0 (b) 4 (c) 8 (d) 16
14. The probability of getting an even number when a die is thrown is:
(a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{6}$ (d) 1
15. The mode of the data: 2, 3, 4, 4, 5, 5, 5, 6 is:
(a) 4 (b) 5 (c) 3 (d) 6
16. The value of $\cot 30^\circ$ is:
(a) 1 (b) $\sqrt{3}$ (c) $\frac{1}{\sqrt{3}}$ (d) 0

17. The sum of roots of $x^2 - 5x + 6 = 0$ is:
(a) 5 (b) -5 (c) 6 (d) -6
18. The area of a circle with radius 7 cm is:
(a) $49\pi \text{ cm}^2$ (b) $14\pi \text{ cm}^2$ (c) $28\pi \text{ cm}^2$ (d) $98\pi \text{ cm}^2$
19. The volume of a sphere of radius r is:
(a) $\frac{4}{3}\pi r^3$ (b) $4\pi r^2$ (c) $\frac{2}{3}\pi r^3$ (d) πr^3
20. If $\sin \theta = \frac{1}{2}$, then $\theta =$
(a) 30° (b) 45° (c) 60° (d) 90°

Section B – Very Short Answer Questions ($2 \times 5 = 10$ marks)

21. Find the HCF of 306 and 657 using Euclid's division algorithm.
22. Find the zeroes of the polynomial $p(x) = x - 5$.
23. Evaluate $\sin 30^\circ + \cos 60^\circ$.
24. Find the distance between the points $(-1, 2)$ and $(3, 2)$.
25. Find the mean of the first five natural numbers.

Section C – Short Answer Questions ($3 \times 6 = 18$ marks)

26. Solve the quadratic equation $x^2 - 5x + 6 = 0$ by factorisation.
27. Find the value of k for which the system has infinitely many solutions:
 $2x + ky = 4$, $4x + 2ky = 8$.
28. Find the coordinates of the midpoint of the line joining $(2, -2)$ and $(-4, 6)$.
29. Find the ratio of the areas of two circles with radii 3 cm and 6 cm.
30. Evaluate $2 \sin 30^\circ \cos 60^\circ$.
31. Find the mean of the following data: 2, 4, 6, 8, 10.

Section D – Long Answer Questions ($5 \times 6 = 30$ marks)

32. Solve the pair of linear equations by substitution: $x - y = 2$, $x + y = 4$.
33. Find the roots of the quadratic equation $2x^2 - 7x + 3 = 0$ using quadratic formula.
34. Find the coordinates of the point dividing the line joining $(-2, 2)$ and $(2, -2)$ internally in the ratio 1:3.
35. Find the curved surface area and volume of a cylinder of radius 7 cm and height 10 cm.
36. Find the probability of getting a number divisible by 3 when a die is thrown.
37. The difference of the squares of two consecutive integers is 31. Find the integers.

ANSWER KEY WITH DETAILED SOLUTIONS

Section A – MCQ Solutions

Q.No	Answer	Explanation
1	(d)	$x^2 - 9 = 0 \Rightarrow x^2 = 9 \Rightarrow x = \pm 3 \rightarrow$ NCERT Ch 2, Pg 30
2	(b)	Standard trigonometric value: $\sin 60^\circ = \frac{\sqrt{3}}{2} \rightarrow$ NCERT Ch 8, Pg 173
3	(c)	Prime factors: $12 = 2^2 \times 3$, $18 = 2 \times 3^2 \rightarrow \text{HCF} = 2 \times 3 = 6 \rightarrow$ NCERT Ch 1, Pg 4
4	(c)	$\frac{a_1}{a_2} = \frac{2}{4} = \frac{1}{2}$, $\frac{b_1}{b_2} = \frac{1}{2}$, $\frac{c_1}{c_2} = \frac{4}{8} = \frac{1}{2} \rightarrow$ Consistent with infinitely many solutions $\rightarrow$ NCERT Ch 3, Pg 45
5	(b)	Distance = $\sqrt{(3-0)^2 + (4-0)^2} = \sqrt{9+16} = \sqrt{25} = 5 \rightarrow$ NCERT Ch 7, Pg 161
6	(b)	Standard value: $\tan 45^\circ = 1 \rightarrow$ NCERT Ch 8, Pg 173
7	(a)	$x^2 - 4x + 4 = (x-2)^2 = 0 \Rightarrow x = 2, 2$ (repeated root) $\rightarrow$ NCERT Ch 4, Pg 74
8	(a)	Using section formula: $2 = \frac{m \cdot 4 + n \cdot 0}{m+n} \Rightarrow 2(m+n) = 4m \Rightarrow m = n \rightarrow$ Ratio 1:1 $\rightarrow$ NCERT Ch 7, Pg 162
9	(c)	Curved surface area of sphere = Total surface area = $4\pi r^2 \rightarrow$ NCERT Ch 13, Pg 236
10	(d)	$n(A)$ = number of elements in set A = 3 $\rightarrow$ NCERT Ch 14 (Statistics intro)
11	(b)	$\text{LCM}(12, 18) = 2^2 \times 3^2 = 36 \rightarrow$ NCERT Ch 1, Pg 7
12	(b)	$\cos 30^\circ = \frac{\sqrt{3}}{2} \rightarrow$ NCERT Ch 8, Pg 173
13	(a)	Discriminant $D = b^2 - 4ac = (-4)^2 - 4(1)(4) = 16 - 16 = 0 \rightarrow$ NCERT Ch 4, Pg 86
14	(a)	Even numbers on die: {2, 4, 6} $\rightarrow P = \frac{3}{6} = \frac{1}{2} \rightarrow$ NCERT Ch 15, Pg 282

Q.No	Answer	Explanation
15	(b)	Mode = most frequent value = 5 (appears 3 times) → NCERT Ch 14, Pg 267
16	(b)	$\cot 30^\circ = \frac{1}{\tan 30^\circ} = \sqrt{3} \rightarrow$ NCERT Ch 8, Pg 173
17	(a)	Sum of roots = $-\frac{b}{a} = -\frac{(-5)}{1} = 5 \rightarrow$ NCERT Ch 4, Pg 87
18	(a)	Area = $\pi r^2 = \pi \times 7^2 = 49\pi \text{ cm}^2 \rightarrow$ NCERT Ch 12, Pg 226
19	(a)	Volume of sphere = $\frac{4}{3}\pi r^3 \rightarrow$ NCERT Ch 13, Pg 245
20	(a)	$\sin 30^\circ = \frac{1}{2} \Rightarrow \theta = 30^\circ \rightarrow$ NCERT Ch 8, Pg 173

Section B – Detailed Solutions

21. HCF of 306 and 657 using Euclid's Division Algorithm

Solution:

$$\text{Step 1: } 657 = 306 \times 2 + 45$$

$$\text{Step 2: } 306 = 45 \times 6 + 36$$

$$\text{Step 3: } 45 = 36 \times 1 + 9$$

$$\text{Step 4: } 36 = 9 \times 4 + 0$$

$$\therefore \text{HCF} = 9$$

→ NCERT Class 10 Maths, Ch 1 (Real Numbers), Pg 2-3, Example 1

22. Zeroes of $p(x) = x - 5$

Solution:

$$\text{Set } p(x) = 0:$$

$$x - 5 = 0 \Rightarrow x = 5$$

∴ Zero of the polynomial is 5.

→ NCERT Ch 2 (Polynomials), Pg 30, Definition

23. Evaluate $\sin 30^\circ + \cos 60^\circ$

Solution:

$$\sin 30^\circ = \frac{1}{2}, \cos 60^\circ = \frac{1}{2}$$

$$\sin 30^\circ + \cos 60^\circ = \frac{1}{2} + \frac{1}{2} = 1$$

→ NCERT Ch 8 (Introduction to Trigonometry), Pg 173, Table 8.1

24. Distance between $(-1, 2)$ and $(3, 2)$

Solution:

Using distance formula:

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$= \sqrt{(3 - (-1))^2 + (2 - 2)^2} = \sqrt{4^2 + 0^2} = \sqrt{16} = 4 \text{ units}$$

Note: Since y-coordinates are equal, it's a horizontal line $\rightarrow$ distance = $|3 - (-1)| = 4$

$\rightarrow$ NCERT Ch 7 (Coordinate Geometry), Pg 161, Section 7.2

25. Mean of first five natural numbers

Solution:

First five natural numbers: 1, 2, 3, 4, 5

$$\text{Mean} = \frac{1+2+3+4+5}{5} = \frac{15}{5} = 3$$

$\rightarrow$ NCERT Ch 14 (Statistics), Pg 264, Section 14.2

Section C – Detailed Solutions

26. Solve $x^2 - 5x + 6 = 0$ by factorisation

Solution:

$$x^2 - 5x + 6 = 0$$

Splitting the middle term:

$$x^2 - 3x - 2x + 6 = 0$$

$$x(x - 3) - 2(x - 3) = 0$$

$$(x - 3)(x - 2) = 0$$

$$\therefore x - 3 = 0 \text{ or } x - 2 = 0$$

$$x = 3 \text{ or } x = 2$$

Roots are 2 and 3.

$\rightarrow$ NCERT Ch 4 (Quadratic Equations), Pg 74-75, Example 3

27. Value of k for infinitely many solutions

Solution:

For infinitely many solutions:

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

$$\text{Given: } 2x + ky = 4 \text{ and } 4x + 2ky = 8$$

$$\frac{2}{4} = \frac{k}{2k} = \frac{4}{8}$$

$$\frac{1}{2} = \frac{1}{2} = \frac{1}{2} \text{ (true for all } k \neq 0)$$

$\therefore$ System has infinitely many solutions for all non-zero values of k .

Note: If $k = 0$, equations become $2x = 4$ and $4x = 8 \rightarrow$ still consistent with infinite solutions along the line $x = 2$.

$\rightarrow$ NCERT Ch 3 (Pair of Linear Equations), Pg 45, Theorem 1

28. Midpoint of line joining (2, -2) and (-4, 6)

Solution:

$$\text{Midpoint formula: } \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$= \left(\frac{2 + (-4)}{2}, \frac{-2 + 6}{2} \right) = \left(\frac{-2}{2}, \frac{4}{2} \right) = (-1, 2)$$

$\rightarrow$ NCERT Ch 7, Pg 162, Section 7.2

29. Ratio of areas of circles with radii 3 cm and 6 cm

Solution:

$$\text{Area of circle} = \pi r^2$$

$$\text{Ratio} = \frac{\pi(3)^2}{\pi(6)^2} = \frac{9}{36} = \frac{1}{4}$$

$$\therefore \text{Ratio of areas} = 1 : 4$$

→ NCERT Ch 12 (Areas Related to Circles), Pg 226, Example 1

30. Evaluate $2 \sin 30^\circ \cos 60^\circ$

Solution:

$$\sin 30^\circ = \frac{1}{2}, \cos 60^\circ = \frac{1}{2}$$

$$2 \sin 30^\circ \cos 60^\circ = 2 \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{2}$$

Alternative: Using identity $2 \sin A \cos B = \sin(A + B) + \sin(A - B)$

→ NCERT Ch 8, Pg 173, Table 8.1

31. Mean of data: 2, 4, 6, 8, 10

Solution:

$$\text{Mean} = \frac{\text{Sum of observations}}{\text{Number of observations}} = \frac{2+4+6+8+10}{5} = \frac{30}{5} = 6$$

→ NCERT Ch 14, Pg 264, Section 14.2

Section D – Detailed Solutions

32. Solve by substitution: $x - y = 2$, $x + y = 4$

Solution:

$$\text{From equation (1): } x = y + 2$$

Substitute in equation (2):

$$(y + 2) + y = 4$$

$$2y + 2 = 4$$

$$2y = 2 \Rightarrow y = 1$$

Substitute $y = 1$ in $x = y + 2$:

$$x = 1 + 2 = 3$$

$$\therefore \text{Solution: } x = 3, y = 1$$

$$\text{Verification: } 3 - 1 = 2 \checkmark, 3 + 1 = 4 \checkmark$$

→ NCERT Ch 3, Pg 50, Example 7

33. Roots of $2x^2 - 7x + 3 = 0$ using quadratic formula

Solution:

$$\text{Quadratic formula: } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\text{Here, } a = 2, b = -7, c = 3$$

$$\text{Discriminant } D = b^2 - 4ac = (-7)^2 - 4(2)(3) = 49 - 24 = 25$$

$$x = \frac{-(-7) \pm \sqrt{25}}{2(2)} = \frac{7 \pm 5}{4}$$

$$x = \frac{7+5}{4} = \frac{12}{4} = 3 \text{ or } x = \frac{7-5}{4} = \frac{2}{4} = \frac{1}{2}$$

Roots are 3 and $\frac{1}{2}$.

→ NCERT Ch 4, Pg 86, Section 4.4

34. Point dividing $(-2, 2)$ and $(2, -2)$ internally in ratio 1:3

Solution:

Section formula (internal division):

$(\frac{mx_2+nx_1}{m+n}, \frac{my_2+ny_1}{m+n})$ where $m : n = 1 : 3$

$$x = \frac{1(2)+3(-2)}{1+3} = \frac{2-6}{4} = \frac{-4}{4} = -1$$

$$y = \frac{1(-2)+3(2)}{4} = \frac{-2+6}{4} = \frac{4}{4} = 1$$

∴ Required point = $(-1, 1)$

→ NCERT Ch 7, Pg 162, Section 7.2

35. CSA and volume of cylinder ($r = 7$ cm, $h = 10$ cm)

Solution:

Curved Surface Area (CSA) = $2\pi rh$

$$= 2 \times \frac{22}{7} \times 7 \times 10 = 440 \text{ cm}^2$$

Volume = $\pi r^2 h$

$$= \frac{22}{7} \times 7^2 \times 10 = 22 \times 7 \times 10 = 1540 \text{ cm}^3$$

→ NCERT Ch 13 (Surface Areas and Volumes), Pg 240, Formulas

36. Probability of number divisible by 3 on a die

Solution:

Sample space when die is thrown: $\{1, 2, 3, 4, 5, 6\} \rightarrow n(S) = 6$

Favorable outcomes (divisible by 3): $\{3, 6\} \rightarrow n(E) = 2$

$$P(E) = \frac{n(E)}{n(S)} = \frac{2}{6} = \frac{1}{3}$$

→ NCERT Ch 15 (Probability), Pg 282, Example 3

37. Two consecutive integers whose squares differ by 31

Solution:

Let the integers be n and $n + 1$

$$\text{Given: } (n + 1)^2 - n^2 = 31$$

$$n^2 + 2n + 1 - n^2 = 31$$

$$2n + 1 = 31$$

$$2n = 30 \Rightarrow n = 15$$

∴ Integers are 15 and 16

$$\text{Verification: } 16^2 - 15^2 = 256 - 225 = 31 \checkmark$$

→ NCERT Ch 4, Pg 76, Example 11 (similar application)

Reference: NCERT Mathematics Textbook for Class X (2023-24 Edition)

- Chapter 1: Real Numbers (Pages 1-18)
- Chapter 2: Polynomials (Pages 28-39)
- Chapter 3: Pair of Linear Equations in Two Variables (Pages 44-68)

- Chapter 4: Quadratic Equations (Pages 74-94)
- Chapter 7: Coordinate Geometry (Pages 158-173)
- Chapter 8: Introduction to Trigonometry (Pages 171-194)
- Chapter 12: Areas Related to Circles (Pages 223-238)
- Chapter 13: Surface Areas and Volumes (Pages 235-258)
- Chapter 14: Statistics (Pages 262-294)
- Chapter 15: Probability (Pages 280-294)