

CENTRAL BOARD OF SECONDARY EDUCATION
MODEL QUESTION PAPER 2024–25

CLASS X — MATHEMATICS (STANDARD)

Subject Code: 041

Time Allowed: 3 Hours

Maximum Marks: 80

GENERAL INSTRUCTIONS:

1. This Question Paper has 5 Sections A, B, C, D and E.
2. Section A has 20 MCQs carrying 1 mark each.
3. Section B has 5 questions carrying 2 marks each.
4. Section C has 6 questions carrying 3 marks each.
5. Section D has 4 questions carrying 5 marks each.
6. Section E has 3 Case-Based questions carrying 4 marks each.
7. All Questions are compulsory. However, internal choice is provided in some questions.
8. Draw neat diagrams wherever required. Diagrams not drawn will not fetch marks.
9. Use of calculator is NOT allowed.

SECTION – A

(Multiple Choice Questions — Each question carries 1 mark)

1. The HCF and LCM of two numbers are 9 and 360 respectively. If one number is 45, the other number is:
(A) 36
(B) 72
(C) 54
(D) 90
2. If the zeroes of the polynomial $p(x) = x^2 + (a+1)x + b$ are 2 and -3 , then:
(A) $a = -7$, $b = -1$
(B) $a = 5$, $b = -1$
(C) $a = 2$, $b = -6$
(D) $a = 0$, $b = -6$
3. The pair of linear equations $2x + 3y = 5$ and $4x + 6y = 10$ has:
(A) a unique solution
(B) exactly two solutions
(C) infinitely many solutions
(D) no solution
4. Which of the following is NOT a quadratic equation?
(A) $(x - 2)^2 + 1 = 2x - 3$
(B) $x(x + 1) + 8 = (x + 2)(x - 2)$
(C) $x(2x + 3) = x^2 + 1$
(D) $(x + 2)^3 = x^3 - 4$
5. The common difference of an AP whose n^{th} term is $7 - 4n$ is:
(A) 4
(B) -4
(C) 7
(D) -7
6. If the distance between the points $A(2, -2)$ and $B(-1, x)$ is 5, one value of x is:

- (A) 2
(B) -2
(C) -6
(D) 6
7. The mid-point of segment joining $A(2a, 4)$ and $B(-2, 3b)$ is $M(1, 2a + 1)$. The values of a and b are:
(A) $a = 1, b = 2$
(B) $a = 2, b = 1$
(C) $a = 1, b = 1$
(D) $a = 2, b = 2$
8. If $\tan \theta = 12/5$, then $(\sin \theta + \cos \theta)$ equals:
(A) $17/13$
(B) $7/13$
(C) $13/17$
(D) 1
9. The value of $(\sin^2 30^\circ + \cos^2 60^\circ) - (\tan^2 45^\circ - \sin^2 90^\circ)$ is:
(A) $-1/2$
(B) $1/2$
(C) $3/2$
(D) 1
10. The length of the tangent drawn from a point 5 cm away from the centre of a circle of radius 3 cm is:
(A) 4 cm
(B) 6 cm
(C) 8 cm
(D) 3.5 cm
11. In the figure, PA and PB are tangents from external point P. If $\angle APB = 50^\circ$, then $\angle OAB$ is:
(A) 25°
(B) 40°
(C) 65°
(D) 50°
12. A pole 6 m high casts a shadow $2\sqrt{3}$ m long. The angle of elevation of the sun is:
(A) 30°
(B) 45°
(C) 60°
(D) 90°
13. The area of a sector of a circle with radius 6 cm and angle 60° is:
(A) $6\pi \text{ cm}^2$
(B) $12\pi \text{ cm}^2$
(C) $3\pi \text{ cm}^2$
(D) $9\pi \text{ cm}^2$
14. The volume of a solid hemisphere of radius r is:
(A) $(4/3)\pi r^3$
(B) $(2/3)\pi r^3$
(C) $2\pi r^3$

(D) $(1/3)\pi r^3$

15. The mean of 20 observations is 15. If 2 is added to each observation, the new mean is:

(A) 15

(B) 17

(C) 30

(D) 13

16. For a frequency distribution, mean = 10 and median = 12. The mode is:

(A) 14

(B) 16

(C) 8

(D) 11

17. A card is drawn at random from a well-shuffled deck of 52 cards. The probability of getting a face card is:

(A) $1/13$

(B) $3/13$

(C) $4/13$

(D) $2/13$

18. Two dice are thrown simultaneously. The probability of getting a sum of 8 is:

(A) $5/36$

(B) $1/6$

(C) $7/36$

(D) $1/4$

19. DIRECTION: In Q.19 & Q.20, Assertion (A) and Reason (R) are given. Choose the correct answer.

Assertion (A): $\sqrt{3}$ is an irrational number. Reason (R): Square root of any prime number is irrational.

(A) Both A and R are true, and R is the correct explanation of A.

(B) Both A and R are true, but R is NOT the correct explanation of A.

(C) A is true but R is false.

(D) A is false but R is true.

20. Assertion (A): The equation $x^2 + x + 1 = 0$ has no real roots. Reason (R): A quadratic equation has no real roots if discriminant < 0 .

(A) Both A and R are true, and R is the correct explanation of A.

(B) Both A and R are true, but R is NOT the correct explanation of A.

(C) A is true but R is false.

(D) A is false but R is true.

SECTION – B

(Each question carries 2 marks)

21. Find the HCF and LCM of 306 and 657. Verify that $\text{HCF} \times \text{LCM} = \text{Product of two numbers}$.

22. Find the zeroes of the polynomial $p(x) = x^2 - 3$ and verify the relationship between the zeroes and coefficients.

23. In $\triangle ABC$, right-angled at B, $AB = 24$ cm and $BC = 7$ cm. Find $\sin A$ and $\cos C$. OR If $\sin(A + B) = 1$ and $\cos(A - B) = \sqrt{3}/2$, find A and B. ($0^\circ < A + B \leq 90^\circ$, $A > B$)

24. Prove that the tangents drawn from an external point to a circle are equal in length.

25. Find the area of a quadrant of a circle of radius 14 cm.

SECTION – C

(Each question carries 3 marks)

26. Prove that $\sqrt{5}$ is irrational.

27. Find the roots of the equation: $3x^2 - 5x + 2 = 0$ using the quadratic formula. OR The sum of a number and its reciprocal is $10/3$. Find the number.

28. In an AP, the sum of first n terms is $S_n = 3n^2/2 + 5n/2$. Find the AP and its 25th term.

29. Prove that: $(\sin \theta - \operatorname{cosec} \theta)(\cos \theta - \sec \theta) = 1 / (\tan \theta + \cot \theta)$.

30. From a point on the ground, the angle of elevation of the top of a tower is 30° . On walking 20 m towards the tower, the angle of elevation becomes 60° . Find the height of the tower. OR Two poles of heights 6 m and 11 m stand on a plane ground. If the distance between their feet is 12 m, find the distance between their tops.

31. A bag contains 6 red, 5 blue and 4 green balls. One ball is drawn at random. Find the probability that the ball drawn is: (i) red, (ii) not green, (iii) blue or green.

SECTION – D

(Each question carries 5 marks)

32. Solve the pair of equations graphically: $2x + y = 6$ and $2x - y + 2 = 0$. Find the coordinates of the vertices of the triangle formed by these lines and the y-axis. OR A boat goes 30 km upstream and 44 km downstream in 10 hours. In 13 hours it can go 40 km upstream and 55 km downstream. Determine the speed of the stream and that of the boat in still water.

33. State and prove the Basic Proportionality Theorem (Thales' Theorem). Using this theorem, if in $\triangle PQR$, a line DE is drawn parallel to QR such that $PD/DQ = 3/5$, find PE/ER .

34. A metallic sphere of radius 4.2 cm is melted and recast into the shape of a cylinder of radius 6 cm. Find the height of the cylinder. OR A tent is in the shape of a cylinder surmounted by a conical top. If the height and radius of the cylindrical part are 2.1 m and 4 m respectively, and the slant height of the conical top is 2.8 m, find the total area of the canvas required. ($\pi = 22/7$)

35. The following table gives production yield (in kg/ha) of wheat of 100 farms. Find the mean, median and mode of the data:

Production yield	50–55	55–60	60–65	65–70	70–75	75–80	No. of farms
2	12	24	38	16			

SECTION – E

(Case Study Based Questions — Each question carries 4 marks)

36. CASE STUDY 1: Saving Plan

Riya's piggy bank has ₹2 on Day 1, ₹4 on Day 2, ₹6 on Day 3, and so on.

- (i) What type of sequence is this? Write the first four terms. [1 mark]
- (ii) Find the amount she saves on the 15th day. [1 mark]
- (iii) Find the total amount she will have saved in 30 days. [2 marks]

37. CASE STUDY 2: Garden Design

A circular garden has a square park inscribed in it. The diagonal of the square park is 14 m.

- (i) Find the radius of the circular garden. [1 mark]
- (ii) Find the area of the square park. [1 mark]
- (iii) Find the area of the garden that is outside the square park. ($\pi = 22/7$) [2 marks]

38. CASE STUDY 3: Survey

In a survey of 200 people, the following data was recorded about their mode of commute: Car: 80, Bus: 60, Cycle: 40, Walking: 20.

- (i) Find the probability that a randomly selected person travels by car. *[1 mark]*
- (ii) Find the probability that a person does NOT travel by bus. *[1 mark]*
- (iii) Find the probability that a person travels by cycle or walking. Also, find the probability of travelling by any mode other than walking. *[2 marks]*

*** END OF QUESTION PAPER ***

All the best!