[SCHOOL NAME]

HALF YEARLY EXAMINATION (2026–27)

MATHEMATICS — STANDARD (Code 041)

Class: X | **Time Allowed: 3 Hours** | **Maximum Marks: 80**

General Instructions

1. This question paper contains **38 questions**. All questions are compulsory.
2. This question paper is divided into **5 Sections — A, B, C, D and E**.
3. In **Section A**, Question numbers 1 to 18 are Multiple Choice Questions (MCQs) and Question numbers 19 and 20 are Assertion–Reason based questions of **1 mark** each.
4. In **Section B**, Question numbers 21 to 25 are Very Short Answer (VSA) type questions of **2 marks** each.
5. In **Section C**, Question numbers 26 to 31 are Short Answer (SA) type questions carrying **3 marks** each.
6. In **Section D**, Question numbers 32 to 35 are Long Answer (LA) type questions carrying **5 marks** each.
7. In **Section E**, Question numbers 36 to 38 are case-study based questions carrying **4 marks** each, with sub-parts of values 1, 1 and 2 marks respectively.
8. There is no overall choice. However, an internal choice has been provided in **2 questions in Section B, 2 questions in Section C, 2 questions in Section D** and in **1 case-based question of Section E**.
9. Draw neat figures wherever required. Take $\pi = 22/7$ wherever required, if not stated.
10. Use of calculators is **not** allowed.
11. This paper is based on **NCERT Mathematics – Class X, Chapters 1 to 8** (Real Numbers to Introduction to Trigonometry).

SECTION – A

Questions 1–20 carry 1 mark each. For Q1–18, select the correct option. (20 × 1 = 20 marks)

1. The HCF of two numbers is 18 and their product is 3672. Their LCM is: **1**

(a) 202 (b) 204
(c) 206 (d) 208

2. Which of the following is an irrational number? **1**

(a) $\sqrt{16}$ (b) 22/7
(c) $\sqrt{23}$ (d) 0.3333...

3. The number of zeroes that a linear polynomial $p(x) = ax + b$ $(a \neq 0)$ can have is: 1

(a) 0 (b) 1
(c) 2 (d) infinite

4. If the sum and the product of the zeroes of the quadratic polynomial $ax^2 + bx + c$ are both equal to 3, then: 1

(a) $b = -3a, c = 3a$ (b) $b = 3a, c = 3a$
(c) $b = -3a, c = -3a$ (d) $b = 3a, c = -3a$

5. The pair of linear equations $x + 2y - 4 = 0$ and $2x + 4y - 12 = 0$ is: 1

(a) consistent, unique solution (b) consistent, infinitely many solutions
(c) inconsistent (d) none of these

6. Graphically, the pair of equations $6x - 3y + 10 = 0$ and $2x - y + 9 = 0$ represents two lines which are: 1

(a) intersecting at one point (b) parallel
(c) coincident (d) intersecting at two points

7. Which of the following is a quadratic equation in x? 1

(a) $x^2 + 1 = (x-1)^2 + 3$ (b) $x(x+1) + 8 = (x+2)(x-2)$
(c) $(x+2)^3 = x^3 - 4$ (d) $x^2 - 1 = (x-1)(x+1)$

8. The roots of the quadratic equation $x^2 - 3x - 10 = 0$ are: 1

(a) 5, −2 (b) −5, 2
(c) 5, 2 (d) −5, −2

9. The 10^{th} term of the AP 5, 8, 11, 14, ... is: 1

(a) 32 (b) 35
(c) 29 (d) 38

10. If the common difference of an AP is −3 and the first term is 5, then the second term is: 1

(a) 2 (b) 8
(c) −3 (d) 5

11. In $\triangle ABC$, $DE \parallel BC$, with D on AB and E on AC. If AD = 2 cm, DB = 3 cm and AE = 3 cm, then EC equals: 1

(a) 4.5 cm (b) 2 cm
(c) 3 cm (d) 6 cm

12. If $\triangle ABC \sim \triangle PQR$ and $BC : QR = 1 : 3$, then $ar(\triangle ABC) : ar(\triangle PQR)$ is: 1

(a) 1 : 3 (b) 1 : 9
(c) 3 : 1 (d) 9 : 1

13. Which of the following is *not* a criterion for similarity of two triangles? **1**

(a) AA (b) SAS
(c) SSS (d) ASA

14. The distance of the point (3, 4) from the origin is: **1**

(a) 5 (b) 7
(c) 3 (d) 4

15. The coordinates of the midpoint of the segment joining (2, 3) and (4, 7) are: **1**

(a) (3, 5) (b) (6, 10)
(c) (1, 2) (d) (2, 4)

16. The value of $\sin 30° + \cos 60°$ is: **1**

(a) 1 (b) 0
(c) 2 (d) 1/2

17. The value of $\tan 45° \div \operatorname{cosec} 30°$ is: **1**

(a) 1/2 (b) 2
(c) 1 (d) 0

18. If $\sin\theta + \cos\theta = \sqrt{2}$, then the value of $\tan\theta + \cot\theta$ is: **1**

(a) 1 (b) 2
(c) $\sqrt{2}$ (d) 0

19. **Assertion (A):** $3 + 2\sqrt{5}$ is an irrational number. **1**
Reason (R): The sum of a rational number and an irrational number is always 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):** If, in two triangles, the corresponding angles are equal, then the two triangles are similar. **1**
Reason (R): This is a statement of the AA similarity criterion for triangles.

(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

Questions 21–25 are Very Short Answer type questions. (5 × 2 = 10 marks)

21. Find the HCF and LCM of 96 and 404 by the Prime Factorisation method. **2**

22. Find the zeroes of the quadratic polynomial $x^2 - 3x - 4$, and verify the relationship between the zeroes and the coefficients. **2**

23. Which term of the AP 21, 18, 15, 12, ... is −81? Also, is any term of this AP equal to 0? Give a reason for your answer. **2**

OR

Find the sum of the first 24 terms of the AP whose n^{th} term is given by $a_n = 3 + 2n$.

24. Find the point on the x-axis which is equidistant from the points (2, −5) and (−2, 9). **2**

25. Prove that: $(1 + \cot\theta - \text{cosec}\,\theta)(1 + \tan\theta + \sec\theta) = 2$ **2**

OR

If $3\cot\theta = 4$, find the value of $\dfrac{4\sin\theta - \cos\theta}{4\sin\theta + \cos\theta}$.

SECTION – C

Questions 26–31 are Short Answer type questions. (6 × 3 = 18 marks)

26. Solve the following pair of linear equations by the method of substitution or elimination: **3**
$2x + 3y = 11$ and $2x - 4y = -24$.
Hence, find the value of 'm' for which $y = mx + 3$.

27. A train travels a distance of 480 km at a uniform speed. If the speed had been 8 km/h less, it would have taken 3 hours more to cover the same distance. Find the speed of the train. **3**

28. The sum of the 4^{th} and 8^{th} terms of an AP is 24, and the sum of the 6^{th} and 10^{th} terms is 44. Find the first three terms of the AP. **3**

OR

Find the sum: 34 + 32 + 30 + ... + 10.

29. State and prove the Basic Proportionality Theorem (Thales' Theorem). **3**

30. Prove that: $\dfrac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta} = \tan\theta$ **3**

31. Find the area of the triangle whose vertices are (2, 3), (−1, 0) and (2, −4). **3**

OR

Show that the points (1, −1), (5, 2) and (9, 5) are collinear.

SECTION – D

Questions 32–35 are Long Answer type questions. (4 × 5 = 20 marks)

32. Two water taps together can fill a tank in $\frac{75}{8}$ hours (i.e. $9\frac{3}{8}$ hours). The tap of larger diameter takes 10 hours less than the smaller one to fill the tank separately. Find the time in which each tap can separately fill the tank. **5**

33. Prove that in a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides (Pythagoras Theorem). Using this result, find the length of the diagonal of a rectangle whose sides are 30 cm and 16 cm. **5**

OR

In an equilateral triangle ABC, D is a point on side BC such that $BD = \frac{1}{3} BC$. Prove that $9\,AD^2 = 7\,AB^2$.

34. Draw the graphs of the equations $x - y + 1 = 0$ and $3x + 2y - 12 = 0$ on the same graph paper. Determine the coordinates of the vertices of the triangle formed by these two lines and the x-axis, and shade the triangular region. **5**

35. Prove that: $(\operatorname{cosec}\theta - \sin\theta)(\sec\theta - \cos\theta) = \dfrac{1}{\tan\theta + \cot\theta}$ **5**

OR

Evaluate: $\dfrac{\sin^2 25^\circ + \sin^2 65^\circ}{\cos^2 17^\circ + \cos^2 73^\circ} + \sin^2 90^\circ \cdot \tan^2 60^\circ$

SECTION – E

Questions 36–38 are case-study based questions. Each question has three sub-parts of 1, 1 and 2 marks. (3 × 4 = 12 marks)

36. **Case Study — A Day at the Park.** A group of students of Class X planned a picnic at a nearby park. The park is drawn on a coordinate grid, with all distances measured in metres. On this grid, the main gate is located at A(2, 3), a fountain is located at B(6, 3), and a garden bench is located at C(6, 7). **4**

(i) Find the distance between the gate A and the fountain B. **[1]**

(ii) Find the distance between the fountain B and the bench C. **[1]**

(iii) Find the coordinates of the midpoint M of AC, and hence find the distance BM. **[2]**

37. **Case Study — Seating in a Theatre.** A theatre hall has 20 rows of seats. The first row has 30 seats, and each subsequent row has 2 more seats than the row in front of it, forming an arithmetic progression. **4**

(i) How many seats are there in the 10^{th} row? **[1]**

(ii) How many seats are there in the 20^{th} (last) row? **[1]**

(iii) Find the total number of seats in the theatre (all 20 rows together). **[2]**

38. **Case Study — Flying a Kite.** A boy is flying a kite from level ground. At one instant, the string of the kite makes an angle of 60° with the ground, and the kite is at a height of $20\sqrt{3}$ m above the ground. Assume the string is taut and straight. **4**

(i) Find the length of the string at this instant. **[1]**

(ii) Find the horizontal distance between the boy and the point directly below the kite. **[1]**

(iii) The wind later carries the kite horizontally so that the angle of elevation of the string becomes 30°, while the kite's height above the ground remains $20\sqrt{3}$ m. Find the new length of the string.

OR

Find the additional length of string let out by the boy when the angle changes from 60° to 30°. **[2]**

— END OF QUESTION PAPER —