CENTRAL BOARD OF SECONDARY EDUCATION

CBSE 2026-27

Mathematics (Standard)

Subject Code: 041 | Class X

Solutions

Sample Question Paper – Set 5

Time Allowed: 3 Hours **Maximum Marks: 80**

General Instructions

1. This question paper contains 38 questions. All questions are compulsory.
2. The question paper is divided into five Sections – A, B, C, D and E.
3. Section A comprises 18 Multiple Choice Questions (MCQs) of 1 mark each and Question Numbers 19 and 20 are Assertion–Reason based questions of 1 mark each.
4. Section B comprises 5 Very Short Answer (VSA) type questions of 2 marks each (Q.21–25).
5. Section C comprises 6 Short Answer (SA) type questions of 3 marks each (Q.26–31).
6. Section D comprises 4 Long Answer (LA) type questions of 5 marks each (Q.32–35).
7. Section E comprises 3 Case-Study based questions of 4 marks each (Q.36–38), with an internal choice in the 2-mark sub-part of each case study.
8. There is no overall choice. However, an internal choice has been provided in 2 questions in Section B, 2 questions in Section C and 2 questions in Section D, and in the 2-mark sub-part of each question in Section E.
9. Use of calculators is not permitted.
10. Draw neat diagrams wherever required. Take $\pi = \frac{22}{7}$ wherever required, if not stated.

Exam Pattern

Section	Type of Questions	No. of Qs	Marks each	Total Marks
A	Multiple Choice Questions & Assertion–Reason	20	1	20
B	Very Short Answer (VSA)	5	2	10
C	Short Answer (SA)	6	3	18
D	Long Answer (LA)	4	5	20
E	Case-Study Based	3	4	12
	Total	**38**		**80**

Unit-wise Weightage of Marks

Unit	Unit Name	Chapter	Marks
I	Number Systems	Real Numbers	6
II	Algebra	Polynomials; Pair of Linear Equations in Two Variables; Quadratic Equations; Arithmetic Progressions	20
III	Coordinate Geometry	Coordinate Geometry	6
IV	Geometry	Triangles; Circles	15
V	Trigonometry	Introduction to Trigonometry; Some Applications of Trigonometry	12

Unit	Unit Name	Chapter	Marks
VI	Mensuration	Areas Related to Circles; Surface Areas and Volumes	10
VII	Statistics & Probability	Statistics; Probability	11
	Total		**80**

SECTION – A

Section A consists of 20 questions of 1 mark each.

Q1. A pair of irrational numbers whose product is a rational number is: **[1]**

(a) $(\sqrt{16}, \sqrt{4})$ (b) $(\sqrt{5}, \sqrt{2})$ (c) $(\sqrt{3}, \sqrt{27})$ (d) $(\sqrt{36}, \sqrt{2})$

Q2. If $ax + by = a^2 - b^2$ and $bx + ay = 0$, with $a^2 \neq b^2$, then the value of $x + y$ is: **[1]**

(a) $a^2 - b^2$ (b) $a + b$ (c) $a - b$ (d) $a^2 + b^2$

Q3. The fourth vertex D of a parallelogram $ABCD$ whose three vertices are $A(-2, 3)$, $B(6, 7)$ and $C(8, 3)$ is: **[1]**

(a) $(0, 1)$ (b) $(0, -1)$ (c) $(-1, 0)$ (d) $(1, 0)$

Q4. AB is a diameter of a circle with centre O, and AT is a tangent at A. C is a point on the circle with $\angle CAT = 40^\circ$. Then $\angle CBA$ is equal to: **[1]**

(a) 70° (b) 50° (c) 65° (d) 40°

Q5. If θ is an acute angle of a right-angled triangle, then which of the following equations is not true? **[1]**

(a) $\sin\theta \cot\theta = \cos\theta$ (b) $\cos\theta \tan\theta = \sin\theta$ (c) $\text{cosec}^2\,\theta - \cot^2\theta = 1$ (d) $\tan^2\theta - \sec^2\theta = 1$

Q6. The curved surface area of a cylinder of height 5 cm is 94.2 cm^2. The radius of the cylinder is (take $\pi = 3.14$): **[1]**

(a) 2 cm (b) 3 cm (c) 2.9 cm (d) 6 cm

Q7. For the data $2,\ 9,\ x + 6,\ 2x + 3,\ 5,\ 10,\ 5$, if the mean is 7, then the value of x is: **[1]**

(a) 9 (b) 6 (c) 5 (d) 3

Q8. If p and q are natural numbers and p is a multiple of q, then the HCF of p and q is: **[1]**

(a) pq (b) p (c) q (d) $p + q$

Q9. If the zeroes of a polynomial $p(x)$ are -3 and 8, then $p(x)$ equals: **[1]**

(a) $x^2 + 5x - 4$ (b) $(x + 3)(-x + 8)$ (c) $a(x^2 + 5x - 24)$ (d) $x^2 - 24$

Q10. A square pyramid $TABCD$ has every edge (the four slant edges TA, TB, TC, TD and the four base edges) equal to 12 m. Points E and F are the midpoints of TA and TB respectively. The length EF is **[1]**

(a) 24 m (b) 3 m (c) 6 m (d) 10 m

Q11. From a point on the ground, 30 m away from the foot of a vertical tower, the angle of elevation of the top of the tower is 60°. The height of the tower, in metres, is: **[1]**

(a) $10\sqrt{3}$ (b) $30\sqrt{3}$ (c) 60 (d) 30

Q12. A piece of wire 20 cm long is bent into the form of an arc of a circle of radius $\dfrac{60}{\pi}$ cm. The angle subtended by the arc at the centre of the circle is: **[1]**

(a) 30° (b) 60° (c) 90° (d) 50°

Q13. If the probability of a letter chosen at random from the letters of the word MATHEMATICS to be a vowel is $\frac{2}{2x+1}$, then x is equal to: **[1]**

(a) $\frac{4}{11}$ (b) $\frac{9}{4}$ (c) $\frac{11}{4}$ (d) $\frac{4}{9}$

Q14. If x is the LCM of $4, 6, 8$, y is the LCM of $3, 5, 7$, and p is the LCM of x and y, then which of the following is true? **[1]**

(a) $p = 35x$ (b) $p = 4y$ (c) $p = 8x$ (d) $p = 16y$

Q15. The nature of the roots of the quadratic equation $9x^2 - 6x - 2 = 0$ is: **[1]**

(a) No real roots
(b) 2 equal real roots
(c) 2 distinct real roots
(d) More than 2 real roots

Q16. Water in a river, which is 3 m deep and 40 m wide, flows at the rate of 2 km/h into the sea. The volume of

water that falls into the sea in 2 minutes is: **[1]**

(a) 800 m^3 (b) 4000 m^3 (c) 8000 m^3 (d) 2000 m^3

Q17. The 10^{th} term of the A.P. $5, \frac{19}{4}, \frac{9}{2}, \frac{17}{4}, \ldots$ is: **[1]**

(a) $\frac{11}{4}$ (b) $\frac{4}{11}$ (c) $\frac{13}{4}$ (d) $\frac{4}{13}$

Q18. Two lines are parallel. The equation of one of them is $5x - 3y = 2$. The equation of the second line can be: **[1]**

(a) $-15x - 9y = 5$ (b) $15x + 9y = 5$ (c) $9x - 15y = 6$ (d) $-15x + 9y = 5$

Q19. **Assertion (A):** $ABCD$ is a trapezium with $DC \parallel AB$. E and F are points on AD and BC such that $EF \parallel AB$. Then $\frac{AE}{ED} = \frac{BF}{FC}$.

Reason (R): Any line parallel to the parallel sides of a trapezium divides the non-parallel sides proportionally. **[1]**

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).

(c) Assertion (A) is true, but Reason (R) is false.

(d) Assertion (A) is false, but Reason (R) is true.

Q20. **Assertion (A):** TA and TB are two tangents drawn from an external point T to a circle with centre O. If $\angle TBA = 75°$, then $\angle ABO = 25°$.

Reason (R): The tangent drawn at any point of a circle is perpendicular to the radius through the point of contact. **[1]**

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).

(c) Assertion (A) is true, but Reason (R) is false.

(d) Assertion (A) is false, but Reason (R) is true.

SECTION – B

Section B consists of 5 questions of 2 marks each.

Q21. Show that the points $(-2, 3)$, $(8, 3)$ and $(6, 7)$ are the vertices of a right-angled triangle. **[2]**

OR

OR Vertices of a right triangle ABC with $\angle B = 90°$ are $A(3, 4)$, $B(1, 1)$ and $C(-8, 7)$. Find the value of $\tan A$. **[2]**

Q22. Prove that the tangents drawn at the ends of a diameter of a circle are parallel. **[2]**

OR

OR Two tangents inclined at an angle of $60°$ are drawn to a circle of radius 3 cm. Find the length of each tangent. **[2]**

Q23. The mean and mode of the daily water consumption (in litres) of a set of households are 36 and 39 respectively. Using the empirical relation, find the median. **[2]**

Q24. In quadrilateral $ABCD$, the diagonal BD bisects $\angle B$ and $\angle D$. Prove that (i) $\triangle ABD \sim \triangle CBD$; (ii) $AB = BC$. **[2]**

Q25. A bag contains 4 red, 3 blue and 2 yellow balls. One ball is drawn at random from the bag. Find the probability that the drawn ball is (i) red; (ii) yellow. **[2]**

SECTION – C

Section C consists of 6 questions of 3 marks each.

Q26. Prove that $\sqrt{5}$ is an irrational number. **[3]**

OR

OR Prove that $\sqrt{3}$ is an irrational number. **[3]**

Q27. A train covered a certain distance at a uniform speed. Had the train been 6 km/h faster, it would have taken 4 hours less than the scheduled time. Had it been 6 km/h slower, it would have taken 6 hours more than the scheduled time. Find the length of the journey. **[3]**

OR

OR Anuj had some chocolates, which he divided into two lots A and B. He sold lot A at Rs 2 for 3 chocolates and lot B at Rs 1 per chocolate, collecting Rs 400 in all. If he had sold lot A at Rs 1 per chocolate and lot B at Rs 4 for 5 chocolates, his total collection would have been Rs 460. Find the total number of chocolates he had. **[3]**

Q28. Find the coordinates of the points which divide the line segment joining $A(-2, 2)$ and $B(2, 8)$ into four equal parts. **[3]**

Q29. In the figure, PC is a tangent to a circle with centre O at C. AOB is a diameter which, when produced, meets the tangent at P, with B between P and O. CA and CB are chords, and $\angle PCA = 110°$. Find $\angle CBA$ and $\angle BCO$. **[3]**

Q30. The sides of a right triangular field are 25 m, 24 m and 7 m. At the three corners of the field, a cow, a buffalo and a horse are tied separately with ropes of 3.5 m each, to graze in the field. Find the area of the field that cannot be grazed by these animals. (Use $\pi = \frac{22}{7}$.) **[3]**

Q31. A train travelling at a uniform speed for 360 km would have taken 48 minutes less to travel the same distance if its speed were 5 km/h more. Find the original speed of the train. **[3]**

SECTION – D

Section D consists of 4 questions of 5 marks each.

Q32. The zeroes α and β of the quadratic polynomial $p(x) = x^2 - 6x + k$ satisfy $\alpha^2 + \beta^2 = 20$.

(a) Find the value of k. [2 marks]

(b) Find the zeroes of $p(x)$ for this value of k. [1 mark]

(c) Hence form a quadratic polynomial whose zeroes are $\frac{1}{\alpha}$ and $\frac{1}{\beta}$. [2 marks] **[5]**

OR

OR For the quadratic polynomial $p(x) = x^2 - (k + 6)x + 2(2k - 1)$, let α and β be its zeroes.

(a) Find $\alpha + \beta$ and $\alpha\beta$ in terms of k. [1 mark]

(b) If the sum of the zeroes is half of their product, find the value of k. [2 marks]

(c) Write $p(x)$ for this value of k, and verify that the sum of its zeroes is half their product. [2 marks] **[5]**

Q33. Manish is standing on level ground and observes a kite flying 200 m away from him at an angle of elevation of 30°. Mahesh, standing on the roof of a 50 m high building on the opposite side of the kite, observes the same kite at an angle of elevation of 45°. Find the distance between the kite and Mahesh. **[5]**

OR

OR The angles of depression of two ships from the top of a lighthouse, and on the same side of it, are $45°$ and $30°$. If the ships are 200 m apart and one ship is exactly behind the other, find the height of the lighthouse. **[5]**

Q34. The mean of the following frequency distribution is 28. If the sum of all frequencies is 100, then find the values of p and q.

Class interval	0–10	10–20	20–30	30–40	40–50	50–60
Frequency	12	p	27	20	q	6

[5]

OR

OR Find the median and mode of the following distribution.

Class interval	Frequency
0–15	15
15–30	10
30–45	12
45–60	9
60–75	8
75–90	10
90–105	6

[5]

Q35. If $x\sin^3\theta + y\cos^3\theta = \sin\theta\cos\theta$ and $x\sin\theta = y\cos\theta$, prove that $x^2 + y^2 = 1$. **[5]**

OR

OR (i) Prove that $\sqrt{\sec^2\theta + \operatorname{cosec}^2\theta} = \tan\theta + \cot\theta$. (ii) Evaluate $\dfrac{\cos 45°}{\sec 30° + \operatorname{cosec} 30°}$. **[5]**

SECTION – E

Section E consists of 3 case-study based questions of 4 marks each, with an internal choice in the 2-mark sub-part of each.

Q36. Read the following passage carefully and answer the questions that follow. **[4]**

A highway underpass is parabolic in shape. The cross-section is represented by a quadratic polynomial $p(x) = ax^2 + bx + c$, $a \neq 0$, whose graph is a parabola. The parabola is symmetric about a vertical line, the axis of symmetry, which passes through its vertex (the maximum or minimum point). The zeroes of the polynomial are the points where the parabola meets the x-axis.
Based on the above information, answer the following questions:

(i) Find the zeroes of the polynomial $x^2 - 2x - 8$ that represents the underpass. [1]

(ii) Find the number of zeroes of the polynomial $f(x) = (x-2)^2 + 4$. Give a reason. [1]

(iii) Find a quadratic polynomial whose one zero is 6 and the sum of whose zeroes is 0. [2]

OR

(iii) Find the zeroes of the polynomial $x^2 - 36$ and verify the relation between the zeroes and the coefficients. [2]

Q37. Read the following passage carefully and answer the questions that follow. **[4]**

In a technology park in Hyderabad, a company has installed a circular meditation garden for its employees. Arjun, a designer, stood at a point P outside the garden and drew two tangents PA and PB to the circular boundary, touching it at A and B. The radius of the garden is 9 m and the distance of P from the centre O is 18 m. For preparing safety guidelines, Arjun needed the lengths of the tangents.
Based on the above information, answer the following questions:

(i) What is the measure of $\angle OAP$? [1]

(ii) Calculate the length of the tangent PA. [1]

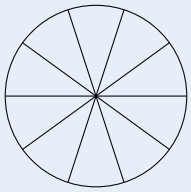
(iii) Calculate the measure of $\angle AOB$. [2]

OR

(iii) If PA and PB were inclined at $60°$ (that is, $\angle APB = 60°$), what would be the length of each tangent? [2]

Q38. Read the following passage carefully and answer the questions that follow. **[4]**

A brooch is crafted from silver wire in the shape of a circle with a diameter of 35 cm. The wire is also used to make 5 diameters, which divide the circle into 10 equal sectors, as shown in the figure.



Based on the above information, answer the following questions:

(i) What is the radius of the circle? [1]

(ii) What is the circumference of the brooch? (Use $\pi = \frac{22}{7}$.) [1]

(iii) What is the total length of silver wire required? [2]

OR

(iii) What is the area of each sector of the brooch? (Use $\pi = \frac{22}{7}$.) [2]

***** END OF PAPER *****