CENTRAL BOARD OF SECONDARY EDUCATION

CBSE 2026-27

Mathematics (Standard)

Subject Code: 041 | Class X

Solutions

Sample Question Paper – Set 7

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. If $x = a^2b^3c^n$ and $y = a^3b^mc^2$, where a, b, c are distinct prime numbers, and the LCM of x and y is $a^3b^4c^3$, then the value of $m + n$ is: **[1]**

(a) 10 (b) 7 (c) 6 (d) 5

Q2. Which term of the A.P. $27, 24, 21, \ldots$ is zero? **[1]**

(a) 9th (b) 11th (c) 10th (d) 8th

Q3. $A(-4, 5)$ and $C(8, 2)$ are two opposite vertices of a parallelogram $ABCD$. Its diagonals intersect each other at $P(a, b)$. The relation between a and b is: **[1]**

(a) $b = a - 1.5$ (b) $b = a + 1.5$ (c) $b = a - 4.5$ (d) $b = a + 4.5$

Q4. PQ and PT are tangents from an external point P to a circle, touching it at Q and T. A third tangent touches the circle at N and meets PQ at L and PT at M. If $PQ = 28$ cm, then the perimeter of $\triangle PLM$ is: **[1]**

(a) 28 cm (b) 56 cm (c) 14 cm (d) 84 cm

Q5. If $7\cos^2\theta + 3\sin^2\theta = 4$, then the value of θ is **[1]**

(a) 30° (b) 45° (c) 60° (d) 90°

Q6. The ratio of the total surface area of a solid hemisphere to the square of its radius is: **[1]**

(a) $2\pi : 1$ (b) $4\pi : 1$ (c) $3\pi : 1$ (d) $1 : 4\pi$

Q7. If the mode of some observations is 10 and the sum of their mean and median is 25, then the mean and median respectively are: **[1]**

(a) 12 and 13 (b) 13 and 12 (c) 10 and 15 (d) 15 and 10

Q8. Which of the following is a rational number between $\sqrt{3}$ and $\sqrt{5}$? **[1]**

(a) $1.4142387954012\ldots$ (b) $2.32\overline{6}$
(c) π (d) 1.857142

Q9. Let p be a prime number. The quadratic equation having its roots as factors of p is **[1]**

(a) $x^2 - px + p = 0$ (b) $x^2 - (p+1)x + p = 0$ (c) $x^2 + (p+1)x + p = 0$ (d) $x^2 - px + p + 1 = 0$

Q10. In $\triangle DEF$, $AB \parallel EF$ with A on DE and B on DF. Given $DA = 2x$, $AE = 3x + 1$, $DB = x$ and $BF = 2x - \dfrac{1}{2}$, the value(s) of x is/are **[1]**

(a) $0,\ 2$ (b) 2 only (c) -2 (d) 1

Q11. A car moves away from the base of a 30 m high tower. The angle of elevation of the top of the tower from the car, when the car is $10\sqrt{3}$ m from the base, is: **[1]**

(a) 30° (b) 45° (c) 90° (d) 60°

Q12. Area of a segment of a circle of radius r and central angle 60° is: **[1]**

(a) $\dfrac{\pi r^2}{2} - \dfrac{1}{2}r^2$ (b) $\dfrac{2\pi r}{4} - \dfrac{\sqrt{3}}{4}r^2$ (c) $\dfrac{\pi r^2}{6} - \dfrac{\sqrt{3}}{4}r^2$ (d) $\dfrac{2\pi r}{4} - r^2\sin 60^\circ$

Q13. Find the probability of getting a black queen when a card is drawn at random from a well shuffled pack of 52 cards. **[1]**

(a) $\frac{1}{52}$ (b) $\frac{1}{26}$ (c) $\frac{1}{13}$ (d) $\frac{1}{4}$

Q14. The sum of the exponents of the prime factors in the prime factorisation of 4004 is: **[1]**

(a) 5 (b) 4 (c) 3 (d) 2

Q15. If $f(x) = px^2 + qx + r$, $p \neq 0$ and $p + r = q$, then one of the zeroes of $f(x)$ is: **[1]**

(a) $\frac{q}{p}$ (b) $\frac{r}{p}$ (c) $-\frac{r}{p}$ (d) $-\frac{q}{p}$

Q16. If a pair of linear equations in two variables is represented by two coincident lines, then the pair has: **[1]**

(a) a unique solution (b) two solutions
(c) no solution (d) an infinite number of solutions

Q17. The quadratic equation $x^2 + x + 1 = 0$ has **[1]**

(a) Real and equal roots (b) Irrational roots
(c) Real and distinct roots (d) Roots which are not real

Q18. In an A.P., if $d = -4$, $n = 7$ and $a_n = 4$, then the first term a is: **[1]**

(a) -28 (b) 28 (c) 4 (d) -4

Q19. **Assertion (A):** The quadratic equation $2x^2 - 3x + 5 = 0$ has two distinct real roots.
Reason (R): The quadratic equation $ax^2 + bx + c = 0$ has no real roots when $b^2 - 4ac < 0$. **[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):** A toy is in the form of a cylinder surmounted by a hemisphere of the same radius. If the radius of the cylinder is 3 cm and its height is 7 cm, then the volume of the toy is 81π cm^3.
Reason (R): The volume of the given solid is the sum of the volume of the cylinder and the volume of the hemisphere. **[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. Find the sum and the product of the roots of the quadratic equation $2x^2 - 9x + 4 = 0$. **[2]**

OR

OR Find the discriminant of the quadratic equation $4x^2 - 5 = 0$ and hence comment on the nature of its roots. **[2]**

Q22. From the top of a watch-tower 15 m high, the angle of depression of a boat on the sea is 30°. Find the distance of the boat from the foot of the tower. **[2]**

OR

OR The angle of elevation of the top of a tower from a point on the ground, which is 30 m away from the foot of the tower, is 30°. Find the height of the tower. **[2]**

Q23. Find the length of the arc of a circle which subtends an angle of 60° at the centre of a circle of radius 42 cm. (Use $\pi = \frac{22}{7}$.) **[2]**

Q24. Two dice bearing the numbers $4, 6, 7, 9, 11, 12$ are rolled together. Find the probability that the product of the numbers obtained is an odd number. **[2]**

OR

OR How many positive three-digit integers have the hundreds digit 8 and the units digit 5? Find the probability of selecting one such number out of all three-digit integers. **[2]**

Q25. Mrs. Garg recorded the marks obtained by her students in the following table. She calculated the modal marks of the students of the class as 45. While printing the data, a blank was left. Find the missing frequency in the table given below.

Marks obtained	Number of students
0–20	5
20–40	10
40–60	(blank)
60–80	6
80–100	3

[2]

OR

OR A survey recorded the hours of reading per week of some students:

Hours per week	0–10	10–20	20–30	30–40
Number of students	2	3	k	5

If the mean of the data is 24, find the value of k. **[2]**

SECTION – C

Section C consists of 6 questions of 3 marks each.

Q26. National Art convention got registrations from students from all parts of the country: 60 are interested in music, 84 in dance and 108 in handicrafts. The organisers wish to keep them in the minimum number of groups such that each group has students of the same art form and every group has the same number of students. Find the number of students in each group, the number of groups in each art form, and the number of rooms required if each group is allotted one room. **[3]**

OR

OR The dimensions of a window are 156 cm $\times$ 216 cm. Arjun wants to fix a grill on the window, creating complete squares of the maximum possible size. Find the side length of each square and hence the number of squares formed. **[3]**

Q27. Find the sum of the integers between 1 and 400 that are multiples of 4 as well as of 5. **[3]**

OR

OR Ridhi drew a polygon with n sides. The smallest exterior angle is 8° and each subsequent exterior angle is 4° more than the previous one. Find the number of sides of the polygon. **[3]**

Q28. State and prove the Basic Proportionality Theorem. **[3]**

Q29. The sum of a two-digit number and the number obtained by reversing its digits is 66. If the digits differ by 2, find the number. How many such numbers are there? **[3]**

Q30. PA and PB are tangents drawn to a circle with centre O from an external point P. The chord AB makes an angle of 30° with the radius OA at the point of contact. If $AB = 6$ cm, find PA and OA. **[3]**

OR

OR Two concentric circles have radii 5 cm and 3 cm. Find the length of the chord of the larger circle which touches the smaller circle. **[3]**

Q31. ABC is a right-angled triangle in which $\angle B = 90°$, $AB = 4$ cm and $BC = 3$ cm. Find the radius of the circle inscribed in $\triangle ABC$. **[3]**

SECTION – D

Section D consists of 4 questions of 5 marks each.

Q32. The sides of a right triangle are such that the longest side is 4 m more than the shortest side and the third side is 2 m less than the longest side. Find the length of each side of the triangle, and also the area of the triangle. **[5]**

OR

OR The area of a right-angled triangle is 600 cm^2. If the base of the triangle exceeds the altitude by 10 cm, find all the three dimensions of the triangle. **[5]**

Q33. The line segment joining $A(1, -2)$ and $B(6, 8)$ is divided into three equal parts by the points P and Q, where P is nearer to A. (a) Find the coordinates of P and Q. (b) Show that $PQ = \frac{1}{3}AB$. (c) Find the point R on the y-axis which is equidistant from A and B. **[5]**

Q34. A horse is tied to a peg at one corner of a square-shaped grass field of side 15 m by means of a 5 m long rope. Find the area of that part of the field in which the horse can graze. Also, find the increase in the grazing area if the length of the rope is increased to 10 m. (Use $\pi = 3.14$.) **[5]**

Q35. Tickets numbered 1 to 60 are put into a box for a school lucky draw. One ticket is drawn at random. Find the probability that the number on the ticket is (i) a multiple of 6; (ii) a prime number; (iii) a perfect square; (iv) a two-digit number divisible by 8; (v) a multiple of 6 or of 8. **[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. Case Study: Height of a tower from shadows **[4]**

A student wants to find the height of a tower near his house by using the properties of similar triangles. At one instant, a building of height 20 m casts a shadow 10 m long on the ground. At the same instant, the tower casts a shadow 50 m long and the student's house casts a shadow 20 m long.
Based on the above information, answer the following questions:

(i) What is the height of the tower? [1]

(ii) What is the height of the student's house? [1]

(iii) What will be the length of the shadow of the tower when the building casts a shadow of 12 m at the same time? [2]

OR

(iii) When the tower casts a shadow of 40 m, what will be the length of the shadow of the student's house at the same time? [2]

Q37. Case Study: Passenger boarding stairs **[4]**

Passenger boarding stairs provide a mobile means of travel between an aircraft door and the ground. Larger aircraft have door sills 5 to 20 feet high (1 foot = 30 cm). An aircraft has a door sill 15 feet above the ground, and a stair car is placed at a horizontal distance of 15 feet from the aircraft.
Based on the above information, answer the following questions:

(i) Find the angle at which the stairs are inclined to reach the door sill. [1]

(ii) Find the length of the stairs used to reach the door sill. [1]

(iii) If 20-feet-long stairs are inclined at 60° to reach the door sill, find the height of the door sill above the ground. (Use $\sqrt{3} = 1.732$.) [2]

OR

(iii) What should be the shortest possible length of stairs to reach a door sill 20 feet above the ground, if the angle of elevation of the stairs cannot exceed 30°? Also find the horizontal distance of the base of the stair car from the aircraft. [2]

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

A solar panel of length 4 m is fixed on a metal frame on the flat roof of a school building. One end of the panel rests on the roof, and the panel is inclined to the roof at an angle θ. The other end of the panel is raised to a vertical height of 2 m above the roof. The engineer uses the position of the panel to plan the cables and the clear space under it. Assume that the panel is a straight line and that the roof is horizontal.
Based on the above information, answer the following questions:

(i) Find the value of $\sin\theta$. [1]

(ii) Write the measure of the angle θ. [1]

(iii) Find the horizontal distance on the roof between the end of the panel resting on the roof and the point directly below its raised end. [2]

OR

(iii) The panel is re-fixed at an angle of 45° with the roof, keeping its length 4 m. Find the vertical height of the raised end above the roof. [2]

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