CENTRAL BOARD OF SECONDARY EDUCATION

CBSE 2026-27

Mathematics (Standard)

Subject Code: 041 | Class X

Marking Scheme – Sample Question Paper – Set 7

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

General Instructions

1. This marking scheme gives value points and the mark split only; questions are in SQP Set 7.
2. Any other relevant answer, correctly worked, should be given due credit.
3. This question paper contains 38 questions. All questions are compulsory.
4. The question paper is divided into five Sections – A, B, C, D and E.
5. 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.
6. Section B comprises 5 Very Short Answer (VSA) type questions of 2 marks each (Q.21–25).
7. Section C comprises 6 Short Answer (SA) type questions of 3 marks each (Q.26–31).
8. Section D comprises 4 Long Answer (LA) type questions of 5 marks each (Q.32–35).
9. 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.
10. 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.
11. Use of calculators is not permitted.
12. 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

Unit	Unit Name	Chapter	Marks
IV	Geometry	Triangles; Circles	15
V	Trigonometry	Introduction to Trigonometry; Some Applications of Trigonometry	12
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. **[1]**

(b) 7. Matching the exponents of the LCM: $\max(3, m) = 4$ gives $m = 4$, and $\max(n, 2) = 3$ gives $n = 3$. So $m+n = 7$.

Q2. **[1]**

(c) 10th. $0 = 27 + (n-1)(-3)$ gives $n - 1 = 9$, so $n = 10$.

Q3. **[1]**

(b) $b = a + 1.5$. The diagonals bisect each other, so P is the mid-point of AC: $P = \left(\frac{-4+8}{2}, \frac{5+2}{2}\right) = (2, 3.5)$. So $a = 2$, $b = 3.5$ and $b = a + 1.5$.

Q4. **[1]**

(b) 56 cm. Tangents from L give $LN = LQ$ and from M give $MN = MT$. So the perimeter is $PL + LM + MP = PL + LQ + MT + MP = PQ + PT = 28 + 28 = 56$ cm.

Q5. **[1]**

(c) $60°$. Using $\sin^2\theta = 1 - \cos^2\theta$: $4\cos^2\theta + 3 = 4$, so $\cos^2\theta = \frac{1}{4}$ and $\theta = 60°$. **[1]**

Q6. **[1]**

(c) $3\pi : 1$. The total surface area is $2\pi r^2 + \pi r^2 = 3\pi r^2$, so the ratio is $3\pi r^2 : r^2 = 3\pi : 1$.

Q7. **[1]**

(b) 13 and 12. Let the mean be X and the median M. Then $X + M = 25$ and $10 = 3M - 2X$. Substituting $X = 25 - M$ gives $5M = 60$, so $M = 12$ and $X = 13$. **[1]**

Q8. **[1]**

(d) 1.857142. We have $\sqrt{3} \approx 1.732$ and $\sqrt{5} \approx 2.236$, and 1.857142 is a terminating (hence rational) decimal in between. (a) is below $\sqrt{3}$, (b) is about $2.3267 > \sqrt{5}$, and (c) π is irrational.

Q9. **[1]**

(b) $x^2 - (p+1)x + p = 0$. The factors of p are 1 and p, with sum $p + 1$ and product p. **[1]**

Q10. **[1]**

(b) 2 only. By the Basic Proportionality Theorem, $\frac{DA}{AE} = \frac{DB}{BF}$, so $2x(2x - \frac{1}{2}) = x(3x + 1)$, i.e. $x^2 - 2x = 0$, giving $x = 0$ or $x = 2$. For $x = 0$ we get $DA = 0$ and $BF = -\frac{1}{2} < 0$, which is impossible; so $x = 2$. Check: $DA = 4$, $AE = 7$, $DB = 2$, $BF = 3.5$, and $\frac{4}{7} = \frac{2}{3.5}$. **[1]**

Q11. **[1]**

(d) $60°$. $\tan\theta = \dfrac{30}{10\sqrt{3}} = \sqrt{3}$, so $\theta = 60°$. **[1]**

Q12. **[1]**

(c) $\frac{\pi r^2}{6} - \frac{\sqrt{3}}{4}r^2$. Segment = sector − triangle $= \frac{60}{360}\pi r^2 - \frac{1}{2}r^2\sin 60° = \frac{\pi r^2}{6} - \frac{\sqrt{3}}{4}r^2$. **[1]**

Q13. **[1]**

(b) $\frac{1}{26}$. There are 2 black queens (queen of spades and queen of clubs), so $P = \frac{2}{52} = \frac{1}{26}$. **[1]**

Q14. **[1]**

(a) 5. $4004 = 2^2 \cdot 7 \cdot 11 \cdot 13$, so the exponents are $2, 1, 1, 1$ with sum 5.

Q15. **[1]**

(c) $-\frac{r}{p}$. Substituting $q = p + r$ gives $f(x) = px^2 + (p + r)x + r = (x + 1)(px + r)$. The zeroes are -1 and $-\frac{r}{p}$.

Q16. **[1]**

(d) Coincident lines have every point in common, so there are infinitely many solutions. **[1]**

Q17. **[1]**

(d) Not real, because $D = 1 - 4 = -3 < 0$. **[1]**

Q18. **[1]**

(b) 28. From $a_7 = a + 6d = 4$ with $d = -4$: $a = 4 + 24 = 28$. (The printed MS value -28 has a sign error.)

Q19. **[1]**

(d) Assertion is false and Reason is true. Here $D = 9 - 40 = -31 < 0$, so the equation has no real roots, which is what the reason states. **[1]**

Q20. **[1]**

(a) The cylinder has volume $\pi(3)^2(7) = 63\pi$ and the hemisphere has volume $\frac{2}{3}\pi(3)^3 = 18\pi$, so the total is 81π cm^3. (A) is true, and (R), the sum of the two volumes, is the correct explanation.

SECTION – B

Section B consists of 5 questions of 2 marks each.

Q21. **[2]**

Sum $= -\dfrac{-9}{2} = \dfrac{9}{2}$. **[1]**

Product $= \dfrac{4}{2} = 2$. **[1]**

OR **[2]**

$D = b^2 - 4ac = 0 - 4(4)(-5) = 80$. **[1]**

$D > 0$, so the roots are real and distinct: $x = \pm\dfrac{\sqrt{5}}{2}$. **[1]**

Q22. **[2]**

If the boat is d m from the foot, then $\tan 30^\circ = \dfrac{15}{d}$, so $d = \dfrac{15}{1/\sqrt{3}}$. **[1]**

$d = 15\sqrt{3} \approx 25.98$ m. **[1]**

OR **[2]**

$\tan 30^\circ = \dfrac{h}{30}$, so $h = \dfrac{30}{\sqrt{3}}$. **[1]**

$h = 10\sqrt{3} \approx 17.32$ m. **[1]**

Q23. **[2]**

Arc $= \frac{60}{360} \times 2 \times \frac{22}{7} \times 42$. [1]
Arc $= 44$ cm. [1]

Q24. [2]

The total number of outcomes is $6 \times 6 = 36$. [1/2]
For the product to be odd, both numbers must be odd, so each die must show 7, 9 or 11. That gives $3 \times 3 = 9$ outcomes. [1]
So $P = \frac{9}{36} = \frac{1}{4}$. [1/2]

OR [2]

There are 900 three-digit integers (from 100 to 999). [1/2]
The numbers of the form $8x5$ are $805, 815, 825, \ldots, 895$, which are 10 numbers. [1]
So $P = \frac{10}{900} = \frac{1}{90}$. [1/2]

Q25. [2]

The modal class is 40–60: $l = 40$, $h = 20$, $f_0 = 10$, $f_2 = 6$, and f_1 is the missing frequency. [0.5]
$45 = 40 + \frac{f_1 - 10}{2f_1 - 10 - 6} \times 20$, so $\frac{f_1 - 10}{2f_1 - 16} = \frac{1}{4}$. [1]
$4f_1 - 40 = 2f_1 - 16$, so $f_1 = 12$. [0.5]

OR [2]

Class marks are $5, 15, 25, 35$. $\sum f_i = 10 + k$ and $\sum f_i x_i = 10 + 45 + 25k + 175 = 230 + 25k$. [0.5]
Mean $= \frac{230 + 25k}{10 + k} = 24$, so $230 + 25k = 240 + 24k$. [1]
$k = 10$. [0.5]

SECTION – C

Section C consists of 6 questions of 3 marks each.

Q26. [3]

Students per group $=$ HCF$(60, 84, 108) = 12$, since $60 = 2^2 \times 3 \times 5$, $84 = 2^2 \times 3 \times 7$ and $108 = 2^2 \times 3^3$. [1]
Groups: music $\frac{60}{12} = 5$, dance $\frac{84}{12} = 7$, handicrafts $\frac{108}{12} = 9$. [1]
Rooms required $= 5 + 7 + 9 = 21$. [1]

OR [3]

$156 = 2^2 \times 3 \times 13$ and $216 = 2^3 \times 3^3$. [1]
The side is HCF$(156, 216) = 2^2 \times 3 = 12$ cm. [1]
Number of squares $= \frac{156}{12} \times \frac{216}{12} = 13 \times 18 = 234$. [1]

Q27. [3]

These are the multiples of 20: $20, 40, \ldots, 380$, an A.P. with $a = 20$ and $d = 20$ [1]
$380 = 20 + (n - 1) \times 20 \Rightarrow n = 19$ [1]
$S_{19} = \frac{19}{2}(20 + 380)$ [1/2]
$S_{19} = 3800$ [1/2]

OR [3]

The exterior angles form an A.P. with $a = 8$ and $d = 4$, and they add up to $360°$. So $\frac{n}{2}[16 + (n - 1)4] = 360$ [1]
This gives $n^2 + 3n - 180 = 0$ [1]
$(n + 15)(n - 12) = 0$, and since $n > 0$, $n = 12$. The polygon has 12 sides [1]

Q28. [3]

Statement: if a line is drawn parallel to one side of a triangle to intersect the other two sides at distinct points, then it divides those two sides in the same ratio. [1]
Proof: Let $DE \parallel BC$ with D on AB and E on AC. Join BE and CD. The triangles BDE and CDE have the same base DE and lie between the same parallels, so $\text{ar}(BDE) = \text{ar}(CDE)$. [1]
Now $\frac{\text{ar}(ADE)}{\text{ar}(BDE)} = \frac{AD}{DB}$ and $\frac{\text{ar}(ADE)}{\text{ar}(CDE)} = \frac{AE}{EC}$ (equal heights). Hence $\frac{AD}{DB} = \frac{AE}{EC}$. [1]

Q29. **[3]**

Let the tens digit be x and the units digit y. Then $(10x + y) + (10y + x) = 66$, so $x + y = 6$. [1]
If $x - y = 2$, then $x = 4$, $y = 2$, giving 42. If $y - x = 2$, then $x = 2$, $y = 4$, giving 24. [1]
So there are two such numbers, 42 and 24. [1]

Q30. **[3]**

$\angle OAP = 90°$, so $\angle PAB = 90° - 30° = 60°$ [1]
$PA = PB$ and $\angle PAB = 60°$, so $\triangle PAB$ is equilateral and $PA = AB = 6$ cm [1]
In right $\triangle OAP$, $\angle APO = 30°$, so $OA = PA \tan 30° = 6 \times \frac{1}{\sqrt{3}} = 2\sqrt{3}$ cm [1]

OR **[3]**

Let the chord AB touch the inner circle at M. Then $OM \perp AB$ and M is the midpoint of AB [1]
By Pythagoras, $AM = \sqrt{5^2 - 3^2} = 4$ cm [1]
So the chord $AB = 2AM = 8$ cm [1]

Q31. **[3]**

By Pythagoras, $AC = \sqrt{4^2 + 3^2} = 5$ cm [1]
Let the circle touch AB, BC, CA at X, Y, Z. Then $BXOY$ is a square, so $BX = BY = r$, and $AX = AZ = 4 - r$, $CZ = CY = 3 - r$ [1]
Hence $AC = AZ + ZC = 7 - 2r = 5$, so $r = 1$ cm [1]

SECTION – D

Section D consists of 4 questions of 5 marks each.

Q32. **[5]**

Let the shortest side be x m. The longest side is $x+4$ and the third side is $x+2$. By Pythagoras, $x^2+(x+2)^2 = (x+4)^2$, so $x^2 - 4x - 12 = 0$. [2]
$(x - 6)(x + 2) = 0$, so $x = 6$ (rejecting -2). [1]
The sides are 6 m, 8 m and 10 m. [1]
Area $= \frac{1}{2}(6)(8) = 24$ m^2. [1]

OR **[5]**

Let the altitude be h cm, so the base is $(h + 10)$ cm. Then $\frac{1}{2}h(h + 10) = 600$. [1]
So $h^2 + 10h - 1200 = 0$, i.e. $(h + 40)(h - 30) = 0$. [1]
Rejecting $h = -40$, $h = 30$. [1]
The base is 40 cm and the hypotenuse is $\sqrt{30^2 + 40^2} = 50$ cm. [2]

Q33. **[5]**

(a) P divides AB in the ratio $1 : 2$, so $P = \frac{2A + B}{3} = \left(\frac{8}{3}, \frac{4}{3}\right)$. [1]
Q divides AB in the ratio $2 : 1$, so $Q = \frac{A + 2B}{3} = \left(\frac{13}{3}, \frac{14}{3}\right)$. [1]
(b) $PQ^2 = \left(\frac{5}{3}\right)^2 + \left(\frac{10}{3}\right)^2 = \frac{125}{9}$, so $PQ = \frac{\sqrt{125}}{3}$. Since $AB^2 = 25 + 100 = 125$, $PQ = \frac{1}{3}AB$. [1]

(c) Let $R = (0, y)$. Then $RA^2 = RB^2$ gives $1 + (y+2)^2 = 36 + (y-8)^2$. **[1]**

Expanding, $5 + 4y = 100 - 16y$, so $y = \dfrac{19}{4}$ and $R = \left(0, \dfrac{19}{4}\right)$. **[1]**

Q34. **[5]**

The peg is at a corner, so the horse grazes a quarter circle of radius 5 m. **[1]**

Area $= \dfrac{1}{4} \times 3.14 \times 5^2 = 19.625$ m^2. **[1]**

With a 10 m rope the grazed quarter circle has area $\dfrac{1}{4} \times 3.14 \times 10^2 = 78.5$ m^2, which lies inside the field since $10 < 15$. **[2]**

Increase $= 78.5 - 19.625 = 58.875$ m^2. **[1]**

Q35. **[5]**

(i) Multiples of 6: $6, 12, \ldots, 60$, which are 10 tickets, so $P = \dfrac{10}{60} = \dfrac{1}{6}$. **[1]**

(ii) Primes up to 60: $2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59$, which are 17 tickets, so $P = \dfrac{17}{60}$. **[1]**

(iii) Perfect squares: $1, 4, 9, 16, 25, 36, 49$, which are 7 tickets, so $P = \dfrac{7}{60}$. **[1]**

(iv) Two-digit multiples of 8: $16, 24, 32, 40, 48, 56$, which are 6 tickets, so $P = \dfrac{6}{60} = \dfrac{1}{10}$. **[1]**

(v) There are 10 multiples of 6 and 7 multiples of 8 ($8, 16, \ldots, 56$). The numbers 24 and 48 are counted in both, so there are $10 + 7 - 2 = 15$ tickets and $P = \dfrac{15}{60} = \dfrac{1}{4}$. **[1]**

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. **[4]**

(i) Heights are proportional to shadows at the same instant, so $\dfrac{\text{tower height}}{50} = \dfrac{20}{10}$, giving tower height $= 100$ m. **[1]**

(ii) $\dfrac{\text{house height}}{20} = \dfrac{20}{10}$, giving house height $= 40$ m. **[1]**

(iii) (B) If l_2 is the house's shadow when the tower's shadow is 40 m, then $\dfrac{l_2}{40} = \dfrac{40}{100}$, so $l_2 = 16$ m. **[2]**

Q37. **[4]**

(i) $\tan\theta = \dfrac{15}{15} = 1$, so $\theta = 45°$. **[1]**

(ii) Length $= \sqrt{15^2 + 15^2} = 15\sqrt{2} \approx 21.21$ feet. **[1]**

(iii) -OR: If the stairs have length L at angle θ, then $L = \dfrac{20}{\sin\theta}$. Since $\theta \le 30°$, $\sin\theta \le \dfrac{1}{2}$, so $L \ge 40$ feet; the shortest length is 40 feet, at $\theta = 30°$. The horizontal distance is $\dfrac{20}{\tan 30°} = 20\sqrt{3} \approx 34.64$ feet. **[2]**

Q38. **[4]**

(i) $\sin\theta = \dfrac{\text{height}}{\text{length}} = \dfrac{2}{4} = \dfrac{1}{2}$ **[1]**

(ii) $\sin\theta = \dfrac{1}{2}$ gives $\theta = 30°$ **[1]**

(iii) OR: Vertical height $= 4\sin 45° = 4 \cdot \dfrac{1}{\sqrt{2}} = 2\sqrt{2}$ m **[1]** for the sine ratio, **[1]** for the value.

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