CENTRAL BOARD OF SECONDARY EDUCATION

CBSE 2026-27

Mathematics (Standard)

Subject Code: 041 | Class X

Marking Scheme – Sample Question Paper – Set 3

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 3.
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]**

(c) 4. Since LCM $\times$ HCF = product, we get $36 \times 2 = 18x$, so $x = 4$.

Q2. **[1]**

(c) 0. $2(p+1) = (p-1) + (2p+3)$ gives $2p + 2 = 3p + 2$, so $p = 0$. (The terms are $-1, 1, 3$.)

Q3. **[1]**

(a) -12. The mid-point of QR is $(-4, 5)$, so $\frac{m}{3} = -4$ and $m = -12$.

Q4. **[1]**

(b) $90°$. The tangent is perpendicular to the radius, so $\angle OQP = 90°$. In $\triangle OPQ$, $x + y + 90° = 180°$, so $x + y = 90°$.

Q5. **[1]**

(c) $45°,\ 15°$. $A + B = 60°$ and $A - B = 30°$, so $2A = 90°$ and $2B = 30°$. **[1]**

Q6. **[1]**

(b) $1 : 3$. $\pi r^2 h_1 = \frac{1}{3}\pi r^2 h_2$, so $h_1 : h_2 = 1 : 3$.

Q7. **[1]**

(c). The mode is the value occurring most frequently, so 52 is the mode of the data. **[1]**

Q8. **[1]**

(c) 38. Since $221 = 13 \times 17$, we have $p = 17$ and $q = 13$, so $3p - q = 51 - 13 = 38$.

Q9. **[1]**

(a) ± 3, because $8k^2 - 72 = 0$ gives $k^2 = 9$. **[1]**

Q10. **[1]**

(c) $1 : 2$. Let $AB = 4u$. Then $PQ = u$ and $QB = QR + RB = 2u$, so $PQ : QB = 1 : 2$. (The printed key $1 : 1$ is wrong: Q is the mid-point of AB, not of PB.)

Q11. **[1]**

(c) 15.3 cm. $OS = ON + NS = 10.8$ cm. As $MN \parallel PS$, $\frac{OM}{OP} = \frac{ON}{OS} = \frac{4.8}{10.8} = \frac{4}{9}$. So $MP = OP - OM = \frac{5}{9}OP = 8.5$, which gives $OP = 15.3$ cm. **[1]**

Q12. **[1]**

(d) $15\sqrt{3}$ m. Height $= 30 \sin 60° = 30 \times \frac{\sqrt{3}}{2} = 15\sqrt{3}$ m. **[1]**

Q13. **[1]**

(d) $8\left[\frac{\pi}{6} - \frac{\sqrt{3}}{4}\right]$ cm^2. The chord has length 1 cm, equal to the radius, so it subtends $60°$ at each centre. Each overlap is two $60°$ segments of radius 1 cm, each of area $\frac{\pi}{6} - \frac{\sqrt{3}}{4}$. Four overlaps give $8\left[\frac{\pi}{6} - \frac{\sqrt{3}}{4}\right]$ cm^2. **[1]**

Q14. **[1]**

(a) -3. For any event, $P(E) + P(\overline{E}) = 1$, so $q = 1$ and $q^2 - 4 = 1 - 4 = -3$. **[1]**

Q15. **[1]**

(b) irrational. $a = \pm\dfrac{\sqrt{23}}{5}$, and $\sqrt{23}$ is irrational because 23 is not a perfect square.

Q16. **[1]**

(d) 2. Inconsistent needs $\frac{3}{2k-1} = \frac{1}{k-1} \neq \frac{1}{2k+1}$. The first equality gives $3k - 3 = 2k - 1$, so $k = 2$; then $\frac{1}{5} \neq 1$ holds. **[1]**

Q17. **[1]**

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

Q18. **[1]**

(c) 40 m. Height above eye level $= 38.2 \tan 45^\circ = 38.2$ m, so the total height is $38.2 + 1.8 = 40$ m. **[1]**

Q19. **[1]**

(a) Both A and R are true, and R is the correct explanation of A. From $\cos A + \cos^2 A = 1$, $\cos A = 1 - \cos^2 A = \sin^2 A$ (using R). Then $\sin^2 A + \sin^4 A = \cos A + \cos^2 A = 1$. **[1]**

Q20. **[1]**

(c) A is true, but R is false. A: $\sqrt{6^2 + 8^2} = \sqrt{100} = 10$ m, so A is true. R: $\tan\theta = \dfrac{8}{6} = \dfrac{4}{3}$, which is not $\sqrt{3}$, so the angle is not 60° and R is false. **[1]**

SECTION – B

Section B consists of 5 questions of 2 marks each.

Q21. **[2]**

Expanding: $(\sin^2 A + 2 + \operatorname{cosec}^2 A) + (\cos^2 A + 2 + \sec^2 A) = 1 + 4 + \operatorname{cosec}^2 A + \sec^2 A$ **[1]**. Using $\operatorname{cosec}^2 A = 1 + \cot^2 A$ and $\sec^2 A = 1 + \tan^2 A$, the right side is $7 + \tan^2 A + \cot^2 A$, so $x = 7$ **[1]**.

OR **[2]**

Numerator $= \frac{3}{2} - 4 \cdot \frac{1}{8} = 1$ **[1]**. Denominator $= 2(\sin^2 50^\circ + \cos^2 50^\circ) = 2$, so the value is $\frac{1}{2}$ **[1]**.

Q22. **[2]**

$\pi r l = \frac{22}{7} \times 56 \times l = 12320$, so the slant height is $l = 70$ cm. **[1]**
Then $h = \sqrt{70^2 - 56^2} = \sqrt{1764} = 42$ cm. **[1]**

OR **[2]**

(i) $V = \frac{1}{3}\pi(3)^2(4) = 12\pi \approx 37.7$ cm^3. **[1]**
(ii) The slant height is $l = \sqrt{3^2 + 4^2} = 5$ cm, so the paper area is $\pi r l = 15\pi \approx 47.1$ cm^2. **[1]**

Q23. **[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 $= \dfrac{230 + 25k}{10 + k} = 24$, so $230 + 25k = 240 + 24k$. **[1]**
$k = 10$. **[0.5]**

OR **[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]**
$45 = 40 + \dfrac{f_1 - 10}{2f_1 - 10 - 6} \times 20$, so $\dfrac{f_1 - 10}{2f_1 - 16} = \dfrac{1}{4}$. **[1]**
$4f_1 - 40 = 2f_1 - 16$, so $f_1 = 12$. **[0.5]**

Q24. **[2]**

If the rope is AC, then $\dfrac{AB}{AC} = \sin 30^\circ$ with $AB = 200$ m, so $AC = \dfrac{200}{1/2}$. **[1]**
Length of the rope $= 400$ m. **[1]**

Q25. **[2]**

The lost card is black, so $52 - 1 = 51$ cards remain, and the queen of hearts is still among them. **[1]**
Therefore $P = \dfrac{1}{51}$. **[1]**

OR **[2]**

(i) $P(\text{queen of hearts}) = \dfrac{1}{52}$. **[1]**
(ii) There are 4 jacks, so 48 cards are not jacks and $P = \dfrac{48}{52} = \dfrac{12}{13}$. **[1]**

SECTION – C

Section C consists of 6 questions of 3 marks each.

Q26. **[3]**

Let $\sqrt{3} = \dfrac{p}{q}$, where p, q are co-prime integers and $q \neq 0$. **[1]**
Then $3q^2 = p^2$, so $3 \mid p$. Write $p = 3a$. **[1]**
Substituting gives $9a^2 = 3q^2$, so $q^2 = 3a^2$ and $3 \mid q$. This contradicts that p and q are co-prime. Hence $\sqrt{3}$ is irrational. **[1]**

OR **[3]**

Let $\sqrt{5} = \dfrac{p}{q}$, where p, q are co-prime integers and $q \neq 0$. **[1]**
Then $p^2 = 5q^2$, so $5 \mid p$. Write $p = 5c$. **[1]**
Then $25c^2 = 5q^2$ gives $q^2 = 5c^2$, so $5 \mid q$. This contradicts that p and q are co-prime. Hence $\sqrt{5}$ is irrational. **[1]**

Q27. **[3]**

The numbers are $56, 63, \ldots, 497$ (first $56 = 7 \times 8$, last $497 = 7 \times 71$) **[1]**
$497 = 56 + (n-1) \times 7 \Rightarrow n = 64$ **[1]**
Sum $= \frac{64}{2}(56 + 497) = 32 \times 553 = 17696$ **[1]**

OR **[3]**

The numbers are $11, 15, \ldots, 299$, an A.P. with $a = 11$ and $d = 4$ **[1]**
$299 = 11 + (n-1) \times 4 \Rightarrow n = 73$ **[1]**
Sum $= \frac{73}{2}(11 + 299) = 73 \times 155 = 11315$ **[1]**

Q28. **[3]**

Right angle at P, so $PQ^2 + PR^2 = QR^2$. Now $QR^2 = (2+2)^2 + (3+3)^2 = 52$; $PQ^2 = (x+2)^2 + (y+3)^2$ and $PR^2 = (x-2)^2 + (y-3)^2$. **[1]**
Adding: $2x^2 + 2y^2 + 26 = 52$, i.e. $x^2 + y^2 = 13$. **[1]**
For $y = 2$: $x^2 = 9$, so $x = 3$ or $x = -3$. **[1]**

Q29. **[3]**

$\tan 60^\circ = \dfrac{h}{b}$, so $h = b\sqrt{3}$ [1]
$\tan 30^\circ = \dfrac{h}{a}$, so $h = \dfrac{a}{\sqrt{3}}$ [1]
Multiplying the two expressions: $h^2 = ab$, so $h = \sqrt{ab}$ cm [1]

Q30. **[3]**

Minor sector $= \dfrac{30}{360} \times \dfrac{22}{7} \times 42^2 = 462$ cm^2. [1]
The major sector has angle 330°: $\dfrac{330}{360} \times \dfrac{22}{7} \times 42^2 = 5082$ cm^2. [1]
Check: $462 + 5082 = 5544 = \dfrac{22}{7} \times 42^2$, the area of the whole circle. [1]

Q31. **[3]**

The height of the solid is $h = 50 \times 0.5 = 25$ cm. [1/2]
The total surface area is $2\pi r(r + h) = 2 \times \frac{22}{7} \times 7 \times 32 = 1408$ cm^2. [1]
The box volume is $25^3 = 15625$ cm^3 and the cylinder volume is $\frac{22}{7} \times 49 \times 25 = 3850$ cm^3. [1/2]
So the space left is $15625 - 3850 = 11775$ cm^3. [1]

SECTION – D

Section D consists of 4 questions of 5 marks each.

Q32. **[5]**

Let the speed of the stream be x km/h. The upstream speed is $18 - x$ and the downstream speed is $18 + x$. [1]
$\dfrac{24}{18 - x} - \dfrac{24}{18 + x} = 1$. [1]
$24(18 + x) - 24(18 - x) = (18 - x)(18 + x)$, i.e. $x^2 + 48x - 324 = 0$. [1]
$(x + 54)(x - 6) = 0$. Rejecting $x = -54$, $x = 6$. [1]
The speed of the stream is 6 km/h. [1]

OR **[5]**

Let the smaller tap take x hours, so the larger takes $(x - 10)$ hours. [1]
Both together fill $\dfrac{8}{75}$ of the tank per hour, since $9\dfrac{3}{8} = \dfrac{75}{8}$: $\dfrac{1}{x} + \dfrac{1}{x - 10} = \dfrac{8}{75}$. [1]
This gives $8x^2 - 230x + 750 = 0$, i.e. $4x^2 - 115x + 375 = 0$. [1]
$x = 25$ or $x = \dfrac{30}{8} = 3.75$. The value 3.75 is rejected because then $x - 10$ would be negative. [1]
The smaller tap takes 25 hours and the larger tap takes 15 hours. [1]

Q33. **[5]**

Let the circle touch AB and AC at E and F. Then $AE = AF = x$, so $AB = x + 10$, $AC = x + 8$ and $BC = 18$ cm [1]
Area $= \frac{1}{2}\, r \times$ (perimeter) $= \frac{1}{2} \times 4 \times (2x + 36) = 4(x + 18)$ [1]
$4(x + 18) = 90$ gives $x + 18 = 22.5$, so $x = 4.5$ cm [1]
Hence $AB = 14.5$ cm and $AC = 12.5$ cm [1]
Check: the semi-perimeter is 22.5 and $\sqrt{22.5 \times (22.5 - 18) \times (22.5 - 12.5) \times (22.5 - 14.5)} = 90$. [1]

OR **[5]**

$PQ = \sqrt{13^2 - 5^2} = 12$ cm [1]
$PC = OP - OC = 13 - 5 = 8$ cm [1]
By symmetry in OP (the tangent AB is perpendicular to OP at C), $PA = PB = x$ and C is the midpoint of AB. Then $AC = AQ = PQ - PA = 12 - x$ [1]
In right $\triangle PCA$ (right angle at C), $PA^2 = PC^2 + AC^2$: $x^2 = 8^2 + (12 - x)^2$, so $24x = 208$ and $x = \frac{26}{3}$ [1]
$AC = 12 - \frac{26}{3} = \frac{10}{3}$, so $AB = 2AC = \frac{20}{3}$ cm and $PA = \frac{26}{3}$ cm (≈ 8.67 cm) [1]

Q34. **[5]**

Class marks $5, 15, \ldots, 75$: $\sum f_i x_i = 35 + 210 + 325 + 420 + 900 + 605 + 975 + 600 = 4070$, and $\sum f_i = 100$. **[1]**
Mean $= \dfrac{4070}{100} = 40.7$ cars. **[1]**
Median: $\dfrac{N}{2} = 50$. The median class is 40–50, with cumulative frequency before it 46 and $f = 20$. **[1]**
Median $= 40 + \dfrac{50 - 46}{20} \times 10 = 42$ cars. **[1]**

Q35. **[5]**

$2x - 3y + 6 = 0$ passes through $(-3, 0)$, $(0, 2)$ and $(3, 4)$; $2x + 3y - 18 = 0$ passes through $(0, 6)$, $(3, 4)$ and $(9, 0)$; $x = 0$ is the y-axis. **[1]**
Plotting the three lines. **[2]**
The line $x = 0$ meets the two slanted lines at $(0, 2)$ and $(0, 6)$, and the two slanted lines meet at $(3, 4)$. **[1]**
Vertices: $(0, 2)$, $(0, 6)$ and $(3, 4)$. **[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) $(12 + 2x)(10 + 2x) = 360$, so $4x^2 + 44x - 240 = 0$, i.e. $x^2 + 11x - 60 = 0$. **[1]**
(ii) Perimeter of the lawn $= 2(12 + 10) = 44$ m. **[1]**
(iii) $(x + 15)(x - 4) = 0$. Rejecting $x = -15$, the width of the walkway is $x = 4$ m. **[2]**

OR

(iii) Area of the walkway $= \dfrac{\text{cost}}{\text{rate}} = \dfrac{12000}{50} = 240$ m^2. **[1]**
Check: the lawn plus walkway is 360 m^2 and the lawn is 120 m^2, so the walkway is $360 - 120 = 240$ m^2. **[1]**

Q37. **[4]**

(i) $AR = AP = x$ m (tangents from A) **[1]**
(ii) $BQOR$ is a square: $\angle B = \angle OQB = \angle ORB = 90°$ and $OQ = OR = r$ **[1]**
(iii) OR: $x = \frac{\sqrt{274} - 8}{2} \approx 4.28$ m **[1]**, and $r = 7 - x = \frac{22 - \sqrt{274}}{2} \approx 2.72$ m **[1]**

Q38. **[4]**

(i) $\angle DPQ = \angle DEF$ (corresponding angles, $PQ \parallel EF$) and $\angle PDQ = \angle EDF$ (common). So $\triangle DPQ \sim \triangle DEF$ by AA. **[1]**

(ii) $DE = DP + PE = 120$ cm. From the similarity, $\dfrac{PQ}{EF} = \dfrac{DP}{DE} = \dfrac{50}{120} = \dfrac{5}{12}$. **[1]**

(iii) (B) $BM = \dfrac{BC}{2}$ and $EN = \dfrac{EF}{2}$, so $\dfrac{BM}{EN} = \dfrac{BC}{EF} = \dfrac{AB}{DE}$. **[1]**
Since $\angle B = \angle E$, $\triangle ABM \sim \triangle DEN$ by SAS. **[1]**

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