CENTRAL BOARD OF SECONDARY EDUCATION

CBSE 2026-27

Mathematics (Standard)

Subject Code: 041 | Class X

Marking Scheme – Sample Question Paper – Set 1

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 1.
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) 26. The required number divides $134-4=130$ and $188-6=182$. Since $130=2\times5\times13$ and $182=2\times7\times13$, the HCF is 26.

Q2. **[1]**

(b) $k=2$. Infinitely many solutions need $\frac{3}{6}=\frac{-1}{-k}=\frac{8}{16}$, so $\frac{1}{k}=\frac{1}{2}$, i.e. $k=2$. **[1]**

Q3. **[1]**

(d) 2 : 1. If $P(x,0)$ divides AB internally in $m:n$, then $0=\dfrac{m(-3)+n(6)}{m+n}$, so $6n=3m$ and $m:n=2:1$.

Q4. **[1]**

(b) 50°. In quadrilateral $OAPB$, $\angle OAP=\angle OBP=90^\circ$ (tangent perpendicular to radius), so $\angle APB=360^\circ-90^\circ-90^\circ-130^\circ=50^\circ$.

Q5. **[1]**

(a) $\frac{11}{9}$. Divide numerator and denominator by $\cos\theta$: $\dfrac{4\tan\theta+1}{4\tan\theta-1}=\dfrac{10+1}{10-1}=\dfrac{11}{9}$. **[1]**

Q6. **[1]**

(a) $3\pi d^2$. The radius is $r=d$. The total surface area is the curved surface $2\pi r^2$ plus the flat circular face πr^2, so $3\pi r^2=3\pi d^2$.

Q7. **[1]**

(c) 25. Empirical relation: Mode $=3$ Median -2 Mean $=3(32)-2(35.5)=96-71=25$. **[1]**

Q8. **[1]**

(a) 7. The common difference is $a_{n+1}-a_n=7(n+1)-4-(7n-4)=7$, independent of n.

Q9. **[1]**

(d) 17.5 cm. The ratio of perimeters of similar triangles equals the ratio of corresponding sides: $\dfrac{56}{70}=\dfrac{14}{x}$, so $x=\dfrac{14\times70}{56}=17.5$ cm. **[1]**

Q10. **[1]**

(a) 60°. $\tan\theta=\dfrac{6}{2\sqrt{3}}=\sqrt{3}$, so $\theta=60^\circ$. **[1]**

Q11. **[1]**

(b) 10^5. The circumference is $\pi\times21=\frac{22}{7}\times21=66$ cm, and 66 km $=66\times10^5$ cm, so the number of revolutions is $\dfrac{66\times10^5}{66}=10^5$. **[1]**

Q12. **[1]**

(a) $\frac{3}{4}$. The outcomes are HH, HT, TH, TT. Those with at most one head are HT, TH, TT, so $P=\frac{3}{4}$. **[1]**

Q13. **[1]**

(c) 2. The curve crosses the x-axis at $x = -3$ and touches it at $x = 2$, where it turns back without crossing. The local maximum near $x = -\frac{4}{3}$ lies above the axis, so it is not a zero.

Q14. **[1]**

(d) $35°$. $\angle POA = 180° - 125° = 55°$ (straight line AOB). Since $PA \perp OA$, $\angle OAP = 90°$, so $\angle APO = 90° - 55° = 35°$.

Q15. **[1]**

(d) -1. Since $\operatorname{cosec}^2\theta - \cot^2\theta = 1$, the expression equals -1. **[1]**

Q16. **[1]**

(a) $\frac{\pi l^3}{12}$. The base radius is $\frac{l}{2}$ and the height is l, so $V = \frac{1}{3}\pi\left(\frac{l}{2}\right)^2 l = \frac{\pi l^3}{12}$. For $l = 2$ this gives $\frac{2\pi}{3}$, the answer to the 2024 version.

Q17. **[1]**

(c) 30. $\dfrac{N}{2} = 22.5$; the cumulative frequencies are $5, 14, 29, \ldots$, so the median class is 20–30 and its upper limit is 30. **[1]**

Q18. **[1]**

(b) 7.5 cm. Since $DE \parallel BC$, $\dfrac{AD}{AB} = \dfrac{AE}{AC}$, so $\dfrac{4}{9} = \dfrac{AE}{13.5}$, giving $AE = 6$ cm. Hence $EC = 13.5 - 6 = 7.5$ cm. **[1]**

Q19. **[1]**

(d) Assertion (A) is false but Reason (R) is true. (R) is the correct arc formula. After the change the arc is unchanged, $\dfrac{\pi(r/2)(2\theta)}{180} = \dfrac{\pi r\theta}{180}$, but the perimeter becomes $2 \cdot \dfrac{r}{2} + \dfrac{\pi r\theta}{180} = r + \dfrac{\pi r\theta}{180}$, not $2r + \dfrac{\pi r\theta}{180}$. So (A) is false. **[1]**

Q20. **[1]**

(c) (A) is true but (R) is false. The cuboid is $8 \times 4 \times 4$ cm, with surface area $2(32 + 16 + 32) = 160$ cm^2, so (A) is true. The correct formula is $2(lb + bh + hl)$; (R) omits the factor 2, so (R) is false.

SECTION – B

Section B consists of 5 questions of 2 marks each.

Q21. **[2]**

Let $AP : PB = m : n$, so $P = \dfrac{nA + mB}{m + n}$. For the x-coordinate, $\dfrac{3m - 6n}{m + n} = -4$, so $7m = 2n$ and $m : n = 2 : 7$. **[1]**

Check with the y-coordinate: $\dfrac{7(10) + 2(-8)}{9} = 6$, which matches. Ratio $2 : 7$. **[1]**

OR **[2]**

Since $BP = \frac{4}{7}AB$, we have $AP = \frac{3}{7}AB$, so $AP : PB = 3 : 4$. **[1]**

Then $P = A + \frac{3}{7}(B - A) = (-2, -2) + \frac{3}{7}(4, -2) = \left(-\dfrac{2}{7}, -\dfrac{20}{7}\right)$. **[1]**

Q22. **[2]**

Let P be the external point, O the centre and A a point of contact. OP bisects $\angle APB$, so $\angle OPA = 30°$ **[1]**

In right $\triangle OAP$, $\tan 30° = \frac{OA}{PA}$, so $PA = \frac{3}{1/\sqrt{3}} = 3\sqrt{3}$ cm. Each tangent is $3\sqrt{3}$ cm **[1]**

OR **[2]**

Let AB be a diameter with tangents at A and B. The radius OA is perpendicular to the tangent at A, and OB is perpendicular to the tangent at B **[1]**
Since O lies on AB, both tangents are perpendicular to the same line AB, so they are parallel **[1]**

Q23. **[2]**

Numerator $= 5 \cdot \frac{1}{4} + 4 \cdot \frac{4}{3} - 1 = \frac{15+64-12}{12} = \frac{67}{12}$ **[1]**. Denominator $= \sin^2 30° + \cos^2 30° = 1$, so the value is $\frac{67}{12}$ **[1]**.

Q24. **[2]**

By the Basic Proportionality Theorem, $\frac{AD}{DB} = \frac{AE}{EC}$, so $\frac{x}{x-2} = \frac{x+2}{x-1}$. **[1/2]**
Cross-multiplying, $x^2 - x = x^2 - 4$, so $x = 4$. **[1/2]**
Hence $x = 4$ **[1]**. Check: $AD = 4$, $DB = 2$, $AE = 6$, $EC = 3$, and $\frac{4}{2} = \frac{6}{3}$.

OR **[2]**

The corresponding sides are $\frac{BC}{YZ} = \frac{6}{7.2} = \frac{5}{6}$ (common scale factor).
From $\frac{AB}{XY} = \frac{5}{6}$, $x = \frac{4 \times 6}{5} = 4.8$ cm. **[1]**
From $\frac{AC}{XZ} = \frac{5}{6}$, $y = \frac{6 \times 5}{6} = 5$ cm. **[1]**

Q25. **[2]**

$\tan 30° = \frac{h}{30}$, so $h = \frac{30}{\sqrt{3}}$. **[1]**
$h = 10\sqrt{3} \approx 17.32$ m. **[1]**

OR **[2]**

If the boat is d m from the foot, then $\tan 30° = \frac{15}{d}$, so $d = \frac{15}{1/\sqrt{3}}$. **[1]**
$d = 15\sqrt{3} \approx 25.98$ m. **[1]**

SECTION – C

Section C consists of 6 questions of 3 marks each.

Q26. **[3]**

$4x^2 + 4x - 3 = (2x+3)(2x-1)$, so the zeroes are $-\frac{3}{2}$ and $\frac{1}{2}$. **[1]**
Sum of the zeroes $= -1 = -\frac{4}{4} = -\frac{b}{a}$. **[1]**
Product of the zeroes $= -\frac{3}{4} = \frac{c}{a}$. **[1]**

OR **[3]**

$a + b = -1$ and $ab = -2$. **[1]**
$\frac{a}{b} + \frac{b}{a} = \frac{a^2+b^2}{ab} = \frac{(a+b)^2-2ab}{ab}$. **[1]**
So $\frac{a}{b} + \frac{b}{a} = \frac{1+4}{-2} = -\frac{5}{2}$. **[1]**

Q27. **[3]**

Let $P(0, y)$ divide the segment in $AP : PB = m : n$ with $A = (5, -6)$, $B = (-1, -4)$. The x-coordinate is $\frac{5n - m}{m + n} = 0$. **[1]**
So $m = 5n$, the ratio is $5 : 1$. **[1]**
$y = \frac{n(-6) + m(-4)}{m+n} = \frac{-6-20}{6} = -\frac{13}{3}$, so the point is $\left(0, -\frac{13}{3}\right)$. **[1]**

OR **[3]**

Let $AP : PB = m : n$. Then the y-coordinate gives $\dfrac{9m+4n}{m+n} = 7$, so $2m = 3n$ and $m : n = 3 : 2$. [1]
Hence P divides AB internally in the ratio $3 : 2$. [1]
$x = \dfrac{3(7)+2(-5)}{5} = \dfrac{11}{5}$. [1]

Q28. **[3]**

From $\triangle NSQ \cong \triangle MTR$ (CPCT): $SQ = TR$ and $\angle SQN = \angle TRM$. [1]
Since S lies on PQ and R lies between Q and N, $\angle SQN = \angle PQR$; similarly $\angle TRM = \angle PRQ$. So $\angle PQR = \angle PRQ$ and $PQ = PR$. [1]
Hence $PS = PQ - SQ = PR - TR = PT$, so $\dfrac{PS}{PQ} = \dfrac{PT}{PR}$. With the common angle $\angle TPS = \angle RPQ$, $\triangle PTS \sim \triangle PRQ$ by SAS. [1]

Q29. **[3]**

The sample space has 8 equally likely outcomes.
(i) The only outcome with no head is TTT, so $P(\text{at least one head}) = 1 - \dfrac{1}{8} = \dfrac{7}{8}$. [1]
(ii) Exactly two tails: HTT, THT, TTH, so $P = \dfrac{3}{8}$. [1]
(iii) At most one tail: HHH, HHT, HTH, THH, so $P = \dfrac{4}{8} = \dfrac{1}{2}$. [1]

OR **[3]**

The sample space has 8 equally likely outcomes.
(a) Exactly two tails: TTH, THT, HTT, so $P = \dfrac{3}{8}$. [1]
(b) At least one head: $P = 1 - \dfrac{1}{8} = \dfrac{7}{8}$. [1]
(c) At most two heads: all outcomes except HHH, so $P = 1 - \dfrac{1}{8} = \dfrac{7}{8}$. [1]

Q30. **[3]**

Adding: $105(x + y) = 315$, so $x + y = 3$. [1]
Subtracting: $19(x - y) = 19$, so $x - y = 1$. [1]
Hence $x = 2, y = 1$. [1]
Check: $62(2) + 43(1) = 167$ and $43(2) + 62(1) = 148$.

OR **[3]**

Let the tens digit be t and the units digit u. Then $t + u = 12$. [1]
$7(10t + u) = 4(10u + t)$ gives $66t = 33u$, so $u = 2t$. [1]
Then $3t = 12$, so $t = 4$ and $u = 8$. The number is 48. [1]
Check: $7 \times 48 = 336 = 4 \times 84$.

Q31. **[3]**

Let the numbers be x and $18 - x$. Then $\dfrac{1}{x} + \dfrac{1}{18-x} = \dfrac{18}{x(18-x)} = \dfrac{9}{40}$. [1]
So $x(18 - x) = 80$, i.e. $x^2 - 18x + 80 = 0$. [1]
$(x - 8)(x - 10) = 0$, so $x = 8$ or $x = 10$. The numbers are 8 and 10. [1]

SECTION – D

Section D consists of 4 questions of 5 marks each.

Q32. **[5]**

(a) $252 = 2^2 \times 3^2 \times 7$, $396 = 2^2 \times 3^2 \times 11$ and $540 = 2^2 \times 3^3 \times 5$. [1]
$\text{HCF}(252, 396, 540) = 2^2 \times 3^2 = 36$ cm, so each piece is 36 cm long. [1]
(b) Pieces from 252 cm: $252 \div 36 = 7$. From 396 cm: $396 \div 36 = 11$. From 540 cm: $540 \div 36 = 15$. [1]
Total number of pieces $= 7 + 11 + 15 = 33$. [1]
(c) $\text{LCM}(252, 396) = 2^2 \times 3^2 \times 7 \times 11 = 2772$. [1/2]
$\text{HCF}(252, 396) \times \text{LCM}(252, 396) = 36 \times 2772 = 99792 = 252 \times 396$, so the identity is verified. [1/2]

Q33. **[5]**

Near car (depression $60°$): $\tan 60° = \dfrac{75}{d_1}$, so $d_1 = \dfrac{75}{\sqrt{3}} = 25\sqrt{3} \approx 43.25$ m. [2]
Far car (depression $30°$): $\tan 30° = \dfrac{75}{d_2}$, so $d_2 = 75\sqrt{3} \approx 129.75$ m. [2]
Distance between the cars $= d_2 - d_1 = 50\sqrt{3} \approx 86.5$ m. [1]

OR **[5]**

Let the point be d m from the building and the tower be h m high. The bottom of the tower is the top of the building, 20 m high: $\tan 45° = \dfrac{20}{d}$, so $d = 20$ m. [2]
The top of the tower is $20 + h$ m high: $\tan 60° = \dfrac{20 + h}{20}$, so $\sqrt{3} = \dfrac{20 + h}{20}$. [1]
Hence $h = 20(\sqrt{3} - 1) \approx 14.64$ m. [2]

Q34. **[5]**

Sector $= \dfrac{60}{360} \times \dfrac{22}{7} \times 14^2 = \dfrac{308}{3}$ cm^2. [1]
The triangle OAB is equilateral with side 14 cm, so its area is $\dfrac{\sqrt{3}}{4} \times 14^2 = 49\sqrt{3}$ cm^2. [1]
Minor segment $= \dfrac{308}{3} - 49\sqrt{3} = \dfrac{308 - 147\sqrt{3}}{3} \approx 17.80$ cm^2. [1]
Major segment $=$ $\pi r^2 -$ minor $= 616 - \left(\dfrac{308}{3} - 49\sqrt{3}\right) = \dfrac{1540}{3} + 49\sqrt{3} \approx 598.20$ cm^2. [2]

OR **[5]**

(i) Arc length $= \dfrac{60}{360} \times 2 \times \dfrac{22}{7} \times 21 = 22$ cm. [2]
(ii) Sector $= \dfrac{60}{360} \times \dfrac{22}{7} \times 21^2 = 231$ cm^2. [1]
The triangle OAB is equilateral with side 21 cm, so its area is $\dfrac{\sqrt{3}}{4} \times 441 = \dfrac{441\sqrt{3}}{4} \approx 190.96$ cm^2. [1]
Minor segment $= 231 - \dfrac{441\sqrt{3}}{4} \approx 40.04$ cm^2. [1]

Q35. **[5]**

There are 25 cards, the odd numbers from 1 to 49.
(i) Multiples of 3: $3, 9, 15, 21, 27, 33, 39, 45$ (8 cards), so $P = \dfrac{8}{25}$. [1]
(ii) Odd composite numbers: $9, 15, 21, 25, 27, 33, 35, 39, 45, 49$ (10 cards), so $P = \dfrac{10}{25} = \dfrac{2}{5}$. [1]
(iii) Perfect squares: $1, 9, 25, 49$ (4 cards), so $P(\text{not a square}) = \dfrac{25 - 4}{25} = \dfrac{21}{25}$. [1]
(iv) Multiples of 3 and 5: $15, 45$ (2 cards), so $P = \dfrac{2}{25}$. [1]
(v) Primes: $3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47$ (14 cards), so $P = \dfrac{14}{25}$. [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) $p(t) = 4t(5 - 4t)$, so the zeroes are $t = 0$ and $t = \frac{5}{4}$ s. **[1]**
(ii) The maximum occurs at $t = -\frac{b}{2a} = \frac{20}{32} = \frac{5}{8}$ s. **[1]**
(iii) $h\left(\frac{3}{2}\right) = 20 \cdot \frac{3}{2} - 16 \cdot \frac{9}{4} = 30 - 36 = -6$ cm. **[1]**
The negative value means the dolphin is 6 cm below the water level at $t = 1.5$ s. It has already re-entered the water, since it returns to the water level at $t = \frac{5}{4}$ s. **[1]**

OR

(iii) The maximum height is $h\left(\frac{5}{8}\right) = 6.25$ cm. The dolphin rises 6.25 cm and falls 6.25 cm, so the total distance covered before it returns to the water level is 12.5 cm. **[1]** for the maximum height and **[1]** for the total.

Q37. **[4]**

(i) $\angle OAP = 90°$, since the radius is perpendicular to the tangent at the point of contact **[1]**
(ii) In right $\triangle OAP$: $OP^2 = OA^2 + AP^2$, so $18^2 = 9^2 + AP^2$, $AP^2 = 243$ and $AP = 9\sqrt{3}$ m **[1]**
(iii) OR: $\angle OPA = \frac{1}{2} \times 60° = 30°$ **[1]**. In $\triangle OAP$, $\tan 30° = \frac{OA}{PA}$, so $PA = \frac{9}{1/\sqrt{3}} = 9\sqrt{3}$ m **[1]**

Q38. **[4]**

(i) $(18 + x)(12 + x) = 2 \times 18 \times 12$, i.e. $(18 + x)(12 + x) = 432$. **[1]**
(ii) $x^2 + 30x + 216 = 432$, so $x^2 + 30x - 216 = 0$. **[1]**
(iii) The discriminant is $900 + 864 = 1764 = 42^2$, so $x = \dfrac{-30 \pm 42}{2} = 6$ or -36. Rejecting -36, $x = 6$. **[1]**
The new dimensions are 24 cm by 18 cm, since $24 \times 18 = 432$. **[1]**

OR

(iii) $(18 + x)(12 + x) = 220$ gives $x^2 + 30x - 4 = 0$. **[1]**
Its discriminant $900 + 16 = 916$ is not a perfect square, so the roots are irrational. No rational x gives an area of 220 cm^2. **[1]**

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