CENTRAL BOARD OF SECONDARY EDUCATION

CBSE 2026-27

Mathematics (Standard)

Subject Code: 041 | Class X

Marking Scheme – Sample Question Paper – Set 2

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 2.
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]**

(d) $180a^3b^4$. We have $p = 2 \cdot 3^2 \cdot a^2b^4$ and $q = 2^2 \cdot 5 \cdot a^3b^2$. The LCM takes the highest power of each prime: $2^2 \cdot 3^2 \cdot 5 \cdot a^3b^4 = 180a^3b^4$.

Q2. **[1]**

(c) $-\dfrac{9}{4}$, because $36 + 16k = 0$ gives $k = -\dfrac{9}{4}$. **[1]**

Q3. **[1]**

(b) $(-4, 0)$. The nearest point on the x-axis is the foot of the perpendicular, which keeps the x-coordinate and sets $y = 0$.

Q4. **[1]**

(b) $\dfrac{ac}{b+c}$. In $\triangle CDE$ and $\triangle CAB$ we have $DE \parallel AB$, so $\dfrac{DE}{AB} = \dfrac{EC}{BC} = \dfrac{c}{b+c}$. Hence $x = \dfrac{ac}{b+c}$. **[1]**

Q5. **[1]**

(d) 36 m. At the same instant the Sun's altitude is the same, so height/shadow is constant: $\dfrac{7.5}{5} = \dfrac{h}{24}$, giving $h = 36$ m. **[1]**

Q6. **[1]**

(c) $35°$. The hour hand turns $30°$ in 60 minutes, that is $\frac{1}{2}^\circ$ per minute, so in 70 minutes it turns $35°$. **[1]**

Q7. **[1]**

(c) $\frac{11}{36}$. The 25 outcomes with no 6 come from $\{1,2,3,4,5\} \times \{1,2,3,4,5\}$, so 6 appears in $36 - 25 = 11$ outcomes and $P = \frac{11}{36}$. **[1]**

Q8. **[1]**

(c) 4. The numbers are $81x$ and $81y$ with $x + y = 15$ and $\gcd(x, y) = 1$. The pairs are $(1, 14), (2, 13), (4, 11), (7, 8)$.

Q9. **[1]**

(c) $3x + y = 900$ and $5x + 3y = 2100$. **[1]**

Q10. **[1]**

(a) $(2, 3)$. $P = (4, 0)$ and $Q = (0, 6)$, so the mid-point is $\left(\dfrac{4+0}{2}, \dfrac{0+6}{2}\right) = (2, 3)$.

Q11. **[1]**

(d) 11 cm. For a quadrilateral circumscribing a circle, $PQ + RS = QR + SP$, so $26 = 15 + SP$ and $SP = 11$ cm.

Q12. **[1]**

(a) 0. Divide numerator and denominator by $\cos\beta$: $\dfrac{4\tan\beta - 3}{4\tan\beta + 3} = \dfrac{3-3}{3+3} = 0$. **[1]**

Q13. **[1]**

(b) $\frac{594}{7}$. From $\frac{2}{3}\pi r^3 = \frac{396}{7}$ with $\pi = \frac{22}{7}$ we get $r^3 = 27$, so $r = 3$ cm. The total surface area is $3\pi r^2 = 3 \times \frac{22}{7} \times 9 = \frac{594}{7}$ cm^2.

Q14. **[1]**

(d) 150. The class frequencies are $4, 7, 18, 11, 6, 5$ for the classes ending at $140, 145, 150, 155, 160, 165$. The largest is 18, for the class 145–150, whose upper limit is 150. **[1]**

Q15. **[1]**

(a) 59. The multiples are $16, 20, \ldots, 248$, with $a = 16$, $d = 4$. Then $n = \frac{248-16}{4} + 1 = 59$.

Q16. **[1]**

(d) 2. The diameter is $\sqrt{(5-5)^2 + (2+2)^2} = 4$ units, so the radius is 2 units.

Q17. **[1]**

(b) 300 m. $\sin 30^\circ = \dfrac{150}{\text{string}}$, so string $= \dfrac{150}{1/2} = 300$ m. **[1]**

Q18. **[1]**

(d) 150°. $\dfrac{\theta}{360} \times 2\pi \times 12 = 10\pi$ gives $\dfrac{\theta}{360} = \dfrac{10}{24}$, so $\theta = 150^\circ$. **[1]**

Q19. **[1]**

(d) A is false: $\frac{1}{2} = \frac{1}{2}$ but $\frac{5}{9} \neq \frac{1}{2}$, so the lines are parallel and never meet. R is true: it is exactly the condition for parallel lines with no solution. **[1]**

Q20. **[1]**

(a) Both are true and R explains A. The reason gives $36 - 4k = 0$, which yields $k = 9$. **[1]**

SECTION – B

Section B consists of 5 questions of 2 marks each.

Q21. **[2]**

Yes, $\angle BAC = \angle DCA$. Since the tangent lengths from P are equal, $PA = PC$, so $\angle PAC = \angle PCA$ **[1]**
Because B lies beyond A on the ray from P, $\angle BAC = 180^\circ - \angle PAC$, and similarly $\angle DCA = 180^\circ - \angle PCA$. Hence $\angle BAC = \angle DCA$ **[1]**
(If the tangents are parallel, the equality follows directly from alternate angles.)

OR **[2]**

$\angle OBA = \angle OCA = 90^\circ$ (tangent perpendicular to radius) **[1]**
In quadrilateral $OBAC$, $\angle BOC = 360^\circ - 90^\circ - 90^\circ - 65^\circ = 115^\circ$ **[1]**

Q22. **[2]**

Dividing numerator and denominator by $\cos\theta$: $\dfrac{1-\tan\theta}{1+\tan\theta} = \dfrac{1-\sqrt{3}}{1+\sqrt{3}}$ **[1]**. Hence $\tan\theta = \sqrt{3}$ **[1/2]**, so $\theta = 60^\circ$ **[1/2]**.

OR **[2]**

$\sin(A+B) = 1 = \sin 90^\circ$, so $A + B = 90^\circ$ **[1/2]**. $\cos(A-B) = \frac{\sqrt{3}}{2} = \cos 30^\circ$, so $A - B = 30^\circ$ **[1/2]**. Adding and subtracting, $A = 60^\circ$ and $B = 30^\circ$ **[1]**.

Q23. **[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]**

OR **[2]**

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

Q24. **[2]**

In $\triangle CDA$ and $\triangle CAB$: $\angle C$ is common, **[1/2]** and $\angle CDA = \angle CAB$ (given). **[1/2]**
So $\triangle CDA \sim \triangle CAB$ (AA). Hence $\frac{CA}{CB} = \frac{CD}{CA}$, i.e. $CA^2 = CD \times CB$. **[1]**

OR **[2]**

From $OA \cdot OB = OC \cdot OD$ we get $\frac{OA}{OC} = \frac{OD}{OB}$. **[1]**
$\angle AOD = \angle COB$ (vertically opposite), so $\triangle OAD \sim \triangle OCB$ by SAS. Hence $\angle OAD = \angle OCB$ and $\angle ODA = \angle OBC$, i.e. $\angle A = \angle C$ and $\angle D = \angle B$. **[1]**

Q25. **[2]**

If the shadow is L m long, then $\tan 60^\circ = \frac{18}{L}$, so $L = \frac{18}{\sqrt{3}}$. **[1]**
$L = 6\sqrt{3} \approx 10.39$ m. **[1]**

SECTION – C

Section C consists of 6 questions of 3 marks each.

Q26. **[3]**

For $x - y + 1 = 0$ (i.e. $y = x + 1$): $(0, 1)$ and $(2, 3)$. For $x + y = 5$: $(0, 5)$, $(5, 0)$ and $(2, 3)$. **[1]**
Plotting both lines on the same axes. **[1]**
The lines meet at $(2, 3)$, so $x = 2$, $y = 3$. **[1]**

OR **[3]**

$y = 2x - 2$ passes through $(0, -2)$ and $(1, 0)$; $y = 4x - 4$ passes through $(0, -4)$ and $(1, 0)$. **[1]**
The lines meet at $(1, 0)$, so $x = 1$ and $y = 0$. **[1]**
They cut the y-axis at -2 and -4, so the absolute difference is 2. **[1]**

Q27. **[3]**

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

OR **[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]**

Q28. **[3]**

The total number of outcomes is 36. **[1]**
(i) Sum 5: $(1, 4), (2, 3), (3, 2), (4, 1)$, which are 4 outcomes, so $P = \frac{4}{36} = \frac{1}{9}$. **[1]**
(ii) Difference 3: $(1, 4), (2, 5), (3, 6), (4, 1), (5, 2), (6, 3)$, which are 6 outcomes, so $P = \frac{6}{36} = \frac{1}{6}$. **[1]**

OR **[3]**

The total number of outcomes is 36. [1]
The pairs with difference 2 are $(1,3),(2,4),(3,5),(4,6),(3,1),(4,2),(5,3),(6,4)$, which are 8 outcomes. [1]
So $P = \dfrac{8}{36} = \dfrac{2}{9}$. [1]

Q29. **[3]**

$\alpha+\beta=-1$ and $\alpha\beta=\frac{1}{5}$. [1]
(i) $\alpha^2+\beta^2=(\alpha+\beta)^2-2\alpha\beta=1-\frac{2}{5}=\frac{3}{5}$. [1]
(ii) $\alpha^{-1}+\beta^{-1}=\frac{\alpha+\beta}{\alpha\beta}=\frac{-1}{1/5}=-5$. [1]

Q30. **[3]**

The modal class is 200–250: $l=200$, $h=50$, $f_1=12$, $f_0=5$, $f_2=2$. [1]
Mode $= 200+\dfrac{12-5}{2(12)-5-2}\times 50 = 200+\dfrac{7}{17}\times 50$. [1]
$\approx$ Rs 220.59. [1]

Q31. **[3]**

Total: $12+a+12+15+b+6+6+4=55+a+b=70$, so $a+b=15$. [1]
The median class is 15–20, with cumulative frequency before it $24+a$ and $f=15$, $h=5$: $16=15+\dfrac{35-(24+a)}{15}\times 5$. [1]
This gives $a=8$, and then $b=7$. [1]

SECTION – D

Section D consists of 4 questions of 5 marks each.

Q32. **[5]**

Let c be the number of correct answers and w the number of wrong answers. Then $3c-w=40$. [1]
Also $4c-2w=50$, i.e. $2c-w=25$. [1]
Subtracting gives $c=15$. [1]
So $w=5$. [1]
Total number of questions $=c+w=20$. [1]

OR **[5]**

$3x+y+4=0$ gives $y=-3x-4$: points $(-2,2),(-1,-1),(0,-4)$. $3x-y+2=0$ gives $y=3x+2$: points $(-2,-4),(-1,-1),(0,2)$. [1]
Plot both lines on the same axes. [2]
They intersect at $(-1,-1)$, so the solution is $x=-1$, $y=-1$. [1]
Check: $3(-1)+(-1)+4=0$ and $3(-1)-(-1)+2=0$. [1]

Q33. **[5]**

Statement: a line parallel to one side of a triangle divides the other two sides in the same ratio. [1]
Join AF, meeting m at G. In $\triangle ACF$, $BG \parallel CF$ (since $m \parallel n$), so $\dfrac{AB}{BC}=\dfrac{AG}{GF}$. [1]
In $\triangle AFD$, $GE \parallel AD$ (since $m \parallel l$), so $\dfrac{AG}{GF}=\dfrac{DE}{EF}$. [1]
Hence $\dfrac{AB}{BC}=\dfrac{DE}{EF}$. [1]
Construction and figure: [1]

OR **[5]**

Statement and figure: let $DE \parallel BC$ with D on AB and E on AC. Join BE and CD. [1]
$\text{ar}(BDE)=\text{ar}(CDE)$, since they have the common base DE and lie between the same parallels DE and BC. [1]

Let h be the perpendicular distance from E to AB. Then $\text{ar}(ADE) = \frac{1}{2}AD \cdot h$ and $\text{ar}(BDE) = \frac{1}{2}DB \cdot h$, so $\dfrac{\text{ar}(ADE)}{\text{ar}(BDE)} = \dfrac{AD}{DB}$. **[1]**

Let k be the perpendicular distance from D to AC. Similarly $\dfrac{\text{ar}(ADE)}{\text{ar}(CDE)} = \dfrac{AE}{EC}$. **[1]**

Since $\text{ar}(BDE) = \text{ar}(CDE)$, we get $\dfrac{AD}{DB} = \dfrac{AE}{EC}$. **[1]**

Q34. **[5]**

Let the tower be h m high and the horizontal distance be x m. For the top of the building (depression $30°$): $\tan 30° = \dfrac{h-50}{x}$, so $h - 50 = \dfrac{x}{\sqrt{3}}$. **[2]**

For the bottom of the building (depression $60°$): $\tan 60° = \dfrac{h}{x}$, so $h = \sqrt{3}\,x$. **[1]**

Substituting, $\sqrt{3}x - 50 = \dfrac{x}{\sqrt{3}}$, so $\dfrac{2x}{\sqrt{3}} = 50$, giving $x = 25\sqrt{3} \approx 43.3$ m and $h = 75$ m. **[2]**

OR **[5]**

Let each tree be h m high, $BO = x$ m, so $OD = (80 - x)$ m. For the tree AB (elevation $60°$): $\tan 60° = \dfrac{h}{x}$, so $h = \sqrt{3}\,x$. **[1]**

For the tree CD (elevation $30°$): $\tan 30° = \dfrac{h}{80-x}$, so $h = \dfrac{80-x}{\sqrt{3}}$. **[1]**

Equating, $3x = 80 - x$, so $x = 20$ m. **[2]**

Hence $h = 20\sqrt{3} \approx 34.6$ m, $BO = 20$ m and $OD = 60$ m. **[1]**

Q35. **[5]**

(i) Arc length $l = 20.0 - 2 \times 5.6 = 8.8$ m. **[1]**

Area $= \dfrac{1}{2} \times l \times r = \dfrac{1}{2} \times 8.8 \times 5.6 = 24.64$ m^2. **[1]**

(ii) Arc $= \dfrac{\theta}{360} \times 2\pi r$, so $8.8 = \dfrac{\theta}{360} \times 2 \times \dfrac{22}{7} \times 5.6 = \dfrac{\theta}{360} \times 35.2$. **[1]**

Hence $\dfrac{\theta}{360} = \dfrac{1}{4}$. **[1]**

So $\theta = 90°$. **[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) Area $= (\sqrt{2})^2 = 2$ cm^2. **[1]**

(ii) Perimeter $= 4\sqrt{2}$ cm, which is irrational (proved in

(iii) OR: Take $\dfrac{3}{2}$. Since $2 < \left(\dfrac{3}{2}\right)^2 = \dfrac{9}{4} < 4$, we get $\sqrt{2} < \dfrac{3}{2} < 2$. **[1]** for the value, **[1]** for the justification.

Q37. **[4]**

(i) $200x^2 = 128(x+1)^2$. **[1]**

(ii) $72x^2 - 256x - 128 = 0$, which is $9x^2 - 32x - 16 = 0$ after dividing by 8. **[1]**

(iii) $9x^2 - 36x + 4x - 16 = 0$, i.e. $(9x+4)(x-4) = 0$. A side length must be positive, so $x = 4$ units. **[1]**

Check: $200 \times 16 = 3200 = 128 \times 25$. **[1]**

OR

(iii) $x = \dfrac{32 \pm \sqrt{1024 + 576}}{18} = \dfrac{32 \pm 40}{18}$. **[1]**

$x = 4$, since the negative root $-\dfrac{4}{9}$ is rejected. The side of each tile is 4 units. **[1]**

Q38. **[4]**

(i) $OA \perp AB$, so $\tan 30^\circ = \frac{OA}{AB}$ and $AB = \frac{75}{1/\sqrt{3}} = 75\sqrt{3}$ cm **[1]**

(ii) $\sin 30^\circ = \frac{OA}{OB}$, so $OB = \frac{75}{1/2} = 150$ cm **[1]**

(iii) OR: $PQ = BQ \sin 30^\circ = 75 \times \frac{1}{2} = 37.5$ cm **[1]**, **[1]**

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