CENTRAL BOARD OF SECONDARY EDUCATION

CBSE 2026-27

Mathematics (Standard)

Subject Code: 041 | Class X

Marking Scheme – Sample Question Paper – Set 8

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 8.
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) 10. We have $40 = 2^3 \cdot 5$, $110 = 2 \cdot 5 \cdot 11$ and $360 = 2^3 \cdot 3^2 \cdot 5$. The common factor is $2 \cdot 5 = 10$.

Q2. **[1]**

(b) 9. We have $p(-4) = 16 + 4 - 2 - 2k = 18 - 2k = 0$, so $k = 9$.

Q3. **[1]**

(a) $2\sqrt{10}$ units. $d = \sqrt{(2\sqrt{5})^2 + (2\sqrt{5})^2} = \sqrt{20 + 20} = \sqrt{40} = 2\sqrt{10}$.

Q4. **[1]**

(d) 16 cm. The scale factor is $\dfrac{DE}{AB} = 2$, so $\dfrac{EF}{BC} = 2$ and $EF = 2 \times 8 = 16$ cm. **[1]**

Q5. **[1]**

(a) $30°$. $\tan\theta = \dfrac{10}{10\sqrt{3}} = \dfrac{1}{\sqrt{3}}$, so $\theta = 30°$. The angle of depression of the snake equals the angle of elevation of the peacock seen from the snake (alternate angles). **[1]**

Q6. **[1]**

(c) $45°$. $\dfrac{\theta}{360} \times 2\pi \times 2.8 = 2.2$. With $\pi = \frac{22}{7}$, $2\pi \times 2.8 = 17.6$, so $\dfrac{\theta}{360} = \dfrac{2.2}{17.6} = \dfrac{1}{8}$ and $\theta = 45°$. **[1]**

Q7. **[1]**

(c) $\frac{1}{6}$. The pairs $(1,4), (2,5), (3,6), (4,1), (5,2), (6,3)$ have difference 3, so $P = \frac{6}{36} = \frac{1}{6}$. **[1]**

Q8. **[1]**

(d) -3. Distinct real roots need $D = b^2 - 4b > 0$, that is $b < 0$ or $b > 4$. **[1]**

Q9. **[1]**

(b) isosceles and similar. $\angle AOD = \angle BOC = 80°$ (vertically opposite). By the intersecting-chords relation, $OA \cdot OB = OD \cdot OC$; with $OA = OD \neq 0$, $OB = OC$. So each triangle is isosceles. For the similarity, in $\triangle ODA$ and $\triangle OBC$: $\dfrac{OA}{OB} = \dfrac{OD}{OC}$ (each equals OA/OB) and the included angles $\angle AOD = \angle BOC$, so $\triangle ODA \sim \triangle OBC$ by SAS. **[1]**

Q10. **[1]**

(d) $30°$. $\dfrac{2\tan A}{1 - \tan^2 A} = 3\tan A$ with $A \neq 0$ gives $\tan^2 A = \frac{1}{3}$, so $A = 30°$. Check: $\tan 60° = \sqrt{3} = 3\tan 30°$. **[1]**

Q11. **[1]**

(c) 96 cm^2. Let $S = lb + bh + hl$. Then $(l + b + h)^2 = l^2 + b^2 + h^2 + 2S$, that is $108 = 12 + 2S$, so $S = 48$ and the total surface area is $2S = 96$ cm^2.

Q12. **[1]**

(a) Median. The median is the middle-most observation of the data arranged in order. **[1]**

Q13. **[1]**

(b) $2 : 3$. $c - b = 2b - c$ gives $2c = 3b$, so $c = \frac{3b}{2}$ and $b : c = 2 : 3$.

Q14. **[1]**

(c) $\frac{1}{8}\pi d^2$. The radius is $\frac{d}{2}$, so the area is $\frac{1}{2}\pi\left(\frac{d}{2}\right)^2 = \frac{\pi d^2}{8}$. **[1]**

Q15. **[1]**

(b) Not parallel means $\frac{3}{2} \neq \frac{2k}{5}$, i.e. $k \neq \frac{15}{4}$. **[1]**

Q16. **[1]**

(b) 160 cm^2. The edge of each cube is $\sqrt[3]{64} = 4$ cm. The cuboid is $8 \times 4 \times 4$ cm, so its surface area is $2(8 \times 4 + 4 \times 4 + 8 \times 4) = 2(80) = 160$ cm^2.

Q17. **[1]**

(b) 20 cm. $\frac{1}{3}\pi(5)^2 h = \frac{4}{3}\pi(5)^3$, so $25h = 500$ and $h = 20$ cm.

Q18. **[1]**

(d) $4 : 5$. The circumference $2\pi r$ is proportional to r, so the radii are in the same ratio, $4 : 5$. **[1]**

Q19. **[1]**

(d) A is false, but R is true. $\tan\theta = \frac{30}{30} = 1$, so the elevation is $45°$, not $60°$. R is a true property of alternate angles. **[1]**

Q20. **[1]**

(a) Both are true and the reason explains the assertion: $\frac{\sum 3x_i}{n} = 3\bar{x}$. **[1]**

SECTION – B

Section B consists of 5 questions of 2 marks each.

Q21. **[2]**

$480 = 2^5 \times 3 \times 5$ and $720 = 2^4 \times 3^2 \times 5$. **[1/2] +** **[1/2]**
LCM $= 2^5 \times 3^2 \times 5 = 1440$. **[1/2]**
HCF $= 2^4 \times 3 \times 5 = 240$. **[1/2]**

OR **[2]**

$85 = 5 \times 17$ and $238 = 2 \times 7 \times 17$, so HCF $= 17$. **[1]**
Then $17 = 85m - 238$, so $85m = 255$ and $m = 3$. **[1]**

Q22. **[2]**

$AB = 6$, $AC = \sqrt{3^2 + 5^2} = \sqrt{34}$ and $BC = \sqrt{3^2 + 5^2} = \sqrt{34}$. **[1]**
Two sides are equal and $AB^2 = 36 \neq 68$ and $\neq 34$ (no two sides are equal to AB), so the triangle is isosceles. **[1]**

Q23. **[2]**

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

Q24. **[2]**

Class marks $15, 25, 35, 45$ give $u = -2, -1, 0, 1$. $\sum f_i u_i = -6 - 5 + 0 + 4 = -7$ and $\sum f_i = 20$. **[1]**

$\bar{x} = a + h\dfrac{\sum f_i u_i}{\sum f_i} = 35 + 10 \times \dfrac{-7}{20} = 31.5$ minutes. **[1]**

Q25. **[2]**

Dividing $\sin^2 A + \cos^2 A = 1$ by $\cos^2 A$ gives $\tan^2 A + 1 = \sec^2 A$**[1]**. With $\sec A = \frac{5}{3}$: $\tan^2 A = \frac{25}{9} - 1 = \frac{16}{9}$, and as A is acute, $\tan A = \frac{4}{3}$ **[1]**.

OR **[2]**

Let $s = \sec\theta$ and $t = \tan\theta$. Then $a^2 + n^2 - b^2 - m^2 = (a^2 - b^2)(1 - s^2 + t^2)$, since the cross terms $\pm 2abst$ cancel**[1]**. As $s^2 - t^2 = 1$, this is 0, so $a^2 + n^2 = b^2 + m^2$ **[1]**.

SECTION – C

Section C consists of 6 questions of 3 marks each.

Q26. **[3]**

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

OR **[3]**

Students per group $= \text{HCF}(60, 84, 108) = 12$, 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 $\dfrac{60}{12} = 5$, dance $\dfrac{84}{12} = 7$, handicrafts $\dfrac{108}{12} = 9$. **[1]**
Rooms required $= 5 + 7 + 9 = 21$. **[1]**

Q27. **[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]**

OR **[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]**

Q28. **[3]**

The two points of trisection divide AB in the ratios $1 : 2$ and $2 : 1$ (from A). **[1]**
For $1 : 2$: $P_1 = \left(\dfrac{1(-3) + 2(-1)}{3}, \dfrac{1(-2) + 2(4)}{3}\right) = \left(-\dfrac{5}{3}, 2\right)$. **[1]**
For $2 : 1$: $P_2 = \left(\dfrac{2(-3) + 1(-1)}{3}, \dfrac{2(-2) + 1(4)}{3}\right) = \left(-\dfrac{7}{3}, 0\right)$. **[1]**

OR **[3]**

So $PR : RQ = 2 : 1$. **[1]**
$R = \dfrac{1 \cdot P + 2 \cdot Q}{3}$, using the section formula with $PR : RQ = 2 : 1$. **[1]**
$R = \left(\dfrac{1(-2) + 2(3)}{3}, \dfrac{1(5) + 2(2)}{3}\right) = \left(\dfrac{4}{3}, 3\right)$. **[1]**

Q29. **[3]**

$\angle ADB = \angle EFC = 90°$. [1]
$\angle ABD = \angle ABC = \angle ACB = \angle ECF$, since $AB = AC$, D lies on BC and E lies on ray CB. [1]
By AA, $\triangle ABD \sim \triangle ECF$. [1]

Q30. **[3]**

Vidhi: the favourable outcomes are HHH, HHT, THH, so $P = \frac{3}{8}$. [1]
Unnati: the favourable outcomes are HHT, HTH, HTT, THT, so $P = \frac{4}{8} = \frac{1}{2}$. [1]
Since $\frac{1}{2} > \frac{3}{8}$, Unnati has the greater probability of driving the car. [1]

Q31. **[3]**

Class marks are $125, 175, 225, 275, 325$. [1]
$\sum f_i = 13 + y$ and $\sum f_i x_i = 500 + 875 + 225y + 550 + 650 = 2575 + 225y$. [1]
$\frac{2575 + 225y}{13 + y} = 211$ gives $2575 + 225y = 2743 + 211y$, so $14y = 168$ and $y = 12$. [1]

OR **[3]**

The modal class is 45–60: $l = 45$, $h = 15$, $f_1 = 16$, $f_0 = x$, $f_2 = 12$. [1]
$54 = 45 + \frac{16 - x}{32 - x - 12} \times 15$, i.e. $15(16 - x) = 9(20 - x)$. [1]
$240 - 15x = 180 - 9x$, so $x = 10$. [1]

SECTION – D

Section D consists of 4 questions of 5 marks each.

Q32. **[5]**

Here $a = 22$ and $d = -1$ [1]
$S_n = \frac{n}{2}[44 - (n-1)] = \frac{n}{2}(45 - n) = 250 \Rightarrow n^2 - 45n + 500 = 0$ [2]
$n = 20$ or $n = 25$ [1]
$n = 25$ would give a top row of $22 - 24 = -2$ logs, which is impossible, so $n = 20$. The top row has $22 - 19 = 3$ logs [1]

OR **[5]**

$\frac{a+10d}{a+16d} = \frac{3}{4} \Rightarrow 4a + 40d = 3a + 48d$ [1]
So $a = 8d$ [1]
$\frac{a_5}{a_{21}} = \frac{a+4d}{a+20d} = \frac{12d}{28d} = \frac{3}{7}$ [1]
$S_5 = \frac{5}{2}(2a + 4d) = 50d$ and $S_{21} = \frac{21}{2}(2a + 20d) = 378d$ [1]
$S_5 : S_{21} = 50 : 378 = 25 : 189$ [1]

Q33. **[5]**

(i) In $\triangle AQD$ and $\triangle RQC$: $DQ = QC$, $\angle AQD = \angle RQC$ (vertically opposite) and $\angle ADQ = \angle RCQ$ (alternate angles, $AD \parallel BR$). So $\triangle AQD \cong \triangle RQC$ (AAS), and $AQ = QR$. [2]
(ii) Since $DC \parallel AB$, $\triangle DPQ \sim \triangle BPA$, so $\frac{PQ}{AP} = \frac{DQ}{AB} = \frac{1}{2}$, i.e. $AP = 2PQ$. [1]
(iii) From the congruence, $CR = AD$, so $BR = BC + CR = 2AD$. Since $AD \parallel BR$, $\triangle PDA \sim \triangle PBR$, so $\frac{AP}{PR} = \frac{AD}{BR} = \frac{1}{2}$, i.e. $PR = 2AP$. [2]

OR **[5]**

$AD \parallel BE$. In $\triangle FAD$ and $\triangle FEB$: $\angle FAD = \angle FEB$ (alternate angles, transversal AE) and $\angle AFD = \angle EFB$ (vertically opposite). [2]
So $\triangle FAD \sim \triangle FEB$ (AA). [1]

Hence $\frac{FA}{FE} = \frac{FD}{FB}$, i.e. $FA \times FB = FE \times FD$, which is $DF \times EF = FB \times FA$. **[2]**

Q34. **[5]**

The balloon moves horizontally by $3 \times 12 = 36$ m, so the two positions differ by 36 m. **[1]**
Let the horizontal distance from the boy to the first position be x m, and the height of the balloon above his eye level be h m. Then $\tan 60^\circ = \frac{h}{x}$, so $h = \sqrt{3}\,x$. **[1]**
Also $\tan 30^\circ = \frac{h}{x+36}$, so $h = \frac{x+36}{\sqrt{3}}$. **[1]**
Solving, $3x = x + 36$, so $x = 18$ and $h = 18\sqrt{3} \approx 31.14$ m. **[1]**
Height of the balloon above the ground $= 1.35 + 31.14 = 32.49$ m. **[1]**

Q35. **[5]**

OP is a tangent to the circle with centre O' at P, so $OP \perp O'P$. Hence $\angle OPO' = 90^\circ$ **[1]**
In right triangle OPO': $OO' = \sqrt{6^2 + 8^2} = 10$ cm **[1]**
Let A be the foot of the perpendicular from P onto OO'. Comparing areas of $\triangle OPO'$: $\frac{1}{2} \times OP \times O'P = \frac{1}{2} \times OO' \times PA$, so $\frac{1}{2} \times 6 \times 8 = \frac{1}{2} \times 10 \times PA$, giving $PA = 4.8$ cm **[2]**
The line of centres OO' bisects the common chord PQ perpendicularly, so $PQ = 2 \times PA = 2 \times 4.8 = 9.6$ cm **[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) Row 10 has $2(10) - 1 = 19$ triangles **[1]**
(ii) The fourth row from the bottom is row 7, which has $2(7) - 1 = 13$ triangles **[1]**
(iii) -OR Rows 5 to 10 contain $100 - 16 = 84$ triangles **[1]**. Rows 1 to 4 contain 16 triangles, so the difference is $84 - 16 = 68$ **[1]**

Q37. **[4]**

(i) Area $= 20^2 = 400$ m^2. **[1]**
(ii) One horse grazes a quarter circle of radius 7 m: $\frac{1}{4} \times \frac{22}{7} \times 7^2 = 38.5$ m^2. **[1]**
(iii) OR: Grazed area $= \frac{1}{4} \times 3.14 \times 10^2 = 78.5$ m^2. **[2]**

Q38. **[4]**

(i) $5x + 4y = 9500$ and $4x + 3y = 7370$. **[1]**
(ii) Multiply the first equation by 3 and the second by 4: $15x + 12y = 28500$ and $16x + 12y = 29480$. Subtracting gives $x = 980$, so the hockey prize is Rs 980 per student. **[1]**
(iii) OR: Cricket gets the larger prize, $y = 1150$ against $x = 980$. **[1]** Difference $y - x =$ Rs 170 per student. **[1]**

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