CENTRAL BOARD OF SECONDARY EDUCATION

CBSE 2026-27

Mathematics (Standard)

Subject Code: 041 | Class X

Marking Scheme – Sample Question Paper – Set 4

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 4.
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) rational number. $\frac{32}{50} = \frac{16}{25}$, so $p = \pm\frac{4}{5}$, which is rational.

Q2. **[1]**

(b) $p = r = -2$. The sum of the zeroes is $\frac{5}{2} = -\frac{5}{p}$, so $p = -2$. The product is $1 = \frac{r}{p}$, so $r = -2$.

Q3. **[1]**

(a) $(0, 0)$. The perpendicular bisector passes through the mid-point of AB, which is $\left(\frac{-3+3}{2}, \frac{-4+4}{2}\right) = (0, 0)$. The other options are not equidistant from A and B: for example, $(0, 3)$ has squared distances $9 + 49 = 58$ from A and $9 + 1 = 10$ from B.

Q4. **[1]**

(a) 3 cm. By the Basic Proportionality Theorem, $\frac{AD}{BD} = \frac{AE}{CE}$, so $\frac{3}{4.5} = \frac{2}{CE}$ and $CE = 3$ cm. **[1]**

Q5. **[1]**

(a) $\frac{20}{\sqrt{3}}$ m. Shadow $= \frac{\text{height}}{\tan 60^\circ} = \frac{20}{\sqrt{3}}$ m. **[1]**

Q6. **[1]**

(b) $1 : 4$. Arc : circumference $= \frac{90}{360} = \frac{1}{4} = 1 : 4$. **[1]**

Q7. **[1]**

(a) $\frac{4}{13}$. MATHEMATICS has 8 distinct letters (M, A, T, H, E, I, C, S) and the alphabet has 26 letters, so $P = \frac{8}{26} = \frac{4}{13}$.**[1]**

Q8. **[1]**

(b) -11, because $50 + 5(k - 1) + 10 = 0$ gives $5k = -55$. **[1]**

Q9. **[1]**

(d) 6 cm. $OAPB$ has right angles at A, B, P and $OA = OB$, so it is a square of side r. AB is a diagonal, so $r\sqrt{2} = 3\sqrt{2}$, giving $r = 3$ cm and diameter 6 cm.

Q10. **[1]**

(c). $\tan\theta = \frac{1}{\cot\theta}$, so $\sec^2\theta = 1 + \tan^2\theta = \frac{1 + \cot^2\theta}{\cot^2\theta}$. Taking the positive root for an acute θ gives (c). **[1]**

Q11. **[1]**

(a) 17 cm. The radius is $\sqrt{13^2 - 12^2} = 5$ cm. The total height is the cone height plus the hemisphere radius, $12 + 5 = 17$ cm.

Q12. **[1]**

(b) increases by 3. $\frac{\sum(x_i + 3)}{n} = \bar{x} + 3$. **[1]**

Q13. **[1]**

(a) 12. $a_{15} - a_{11} = 4d = 48$, so $d = 12$.

Q14. **[1]**

(a) -1. $\frac{3}{4} \cdot \frac{1}{3} - 2 + \frac{3}{4} = \frac{1}{4} + \frac{3}{4} - 2 = -1$. **[1]**

Q15. **[1]**

(b) 100. The diameter of each depression is 0.7 cm. Along each edge $7 \div 0.7 = 10$ depressions fit, so the top face holds $10 \times 10 = 100$ depressions.

Q16. **[1]**

(d) 37.5. With x men and y women, $\dfrac{38x + 30y}{x + y} = 35$, so $3x = 5y$ and $\dfrac{x}{y} = \dfrac{5}{3}$. Women form $\dfrac{3}{8} \times 100 = 37.5\%$ of the group. **[1]**

Q17. **[1]**

(b) 21 cm. $\dfrac{60}{360} \times 2\pi r = 22$ gives $\dfrac{\pi r}{3} = 22$, so $r = \dfrac{66}{\pi} = \dfrac{66 \times 7}{22} = 21$ cm. **[1]**

Q18. **[1]**

(a) $\frac{11}{13}$. There are $4 + 4 = 8$ kings and queens, so $P = \frac{52-8}{52} = \frac{44}{52} = \frac{11}{13}$. **[1]**

Q19. **[1]**

(b) Both (A) and (R) are true, but (R) is not the correct explanation of (A). LCM $= \dfrac{5780}{17} = 340$, so (A) is true. (R) is true, but it does not explain why LCM equals the product divided by the HCF.

Q20. **[1]**

(c). The assertion is true. For $(-3, k)$ on the segment from $(-5, 4)$ to $(-2, 3)$, the x-distances from (-5) and (-2) are 2 and 1, so the ratio is $2 : 1$, not $1 : 2$. The reason is false.

SECTION – B

Section B consists of 5 questions of 2 marks each.

Q21. **[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]**

OR **[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]**

Q22. **[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]**.

OR **[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]**.

Q23. **[2]**

Let there be x red balls. The old probability is $\frac{x}{12}$ and the new one is $\frac{x+6}{18}$. **[1]**

From $\frac{x+6}{18} = \frac{2x}{12}$ we get $12(x+6) = 36x$, so $24x = 72$ and $x = 3$. There are 3 red balls. **[1]**

Q24. **[2]**

Let $P(x, y)$. Then $PA = PB$ gives $(x-7)^2 + (y-1)^2 = (x-3)^2 + (y-5)^2$. Expanding, $-8x + 8y + 16 = 0$, which gives $x - y = 2$. **[1]**

So $x = y + 2$, i.e. the abscissa is 2 more than the ordinate. **[1]**

Q25. **[2]**

If the height is h m, then $\sin 60° = \frac{h}{8}$, so $h = 8 \times \frac{\sqrt{3}}{2}$. **[1]**

$h = 4\sqrt{3} \approx 6.93$ m. **[1]**

SECTION – C

Section C consists of 6 questions of 3 marks each.

Q26. **[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]**

OR **[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]**

Q27. **[3]**

In $\triangle MDE$ and $\triangle MCB$: $DM = MC$ (M is the midpoint of CD), $\angle DME = \angle CMB$ (vertically opposite), and $\angle MDE = \angle MCB$ (alternate angles, $AD \parallel BC$). So $\triangle MDE \cong \triangle MCB$ (ASA), giving $DE = BC = AD$. **[1]**

Hence $AE = AD + DE = 2BC$. **[1/2]**

In $\triangle LBC$ and $\triangle LEA$: $BC \parallel AE$, so $\angle LBC = \angle LEA$ and $\angle LCB = \angle LAE$. Thus $\triangle LBC \sim \triangle LEA$ (AA), and $\frac{BL}{EL} = \frac{BC}{AE} = \frac{1}{2}$. **[1]**

So $EL = 2BL$. **[1/2]**

OR **[3]**

Since $CD \perp AB$ and $EF \perp CD$, we have $EF \parallel BD \parallel AD$. **[1]**

In $\triangle CEF$ and $\triangle CBD$ (with $EF \parallel BD$): $\frac{CF}{CD} = \frac{EF}{BD}$. **[1]**

In $\triangle GFE$ and $\triangle GDA$ (with $EF \parallel AD$): $\frac{FG}{DG} = \frac{EF}{AD}$. Since $BD = AD$, $\frac{CF}{CD} = \frac{FG}{DG}$. **[1]**

Q28. **[3]**

In 30 minutes the water flows $\frac{10000}{60} \times 30 = 5000$ m. **[1/2]**

The volume of water is $5000 \times 6 \times 1.5 = 45000$ m^3. **[1]**

If the irrigated area is A, then $A \times \frac{8}{100} = 45000$. **[1]**

So $A = 562500$ m^2. **[1/2]**

OR **[3]**

The volume of the cone is $\frac{1}{3}\pi(40)^2(72) = 38400\pi$ cm^3. [1]
Water leaves the pipe at $\pi(2)^2 \times 2000 = 8000\pi$ cm^3 per minute, since the speed is 20 m/min $= 2000$ cm/min. [1]
Time $= \frac{38400\pi}{8000\pi} = 4.8$ minutes. [1]

Q29. **[3]**

$\angle APB = 90°$ (angle in a semicircle) and $\angle ODB = 90°$ (radius perpendicular to tangent) [1]
$\triangle ABP \sim \triangle OBD$ (AA, common angle at B) [1]
$\frac{AP}{OD} = \frac{AB}{OB}$, so $\frac{AP}{8} = \frac{26}{13} = 2$, giving $AP = 16$ cm [1]

Q30. **[3]**

(i) Major arc $ACB = \dfrac{240}{360} \times 2 \times \dfrac{22}{7} \times 7 = \dfrac{88}{3}$ cm. [1]
Perimeter $= 7 + 7 + \dfrac{88}{3} = \dfrac{130}{3} \approx 43.33$ cm. [1/2]
(ii) Minor sector $= \dfrac{120}{360} \times \dfrac{22}{7} \times 7^2 = \dfrac{154}{3}$ cm^2. [1]
Segment $= \dfrac{154}{3} - 21.2 = \dfrac{452}{15} \approx 30.13$ cm^2. [1/2]

Q31. **[3]**

The ratio of perimeters equals the ratio of corresponding sides: $\dfrac{\text{perimeter } ABC}{\text{perimeter } DEF} = \dfrac{25}{15} = \dfrac{5}{3}$. [1]
So $\dfrac{AB}{DE} = \dfrac{5}{3}$, i.e. $\dfrac{9}{DE} = \dfrac{5}{3}$. [1]
Hence $DE = \dfrac{27}{5} = 5.4$ cm. [1]

SECTION – D

Section D consists of 4 questions of 5 marks each.

Q32. **[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]

OR **[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]

Q33. **[5]**

(i) $\sec^2\theta + \text{cosec}^2\theta = \dfrac{\sin^2\theta + \cos^2\theta}{\sin^2\theta\cos^2\theta} = \dfrac{1}{\sin^2\theta\cos^2\theta}$ [1]. Also
$(\tan\theta + \cot\theta)^2 = \left(\dfrac{\sin^2\theta + \cos^2\theta}{\sin\theta\cos\theta}\right)^2 = \dfrac{1}{\sin^2\theta\cos^2\theta}$ [1]. Both sides are positive for acute θ, so taking square roots gives the result [1]. (3 marks)

(ii) $\cos 45° = \frac{1}{\sqrt{2}}$ and $\sec 30° + \text{cosec}\, 30° = \frac{2}{\sqrt{3}} + 2 = \dfrac{2(1+\sqrt{3})}{\sqrt{3}}$ [1]. The value is
$\dfrac{\sqrt{3}}{2\sqrt{2}(1+\sqrt{3})} = \dfrac{\sqrt{3}(\sqrt{3}-1)}{4\sqrt{2}} = \dfrac{3\sqrt{2}-\sqrt{6}}{8} \approx 0.224$ [1]. (2 marks)

OR **[5]**

From $x\sin\theta = y\cos\theta$, $x = \dfrac{y\cos\theta}{\sin\theta}$ **[1]**. Substituting in the first equation:
$y\cos\theta\sin^2\theta + y\cos^3\theta = y\cos\theta(\sin^2\theta + \cos^2\theta) = y\cos\theta = \sin\theta\cos\theta$ **[2]**. Hence $y = \sin\theta$ **[1]**. Then
$x\sin\theta = \sin\theta\cos\theta$ gives $x = \cos\theta$, so $x^2 + y^2 = \cos^2\theta + \sin^2\theta = 1$ **[1]**.

Q34. **[5]**

The green covers number $40 - 12 - 9 - 11 = 8$.
(i) $P(\text{green}) = \dfrac{8}{40} = \dfrac{1}{5}$. **[1]**
(ii) Not red: $\dfrac{40-12}{40} = \dfrac{28}{40} = \dfrac{7}{10}$. **[1]**
(iii) Red or blue: $\dfrac{12+9}{40} = \dfrac{21}{40}$. **[1]**
(iv) After adding 6 black covers there are 46 covers, of which $11 + 6 = 17$ are black, so $P = \dfrac{17}{46}$. **[1]**
(v) After removing the 8 green covers, 32 covers remain, of which 9 are blue, so $P = \dfrac{9}{32}$. **[1]**

Q35. **[5]**

Let the numerator be x and the denominator $2x + 1$. Then $\dfrac{x}{2x+1} + \dfrac{2x+1}{x} = \dfrac{58}{21}$. **[2]**
Clearing denominators: $11x^2 - 26x - 21 = 0$. **[1]**
$(11x + 7)(x - 3) = 0$, so $x = 3$ or $x = -\dfrac{7}{11}$. **[1]**
Rejecting the negative root, $x = 3$ and the fraction is $\dfrac{3}{7}$. **[1]**

OR **[5]**

Let the numerator be x, so the fraction is $\dfrac{x}{x+2}$ and the new fraction is $\dfrac{x+2}{x+4}$. **[1]**
$\dfrac{x}{x+2} + \dfrac{x+2}{x+4} = \dfrac{46}{35}$. **[1]**
Clearing denominators: $6x^2 + x - 57 = 0$. **[1]**
$(x - 3)(6x + 19) = 0$. The root $x = -\dfrac{19}{6}$ is not a valid numerator, so $x = 3$. **[1]**
The original fraction is $\dfrac{3}{5}$. Check: $\dfrac{3}{5} + \dfrac{5}{7} = \dfrac{46}{35}$. **[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) $173250 = 2 \times 3^2 \times 5^3 \times 7 \times 11$, so the primes used are $3, 3, 5, 5, 5, 7, 11$. The least prime used is 3. **[1]**
(ii) Each student uses one prime, so there are 7 students. **[1]**
(iii) OR: The distinct primes used are $3, 5, 7, 11$. **[1]**
Their sum is $3 + 5 + 7 + 11 = 26$. **[1]**

Q37. **[4]**

(i) The graph crosses the x-axis at two points, so the polynomial has 2 zeroes. **[1]**
(ii) The zeroes are -7 and 7. **[1]**
(iii) The sum of the zeroes is $2 + (-3) = -1 = -(a + 1)$, so $a = 0$. **[1]**
The product is $2 \times (-3) = -6 = b$, so $b = -6$. **[1]**

OR

(iii) If α, β are the zeroes, then $(\alpha - \beta)^2 = (\alpha + \beta)^2 - 4\alpha\beta = p^2 - 180$. **[1]**
So $p^2 - 180 = 144$, giving $p^2 = 324$ and $p = \pm 18$. **[1]**

Q38. **[4]**

(i) The tangent at S is perpendicular to the radius OS, so $\angle OSA = 90°$ **[1]**
(ii) For a quadrilateral circumscribing a circle, $AB + CD = AD + BC$. With $AB = AD$ this gives $CD = BC$. So $ABCD$ has two pairs of equal adjacent sides: it is a kite (it is a rhombus only if all four sides are equal) **[1]**
(iii) OR: $\angle OQC = \angle ORC = 90°$, so $\angle QOR = 180° - \angle QCR = 180° - 60° = 120°$ **[1]**, **[1]**

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