MARKING SCHEME — MATHEMATICS (STANDARD) CLASS X

SET-2 (80 MARKS)

SECTION A (Q.1 – Q.20 : 1 mark each)

Q.1 (C) 3, −2 $[x^2 - x - 6 = (x - 3)(x + 2)]$ 1

Q.2 (A) $x\,y^2$ 1

Q.3 (C) 24 $[m + n = 4, mn = -4\,;\, m^2 + n^2 = 16 + 8]$ 1

Q.4 (A) 3 [product of zeroes = $\frac{k}{3} = 1$] 1

Q.5 (C) infinitely many solutions 1

Q.6 (B) 42 years $[y - 7 = 7(x - 7)$ and $y + 3 = 3(x + 3) \Rightarrow x = 12, y = 42]$ 1

Q.7 (B) 10 1

Q.8 (A) 12 $[D = 36 - 24]$ 1

Q.9 (B) $5x^2 - 26x + 5 = 0$ $[x + \frac{1}{x} = \frac{26}{5}]$ 1

Q.10 (A) −1 1

Q.11 (C) 25 $[a_{18} - a_{13} = 5d]$ 1

Q.12 (A) ₹ 86 $[20 + 11 \times 6]$ 1

Q.13 (B) 50° 1

Q.14 (A) 40 m $[\frac{8}{6} = \frac{h}{30}]$ 1

Q.15 (B) 4.8 cm $[\frac{1.8}{5.4} = \frac{1.6}{EC}]$ 1

Q.16 (D) $2\sqrt{2}$ 1

Q.17 (A) (0, 2) 1

Q.18 (A) 24 cm $[PQ^2 = 25^2 - 7^2 = 576]$ 1

Q.19 (A) Both true, (R) correctly explains (A) 1

Q.20 (A) Both true, (R) correctly explains (A) 1

SECTION B (Q.21 – Q.25 : 2 marks each)

Q.21 $12^n = (2^2 \times 3)^n = 2^{2n} \times 3^n$; its prime factorisation contains only the primes 2 and 3 ..... 1 2

A number ends with the digit 0 only if it has both 2 and 5 as prime factors ; since 5 does not occur, 12^n cannot end with 0 1

OR

Assume $3 + 2\sqrt{5}$ is rational, i.e. $3 + 2\sqrt{5} = \frac{a}{b}$, where a, b are integers, $b \neq 0$ ..... ½

Then $\sqrt{5} = \frac{a - 3b}{2b}$, which is rational 1

This contradicts the fact that $\sqrt{5}$ is irrational ; hence $3 + 2\sqrt{5}$ is irrational ..... ½

Q.22 $336 = 2^4 \times 3 \times 7$, $54 = 2 \times 3^3$ ..... ½ 2

HCF = $2 \times 3 = 6$; LCM = $2^4 \times 3^3 \times 7 = 3024$ 1

Verification : $6 \times 3024 = 18144 = 336 \times 54$ ..... ½

Q.23 $x^2 + 7x + 10 = (x + 2)(x + 5)$; zeroes are −2 and −5 ..... 1 2

Sum = $-7 = \frac{-7}{1}$; Product = $10 = \frac{10}{1}$; relationship verified 1

Q.24 $PQ^2 = (x - 1)^2 + (7 + 5)^2 = 13^2$ 1 2

$(x - 1)^2 = 169 - 144 = 25 \Rightarrow x - 1 = \pm 5 \Rightarrow x = 6$ or $x = -4$ 1

Q.25 $OP \perp PQ$ (tangent ⊥ radius at the point of contact) ..... ½ 2

$r^2 = 17^2 - 15^2 = 289 - 225 = 64$ 1

Radius = 8 cm ..... ½

OR

$\angle OAP = 90°$; $\angle APO = \frac{70°}{2} = 35°$ 1

$\angle POA = 180° - 90° - 35° = 55°$ 1

SECTION C (Q.26 – Q.31 : 3 marks each)

Q.26 $\alpha + \beta = \frac{5}{3}$, $\alpha\beta = \frac{2}{3}$ 1 3

$\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta = \frac{25}{9} - \frac{4}{3} = \frac{13}{9}$ 1

$\frac{\alpha}{\beta} + \frac{\beta}{\alpha} = \frac{\alpha^2 + \beta^2}{\alpha\beta} = \frac{13}{9} \div \frac{2}{3} = \frac{13}{6}$ 1

Q.27 $S_n = \frac{n}{2}[126 + (n - 1)(-3)] = 693$ 1 3

$n^2 - 43n + 462 = 0 \Rightarrow (n - 21)(n - 22) = 0 \Rightarrow n = 21$ or 22 1

Both answers are valid : the 22nd term is 0, so the sum of 21 and of 22 terms is the same 1

OR

$a = 7$, $d = -5$, $n = 25$ ..... ½

$S_{25} = \frac{25}{2}[2(7) + 24(-5)] = \frac{25}{2}[14 - 120]$ 1½

$= \frac{25}{2} \times (-106) = -1325$ 1

Q.28 $AB^2 = 3^2 + 4^2 = 25$ and $AC^2 = 4^2 + 3^2 = 25$ 1 3

$BC^2 = 7^2 + 1^2 = 50$ 1

$AB = AC$ and $AB^2 + AC^2 = BC^2 \Rightarrow$ right-angled isosceles triangle (right angle at A) 1

Q.29 Let the x-axis divide AB in the ratio $k : 1$; the point on the x-axis has $y = 0$ ..... ½ 3

$\frac{5k-5}{k+1} = 0 \Rightarrow k = 1$, i.e. ratio 1 : 1 ..... 1½

Point of division = $(\frac{-4+1}{2}, 0) = (-\frac{3}{2}, 0)$ 1

Q.30 Correct figure : circle centre O, external point P, tangents PA and PB ..... ½ 3

In ΔOAP and ΔOBP : $OA = OB$ (radii), OP common, $\angle OAP = \angle OBP = 90°$ (tangent ⊥ radius) 1½

$\Delta OAP \cong \Delta OBP$ (RHS) $\Rightarrow PA = PB$ 1

Q.31 Tangent lengths from an external point are equal : $AP = AS$, $BP = BQ$, $CR = CQ$, $DR = DS$ 1½ 3

Adding : $AB + CD = AD + BC$; but $AB = CD$ and $AD = BC$ (parallelogram) 1

$2AB = 2BC \Rightarrow AB = BC$; all sides equal ⇒ rhombus ..... ½

OR

Let the chord AB of the larger circle touch the smaller circle at M ; then $OM \perp AB$ (tangent ⊥ radius) 1½

The perpendicular from the centre to a chord bisects the chord 1

Hence $AM = MB$, i.e. AB is bisected at the point of contact ..... ½

SECTION D (Q.32 – Q.35 : 5 marks each)

Q.32 Let the fixed charge be ₹ x and the charge for each extra day be ₹ y. 5

$x + 4y = 27$ and $x + 2y = 21$ 1½

Subtracting : $2y = 6 \Rightarrow y = 3$ 1½

(a) $x = 21 - 2 \times 3 = 15$; fixed charge = ₹ 15, extra-day charge = ₹ 3 1

(b) Charge for 10 days = $x + 7y = 15 + 21 = ₹\,36$ 1

Q.33 Let the speed of the stream be x km/h. 5

$\frac{24}{18-x} - \frac{24}{18+x} = 1$ 1½

$24[(18 + x) - (18 - x)] = (18 - x)(18 + x) \Rightarrow x^2 + 48x - 324 = 0$ 1½

$(x + 54)(x - 6) = 0$ 1

$x = 6$ (rejecting $x = -54$) ; speed of stream = 6 km/h 1

OR

Let the original speed of the train be x km/h.

$\frac{300}{x} - \frac{300}{x+5} = 2$ 1½

$1500 = 2x(x + 5) \Rightarrow x^2 + 5x - 750 = 0$ 1½

$(x + 30)(x - 25) = 0$ 1

$x = 25$ (rejecting $x = -30$) ; original speed = 25 km/h 1

Q.34 The numbers of plants 23, 21, 19, ... form an AP with $a = 23$ and $d = -2$ 1 5

(a) $5 = 23 + (n - 1)(-2) \Rightarrow n = 10$ rows 1½

(b) $S_{10} = \frac{10}{2}(23 + 5) = 140$ rose plants 1½

(c) $23 + (n - 1)(-2) = 11 \Rightarrow n = 7$; the 7th row 1

Q.35 Statement of Basic Proportionality Theorem ..... ½ 5

Correct figure and construction (join BE, CD ; draw EL ⊥ AB, DM ⊥ AC) 1

Correct proof that $\frac{AD}{DB} = \frac{AE}{EC}$ 2½

Application : $\frac{4x-3}{3x-1} = \frac{8x-7}{5x-3} \Rightarrow 2x^2 - x - 1 = 0 \Rightarrow (2x+1)(x-1) = 0 \Rightarrow x = 1$ (rejecting $x = -\frac{1}{2}$) 1

OR

$\Delta ABC \sim \Delta PQR \Rightarrow \frac{AB}{PQ} = \frac{BC}{QR}$ and $\angle B = \angle Q$ 1

$BD = \frac{1}{2} BC$ and $QM = \frac{1}{2} QR$, so $\frac{AB}{PQ} = \frac{BD}{QM}$ 1½

$\Delta ABD \sim \Delta PQM$ (SAS similarity) 1½

Hence $\frac{AB}{PQ} = \frac{AD}{PM}$ 1

SECTION E (Q.36 – Q.38 : case study, 4 marks each)

Q.36 (i) $5x + 3y = 130$ and $3x + 5y = 110$ 1 4

(ii) Adding : $8x + 8y = 240 \Rightarrow x + y = 30$; subtracting : $2x - 2y = 20 \Rightarrow x - y = 10$; so $x = 20$; cost of one flag = ₹ 20 1

(iii) $y = 10$; cost of 2 flags and 6 badges = $40 + 60 = ₹\,100$; the class has exactly ₹ 100, so yes — just enough 2

OR

(iii) Number of badges for ₹ 90 = $\frac{90}{10} = 9$ 2

Q.37 (i) $x(40 - x) = 400 \Rightarrow x^2 - 40x + 400 = 0$ 1 4

(ii) $D = 1600 - 1600 = 0 \Rightarrow$ real and equal roots ; the playground is possible and its dimensions are unique 1

(iii) $(x - 20)^2 = 0 \Rightarrow x = 20$; breadth = 20 m, length = $40 - 20 = 20$ m 2

OR

(iii) $x^2 - 40x + 375 = 0 \Rightarrow (x - 15)(x - 25) = 0$; dimensions 15 m × 25 m 2

Q.38 (i) $\Delta ABE \sim \Delta CDE$ by AA similarity (each has a right angle and ∠E is common) 4 1

(ii) Ratio of lamp-post to boy = $\frac{4.8}{1.2}$ = 4 : 1 1

(iii) Distance walked in 4 s = $0.9 \times 4 = 3.6$ m ; if shadow = s : $\frac{3.6 + s}{s} = 4 \Rightarrow 3s = 3.6 \Rightarrow s = 1.2$ m 2

OR

(iii) If he is d m from the post and his shadow is s m : $\frac{d+s}{s} = 4 \Rightarrow s = \frac{d}{3}$; each second d increases by 0.9 m, so s increases by $\frac{0.9}{3} = 0.3$ m — a uniform rate of 0.3 m/s 2

Note : Competency-based / application questions (Q.6, 9, 12, 14, 19, 20, 21, 25, 27, 28, 32–34, 36–38) ≈ 43 marks (54%), meeting the CBSE requirement of at least 50% competency-focused assessment.