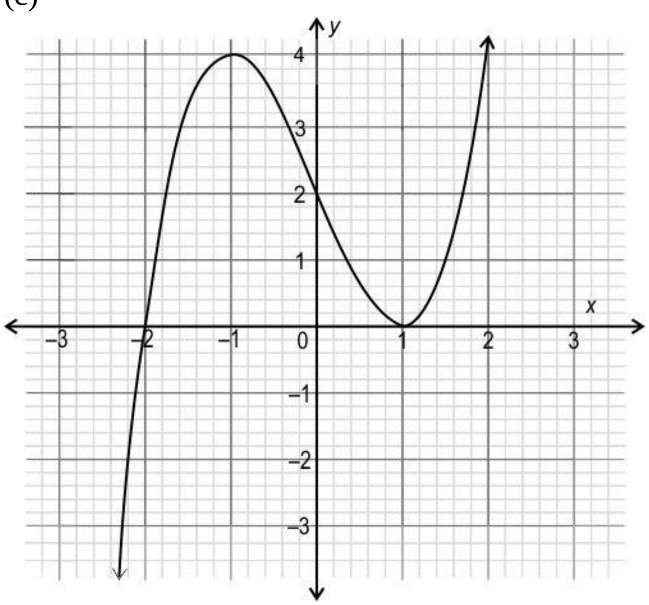
CBSE

ADDITIONAL PRACTICE QUESTIONS - MARKING SCHEME

MATHEMATICS STANDARD (041)

Class X | 2023–24

SECTION A - Multiple Choice Questions of 1 mark each.

Q. No.	Answer/Solution	Marks
1	(c) 	1
2	(a) $x - y = 3$	1
3	(d) 0 and 2	1
4	(b) 2 units	1
5	(b) 8 cm	1
6	(a) Only Anas	1
7	(d) $\frac{111}{7}$ cm	1
8	(c) $\frac{9}{\sqrt{2}}$ cm	1
9	(c) 38 cm	1
10	(c) 1.7 and 1.1	1

11	(a) $\frac{8}{17}$	1
12	(a) step 1	1
13	(a) $\frac{16\pi}{3}$ cm	1
14	(d) 10π cm^2	1
15	(b) $\frac{R}{P}$ units	1
16	(b) Nitesh	1
17	(a) 5	1
18	(c) 0.5	1
19	(d) (A) is false but (R) is true.	1
20	(d) (A) is false but (R) is true.	1

SECTION B – Very short answer questions of 2 marks each.

Q. No.	Answer/Solution	Marks
21	Takes a number which is not a perfect square but is a composite number. For example, 6. Assumes $\sqrt{6} = \frac{a}{b}$, where $b \neq 0$, a and b are co-primes. Writes $b\sqrt{6} = a$ and squares on both sides to get $6b^2 = a^2$. Writes that as a^2 is divisible by 2 and 3 which are both prime numbers, a is also divisible by both 2 and 3. Hence concludes that a is divisible by 6. Writes $a = 6c$, where c is an integer and squares on both sides to get $a^2 = 36c^2$. Replaces a^2 with $6b^2$ from step 2 to get $6b^2 = 36c^2$ and solves it to get $b^2 = 6c^2$. Writes that as b^2 is divisible by 2 and 3 which are both prime numbers, b is also divisible by both 2 and 3. Hence concludes that b is divisible by 6. Writes that 2 and 3 divide both a and b which contradicts the assumption that a and b are co-prime and hence $\sqrt{6}$ is irrational. Concludes that the given statement is false.	0.5 0.5 0.5 0.5
22	Assumes the time taken by Kimaya and Heena to reach the club house and the badminton court as t_1 and t_2 respectively and frames the equation as: $t_2 - t_1 = 1$ Assumes the distance travelled by Kimaya as x m and by Heena as y m and frames the equation for the total distance travelled by Kimaya and Heena together as:	

	$x + y = 800 - 180 = 620$ Uses the constant speeds of Kimaya and Heena to find the values of x and y as: $x = 100t_1$ and $y = 80t_2$ Replaces the values of x and y in the equation of distance travelled as: $100t_1 + 80t_2 = 620$ Substitutes the value of t_1 in the above equation as: $100(t_2 - 1) + 80t_2 = 620$ Solves the above equation to find the value of t_2 as 4 minutes.	1.0 0.5 0.5
23	Writes that the statement is true. Gives a valid reason. For example, as tangents are drawn at A and E, ∠OAB = ∠OED = 90°. Since these are adjacent interior angles, and are supplementary, AB||ED. Hence, atleast one pair of opposite sides of AEDB is parallel.	0.5 1.5
24	Uses the formula for the volume of a cone and solves for height, h, as: $\frac{1}{3} \times 3 \times 20 \times 20 \times h = 13600$ $\Rightarrow h = 34$ cm Finds the angle, θ, which the slant height makes with the base radius as: $\tan\theta = \frac{34}{20}$ $\Rightarrow \tan\theta = 1.7$ $\Rightarrow \tan\theta = \tan 60°$ $\Rightarrow \theta = 60°$ OR Writes $\sin 45° = \frac{2}{hypotenuse}$ and finds the hypotenuse as $2\sqrt{2}$ cm. (Award full marks if it is solved correctly by applying any other properties of triangles.) Writes $\cos 60° = \frac{base}{2\sqrt{2}}$ and finds the unknown side marked with '?' as:	1.0 1.0 1.0 1.0

	$2\sqrt{2} \times \frac{1}{2} = \sqrt{2}$ cm	

25	Finds the area of sector ABD as $\frac{60}{360} \times \pi \times 3^2 = \frac{3\pi}{2}$ cm^2 Finds the area of ΔABD as $\frac{\sqrt{3}}{4} \times 9 = \frac{9\sqrt{3}}{4}$ cm^2 Finds the required area as: 2 × (area of sector ABD - area of ΔABD) $= 2 \times (\frac{3}{2}\pi - \frac{9\sqrt{3}}{4})$ $= 3\pi - \frac{9\sqrt{3}}{2}$ cm^2 OR Assumes the radius of the circle as r cm and writes the equation for the area as: $120\pi = \frac{300}{360} \times \pi \times r^2$ $\Rightarrow r = 12$ cm Finds the length of ribbon required as: $(\frac{300}{360} \times 2 \times \pi \times 12) + 24$ cm $= (20\pi + 24)$ cm	1.0 1.0 1.0 1.0

SECTION C – Short answer questions of 3 marks each.

Q No.	Answer/Solution	Marks
26	Finds the HCF and LCM of A, B and C from the prime factorisation as: HCF = $2^p \times 3^p \times 5^p$ LCM = $2^r \times 3^r \times 5^q$ From the given information, infers that HCF of A, B and C is 30 and equates it to the HCF obtained in step 1 to get the value of p as: $2^p \times 3^p \times 5^p = 30$ $\Rightarrow (2 \times 3 \times 5)^p = (2 \times 3 \times 5)^1$ $\Rightarrow p = 1$	0.5 0.5

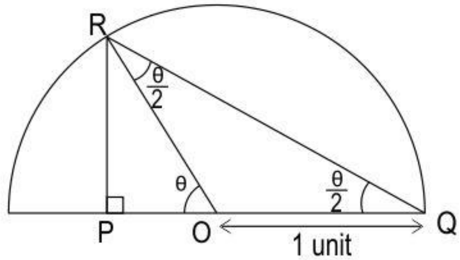
	From the given information, infers that LCM of A, B and C is 5402 - 2 = 5400. Equates it to the LCM obtained in step 1 to get the values of q and r as: $2^r \times 3^r \times 5^q = 5400$ $\Rightarrow (2 \times 3)^r \times (5)^q = (2 \times 3)^3 \times (5)^2$ $\Rightarrow q = 2$ and $r = 3$ Substitutes the values of p, q and r to find the values of A, B and C as: $A = 2^3 \times 3^1 \times 5^2 = 600$ $B = 2^1 \times 3^3 \times 5^1 = 270$ $C = 2^2 \times 3^2 \times 5^1 = 180$	1.0 1.0
27	i) Assumes the polynomial to be $ax^2 + bx + c$ and considers its zeroes to be α and β. Given: $\alpha + \beta = 1$ $\alpha^2 + \beta^2 = 25$ Uses the identity $(\alpha + \beta)^2$ to find $\alpha\beta$ as (-12). From the relation between coefficients and zeroes of a polynomial, finds b and c in terms of a as: $b = (-a)$ and $c = (-12a)$ Frames the expression of polynomial as: $ax^2 - ax - 12a$ Assumes the value of a as 1 and factorises the above polynomial as: $x^2 - x - 12 = (x - 4)(x + 3)$ Finds the zeroes as 4 and (-3). Thus, finds the coordinates of P and Q as (4, 0) and (-3, 0). ii) Writes that the distance between Riddhi and the point where the stones lands (P) is (2 + 4) = 6 units. Finds the distance between Riddhi and point P as (6 × 25) = 150 metres.	1.0 0.5 1.0 0.5

28	i) Writes that for the equations to have unique solution: $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ Hence in the given equations: $\frac{m}{n} \neq \frac{2}{4}$ or $\frac{m}{n} \neq \frac{1}{2}$ Substitutes a set of values for *m* and *n* in the given pair of equations which satisfies the above condition and frames a pair of equations. For example: $2x - 2y = 9$ $4x - 6y = 9$ (Award full marks if any other pair of equations satisfying the above conditions is framed.)	1.0
	ii) Writes that for the equations to have infinitely many solutions: $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ Reasons that in the pair of equations provided: $\frac{a_1}{a_2} = \frac{2}{4} = \frac{1}{2}$ while $\frac{c_1}{c_2} = \frac{9}{9} = 1$ Concludes that as the required condition can never be satisfied, it is not feasible to frame a pair of equations having infinitely many solutions.	1.0
	iii) Writes that for the equations to have no solution: $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ In the given equations: $\frac{c_1}{c_2} =$ which is not equal to $\frac{a_1}{a_2}$ Now, substitutes a pair of values for *m* and *n* in the given equations such that:	

	$\frac{m}{n} = \frac{a_1}{a_2} = \frac{1}{2}$ For example, $2x - 3y = 9$ $4x - 6y = 9$ (Award full marks if any other pair of equations satisfying the above conditions is framed.)	1.0
	OR i) Writes that the pair will have infinitely many solutions. Reasons that as there are more than one points of intersection, the pair is of coincident or overlapping lines.	1.0
	ii) Substitutes the values of the point of intersection (6, 0) in the equation of a line $ax + by = c$ as: $6a + 0 = c$ or $a = \frac{c}{6}$	0.5
	Substitutes the values of the second point of intersection (0, 2) in the equation as: $2b = c$ or $b = \frac{c}{2}$	0.5
	Rewrites the equation of a line by substituting the values of a and b in terms of c as: $\frac{c}{6}x + \frac{c}{2}y = c$ Simplifies the above equation by taking $c = 1$ to find the equation of the line as $x + 3y = 6$.	1.0

29	Finds that $\angle OPR = \angle ORP$, and $\angle ORP = \angle ROS$. Finds $\angle QOS = \angle ROS = \angle ORP$. Gives a valid reason. For example: Using exterior angle property, $\angle OPR + \angle ORP = \angle QOS + \angle ROS$. $\Rightarrow 2\angle ROS = \angle QOS + \angle ROS$ $\Rightarrow \angle QOS = \angle ROS$ Writes that $\Delta ORS \cong \Delta OQS$ by SAS congruence. The working may look as follows: OS = OS (common side) OR = OQ (radius) $\angle ROS = \angle QOS$ Notes that as RS is a tangent to the circle, $\angle ORS = 90°$. Concludes that SQ is a tangent to the circle as $\angle ORS = \angle OQS = 90°$, by CPCT. OR Writes that AB = BC, as they are tangents from an external point to a circle. Notes that OA = OC as they are radii. Writes that $\angle BAO = \angle BCO = 90°$ as AB and BC are tangents. Notes that OA || BC as $\angle AOC + \angle OCB = 180°$ (adjacent interior angles) Notes that OC || AB as $\angle AOC + \angle OAB = 180°$ (adjacent interior angles) Concludes that OABC is a parallelogram. Writes that, as opposite sides in a parallelogram are equal, OA = BC and OC = AB. Also, as opposite angles in a parallelogram are equal, $\angle AOC = \angle ABC = 90°$ (Award full marks if students first proves that OABC is a rectangle using angle sum property and then shows that the adjacent sides are equal.) Concludes that OABC is a square as all of its angles are 90°, and OA = AB = BC = OC.	0.5 1.0 0.5 1.0 0.5 0.5 0.5 0.5 0.5 0.5

30	Draws a rough figure with the necessary constructions. The figure may look as follows:	

	 *(Note: The figure is not to scale.)* Writes that in ΔRPO, $\sin\theta = \frac{RP}{OR}$ => RP = sin θ Writes that in ΔRPO, $\cos\theta = \frac{PO}{OR}$ => PO = cos θ Writes that in ΔRPQ, $\tan\frac{\theta}{2} = \frac{RP}{PQ}$ $\Rightarrow \tan\frac{\theta}{2} = \frac{\sin\theta}{1+\cos\theta}$	1.0 0.5 0.5 1.0
31	Writes that the sum of the two numbers on the dice is one of these: odd + odd = even odd + even = odd even + odd = odd even + even = even Finds the probability of getting an odd number as the sum on rolling the two dice as $\frac{1}{2}$. Writes that the product of the two numbers on the dice is one of these: odd × odd = odd odd × even = even even × odd = even even × even = even Finds the probability of getting an odd number as the product on rolling the two dice as $\frac{1}{4}$.	1.0 0.5 1.0

	Hence, concludes that Naima should choose option 1.	0.5

SECTION D – Long answer questions of 5 marks each.

Q No.	Answer/Solution	Marks
32	Assumes the time Manu took to finish the race as t hours and writes the equation for his average speed as $\frac{60}{t}$ km/hr.	0.5
	Frames the equation for Aiza using the given information as: $(\frac{60}{t} + 10)(t - \frac{1}{2}) = 60$	1.5
	Simplifies the above equation into standard quadratic equation form as: $2t^2 - t - 6 = 0$	1.5
	Factorises the above equation as $(t - 2)(t + \frac{3}{2}) = 0$	1.0
	Finds the time taken by Manu to finish the race as 2 hours.	0.5
	OR	
	Assumes the vertical length of the cuboid in orientation I as h cm and finds the height of water as $(h - 4)$ cm.	0.5
	Finds the height of water in orientation II as $\frac{1}{2}(h - 4)$ cm.	0.5
	Writes the equation for the volume of water as: $5 \times h \times \frac{1}{2}(h - 4) = 480$	1.0
	Simplifies the above equation as: $h^2 - 4h - 192 = 0$	1.0
	Solves and finds the roots of the above equation as (-12) and 16. (Rejects h = (-12) as height cannot be negative.) Finds the height of water in:	1.0

	orientation I as 16 - 4 = 12 cm orientation II as $\frac{1}{2} \times 12 = 6$ cm (Award full marks if an alternate method is correctly used.)	1.0
33	Finds PR as PC - RC. Finds RC as $\frac{50}{5} = 10$ cm and PC as $\frac{50}{3}$ cm. Hence, finds PR as $\frac{20}{3}$ cm. Writes that $\Delta PQR \sim \Delta PTC$ by basic proportionality theorem, as QR || BC. Writes that $\frac{PR}{CR} = \frac{PQ}{QT}$. Hence, $\frac{20}{10 \times 3} = \frac{PQ}{8}$ => PQ = $\frac{16}{3}$ cm. Uses Pythagoras theorem in ΔPQR to find the length of QR as: QR = $\left(\sqrt{\frac{20}{3}}\right)^2 - \left(\sqrt{\frac{16}{3}}\right)^2$ = 4 cm Finds the area of ΔPQR as $\frac{1}{2} \times 4 \times \frac{16}{3} = \frac{32}{3}$ cm^2. (Award full marks if a different solution method is used correctly to find the answer.)	1.5 0.5 1.0 1.0 1.0

34	i) Writes that, in the sheet 1 cylinder, the height of the cylinder = 155 cm. Hence finds area wasted in overlap = 155 x 1 = 155 cm^2. Writes that, in the sheet 2 cylinder, the height of the cylinder = 45 cm. Hence finds area wasted in overlap = 45 x 1 = 45 cm^2. Writes that, as the sheets used are identical, the difference in curved surface area = difference between area wasted in overlap = 155 - 45 = 110 cm^2. (Award full marks if solved using formula). ii) Notes that the circumference of the circle in the Sheet 1 cylinder is: 45 cm - 1 cm = 44 cm Finds the radius of the sheet 1 cylinder as 7 cm. The working may look as follows: $2\pi r_1 = 44$ cm => $r_1 = 7$ cm Notes that the circumference of the circle in the Sheet 2 cylinder is: 155 cm - 1 cm = 154 cm Finds the radius of the sheet 2 cylinder as $\frac{49}{2}$ cm. The working may look as follows: $2\pi r_2 = 154$ cm => $r_2 = \frac{49}{2}$ cm Finds the ratio of the volumes of the two cylinders as follows: $\frac{V_1}{V_2} = \frac{\pi\times7\times7\times155}{\pi\times\frac{49}{2}\times\frac{49}{2}\times45} = \frac{31\times4}{49\times9} = \frac{124}{441}$ where V_1 is the volume of the cylinder made by sheet 1, and V_2 is the volume of the cylinder made by sheet 2.	0.5 0.5 1.0 1.0 1.0 1.0

	OR i) Finds the side of the cubical container as $2p$ from the figure. Calculates that $2p \div \frac{p}{2} = 4$ cans can be packed in each of the length's and the breadth's directions in the container. Finds the total number of cans that can fit in the container as: $4 \times 4 \times 2 = 32$ ii) Writes the formula for the volume of the can to find the value of p as: $539 = \frac{22}{7} \times \frac{p^2}{16} \times p$ Solves the above equation to find the value of p as 14 cm. (Award 0.5 marks if only the formula for volume of a cylinder is written correctly.) Finds the side of the cube as $2 \times 14 = 28$ cm. Finds the internal volume of the cubical container as $(28)^3$ cm^3 or 21952 cm^3.	1.0 1.0 2.0 1.0
35	i) Prepares the frequency distribution table as below: (see table below) Finds the mean of the given data as $\frac{664}{90}$ = 7.38 approximately. (Award 0.5 marks if only the formula for mean is written correctly.)	2.5

Cars assembled per day	**Number of days (f_i)**	**Class mark (x_i)**	$f_i x_i$
0 - 4	33	2	66
4 - 8	18	6	108
8 - 12	21	10	210
12 - 16	11	14	154
16 - 20	7	18	126
	$\sum f_i = 90$		$\sum f_i x_i =$ 664

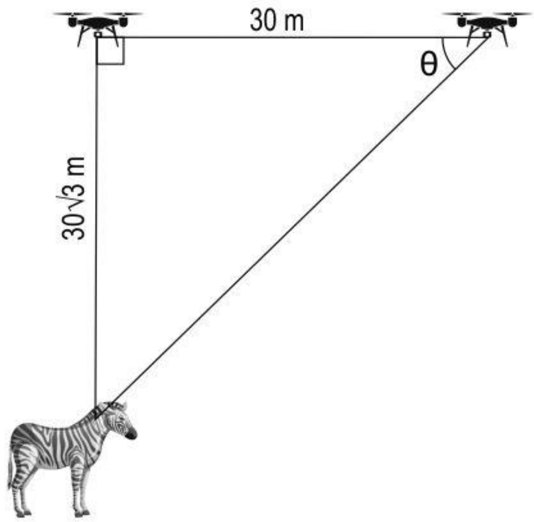
	As the demand has doubled, the new average to meet the demand should be: $2 \times 7.38 = 14.76$ approximately. Concludes that nearly 15 cars should be assembled per day on an average to meet the increased demand.	1.0 0.5
	ii) From the table concludes that as mean lies in the range of (4 - 8), at least on 33 days less than average number of cars were assembled.	1.0

SECTION E – Case-based questions of 4 marks each.

Q No.	Answer/Solution	Marks
36 (i)	Notes that the amounts Manan is paid for each painting forms an AP. Takes $a = 6000$, $d = 200$ and $n = 25$ to find the amount as $6000 + (25 - 1)200 =$ Rs 10800.	 1.0
36 (ii)	Finds the total amount earned by Bhima as follows: $S_{50} = \frac{50}{2}[2(4000) + (50 - 1)(400)]$ Solves the above expression to find the total amount as Rs 6,90,000.	0.5 0.5
36 (iii)	Frames equation as follows: $6000 + (n - 1)200 = 4000 + (n - 1)400$ Solves the above equation to find the value of n as 11. Writes that, since they both earn the same amount for the 11th painting, as Bhima's increment is more, Bhima gets more money than Manan for the 12th painting. OR Assumes that the number of paintings required is n. Frames equation as follows:	 0.5 1.0 0.5

	S_n(Manan) = S_n(Bhima) => $\frac{n}{2}[2(6000) + (n - 1)200] = \frac{n}{2}[2(4000) + (n - 1)400]$ Solves the equation from step 1 to find n as 21.	1.0 1.0
37 (i)	Writes two pairs of possible coordinates such that Rohan scored 20 and 5 points for them. For examples, (1.5, 0) and (3.5, 0).	1.0
37 (ii)	Finds the distance of (2, 2.5) from (0, 0) as: $\sqrt{(4 + 6.25)} = \sqrt{10.25}$ units Hence, concludes that 5 points will be awarded. (Award full marks if students answer correctly based on any other method with appropriate justification.)	1.0
37 (iii)	Finds the distance of (1.2, 1.6) from the origin as: $\sqrt{\{(1.2)^2 + (1.6)^2\}} = 2$ units Assumes that the second arrow lands on the boundary mark and writes that the ratio in which the first arrow divides the origin and the second arrow's landing mark is the ratio of their radii = 2:1. Assumes the coordinates of the second arrow's landing mark as (x, y) and uses section formula to write: $(\frac{2x+0}{3}, \frac{2y+0}{3}) = (1.2, 1.6)$ Solves the above equation to find the values of the coordinates of the second arrow's landing mark as (1.8, 2.4). OR Identifies the distance between the origin and the coordinate $(m, -m)$ as 2 units and uses the distance formula to write the equation as: $m^2 + (-m)^2 = 2^2$ Simplifies the above equation as $2m^2 = 4$. Solves the above equation to get y as $\sqrt{2}$ and $(-\sqrt{2})$.	0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5

	Finds the coordinates as $(\sqrt{2}, -\sqrt{2})$ and $(-\sqrt{2}, \sqrt{2})$.	
38 (i)	Assumes the vertical distance between the top of the tree and the drone to be h and finds h as: $h = 5\sqrt{3} \times \tan 30° = 5\sqrt{3} \times \frac{1}{\sqrt{3}} = 5$ m Finds the height of the tree as 100 - 65 - 5 = 30 m.	0.5 0.5
38 (ii)	Draws a rough diagram to represent the situation. The figure may look as follows:	

	 Finds the value of θ as: $\tan\theta = \frac{30\sqrt{3}}{30} = \sqrt{3}$ Thus finds the value of θ as 60°.	0.5 0.5

38 (iii)	Assumes the horizontal distance between the remote and the drone as x and finds its value as: $x = \frac{50\sqrt{3}}{\tan 60^\circ} = 50\ m$	0.5
	Finds the distance covered by the jeep in 2 mins as: $10 \times 120 = 1200$ m	0.5
	Finds the horizontal distance covered by the drone before it stopped as: $1200 + 50 = 1250$ m Finds the speed of the drone as: $\frac{1250}{120} = 10.42$ m/s	1.0
	OR	
	Assumes the horizontal distance between the drone and the tiger to be x when the angle of depression was 30° and finds the value of x as: $x = 54\sqrt{3} \times \tan 30^\circ = 54\sqrt{3} \times \frac{1}{\sqrt{3}} = 54$ m	0.5
	Assumes the horizontal distance between the drone and the tiger after 3 seconds as y and finds the value of y as: $y = 54\sqrt{3} \times \tan 45^\circ = 54\sqrt{3}$ m	0.5
	Finds the distance covered by the tiger in 3 seconds as: $54\sqrt{3} - 54 = 39.42$ m	0.5
	Finds the average speed of the tiger during that time as: $\frac{39.42}{3} = 13.14$ m/s	0.5