KENDRIYA VIDYALAYA SANGATHAN, CHENNAI REGION
FIRST PRE-BOARD EXAMINATION: 2024-2025
MATHEMATICS STANDARD (041)

CLASS :X **ANSWER KEY** **Time Allowed: 3 Hrs.**

Maximum Marks: 80

SECTION A		
Q. No.	**Section A consists of 20 questions of 1 mark each.**	**Marks**
1	d, a=0,b= -6	1
2	both negative	1
3	c, 3	1
4	a,4	1
5	d,6	1
6	a, (3,-10)	1
7	a,2	1
8	b,0	1
9	c, $\frac{3}{4}$	1
10	d,10 cm	1
11	b, parallel	1
12	d, 155°	1
13	d, 5:1	1
14	a, 9 units	1
15	d, 4	1
16	b, 315	1
17	d, $\frac{3}{10}$	1
18	b, $\frac{6}{23}$	1
19	a	1

20	.c	1
SECTION B		
Section B consists of 5 questions of 2 marks each.		
21	Let us assume that $2+5\sqrt{3}$ is a rational number. Thus, $2+5\sqrt{3}$ can be represented in the form of $\frac{p}{q}$, where p and q both are integers, q ≠ 0, p and q are co-prime numbers. $2+5\sqrt{3}=\frac{p}{q}$ $\Rightarrow 5\sqrt{3}=\frac{p}{q}-2$ $\Rightarrow 5\sqrt{3}=\frac{p-2q}{q}$ $\Rightarrow \sqrt{3}=\frac{p-2q}{5q}$ since, $\frac{p-2q}{5q}$ is rational ⇒ $\sqrt{3}$ is rational. But, it is given that $\sqrt{3}$ is an irrational number. Therefore, our assumption is wrong. Hence, $2+5\sqrt{3}$ is an irrational number. **(or)**	½ ½ ½ ½ ½ ½ ½ ½

	Let us assume that $3\sqrt{7}$ is rational. $3\sqrt{7} = \frac{a}{b}$ Rearranging, we get $\sqrt{7} = \frac{a}{3b}$ Since 3, a and b are integers, $\frac{a}{3b}$ can be written in the form of $\frac{p}{q}$, so $\frac{a}{3b}$ is rational, and so $\sqrt{7}$ is rational. But this contradicts that $\sqrt{7}$ is irrational. So, we conclude that $3\sqrt{7}$ is irrational.	
22	distance between (a, b) and (− a, − b) is given by $l = \sqrt{(a-(-a))^2 + (b-(-b))^2}$ $= \sqrt{(2a)^2 + (2b)^2}$ $= \sqrt{4a^2 + 4b^2}$ $= 2\sqrt{a^2 + b^2}$	½ ½ ½ ½

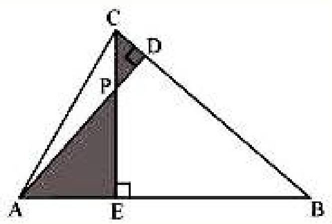
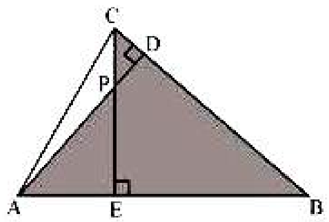
23	The point which divides the given line segment lies on y-axis. This implies, Its abscissa is 0. Let the point $(0, y)$ intersects the line segment joining the points $(5, -6)$ and $(-1, -4)$ in the ratio $m : n$. Using section formula, we have, $(x, y) = (\frac{mx_2+nx_1}{m+n}, \frac{my_2+ny_1}{m+n})$ Therefore, $(0, y) = \left(\frac{m\times(-1)+n\times(5)}{m+n}, \frac{m\times(-4)+n\times(-6)}{(m+n)}\right)$ $\Rightarrow \frac{-m+5n}{m+n} = 0$ $\Rightarrow -m + 5n = 0$ $\Rightarrow m = 5n$ $\Rightarrow \frac{m}{n} = \frac{5}{1}$ $\Rightarrow m : n = 5 : 1$	½ ½ ½ ½

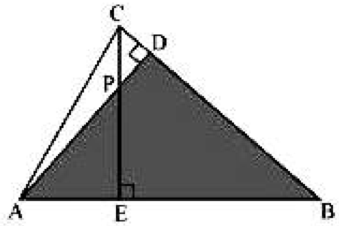
24	tan (A + B) = $\sqrt{3}$ ⇒ tan(A + B) = tan60° ⇒ (A + B) = 60° ... (i) tan (A - B) = $\frac{1}{\sqrt{3}}$ ⇒ tan(A − B) = tan30° ⇒ (A − B) = 30° ... (ii) Adding (i) and (ii); we get, A + B + A − B = 60° + 30° 2A = 90° A = 45° Putting the value of A in equation (i), 45° + B = 60° ⇒ B = 60° − 45° ⇒ B = 15° Thus, A = 45° and B = 15°	½ ½ ½ ½
25	Total balls = x + 2x + 3x = 24. ⇒ 6x = 24 ⇒ x = 4. (i)Probability of getting red ball = $\frac{x}{24}=\frac{4}{24}=\frac{1}{6}$ (ii) Probability of getting blue ball = $\frac{3x}{24}=\frac{3\times 4}{24}=\frac{1}{2}$ (iii) Probability of getting neither red nor blue= Probability of getting white ball $=\frac{2x}{24}=\frac{2\times 4}{24}=\frac{1}{3}$ **(or)** Total number of cards=52 Total number of aces=4 P(getting an ace)=Number of aces/Total number of cards =4/52 =1/13 P(not an Ace)=1-P(get an Ace) =1-(1/13) =12/13 (ans	½ ½ ½ ½ 1 1

SECTION C		
Section C consists of 6 questions of 3 marks each.		
26	Let us assume that $\sqrt{5}$ is a rational number. So it can be expressed in the form p/q where p, q are co-prime integers and $q \neq 0$ $\Rightarrow \sqrt{5} = \frac{p}{q}$ On squaring both the sides we get, $\Rightarrow 5 = p^2/q^2$ $\Rightarrow 5q^2 = p^2$ —————(i) $p^2/5 = q^2$ $So\ 5\ divides\ p^2,\ p\ is\ a\ multiple\ of\ 5$ $\Rightarrow p = 5m$ $\Rightarrow p^2 = 25m^2$ ————— (ii) $From\ equations\ (i)\ and\ (ii),\ we\ get,$ $5q^2 = 25m^2$ $\Rightarrow q^2 = 5m^2$ $q^2\ is\ a\ multiple\ of\ 5$ $\Rightarrow q\ is\ a\ multiple\ of\ 5$ Thus, p, q have a common factor 5. This contradicts our assumption that they are co-primes. Therefore, $\frac{p}{q}$ is not a rational number **Hence, $\sqrt{5}$ is an irrational number.**	½ ½ ½ ½ ½ ½

27	1) Let f(x) = 3x2+ 8x + (2k + 1) and α and β be its zeroes Here a = 3, b = 8 and c = 2k + 1 Given, α = 7β -(i) Sum of roots, α + β = -b/a 7β + β = -8/3 [Using (i)] 8β = -8/3 β = -1/3 Putting β = -1/3 in (i), we have α = 7*-1/3 = -7/3 So, the zeroes are α = -7/3 and β = -1/3 Now, Product of roots = -1/3*-7/3 c/a = 7/9 (2k + 1)/3 = 7/9 2k + 1 = 7/3 2k = 4/3 k = 2/3 So, value of k = 2/3	½ ½ ½ ½ 1

28(i)	On comparing the given equation with $ax^2+bx+c=0$, we get, $a=2,\ b=k$ and $c=3$ As we know, Discriminant : $D=b^2-4ac$ $=k^2-4(2)(3)$ $=k^2-24$ For equal roots, Discriminant $D=0$ $\Rightarrow k^2-24=0$ $\Rightarrow \quad k^2=24$ $\Rightarrow \quad k=\pm\sqrt{24}$ $=\pm 2\sqrt{6}$ **Hence, the value of k is $\pm 2\sqrt{6}$.** (ii) The given quadratic equation is k x (x - 2) + 6 = 0. This equation can be rewritten as $kx^2 - 2kx + 6 = 0$. For equal roots, it discriminate, D = 0. $b^2 - 4ac = 0$, where a = k, b = -2k and c = 6 $4k^2 - 24k = 0$ 4k (k - 6) = 0 K = 0 or k = 6 But k cannot be 0, so the value of k is 6.	½ ½ ½ ½ ½ ½
29	$\frac{1}{\cot A(1-\cot A)}-\frac{\cot^2 A}{(1-\cot A)}=\frac{1-\cot^3 A}{\cot A(1-\cot A)}$ $=\frac{\operatorname{cosec}^2 A+\cot A}{\cot A}$ $= 1 + \sec A \operatorname{cosec} A$	1 1 1

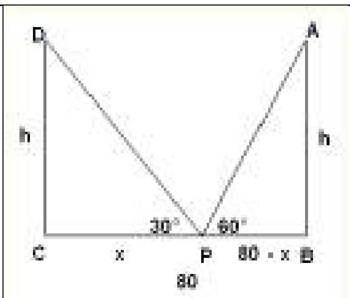
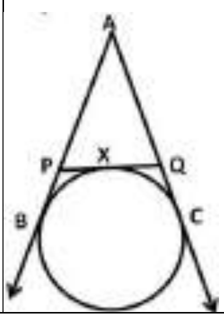
30	For correct diagram, given and proof **(or)** (i)  In ΔAEP and ΔCDP, ∠AEP = ∠CDP (Each 90°) ∠APE = ∠CPD (Vertically opposite angles) Hence, by using AA similarity criterion, ΔAEP ~ ΔCDP (ii)  In ΔABD and ΔCBE, ∠ADB = ∠CEB (Each 90°) ∠ABD = ∠CBE (Common) Hence, by using AA similarity criterion, ΔABD ~ ΔCBE	3 1 1 1

	(iii)  In ΔAEP and ΔADB, ∠AEP = ∠ADB (Each 90°) ∠PAE = ∠DAB (Common) Hence, by using AA similarity criterion, ΔAEP ~ ΔADB	
31	We know that in 1 hour (i.e., 60 minutes), the minute hand rotates360° In 5 minutes, minute hand will rotate = $\frac{360}{60}$. 5 = 30° = $\frac{360°}{60} \times 5 = 30°$ Therefore, the area swept by the minute hand in 5 minutes will be the area of a sector of 30° in a circle of 14 cm radius. Area of sector of angle θ = $\frac{\theta}{360°}$. π. r^2 Area of sector of 30° = $\frac{30°}{360°} \frac{22}{7}$. 14 .14 → = $\frac{22}{12}$. 2 .14 = $\frac{(11).(14)}{3}$ = $\frac{154}{3}$ cm^2 = 51.33 cm^2 Therefore, the area swept by the minute hand in 5 minutes is 51.33 cm^2 **(OR)**	½ ½ ½ ½ ½ ½

	There are 8 equally spaced ribs in an umbrella, so the umbrella is assumed to be a flat circle. ∴ The angle between 2 consecutive ribs (θ) = 360°/8 = 45° The radius of the flat circle (r) is given as 45 cm. The area between 2 consecutive ribs of the umbrella = Area of a sector with an angle of 45° = $\theta/360° \times \pi r^2$ = 45°/360° × 22/7 × 45 cm × 45 cm = 1/8 × 22/7 × 45 cm × 45 cm = 22275/28 cm^2 = 795.535 cm^2	½ ½ 1 ½ ½
SECTION D		
Section D consists of 4 questions of 5 mark each.		
32	Let numerator be = x Let denominator be = y so Fraction is = x / y If two is added to both numerator and denominator x + 2 / y + 2 = 9 / 11 11 (x + 2) = 9 (y + 2) 11x + 22 = 9y + 18 11x - 9y + 4 = 0 ...... (1) If 3 is added both numerator and denominator	½ 1

	$x + 3 / y + 3 = 5 / 6$ $6 (x + 3) = 5 (y + 3)$ $6x + 18 = 5y + 15$ $6x - 5y + 3 = 0$ .... (2) EQUATION = $11x - 9y + 4 = 0$ ..... (1) $6x - 5y + 3 = 0$ ...... (2) from equation (1) and equation (2) we get $x = 7$ put $x = 7$ in equation (2) $6 (7) - 5y + 3 = 0$ $45 - 5y = 0$ $y = 9$ therefore, Numerator = $x = 7$ Denominator = $y = 9$ Hence, fraction is = $7 / 9$ **(or)** Let us assume the uniform speed of the train to be x km/h and the time taken to travel the given distance be t hours. Then distance can be calculated as follows: Distance = speed × time = xt Thus, the distance is xt According to the question, **Condition 1:** When the train would have been 10 km/h faster, it would have taken 2 hours less than the scheduled time. $(x + 10)(t - 2) = xt$ $xt - 2x + 10t - 20 = xt$ $- 2x + 10t = 20$ ....(1) **Condition 2:** When the train would have been slower by 10 km/h, it would have taken 3 hours more than the scheduled time. $(x - 10)(t + 3) = xt$ $xt + 3x - 10t - 30 = xt$	1 1 ½ 1 ½ 1

	3x -10t = 30 ....(2) Adding equations (1) and (2), we obtain - 2x + 10t + 3x -10t = 20 + 30 x = 50 Substituting x = 50 in equation (1), we obtain - 2 × 50 + 10t = 20 - 100 + 10t = 20 10t = 120 t = 120/10 t = 12 Therefore, distance = xt = 50 × 12 = 600 Hence, the distance covered by the train is 600 km.	1 1 1 ½

33	 **Let AB and CD be the two poles of equal height and their heights be h m. BC be the 80 m wide road. P be any point on the road.** **Let CP be x m, therefore BP = (80 – x) .** **Also, ∠APB = 60° and ∠DPC = 30°** **In right angled triangle DCP,** $\tan 30° = \frac{CD}{CP}$ $\Rightarrow \frac{h}{x} = \frac{1}{\sqrt{3}}$ $\Rightarrow h = \frac{x}{\sqrt{3}}$ ––––––––––––(1) **In right angled triangle ABP,** $\tan 60° = \frac{AB}{AP}$ $\Rightarrow \frac{h}{(80-x)} = \sqrt{3}$ $\Rightarrow h = \sqrt{3}(80-x)$ $\Rightarrow \frac{x}{\sqrt{3}} = \sqrt{3}(80-x)$ $\Rightarrow x = 3(80-x)$ $\Rightarrow x = 240-3x$ $\Rightarrow x + 3x = 240$ $\Rightarrow 4x = 240$ $\Rightarrow x = 60$ **Height of the pole,** $h = \frac{x}{\sqrt{3}} = \frac{60}{\sqrt{3}} = 20\sqrt{3}$. **Thus, position of the point P is 60 m from C and height of each pole is** $20\sqrt{3}$ **m.**	½ ½ 1 1 1 1
34	For correct proof of the theorem  	2

	By looking at the figure, we can rewrite the above as follows, Let the Perimeter of ΔAPQ be P. So P= AP + AQ + PX + XQ From the property of tangents we know that when two tangents are drawn to a circle from the same external point, the length of the two tangents will be equal. Therefore we have, PX =PB XQ =QC Replacing these in the above equation we have, P =AP + AQ + PB + QC From the figure we can see that, AP + PB = AB AQ + QC = AC Therefore, we have, P= AB + AC It is given that AB = 5 cm. Again from the same property of tangents we know that that when two tangents are drawn to a circle from the same external point, the length of the two tangents will be equal. Therefore we have, AB = AC Therefore, AC = 5 cm Hence, P = 5 + 5=10 Thus the perimeter of triangle APQ is 10 cm.	½ ½ ½ ½ ½ ½

35

Age	No. of people (f)	$x_i = \frac{\text{lower limit + upper limit}}{2}$	$x_i f_i$
0-20	15	10	150
20-40	f_1	30	$30f_1$
40-60	21	50	1050
60-80	f_2	70	$70f_2$
80-100	17	90	1530

1

1

$\Sigma f_i = 53 + f_1 + f_2$

$\Sigma f_i . x_i = 2730 + 30f_1 + 70f_2$

Given:- $\Sigma f_i = 100$

$\Rightarrow 53 + f_1 + f_2 = 100$ 1

$\Rightarrow f_1 + f_2 = 100 - 53$

$\Rightarrow f_1 + f_2 = 47 \longrightarrow$ eq. (i)

Given:- Mean $= \frac{\Sigma x_i . f_i}{\Sigma f_i} = 53$ 1

$\Rightarrow \frac{2730 + f_1 + f_2}{100} = 53$

$\Rightarrow 273 + f_1 + f_2 = 530$

$f_1 + f_2 = 257 \longrightarrow$ eq. (ii)

from eq. (i) & (ii), we get

$f_1 = 18, f_2 = 29$ 1

$\Rightarrow f_1 = 18, f_2 = 29$

(or)

Class interval	No. of bowlers f_i	Class mark x_i	$f_i x_i$
20 – 60	7	40	280
60 – 100	5	80	400
100 – 140	16	120	1920
140 – 180	12	160	1920
180 – 220	2	200	400
220 – 260	3	240	720
Total	$\sum f_i = 45$		$\sum f_i x_i = 5640$

½

½

$\bar{x} = \frac{\sum f_i x_i}{\sum f_i} = \frac{5640}{45} = 125.33$ 1

	Number of wickets | Number of bowlers | Cumulative Frequency	

Number of wickets	Number of bowlers	Cumulative Frequency
20 – 60	7	7
60 – 100	5	12
100 – 140	16	28
140 – 180	12	40
180 – 220	2	42
220 – 260	3	45

1

$n = 45$

$\Rightarrow \frac{n}{2} = \frac{45}{2} = 22.5$

Median class $= 100 - 140$

$$\text{Median} = l + \frac{\left(\frac{n}{2} - cf\right)}{f} \times h$$

$l = 100,\ \frac{n}{2} = 22.5,\ cf = 12,\ f = 16,\ h = 40$

$$\text{Median} = 100 + \frac{22.5 - 12}{16} \times 40$$
$$= 100 + 26.25$$
$$= 126.25$$

2

SECTION – E : CASE STUDY BASED QUESTIONS.

Section E consists of 3 questions of 4 mark each.

36	(i)	Sum of common difference = 3 + (-3) =0	1
	(ii)	34^{th} term of A.P. of Roshan = 88	1
	(iii)	S_{10} = 85 (or) 33^{rd} terms will have the same value	2
37	(i)	100m	1
	(ii)	40m	1
	(iii)	60 m (or) 8m	2
38	(i)	$6\sqrt{2}$ cm	1
	(ii)	343 cm^3	1
	(iii)	308 cm^2 (or) h = 3 cm	2