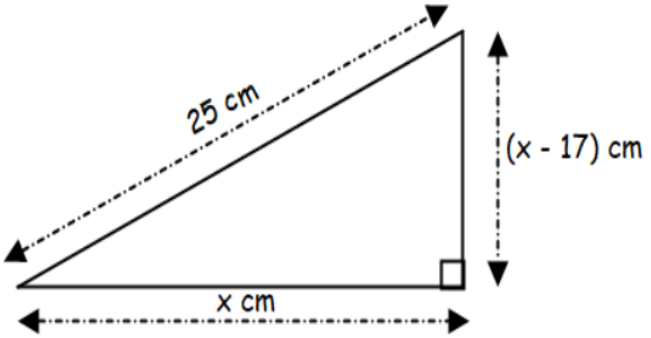
Pre-Board Examination (2025-26) **SET- 1**
Class- X
Subject: Mathematics Basic (241)
Marking Scheme

	Section A	
1.	(D) 4	1
2.	(C) $x^2 - x - 12$	1
3.	(D) 0, 8	1
4.	(B) an AP with d = 4	1
5.	(B) 3	1
6.	(A) (2, 2)	1
7.	(B) 3	1
8.	(A) $\frac{4}{3}$	1
9.	(D) $\frac{1}{13}$	1
10.	(A) 2	1
11.	(B) 45°	1
12.	(D) 110°	1
13.	(C) 3 cm	1
14.	(A) $\frac{\pi r^2\theta}{360}$	1
15.	(A) a cone and a cylinder	1
16.	(B) 2r cm	1
17.	(B) median	1
18.	(B)315	1
19.	A) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)	1
20.	D) Assertion (A) is false but reason (R) is true.	1
	Section B	
	Section B consists of 5 questions of 2 marks each.	
21.	(A) It can be observed that, 2×5×7×11+11×13=11 × (70+13) = 11 x 83 which is the product of two factors other than 1. Therefore, it is a composite number. OR	2
	(B) The smallest number which is divisible by any two numbers is their LCM. So, Number which is divisible by both 306 and 657 = LCM (306, 657) Since, 306 = $2 \times 3^2 \times 17$ and 657 = $3^2 \times 73$ LCM (306, 657) = $2 \times 3^2 \times 17 \times 73 = 22338$	1 1
22.	Let P(– 1, 6) divides joining of A(– 3, 10) and B(6, – 8) in the ratio $m_1:m_2$ Then, we know $-1 = \frac{(m1\ X\ 6)+(m2\ X-3)}{m1+m2}$ [since $x = \frac{(m1\ X\ x2)+(m2\ X\ x1)}{m1+m2}$ i.e.- $m_1 - m_2 = 6\ m_1 - 3m_2$ i.e. $-m_1 - 6m_1 = m_2 - 3m_2$ i.e. $-7m_1 = -2m_2$ i.e. $m_1 : m_2 = 2:7$ So, the required ratio is 2:7	2
23.	Since P(x, y) is equidistant from the point A(3, 6) and B(– 3, 4),	2

	So, PA = PB i.e. $PA^2 = PB^2$ i.e. $(3 – x)^2 + (6 - y)^2 = (-3 - x)^2 + (4 - y)^2$ i.e. $9 – 6x + x^2 + 36 – 12y + y^2 = 9 + 6x + x^2 + 16 – 8y + y^2$ i.e. $– 6x + 36 – 12y = 6x + 16 – 8y$ i.e. $– 6x + 36 – 12y - 6x - 16 + 8y = 0$ i.e. $-12x -4y + 20 = 0$ i.e. $3x + y - 5 = 0$ This is the required relation between x and y.	
24.	Since $\cos 60^0 = \frac{1}{2}$ and $\cos 30^0 = \frac{\sqrt{3}}{2}$, So, $A + B = 60^0$ …….. (i) And $A – B = 30^0$ …….. (ii) Solving equations (i) and (ii), we get $A = 45^0$ and $B = 15^0$	2
25.	Numbers divisible by 5 are 10,15,20,25,30,35,40,45,50,55,60,65,70,75,80,85,90 Number of Fvaourable outcomes = 17 P(E) = 17/81 (OR) A coin is tossed two times so the possible outcomes are (H,H), (H,T), (T,H), (T,T) = 4 Getting at most one head = (H,T), (T,H), (T,T) so, the probability of getting at most one head = $\frac{3}{4}$	1 + 1
	Section C	
	Section C consists of 6 questions of 3 marks each.	
26.	Proof as given in NCERT textbook example.	3
27.	Find the zeroes of the polynomial$6x^2 + 5\sqrt{3}x – 3$ by factorisation method and verify the relation between the zeroes and the coefficients of the polynomial. Here, $p(x) = 6x^2 + 5\sqrt{3}x – 3$ $= 6x^2 + (6\sqrt{3} – \sqrt{3})x – 3$ $= 6x^2 + 6\sqrt{3}\,x – \sqrt{3}x – 3$ $= 6x (x + \sqrt{3}) - \sqrt{3} (x + \sqrt{3})$ $= (x + \sqrt{3}) (6x - \sqrt{3})$ So, the zeros of the polynomial $6x^2 + 5\sqrt{3}x – 3$ are $-\sqrt{3}$ and $\frac{\sqrt{3}}{6}$ Now, sum of zeros = $-\sqrt{3} + \frac{\sqrt{3}}{6}$ $= -\frac{5\sqrt{3}}{6} = -\frac{Coefficient\ of\ Coefficient\ of\ x}{Coefficient\ of\ Coefficient\ of\ x^2}$ Product of zeros = $-\sqrt{3} \times \frac{\sqrt{3}}{6}$ $= -\frac{3}{6} = -\frac{1}{2} = \frac{Constant\ term}{Coefficient\ of\ Coefficient\ of\ x^2}$	1 + 1 + 1
28.	For Given, To Prove, Construction 1-mark For Correct Proof 2-marks	3

29.	Let the base of a triangle = x cm Then, its altitude = (x - 17) cm Hypotenuse = 25 cm By Pythagoras theorem, we have $x^2 + (x - 17)^2 = 25^2$ i.e. $x^2 + x^2 - 34x + 289 = 625$ i.e. $2x^2 - 34x - 336 = 0$ i.e. $x^2 - 17x - 168 = 0$ i.e. $x^2 - (24-7)x - 24 \times 7 = 0$ i.e. $x^2 - 24x + 7x - 24 \times 7 = 0$ i.e. $x(x - 24) + 7(x - 24) = 0$ i.e. $(x - 24)(x + 7) = 0$ so, $x = 24, -7$ Since x is taken length so, it cannot be negative. Therefore, base of the triangle = 24 cm And, its altitude = x – 17 = 24 – 17 = 7cm  OR Here, we have a = 6, b = -7, c = 2 so, discriminant = $b^2 - 4ac$ $= (-7)^2 - 4 \times 6 \times 2$ $= 49 - 48 = 1 > 0$, hence the equation will have real roots. Now, by Quadratic Formula, we have $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{7 \pm \sqrt{1}}{2 X 6} = \frac{7 \pm 1}{12} = \frac{7+1}{12}, \frac{7-1}{12} = \frac{8}{12}, \frac{6}{12} = \frac{2}{3}, \frac{1}{2}$ Therefore, the required roots are $\frac{2}{3}$ *and* $\frac{1}{2}$.	1 + 1 + 1
30.	We have, LHS = $(\sin A + \operatorname{cosec} A)^2 + (\cos A + \sec A)^2$ $= \sin^2 A + 2\sin A \operatorname{cosec} A + \operatorname{cosec}^2 A + \cos^2 A + 2\cos A \sec A + \sec^2 A$ [using identity $(a + b)^2 = a^2 + 2ab + b^2$ 1 $= (\sin^2 A + \cos^2 A) + 2\sin A \operatorname{cosec} A + \operatorname{cosec}^2 A + 2\cos A \sec A + \sec^2 A$ $= 1 + 2 + \operatorname{cosec}^2 A + 2 + \sec^2 A$ [since $\sin^2 A + \cos^2 A = 1$, $\sin A \operatorname{cosec} A = 1$, $\cos A \sec A = 1$ $= 5 + (1 + \cot^2 A) + (1 + \tan^2 A)$ 1 [since $\operatorname{cosec}^2 A = 1 + \cot^2 A$ and $\sec^2 A = 1 + \tan^2 A$ $= 7 + \tan^2 A + \cot^2 A = RHS$ 1 Hence proved OR We have, LHS = $(\sin \alpha + \cos \alpha)(\tan \alpha + \cot \alpha)$ $= \sin \alpha \times \tan \alpha + \cos \alpha \times \tan \alpha + \sin \alpha \times \cot \alpha + \cos \alpha \times \cot \alpha$ $= \sin \alpha \times \frac{\sin\alpha}{\cos\alpha} + \cos \alpha \times \frac{\sin\alpha}{\cos\alpha} + \sin \alpha \times \frac{\cos \alpha}{\sin\alpha} + \cos \alpha \times \frac{\cos \alpha}{\sin\alpha}$ [since $\tan A = \frac{\sin A}{\cos A}$ and $\cot A = \frac{\cos A}{\sin A}$ 1 $= \frac{\sin^3\alpha + \sin^2\alpha \cos\alpha + \sin\alpha \cos^2\alpha + \cos^3\alpha}{\sin\alpha \cos\alpha}$ $= \frac{(\sin^3\alpha + \cos^3\alpha) + (\sin^2\alpha \cos\alpha + \sin\alpha \cos^2\alpha)}{\sin\alpha \cos\alpha}$ $= \frac{(\sin\alpha + \cos\alpha)(\sin^2\alpha + \cos^2\alpha - \sin\alpha\cos\alpha) + (\sin\alpha \cos\alpha)(\sin\alpha + \cos\alpha)}{\sin\alpha \cos\alpha}$ [using identity, $a^3 + b^3 = (a + b)(a^2 + b^2 - ab)$ 1 $= \frac{(\sin\alpha + \cos\alpha)[\sin^2\alpha + \cos^2\alpha - \sin\alpha\cos\alpha + \sin\alpha\cos\alpha]}{\sin\alpha \cos\alpha}$ $= \frac{(\sin\alpha + \cos\alpha)[1 - 0]}{\sin\alpha \cos\alpha}$	3

[since, $\sin^2 A + \cos^2 A = 1$

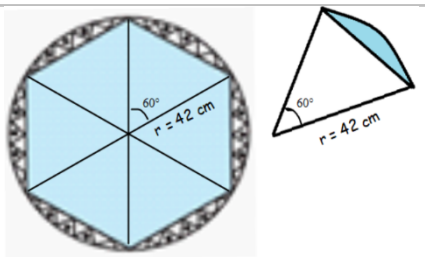
$= \frac{(\sin\alpha)}{\sin\alpha \cos\alpha} + \frac{(\cos\alpha)}{\sin\alpha \cos\alpha}$

$= \frac{1}{\cos\alpha} + \frac{1}{\sin\alpha}$

$= \sec\alpha + \operatorname{cosec}\alpha = RHS \quad [\frac{1}{\cos A} = secA, \ \frac{1}{\sin A} = cosecA$ 1

Hence proved

31. Here, we are



Area of the design

= 6 X Area of a segment of the circle

[since designed is made on six segments

$= 6 \text{ X } [\frac{\theta}{360}\pi r^2 - \frac{1}{2} r^2 \sin\theta]$

[since, Area of segment = $\frac{\theta}{360}\pi r^2 - \frac{1}{2} r^2 \sin\theta$

$= 6 \text{ X } r^2 [\frac{60°}{360}\pi - \frac{1}{2} \sin 60°]$

[a segment is subtending an angle 60° at the centre

$= 6 \text{ X } 42 \text{ X } 42 \ (\frac{1}{6} X \frac{22}{7} - \frac{1}{2} X \frac{\sqrt{3}}{2})$

$= \frac{6 X 42 X 42}{84}(44 - 21\sqrt{3})$

$= 126 (44 - 21 \text{ X } 1.7)$

$= 126 (44 - 21 \text{ X } 1.7)$

$= 126 (44 - 35.7)$

$= 126 \text{ X } 8.3$

$= 1045.8 \text{ cm}^2$

Now, cost of making the design = Area of design X cost per 100cm^2

$= 1045.8 \text{ X } \frac{20}{100}$

$= 209.16$

Therefore, the cost of making the designs at the rate of ₹20 per $100\text{cm}^2$is ₹209.16.

1 + 1 + 1

Section D

Section D consists of 4 questions of 5 marks each.

32. From first eqn., we have

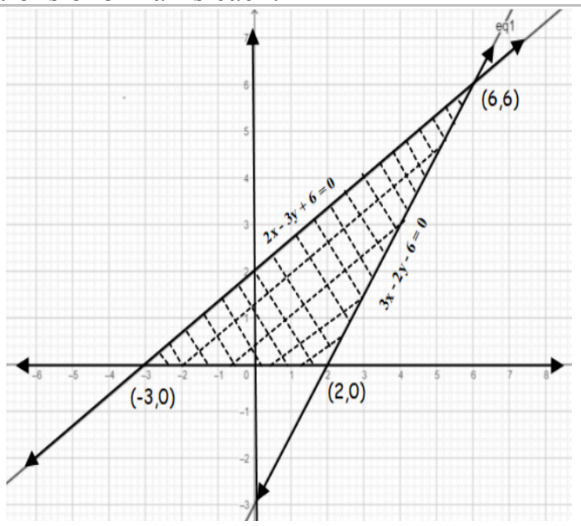
x	0	2
y	-3	0

$y = \frac{3x-6}{2}$,

From second eqn., we have

x	0	3
y	2	4

$y = \frac{2x+6}{3}$,



From the graph, x = 6, y = 6 is the solution of given equations.

Now, area of $\Delta = \frac{1}{2}$ b X h

$= \frac{1}{2} \text{ X } 5 \text{ X } 6$

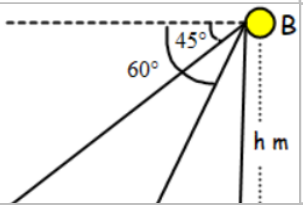
= 15 sq units

1 + 1 + 2 + 1

33. Let B is a balloon h m vertically above a straight road from where the angles of depression of two cars G and C,100 m apart at an instant are found to be 45° and 60°respectively.

Let CA = x m.

From rt ΔBAC, we have



1 + 2 + 2

$\frac{CA}{BA}$ = cot60° [$since\ \frac{base}{perpendicular}$ = cot θ

i.e. x = h X $\frac{1}{\sqrt{3}}$ ……(i) [$since\ cot60° = \frac{1}{\sqrt{3}}$

Also from rt ΔBAG, we have

$\frac{GA}{BA}$ = cot45°

i.e. 100 + x = h X 1 [$since\ cot45° = 1$

i.e. 100 + h X $\frac{1}{\sqrt{3}}$ = h [From eqn. (i)

i.e. $100\sqrt{3}$ + h = h$\sqrt{3}$

i.e. h = $\frac{100}{\sqrt{3}-1} = \frac{100}{\sqrt{3}-1}$ X $\frac{\sqrt{3}+1}{\sqrt{3}+1}$ [Rationalising denominator

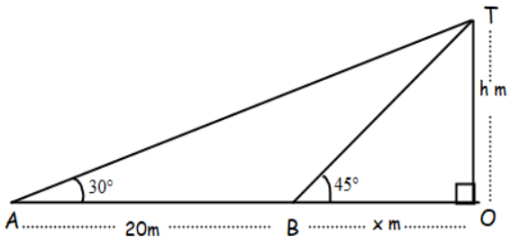
= $\frac{100(\sqrt{3}+1)}{3-1}$

= $50(\sqrt{3} + 1)$m

So, the height of the balloon is $50(\sqrt{3} + 1)$m.

OR

Let the angle of elevation of the top of a tower T having height h m from certain point A is 30°. If the observer moves 20 metres towards the tower at point B, the angle of elevation of the top increases by 15° i.e. 30°+15°=45°. Let BO=x m.



From rt ΔTOB, we have

$\frac{BO}{TO}$ = cot45° [$since\ \frac{base}{perpendicular}$ = cot θ

i.e. x = h X 1 ……(i) [$since\ cot45° = 1$

Also from rt ΔTOA, we have

$\frac{AO}{TO}$ = cot30°

i.e. 20+ x = h X $\sqrt{3}$[$since\ cot30° = \sqrt{3}$

i.e. 20+ h = $\sqrt{3}$ h[From eqn. (i)

i.e. $\sqrt{3}$ h – h = 20

i.e. $h(\sqrt{3} - 1) = 20$

i.e. h = $\frac{20}{\sqrt{3}-1}$

= $\frac{20}{\sqrt{3}-1}$ X $\frac{\sqrt{3}+1}{\sqrt{3}+1}$ [Rationalising denominator

= $\frac{20(\sqrt{3}+1)}{3-1}$

= $10(\sqrt{3} + 1)$ m

So, the height of the tower is $10(\sqrt{3} + 1)$m.

34.	In ΔAOP and ΔAOC, $AP = AC$ [Tangents from the point] $OP = OC$ [Radii of the same circle] $OA = OA$ [Common] $\therefore \Delta AOP \cong \Delta AOC$ [By SSS congruence] $\Rightarrow \angle PAO = \angle CAO$ [CPCT] $\Rightarrow \angle PAC = 2\angle PAO = 2\angle CAO$ $\Rightarrow \angle PAC = 2\angle OAC$ ...(i) Similarly, $\angle QBC = 2\angle OBC$ ...(ii) Adding equations (i) and (ii), we get: $\angle PAC + \angle QBC = 2(\angle OAC + \angle OBC)$ $\Rightarrow 180^\circ = 2(\angle OAC + \angle OBC)$ $\Rightarrow \angle OAC + \angle OBC = 90^\circ$ Then, in triangle AOB, we have $\angle AOB + \angle OAC + \angle OBC = 180^\circ$ $\Rightarrow \angle AOB + 90^\circ = 180^\circ$ $\Rightarrow \angle AOB = 90^\circ$. Hence, **proved**.	1 + 2 + 2
35.		1 + 1 + 2 + 1

Class interval	**f**	**cf**
0-10	5	5
10-20	x	5 + x
20-30	20	25 + x
30-40	15	40 + x
40-50	y	40 + x + y
50-60	5	**45 + x + y**
Total	**60**	

From the table, we have

$45 + x + y = 60$

i.e. $x + y = 15$ ….....(i)

If the median of the distribution given below is 28.5, then the median class is 20-30.

Hence, $l = 20$

$h = 10$

$cf = 5 + x$

$f = 20$

$n/2 = 30$

We know,

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

i.e. $28.5 = 20 + [\frac{30-(5+x)}{20}] \text{ X } 10$

i.e. $8.5 \text{ X } 2 = 25 - x$

i.e. $x = 25 - 17 = 8$

Substituting x = 8 in eqn. (i), we get

$8 + y = 15$

i.e. $y = 7$

Therefore, the value of x is 8 and y is 7.

OR

Here, $h = 3$.

Class interval	Frequency (f_i)	Cumulative frequency (cf)	Class marks (x_i)	$u_i = \frac{x_i - a}{h}$	$f_i u_i$
1 – 4	6	6	2.5	–2	–12
4 – 7	30(f_1)	36(c)	5.5	–1	–30
7 – 10	40(f_m)	76	8.5 = a	0	0
10 – 13	16(f_2)	92	11.5	1	16
13 – 16	4	96	14.5	2	8
16 – 19	4	100	17.5	3	12
			$n = 100$		$\Sigma f_i u_i = -6$

$\because \quad n = 100$

$n \quad 100$

Since 40 is the maximum frequency, so the median class is (7 – 10).

Here, $l = 7, f_m = 40, cf = 36$ and $h = 3$.

$$\therefore \textbf{Median} = l + \left(\frac{\frac{n}{2} - cf}{f_m}\right) \times h$$

$$= 7 + \left(\frac{50 - 36}{40}\right) \times 3 = 7 + \frac{14}{40} \times 3$$

$$= 7 + \frac{21}{20} = 7 + \frac{10.5}{10}$$

$$= 7 + 1.05 = \textbf{8.05}$$

$$\textbf{Mean} = a + \frac{\Sigma f_i u_i}{\Sigma f_i} \times h = 8.5 + \frac{(-6)}{100} \times 3$$

$$= 8.5 + \frac{(-18)}{100} = 8.50 - 0.18 = \textbf{8.32}.$$

Now since the maximum number of letters in surnames = 40

$\therefore$ Modal class = 7 – 10

$$\therefore \textbf{Mode} = l + \left(\frac{f_m - f_1}{2f_m - f_1 - f_2}\right) \times h$$

$$= 7 + \left(\frac{40 - 30}{80 - 30 - 16}\right) \times 3$$

$$= 7 + \frac{10}{34} \times 3 = 7 + \frac{30}{34} = 7 + 0.88$$

$$= \textbf{7.88}.$$

Section E

Section E consists of 3 case study based questions of 4 marks each.

36. 4

Given

Pipes are stacked in rows with counts forming an arithmetic sequence that decreases by 1 each row. Bottom row = 20, next = 19, etc. Total pipes = 200.

(i) Number of rows

Let the number of rows be r. Topmost row will have $20 - (r - 1)$ pipes. Sum of the r terms:

$$S = \frac{r(\text{first} + \text{last})}{2} = \frac{r\big(20 + [20 - (r-1)]\big)}{2} = \frac{r(41 - r)}{2}.$$

Set $S = 200$:

$$\frac{r(41 - r)}{2} = 200 \quad \Rightarrow \quad r(41 - r) = 400.$$

Solve the quadratic:

$$r^2 - 41r + 400 = 0 \quad \Rightarrow \quad (r - 16)(r - 25) = 0.$$

Possible roots $r = 16$ or $r = 25$. $r = 25$ would make the top row negative, so take $r = 16$.

Answer (i): 16 rows.

(ii) Pipes in the topmost row

Topmost = $20 - (16 - 1) = 20 - 15 = 5$.

Topmost row: 5 pipes.

They also asked: *Find the number of pipes lying between the top and bottom row.*

If "between" means **excluding** top and bottom rows, then

$$\text{pipes between} = 200 - (20 + 5) = 175.$$

If they meant **number of rows between**, that is $16 - 2 = 14$ rows.

Answer (ii): Topmost = 5 pipes; pipes between top & bottom (excluding them) = 175 (or 14 rows between).

	(iii) A stack of 105 pipes arranged in 6 rows — find bottom row Let bottom row $= b$. Rows go $b, b-1, b-2, b-3, b-4, b-5$. Sum: $$S = \frac{6(b+(b-5))}{2} = 3(2b-5) = 6b-15.$$ Set $6b - 15 = 105$: $$6b = 120 \Rightarrow b = 20.$$ **Answer (iii):** Bottom row has 20 pipes.	
37.	i) Volume of Sphere = $\frac{4}{3}\pi r^3$ 1 ii) Shape the Paridakshinapatha is forming a ring.1 iii) volume of the stupa = volume of hemisphere + volume of the cuboid = $\frac{2}{3}\pi r^3 + lbh$ = $\frac{2}{3} X \frac{22}{7} X 14^3$ + 8m x 6m x 4m = 5749.33 + 192 = 5941.33 m^3 2 OR The cloth require to cover the hemispherical dome = CSA of hemisphere – Area of base of cuboidal top = $2\pi r^2 - lb$ = $2 X \frac{22}{7} X 14^2 - 8 X 6$ = 1232 – 48 = 1184 m^2 2	4
38.	i) Similarity of triangles. 1 ii) 1.6 : 1.2 = 4 : 3 1 iii) Since heights of objects and their shadow at same time form similar triangles so, 4 : 3 = 20 : x i.e. x = $\frac{20 X 3}{4}$ = 15m So, the length of shadow of Alina's house is 15m. 2 OR Since heights of objects and their shadow at same time form similar triangles so, 4 : 3 = h : 54 i.e. h = $\frac{4 X 54}{3}$ = 72m 2	4