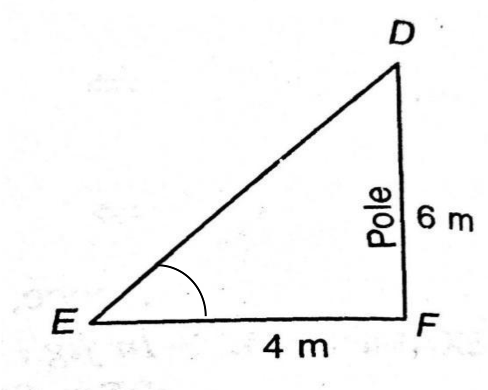
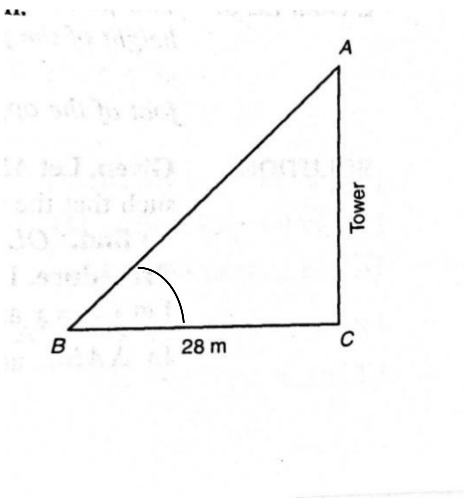
	Marking Scheme Class X, Maths , 2023-24(English Medium)	
Q. no.	**Expected solutions**	**marks**
	Section-A	
1	(c) LCM(p, q)=$a^3 b^2$	1
2	(c) 2+ $\sqrt{9}$	1
3	(b) 2-$\sqrt{3}$	1
4	(d) 15^{th}	1
5	(d) 0,8	1
6	(c) 6	1
7	(b) similar but not congruent	1
8	(b) 70^0	1
9	(c) 50^0	1
10	(b) 0	1
11	tanA= $\frac{3}{4}$	1
12	(c) $\frac{1}{2}$	1
13	(c) 132 cm	1
14	(d) $\frac{p}{720°} \times 2\ \pi R^2$	1
15	(d) 16:9	1
16	Mode = 3Median – 2Mean (b) 8	1
17	(b) 25	1
18	(c) $\frac{1}{0.1}$	1
19	(c) Assertion (A) is true but Reason (R) is false.	1

20	(a)Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).	1
Q. no.	**solution**	**marks**
	Section-B	
21	**Solve the following pair of linear equations:** $\boldsymbol{x - y = 3}$ $\boldsymbol{\frac{x}{3} + \frac{y}{2} = 6}$ **Solution**: $x - y = 3 \Rightarrow x - y = 3$ ....(1) $\frac{x}{3} + \frac{y}{2} = 6 \Rightarrow$ 2x + 3y = 36................(2) --- Eq (2) - 2× Eq (1) ⇒ 2x + 3y – (2x – 2y) --- ⇒ 5y = 30 ⇒ y = 6 -- Putting value of y= 6 in eq (1) , we get x = 9	½ ½ ½ ½
22	**A vertical pole of length 6 m casts a shadow 4 m long on the ground and at the same time a tower casts a shadow 28 m long. Find the height of the tower.** **Solution:** 	

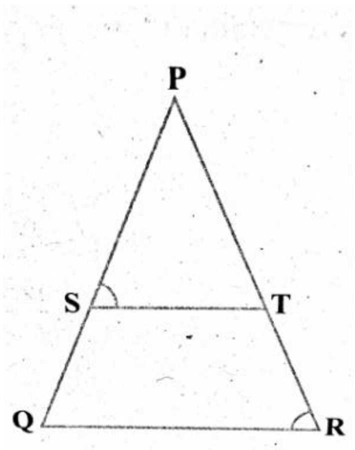
Let x be the height of the Tower ½

Two Triangles are similar as at the same time $\angle E = \angle B$ ½

$\therefore \frac{6}{4} = \frac{x}{28}$ ½

Or x = 42 m ½

OR



In the fig., $\frac{\mathbf{PS}}{\mathbf{SQ}} = \frac{\mathbf{PT}}{\mathbf{TR}}$ $\boldsymbol{and\ \angle PST = \angle PRQ}$. Prove that PQR is an isosceles triangle.

Solution:

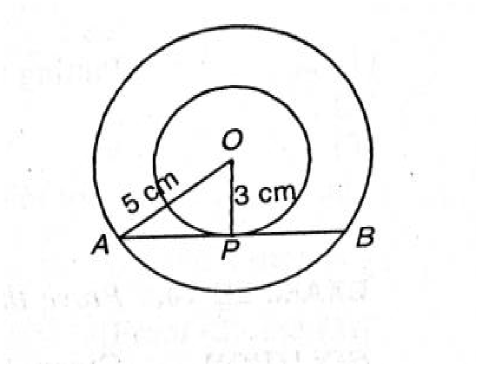
$\frac{PS}{SQ} = \frac{PT}{TR}$ (Given)

So, ST ∥ QR (Converse of BPT) ½

$\therefore \angle PST = \angle PQR$ ....(1) (Corresponding Angles) ½

Also $\angle PST = \angle PRQ$ ....(2) (Given)

$\therefore$ $\angle PRQ = \angle PQR$ [From (1) and (2)] ½

	So PQ = PR (sides opposite to equal angles) Hence PQR is an isosceles Triangle	½
23	**Two concentric circles are of radii 5 cm and 3 cm. Find the length of the chord of the larger circle which touches the smaller circle.** **Solution:**  OA=5cm,OP=3cm -- OT ⊥ AB -- Therefore AP =$\sqrt{5^2 - 3^2}$ = $\sqrt{16}$ = 4 -- ∴ AB= 2AP	1/2 1/2 1/2 1/2
24	**Evaluate the following:** $$\frac{\mathbf{5\cos^2 60^\circ + 4\sec^2 30^\circ - \tan^2 45^\circ}}{\mathbf{\sin^2 30^\circ + \cos^2 30^\circ}}$$ **Solution:** $$\frac{5\cos^2 60^\circ + 4\sec^2 30^\circ - \tan^2 45^\circ}{\sin^2 30^\circ + \cos^2 30^\circ}$$	

	$= \dfrac{5(\frac{1}{2})^2 + 4(\frac{2}{\sqrt{3}})^2 - (1)^2}{(\frac{1}{2})^2 + (\frac{\sqrt{3}}{2})^2}$	1

	$= \dfrac{\frac{5}{4} + \frac{16}{3} - 1}{\frac{1}{4} + \frac{3}{4}}$	½

	$= \dfrac{67}{12}$	½
25.	**A chord of a circle of radius 15 cm subtends an angle of 60^0 at the centre. Find the areas of the corresponding minor and major segments of the circle.** **(Use $\pi = 3.14$ *and* $\sqrt{3}$ =1.73)** **Solution:**	
	Area of minor segment= $\frac{\theta}{360°} \times \pi r^2$ - $\frac{1}{2} \times r^2 \sin\theta$	½

	$= \frac{60}{360} \times 3.14 \times (15)^2$ - $\frac{1}{2} \times (15)^2 \sin 60°$ = 3.14× 225× 6 - $\frac{1}{2} \times 225 \times \frac{\sqrt{3}}{2}$	½

	=117.75 - 97.312 = 20.4375 cm^2	½

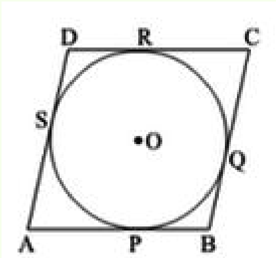
	Area of major segment = Area of circle – Area of minor segment = 3.14 x $(15)^2$ – 20.4375	

	$= 706.5 - 20.4375$ $= 686.0625\ cm^2$ **OR** **Find the area of a quadrant of a circle whose circumference is 22 cm**. **Solution:** Cicumference of circle = $2\pi r = 22$ -- $\Rightarrow r = \frac{7}{2}$ cm -- $\therefore$ Area of quadrant= $\frac{1}{4} \times \pi r^2$ -- $= \frac{1}{4} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2}$ $= \frac{77}{8}\ cm^2$	½ ½ ½ ½ ½
	Section-C	
26.	**Prove that $\sqrt{3}$ is irrational**. **Solution:** Let, if possible, $\sqrt{3}$ be a rational no. -- $\therefore \sqrt{3} = \frac{p}{q}$, where p and q are co-prime integers and $q \neq 0$. -- $\Rightarrow 3 = \frac{p^2}{q^2}$ $\Rightarrow p^2 = 3q^2$ ....(i) $\Rightarrow$ 3 divides $p^2 \Rightarrow$ 3 divides p also.	½ ½ ½

	-- Let $p = 3m$,................................(ii) where m is any integer. $\Rightarrow p^2 = 9m^2$................................(iii) -- From (i) and (iii) $3q^2 = 9m^2$ $\Rightarrow q^2 = 3m^2$ $\Rightarrow$ 3 divides $q^2 \Rightarrow$ 3 divides q also. $\Rightarrow q = 3n$.....................................(iv) -- From (i) and (iv) , p and q have 3 as common factor. $\therefore$ p and q are not co-prime. Hence our supposition is wrong. $\therefore \sqrt{3}$ is an irrational number.	½ ½ ½
27	**Find the zeroes of the quadratic polynomial $6x^2$ -3 -7x and verify the relationship between the zeroes and the coefficients.** **Solution:** Given polynomial is $6x^2 - 7x - 3 = (2x - 3)(3x + 1)$ -- For zeroes , $2x - 3 = 0$, $3x + 1 = 0$ $\Rightarrow x = \frac{3}{2}$, $x = -\frac{1}{3}$ $\Rightarrow$ Zeroes of polynomial are $\frac{3}{2}$, $-\frac{1}{3}$ -- Sum of zeroes = $\frac{3}{2} - \frac{1}{3} = \frac{7}{6} = -\frac{(-7)}{6} = \frac{-\,coefficient\ of\ x}{coefficient\ of\ x^2}$ --	1 1 ½

	Product of zeroes = $\frac{3}{2} \times \frac{-1}{3} = -\frac{1}{2} = -\frac{3}{6} = \frac{constant\ term}{coefficient\ of\ x^2}$	½
28	**Meena went to a bank to withdraw Rs 2000. She asked the cashier to give her Rs 50 and Rs 100 notes only. Meena got 25 notes in all. Find how many note Rs 50 and Rs 100 she received.** **Solution:** -- Let the number of Rs. 50 and Rs. 100 notes be 'x' and 'y' respectively. -- ⇒ 50x + 100y = 2000 ⇒ x+ 2y = 40 …… (1) -- Also, Meena got 25 notes in all. ⇒ x + y = 25 ……(2) -- (1) – (2) ⇒ x+2y–(x+y) =40–25 ⇒ x+2y–x–y=40–25 -- ⇒ y = 15 -- Putting y = 15 in eq (1) , we get x = 10 OR **Five years hence, the age of jacob will be three times that of his son. Five years ago, Jacob's age was seven times that of his son. What are their present ages?**	 ½ ½ ½ ½ ½ ½

	Solution : Let Jacob's age be x years and his son's age be y years. --- Five years hence(later), $x+5=3(y+5)$ $\Rightarrow x+5=3y+15$ $\Rightarrow x-3y=10$.......(1) --- Also, five years ago(before), x-5 = 7 (y –)5 $\Rightarrow x-5=7y-35$ $\Rightarrow x-7y=-30$........(2) --- Subtracting equation (2) from (1), $x-3y=10$ $\underline{-x+7y=30}$ ($\because$ eq.(2) changes its sign) $\underline{4y=40}$ $\because 4y=40$ $\therefore y=10$ --- Put y = 10 in eq. (1), $x-3(10)=10 \Rightarrow x-30=10$ $\Rightarrow x=40$ --- Thus, present age of Jacob=x=40 years and present age of Jacob's son=y=10 years.	½ ½ ½ ½ ½ ½
29	-- **Prove that a parallelogram circumscribing a circle is a rhombus.**	

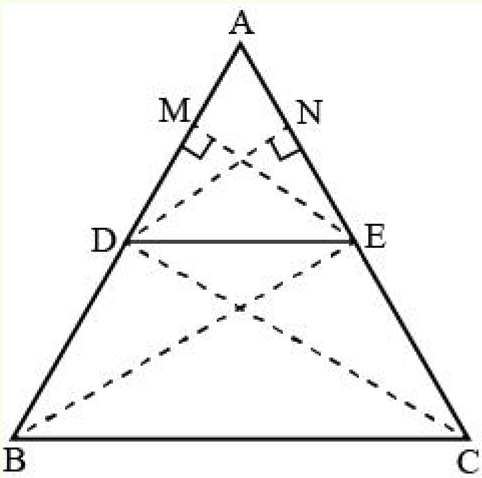
	Solution:  	½
	--- **Given** :- ABCD be a parallelogram circumscribing a circle with centre O. **To Prove** :- ABCD is a rhombus.	½
	--- **Proof**:- We know that the tangents drawn to a circle from an exterior point are equal is length. ∴ AP = AS, BP = BQ, CR = CQ and DR = DS.	½
	--- AP+BP+CR+DR = AS+BQ+CQ+DS (AP+BP) + (CR+DR) = (AS+DS) + (BQ+CQ) ∴ AB+CD=AD+BC	½
	--- or 2AB = 2AD (since AB = DC and AD=BC of parallelogram ABCD)	½
	--- ∴ AB = BC = DC = AD Therefore, ABCD is a rhombus.	½
30	**If sin θ + cos θ = √3, then prove that tan θ + cot θ = 1** **Solution:** sin θ + cos θ = √3 squaring on both sides ⇒ $(\sin\theta + \cos\theta)^2 = 3$	1/2

	$\Rightarrow \quad \sin^2\theta + \cos^2\theta + 2\sin\theta\cos\theta = 3$	1/2
	$\Rightarrow 1 + 2\sin\theta\cos\theta = 3 \qquad (\because\ \sin^2\theta + \cos^2\theta = 1\ )$ $2\sin\theta\cos\theta = 3 - 1$ $2\sin\theta\cos\theta = 2$ Divide both sides by 2	1/2
	$\sin\theta\cos\theta = 1 = \sin^2\theta + \cos^2\theta$	1/2
	$1 = (\sin^2\theta + \cos^2\theta)/\sin\theta\cos\theta$	1/2
	$= \tan\theta + \cot\theta = 1$	1/2
	OR	
	LHS= $1+\dfrac{\cot^2\theta}{1+cosec\theta}$	
	$=1+\dfrac{cosec^2\theta-1}{1+cosec\theta} \qquad [\because\ \cot^2\theta = cosec^2\theta - 1]$	1
	$= 1+\dfrac{(cosec\theta+1)(cosec\theta-1)}{(1+cosec\theta)}$	1

	$= 1 + (\text{cosec}\,\theta\ - 1)$ $= \text{cosec}\,\theta\ = \text{RHS}$ Hence proved	1
31	**All the jacks, queens and kings are removed from a deck of 52 playing cards. The remaining cards are well shuffled and then one card is drawn at random. Giving ace a value 1 similar value for other cards, find the probability that the card has a value. (i) 7 (ii) greater than 7 (iii) less than** **Solution:** In out of 52 playing cards, 4 jacks, 4 queens and 4 kings are removed, then total no. of remaining cards = 52 - 3×4 = 40 (i) no. of favourable outcomes to card value 7= 4 because card value 7 may be of a spade, a diamond, a club or a heart ∴ P(card value7) = $\frac{\text{no.of favourable outcomes to the event}}{\text{Total no.of possible outcomes}} =$ $= \frac{4}{40} = \frac{1}{10}$ --- (ii)Cards having value greater than 7are from 8, 9 or 10⇒	1

	∴ no. of favourable outcomes = 3x4 =12 ∴ P(card having value greater than 7) = $= \frac{12}{40} = \frac{3}{10}$ --- (iii) Cards having value less than 7are from 1,2,3,4,5or 6 ∴ no. of favourable outcomes = 6×4 = 24 ∴ P(card having value less than 7) $= \frac{24}{40} = \frac{3}{5}$	1 1
32	**SECTION-D** **A train travels at a certain average speed for a distance of 63km and then travels a distance of 72km at an average speed of 6 km/h more than its original speed. If it takes 3 hours to complete the total journey, what is its original average speed?** **Solution:** Let original speed of the train be x km/h. Then, time taken to travel 63 km = 63/x hours --- New speed = (x + 6) km/hr Time taken to travel 72 km = 72/(x + 6) hours --- ATQ $\frac{63}{x} + \frac{72}{x+6} = 3$ $\frac{63x + 378 + 72x}{x^2 + 6x} = 3$ $135x + 378 = 3x^2 + 18x$ $3x^2 - 117x - 378 = 0$	1/2 1 1 1

	$x^2 - 39x - 126 = 0$ ---	1
	$(x - 42)(x + 3) = 0$ $x = -3$ or $x = 42$ ---	½
	As the speed cannot be negative, x = 42 Thus, the average speed of the train is 42 km/hr. OR **A motor boat whose speed is 18 km /h in still water takes 1 hour more to go 24Km upstream than to return downstream to the same spot.Find the speed of the stream.** **Solution** Let the speed of the stream be x km/h. ∴ The speed of the boat upstream = (18 – x) km/h And the speed of the boat downstream = (18 + x) km/h ---	$1\frac{1}{2}$
	We know that time = distance/speed ⇒ Time taken to go upstream = $\frac{24}{18-x}$ hours Also, time taken to go downstream = $\frac{24}{18+x}$ hours ---	1
	ATQ $\frac{24}{18-x} - \frac{24}{18+x} = 1$	1

	$\Rightarrow 24\ (18 + x) - 24\ (18 - x) = (18 - x)\ (18 + x)$ $\Rightarrow x^2 + 48x - 324 = 0$ -- $\Rightarrow (x + 54)(x- 6) = 0$ -- $\Rightarrow$ x= 6 or -54 Since x is the speed of the stream, it cannot be negative. $\therefore$ x = 6 gives the speed of the stream as 6 km/h.	½ ½ ½
33	**Prove that if a line is drawn parallel to one side of a triangle intersecting the other two sides in distinct points, then the other two sides are divided in the same ratio.** **Solution:** **Given:** In ΔABC, DE||BC  **To prove:** $\frac{AD}{DB} = \frac{AE}{EC}$ -- **Construction :** Draw EM⊥AB and DN⊥AC. Join B to E and C to D	½ ½ ½ ½

Proof: In ΔADE and ΔBDE

$$\frac{\text{Area of}\Delta \text{ADE}}{\text{Area of }\Delta \text{BDE}} = \frac{\frac{1}{2}\times AD\times EM}{\frac{1}{2}\times DB\times EM} = \frac{AD}{DB}$$ --------------(i) ½

In ΔADE and ΔCDE

$$\frac{\text{Area of}\Delta \text{ADE}}{\text{Area of }\Delta \text{CDE}} = \frac{\frac{1}{2}\times AE\times DN}{\frac{1}{2}\times EC\times DN} = \frac{AE}{EC}$$ -----------------(ii) ½

Since, DE||BC [Given]

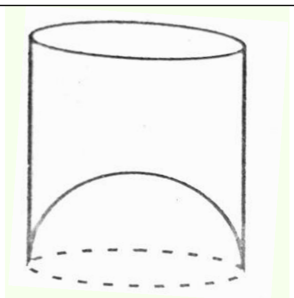
∴ ar(ΔBDE) = ar(ΔCDE) --------------------------------------- (iii) 1

[Δs on the same base and between the same parallel sides are equal in area]

From eq. (i), (ii) and (iii)

: $\frac{AD}{DB} = \frac{AE}{EC}$ Hence proved. 1

34 **A juice seller was serving his customer using glasses as shown in the figure. The inner diameter of the cylindrical glass was 5 cm but bottom of the glass had a hemispherical raised portion which reduced the capacity of the glass . If the height of the glass was 10cm, find the apparent and actual capacity of the glass.**
[Use $\pi = 3.14$]



Solution:

The inner radius of the glass = $\frac{5}{2}$ cm = 2.5 cm ½

Height of the glass = 10 cm

The apparent capacity of the glass = $\pi r^2 h$

$=3.14\times2.5\times2.5\times10\ cm^3=196.25\ cm^3$ $1\frac{1}{2}$

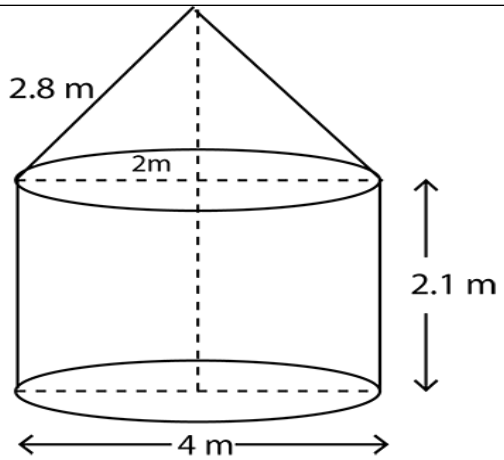
Volume of hemisphere = $\frac{2}{3}\pi r^3=\frac{2}{3}\times3.14\times2.5\times2.5\times2.5\ cm^3=32.71\ cm^3$ $1\frac{1}{2}$

The actual capacity of the glass = apparent capacity of glass - volume of the hemisphere

$=(196.25-32.71)\ cm^3$

$=163.54\ cm^3$ $1\frac{1}{2}$

OR



A tent is in the shape of a cylinder surmounted by a conical top. If the height and diameter of the cylindrical part are 2.1 m and 4 m respectively,and the slant height of the top is 2.8 m, find the area of the canvas used for making the tent. Also, find the cost of canvas of the tent at the rate of Rs 500per m^2.(Note that the base of the tent will not covered with canvas.)

Solution:

Radius of base of cylindrical portion = 2 m,

Height of the cylindrical portion = 2.1 m

slant height of conical top = 2.8 m — 1

Curved surface area of cylindrical portion = 2πrh

=2π×2×2.1

=8.4 π m^2 — 1

Curved surface area of conical portion = πrl

=π×2×2.8

=5.6πm^2 — 1

Total curved surface area= Area of canvas used = 2πrh + πrl

= 8.4π + 5.6π

=14×22/7=44m^2 — 1

	-- Cost of canvas = Rate × Surface area =500×44 = Rs.22000	1

35 The median of the following data is 525.find the values of x and y, if total frequency is 100.

Class Interval वर्ग अंतराल	Frequency बारंबारता
0-100	2
100-200	5
200-300	x
300-400	12
400-500	17
500-600	20
600-700	y
700-800	9
800-900	7
900-1000	4

Solution:

Class Interval *वर्ग अंतराल*	Frequency *बारंबारता*	Cummulative Frequency
0-100	2	2
100-200	5	7
200-300	x	7 + x
300-400	12	19 + x
400-500	17	36 + x
500-600	20	56 + x
600-700	y	56 + x + y
700-800	9	65 + x + y
800-900	7	72 + x + y
900-1000	4	76 + x + y

1

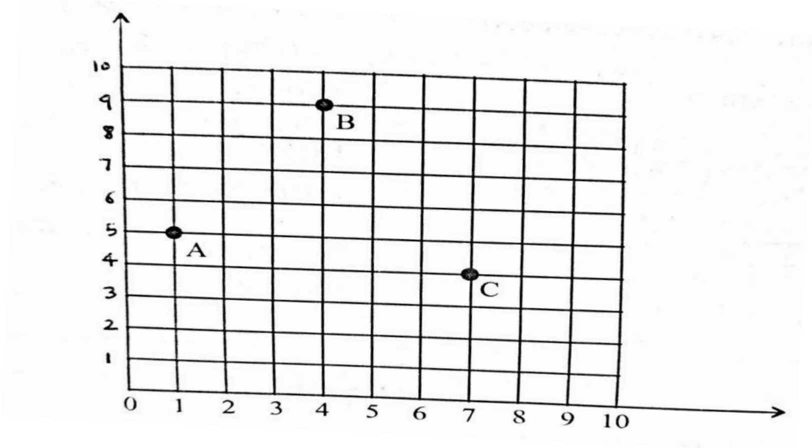
$n = 100 \Rightarrow \frac{n}{2} = 50$

1

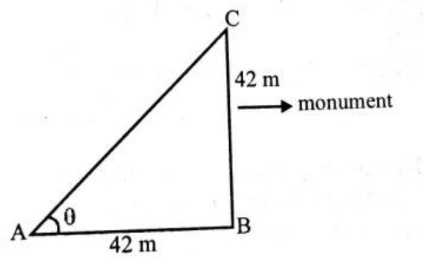
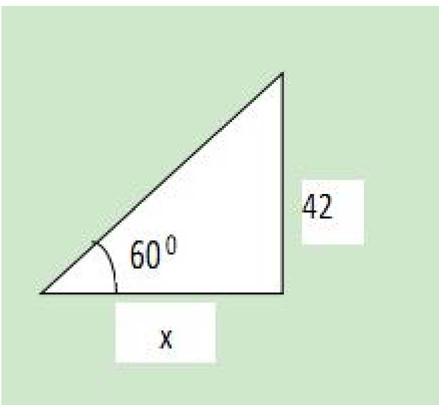
So, 76 + x + y = 100 ⇒ x + y = 24--------------------------(1)

	Median = 525 ∴ Median class = 500 - 600 So, l = 500, f = 20, c f = 36 + x, h = 100 -- Median = $l + \left(\frac{\frac{n}{2} - cf}{f}\right) \times h$ $\Rightarrow 525 = 500 + \left(\frac{50-36-x}{20}\right) \times 100$ -- $\Rightarrow 525 - 500 = (14 - x) \times 5$ $\Rightarrow 25 = 70 - 5x$ $\Rightarrow 5x = 70 - 25 = 45 \Rightarrow x = 9$ -- From (1), we get 9 + y = 24 y = 24 - 9= 15	1 1 ½ ½
	SECTION-E	
36	**Rahul wants to buy a car and plans to take loan from a bank for his car. He repays his total loan of Rs 1,18,000 by paying every month starting with the first instalment of Rs 1000.If he increases the instalment by Rs 100 every month. Based on the above information ,answer the following questions:** **(i) Find the amount paid by him in 30^{th} instalment .** **(ii)Find the amount paid by him in 30 instalments.** **(iii) What amount does he still have to pay after 30^{th} instalment?**	

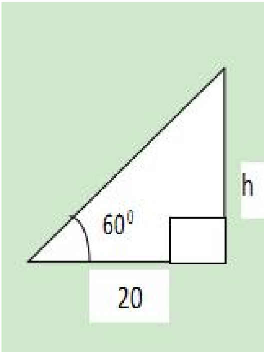
	OR **If total instalments are 40 then amount paid in the last instalment** **SOLUTION** (i) Monthly instalment paid by Rahul are 1000, 1100, 1200, … 30 terms a = 1000, d = 100, an = ?, n = 30 a_{30} = a + (29)d = 1000 + (29) 100 = 3900 So, the amount paid by him in 30th instalment = ₹ 3900. -- (ii)Total amount of all 30 instalments paid = 1000 + 1100 + 1200 + … + 3900 Here, a = 1000, d = 100, n = 30 $\therefore S_n=\frac{n}{2}[2a+(n-1)d] \Rightarrow S_{30}=\frac{30}{2}[2\times1000+(30-1)100]$ =15[2000+2900] =₹73500 -- (iii)So, the loan amount left after 30th instalment = ₹ 118000 – 73500 = = ₹ 44500 Hence, he still has to pay ₹44500 after 30th instalment. OR a_{40} = a+ 39 d	1 1 1 1

	= 1000 + 39(100) -- = 4900 Amount paid in last instalment = ₹ 4900	1 1
37	**Resident welfare Association (RWA)of a society put up three electric poles A,B and C in a society's park. Despite these three poles, some parts of the park are still in dark.So, RWA decides to have one more electric pole D in the park.**  **Based on the above information ,answer the following questions:** **(i) Find the position of the pole C.** **(ii) Find the distance of the pole B from corner O of the park.** **(iii) Find the position of the fourth pole D so that four points A,B,C and D form a parallelogram.** **OR** **Find the distance between poles A and C.** **SOLUTION** (i) Position of point C(7,4) **--**	 1

	(ii) Distance of pole B(4,9) from corner O(0,0) $= \sqrt{(4-0)^2+(9-0)^2} = \sqrt{97}$ units	1
	--- (iii) A(1,5),B(4,9) ,C(7,4) are three vertices of parallelogram ABCD and let D(x,y) be the fourth vertex Mid-point of diagonal AC = Mid-point of BD	1
	--- $(\frac{7+1}{2}, \frac{5+4}{2}) = (\frac{x+4}{2}, \frac{9+y}{2})$ ⇒ x=4 ,y=0 ∴ D(4,0)	1
	--- OR Distance between Pole A and C = $\sqrt{(7-1)^2+(4-5)^2}$	1
	$= \sqrt{36+1} = \sqrt{37}$	1
38.	**A group of students of class X visited India Gate on an educational trip. The teacher and students had interest in history as well. The teacher narrated that India Gate , official name Delhi Memorial, originally called All-India War Memorial, monumental sandstone arch in New Delhi,dedicated to the troops of British India who died in wars fought between 1914 and 1919.The teacher also said that India Gate ,which is located at the eastern end of the Rajpath(formely called the Kingsway),is about 138 feet (42 metres) in height.** **Based on the above information answer the following questions:** **(i)What is the angle of elevation if they are standing at a distance of 42 m**	

	away from the monument? **(ii) They want to see the tower at an angle of 60^0.So, they want to know the distance where they should stand and hence find the distance.** **(iii)If the altitude of the Sun is at 60^0, then find the height of the vertical tower that will cast a shadow of length 20m.** **OR** **The ratio of the length of a rod and its shadow is 1:1. Find the angle of elevation of the Sun .** **SOLUTION:**  (i) $\tan\theta = \frac{42}{42} = 1$ -- $\Rightarrow \theta = 45°$ -- (ii)  $\tan 60° = \frac{42}{x}$ -- $\sqrt{3} = \frac{42}{x} \Rightarrow x = \frac{42}{\sqrt{3}} \Rightarrow x = 14\sqrt{3}$ m	1/2 1/2 ½ ½

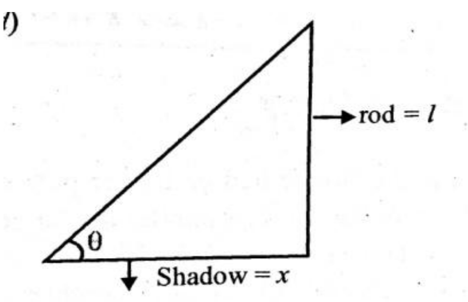
(iii)



$$\frac{h}{20} = \tan 60°$$ 1

$$\Rightarrow h = 20\sqrt{3}\ m$$ 1

OR



$$\tan\theta = \frac{l}{x}$$ 1

$$\Rightarrow \tan\theta = 1 \Rightarrow \theta = 45°$$ 1