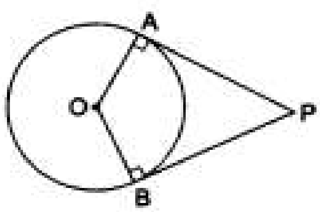
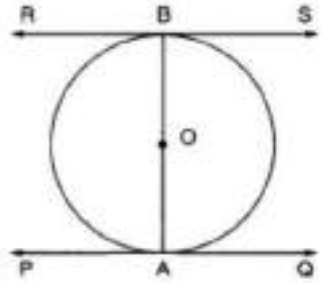
CLASS 10 – BASIC MATHEMATICS
MARKING SCHEME

	Section A	
1	b) 3	**[1]**
2	b) 0	**[1]**
3	c) 11	**[1]**
4	c) - 5, 6	**[1]**
5	b) coincident	**[1]**
6	c) 2, - 5	**[1]**
7	b) $\angle B = \angle D$	**[1]**
8	b) 9 m	**[1]**
9	d) (3, 5)	**[1]**
10	c) rectangle	**[1]**
11	a) $\frac{12}{13}$	**[1]**
12	d) 2	**[1]**
13	a) $\frac{1-\cos\theta}{1+\cos\theta}$	**[1]**
14	b) 24 cm	**[1]**
15	b) 22 cm	**[1]**
16	d) $\frac{4}{3}\pi a^3$	**[1]**
17	a) 91.67 cm^3	**[1]**
18	d) 20	**[1]**
19	d) A is false but R is true.	**[1]**
20	a) Both A and R are true and R is the correct explanation of A.	**[1]**
	Section B	
21	**In an A.P. if the sum of third and seventh term is zero, find its 5^{th} term.** Given, sum of third and seventh term of A.P. is zero.	

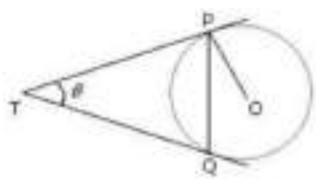
	We know that, n^{th} term of an A.P. is $T_n = a + (n-1)d$ $\therefore T_3 + T_7 = 0$ $\Rightarrow a + 2d + a + 6d = 0$ $\Rightarrow 2a + 8d = 0$ $\Rightarrow a + 4d = 0$ Now, $T_5 = a + (5-1)d$ $= a + 4d$ $= 0$ Hence, 5 $^{\text{th}}$ term of A.P. is zero. **OR** **Which term of the AP 5, 9, 13, 17,...... is 81?** Here we are having $a = 5$ and $d = 9 - 5 = 4$ Let its nth term be 81. Then, $T_n = 81$ $a + (n-1)d = 81$ $5 + (n-1) \times 4 = 81$ $4n = 80$ $n = 20$. Hence 81 is 20 $^{\text{th}}$ term.	½ ½ ½ ½ ½ ½ ½ ½
22	**In a $\triangle ABC$, AD is the bisector of $\angle A$, meeting side BC at D. If AB = 5.6 cm, AC = 6 cm and DC = 3 cm, find BC.** It is given that $AB = 5.6$ cm, $BC = 6$ cm and $DC = 3$ cm In $\triangle ABC$, AD is the bisector of $\angle A$, meeting side BC at D We have to find BC Since AD is $\angle A$ bisector So $\frac{AC}{AB} = \frac{DC}{BD}$ Then, $\frac{6}{5.6} = \frac{3}{BD}$ $\Rightarrow BD = 2.8$ So, $BC = 2.8 + 3$ = 5.8 Hence, $BC = 5.8$ cm	½ ½ ½ ½
23	**Prove the trigonometric identity:** $\boldsymbol{\frac{\tan\theta + \sin\theta}{\tan\theta - \sin\theta} = \frac{\sec\theta + 1}{\sec\theta - 1}}$ L.H.S. $= \frac{\tan\theta + \sin\theta}{\tan\theta - \sin\theta}$	½

	$= \dfrac{\dfrac{\sin\theta}{\cos\theta} + \sin\theta}{\dfrac{\sin\theta}{\cos\theta} - \sin\theta}$ $= \dfrac{\sin\theta\left(\frac{1}{\cos\theta}+1\right)}{\sin\theta\left(\frac{1}{\cos\theta}-1\right)}$ $= \dfrac{\dfrac{1}{\cos\theta}+1}{\dfrac{1}{\cos\theta}-1}$ $= \dfrac{\sec\ \theta+1}{\sec\ \theta-1} = \text{RHS}$	½ ½ ½
24	**PA and PB are tangents to the circle with centre O from an external point P, touching the circle at A and B respectively. Show that the quadrilateral AOBP is cyclic.**  Given: PA and PB are tangents to the circle with centre O from an external point P. To Prove: Quadrilateral AOBP is cyclic. Since tangents to a circle is perpendicular to the radius, $\therefore$ OA $\perp$ AP and OB $\perp$ BP. $\Rightarrow \angle OAP = 90^\circ$ and $\angle OBP = 90^\circ$ $$\Rightarrow \angle OAP + \angle OBP = 90^\circ + 90^\circ = 180^\circ \qquad (1)$$ In quadrilateral OAPB , $\angle OAP + \angle APB + \angle AOB + \angle OBP = 360^\circ$ $\Rightarrow (\angle APB + \angle AOB) + (\angle OAP + \angle OBP) = 360^\circ$ $\Rightarrow \angle APB + \angle AOB + 180^\circ = 360^\circ$[From (1)] $$\Rightarrow \angle APB + \angle AOB = 180^\circ \qquad (2)$$ From (1) and (2), the quadrilateral AOBP is cyclic. **OR** **Show that tangent lines at the end points of a diameter of a circle are parallel.**	½ ½ ½ ½ ½

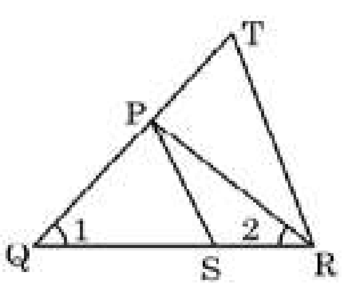
	 Let AB be a diameter of a given circle, and let PQ and RS be the tangent lines drawn to the circle at points A and B respectively. Since tangent at a point to a circle is perpendicular to the radius through the point. $\therefore\ AB \perp PQ$ and $AB \perp RS$ $\Rightarrow \angle PAB = 90^\circ$ and $\angle ABS = 90^\circ$ $\Rightarrow\ \angle PAB = \angle ABS$ $\Rightarrow$ PQ||RS[$\because \angle PAB$ and $\angle ABS$ are alternate angles]	½ ½ ½
25	**The minute hand of a clock is 15 cm long. Calculate the area swept by it in 20 minutes. [Take π = 3.14.]** Angle described by the minute hand in 60 minutes $= 360^\circ$ Angle described by the minute hand in 20 minutes $= \left(\frac{360}{60} \times 20\right)$ $= 120^\circ$ Required area swept by the minute hand in 20 minutes $=$ Area of the sector (with r $= 15$ cm and $\theta = 120^\circ$) $= \left(\frac{\pi r^2 \theta}{360^\circ}\right) \mathrm{cm}^2$ $= \left(3.14 \times 15 \times 15 \times \frac{120^\circ}{360^\circ}\right)$ $= 235.5\ \mathrm{cm}^2$	**½** **½** **½** **½**
	Section C	
26	**Is it possible to design a rectangular park of perimeter 80 metres and area 400 m^2. If so, find its length and breadth.** Let length of park $= x$ metres We are given area of rectangular park $= 400\ \mathrm{m}^2$ Therefore, breadth of park $= \frac{400}{x}$ metres { Area of rectangle = length × breadth } Perimeter of rectangular park = 2(length + breath) $= 2\left(x + \frac{400}{x}\right)$ metres We are given perimeter of rectangle $= 80$ metres According to condition: $2\left(x + \frac{400}{x}\right) = 80$ $\Rightarrow 2\left(\frac{x^2 + 400}{x}\right) = 80$	**1**

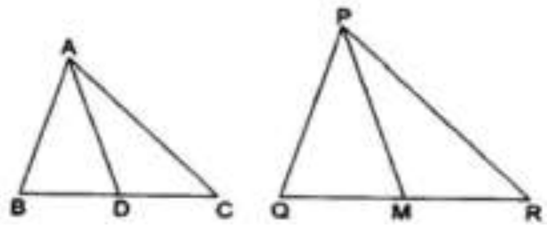
	$\Rightarrow 2x^2 + 800 = 80x$ $\Rightarrow 2x^2 - 80x + 800 = 0$ $\Rightarrow x^2 - 40x + 400 = 0$ (Dividing whole equation by 2) Comparing equation, $x^2 - 40x + 400 = 0$ with general quadratic equation $ax^2 + bx + c = 0$, we get $a = 1, b = -40$ and $c = 400$ Discriminant $= b^2 - 4ac = (-40)^2 - 4(1)(400) = 1600 - 1600 = 0$ Discriminant is equal to 0 . Therefore, two roots of the equation are real and equal which means that it is possible to design a rectangular park of perimeter 80 metres and area 400 m^2. Using the quadratic formula $x = \frac{-b\pm\sqrt{b^2-4ac}}{2a}$ to solve the equation, $x = \frac{40 \pm \sqrt{0}}{2} = \frac{40}{2} = 20$ Here, both the roots are equal to 20. Therefore, length of the rectangular park = 20 metres The breadth of rectangular park $= \frac{400}{x} = \frac{400}{20} = 20$ m	**1** **1**
27	**Ifα , β are zeroes of the quadratic polynomial x ^{2} + 3x + 2, find a quadratic polynomial whose zeroes are α + 1, β + 1.** $p(x) = x^2 + 3x + 2$ α, β are its zeroes $\therefore \alpha + \beta = -3, \alpha\beta = 2$ Now, $(\alpha + 1) + (\beta + 1) = \alpha + \beta + 2 = -3 + 2 = -1$ $(\alpha + 1)(\beta + 1) = \alpha\beta + (\alpha + \beta) + 1 = +2 - 3 + 1 = 0$ $\therefore$ Required Polynomial is $k(x^2 + x)$ or $x^2 + x$	1 1 1
28	**Solve 2x + 3y = 11 and 2x – 4y = –24 and hence find the value of m for which y = mx + 3.** The given pair of linear equations $$2x + 3y = 11 \quad (1)$$ $$2x - 4y = -24 \quad (2)$$ From equation (1), $3y = 11 - 2x$ $\Rightarrow\ y = \frac{11 - 2x}{3}$ Substituting this value of y in equation (2), we get $2x - 4\left(\frac{11 - 2x}{3}\right) = -24$ $\Rightarrow 6x - 44 + 8x = -72$ $\Rightarrow 14x - 44 = -72$ $\Rightarrow 14x = 44 - 72$ $\Rightarrow 14x = -28$	

	$\Rightarrow x = -\frac{28}{14} = -2$ Substituting this value of x in equation (3), we get $y = \frac{11-2(-2)}{3} = \frac{11+4}{3} = \frac{15}{3} = 5$ Verification, Substituting $x = -2$ and $y = 5$, we find that both the equations (1) and (2) are satisfied as shown below: $2x + 3y = 2(-2) + 3(5) = -4 + 15 = 11$ $2x - 4y = 2(-2) - 4(5) = -4 - 20 = -24$ This verifies the solution, Now, $y = mx + 3$ $\Rightarrow 5 = m(-2) + 3$ $\Rightarrow -2m = 5 - 3$ $\Rightarrow -2m = 2$ $\Rightarrow m = \frac{2}{-2} = -1$	**1** **1** **1**
29	**If $cosecA = \sqrt{10}$ find other five trigonometric ratios.** We have, $\text{cosec}A = \frac{\text{Hypotenuse}}{\text{Perpendicular}} = \frac{\sqrt{10}}{1}$ So, we draw a right triangle ABC , right-angled at B such that Perpendicular = BC = 1 unit and, Hypotenuse $= AC = \sqrt{10}$. By Pythagoras theorem, we have $AC^2 = AB^2 + BC^2$ $\Rightarrow (\sqrt{10})^2 = AB^2 + 1^2$ $\Rightarrow AB^2 = 10 - 1 = 9$ $\Rightarrow AB = \sqrt{9} = 3$ When we consider the trigonometric ratios of $\angle A$, we have Base = AB = 3 units, Perpendicular = BC = 1 units and, Hypotenuse $= AC = \sqrt{10}$ units $\therefore \sin A = \frac{\text{Perpendicular}}{\text{Hypotenuse}} = \frac{1}{\sqrt{10}}, \cos A = \frac{\text{Base}}{\text{Hypotenuse}} = \frac{3}{\sqrt{10}}$ $\tan A = \frac{\text{Perpendicular}}{\text{Base}} = \frac{1}{3}, \sec A = \frac{\text{Hypotenuse}}{\text{Base}} = \frac{\sqrt{10}}{3}.$ and, $\cot A = \frac{\text{Base}}{\text{Perpendicular}} = \frac{3}{1} = 3$ **OR** **Prove the identity:** **(tanA + cosecB) ^{2} - (cotB - secA) ^{2} = 2tanA cotB (cosecA + secB)** We have, LHS $= (\tan A + \text{cosec}B)^2 - (\cot B - \sec A)^2$ $= (\tan^2 A + \text{cosec}^2 B + 2\tan A \text{cosec} B) - (\cot^2 B + \sec^2 A - 2\cot B \sec A)$	1 1 1

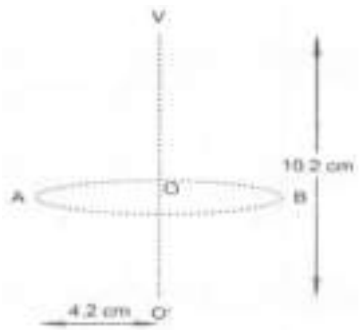
	$= (\tan^2 A - \sec^2 A) + (\mathrm{cosec}^2 B - \cot^2 B) + 2\tan A \mathrm{cosec}\, B + 2\cot B \sec A$ But, $\mathrm{Sec}^2 A - \tan^2 A = 1 \& \mathrm{cosec}^2 A - \cot^2 A = 1$ $\therefore \mathrm{LHS} = -1 + 1 + 2\tan A \mathrm{cosec}\, B + 2\cot B \sec A$ $\Rightarrow \mathrm{LHS} = 2(\tan A \mathrm{cosec}\, B + \cot B \sec A)$ $\Rightarrow \mathrm{LHS} = 2\tan A \cot B \left(\frac{\mathrm{cosec} B}{\cot B} + \frac{\sec A}{\tan A}\right)$ [Dividing and multiplying by $\tan A \cot B$] $\Rightarrow \mathrm{LHS} = 2\tan A \cot B \left\{\frac{\frac{1}{\sin B}}{\frac{\cos B}{\sin B}} + \frac{\frac{1}{\cos A}}{\frac{\sin A}{\cos A}}\right\}$ [Since, $\mathrm{Cosec}\, A \cdot \mathrm{Sin} A = 1, \mathrm{Sec}\, A \cdot \cos A = 1, (\sin A/\cos A) = \tan A \& (\cos A/\mathrm{Sin} A) = \cot A$] $\Rightarrow \mathrm{LHS} = 2\tan A \cot B \left(\frac{1}{\cos B} + \frac{1}{\sin A}\right) = 2\tan A \cot B(\sec B + \mathrm{cosec} A) = \mathrm{RHS}$. Hence, proved.	1 1 1
30	**Two tangents TP and TQ are drawn to a circle with centre O from an external point T. Prove that ∠PTQ = 2 ∠ OPQ.**  Given A circle with centre O and an external point T and two tangents TP and TQ to the circle, where P, Q are the points of contact. To Prove: $\angle PTQ = 2\angle OPQ$ Proof: Let $\angle PTQ = \theta$ Since TP, TQ are tangents drawn from point T to the circle. $TP = TQ$ $\therefore$ TPQ is an isoscles triangle $\therefore \angle TPQ = \angle TQP = \frac{1}{2}(180^\circ - \theta) = 90^\circ - \frac{\theta}{2}$ Since, TP is a tangent to the circle at point of contact P $\therefore \angle OPT = 90^\circ$ $\therefore \angle OPQ = \angle OPT - \angle TPQ = 90^\circ - \left(90^\circ - \frac{1}{2}\theta\right) = \frac{\theta}{2} = \frac{1}{2}\angle PTQ$ Thus, $\angle PTQ = 2\angle OPQ$	**1** **1** **1**
31	**The king, queen and jack of club are removed from a deck of 52 cards. Then the cards are well - shuffled. One card is drawn at random from the remaining cards. Find the probability of getting** **1. a heart** **2. a king** **3. a club** **4. a '10'of hearts.** According to the question, Cards removed = king, queen and jack of clubs = 3 $\therefore$ Cards left $= 52 - 3 = 49$ Probability $= \frac{\text{favourable outcomes}}{\text{Total outcomes}}$ i. Number of hearts $= 13$	

	$\therefore$ Probability of drawing a heart $= \frac{13}{49}$ ii. Total number of kings $= 4$ Number of kings left $= 4 - 1 = 3$ $\therefore$ Probability of drawing a king $= \frac{3}{49}$ iii. Number of clubs left $= 13 - 3 = 10$ Probability of drawing a club $= \frac{10}{49}$ iv. There is only one ' 10 ' of hearts. $\therefore$ Probability of drawing one '10' of hearts $= \frac{1}{49}$ **OR** **A die is thrown once. Find the probability of getting** **(i) a prime number; (ii) a number lying between 2 and 6; (iii) an odd number.** Total no. of outcomes $= 6$ (i) No. of prime nos. $= 3$ Pa prime no.) $= \frac{3}{6} = \frac{1}{2}$ (ii) Total no. of nos. lying between 2 and 6 $= 3$ P(a no. lying between 2 and 6) $= \frac{3}{6} = \frac{1}{2}$ (iii) No. of odd nos. $= 3$ P (an odd no.) $= \frac{3}{6} = \frac{1}{2}$	**1** **1** **1** **1** **1** **1**
	Section D	
32	**A motor boat whose speed is 18 km/h in still water takes 1 hour more to go 24 km upstream, than to return to the same point. Find the speed of the stream and total time of the journey.** Given:- Speed of boat $= 18$ km/hr Distance $= 24$ km Let x be the speed of stream. Let t_1 and t_2 be the time for upstream and downstream As we know that, speed $= \frac{\text{distance}}{\text{time}}$ $\Rightarrow$ time $= \frac{\text{distance}}{\text{speed}}$ For upstream, Speed $= (18 - x)$km/hr	

	Distance = 24 km Time = t_1 Therefore, $t_1 = \frac{24}{18-x}$ For downstream, Speed = $(18 + x)$km/hr Distance = 24 km Time = t_2 Therefore, $t_2 = \frac{24}{18+x}$ Now according to the question- $t_1 = t_2 + 1$ $\frac{24}{18-x} = \frac{24}{18+x} + 1$ $\Rightarrow \frac{1}{18-x} - \frac{1}{18+x} = \frac{1}{24}$ $\Rightarrow \frac{(18+x)-(18-x)}{(18-x)(18+x)} = \frac{1}{24}$ $\Rightarrow 48x = (18-x)(18+x)$ $\Rightarrow 48x = 324 + 18x - 18x - x^2$ $\Rightarrow x^2 + 48x - 324 = 0$ $\Rightarrow x^2 + 54x - 6x - 324 = 0$ $\Rightarrow x(x+54) - 6(x+54) = 0$ $\Rightarrow (x+54)(x-6) = 0$ $\Rightarrow x = -54$ or $x = 6$ Since speed cannot be negative. $\Rightarrow x \neq -54$ $\therefore x = 6$ Thus the speed of stream is 6 km/hr. Total time of Journey = $t_1 + t_2$ $= \frac{24}{18-x} + \frac{24}{18+x}$ $= \frac{24}{12} + \frac{24}{24} = 2 + 1 = 3$hrs.	**1** **1** **1** **1** **1**
33	In the given figure, $\frac{QR}{QS} = \frac{QT}{PR}$ and $\angle 1 = \angle 2$. Prove that $\triangle PQS \sim \triangle TQR$. 	

	In $\triangle$ PQR, $\angle 1$ $\therefore$ PQ = PR (sides opposite to equal angles) Now $\frac{QR}{QS} = \frac{QT}{PR}$ $\Rightarrow \frac{QS}{QR} = \frac{PR}{QT} \Rightarrow \frac{QS}{QR} = \frac{PQ}{QT}$ (as PR = PQ) ... In $\triangle$ PQS and $\triangle$ TQR, $\angle Q = \angle Q$ (common) $\frac{QS}{QR} = \frac{PQ}{QT}$ (from (i)) $\therefore \triangle$ PQS $\sim \triangle$ TQR (SAS similarity) (b)  It is given that: $\frac{AB}{PQ} = \frac{BC}{QR} = \frac{AD}{PM}$ $\Rightarrow \frac{AB}{PQ} = \frac{AD}{PM} = \frac{BC}{QR} = \frac{\frac{1}{2}BC}{\frac{1}{2}QR} = \frac{BD}{QM}$ In $\triangle ABD$ and $\triangle PQM$, we have $\frac{AB}{PQ} = \frac{AD}{PM} = \frac{BD}{QM}$ [from(i)] $\therefore \triangle ABD \sim \triangle PQM$ [by SSS-similarity criteria]. And also, $\angle B = \angle Q$ [corresponding angles of similar triangles are equal]. Now, in $\triangle ABC$ and $\triangle PQR$, we have $\angle B = \angle Q$ [proved above] and $\frac{AB}{PQ} = \frac{BD}{QM}$ [from(i)]. $\therefore \triangle ABC \sim \triangle PQR$ [by SAS-similarity criteria].	**1** **1** 1½ 1½

34 **A solid wooden toy is in the shape of a right circular cone mounted on a hemisphere. If the radius of the hemisphere is 4.2 cm and the total height of the toy is 10.2 cm, find the volume of that wooden toy.**



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We have, $\mathrm{VO}' = 10.2\ \mathrm{cm}, \mathrm{OA} = \mathrm{OO}' = 4.2\ \mathrm{cm}$ **1**

Let r be the radius of the hemisphere and h be the height of the conical part of the toy.
Then, $\mathrm{r = OA = 4.2\ cm, h = VO = VO' - OO' = (10.2 - 4.2)cm = 6\ cm}$
Also, radius of the base of the cone $= \mathrm{OA = r = 4.2\ cm}$
∴ Volume of the wooden toy = Volume of the conical part + Volume of the hemispherical part **1**

$= \left(\frac{1}{3}\pi r^2 h + \frac{2\pi}{3} r^3\right) \mathrm{cm}^3$ **1**

$= \frac{\pi r^2}{3}(\mathrm{\ h + 2r})\mathrm{cm}^3$ **1**

$= \frac{1}{3} \times \frac{22}{7} \times 4.2 \times 4.2 \times (6 + 2 \times 4.2)\mathrm{cm}^3$ **1**

$= \frac{1}{3} \times \frac{22}{7} \times 4.2 \times 4.2 \times 14.4\ \mathrm{cm}^2 = 266.11\ \mathrm{cm}^3$

OR

A solid is in the shape of a cone surmounted on a hemisphere with both their diameters being equal to 7 cm and the height of the cone is equal to its radius. Find the volume of the solid.

Radius of hemisphere = radius of cone = $\frac{7}{2}$ cm **1**
Height of cone = $\frac{7}{2}$ cm **1**
Volume of the solid = Volume of hemisphere + Volume of cone **1**

$= \frac{2}{3}\pi \mathrm{r}^3 + \frac{1}{3}\pi \mathrm{r}^2\ \mathrm{h}$ **1**

$= \frac{1}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2}\left(2 \times \frac{7}{2} + \frac{7}{2}\right)$ **1**

$= \frac{539}{4}\ \mathrm{cm}^3$ or $134.75\ \mathrm{cm}^3$

35 **(a) The mode of the following frequency distribution is 36. Find the missing frequency (f).**

Class	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70
Frequency	8	10	f	16	12	6	7

Since the mode of the given series is 36 and maximum frequency 16 lies in the class 30 − 40, so the modal class is 30-40. ½

Let the missing frequency be x .

$x_k = 30, h = 10, f_k = 16, f_{k-1} = x, f_{k+1} = 12$ ½

Mode, M $= x_k + \left\{h \times \frac{(f_k - f_{k-1})}{(2f_k - f_{k-1} - f_{k+1})}\right\}$ 1

$36 = 30 + \left\{10 \times \frac{(16-x)}{(32-x-12)}\right\}$

$\Rightarrow \frac{10 \times (16-x)}{(20-x)} = 6$

$\Rightarrow 160 - 10x = 120 - 6x$

⇒ 4x = 40

⇒ x = 10 1

(b) If mode and mean of the given frequency table is 36 and 33.7 respectively. Find the median.

Mode = 36
Mean = 33.7

3 Median = Mode + 2 Mean
Or 3 Median = 36 + 2 x 33.7 1
= 36 + 67.4
= 103.4
Median = 103.4/3
= 34.46

1

OR

Find the mean, median and mode of the following data:

Class	0 - 10	10 - 20	20 -30	30 - 40	40 - 50	50 - 60	60 - 70
Frequency	6	8	10	15	5	4	2

Class Interval	Frequency f_i	Mid value x_i	$f_i x_i$	Cumulative Frequency
0-10	6	5	30	6
10-20	8	15	120	14
20-30	10	25	250	24

30-40	15	35	525	39
40-50	5	45	225	44
50-60	4	55	220	48
60-70	2	65	130	50
	$\sum f_i = 50$		$\sum f_i u_i = 1500$	

1

i. Mean $= \frac{\sum f_i x_i}{\sum f_i} = \frac{1500}{50} = 30$

ii. Median

$\text{N} = 50 \Rightarrow \frac{N}{2} = 25$

median class is 30-40. **1**

$\therefore l = 30, h = 10, f = 15, c.f. = 24$

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

$= 30 + \left\{10 \times \frac{25 - 24}{15}\right\}$ **1**

$= 30 + 0.67 = 30.67$

iii. Mode

Maximum frequency = 15 **1**

Hence, modal class is 30-40.

Now, Mode $= x_k + h\left\{\frac{(f_k - f_{k-1})}{(2f_k - f_{k-1} - f_{k+1})}\right\}$ **1**

$= 30 + 10\left\{\frac{15 - 10}{2(15) - 10 - 5}\right\}$

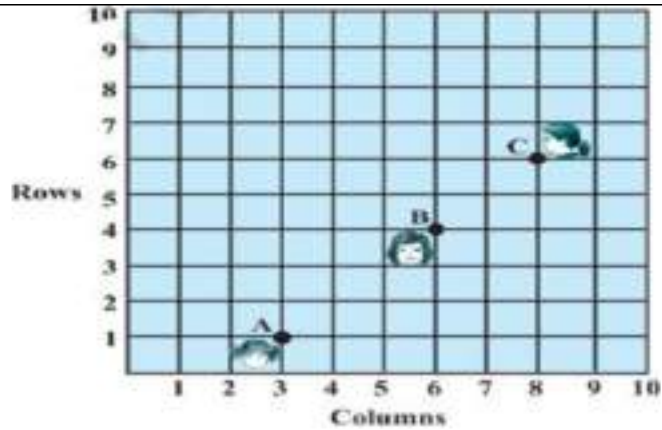
$= 30 + 3.33 = 33.33$

Section E

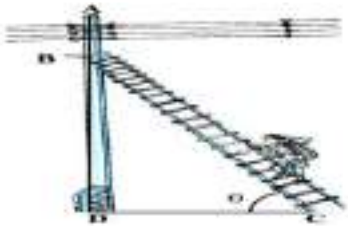
36 **Read the following text carefully and answer the questions that follow:**

In a school garden, Dinesh was given two types of plants viz. sunflower and rose floweras shown in the following figure.

	The distance between two plants is to be 5m, a basket filled with plants is kept at point A which is 10 m from the first plant. Dinesh has to take one plant from the basket and then he will have to plant it in a row as shown in the figure and then he has to return to the basket to collect another plant. He continues in the same way until all the flower plants in the basket. Dinesh has to plant ten numbersof flower plants. **1. Write the above information in the progression and find first term and common difference. (1)** **2. Find the distance covered by Dinesh to plant the first 5 plants and return to basket. (1)** **3. Find the distance covered by Dinesh to plant all 10plants and return to basket. (2)** **OR** **If the speed of Dinesh is 10 m/min and he takes 15 minutes to plant a flower plant then find the total time taken by Dinesh to plant 10 plants. (2)** i. The distance covered by Dinesh to pick up the first flower plant and the second flower plant, $= 2 \times 10 + 2 \times (10 + 5) = 20 + 30$ therefore, the distance covered for planting the first 5 plants $= 20 + 30 + 40 + \cdots 5$ terms This is in AP where the first term $a = 20$ and common difference $d = 30 - 20 = 10$ ii. We know that $a = 20$, $d = 10$ and number of terms $= n = 5$ so, $S_n = \frac{n}{2}[2a + (n-1)d]$ So, the sum of 5 terms $S_5 = \frac{5}{2}[2 \times 20 + 4 \times 10] = \frac{5}{2} \times 80 = 200$ m Hence, Dinesh will cover 200 m to plant the first 5 plants. iii. As $a = 20$, $d = 10$ and here $n = 10$ So, $S_{10} = \frac{10}{2}[2 \times 20 + 9 \times 10] = 5 \times 130 = 650$ m Hence, Ramesh will cover 650 m to plant all 10 plants. **OR** Total distance covered by Ramesh 650 m Time $= \frac{\text{distance}}{\text{speed}} = \frac{650}{10} = 65$ minutes Time taken to plant all 10 plants $= 15 \times 10 = 150$ minutes Total time $= 65 + 150 = 215$ minutes $=$ 3hrs35 minutes	**1** **1** **2** **2**
37	**Read the following text carefully and answer the questions that follow:** **There is a function in the school. Anishka, Bhawna and Charu are standing in a rectangular ground at points A, B and C respectively as shown in the figure. They are ready to perform an aerobic dance.**	

	 **1. How far is Charu from y - axis? (1)** **2. Find distance between Anishka and Bhawna. (1)** **3. Check whether AB + BC = AC? (2)** **OR** **Is A, B and C lies in a straight line? (2)** i. Distance of Charu from y-axis $= 8$ ii.  Distance between Anishka and Bhawna $= \sqrt{(6-3)^2 + (4-1)^2}$ $= \sqrt{3^2 + 3^2}$ $= 3\sqrt{2}$ iii. $\mathrm{AB} = 3\sqrt{2}$ $\mathrm{BC} = \sqrt{(8-6)^2 + (6-4)^2}$ $= \sqrt{2^2 + 2^2}$ $= 2\sqrt{2}$ $\mathrm{AC} = \sqrt{(8-3)^2 + (6-1)^2}$ $= \sqrt{25 + 25}$ $= 5\sqrt{2}$ $\mathrm{AC} = 5\sqrt{2}$ $\mathrm{AB} + \mathrm{BC} = \mathrm{AC}$ OR Yes, because $\mathrm{AB} + \mathrm{BC} = \mathrm{AC}$	1 1 2 2
38	**Read the following text carefully and answer the questions that follow:** **In a village, group of people complained about an electric fault in their area. On their complaint, an electrician reached village to repair an electric fault on a pole of height 10m. She needs to reach a point 1.5 m below the top of the pole to undertake the repair**	

work (see the adjoining figure). She used ladder, inclined at an angle of θ to the horizontal such that cosθ = $\frac{\sqrt{3}}{2}$, to reach the required position.



1. **Find the height BD? (1)**
2. **Find the length of ladder. (1)**
3. **How far from the foot of the pole should she place the foot of the ladder? (2)**
   OR
   If the height of pole and distance BD is doubled, then what will be the length of the ladder? (2)

i. Length BD $=$ AD $-$ AB

$= 10 - 1.5 = 8.5$ **1**

ii. The length of ladder BC

In $\triangle$ BDC

$$\cos\ \theta = \frac{\sqrt{3}}{2}$$
$$\Rightarrow \theta = 30^\circ$$
$$\sin\ 30^\circ = \frac{BD}{BC}$$
$$\Rightarrow \frac{1}{2} = \frac{8.5}{BC}$$
$$\Rightarrow BC = 2 \times 8.5 = 17 \text{ m}$$

1

iii. Distance between foot of ladder and foot of wall= CD

In $\triangle$ BDC

$$\cos\ 30^\circ = \frac{CD}{BC}$$
$$\Rightarrow \frac{\sqrt{3}}{2} = \frac{CD}{17}$$
$$\Rightarrow CD = 8.5\sqrt{3} \text{ m}$$

OR **2**

If the height of pole and distance BD is doubled, then the length of the ladder is

$$\sin\ 30^\circ = \frac{BD}{BC}$$
$$\Rightarrow \frac{1}{2} = \frac{17}{BC}$$
$$\Rightarrow BC = 2 \times 17 = 34 \text{ m}$$

2