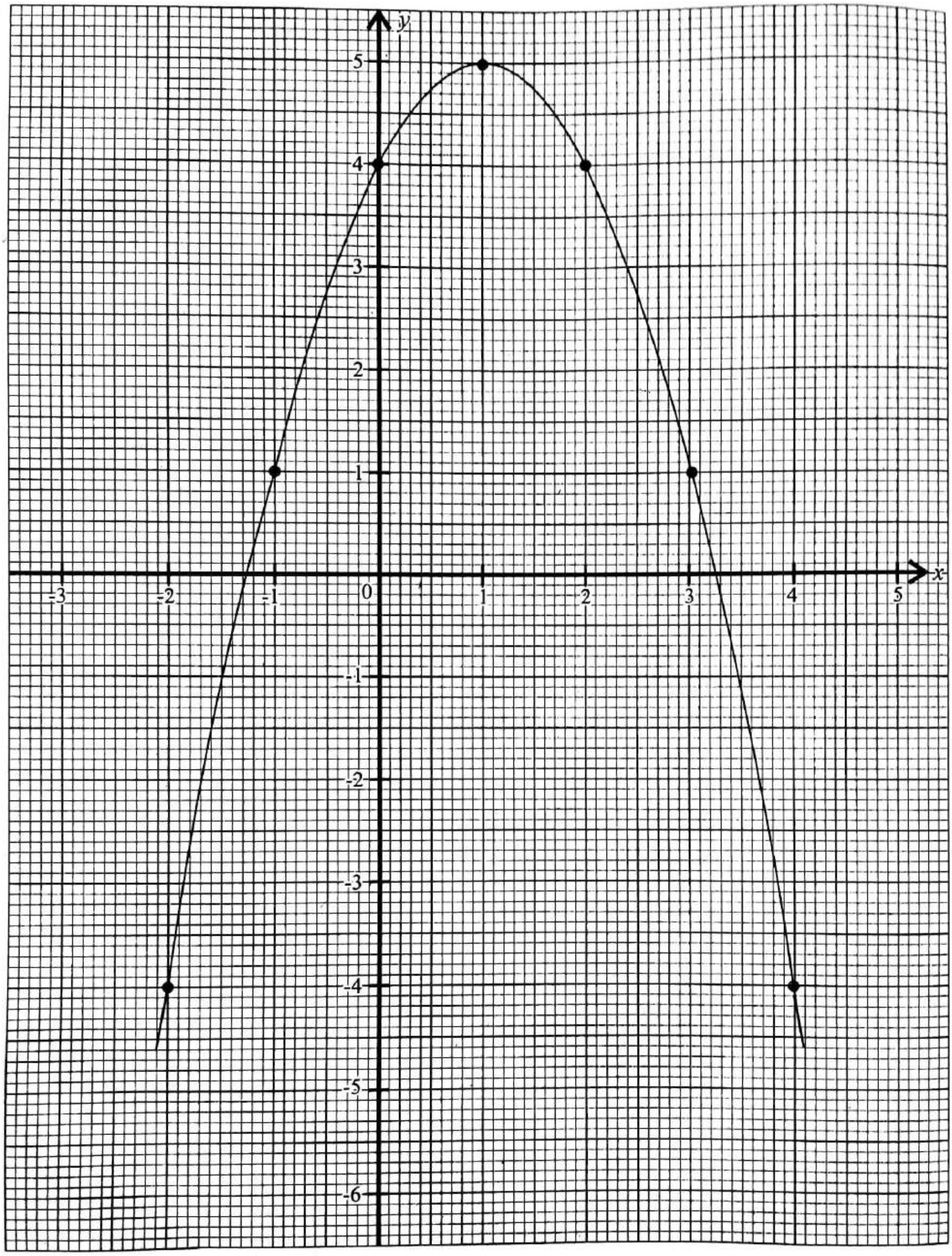
Part A

	Marks	Part Marks	Total Marks
01. Interest Saman received at the end of the first year $\Big\} = \text{Rs.}200\,000 \times \frac{10}{100}$	01		
$= \text{Rs.}20\,000$			
Interest at the end of the second year $= \text{Rs.}220\,000 \times \frac{10}{100}$	01		
$= \text{Rs.}22\,000$			
Total amount Saman has at the end of the two years $\Big\} = \text{Rs.}220\,000 + 22\,000$	01		
$= \text{Rs.}242\,000$	01		
Another method : Total amount Saman has at the end of the two years $\Big\} = \text{Rs.}\left(200\,000 \times \frac{110}{100} \times \frac{110}{100}\right)$			
$= \text{Rs.}242\,000$			
Number of shares Kamal bought $= \frac{200\,000}{40}$	01		
$= 5\,000$			
Dividends for the first year $= \text{Rs.}5\,000 \times 2.50$	01		
$= \text{Rs.}12\,500$			
$\therefore$ Dividends for the two years $= \text{Rs.}12\,500 \times 2$			
$= \text{Rs.}25\,000$	01		
Amount obtained by selling the shares $= \text{Rs.}5\,000 \times 45$	01		
$= \text{Rs.}225\,000$			
Total amount Kamal has at the end of the two years $\Big\} = \text{Rs.}225\,000 + 25\,000$	01		
$= \text{Rs.}250\,000$			
Extra amount Kamal has $= \text{Rs.}250\,000 - 242\,000$ $= \underline{\underline{\text{Rs.}8\,000}}$	01		
			10
02. (*a*) (i) When $x = 2$, $y = 4 + 2x - x^2$			
$y = 4 + 2 \times 2 - 2^2$			
$y = 4$	01		
(ii) See the graph in page 20			
Drawing the correct axes	01		
At least 5 points marked correctly	01		
Smooth curve	01	04	
(*b*) (i) $2 < x < 3$ or between 2 and 3	1+1		
(ii) $y = 5 - (1 - x)^2$	02		
(iii) Positive root of $4 + 2x - x^2 = 0$ is 3.2 ($\pm$0.1)	01		
When $y = 0$ $\quad 0 = 5 - (1 - x)^2$			
$\therefore (1 - x)^2 = 5$			
$1 - x = \pm\sqrt{5}$			
$x - 1 = +\sqrt{5}$			
$3.2\ (\pm 0.1) - 1 = \sqrt{5}$			
$\therefore \sqrt{5} = 2.2\ (\pm 0.1)$ (ie one of 2.1, 2.2, 2.3)	01	06	
			10

02. (*a*) (ii)



	Marks	Part Marks	Total Marks

03. Area of the lamina of radius $r = \pi r^2$

Area of the lamina of radius $(2r+3) = \pi(2r+3)^2$ — 01

Area of the remaining portion interms of $r = \pi(2r+3)^2 - \pi r^2$

Area of the remaining portion $= 27\pi \text{ cm}^2$

$\therefore \pi(2r+3)^2 - \pi r^2 = 27\pi$ — 01

$\cancel{\pi}(2r+3)^2 - \cancel{\pi}r^2 = 27\cancel{\pi}$

$(2r+3)^2 - r^2 = 27$

$(2r)^2 + 2 \times 2r \times 3 + 3^2 - r^2 = 27$ — 01

$4r^2 + 12r + 9 - r^2 = 27$

$4r^2 + 12r + 9 - r^2 - 27 = 0$

$$\left.\begin{aligned} 3r^2 + 12r - 18 &= 0 \\ 3 \div \quad \frac{3r^2}{3} + \frac{12r}{3} - \frac{18}{3} &= \frac{0}{3} \\ r^2 + 4r - 6 &= 0 \end{aligned}\right\}$$ — 01

$r^2 + 4r - 6 = 0$

Solving quadratic equation by using the completing square method

$(r+2)^2 = 6 + 4$ (01)

$(r+2) = \pm\sqrt{10}$

$r = -2 \pm \sqrt{10}$

$r = -2 \pm 3.16$ (01)

$r = 1.16\ (\because r > 0)$ (01)

$r \simeq \underline{\underline{1.2 \text{ cm}}}$ (01)

Or

Solving quadratic equation by using the quadratic formula

$a = 1, \quad b = 4, \quad c = -6$

$r = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$r = \dfrac{-(4) \pm \sqrt{4^2 - 4 \times 1 \times (-6)}}{2 \times 1}$ (01)

$r = \dfrac{-4 \pm \sqrt{16 + 24}}{2 \times 1}$

$r = \dfrac{-4 \pm \sqrt{40}}{2}$

$r = \dfrac{-4 \pm 2\sqrt{10}}{2}$ (01)

$r = -2 \pm \sqrt{10}$

$r = -2 \pm 3.16$

$\therefore\ r = 1.16 \quad (\because r > 0)$ (01)

$r \simeq \underline{\underline{1.2 \text{ cm}}}$ (01)

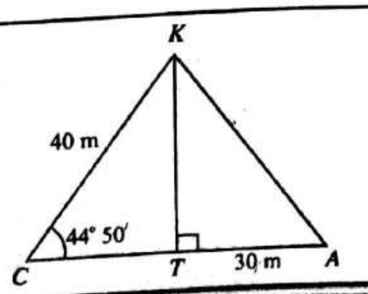
Circumference of the smaller lamina $= 2\pi r$

$= 2 \times 3.1 \times 1.2$ — 01

$= \underline{\underline{7.44 \text{ cm}}}$ — 01

Total: 10

04. (i)



Marking 40 m or 30 m — 01

44°50′ — 01

90° — 01 — 03

Answer	Marks	Part Marks	Total Marks
(ii) From the triangle KCT,			
$\sin K\hat{C}T = \frac{KT}{KC}$			
$\sin 44°50' = \frac{KT}{40}$	01		
$\therefore KT = 0.7050 \times 40$	01		
$= 28.2\ m$	01	03	
(iii) From the triangle KTA,			
$\tan K\hat{A}T = \frac{KT}{AT}$			
$\tan K\hat{A}T = \frac{28.2}{30}$	01		
$= 0.9400$	01		
$K\hat{A}T = 43°14'$	01	03	
(iv) Since $44°50' > 43°14'$ $CT < AT$ $\therefore$ Chamara is closer to the tree.	01	01	
			10

> **Another method:**
> Consider CTK triangle
> $CT = 40 \cos (44°50')$
> $CT = 40 \times (0.70916)$
> $CT = 28.37\ m$
> but $TA = 30\ m$
> $\therefore\ CT < TA$
> $\therefore$ Chamara is closer to the tree.

Answer	Marks	Part Marks	Total Marks
05. (i) $3x + 8y = 6\ 160$ —— ①	01		
$2x + 5y = 4\ 000$ —— ②	01		
①$\times 2$ $6x + 16y = 12\ 320$ —— ③	01		
②$\times 3$ $6x + 15y = 12\ 000$ —— ④	01		
③$-$④ $6x + 16y - 6x - 15y = 12\ 320 - 12\ 000$			
$\therefore\ y = 320$	01		
Substituting $y = 320$ in ②			
$2x + 5y = 4\ 000$			
$2x + 5 \times 320 = 4\ 000$	01		
$2x + 1600 = 4\ 000$			
$2x = 4\ 000 - 1\ 600$			
$x = \frac{2\ 400}{2}$			
$x = 1\ 200$	01		
$\therefore$ Price of a cricket bat = Rs. 1 200 Price of a ball = Rs. 320	01	08	

	Marks	Part Marks	Total Marks
(ii) If the number of cricket bats is a and balls is b then,			
$1\,200\,a + 320\,b = 9\,200$	01		
since $b = 2a$,			
$1\,200\,a + 320 \times (2a) = 9\,200$			
$1\,200\,a + 640a = 9\,200$			
$1\,840\,a = 9\,200$			
$a = \frac{9\,200}{1\,840} = 5$			
$\therefore b = 2 \times 5 = 10$			
$\therefore$ 5 bats and 10 balls can be bought.	01	02	10

Another method
Total cost for one bat and one ball = Rs. 1 840
$\therefore$ Number of bats can be bought $= \frac{9\,200}{1\,840}$
$= \underline{\underline{5}}$
$\therefore$ Number of balls can be bought $= \underline{\underline{10}}$

06.

Distance (km)	Number of trips (f)	Mid Value (x)	$f \times x$	d^*	fd^*
1 - 3	6	2	12	-4	-24
3 - 5	10	4	40	-2	-20
5 - 7	20	6	120	0	0
7 - 9	8	8	64	2	16
9 - 11	4	10	40	4	16
11 - 13	0	12	00	6	0
13 - 15	2	14	28	8	16
	$\sum f = 50$		$\sum fx = 304$		$\sum fd = 4$

(i) Mean distance $= \frac{\sum fx}{\sum f} = \frac{304}{50}$ (01)
$= \underline{\underline{6.08 \text{ km}}}$ (01)

Or

*** Using Assumed Mean**
Mean $= A + \frac{\sum fd}{\sum f}$
Mean distance $= 6 + \frac{4}{50}$ (01)
$= 6 + 0.08$
$= \underline{\underline{6.08 \text{ km}}}$ (01)

Mid - Value Column 01
fx Column 01
$\sum fx = 304$ 01 — Part marks 05

(ii) Distance travelled in 120 trips $= 6.08 \times 120$ km (01)
$\therefore$ Distance that can be travelled on one litre of fuel $\Big\} = \frac{6.08 \times 120}{80}$ km (01)
$= \underline{\underline{9.12 \text{ km}}}$ (01) — Part marks 03

(iii) Minimum distance travelled by bicycle $= 6 \times 1 + 10 \times 3$ (01)
$= \underline{\underline{36 \text{ km}}}$

$\therefore$ Minimum amount that can be saved $=$ Rs. $\frac{36}{9} \times 400$
$= \underline{\underline{\text{Rs. } 1600}}$ $\Big\}$ (01) — Part marks 02

$\therefore$ He can save at least $\underline{\underline{\text{Rs. } 1600}}$ — Total marks 10

*****

Part B

	Marks	Part Marks	Total Marks
07. (i) 7, 10, 13	02	02	
(ii) $T_n = a + (n-1)\,d$	01		
$T_n = 7 + (n-1)\,3$	01		
$T_n = 7 + 3n - 3$		02	
$\underline{\underline{T_n = 3n + 4}}$			
(iii) $T_n = 3n + 4$			
$40 = 3n + 4$	01		
$40 - 4 = 3n$			
$36 = 3n$			
$\therefore n = \frac{36}{3}$			
$n = 12$	01	02	
There are 40 students in 12^{th} row.			
(iv) $S_n = \frac{n}{2}\{2a + (n-1)\,d\}$	01		
$= \frac{20}{2}\{2 \times 7 + (20-1) \times 3\}$	01		
$= 10\,\{14 + 19 \times 3\}$			
$= 10\,\{14 + 57\}$			
$= 10 \times 71$			
$= 710$	01		
Since $700 < 710$, The first 20 rows cannot be filled.	01	04	
			10
08. See the construction in page 25.			
(i) Constructing the circle and marking the point C.		01	
(ii) Constructing the chord.		01	
(iii) Constructing the perpendicular bisector.	02		
Marking the point P.	01	03	
(iv) Constructing the angle bisector of $P\hat{A}B$.		02	
(v) Constructing the tangent.	01		
$K\hat{P}C = A\hat{T}C = 90^\circ$	01		
$PK \parallel AB$ (Since the alternate angles are equal.)	01	03	
			10

Another Method:

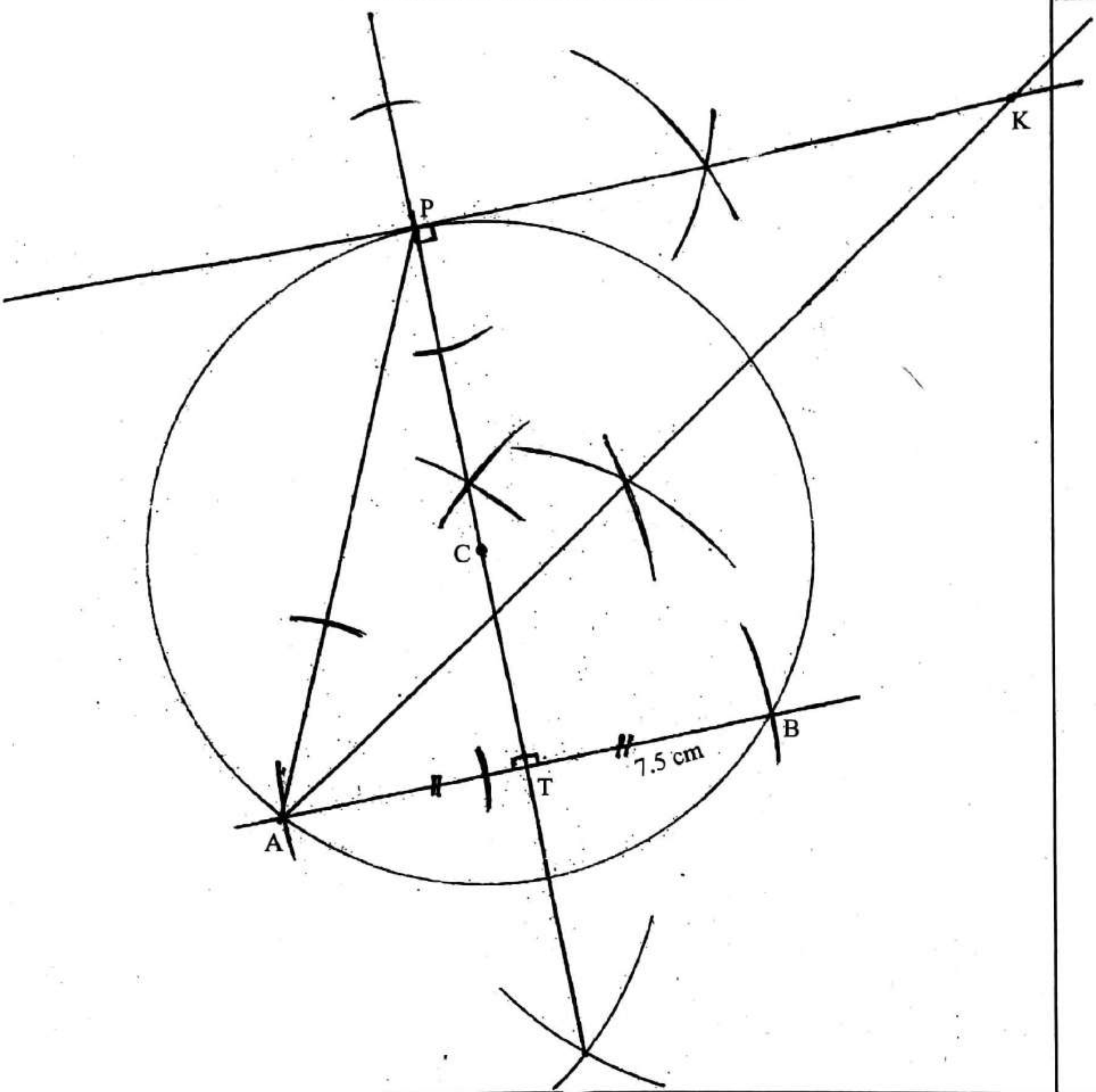
$P\hat{A}K = P\hat{K}A$ ($\because PA = PK$)

But $P\hat{A}K = K\hat{A}B$ ($\because AK$ is a bisector of $P\hat{A}B$)

$\therefore P\hat{K}A = K\hat{A}B$

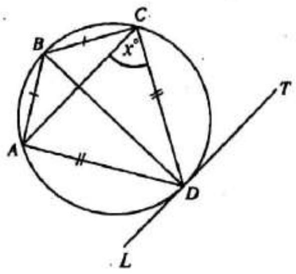
$\therefore PK \parallel AB$ ($\because$ alternate angles are equal)

Marks	Part Marks	Total Marks



09. Data : $ABCD$ is a cyclic quadrilateral

To be proved : $AC \parallel DT$ and BD bisects $A\hat{B}C$ and BD is a diameter of the circle.



Including the information in the figure — 01

Proof :

$D\hat{C}A = x°$ (Datum)

$D\hat{C}A = D\hat{A}C = x°$ (Since $AD = DC$) — 01

$D\hat{A}C = C\hat{D}T$ (angle in the alternate segment) — 01

$\therefore\ C\hat{D}T = x°$

$\therefore\ C\hat{D}T = D\hat{C}A$ — 01

Since the alternate angles are equal, $AC \parallel DT$. — 01 — 05

Marks | Part Marks | Total Marks

$A\hat{C}D = A\hat{B}D = x^\circ$ (Angles in the same segment) 01

$C\hat{A}D = D\hat{B}C = x^\circ$ (Angles in the same segment) 01

$\therefore A\hat{B}D = D\hat{B}C$
$\therefore BD$ bisects $A\hat{B}C$ 01

> **Another method :**
> In the triangles DCB and DAB
> A $BC = BA$ (given)
> $CD = AD$ (given)
> $BD = BD$ (common)
> $\therefore \Delta\, DCB \equiv \Delta\, DAB$ (S.S.S)
> $\therefore C\hat{B}D = D\hat{B}A$ (Corresponding angles of congruent triangles)
> $\therefore BD$ bisects $A\hat{B}C$

In the triangle ABC
If $B\hat{A}C = B\hat{C}A = a^\circ$, Then
$2a^\circ + 2x^\circ = 180^\circ$ (Opposite angles of a cyclic Quadrilateral)

$a^\circ + x^\circ = 90^\circ$ 01

Since $B\hat{D}C = a^\circ$ (Angles in the same segment)
$B\hat{D}T = a^\circ + x^\circ = 90^\circ$

$\therefore BD$ is perpendicular to the tangent at D. 01
$\therefore BD$ is a diameter.

Total: 10

> **Another method :**
> $C\hat{D}B = B\hat{D}A$ ($\because \Delta\, BCD \equiv \Delta\, BDA$)
> $T\hat{D}C = A\hat{D}L$ ($\because AC\, //\, DT$ and $D\hat{C}A = C\hat{A}D$)
> $\therefore 2T\hat{D}C + 2C\hat{D}B = 180^\circ$ (angles on the straight line)
> $\therefore T\hat{D}C + C\hat{D}B = 90^\circ$
> $\therefore BD$ is perpendicular to the tangent at D.
> $\therefore$ BD is a diameter.

10. Volume of 7 spheres $= 7 \times \frac{4}{3}\pi a^3 \text{ cm}^3$ 01

Volume of water that rises $= 42 \times h \text{ cm}^3$ 01

$$\left.\begin{aligned} \therefore 7 \times \frac{4}{3}\pi a^3 &= 42 \times h \\ a^3 &= \frac{42 \times h \times 3}{7 \times 4 \times \pi} \\ a^3 &= \frac{9h}{2\pi} \end{aligned}\right\}$$ 01

$$a^3 = \frac{9 \times \sqrt{31.17}}{2 \times 3.14}$$ 01

	Marks	Part Marks	Total Marks
$lg\, a^3 = lg\, 9 + \frac{1}{2}\, lg\, 31.17 - lg\, 2 - lg\, 3.14$	01		
$= 0.9542 + \frac{1}{2} \times 1.4938 - 0.3010 - 0.4969$	02		
$= 0.9542 + 0.7469 - 0.3010 - 0.4969$			
$= 1.7011 - 0.7979$			
$lg\, a^3 = 0.9032$			
$a^3 = antilog\,(0.9032)$	01		
$a^3 = 8.001$			
$a^3 \simeq 8 = 2^3$	01		
$\therefore \underline{a = 2}$	01		
			10

Note : Calculation can be done as follows

Another method I :

$$a^3 = \frac{9 \times \sqrt{31.17}}{2 \times 3.14}$$

$$a^3 = \frac{4.5 \times \sqrt{31.17}}{3.14}$$

$$lg\, a^3 = lg\, 4.5 + \frac{1}{2}\, lg\,(31.17) - lg\,(3.14)$$

$$lg\, a^3 = 0.6532 + \frac{1}{2}\,(1.4938) - (0.4969)$$

$$lg\, a^3 = 1.4001 - 0.4969$$

$$lg\, a^3 = 0.9032$$

$$\therefore a^3 = antilog\,(0.9032)$$

$$a^3 = 8.001$$

$$a^3 \simeq 8 = 2^3$$

$$\underline{a = 2}$$

Another method II :

$$a^3 = \frac{9 \times \sqrt{31.17}}{2 \times 3.14}$$

$$a^3 = \frac{9 \times \sqrt{31.17}}{6.28}$$

$$lg\, a^3 = lg\, 9 + \frac{1}{2}\, lg\,(31.17) - lg\,(6.28)$$

$$lg\, a^3 = 0.9542 + \frac{1}{2}\,(1.4938) - (0.7980)$$

$$lg\, a^3 = 1.7011 - (0.7980)$$

$$lg\, a^3 = 0.9031$$

$$\therefore a^3 = antilog\,(0.9031)$$

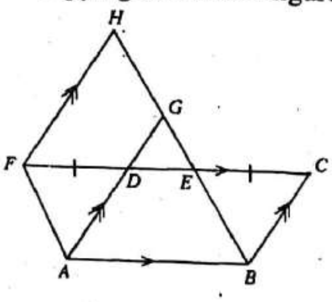
$$a^3 \simeq 8 = 2^3$$

$$\underline{a = 2}$$

---

11. Data : $ABCD$ is a parallelogram.
$DF = CE$ and $FH \,//\, AG$

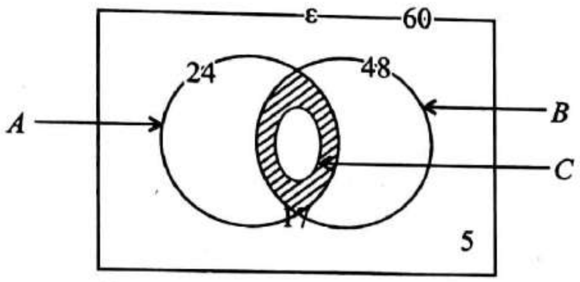
Copying the correct figure — 01



To prove: $\Delta\, ADF \equiv \Delta\, BCE$, $ABEF$ and $AGHF$ are parallelograms and Areas of the parallelograms $ABEF$ and $AGHF$ are equal.

Proof : In the triangles ADF and EBC

	Marks	Part Marks	Total Marks
$DF = EC$ (Datum)			
$AD = BC$ (Opposite sides of a parallelogram)	01		
$F\hat{D}A = E\hat{C}B$ (Corresponding angles, $AD \,//\, BC$)	01		
$\therefore \underline{\Delta\, ADF \equiv \Delta\, EBC \text{ (S.A.S)}}$	01		

	Marks	Part Marks	Total Marks
In the quadrilateral $ABEF$,			
$AB \,//\, FE$ (Opposite sides of a parallelogram are paralled.)	01		
$FD + DE = CE + ED$			
$\therefore FE = DC$			
but $AB = DC$ (Opposite sides of a parallelogram)			
$\therefore AB = EF$	01		
$\therefore$ $ABEF$ is a parallelogram (Opposite sides are parallel and equal)	01		
in the quadrilateral $AGHF$			
$FH \,//\, AG$ (Datum)			
$FA \,//\, HG$ ($ABEF$ is a parallelogram)	01		
$\therefore$ $AGHF$ is a parallelogram (Opposite sides are parallel)	01		
$\therefore$ Area of $AGHF$ = Area of $ABEF$ (The same base AF and between the parallel lines AF and BH)	01		
			10
12. (i)  Copying the figure	01		
B – Homes that use gas	01		
C – Homes that use electricity	01	03	
(ii) Total Homes = 60			
Number of homes use firewood and do not use any one of firewood, electricity and gas $= (24 + 5)$			
$\therefore$ Number of homes use only gas $= 60 - (24 + 5)$	01		
$= \underline{\underline{31}}$	01	02	
(iii) Number of homes that use firewood = 48			
Number of homes that use only gas = 31			
$\therefore$ Number of homes that use gas and firewood $= 48 - 31$	01		
$= 17$	01	02	
(iv) Number of homes that use only firewood $= 24 - 17$			
$\therefore$ Number of homes that used electricity only $= 7$	01		
$\therefore$ Number of homes that use only gas and firewood $= 17 - 7$			
$= \underline{\underline{10}}$	01		
For Shading	01	03	
			10

*****