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Model : If the scale of a model is $1 : p$

then $\boxed{\text{Scale factor } k = \frac{1}{p}}$

(i) Length in model $= k \times$ Length of actual figure

(ii) Area of model $= k^2 \times$ Area of actual fig.

(iii) Volume of model $= k^3 \times$ Volume of actual fig.

Size transformation of standard shapes

Let k be the scale factor, then

$k > 1 \Rightarrow$ Enlargement

$k < 1 \Rightarrow$ Reduction

Size of resulting figure $= k \times$ Size of actual figure

Area of resulting figure $= k^2 \times$ Area of actual figure

Vol. of resulting figure $= k^3 \times$ Vol. of actual figure

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(*ii*) the volume of the room in the model, whose actual volume is 648 cubic metres.

$$\text{Model Volume} = k^3 \times \text{Actual Volume}$$

$$= \frac{1}{(60)^3} \times 648\ m^3$$

$$1\ m^3 = 10^6\ cm^3$$

$$= \frac{648 \times 10^6}{60 \times 60 \times 60} = \frac{\overset{3}{\cancel{648}} \times 1000\cancel{000}}{\cancel{216} \times 1\cancel{000}}$$

Volume of room in Model = 3000 cm^3

Q. 9. A model of a ship is made to a scale of 1 : 250. Find :

(*i*) the length of the ship, if the length of its model is 1·2 *m*.

(*ii*) the area of the deck of the ship, if the area of the deck of its model is 1·6 m^2.

(*iii*) the volume of its model, when the volume of the ship is 1 cubic kilometre.

Scale = 1:250 $\Rightarrow$ Scale factor $k = \frac{1}{250}$

(i) **Model dimension = k × Actual dimension**

$$1{\cdot}2m = \frac{1}{250} \times \text{Actual ship length}$$

Actual ship length = 300m

(ii) **Model area = k^2 × Actual area**

$$1{\cdot}6\ m^2 = \frac{1}{(250)^2} \text{ Actual Area}$$

Actual deck area = $1{\cdot}6 \times 250 \times 250$ = **100000 m^2**

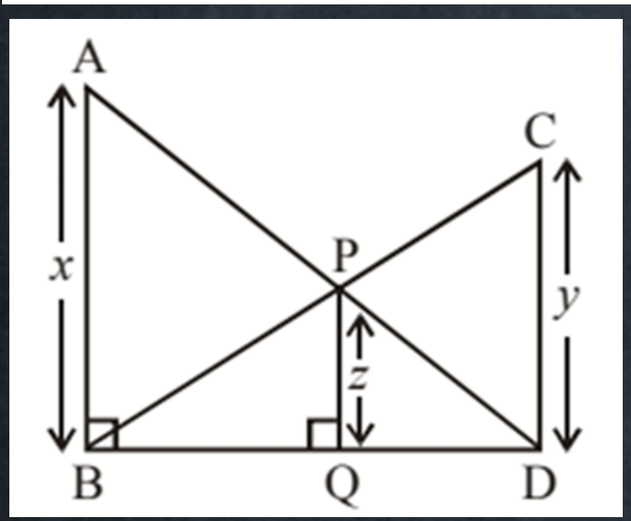
625
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0 | 3 6 | 1 8 | 3 7 | 0
1900

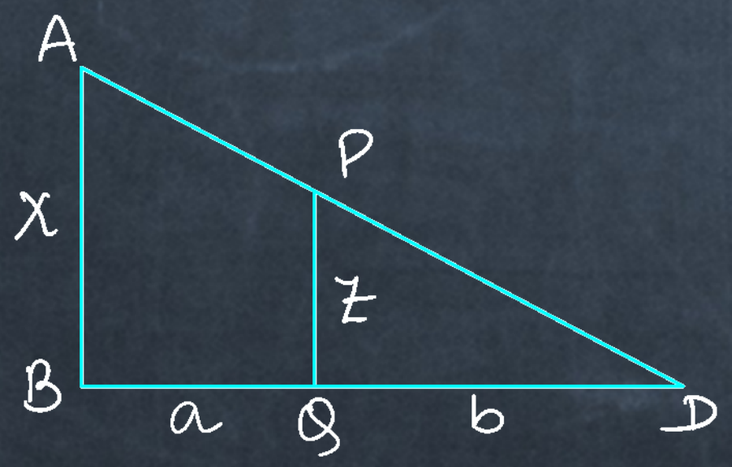
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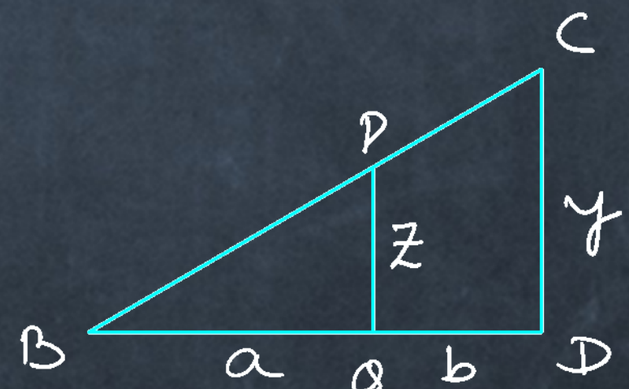
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Q.4. In the given figure, it is given that $\angle ABD = \angle CDB = \angle PQB = 90°$. If AB = x units, CD = y units and PQ = z units, prove that $\frac{1}{x} + \frac{1}{y} = \frac{1}{z}$.







- Consider $\triangle PQD$ & $\triangle ABD$
  - $\angle D$ is Common
  - $\angle ABD = \angle PQD = 90°$ (∵ given)

By AA axiom of similarity $\triangle PQD \sim \triangle ABD$

$$\frac{z}{x} = \frac{b}{a+b} \quad \text{—(i)}$$

- Consider $\triangle PQB$ & $\triangle CDB$
  - $\angle B$ is common
  - $\angle PQB = \angle CDB = 90°$ (∵ given)

By AA axiom of similarity

$\triangle PQB \sim \triangle CDB$

$$\therefore \frac{z}{y} = \frac{a}{a+b} \quad \text{——(ii)}$$

Add (i) & (ii)

$$\frac{z}{x} + \frac{z}{y} = \frac{b}{a+b} + \frac{a}{a+b} \Rightarrow z\left(\frac{1}{x} + \frac{1}{y}\right) = \frac{a+b}{a+b} \Rightarrow \boxed{\frac{1}{x} + \frac{1}{y} = \frac{1}{z}}$$

Hence proved

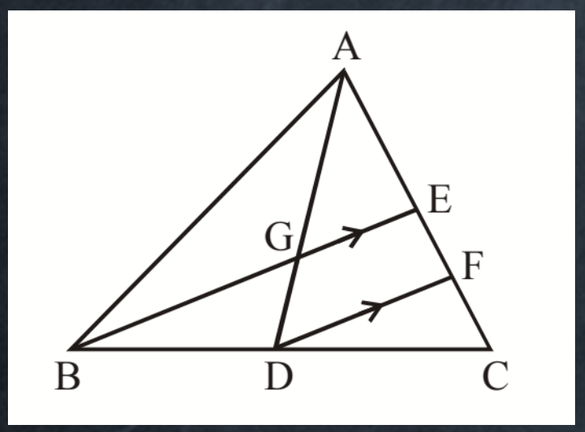
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Q.11. In the given figure, medians AD and BE of ΔABC meet at G and DF $\parallel$ BE.

Prove that :

(*i*) EF = FC (*ii*) AG : GD = 2 : 1.



Given : • AD & BE are medians

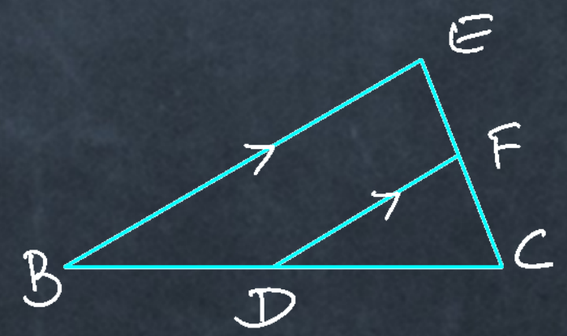
$\Rightarrow$ BD = DC & AE = EC

• DF // BE

(i) Prove EF = FC

In Δ BEC

$\frac{CD}{DC} = \frac{CF}{EF}$ (∵ B.P.T.)

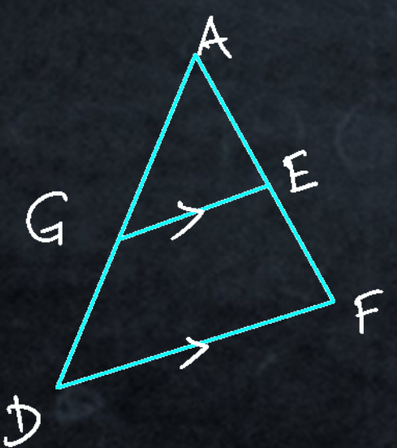


But BD = CD (∵ given)

$\therefore \quad 1 = \frac{CF}{EF} \Rightarrow$ **EF = FC** Hence proved

(ii) Prove AG : GD = 2 : 1

Consider Δ ADF :



$\frac{AG}{GD} = \frac{AE}{EF}$ —(i) (∵ BPT.)

But AE = EC (∵ given)

AE = EF + FC

AE = 2EF (∵ Proved earlier)

∴ Eq^{n} (i) becomes $\frac{AG}{GD} = \frac{2EF}{EF} \Rightarrow$ **AG : GD = 2 : 1** Hence Proved

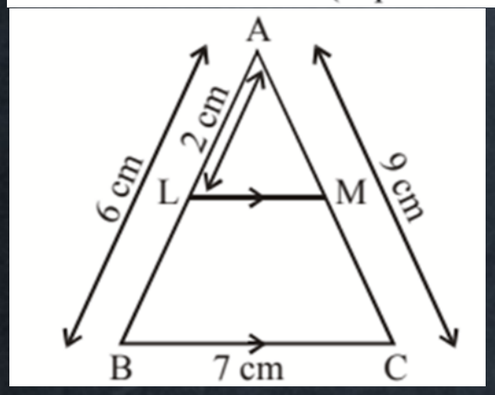
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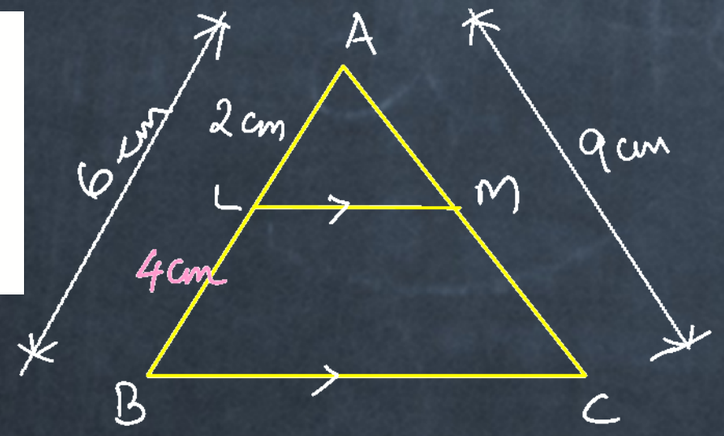
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Q.6. In the given figure, LM ∥ BC.
If AB = 6cm, AL = 2cm and AC = 9cm, calculate :

(*i*) the length of CM.

(*ii*) the value of $\frac{\text{ar}(\Delta ALM)}{\text{ar(trap. LBCM)}}$





(i) Consider $\triangle ALM$ & $\triangle ABC$

- $\angle A$ is common
- $\angle ALM = \angle ABC$ (∵ Corresponding $\angle$s)

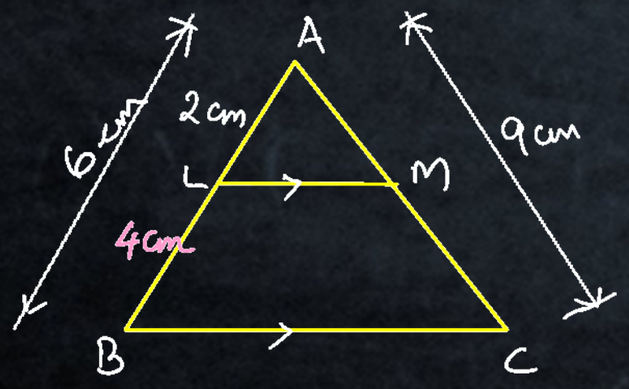
∴ By AA axiom of similarity $\triangle ALM \sim \triangle ABC$

$$\Rightarrow \frac{AL}{AB} = \frac{AM}{AC} \Rightarrow \frac{2}{6} = \frac{AM}{9} \Rightarrow AM = 3\text{ cm}$$

$$\therefore CM = AC - AM = 9 - 3$$

$$\boxed{CM = 6\text{ cm}}$$

(ii) the value of $\frac{\text{ar}(\Delta ALM)}{\text{ar(trap. LBCM)}}$



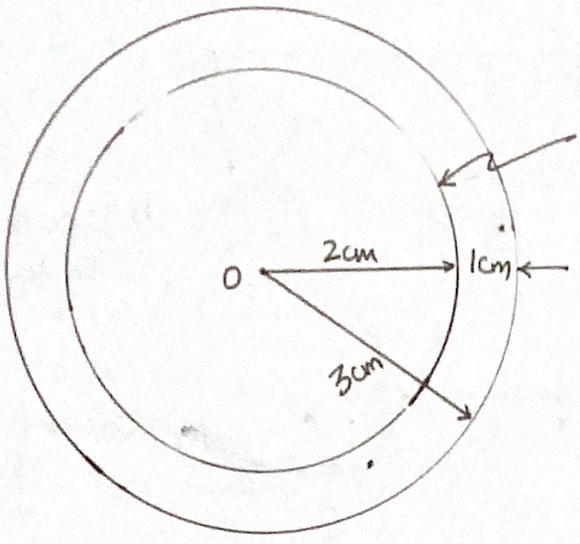
$$\frac{\text{ar}(\Delta ALM)}{\text{ar}(\Delta ABC)} = \frac{AL^2}{AB^2} \Rightarrow \frac{\text{ar}(\Delta ALM)}{\text{ar}(\Delta ABC)} = \frac{2^2}{6^2} = \frac{4}{36} = \frac{1}{9}$$

$$\Rightarrow \text{ar}(\Delta ALM) = \frac{\text{ar}(\Delta ABC)}{9} \quad \text{---- (1)}$$

$$\text{Now } \frac{\text{ar}(\Delta ALM)}{\text{ar(trap. LBCM)}} = \frac{\text{ar}(\Delta ALM)}{\text{ar}(\Delta ABC) - \text{ar}(\Delta ALM)}$$

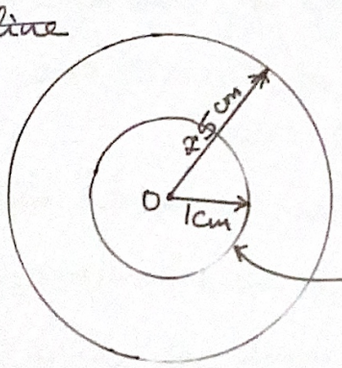
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(viii)



locus is a concentric circle of r = 2cm

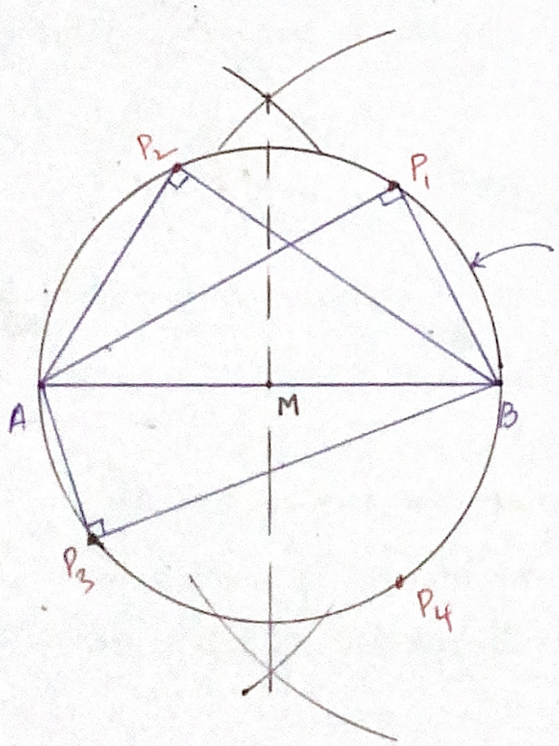
(ix) ~~a Vertical Straight line~~



locus is a concentric circle $\overline{c}$ r = 1cm

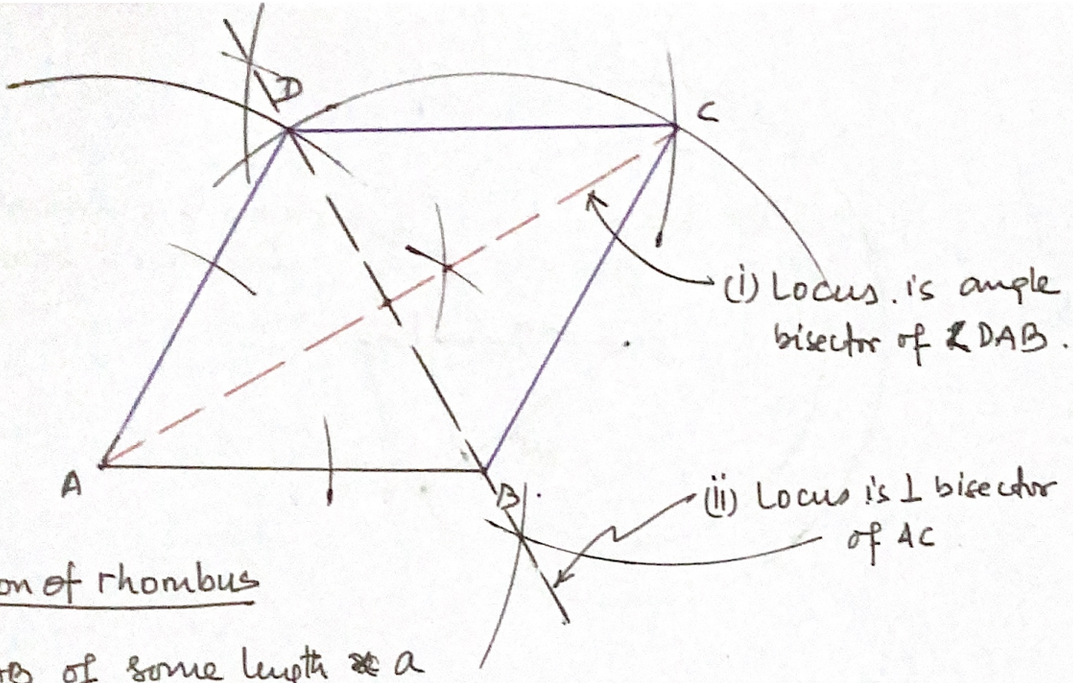
(x) A vertical straight line

(xi)



locus is a circle $\overline{c}$ AB as dia.

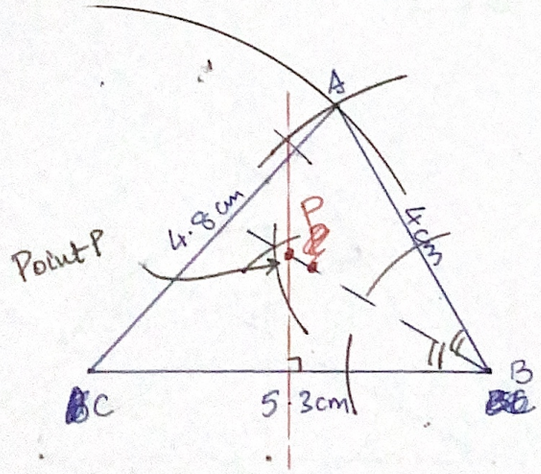
(2.)



Construction of rhombus

- Draw AB of some length a
- With A centre & radius 'a', cut arc above
- With B centre & radius 'a', cut arc above to cut previous arc at D
- From D cut the other arc at C with same radius 'a'
- Join ABCD to obtain the rhombus.

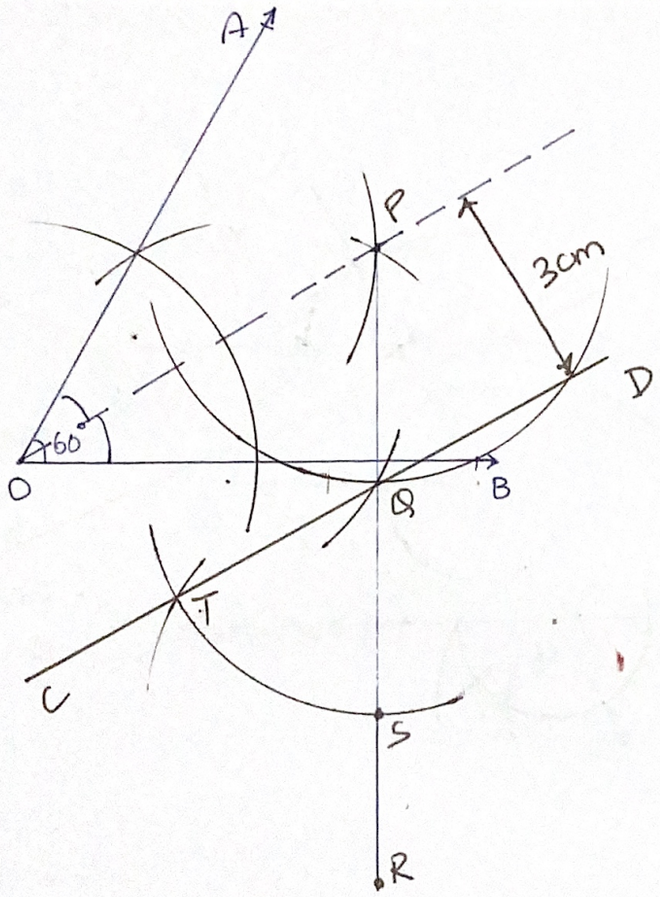
(3.)



Point P lies at the intersection of

- bisector of ∠ABC and
- ⊥ bicector of BC.

(4)



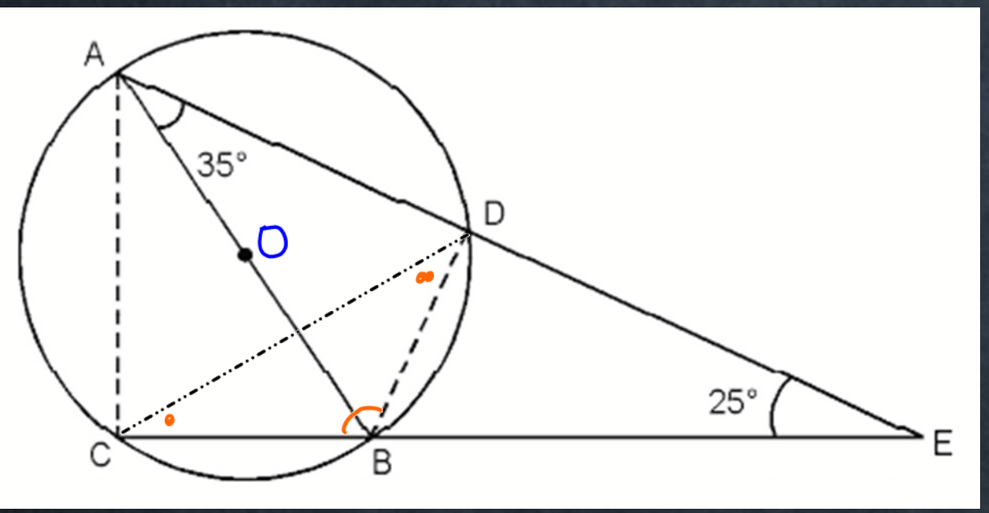
- Construct $\angle AOB = 60^\circ$.
- Construct bisector of $\angle AOB$
- Choose any point on the angle bisector at P (say)
- ~~Draw~~ Construct CD // to OP at 3cm distance
  - With centre P & r = 3cm, draw an arc & Select a point Q on it
  - Draw line PQR
  - Draw an arc of any radius at P.
  - With Q as centre draw the same arc on PR to cut at S
  - Measure $\angle OPQ$ and with centre S, cut the previous arc at T
  - Join QT and extend both sides to get CD
  - Now P is at 3cm from CD

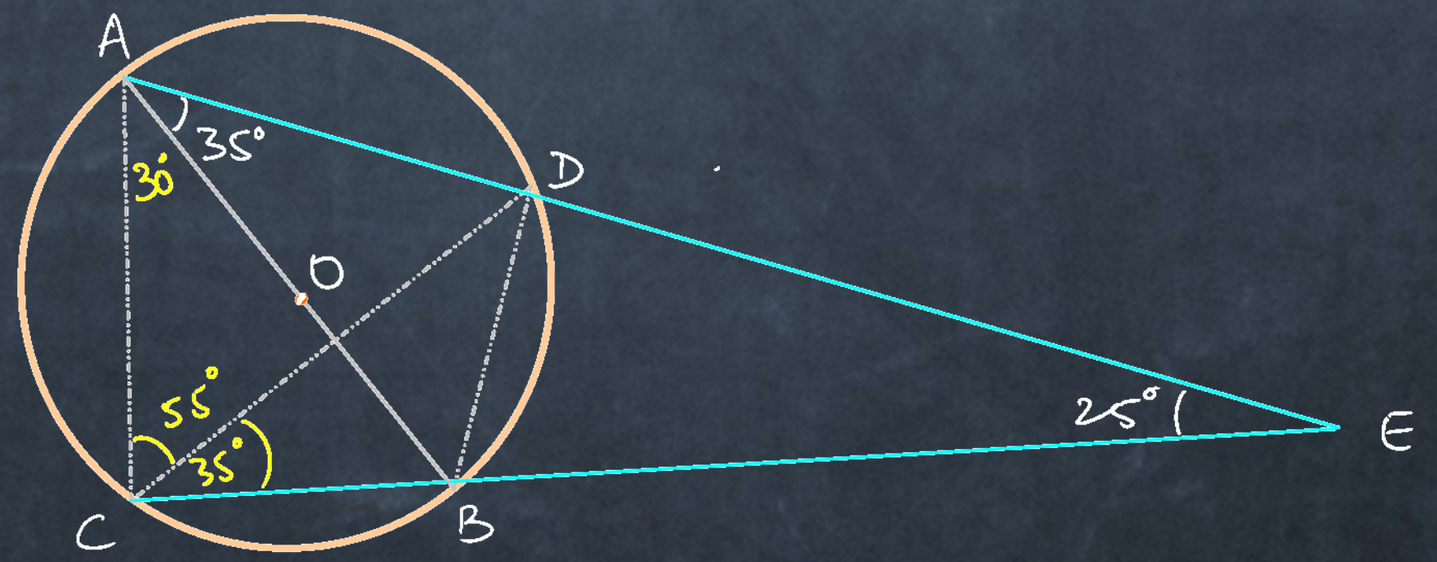
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Q. 24. In the given figure, AB is a diameter of a circle with centre O. If ADE and CBE are straight lines, meeting at E such that $\angle BAD = 35°$ and $\angle BED = 25°$. Find :

(*i*) $\angle DCB$ (*ii*) $\angle DBC$

(*iii*) $\angle BDC$.





- $\angle DCB = \angle BAD = 35°$ (∵ Angles in same segment)
- $\angle ACB = 90°$ (∵ AB is diameter)

$\Rightarrow \angle DCA = 90° - 35° = 55°$

Now In $\triangle ACE$,

$\angle CAB = 180° - (90° + 25° + 35°)$

$\angle CAB = 30°$

$\Rightarrow \angle DBC = 180° - (30° + 35°)$ (∵ Opp. $\angle$s of cyclic Quad.)

$\angle DBC = 115°$

In $\triangle DCB$, $\angle BDC = 180° - (115° + 35°)$

$\angle BDC = 30°$

(i) $\angle DCB = 35°$
(ii) $\angle DBC = 115°$
(iii) $\angle BDC = 30°$

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