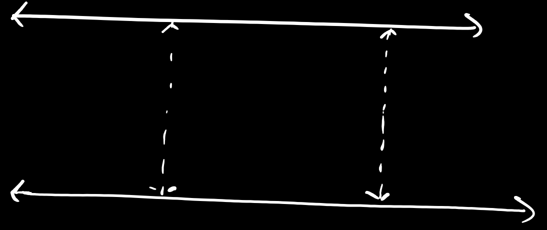
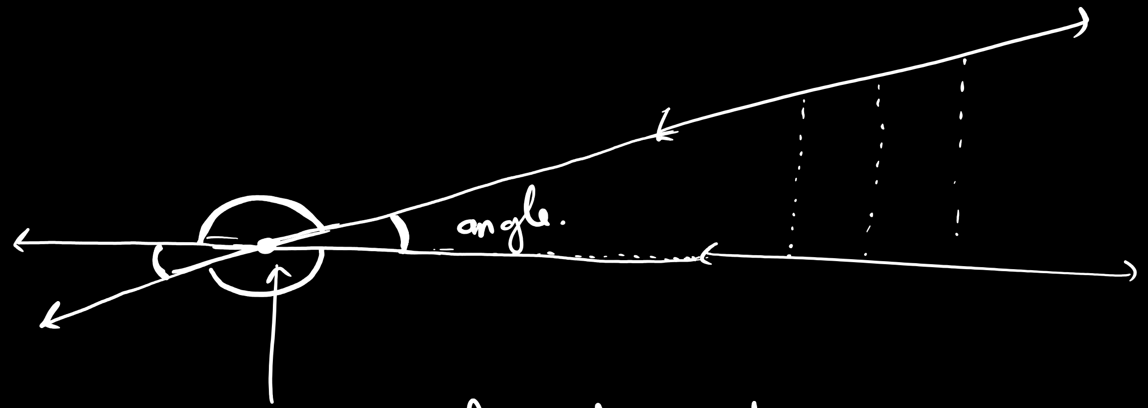
Geometry

Chapter 1

Parallel Lines



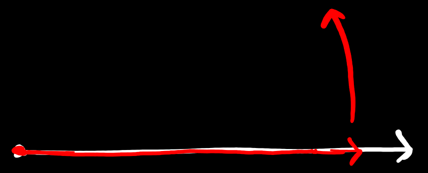
distance between two line is constant.

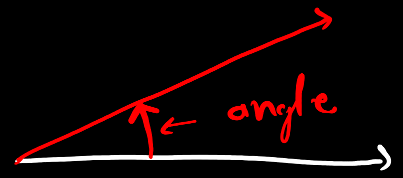


Point of intersection

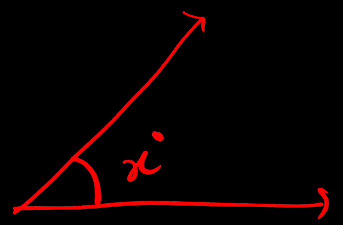
Intersecting line.

Angles.





Types of angle



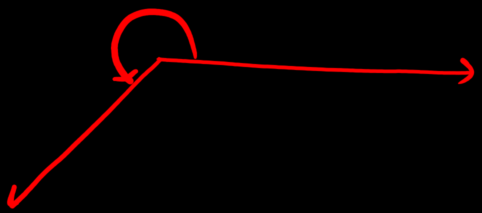
→ Acute angle $0^\circ < x^\circ < 90^\circ$

→ Right angle $x = 90^\circ$

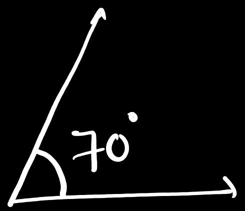
→ Obtuse angle $90^\circ < x < 180^\circ$

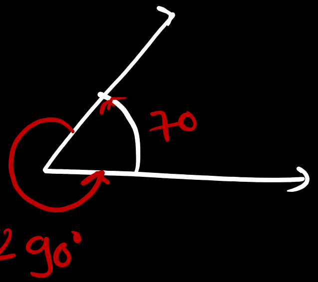
$\Rightarrow \quad \underline{\underline{x = 180^\circ}}$ straight line / straight angle.

$\Rightarrow \quad 180^\circ < x < 360^\circ$ <u>Reflex angle</u>



$\Rightarrow$ <u>Complete angle</u> made by two rays $\Rightarrow 360^\circ$



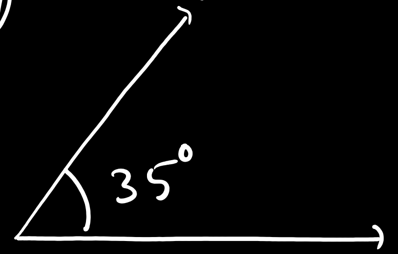


Reflex angle.

Reflex angle

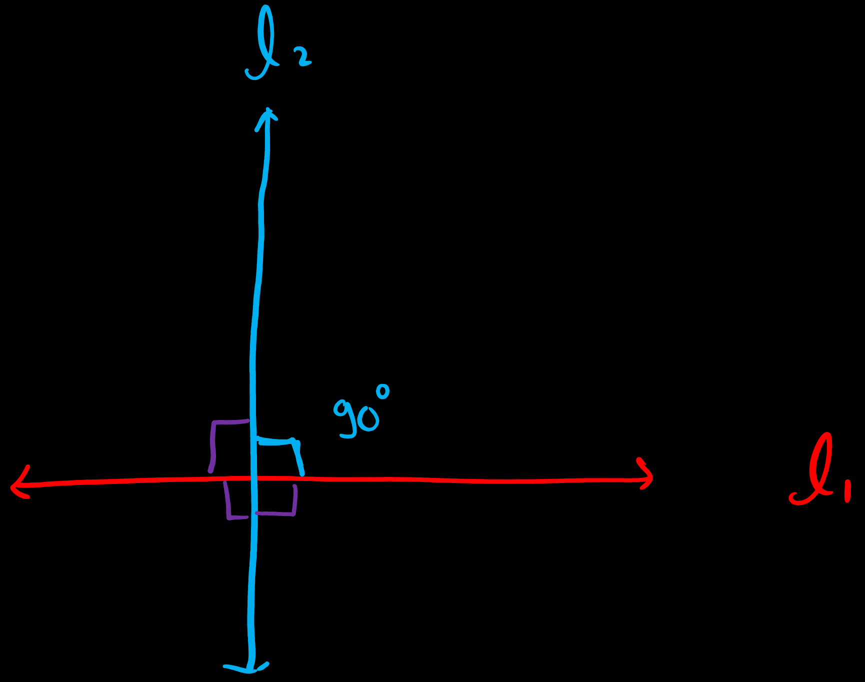
$= \underline{360^\circ - 70^\circ}$

Find Reflex angle:

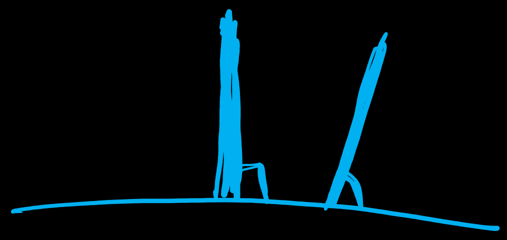


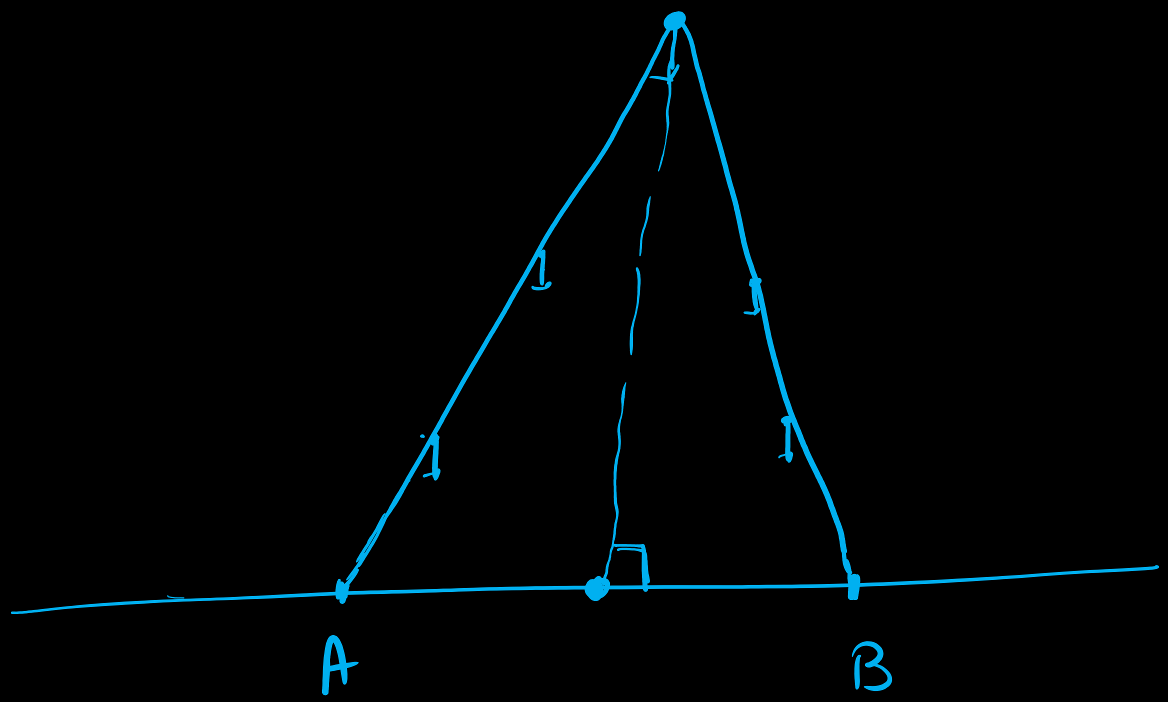
$360^\circ - 35^\circ = \underline{\underline{325^\circ}}$

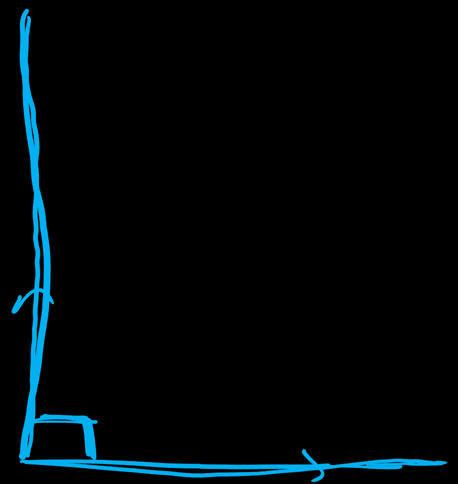
Perpendicular lines

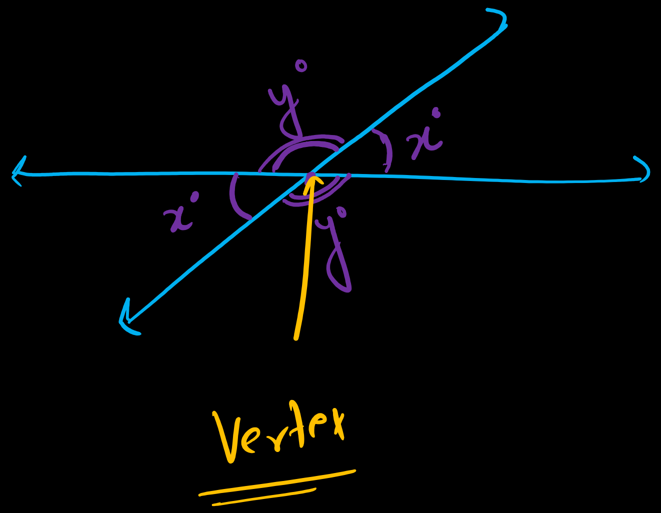


Two lines intersect at 90°




A
B





Vertically opposite angles are same

Complementary angle

$\angle 30^\circ + \angle 60^\circ = 90^\circ$

Complementary.

Supplementary angle

Sum of two angles is 180°

$\angle 60^\circ + \angle 120^\circ = 180^\circ$

Find supplementary angle of 45°.

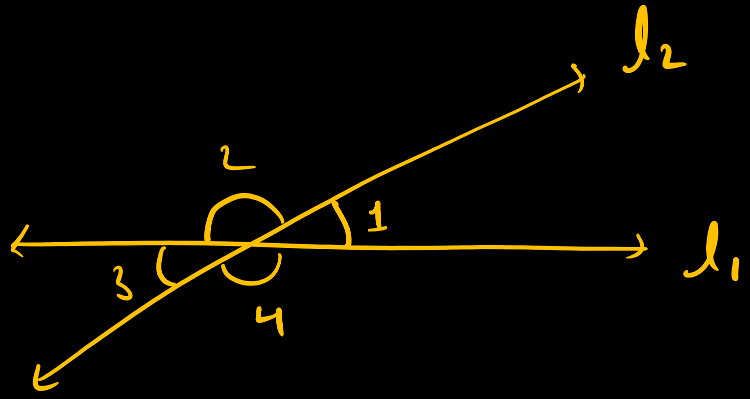
$$x + 45^\circ = 180^\circ$$

$$x = 180^\circ - 45^\circ$$

$$= \underline{\underline{135^\circ}}$$

Find complementary angle of $26°$.

Adjacent angles

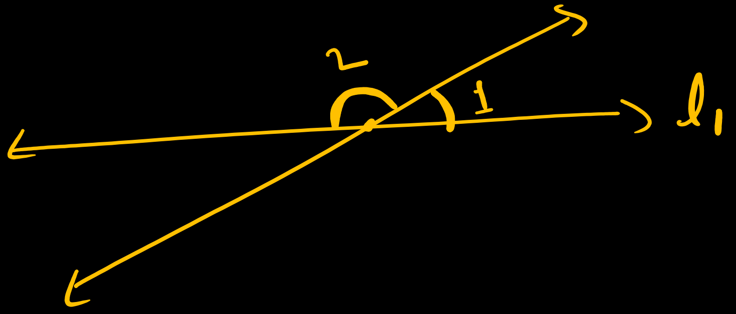


$\angle 1$ & $\angle 2$ are adjacent

$\angle 2$ and $\angle 4$ are adjacent to $\angle 1$.

Linear Pair

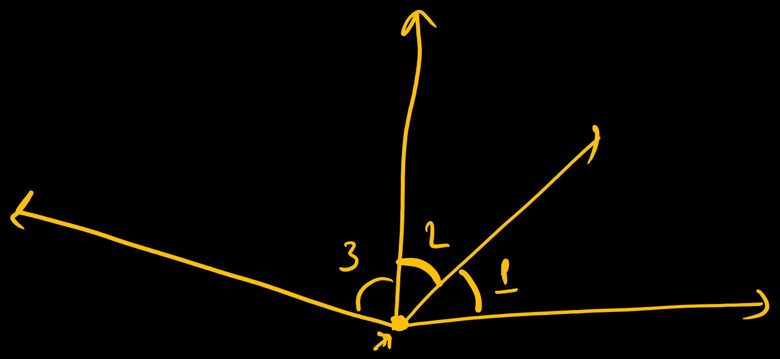
$\angle 1$ & $\angle 2$ are adjacent



$\underline{\angle 1 + \angle 2} = 180^\circ$

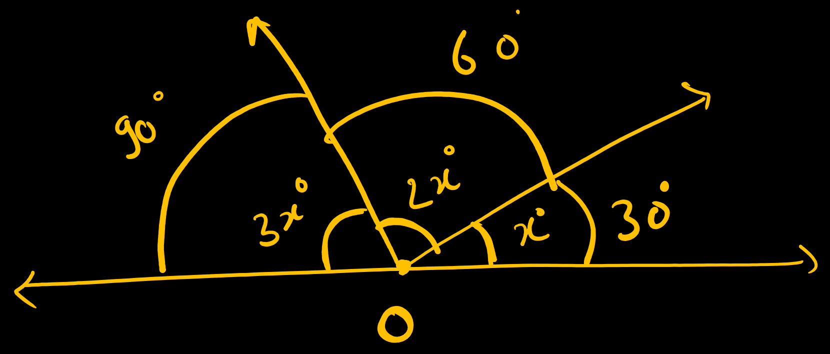
↑

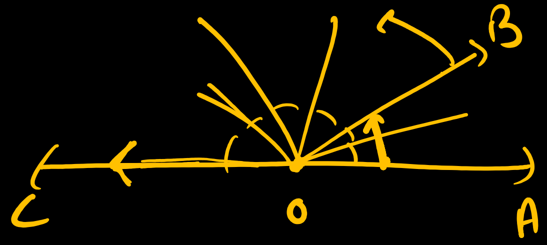
Linear pair.



$\left.\begin{array}{l}\angle 1 \ \& \ \angle 2 \\ \angle 2 \ \& \ \angle 3\end{array}\right\}$ adjacent

$\angle 1$ & $\angle 3$ } Not adjacent.



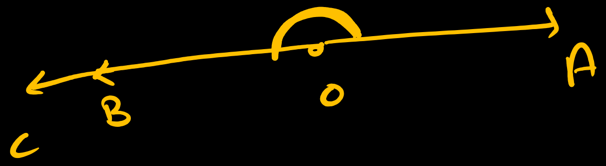


find ∠x

$$x + 2x + 3x = 180^\circ$$

$$6x = 180^\circ$$

$$\boxed{x = 30^\circ}$$



Tue : 2 : 15 pm IST

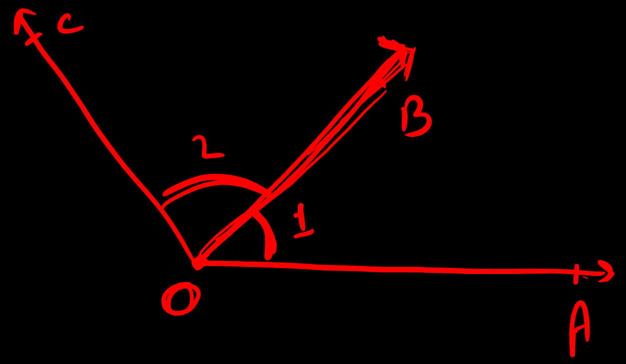
Friday : 2:15 pm IST

Sat : 8 am IST

Th : 2: 15 pm

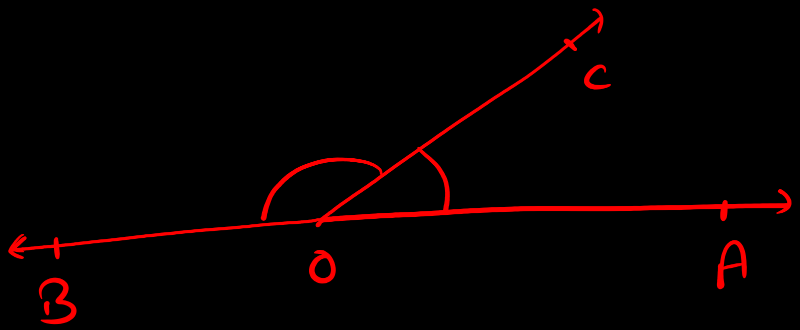
$\boxed{6:30 \text{ pm}}$

L-2



Adjacent

$\angle AOB$ $\angle COB$



AOB ⇒ straight line

$\angle AOC$ & $\angle BOC$

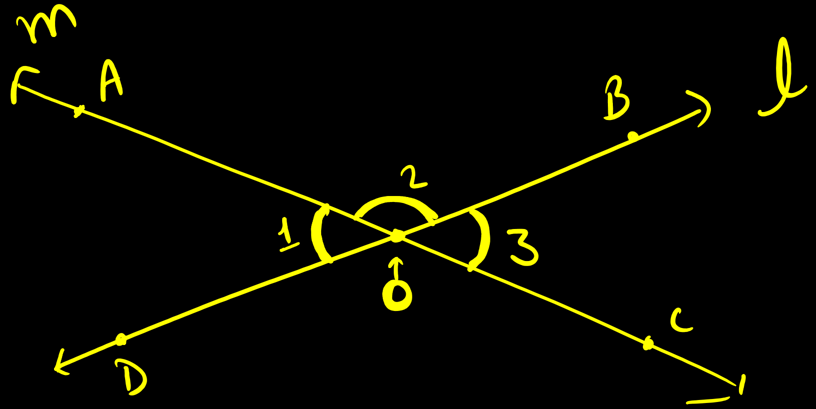
Adjacent $\angle$s

$\angle AOC$ & $\angle BOC$

Linear pair

Vertically opposite angles aka Vertical angle

formed by two intersecting lines.



$\angle AOD$ & $\angle AOB$

$\angle AOD$ and $\angle BOC$ are vertical angles or vertically opp. $\angle$s.

$\Rightarrow$ Vertical angles are congruent (= look alike or same)

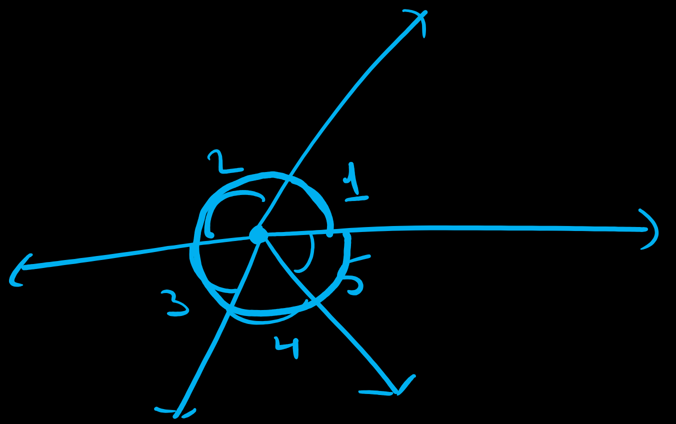
i.e. $m\angle AOD = m\angle BOC$

- $\angle AOB$ & $\angle DOC$ are also <u>vertical angles</u> or <u>vertically opposite $\angle$s.</u>

$$\boxed{m\angle AOB = m\angle DOC}$$

Angles at a point

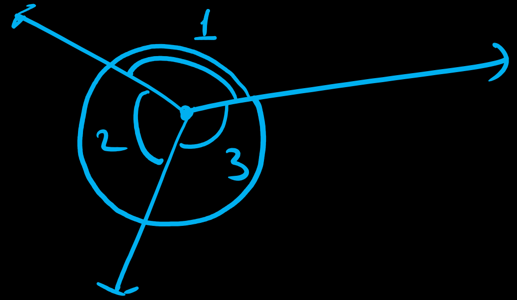
Sum of all the angles at a point is always $\underline{\underline{360^\circ}}$



$\Rightarrow \underline{\angle 1 + \angle 2 + \angle 3 + \angle 4 + \angle 5 = 360^\circ}$

$\angle \Rightarrow$ symbol for angle

$\angle$

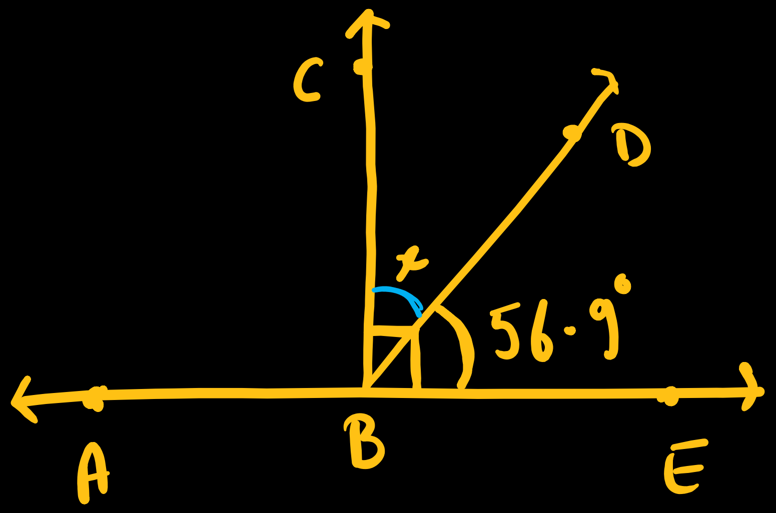


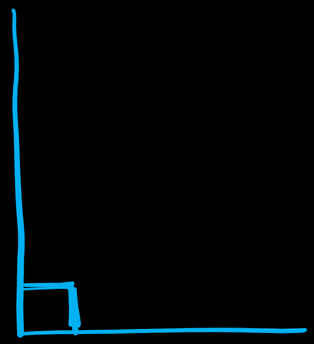
$\Rightarrow \underline{\angle 1 + \angle 2 + \angle 3 = 360^\circ}$

Find x

$\angle CBE = 90^\circ$

$\angle DBE = 56.9^\circ$



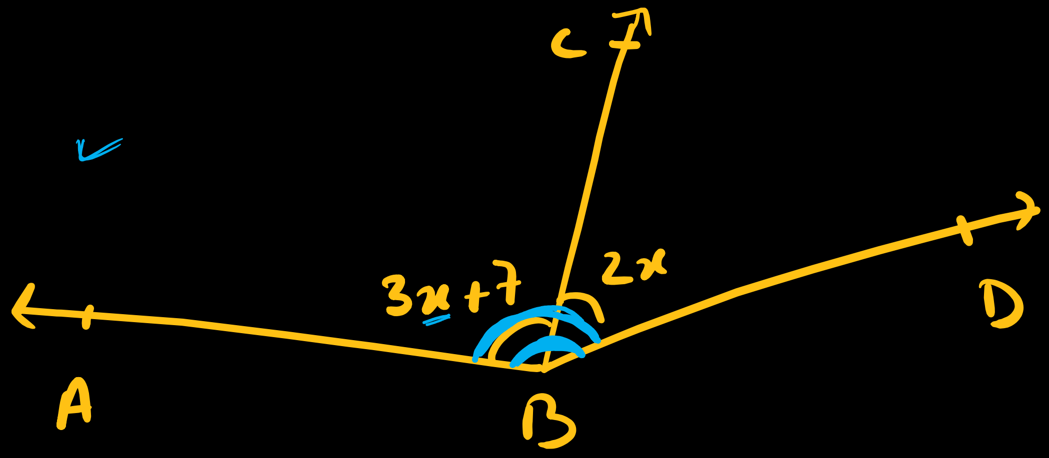


$x = 90^\circ - 56.9^\circ$

$= 33.1^\circ$

Given: $m\angle ABD = 178.9^\circ$

Find $\angle ABC$.



$\angle ABC = 3x + 7 = ?$

$\angle CBD = 2x$

$\angle ABC + \angle CBD = \angle ABD$

$\boxed{3x + 7 + 2x = 178.9^\circ}$

$5x + 7 = 178.9^\circ$

$5x = 178.9 - 7$

$\frac{\cancel{5}x}{\cancel{5}} = \frac{171.1}{5}$

$x = \frac{171.1}{5}$

$x = 34.22$

$$\begin{array}{r} 34.22 \\ 5 \,)\, 171.1 \\ -15 \\ \hline 21 \\ 20 \\ \hline 11 \\ 10 \\ \hline 10 \end{array}$$

$\angle ABC = 3x + 7$

$= 3 \times (34.22) + 7$

$= 102.66 + 7$

$= 109.66^\circ$

Ex. Two supplementary angles differ by 34°. Find the angles.

tr

one angle : $\boxed{x}$ ✓   other ∠ : $\boxed{x+34}$

$2x = \underbrace{180 - 34}$

$2x = 146$

$x + (x+34) = 180°$

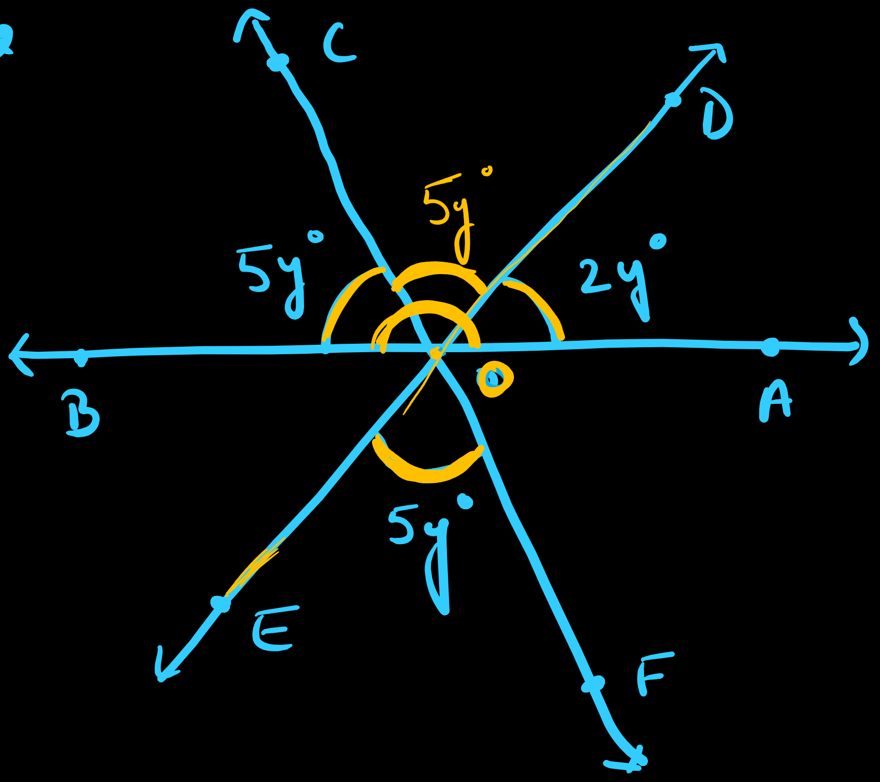
$\frac{2x}{2} = \frac{146}{2}$

$2x + 34 = 180°$

$\boxed{x = 73°}$

one angle = 73°   other angle = 73° + 34° = 107°

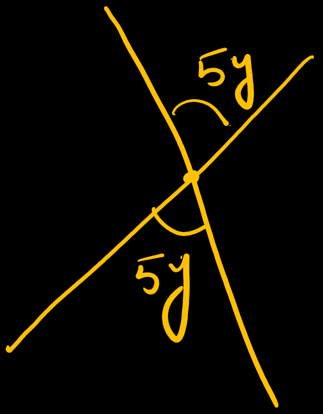
Three straight line AB, CF and DE intersects at O. Determine the value of y.



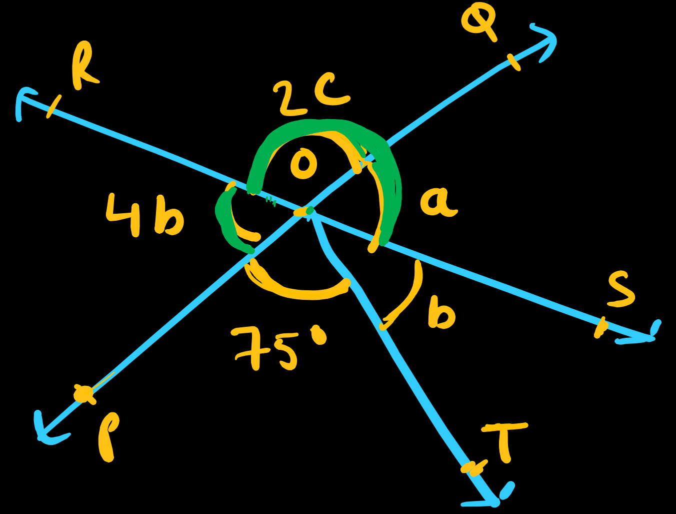
$$5y + 5y + 2y = 180^\circ$$

$$\frac{\cancel{12}y}{\cancel{12}} = \frac{180^\circ}{12}$$

$$\boxed{y = 15^\circ}$$



Two straight lines PQ and RS intersects each other at O. If $m\angle POT = 75^\circ$, find the value of a, b, and c.



$4b + 75^\circ + b = 180^\circ$

$5b + 75^\circ = 180^\circ$

$5b = 180^\circ - 75^\circ$

$5b = 105$

$\boxed{b = 21}$

$\angle ROP$ & $\angle QOS$ are vertical $\angle$s.

$\therefore \angle ROP = \angle QOS$

$4b = a$

$a = 4b$

$a = 4 \times 21$

$\boxed{a = 84}$

$2c + a = 180^\circ$

$2c + 84 = 180^\circ$

$2c = 180^\circ - 84$

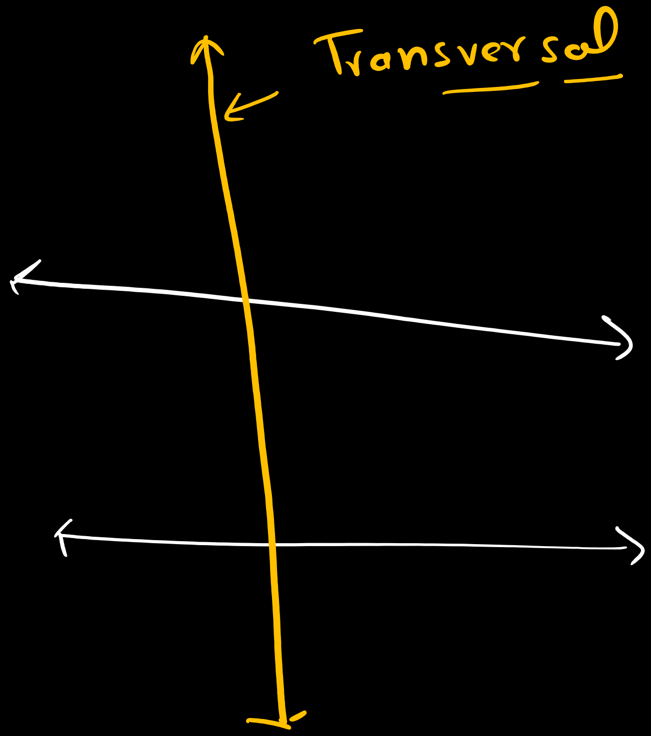
$2c = 96^\circ$

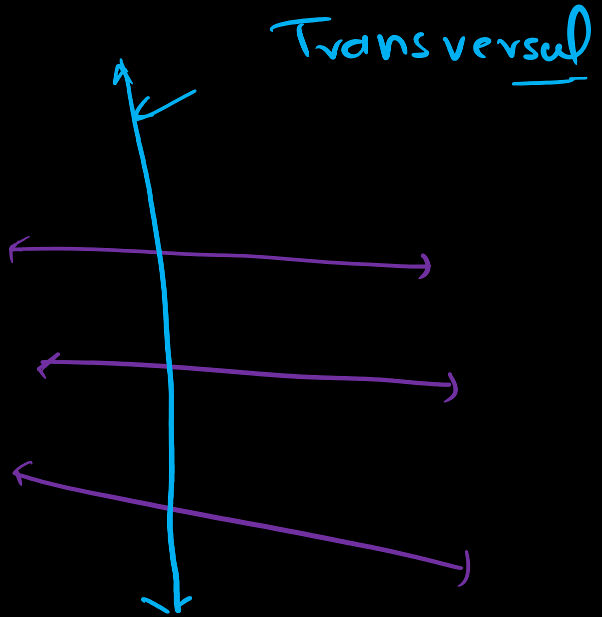
$c = \frac{96}{2}$

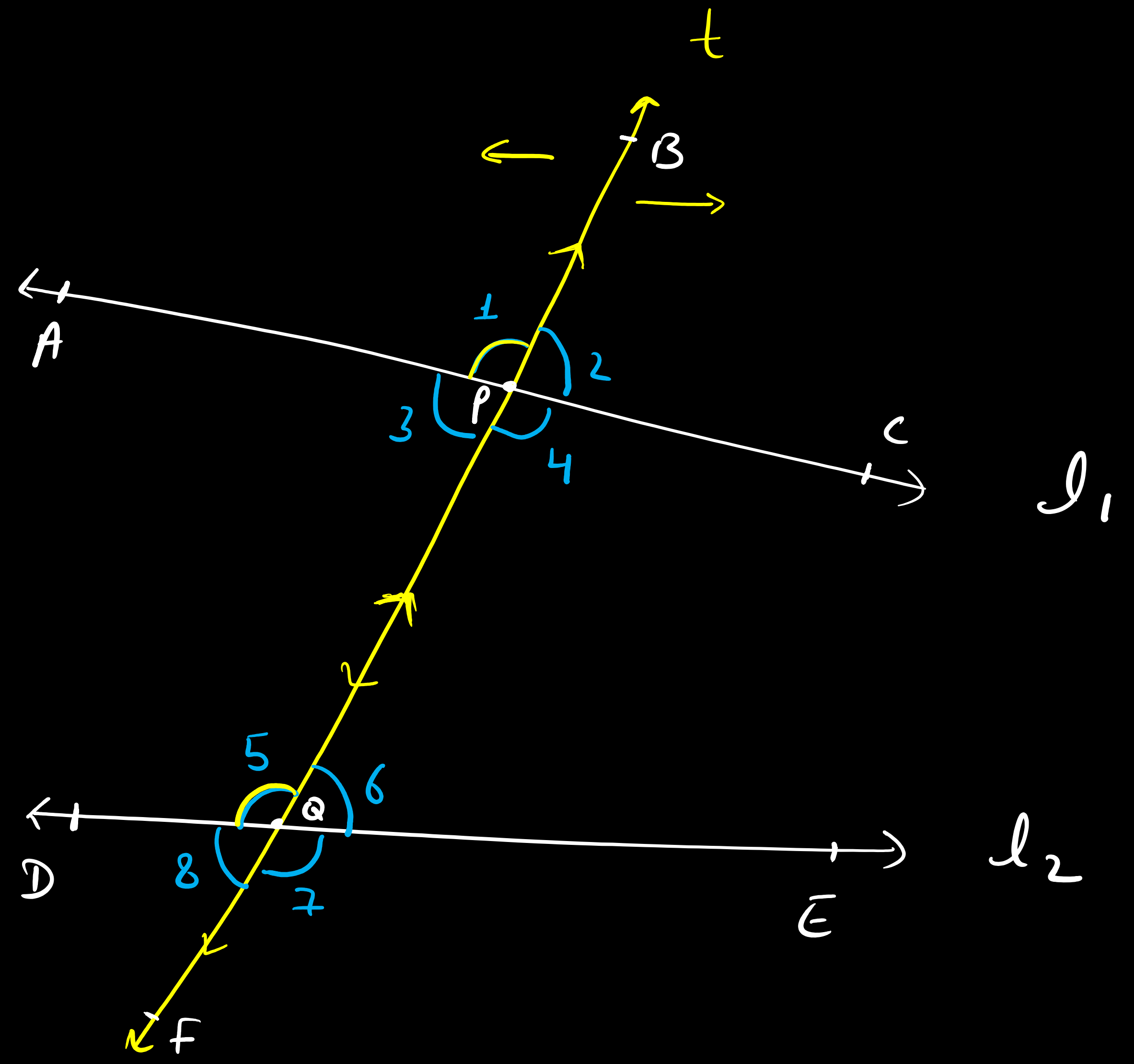
$\boxed{c = 48}$

L-3

Transversal





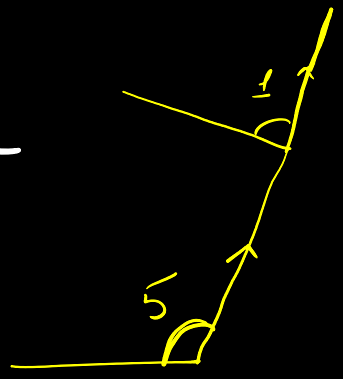


Corresponding angle

Pair

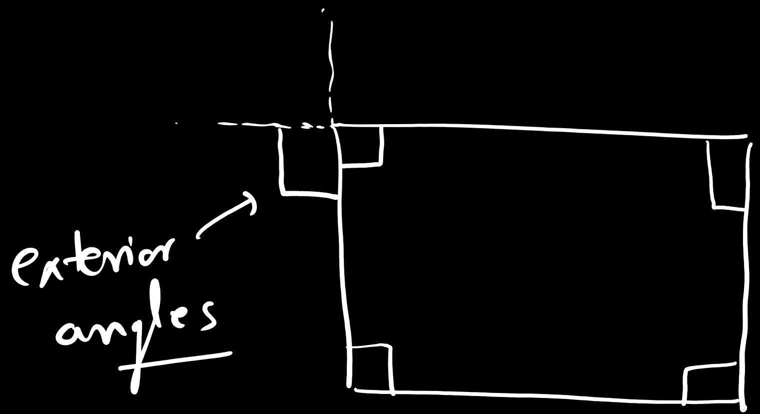
$\angle 1$ & $\angle 5$

$\angle 3$ & $\angle 8$



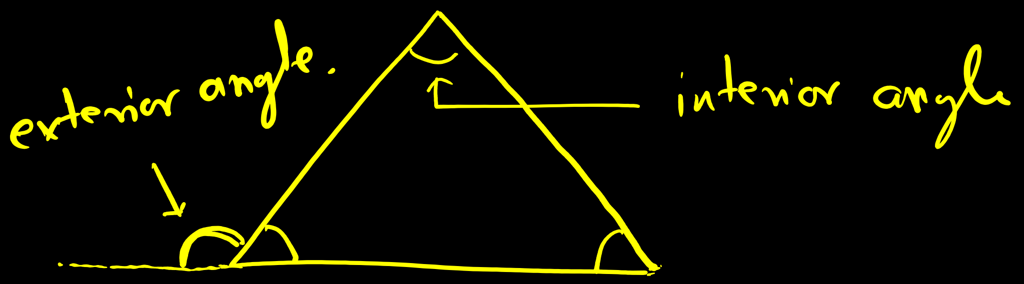
Exterior Angles : Angles whose arms does not include PQ are exterior angles

eg: $\angle 1$, $\angle 2$, $\angle 7$ and $\angle 8$ are exterior angles.



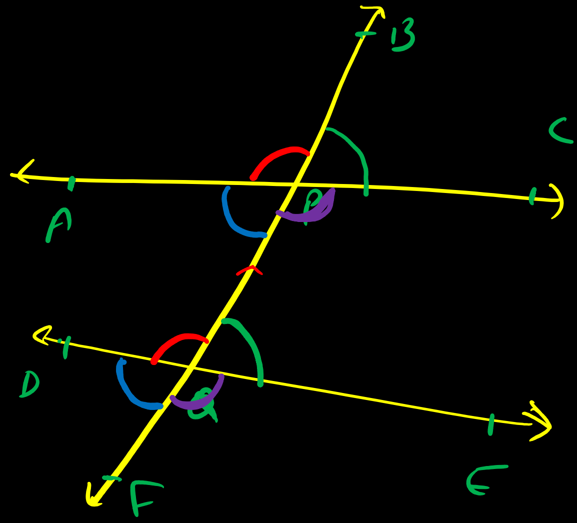
Interior Angles: The Angles whose arms includes line segment PQ. are called interior angles

eg: $\angle 3$, $\angle 4$, $\angle 5$ & $\angle 6$ are interior angles.



Corresponding Angles

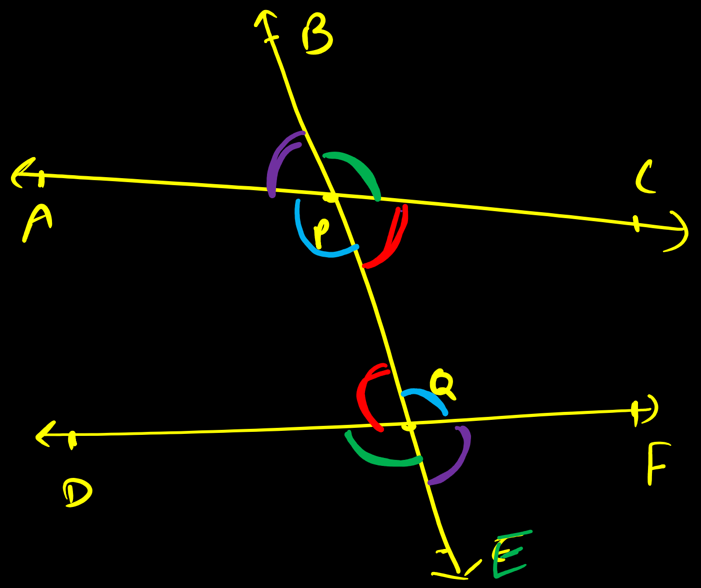
↳ Pair of angles in which one arm of both the angles is on the same side of the transversal and the other arms are directed in the same direction.



Alternate angles : A pair of angles in which one arm of each angles is on the opposite sides of the transversal and others arms are directed in opposite direction are called alternate angle.

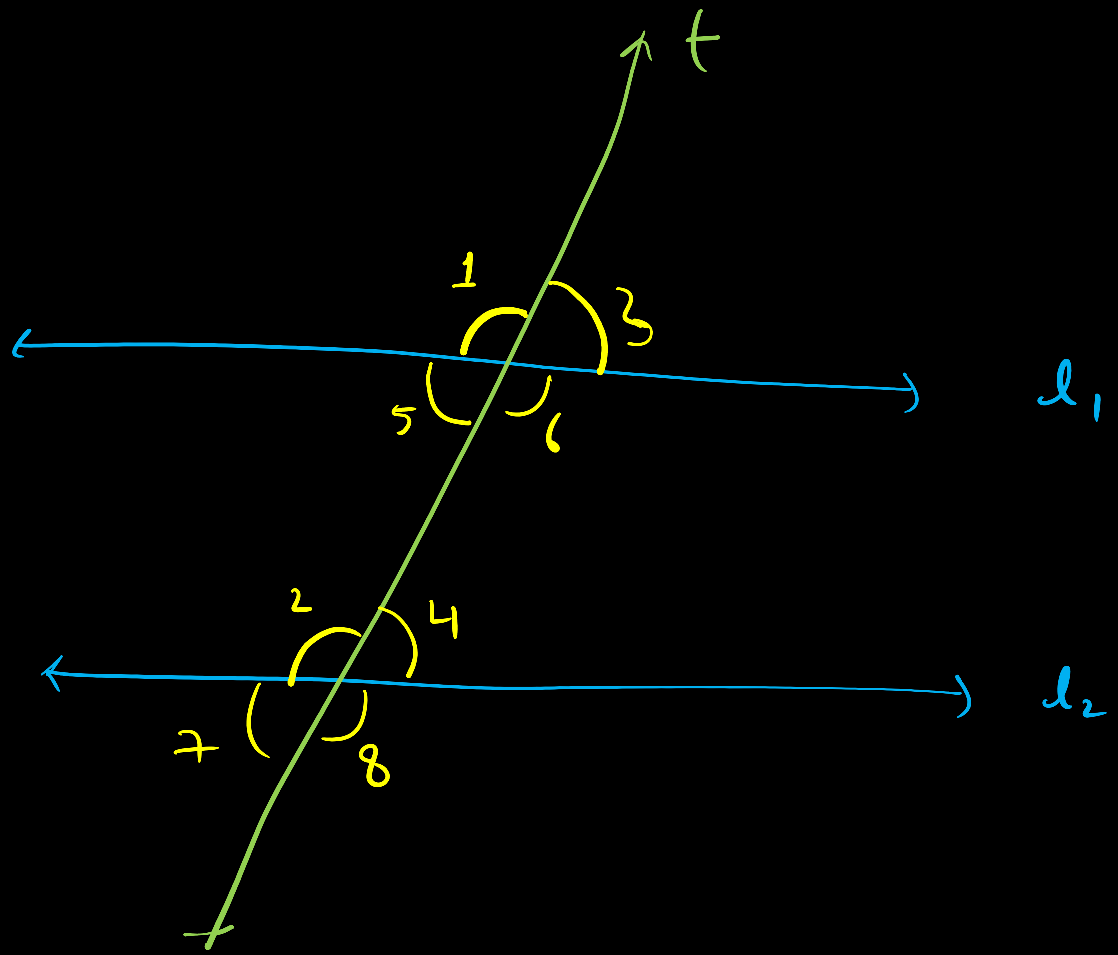
→ Alt. interior angles

→ Alt. exterior angles



l_1 & l_2 are Parallel lines

$t \rightarrow$ transversal



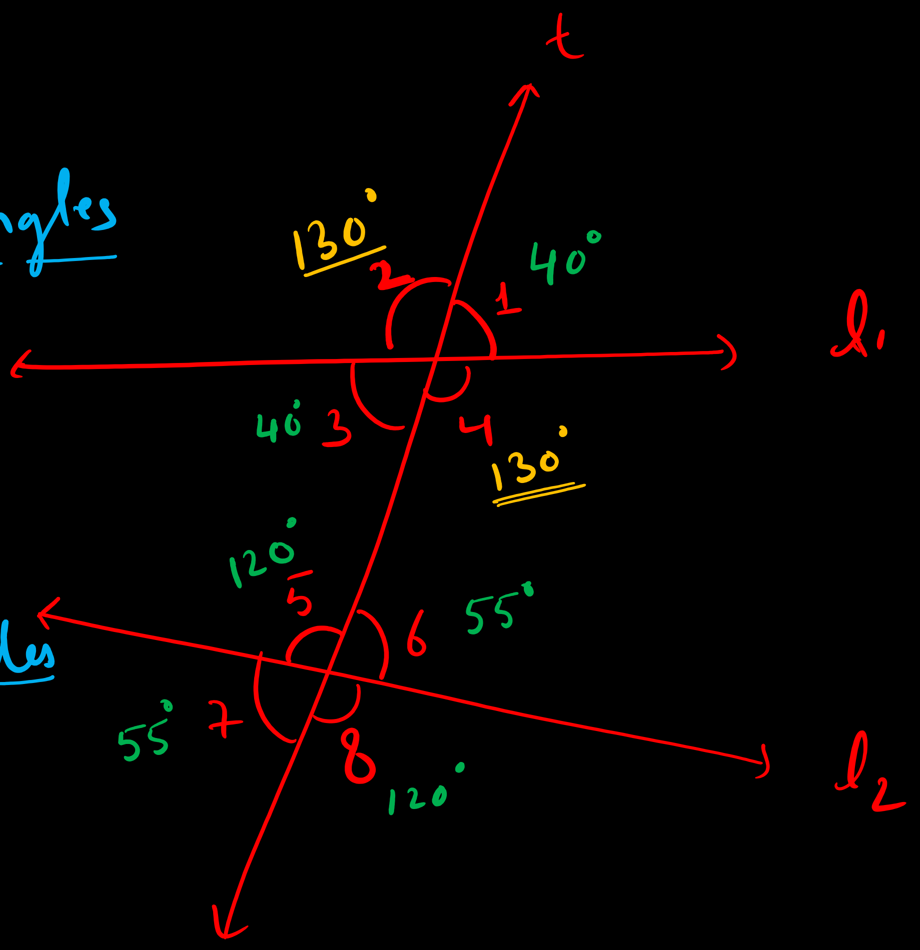
$\Rightarrow$ Pair of corresponding angles are equal. i.e. $\angle 1 = \angle 2$, $\angle 3 = \angle 4$, etc.

$\Rightarrow$ Pair of alternate angles are equal i.e. $\angle 6 = \angle 2$, $\angle 3 = \angle 7$, etc.

L-4

Experiment 1: Non-parallel lines & transversal

Draw two non-parallel lines and a transversal.



Alternate interior angles

$\angle 3 \neq \angle 6$

$\angle 4 \neq \angle 5$

Alternate exterior angles

$\angle 1 \neq \angle 7$

$\angle 2 \neq \angle 8$

Vertical Angles

$\angle 2 = \angle 4$

$\angle 1 = \angle 3$

$\angle 5 = \angle 8$

$\angle 6 = \angle 7$

Corresponding angles

$\angle 2 \neq \angle 5$

$\angle 1 \neq \angle 6$

$\angle 3 \neq \angle 7$

$\angle 4 \neq \angle 8$

Co-interior angles.

→ interior angles on the same side of transversal.

eg: $\angle 4$ & $\angle 6$ are co interior $\angle$s

$\angle 3$ & $\angle 5$ are co interior $\angle$s

Sum of co interior angles

$$\angle 4 + \angle 6 = 130^\circ + 55^\circ = 185^\circ \neq 180^\circ$$

they are not supplementary

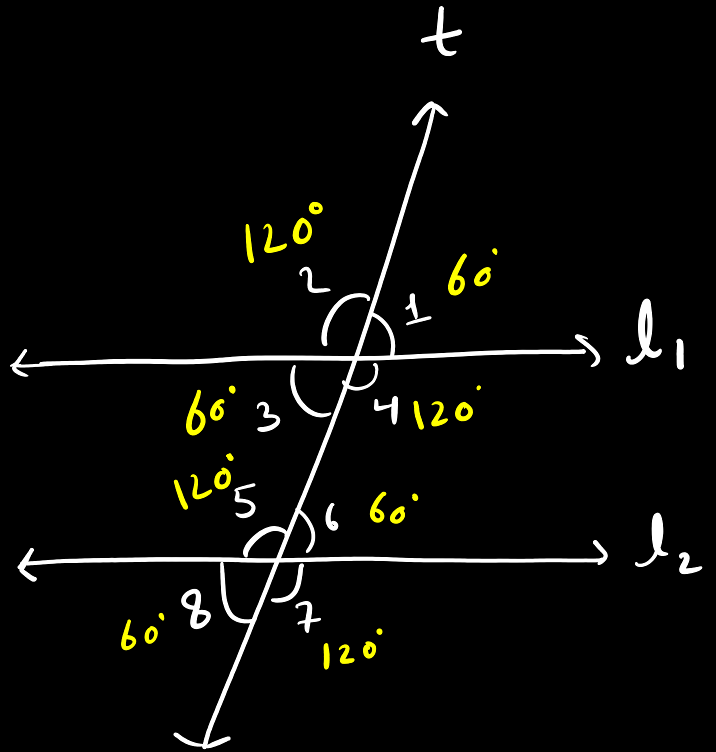
Experiment 2: Parallel Lines and transversal

Draw two parallel lines and a transversal

Alternate interior angles:

$\angle 4 = \angle 5$

$\angle 3 = \angle 6$



Corresponding angles

$\angle 2 = \angle 5$

$\angle 1 = \angle 6$

$\angle 3 = \angle 8$

$\angle 4 = \angle 7$

Alternate exterior angles

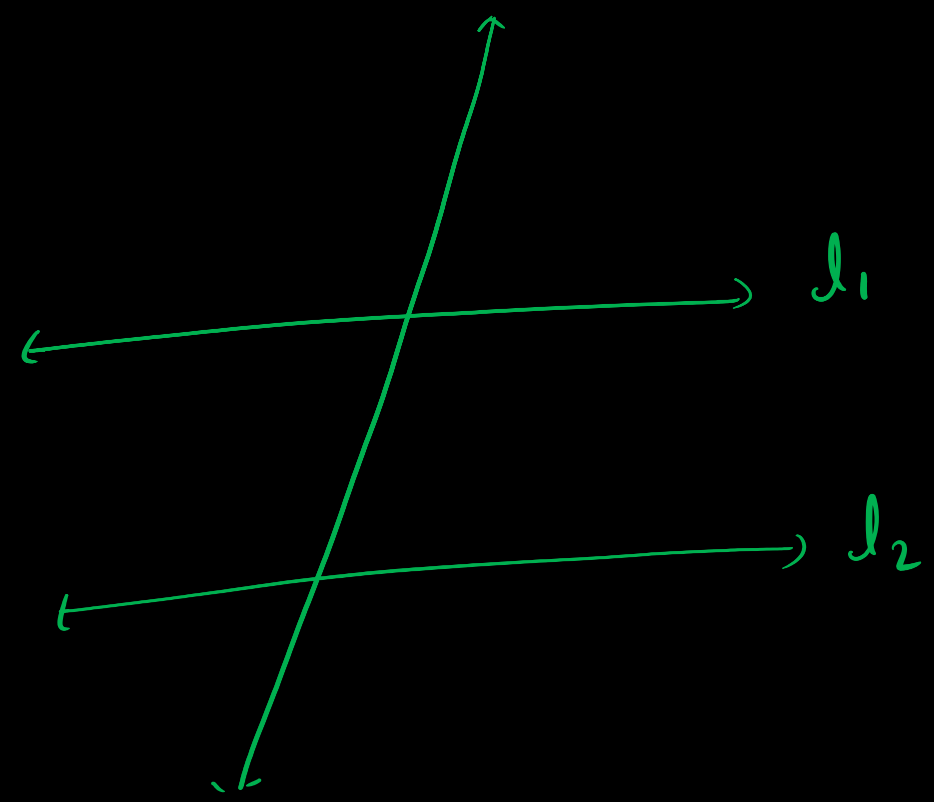
$\angle 2 = \angle 7$

$\angle 1 = \angle 8$

Sum of co interior angles

$\angle 4 + \angle 6 = 120° + 60° = 180° =$ Supplementary

$\angle 3 + \angle 5 = 60° + 120° = 180° =$ Supplementary



Two lines are parallel if:

(i) pairs of corresponding angles are equal / congruent

OR

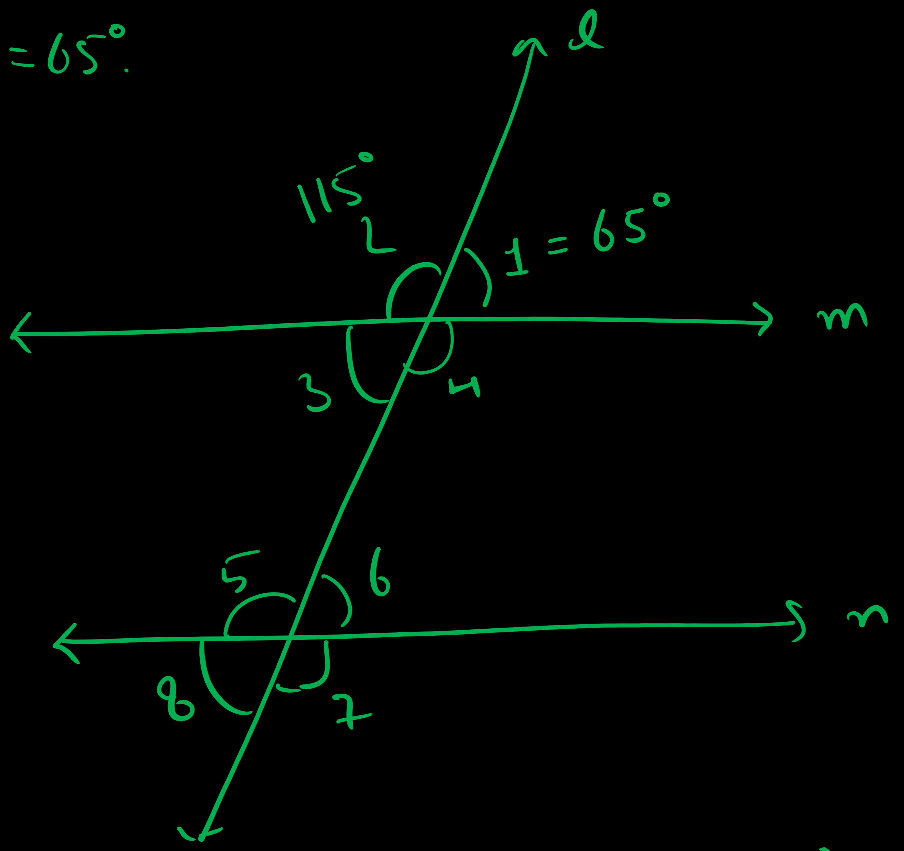
(ii) pairs of alternates angles are equal.

OR

(iii) Co interior angles must be supplementary

Q. In the given fig. m || n and ∠1 = 65°.
(|| : parallel to)

Find all other angles



Sol: Given, ∠1 = 65°

∵ ∠1 & ∠2 are linear pair

∴ $\angle 1 + \angle 2 = 180^\circ$

$\angle 2 = 180^\circ - \angle 1$

$= 180^\circ - 65^\circ$

$= 115^\circ$

$\angle 3 = \angle 1 = 65^\circ$ { vertical angles }

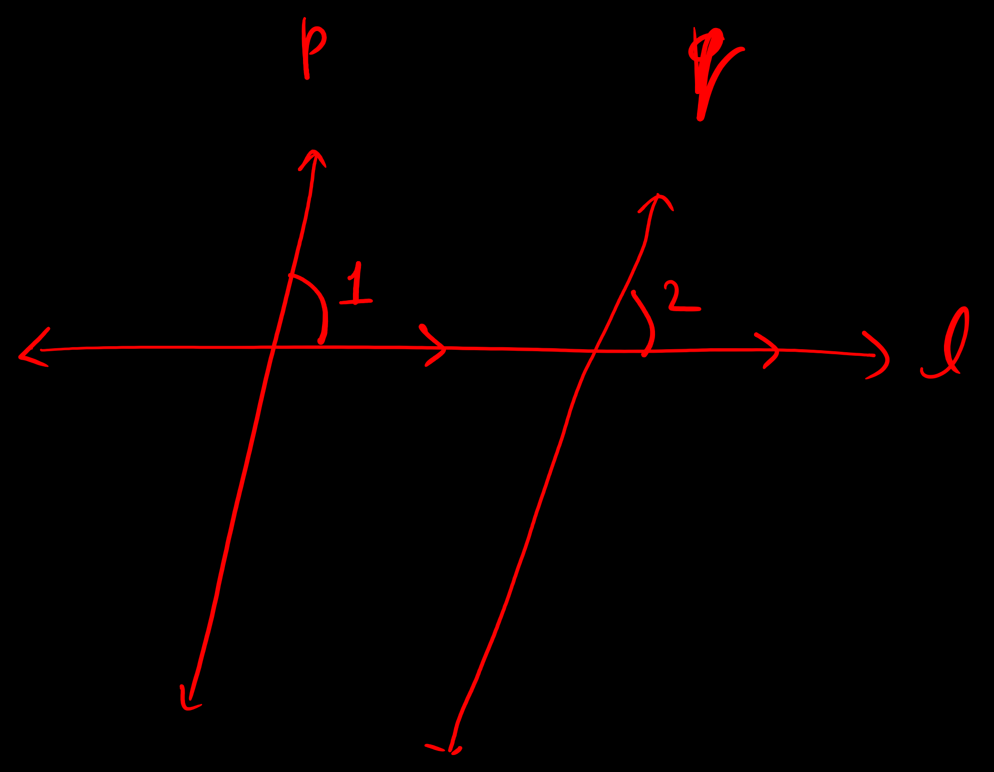
$\angle 4 = \angle 2 = 115^\circ$ [vert. ∠s]

$\angle 8 = 65^\circ$ { $\angle 3 = \angle 8$ }

$\angle 7 = 115^\circ$ { $\angle 2 = \angle 7$, alt. ext. ∠s }

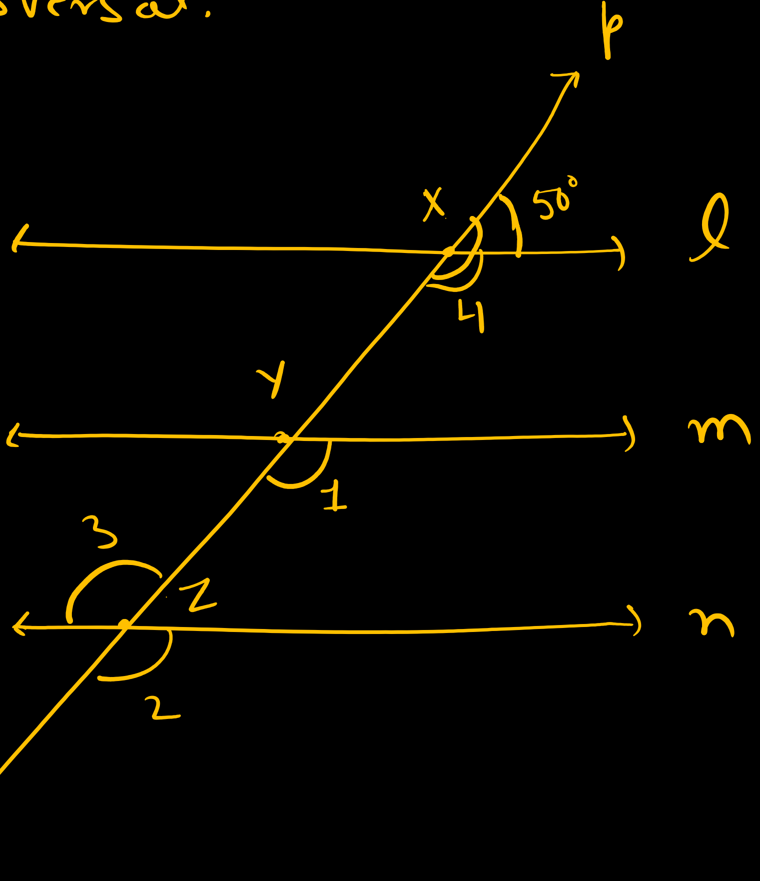
$\angle 6 = 65^\circ$ { ∠1 & ∠6 are corresponding ∠s }

$\angle 5 = 115^\circ$



p
r
1
2
l

Q. $l \parallel m \parallel n$, $p \rightarrow$ transversal.



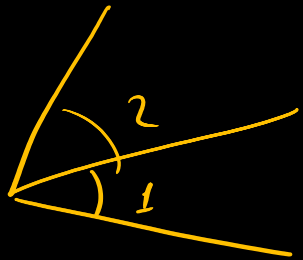
$\angle 4 = 180° - 50°$

$= 130°$

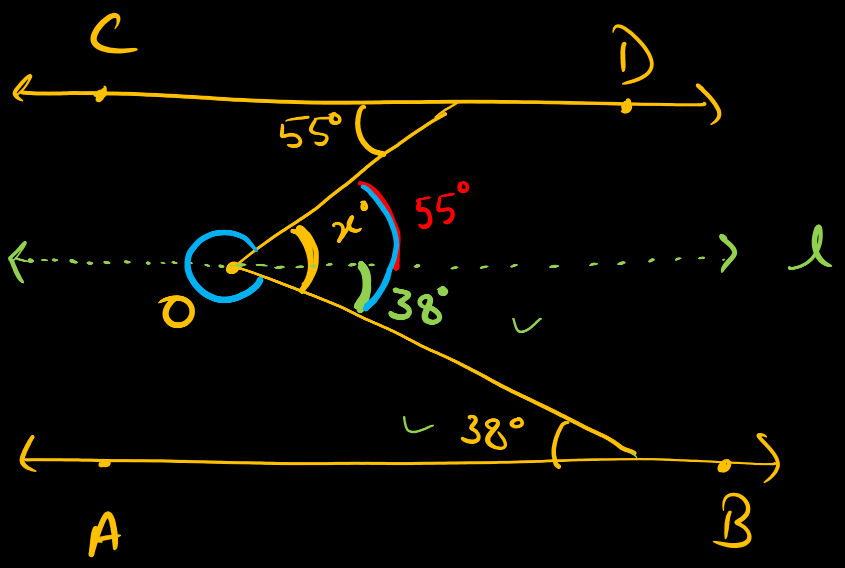
$\angle 1 = \angle 4 = 130°$ (corres. $\angle$s)

$\angle 2 = \angle 1 = 130°$ (corres. $\angle$s)

$\angle 3 = \angle 2 = 130°$ (vertical $\angle$s)



Q. CD || AB



Construction :

Draw a line l || CD.

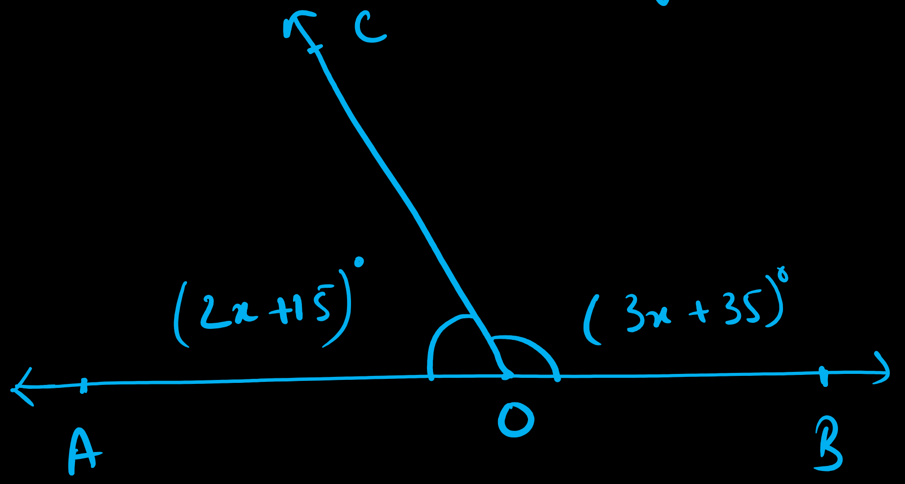
$\because$ CD || AB (given in question)

$\therefore$ l || AB

$\angle x = 55^\circ + 38^\circ$

$\angle x = 93^\circ$

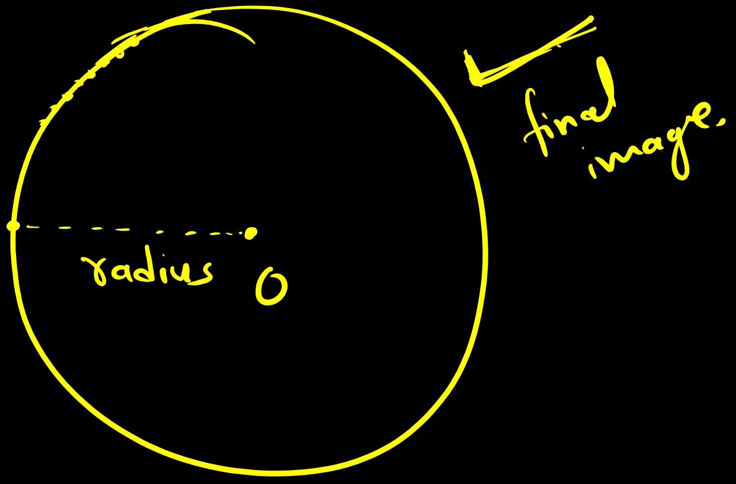
Q. Find the value of x in the given fig.

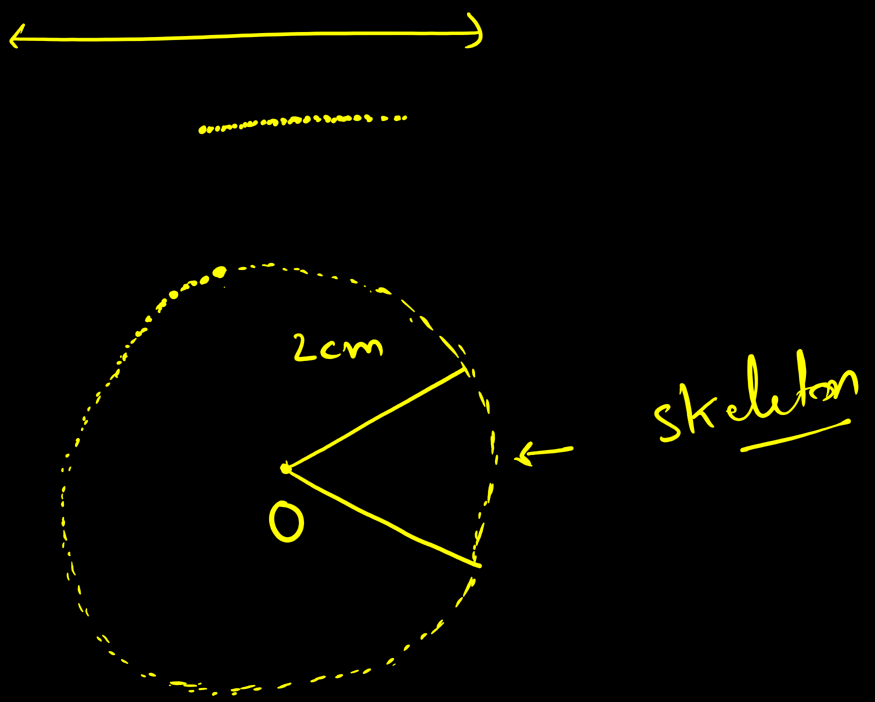


$$(2x+15)^\circ + (3x+35)^\circ = 180^\circ$$

$$\boxed{x = 26^\circ}$$

Area of Circle





⇒ Collection of points which are equidistant from a fixed central point

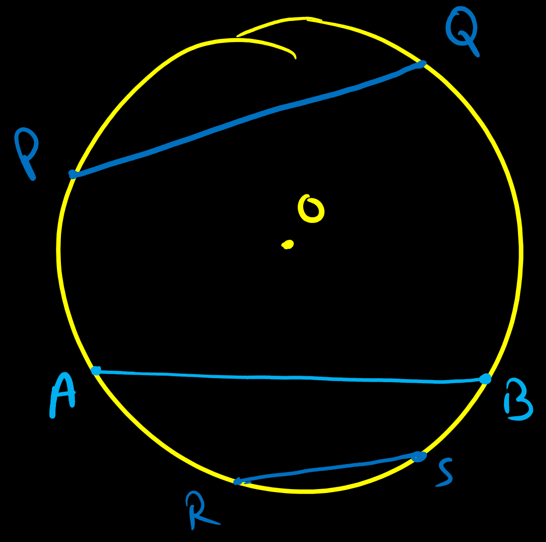
equidistant ↓ Radius of circle.

central point ↓ Centre of circle

Chord

↓

a line segment which joins any two points on a circle.



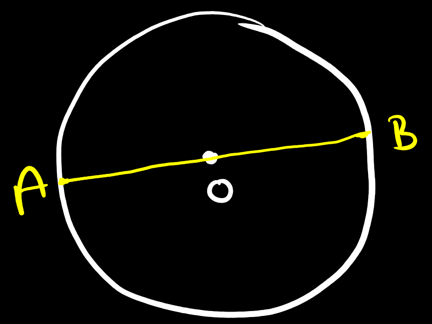
Here line segment AB is a chord of circle.

$\overline{PQ}$ & $\overline{RS}$ are also chords.

Diameter

⇒ A chord which passes through the centre of a circle

⇒ AB is a chord which passes through centre of circle hence AB is also diameter of circle.



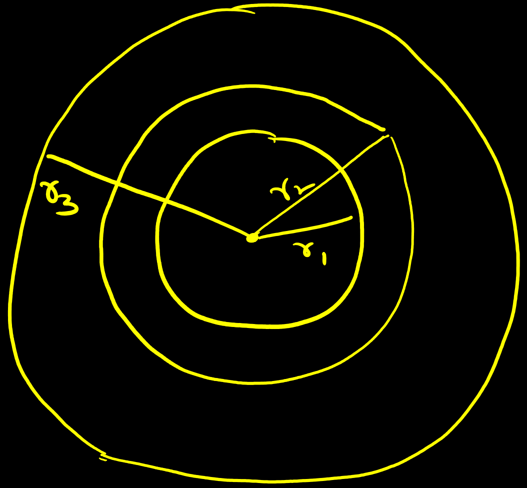
OA ⇒ Radius

OB ⇒ Radius.

Diameter = Radius + Radius

Diameter = 2 x Radius

Concentric Circle :



$r_1 = 3$ cm

$r_2 = 4$ cm

$r_3 = 5$ cm.

Two or more circles with same centre but different radii.