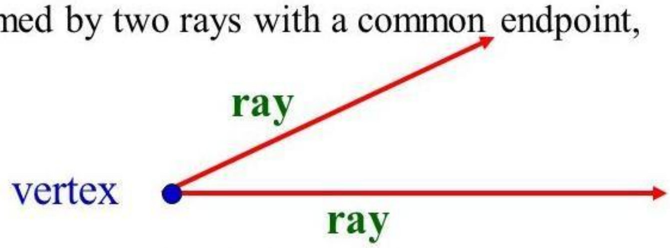
Lines and Angles

Recap Geometrical Terms

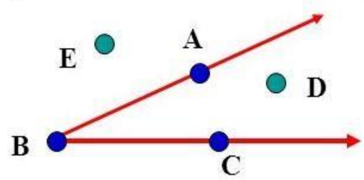
Point		An exact location on a plane is called a point.
Line		A straight path on a plane, extending in both directions with no endpoints, is called a line.
Line segment		A part of a line that has two endpoints and thus has a definite length is called a line segment.
Ray		A line segment extended indefinitely in one direction is called a ray.

Angle and Points

- An Angle is a figure formed by two rays with a common endpoint, called the **vertex.**



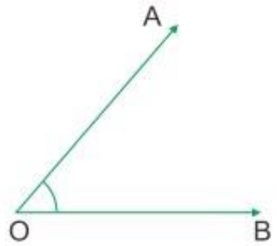
- Angles can have points in the interior, in the exterior or on the angle.



Points A, B and C are on the angle. D is in the interior and E is in the exterior. B is the vertex.

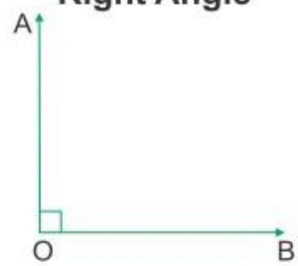
Types of Angles

Acute Angle



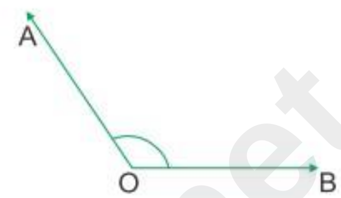
$0^\circ <$ Measure $< 90^\circ$

Right Angle



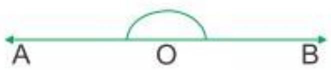
Measure = 90°

Obtuse Angle



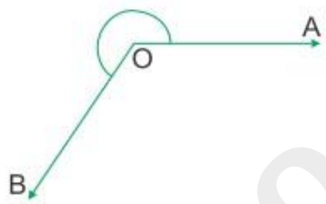
$90^\circ <$ Measure $< 180^\circ$

Straight Angle



Measure = 180°

Reflex Angle

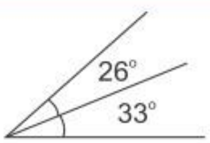


$180^\circ <$ Measure $< 360^\circ$

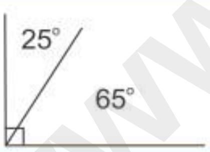
Complete Angle

Measure = 360°

Pair of Angles

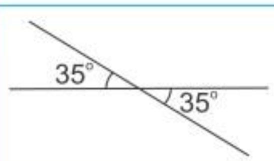


Adjacent Angles
- a common vertex and arm
- other arms lie on opposite sides of the common arm



Complementary Angles
- sum of measures of two angles is 90°
- each angle is called a complement of the other

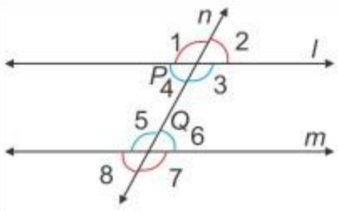
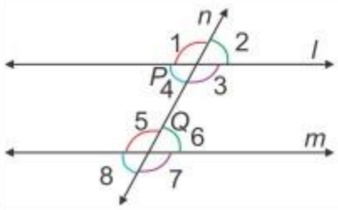
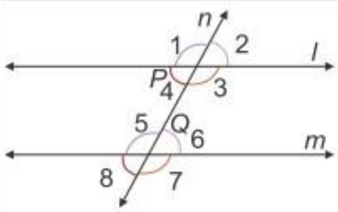
Supplementary Angles
- sum of measures of two angles is 180°
- each angle is called a supplement of the other



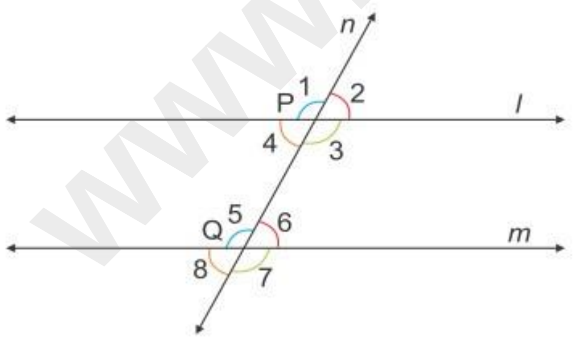
Vertically Opposite Angles
- angles formed by two intersecting lines having no common arm

Angles Made by Transversal

Transversal: A line intersecting two or more given lines in a plane at different points.

	**Exterior Angles**: Outside of the lines *l* and *m*. $\angle 1, \angle 2, \angle 7, \angle 8$ **Interior Angles**: Inside of the lines *l* and *m*. $\angle 3, \angle 4, \angle 5, \angle 6$
	**Corresponding Angles:** Pairs of angles that are at the same position at each intersection on the same side of the transversal. $\angle 1$ and $\angle 5$, $\angle 2$ and $\angle 6$, $\angle 3$ and $\angle 7$, $\angle 4$ and $\angle 8$
	**Alternate Exterior Angles:** Pairs of angles on opposite sides of the transversal but outside the two lines *l* and *m*. $\angle 1$ and $\angle 7$, $\angle 2$ and $\angle 8$ **Alternate Interior Angles:** Pairs of angles on opposite sides of the transversal but inside the two lines *l* and *m*. $\angle 4$ and $\angle 6$, $\angle 3$ and $\angle 5$

Conditions for Parallel Lines



Lines *l* and *m* are parallel if any of the following is true:

- Pairs of **alternate angles** are equal.

  $\angle 3 = \angle 5$, $\angle 1 = \angle 7$

- Pairs of **corresponding angles** are equal.

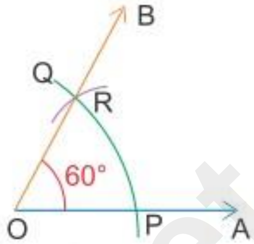
  $\angle 2 = \angle 6$, $\angle 4 = \angle 8$

- The sum of the **interior (or exterior) angles** on the same side of the transversal is **180°**.

  $\angle 3 + \angle 6 = 180^\circ$ *or*

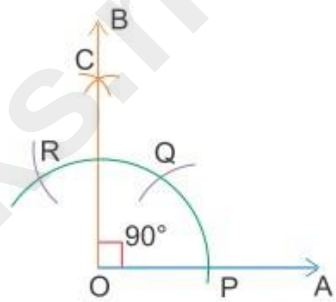
  $\angle 1 + \angle 8 = 180^\circ$

Constructions of Specific Angles



i Draw a ray OA
ii Using a compass, with O as centre and any radius draw an arc PQ which cuts OA at P
iii With P as centre and same radius draw an arc to cut the arc PQ at R
iv Join OR and produce it to form the ray OB
v The ∠AOB thus formed measures 60°

Note: To get angle of 30°, follow the above steps and then draw a angle bisector.



i Draw a ray OA
ii With O as centre and any radius draw an arc which cuts OA at P
iii With P as centre and same radius draw an arc to cut the arc in step (ii) at Q
iv With Q as centre and same radius as in step (ii) draw an arc to cut the arc in step (ii) at R
v With Q as centre and same radius draw an arc
vi With R as centre and same radius draw an arc, to cut the arc in Step (v) at C
vii Join OC and produce it to B
viii The ∠AOB thus formed measures 90°

Note: To get angle of 45°, follow the above steps and then draw a angle bisector
To get angle 120°, follow steps (i) to (iv) above, and join OR and produce it to B.

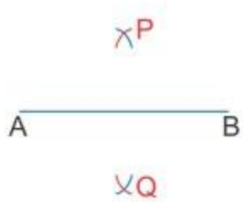
Constructions

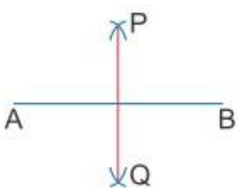
Drawing a Perpendicular Bisector

i. Draw a line segment AB of given length by using a scale

ii. With A as centre and radius more than half of AB, draw arcs on each side of AB

iii. With B as centre and same radius, repeat step (ii)

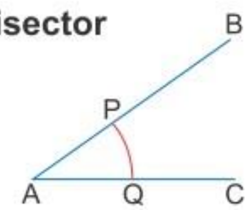


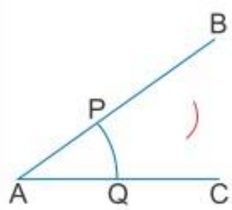


iv. Join line segment PQ, which is a perpendicular bisector to AB

Drawing an Angle Bisector

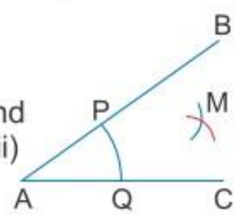
i. With A as centre and any radius, draw an arc cutting AB at P and AC at Q

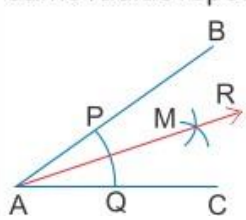




ii. With P as centre and radius more than half of PQ, draw an arc

iii. With Q as centre and same radius repeat step (ii)





iv. Join AM and produce it to AR. The ray AR is bisector of ∠BAC