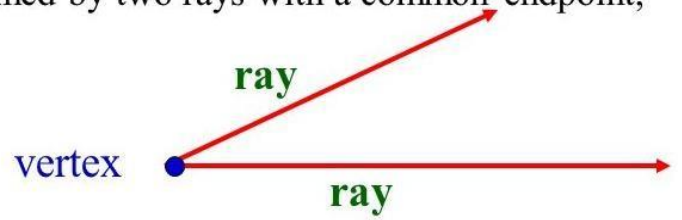
Lines and Angles

Recap Geometrical Terms

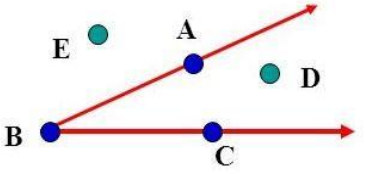
Point		An exact location on a plane is called a point.
Line		A straight path on a plane, extending in both directions with no endpoints, is called a line.
Line segment		A part of a line that has two endpoints and thus has a definite length is called a line segment.
Ray		A line segment extended indefinitely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



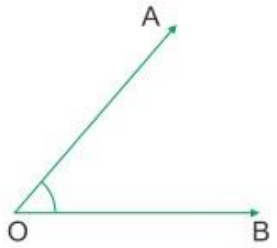
- Angles can have points in the interior, in the exterior or on the angle.



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

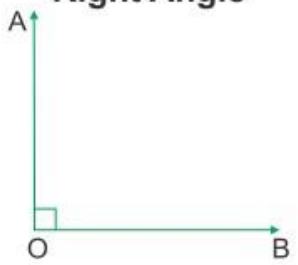
Types of Angles

Acute Angle



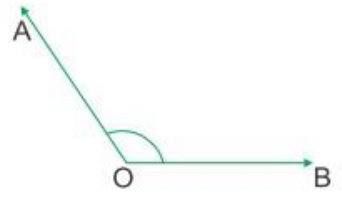
$0^\circ < \text{Measure} < 90^\circ$

Right Angle



Measure = 90°

Obtuse Angle

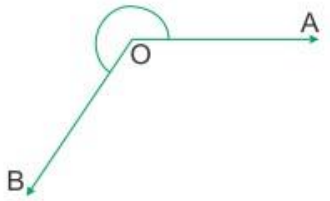


$90^\circ < \text{Measure} < 180^\circ$

Straight Angle

Measure = 180°

Reflex Angle

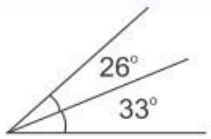


$180^\circ < \text{Measure} < 360^\circ$

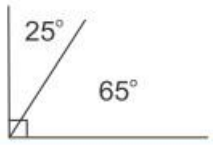
Complete Angle

Measure = 360°

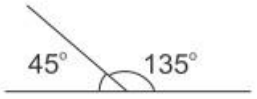
Pair of Angles



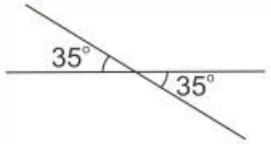
Adjacent Angles
- a common vertex and arm
- other arms lie on opposite sides of the common arm



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



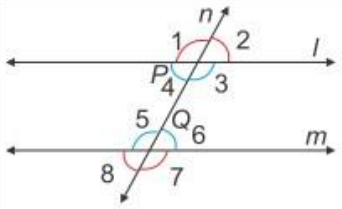
Supplementary Angles
- sum of measures of two angles is 180°
- each angle is called a supplement of the other



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

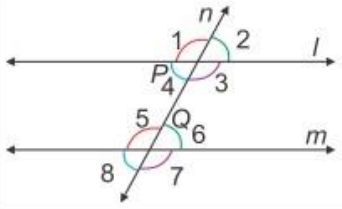
Angles Made by Transversal

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



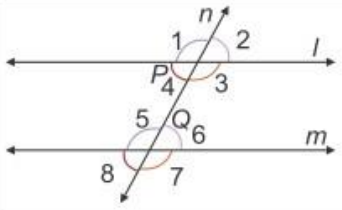
Exterior Angles: Outside of the lines *l* and *m*.
∠1, ∠2, ∠7, ∠8

Interior Angles: Inside of the lines *l* and *m*.
∠3, ∠4, ∠5, ∠6



Corresponding Angles: Pairs of angles that are at the same position at each intersection on the same side of the transversal.

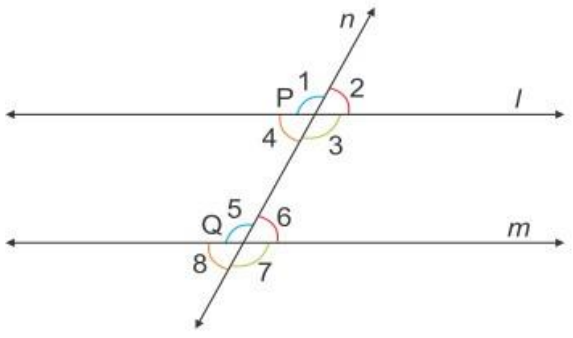
∠1 and ∠5, ∠2 and ∠6, ∠3 and ∠7, ∠4 and ∠8



Alternate Exterior Angles: Pairs of angles on opposite sides of the transversal but outside the two lines *l* and *m*. ∠1 and ∠7, ∠2 and ∠8

Alternate Interior Angles: Pairs of angles on opposite sides of the transversal but inside the two lines *l* and *m*. ∠4 and ∠6, ∠3 and ∠5

Conditions for Parallel Lines

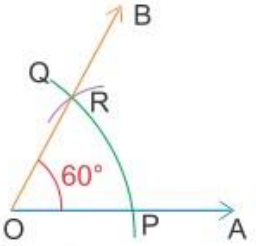


Lines *l* and *m* are parallel if any of the following is true:

- Pairs of **alternate angles** are equal.
  ∠3 = ∠5, ∠1 = ∠7
- Pairs of **corresponding angles** are equal.
  ∠2 = ∠6, ∠4 = ∠8
- The sum of the **interior (or exterior) angles** on the same side of the transversal is **180°**.
  ∠3 + ∠6 = 180° *or*
  ∠1 + ∠8 = 180°

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.

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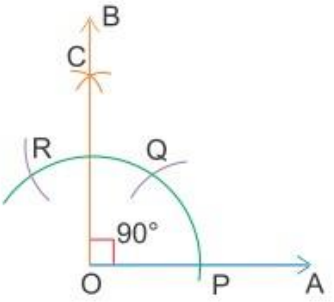
i Draw a ray OA
ii With O as centre and any radius draw an arc which cuts OA at P
iii With P as centre and same radius draw an arc to cut the arc in step (ii) at Q
iv With Q as centre and same radius as in step (ii) draw an arc to cut the arc in step (ii) at R
v With Q as centre and same radius draw 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°



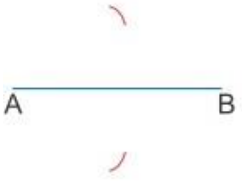
Note: To get angle of 45°, follow the above steps and then draw a angle bisector
To get angle 120°, follow steps (i) to (iv) above, and join OR and produce it to B.

Constructions

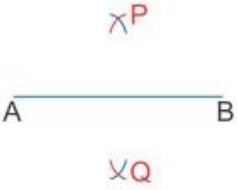
Drawing a Perpendicular Bisector

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

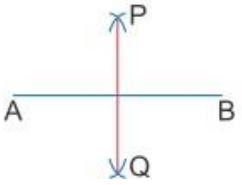
ii. With A as centre and radius more than half of AB, draw arcs on each side of AB



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

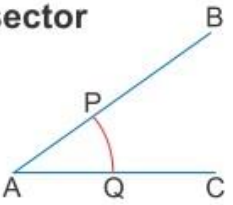


iv. Join line segment PQ, which is a perpendicular bisector to AB

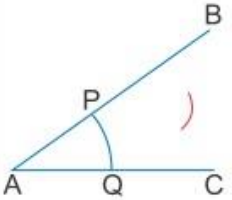


Drawing an Angle Bisector

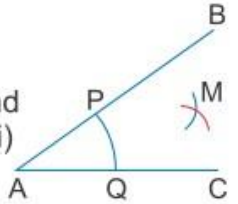
i. With A as centre and any radius, draw an arc cutting AB at P and AC at Q



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