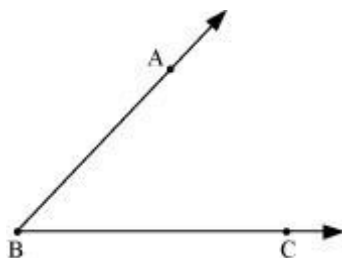


2. Angles

- **Angle:** An angle is made up of two rays starting from a common end point.



In this figure, rays \overrightarrow{BA} and \overrightarrow{BC} have one common end point, that is, B. The rays \overrightarrow{BA} and \overrightarrow{BC} are called the arms or sides of the angle. The common end point B is the vertex of the angle. We can name the above angle as $\angle ABC$ or $\angle CBA$.

- One complete turn of the hand of a clock is one revolution. The angle of one revolution is called a **complete angle**.



- A right angle is $\left(\frac{1}{4}\right)^{\text{th}}$ of a revolution and a straight angle is $\left(\frac{1}{2}\right)^{\text{th}}$ of a revolution.



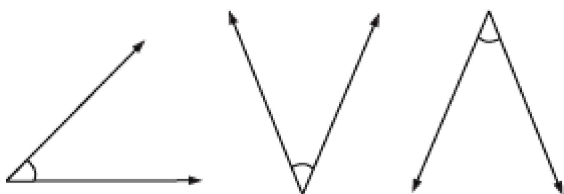
Right angle



Straight angle

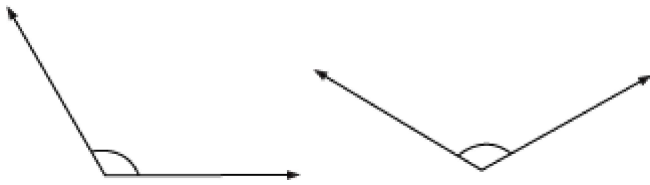
- 1 complete angle = 2 straight angles = 4 right angles
- 1 straight angle = 2 right angles
- If an angle measures less than a right angle then it is known as an **acute angle**.

The following angles are acute:



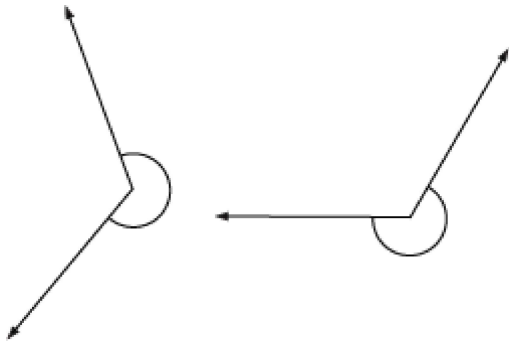
- If an angle measures more than a right angle but less than a straight angle, then it is an **obtuse angle**.

The following angles are obtuse:

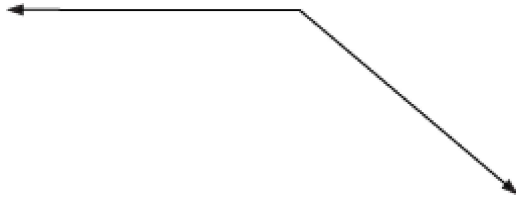


- If an angle measures more than a straight angle, then it is known as a **reflex angle**.

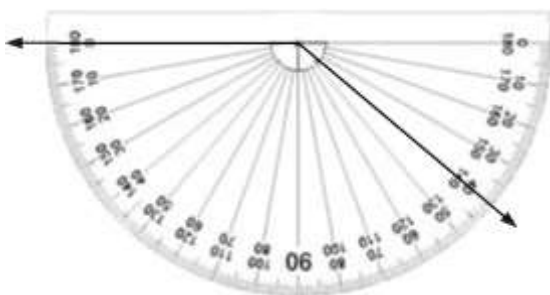
The following angles are reflex:



- We use a protractor to measure an angle.
- One complete revolution is divided into 360 equal parts. Each part is called a **degree**. Thus, the unit of angle is degree ($^{\circ}$).
- Right angle measures 90° , complete angle measures 360° , and straight angle measures 180° .
- Acute angle is less than 90° , obtuse angle is more than 90° but less than 180° , and reflex angle is more than 180° but less than 360° .
- **We can measure the given angle using a protractor as follows:**



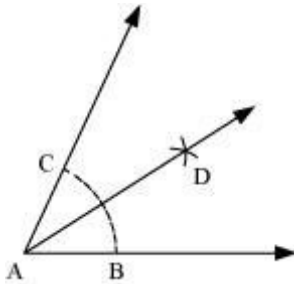
We overlap the protractor with the given angle by coinciding the midpoint of the protractor with the vertex of the angle in such a way that the straight edges of the protractor coincide with the arm of the given angle.



It is seen that the measure of the given angle is 140° .

- **Steps of construction for the bisector of a given angle (say 60°):**

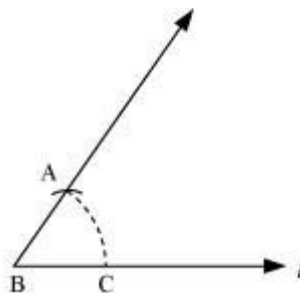
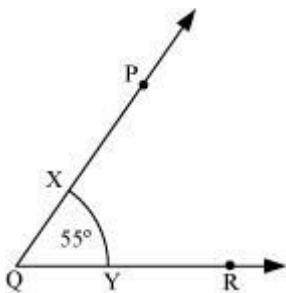
1. Draw $\angle A$ such that $\angle A = 60^\circ$
2. With A as the centre, draw an arc that cuts both the rays of $\angle A$ at B and C.
3. With B and C as centres and radius more than $\frac{1}{2} BC$, draw two arcs that intersect each other at D.
4. Join AD. AD is the bisector of $\angle A$.



- **Steps for the construction of copy of a given angle:**

Given $\angle PQR = 55^\circ$.

1. Draw a line l and mark a point B on it.
2. Place the compass at Q and draw an arc to cut the rays QP and QR at points X and Y respectively.
3. Use the same compass setting to draw an arc with B as the centre, cutting l at C.
4. Set your compass to length XY.
5. Place the compass pointer at C and draw the arc (with the same setting) that cuts the arc drawn earlier at A.
6. Join B with A and extend it.



Now, $\angle ABC = \angle PQR = 55^\circ$