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| Board- CBSE | Std- 6 | Topic- Practical Geometry | Revision Notes |
|-------------|--------|---------------------------|----------------|

## Geometry

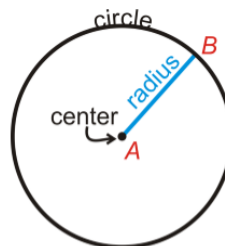
Geometry tells us about the lines, angles, shapes, whereas practical geometry is about the construction of these shapes.

Tools to be used for construction

1. The Ruler
2. The Compass
3. The Divider
4. Set-squares
5. The Protractor

## Circle

It is a round shape in which all the points of its boundary are at an equal distance from its center.



Construction of a circle if the radius is known

Draw a circle of radius 5 cm.

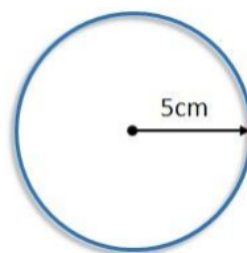
To draw a circle, we need a compass and a ruler to measure the length.

Step 1: Open the compass and measure the length of 5 cm using a ruler.

Step 2: Mark a point O, which we will use as the center of the circle.

Step 3: Put the pointer on point O.

Step 4: Turn the compass to make a complete circle. Remember to do it in one instance.



## Line Segment

A line segment is a part of a line that has two endpoints. It has a fixed length so it can be measured using a ruler.

## 1. Construction of line segment if the length is known

Draw a line segment of 5 cm.

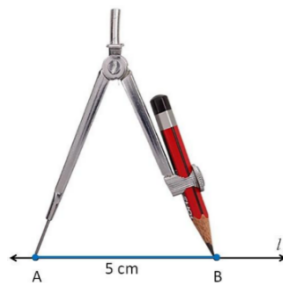
To draw a line segment of a particular length, we need a compass and a ruler.

Step 1: First of all draw a line  $l$  of any length and mark a point named A on it.

Step 2: Measure the length of 5 cm by putting the compass on the ruler. Put the pointer on 0 and open the compass till it measures 5 cm on the ruler.

Step 3: Put the pointer at point A on the line and draw an arc of 5 cm which intersects the line at B.

Step 4: Hence the line segment of 5 cm is  $\overline{AB}$ .



## 2. Construction of a copy of a given line segment

To make a copy of a line segment, there are three methods-

1. Measure the length of the given line segment using a ruler and draw the line segment of the same length with the ruler only.

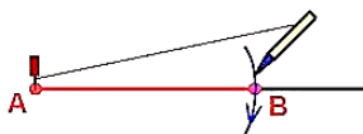
2. Take a transparent sheet and trace the given line on another part of the paper.

3. These methods are not very accurate so we can use a ruler and compass to make an accurate line segment.

Draw a copy of the line segment  $\overline{AB}$ .

Step 1:  $\overline{AB}$  is the given line segment whose length is known.

Step 2: Use the compass and put the pointer on A. open the compass to place the pencil side on point B. Now the open compass is of the same length as given  $\overline{AB}$ .



Step 3: Draw a new line  $l$  and mark a point C on it. Put the pointer on point C.

Step 4: Using the same radius draw an arc on line  $l$  which cuts the line at the point D.

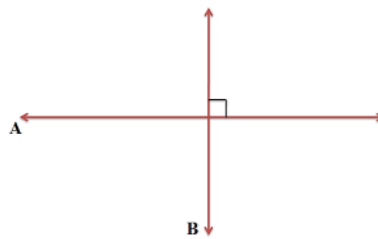


Step 5:  $\overline{CD} = \overline{AB}$ .



## Perpendiculars

If two lines intersect in such a way that they make a right angle at the point of intersection then they are perpendicular to each other.



1. Perpendicular to a line if a point is given on it (using a ruler and a set square)

Step 1: A line  $l$  is given with a point  $P$  on it.



Step 2: Put the ruler with one of its sides next to  $l$ .



Step 3: Put the set square with one of its sides by the side of the already aligned edge of the ruler so that the right-angled corner comes in contact with the ruler.



Step 4: Slide the set square so that the right-angled corner coincides with  $P$ .



Step 5: Hold the set-square. Draw  $PQ$  along the edge of the set-square.

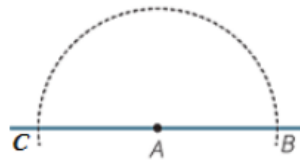
PQ is the required perpendicular to  $l$  from the given point P.



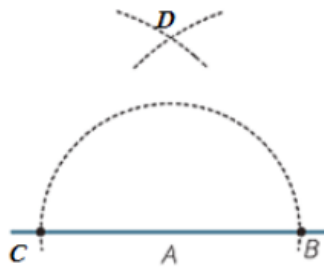
2. Perpendicular to a line if a point is given on it (using a ruler and compass)

Draw a perpendicular to a given line at a given point A.

Step 1: Take A as the center and draw a big arc with any radius so that it intersects the line at points B and C.

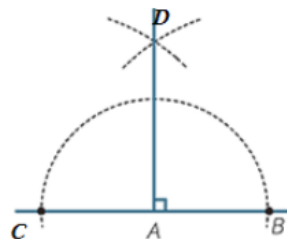


Step 2: Take B as the center and draw an arc with a radius more than AC and then take C as the center and draw an arc so that they intersect each other at point D.



Step 3: Join AD. AD is perpendicular to CB.

$AD \perp CB$ .



3. Perpendicular to a line from a point which is not on it (using ruler and a set square)

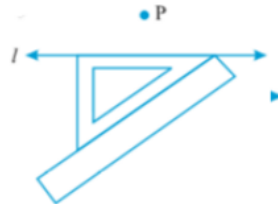
Step 1: P is the point outside the given line  $l$ .



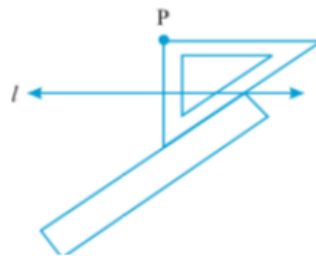
Step 2: Put the set-square on  $l$  so that one side of its right angle comes on  $l$ .



Step 3: Put a ruler on the hypotenuse of the set square.

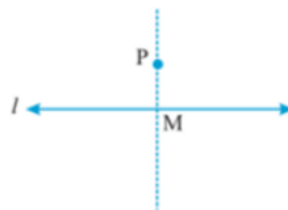


Step 4: Hold the ruler and slide the set square until it touches point P.



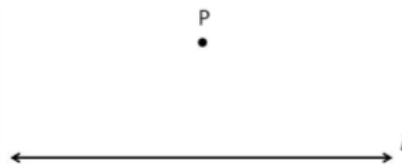
Step 5: Join PM.

Now  $PM \perp l$ .

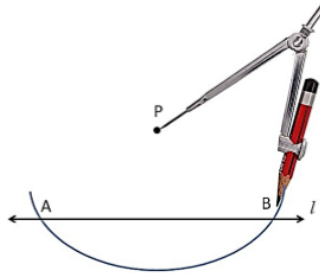


4. Perpendicular to a line from a point not on it (using ruler and a compass)

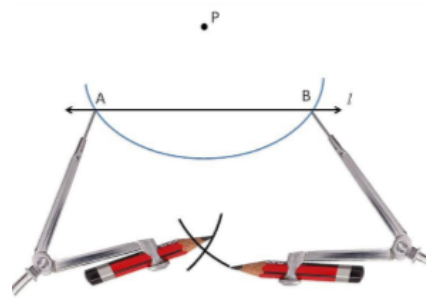
Step 1: P is the point outside the given line l.



Step 2: Take P as the center and draw a big arc of any radius which intersects line l at two points A and B.

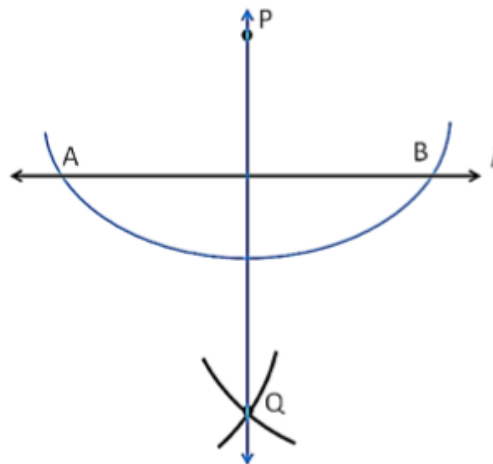


Step 3: Take A and B as radius and draw arcs from both points with the same radius as taken before so that they intersect with each other.



Step 4: Join PQ.

PQ is perpendicular to line l.

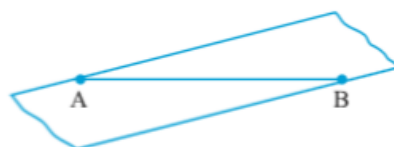


5. The perpendicular bisector of a line segment (using transparent tapes)

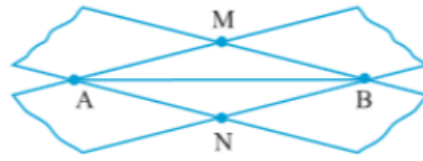
A line that divides the given line into two equal parts is known as a perpendicular bisector.

Step 1: Draw a line segment AB.

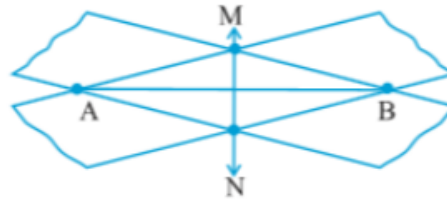
Step 2: Take a strip of transparent rectangular tape and put it diagonally on line AB so that the endpoints of the line segment lie on the edges of the tape.



Step 3: Take another strip and put it over A and B diagonally across the previous tape so that the two tapes intersect at points M and N.



Step 4: Join MN. MN is the perpendicular of AB.

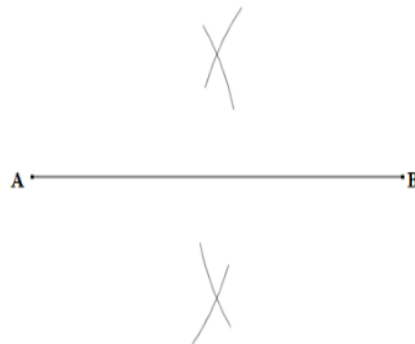


6. The perpendicular bisector of a line segment (using ruler and compass)

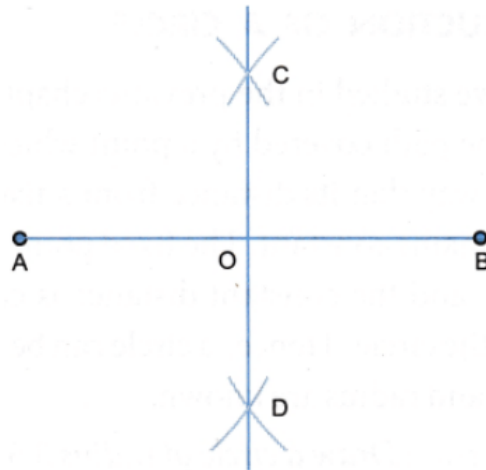
Step 1: Draw a line segment AB.

Step 2: Take A as the center and draw two arcs – one upside and one downside with a radius of more than half of the length of AB. Or you can draw a circle taking A as the center for convenience.

Again make the arcs with taking B as the center so that they intersect the previous arcs.



Step 3: Join the intersections of the arcs and name them C and D.



Step 4: The required perpendicular bisector of AB is CD. Hence,  $AO = OB$ .

Angles

Angle is a figure formed by two rays. The two rays have a common endpoint which is called the Vertex of the Angle.

1. Construction of an angle with a given measure

Draw an angle of  $60^\circ$  using a protractor.

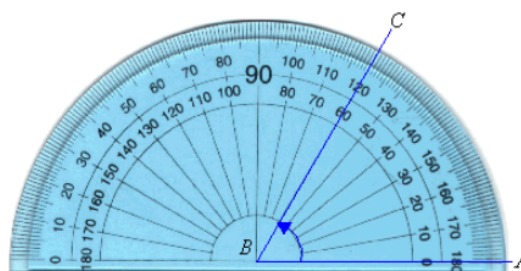
Step 1: Draw a line BA.



Step 2: Put the protractor on the line in such a way that the center of the protractor lays on point B and the zero edge coincides on the line segment BA.

Step 3: Start from  $0^\circ$  and mark a point C at  $60^\circ$ .

Step 4: Join BC.

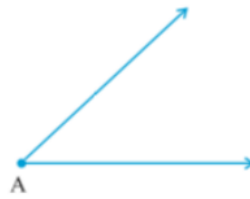


$\angle CBA$  is the required angle.

2. Construction of a copy of an angle of unknown measure (using a ruler and a compass).

Draw a copy of  $\angle A$ .

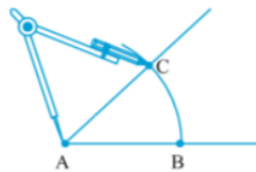




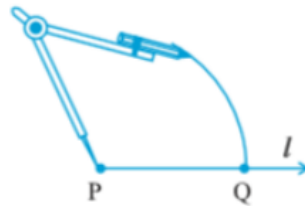
Step 1: P is a point on the line l.



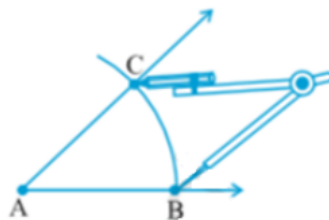
Step 2: Take A as the center at the given angle and draw an arc of any radius which cuts the two rays at B and C.



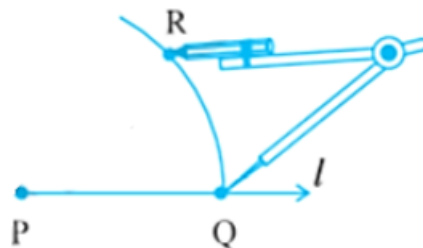
Step 3: On line l, take P as the center and draw an arc with the same radius as above which cuts line l at Q.



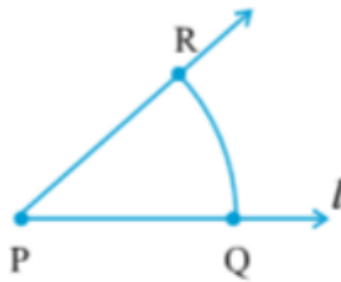
Step 4: Open your compass to measure the length of the arc BC.



Step 5: Take Q as the center and draw an arc with the same radius, to cut the arc drawn earlier, at point R.



Step 6: Join PR. It will make the angle of the same measure as given.



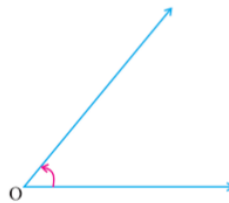
Hence,  $\angle P = \angle A$

### 3. The bisector of an angle

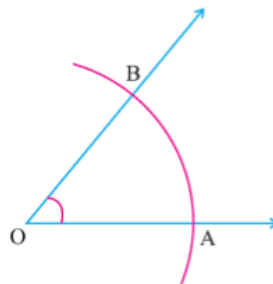
An angle bisector is the line segment that divides a particular angle into two equal parts. It is also called the line of symmetry of the angle.

Construction of angle bisector (using a ruler and a compass)

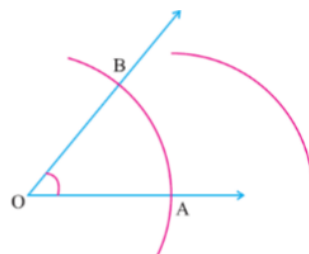
Draw the angle bisector of  $\angle O$ .



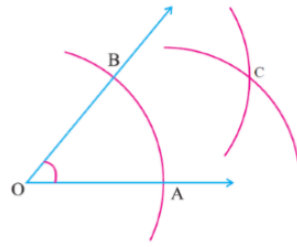
Step 1: Put the pointer on O and draw an arc of any radius so that it cut the rays at point A and B.



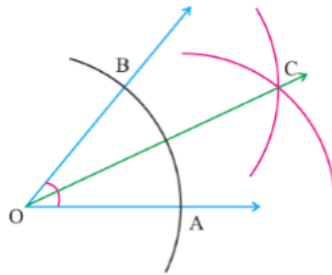
Step 2: Put the pointer on point A and draw an arc of the radius of more than half of AB.



Step 3: While taking B as the center we will draw an arc of the same radius so that it cuts the previous arc at point C.



Step 4: Join OC. OC is the required angle bisector of  $\angle O$ .



Hence,  $\angle BOC = \angle COA$ .

#### 4. Angles of special measures

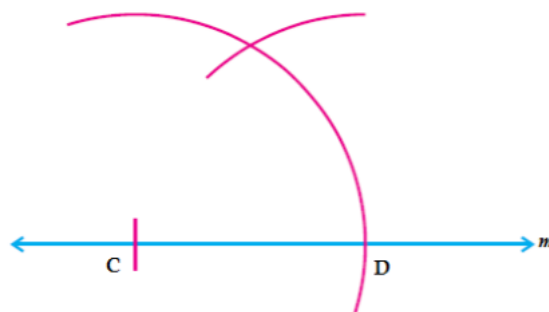
There are some angles that we can construct accurately with the help of a compass without using a protractor.

##### a. Construction of $60^\circ$ angle.

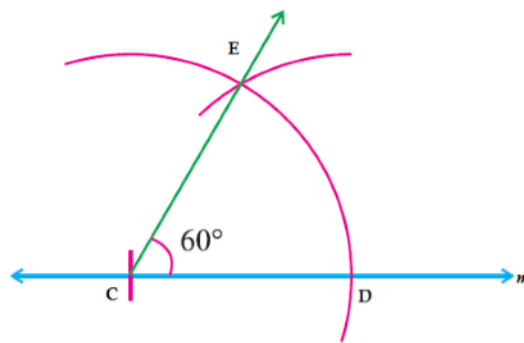
Step 1: Draw a line  $m$  and mark a point  $C$  on it.

Step 2: Take  $C$  as the center and draw an arc of any radius to cut the line at point  $D$ .

Step 3: While taking  $D$  as the center we need to draw an arc of the same radius to cut the previous arc.



Step 4: Join CE.  $\angle C = 60^\circ$ .



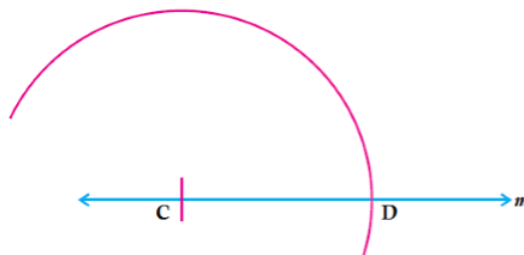
b. Construction of  $120^\circ$  angle.

It is twice of  $60^\circ$  angle.

Step 1: Draw a line  $m$  and mark a point  $C$  on it.

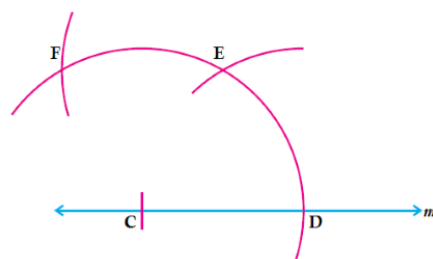


Step 2: Put the pointer on point  $C$  and draw an arc of any radius which cuts the line  $m$  at point  $D$ .

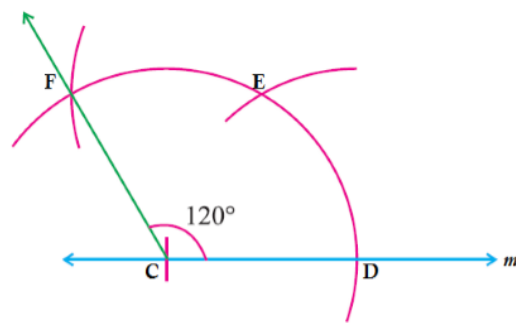


Step 3: While taking  $D$  as the center, we need to draw an arc with the same radius to cut the previous arc at  $E$ .

Again take  $E$  as the center, draw an arc of the same radius to cut the first arc at point  $F$ .

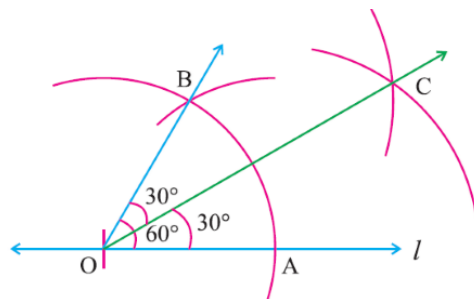


Step 4: Join  $CF$ .  $\angle FCD = 120^\circ$ .



c. Construction of  $30^\circ$  angle.

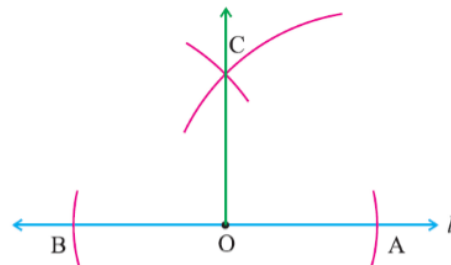
To construct an angle of  $30^\circ$ , we need to draw an angle of  $60^\circ$  as above then bisect it with the process of an angle bisector.



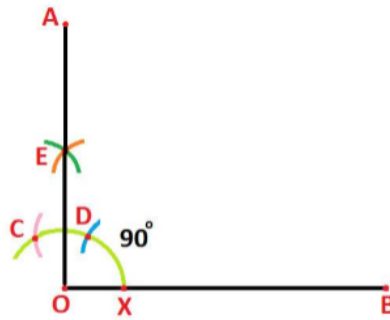
d. Construction of  $90^\circ$  angle

It can be made by two methods-

i. Draw a perpendicular bisector of  $180^\circ$  i.e. a straight line.



ii. Draw a bisector of  $60^\circ$  and  $120^\circ$ .



e. Construction of  $45^\circ$  angle.

Draw an angle of  $90^\circ$  then bisect it to make an angle of  $45^\circ$ .

