Constructions

- **Construction of perpendicular bisector of a line segment**

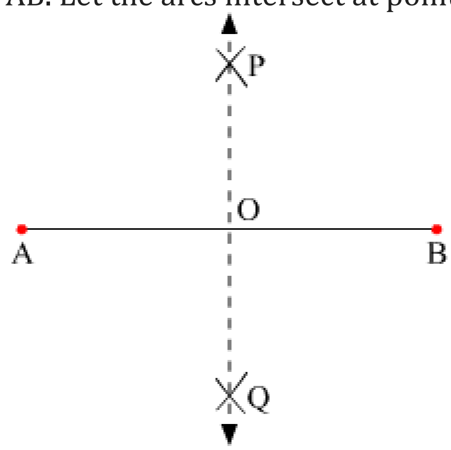
Perpendicular Bisector: A line that bisects a line segment at 90° is called the perpendicular bisector of the line segment.

Example: Construct a perpendicular bisector of the line segment AB of length 8.2 cm.

Solution:

(1) Draw a line segment AB = 8.2 cm using a ruler.

(2) Draw two arcs taking A and B as centres and radius more than 4.1 cm on both sides of AB. Let the arcs intersect at points P and Q. Join PQ.



PQ is the required perpendicular bisector of line segment AB.

Note: We can verify the validity of construction of perpendicular bisector of a line segment using congruence.

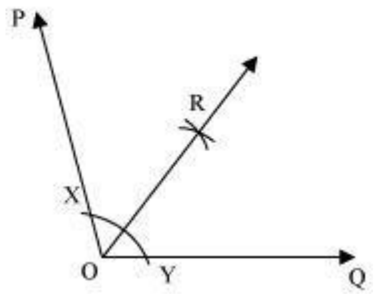
- **Construction Of Bisector Of An Angle**

Bisector of an angle: A ray that divides an angle into two equal parts is called the bisector of the angle.

Example: Construct 55° by bisecting an angle of measure 110°.

Solution:
(i) With the help of a protractor, draw ∠POQ = 110°.
(ii) Draw an arc of any radius taking O as centre. Let this arc intersect the arms OP and OQ at points X and Y respectively.

(iii) Taking X and Y as centres and radius more than half of XY, draw arcs to intersect each other, say at R. Join ray OR.

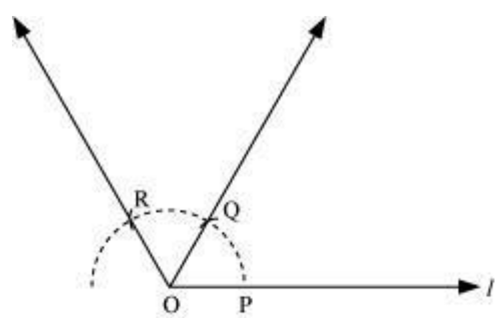


Now, OR is the bisector of ∠POQ i.e., ∠POR = ∠ROQ = 55°

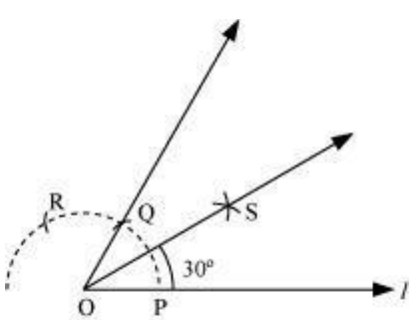
Note: We can verify the validity of construction of angle bisector using congruence.

- The steps for the construction of angles of measures 60° and 120° are as follows:

1. Draw a line *l* and mark a point O on it.
2. Place the pointer of the compass at O and draw an arc of convenient radius that cuts *l* at P.
3. With the same radius, draw an arc with centre P that cuts the previous arc at Q.
4. Similarly, with the same radius, draw an arc with centre Q that cuts the arc at R.
5. Join OQ and OR to get ∠QOP = 60° and ∠ROP = 120°.



- Now, 30° is nothing but half of angle 60°. Therefore, 30°angle can be obtained by drawing the bisector of ∠QOP.



Here, ∠SOP = 30°.

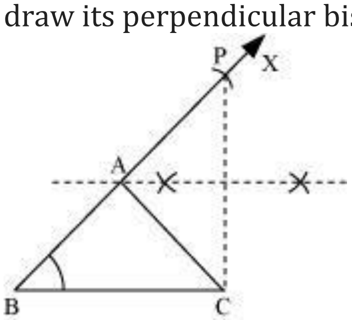
Similarly, we can draw other angles of measures 45°, 90°, 135°, and 150° using the above method.

- **Construction of a triangle when the length of base, base angle and the sum of other two sides are given**

  Let us suppose that base BC, ∠B and (AB + AC) of ΔABC are given.

  Step 1: Draw BC and construct∠B at point B.

  Step 2: Draw an arc on BX, which cuts it at point P, such that BP = AB + AC. Join PC and draw its perpendicular bisector. Let this perpendicular bisector intersect BP at A.

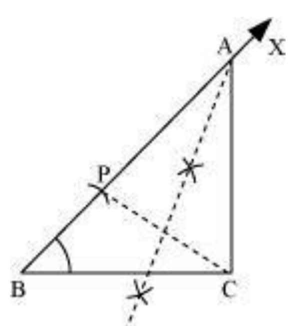


  Now, ΔABC is the required triangle.

- **Construction of triangle when the length of base, base angle and the difference between the other two sides are given**
  Let us suppose base BC, ∠B, and (AB – AC) are given.

  Step 1: Draw BC and construct ∠B at point B.

  Step 2: Draw an arc on BX, which cuts it at point P, such that BP = AB – AC. Join PC and draw its perpendicular bisector. Let this perpendicular bisector intersect BX at point A. Join AC.



  Now, ΔABC is the required triangle.
  Note: We can easily verify both the constructions.

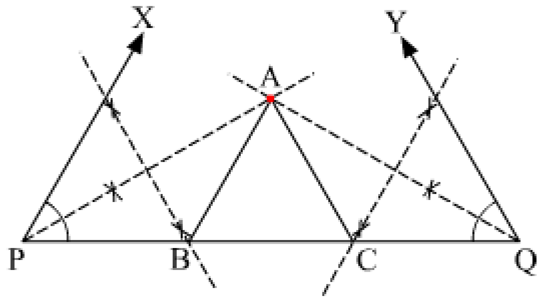
- **Construction of a triangle when its perimeter and base angles are given**

Let us suppose that the perimeter and base angles, ∠B and ∠C of ΔABC are given.

Step 1: Draw a line segment PQ of length equal to the perimeter of the triangle and draw the base angles at points P and Q.

Step 2: Draw the angle bisectors of ∠P and ∠Q. Let these angle bisectors intersect each other at point A.

Step 3: Draw the perpendicular bisectors of AP and AQ. Let these perpendicular bisectors intersect PQ at points B and C respectively. Join AB and AC.



Now, ΔABC is the required triangle.

Note: We can easily verify our construction using congruence.