

EXERCISE 19.5

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1. Draw an angle and label it as $\angle BAC$. Construct another angle, equal to $\angle BAC$.

Solution:

Construct an angle $\angle BAC$ and draw a ray OP .

Taking A as centre and suitable radius, construct an arc which intersects AB and AC at points X and Y .

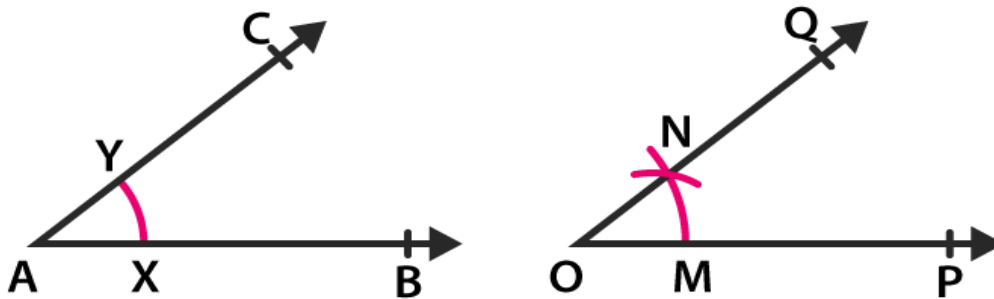
Taking O as centre and same radius, construct an arc which intersects the arc OP at the point M .

Now measure XY with the help of compass.

Taking M as centre and XY as radius construct an arc which intersects the arc which is drawn from O and name it as point N .

Now join the points O and N and extend it to the point Q .

Here, $\angle POQ$ is the required angle.



2. Draw an obtuse angle. Bisect it. Measure each of the angles so obtained.

Solution:

We know that obtuse angles are those which are greater than 90° and less than 180° .

Construct an obtuse angle $\angle BAC$.

Taking A as centre with appropriate radius construct an arc which intersects AB and AC at the points P and Q .

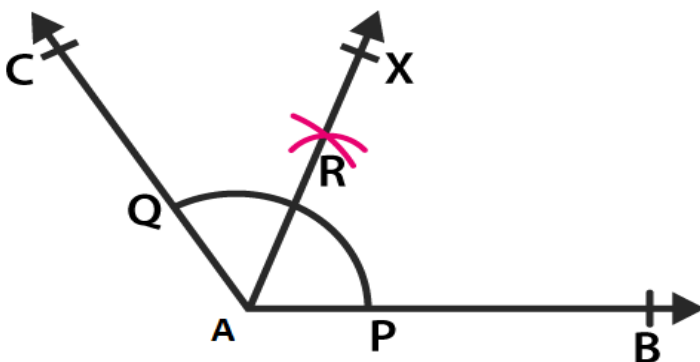
Taking P as centre and radius which is more than half of PQ construct an arc.

Taking Q as centre and same radius construct another arc which intersects the previous arc at the point R .

Now join A and R and extend it to the point X .

So the ray AX is the required bisector of $\angle BAC$.

By measuring $\angle BAR$ and $\angle CAR$ we get $\angle BAR = \angle CAR = 65^\circ$.



3. Using your protractor, draw an angle of measure 108° . With this angle as given, drawn an angle of 54° .

Solution:

Construct a ray OA.

Using protractor, draw an angle $\angle AOB$ of 108° where $108/2 = 54$

Hence, 54° is half of 108° .

In order to get angle 54° , we must bisect the angle of 108° .

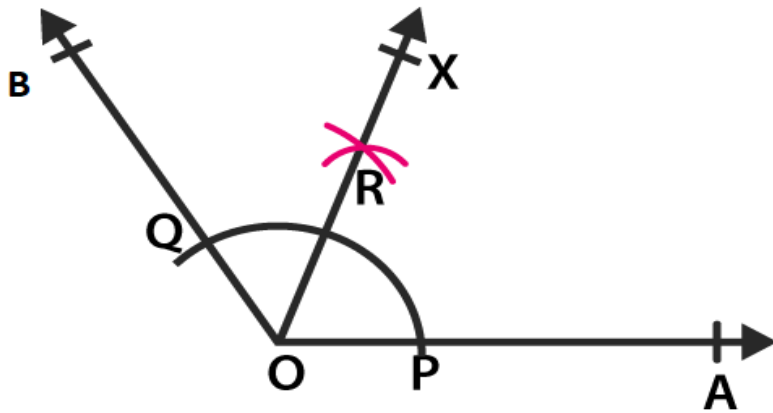
Taking O as centre and convenient radius, construct an arc which cuts the sides OA and OB at the points P and Q.

Taking P as centre and radius which is more than half of PQ construct an arc.

Taking Q as centre and same radius construct another arc which intersects the previous arc and name it as point R.

Now join the points O and R and extend it to the point X.

Here, $\angle AOX$ is the required angle of 54° .



4. Using protractor, draw a right angle. Bisect it to get an angle of measure 45° .

Solution:

Construct a ray OA.

Using a protractor construct $\angle AOB$ of 90° .

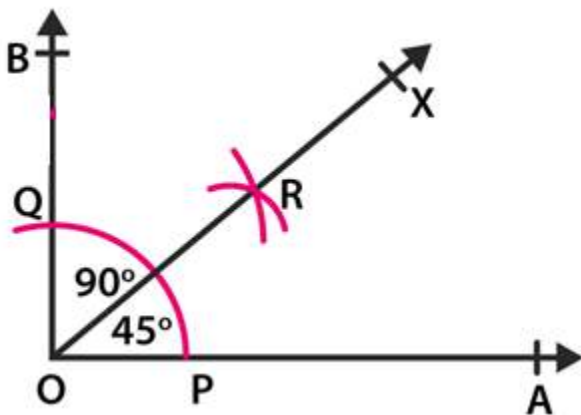
Taking O as centre and convenient radius, construct an arc which cuts the sides OA and OB at the points P and Q.

Taking P as centre and radius which is more than half of PQ, construct an arc.

Taking Q as centre and same radius, construct another arc which intersects the previous arc and name it as point R.

Now join the points O and R and extend it to the point X.

Here, $\angle AOX$ is the required angle of 45° where $\angle AOB = 90^\circ$ and $\angle AOX = 45^\circ$.



5. Draw a linear pair of angles. Bisect each of the two angles. Verify that the two bisecting rays are perpendicular to each other.

Solution:

We know that the two angles which are adjacent and supplementary are known as linear pair of angles.

Construct a line AB and mark a point O on it.

By constructing an angle $\angle AOC$ we get another angle $\angle BOC$.

Now bisect $\angle AOC$ using a compass and a ruler and get the ray OX.

In the same way bisect $\angle BOC$ and get the ray OY.

We know that

$$\angle XOY = \angle XOC + \angle COY$$

It can be written as

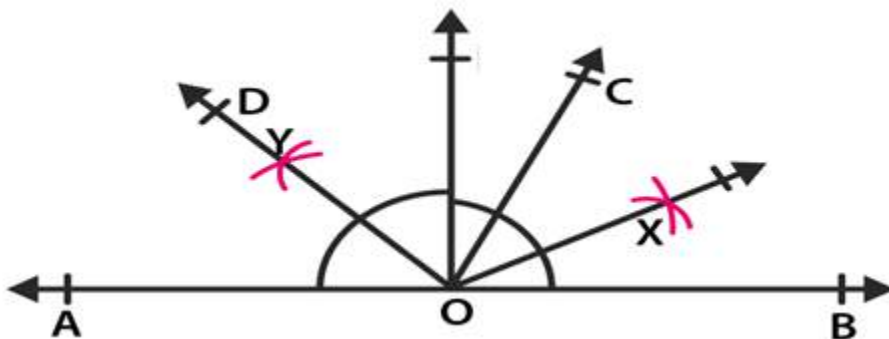
$$\angle XOY = \frac{1}{2} \angle AOC + \frac{1}{2} \angle BOC$$

So we get

$$\angle XOY = \frac{1}{2} (\angle AOC + \angle BOC)$$

We know that $\angle AOC$ and $\angle BOC$ are supplementary angles

$$\angle XOY = \frac{1}{2} (180) = 90^\circ$$



6. Draw a pair of vertically opposite angles. Bisect each of the two angles. Verify that the bisecting rays are in the same line.

Solution:

Construct two lines AB and CD which intersects each other at the point O

Since vertically opposite angles are equal we get

$$\angle BOC = \angle AOD \text{ and } \angle AOC = \angle BOD$$

Now bisect angle AOC and construct the bisecting ray as OX.

In the same way, we bisect $\angle BOD$ and construct bisecting ray OY.

We get

$$\angle XOY = \angle XOY = \frac{1}{2} \angle AOC + \angle AOD + \frac{1}{2} \angle BOD$$

We know that $\angle AOC = \angle BOD$

$$\angle XOY = \frac{1}{2} \angle BOD + \angle AOD + \frac{1}{2} \angle BOD$$

So we get

$$\angle XOY = \angle AOD + \angle BOD$$

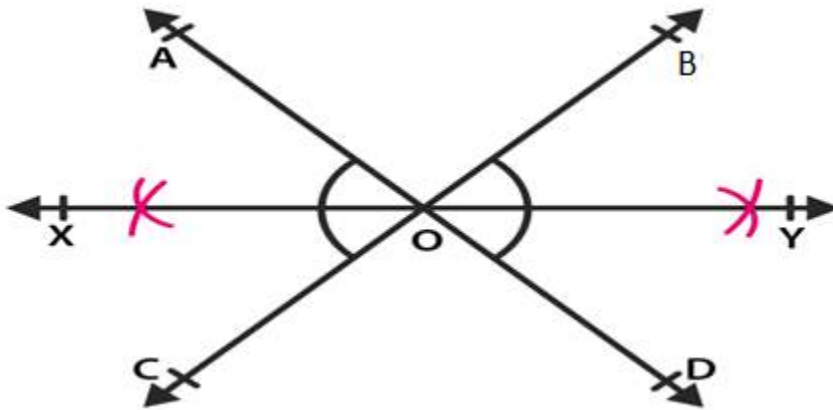
AB is a line

We know that $\angle AOD$ and $\angle BOD$ are supplementary angles whose sum is equal to 180° .

$$\angle XOY = 180^\circ$$

The angles on one side of a straight line is always 180° and also the sum of angles is 180°

Here, XY is a straight line where OX and OY are in the same line.



7. Using ruler and compasses only, draw a right angle.

Solution:

Construct a ray OA.

Taking O as centre and convenient radius construct an arc PQ using a compass intersecting the ray OA at the point Q.

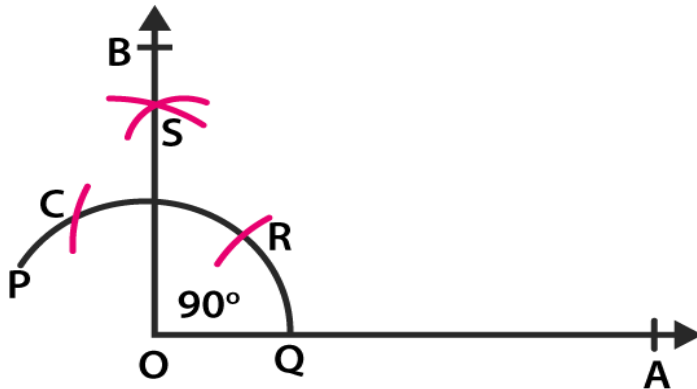
Taking P as centre and same radius construct another arc which intersects the arc PQ at the point R.

Taking R as centre and same radius, construct an arc which cuts the arc PQ at the point C opposite to P.

Using C and R as the centre construct two arcs of radius which is more than half of CR intersecting each other at the point S.

Now join the points O and S and extend it to the point B.

Here, $\angle AOB$ is the required angle of 90° .



8. Using ruler and compasses only, draw an angle of measure 135° .

Solution:

Construct a line AB and mark a point O on it.

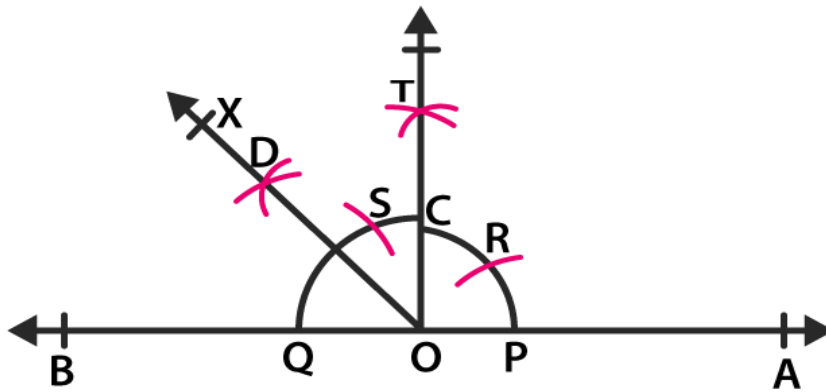
Taking O as centre and convenient radius, construct an arc PQ using a compass which intersects the line AB at the point P and Q.

Taking P as centre and same radius, construct another arc which intersects the arc PQ at the point R.

Taking Q as centre and same radius, construct another arc which intersects the arc PQ at the point S which is opposite to P.

Considering S and R as centres and radius which is more than half of SR, construct two arcs which intersects each other at the point T.

Now join the points O and T which intersects the arc PQ at the point C.
Considering C and Q as centres and radius which is more than half of CQ, construct two arcs which intersects each other at the point D.
Now join the points O and D and extend it to point X to form the ray OX.
Here, $\angle AOX$ is the required angle of 135° .



9. Using a protractor, draw an angle of measure 72° . With this angle as given, draw angles of measure 36° and 54° .

Solution:

Construct a ray OA.

Using protractor construct $\angle AOB$ of 72°

Taking O as centre and convenient radius, construct an arc which cut sides OA and OB at the point P and Q.

Taking P and Q as centres and radius which is more than half of PQ, construct two arcs which cuts each other at the point R.

Now join the points O and R and extend it to the point X.

Here, OR intersects the arc PQ at the point C.

Taking C and Q as centres and radius which is more than half of CQ, construct two arcs which cuts each other at point T.

Now join the points O and T and extend it to the point Y.

OX bisects $\angle AOB$

It can be written as

$$\angle AOX = \angle BOX = 72/2 = 36^\circ$$

OY bisects $\angle BOX$

It can be written as

$$\angle XOY = \angle BOY = 36/2 = 18^\circ$$

We know that

$$\angle AOY = \angle AOX + \angle XOY = 36^\circ + 18^\circ = 54^\circ$$

Here, $\angle AOX$ is the required angle of 36° and $\angle AOY$ is the required angle of 54° .

