

Exercise 19.5

Question: 1

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

Solution:

Draw an angle $\angle BAC$ also draw a ray OP .

With a suitable radius and A as center, draw an arc intersecting AB and AC at X and Y , respectively.

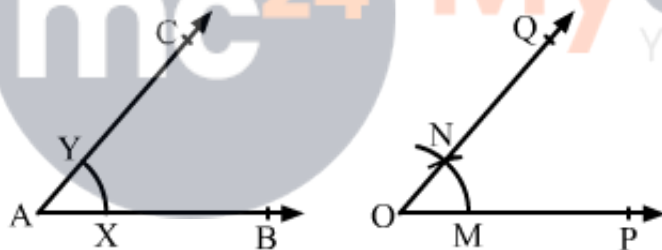
With the same radius and O as center, draw an arc to intersect the arc OP at M .

Measure XY using the compass.

With M as centre and radius equal to XY , draw an arc to intersect the arc drawn from O at N .

Join O and N and extend it to Q .

$\angle POQ$ is the required angle.

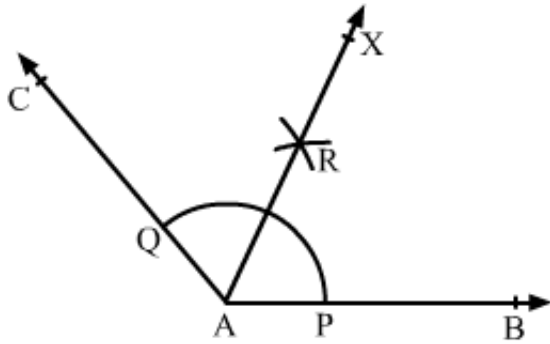


Question: 2

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

Solution:

Obtuse angles are those angles which are greater than 90° but less than 180° .



Draw an obtuse angle $\angle BAC$.

With an appropriate radius and centre at A, draw an arc such that it intersects AB and AC at P and Q, respectively.

With centre P and radius more than half of PQ, draw an arc.

With the same radius and centre at Q, draw another arc intersecting the previous arc at R.

Join A and R and extend it to X.

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

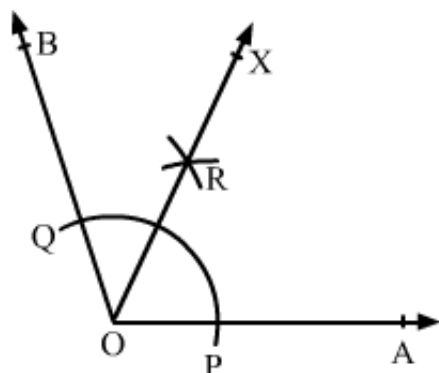
If we measure $\angle BAR$ and $\angle CAR$,
we have $\angle BAR = \angle CAR = 65^\circ$

Question: 3

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

Solution:

Draw a ray OA.



With the help of a protractor, construct an angle $\angle AOB$ of 108° .

Since, $108/2 = 54^\circ$

Therefore, 54° is half of 108° .

To get the angle of 54° , we need to bisect the angle of 108° .

With centre at O and a convenient radius, draw an arc cutting sides OA and OB at P and Q, respectively.

With centre at P and radius more than half of PQ, draw an arc.

With the same radius and centre at Q, draw another arc intersecting the previous arc at R.

Join O and R and extend it to X.

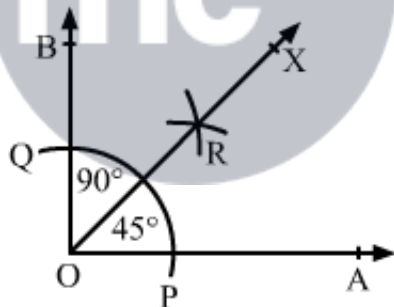
$\angle AOX$ is the required angle of 54° .

Question: 4

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

Solution:

We know that a right angle is of 90° .



Draw a ray OA.

With the help of a protractor, draw an $\angle AOB$ of 90° .

With centre at O and a convenient radius, draw an arc cutting sides OA and OB at P and Q, respectively.

With centre at P and radius more than half of PQ, draw an arc.

With the same radius and centre at Q, draw another arc intersecting the previous arc at R.

Join O and R and extend it to X.

$\angle AOX$ is the required angle of 45° .

$$\angle AOB = 90^\circ$$

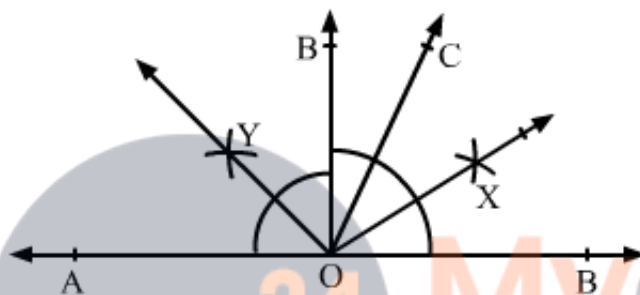
$$\angle AOX = 45^\circ$$

Question: 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:

Two angles, which are adjacent and supplementary, are called linear pair of angles.



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

When we draw any angle $\angle AOC$, we also get another angle $\angle BOC$.

Bisect $\angle AOC$ by a compass and a ruler and get the ray OX.

Similarly, bisect $\angle BOC$ and get the ray OY.

Now,

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

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

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

$$= \frac{1}{2} \times 180^\circ = 90^\circ \text{ (As } \angle AOC \text{ and } \angle BOC \text{ are supplementary angles)}$$

Question: 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:

Draw two lines AB and CD intersecting each other at O.

We know that the vertically opposite angles are equal.

Therefore, $\angle BOC = \angle AOD$ and

$\angle AOC = \angle BOD$.

We bisect angle AOC and draw the bisecting ray as OX.

Similarly, we bisect angle BOD and draw the bisecting ray as OY.

Now, $\angle XO A + \angle AOD + \angle DOY$

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

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

[As, $\angle AOC = \angle BOD$]

$= \angle AOD + \angle BOD$

Since, AB is a line.

Therefore, $\angle AOD$ and $\angle BOD$ are supplementary angles and the sum of these two angles will be 180° .

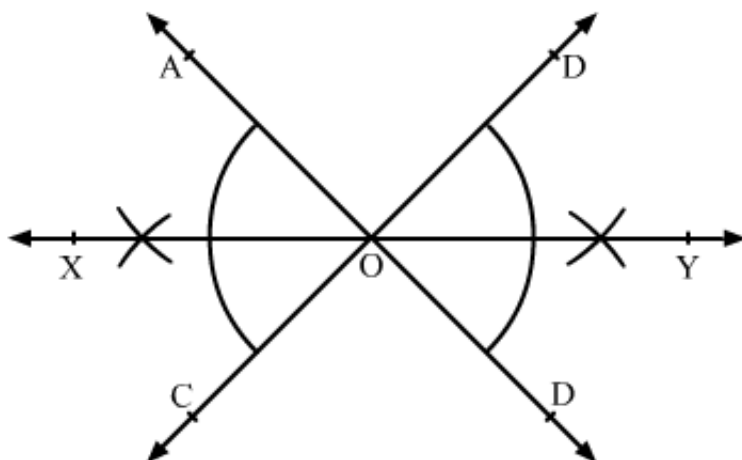
Therefore, $\angle XO A + \angle AOD + \angle DOY = 180^\circ$

We know that the angles on one side of a straight line will always add to 180° .

Also, the sum of the angles is 180° .

Therefore, XY is a straight line.

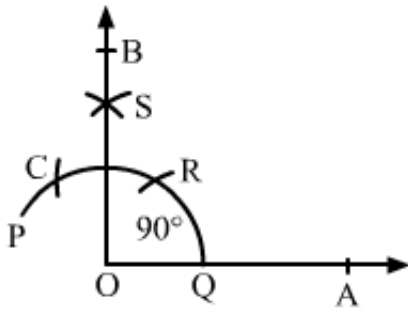
Thus, OX and OY are in the same line.



Question: 7

Using ruler and compass only, draw a right angle.

Solution:



Draw a ray OA.

With a convenient radius and centre at O, draw an arc PQ with the help of a compass intersecting the ray OA at P.

With the same radius and centre at P, draw another arc intersecting the arc PQ at R.

With the same radius and centre at R, draw an arc cutting the arc PQ at C, opposite P.

Taking C and R as the centre, draw two arcs of radius more than half of CR that intersect each other at S.

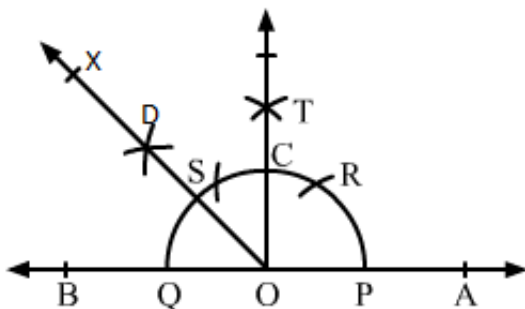
Join O and S and extend the line to B.

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

Question: 8

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

Solution:



We draw a line AB and mark a point O on it.

With a convenient radius and centre at O, draw an arc PQ with the help of a compass intersecting the line AB at P and Q.

With the same radius and centre at P, draw another arc intersecting the arc PQ at R.

With the same radius and centre at Q, draw one more arc intersecting the arc PQ at S, opposite to P.

Taking S and R as centres and radius more than half of SR, draw two arcs intersecting each other at T.

Join O and T intersecting the arc PQ at C.

Taking C and Q as centres and radius more than half of CQ, draw two arcs intersecting each other at D.

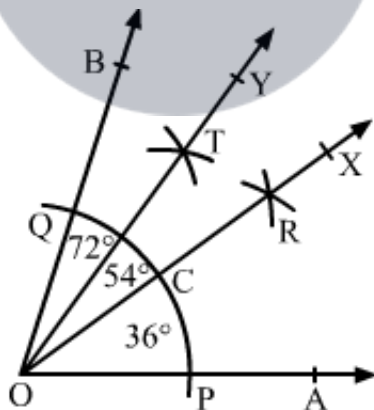
Join O and D and extend it to X to form the ray OX.

$\angle AOX$ is the required angle of measure 135° .

Question: 9

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

Solution:



Draw a ray OA.

With the help of a protractor, draw an angle $\angle AOB$ of 72° .

With a convenient radius and centre at O, draw an arc cutting sides OA and OB at P and Q, respectively.

With P and Q as centres and radius more than half of PQ, draw two arcs cutting each other at R.

Join O and R and extend it to X.

OR intersects arc PQ at C.

With C and Q as centres and radius more than half of CQ, draw two arcs cutting each other at T.

Join O and T and extend it to Y.

Now, OX bisects $\angle AOB$

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

Again, OY bisects $\angle BOX$

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

Therefore, $\angle AOX$ is the required angle of 36° and $\angle AOY = \angle AOX + \angle XOY = 36^\circ + 18^\circ = 54^\circ$

Therefore, $\angle AOY$ is the required angle of 54° .



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