Geometrical Constructions

Exercise 19.1

Question: 1

Construct line segments whose lengths are:

(i) 4.8 cm

(ii) 12 cm 5 mm

(ii) 7.6 cm

Solution:

(i) Draw a line L on the paper and mark a point A on it.

Take a compass and place its metal point at zero mark of the ruler.

Adjust the compass such that the pencil point is at 4.8 cm mark on the ruler.

Now, take the compass to L such that its metal point is on point A.

Mark a small mark at B on L corresponding to the pencil point of the compass.

AB is the required line segment of 4.8 cm.

(ii) Draw a line L on the paper and mark a point A on it.

Take a compass and place its metal point at zero mark of the ruler.

Adjust the compass such that the pencil point gets placed at the point which is 5 small points from the mark of 12 cm to 13 cm of the ruler.

Now, take the compass to L such that its metal point is on A.

Mark a small mark at B on L corresponding to the pencil point of the compass.

AB is the required line segment of 12 cm 5 mm.

(iii) Draw a line L on the paper and mark a point A on it.

Take a compass and place its metal point at zero mark of the ruler.

Adjust the compass such that the pencil point gets placed at the point which is 6 small points from the mark of 7 cm to 8 cm of the ruler.

Take the compass to L such that its metal point is on A.

Mark a small mark at B on the line L corresponding to the pencil point of the compass.

AB is the required segment of 7.6 cm.

Question: 2

Construct two segments of lengths 4.3 cm and 3.2 cm.Construct a segment whose length is equal to the sum of the lengths of these segments.

Solution:

Using compass and ruler, we construct two segments AB and CD of lengths 4.3 cm and 3.2 cm, respectively.

Draw a line L and mark a point P on it.

Take a compass and place its metal point at A and adjust it, such that the pencil point reaches point B.

Take the compass to line L, such that its metal point is on P.

Mark a small mark at Q on the line L corresponding to the pencil point of the compass.

Now, reset the compass, such that its metal and pencil points are on C and D, respectively.

Take the compass again to line L, such that its metal point is on Q and the pencil point makes a small mark at point R, which opposite to point P on line L

PR is the required segment, whose length is equal to the sum of the lengths of these segments.

Exercise 19.2

Question: 1

How many lines can be drawn which are perpendicular to a given line and pass through a given point lying

(i) outside it?

(ii) on it?

Solution:

(i) Explanation:

Perpendicular line from a given point to a given line is the shortest distance between them.

Only one shortest distance is possible.

Thus, only one perpendicular line is possible from the given point (outside the line) to a given line.

(ii) Explanation:

At any point on the line, we can draw only one perpendicular line.

Thus, on the given line on a point, we can draw only one perpendicular line.

Question: 2

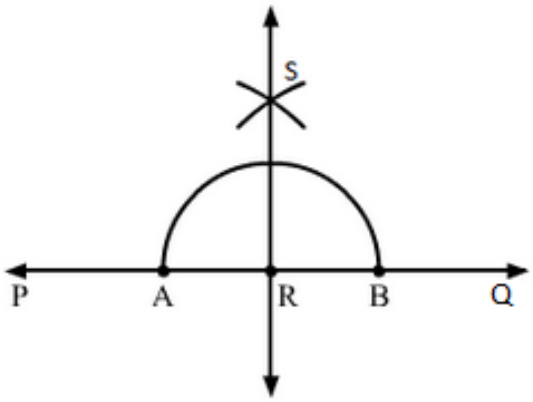
Draw a line PQ. Take a point R on it. Draw a line perpendicular to PQ and passing through R.

(i) Using ruler and set square.

(ii) ruler and compasses.

Solution:

(i) Draw a line PQ and take a point R on it.



Place a set-square, such that its one arm of the right angle is along the line PQ .

Without disturbing the position of the set-square, place a ruler along its edge.

Now, without disturbing the position of the ruler, remove the set-square and draw a line MN through point R.

MN is the required line perpendicular to line PQ passing through R.

(ii) Draw a line PQ and take a point R on it.

With R as centre and taking a convenient radius, construct an arc touching the line PQ at two points A and B.

Now, with A and B as centres and radius greater than AR, construct two arcs cutting each other at S.

Join RS and extend it in both directions. This is the required line, which is perpendicular to PQ and passes through R.

Question: 3

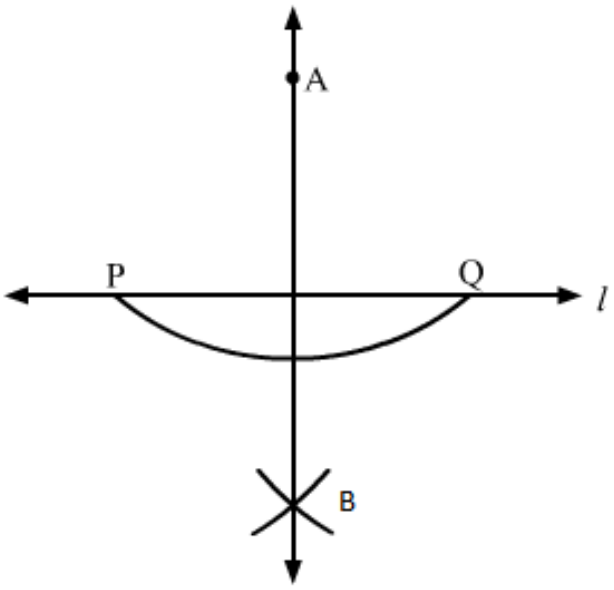
Draw a line l, take a point A not lying on l. Draw a line m such that and passing through A. Using

(i) ruler and set square

(ii) ruler and compass.

Solution:

(i) We draw a line L and take a point A outside it.



Place a set square PQR such that its one arm PQ of the right angle is along the line L.

Without disturbing the position of set-square, place a ruler along its edge PR.

Now, without disturbing the position of the ruler, slide the set-square along the ruler until its arm QR reaches point A.

Without disturbing the position of the set-square, draw a line m.

Line m is the required line perpendicular to line L.

(ii) With A as centre, draw an arc PQ, which intersects line L at points P and Q.

Without disturbing the compass and taking P and Q as centres, we construct two arcs such that they intersect each other.

The point where both arcs intersect is B.

Join points A and B and extend it in both directions. This is the required line.

Question: 4

Draw a line AB and take two points C and E on opposite sides of AB. Through C, draw draw CD⊥AB and through E draw EF⊥AB. Using

(i) ruler and set square

(ii) ruler and compass.

Solution:

(i) Draw a line AB and take two points C and E on the opposite sides of the line AB.

On the side of E, place a set-square PQR, such that its one arm PQ of the right angle is along the line AB. Without disturbing the position of the set-square, place a ruler along its edge PR.

Now, without disturbing the position of the ruler, slide the set square along the ruler until the arm QR reaches point C.

Without disturbing the position of the set-square, draw a line CD, where D is a point on AB.

CD is the required line and CD $\perp$ AB.

We repeat the same process starting with taking set-square on the side of E, we draw a line EF $\perp$ AB.

(ii) Draw a line AB and take two points C and E on its opposite sides.

With C as centre, draw an arc PQ, which intersects line AB at P and Q.

Taking P and Q as centres, construct two arcs, such that they intersect each other at H.

Join points H and C. HC crosses AB at D.

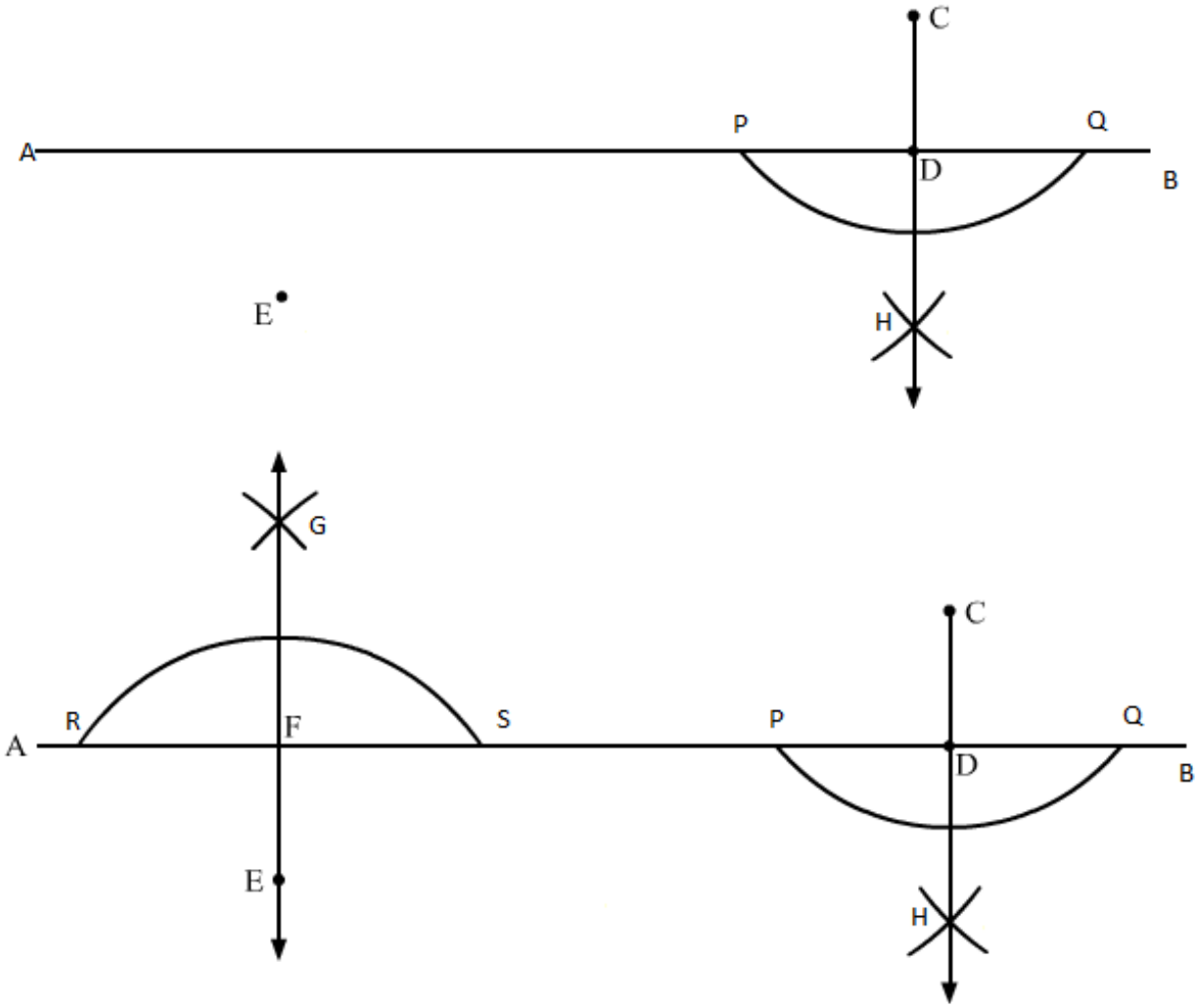
We have CD $\perp$ AB.

Similarly, take E as centre and draw an arc RS.

Taking R and S as centres, draw two arcs which intersect each other at G.

Join points G and E. GE crosses AB at F.

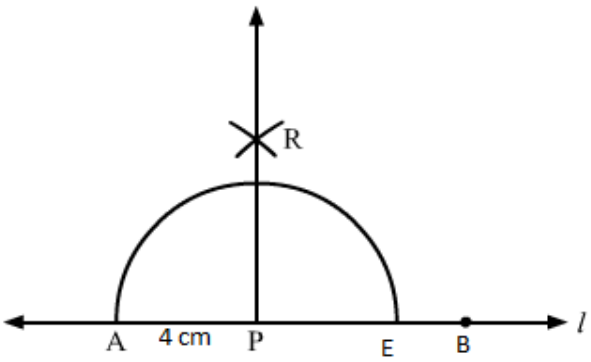
We have EF $\perp$ AB.



Question: 5

Draw a line segment AB of length 10 cm. Mark a point P on AB such that AP = 4 cm. Mark a point P on AB such that AP = 4 cm. Draw a line through P perpendicular to AB.

Solution:



We draw line L and take a point A on it.

Using a ruler and a compass, we mark a point B, 10 cm from A, on the line L.

AB is the required line segment of 10 cm.

Again, we mark a point P, which is 4 cm from A, in the direction of B.

With P as centre, take a radius of 4 cm and construct an arc intersecting the line L at two points A and E.

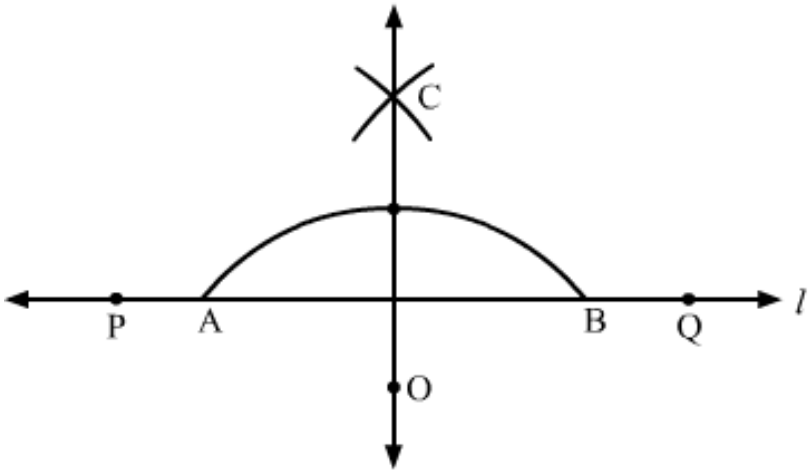
With A and E as centres, take a radius of 6 cm and construct two arcs intersecting each other at R.

We join PR and extend it. PR is the required line, which is perpendicular to AB.

Question: 6

Draw a line segment PQ of length of length 12 cm. Mark a point O outside this segment. Draw a line through O perpendicular to PQ.

Solution:



Draw a line L and take a point P on it.

Using a ruler and a compass, mark a point Q on the line L, where PQ = 12 cm.

Mark a point Q outside PQ.

Now, with O as centre, draw an arc of appropriate radius such that the arc cuts the line at points A and B.

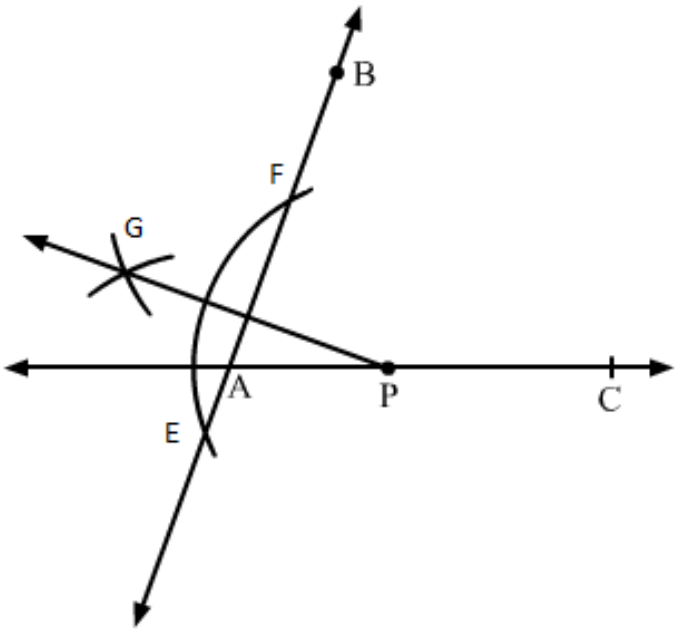
Taking A and B as centres, construct two arcs such that they intersect each other at C.

Join OC. OC is the required line, which is perpendicular to PQ.

Question: 7

Using a protractor, draw ∠BAC of measure 70°. On side AC, take a point P, such that AP = 2cm. From P draw a line perpendicular to AB.

Solution:



Draw a line segment AC on a line L

(i) Take a protractor and place it on the segment AC such that segment AC coincides with the line of diameter of protractor and middle of this line coincides with point A.

(ii) Counting from the right side, mark the point as B at the point of 70° of the protractor and draw AB.

(iii) Now, measuring 2 cm from A on AC, mark a point P.

(iv) With P as centre, draw an arc intersecting line 1 at points E and F.

(v) Using the same radius and E and F as centres, construct two arcs that intersect at point G on the other side.

(vi) Join PG.

Question: 8

Draw a line segment AB of length 8 cm. At each end of this line segment, draw a line perpendicular to AB. Are these two lines parallel?

Solution:

(i) Take a convenient radius with A as centre and draw an arc intersecting the line at points W and X.

(ii) With W and X as centres and radius greater than AW, construct two arcs intersecting each other at M.

(iii) Join AM and extend it in both directions to P and Q.

(iv) Take a convenient radius with B as centre and draw an arc intersecting the line at points Y and Z.

(v) With Y and Z as centres and a radius greater than YB, construct two arcs intersecting each other at N.

(vi) Join BN and extend it in both directions to S and R.

Let the lines perpendicular at A and B be PQ and RS, respectively.

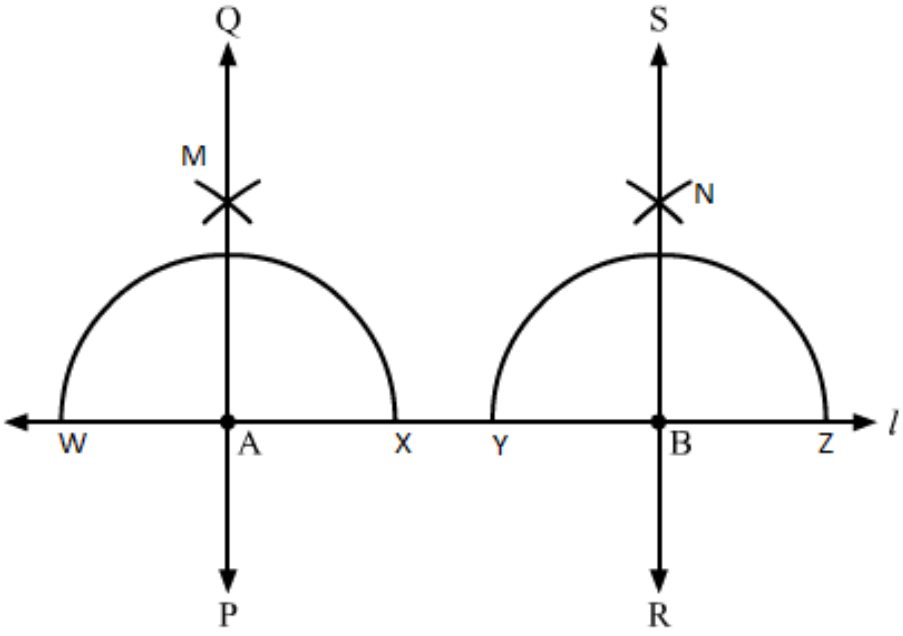
Since, $\angle QAB = 90°$ and $\angle ABR = 90°$

Therefore, $\angle QAB = \angle ABR$.

When two parallel lines are intersected by a third line, the two alternate interior angles are equal.

Since, $\angle QAB = \angle ABR$

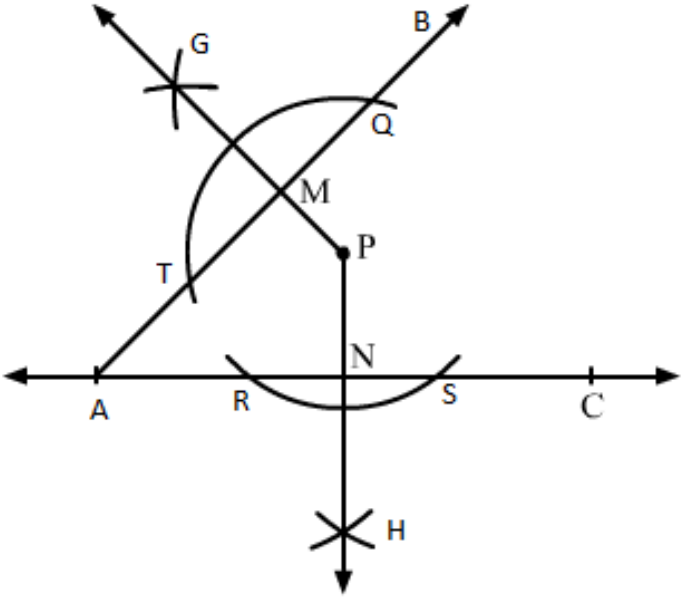
Therefore, PQ and RS are parallel.



Question: 9

Using a protractor, draw ∠BAC of measure 45°. Take a point P in the interior of ∠BAC. From P draw line segments PM and PN such that PM⊥AB and PN⊥AC. Measure ∠MPN.

Solution:



(i) Draw a line segment A on the line L .

(ii) Take a protractor and place it on the segment AC such that AC coincides with the line of the diameter of the protractor and the middle point of the line coincides with point A.

(iii) Counting from the right side, mark a point as B at the point of 45° of protractor and draw a line segment AB.

(iv) Take a convenient radius with P as centre, construct an arc intersecting the line segments AB at T and Q and AC at R and S.

(v) Using the same radius and with T and Q as centres, construct two arcs intersecting at G on the other side.

(vi) Using the same radius and with R and S as centres, construct two arcs intersecting at H on the other side.

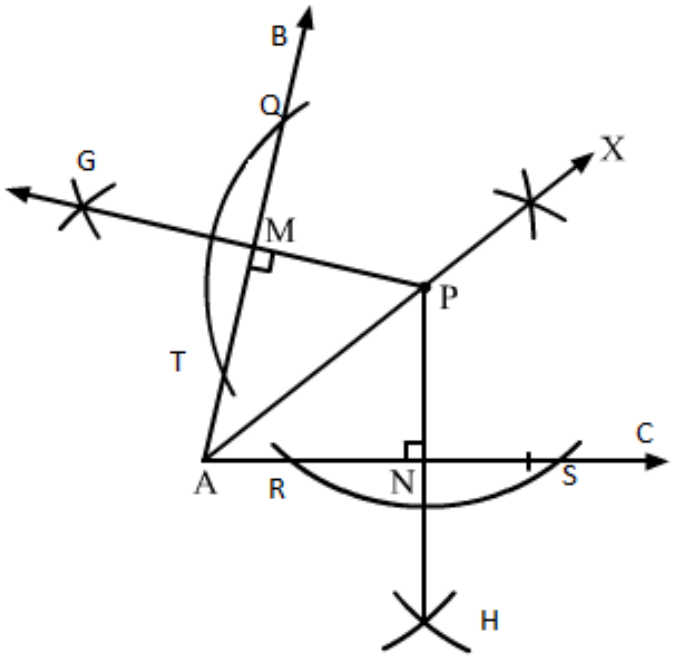
(vii) Join PG and PH which intersects AB and AC at M and N, respectively.

On measuring ∠MPN using a protractor, we get it equal to 135°.

Question: 10

Draw an angle and label it as ∠BAC. Draw a bisector ray AX and take point P on it. From P draw line segments PM and PN, such that PM⊥AB and PN⊥ AC, where M and N are respectively, points on rays AB and AC. Measure PM and PN. Are the two lengths equal?

Solution:



(i) Draw ∠BAC on the line segment AC.

With a convenient radius and A as centre, draw an arc from AB and AC.

(ii) The points where arc cuts AB and AC, take both points as centres and draw two small arcs intersecting at X. Now, draw AX.

(iii) Take a point P on the ray AX.

(iv) Take a convenient radius with P as centre and construct an arc intersecting the line segments AB at T and Q and AC at R and S, respectively.

(v) Using the same radius and with T and Q as centres, construct two arcs intersecting at G on the other side.

(vi) Using the same radius and with R and S as centres, construct two arcs intersecting at H on the other side.

(vii) Join PG and PH, which intersects AB and AC at M and N, respectively.

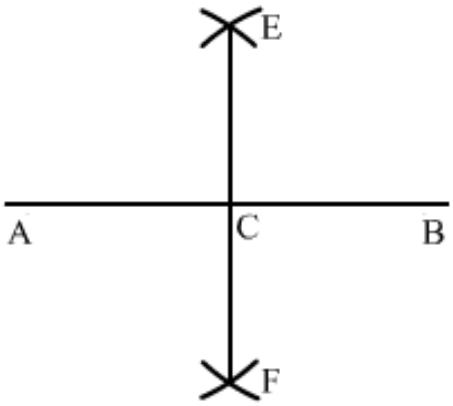
On measuring PM and PN using a ruler, we find that both are equal.

Exercise 19.3

Question: 1

Draw a line segment of length 8.6 cm. Bisect it and measure the length of each part.

Solution:



Draw a line segment AB of length 8.6 cm.

With A as centre and radius more than half of AB, draw arcs on both sides of AB.

With the same radius and B as centre, draw arcs on the both sides of AB, cutting the previous two arcs at E and F.

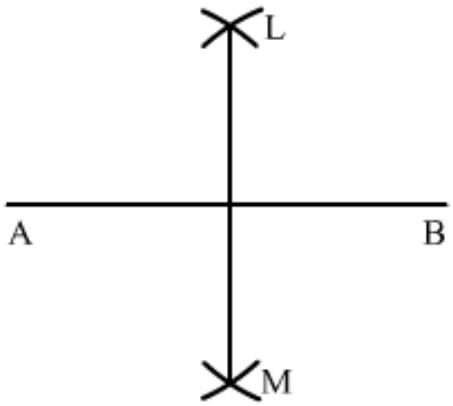
Draw a line segment from E to F intersecting AB at C.

On measuring AC and BC, we get: AC = BC = 4.3 cm.

Question: 2

Draw a line segment AB of length 5.8 cm. Draw the perpendicular bisector of this line segment.

Solution:



Draw a line segment AB of length 5.8 cm using a ruler.

With A as centre and radius more than half of AB, draw arcs on both sides of AB.

With the same radius and B as centre, draw arcs on both sides of AB, intersecting the previous arcs at L and M.

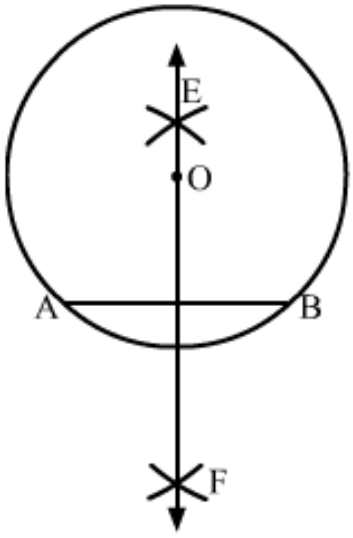
Draw the line segment LM with L and M as end-points.

LM is the required perpendicular bisector of AB.

Question: 3

Draw a circle with centre at point O and radius 5 cm. Draw its chord AB, draw the perpendicular bisector of line segment Ab. Does it pass through the centre of the circle?

Solution:



Draw a point O. With O as centre and radius equal to 5 cm, draw a circle.

Take any two points A and B on the circumference of the circle and draw a line segment with A and B as its end points.

AB is the chord of the circle.

With A as centre and radius more than half of AB, draw arcs on both sides of AB.

With the same radius and B as a centre, draw arcs on both sides of AB, cutting the previous two arcs at E and F.

Draw a line passing through E and F.

Line EF passes through the centre of the circle O.

Question: 4

Draw a circle with centre at point O. Draw its two chords AB and CD such that AB is not parallel to CD. Draw the perpendicular bisector of AB and CD. At what point do they intersect?

Solution:

Draw a circle with centre at O. We draw two chords AB and CD as shown in the figure.

(i) With A as centre and radius more than half of AB, draw arcs on both sides of AB.

(ii) With the same radius and B as centre, draw arcs cutting the arcs of step (i) at P and Q.

(iii) Join P and Q.

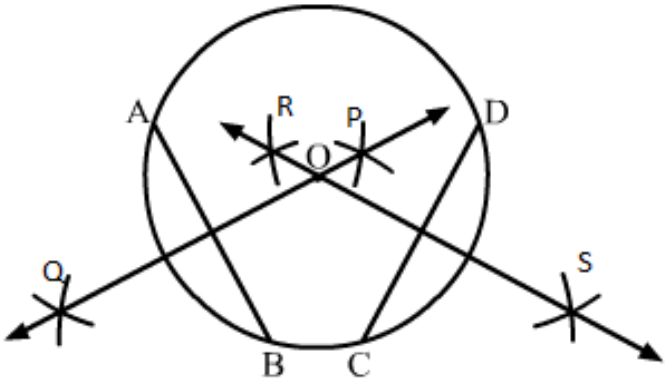
(iv) With C as centre and radius more than half of CD, draw arcs on both sides of CD.

(v) With the same radius and D as centre, draw arcs cutting the arcs of step (iv) at R and S.

(vi) Join R and S.

We draw the line segments of perpendicular bisector of AB and CD.

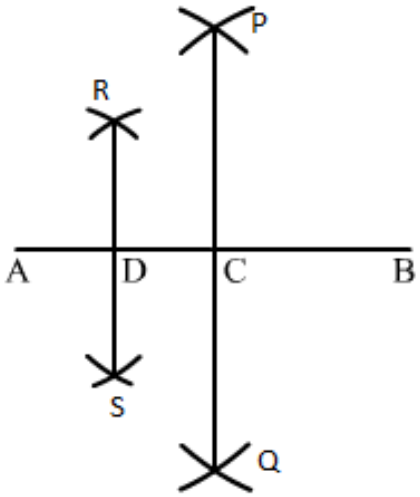
We see that the perpendicular bisector of AB and CD meet at 0, the centre of the circle.



Question: 5

Draw a line segment of length 10 cm and bisect it. Further bisect one of the equal parts and measure its length.

Solution:



Draw a line segment AB of length 10 cm and bisect it.

(i) With A as centre and radius more than half of AB, draw arcs on both sides of AB.

(ii) With the same radius and B as centre, draw arcs cutting the arcs of step (i) at P and Q, respectively.

(iii) Join P and Q. Line PQ intersects line AB at C.

(iv) With A as centre and radius more than half of AC, draw arcs on both sides of AB.

(v) With the same radius and C as centre, draw arcs cutting the arcs of step (iv) at R and S, respectively.

(vi) Join R and S.

Line RS intersects AC at D.

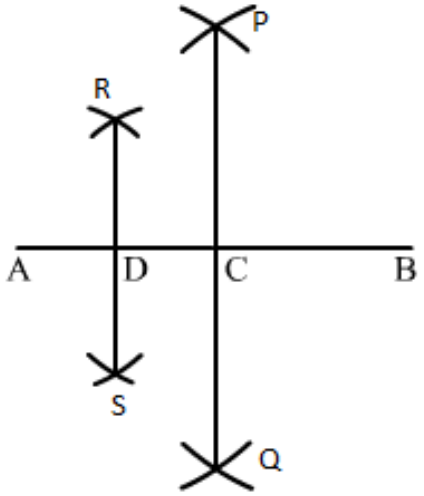
If we measure AD with the ruler, we have AD = 2.5 cm

Question: 6

Draw a line segment AB and bisect it. Bisect one of the equal parts to obtain a line segment of length 1/2(AB).

Solution:

Draw a line segment AB.



(i) With A as centre and radius more than half of AB, draw arcs on both sides of AB.

(ii) With the same radius and B as centre, draw arcs cutting the arcs drawn in step (1) at P and Q.

(iii) Join P and Q. PQ intersects AB at C.

(iv) With A as centre and radius more than half of AC, draw arcs on both sides of AC.

(v) With the same radius and C as centre, draw arcs cutting the arcs drawn in step

(iv) at R and S.

(vi) Join R and S. RS intersects AB at D.

Now, AC and CB are equal.

Both are 1/2(AB). Again, divide AC at D.

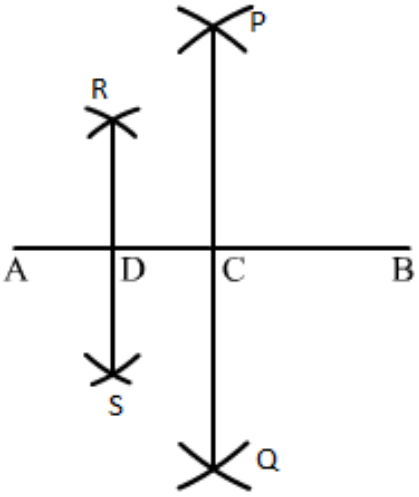
So, AD and AC are of same length, i.e., 1/4(AB).

Question: 7

Draw a line segment AB and by ruler and compasses, obtain a line segment of length 3/4(AB).

Solution:

Draw a line segment AB using the ruler.



(i) With A as centre and radius more than half of AB, draw arcs on both sides of AB.(ii) With the same radius and B as centre, draw arcs cutting the arcs drawn in step (i) at P and Q.

(iii) Join P and Q. PQ intersects AB at C.

(i) With A as centre and radius more than half of AB, draw arcs on both sides of AC.

(ii) With the same radius and C as centre, draw arcs cutting the arcs drawn in step (iv) at R and S.

(iii) Join R and S. RS intersects AB at D.

Bisect AC again and mark the point of bisection as D.

So, we have: AD = 1/4(AB),

DC = 1/4 (AB) and CB = 1/2(AB)

Therefore, DB = 1/4 (AB) + 1/2(AB) = 3/4(AB)

Thus, DB is the required line segment of length 3/4(AB).

Exercise 19.4

Question: 1

Construct the following angles with the help of protractor:

45°, 67°, 38°, 110°, 179°, 98°, 84°.

Solution:

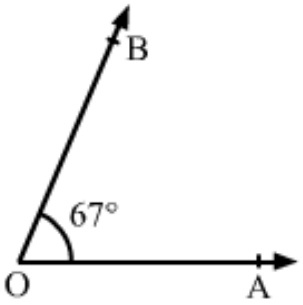
We draw a ray OA.

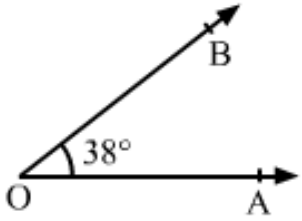
We place the protractor on OA such that its center coincides with the point 0 and the diameter of the protractor coincides with OA.

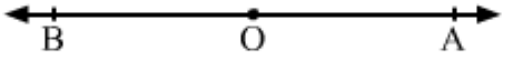
We mark a point B against the mark of 45° on the protractor.

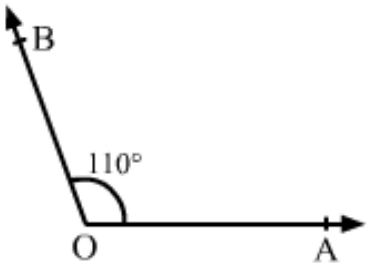
We remove the protractor and draw OB. ∠AOB is the required angle of 45°.

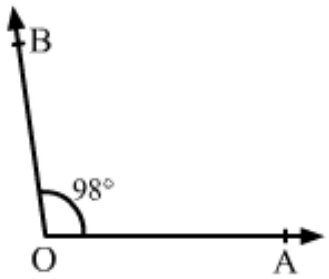
Similarly, we draw the angles 67°, 38°, 110°, 179°, 98° and 84°.

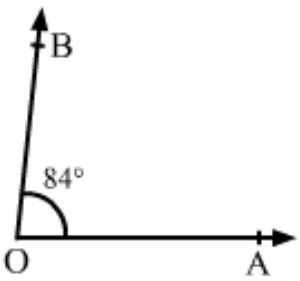












Question: 2

Draw two rays PQ and RS as shown in figure. Using the protractor, construct angles of 15° and 138° with one arm PQ and RS respectively.

Solution:

(i) Draw a ray PQ as given in the question.

Place the protractor on the ray PQ such that its center coincides with the point P and the diameter of the protractor coincides with PQ.

Mark a point B against the mark of 15° on the protractor.

Remove the protractor and draw PB. ∠QPB is the required angle of 15°.

(ii) Draw a ray RS as given in the question.

Place the protractor on ray RS such that its centre coincides with the point R and diameter of the protractor coincides with RS.

Mark a point T against the mark of 138° on the protractor.

Remove the protractor and draw RJ.

∠SRTIIs the required angle of 138°.

Exercise 19.5

Question: 1

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

Solution:

Draw an 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.

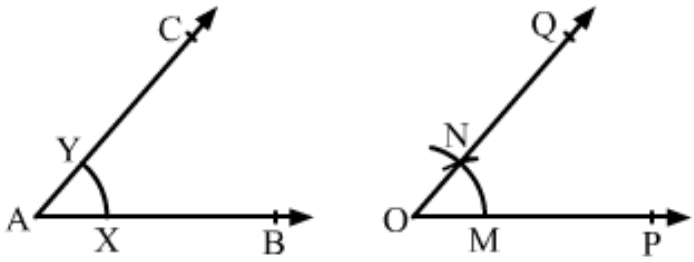
With the same radius and O as center, draw an arc to intersect the arc OP at M.

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 0 and N and extend it to Q.

∠POQ is the required angle.

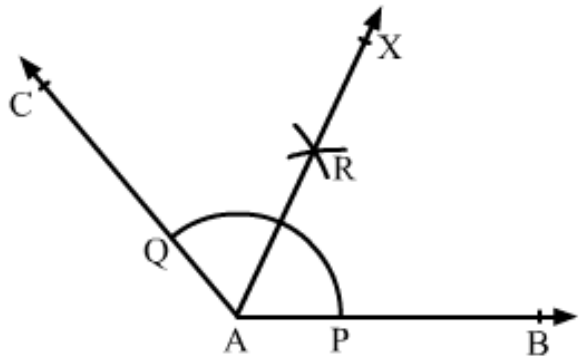


Question: 2

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 ∠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 ∠BAC.

If we measure ∠BAR and ∠CAR,

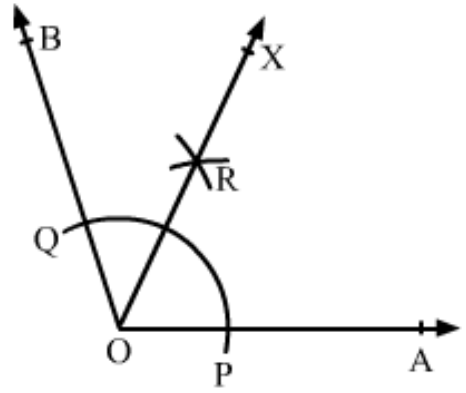
we have ∠BAR = ∠CAR = 65°

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 ∠AOB of 108°.

Since, 108/2 = 54°

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.

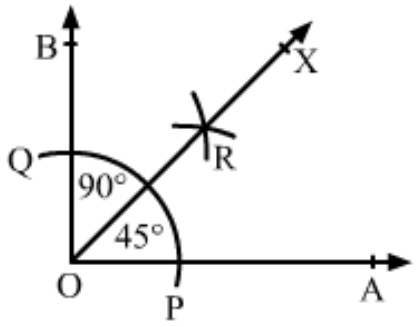
∠AOX is the required angle of 54°.

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 ∠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.

∠AOX is the required angle of 45°.

∠AOB = 90°

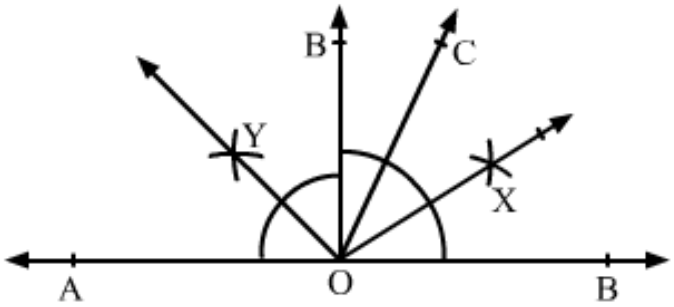
∠AOX = 45°

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 ∠AOC, we also get another angle ∠BOC.

Bisect ∠AOC by a compass and a ruler and get the ray OX.

Similarly, bisect ∠BOC and get the ray OY.

Now,

∠XOY = ∠XOC + ∠COY

= 1/2 ∠AOC + 12 ∠BOC

= 1/2(∠AOC + ∠BOC)

= 1/2 x 180° = 90° (As ∠AOC and ∠BOC 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, ∠BOC = ∠AOD and

∠AOC = ∠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, ∠XOA + ∠AOD + ∠DOY

= 1/2 ∠AOC + ∠AOD + 1/2 ∠BOD

= 1/2 ∠BOD + ∠AOD + 1/2 ∠BOD

[As, ∠AOC = ∠BOD]

= ∠AOD + ∠BOD

Since, AB is a line.

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

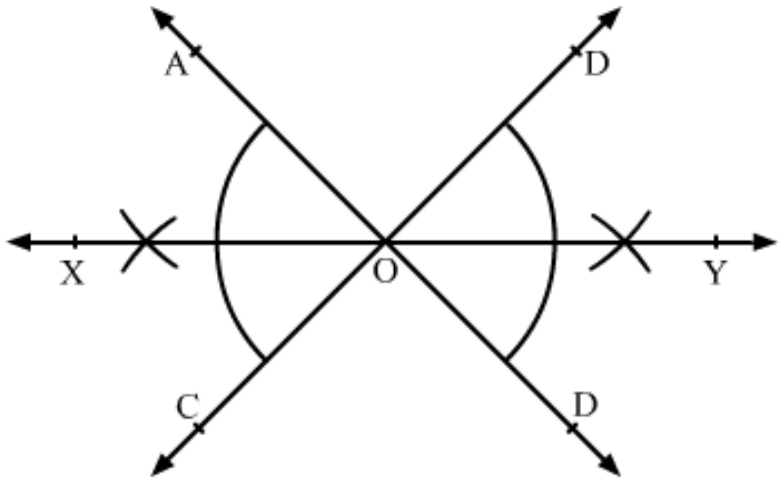
Therefore, ∠XOA + ∠AOD + ∠DOY = 180°

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.

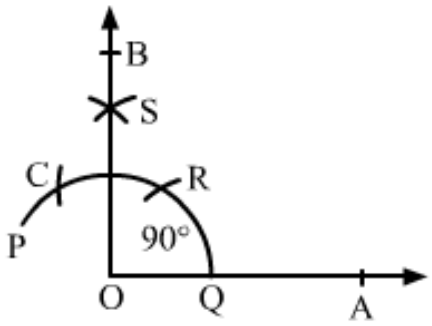
Thus, OX and OY are in the same line.



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.

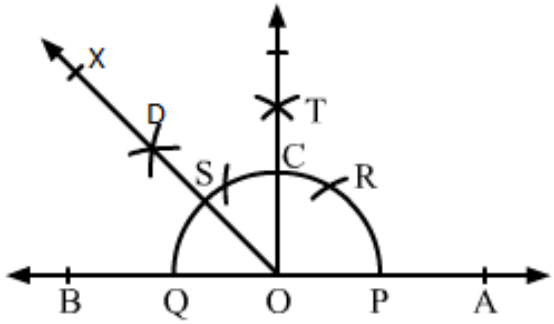
Join O and S and extend the line to B.

$\angle AOB$ 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.

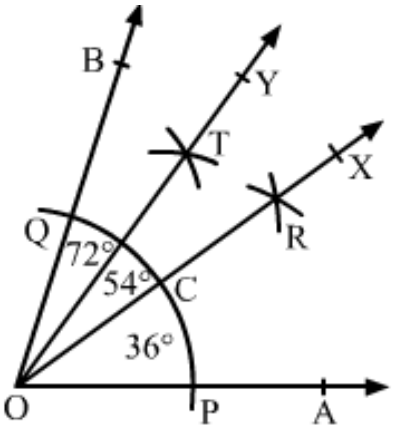
Join O and D and extend it to X to form the ray OX.

∠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 ∠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 ∠AOB

Therefore, ∠AOX = ∠BOX = 72/2 = 36°

Again, OY bisects ∠BOX

Therefore, ∠XOY = ∠BOY = 36/2 = 18°

Therefore, ∠AOX is the required angle of 36° and ∠AOY = ∠AOX + ∠XOY = 36° + 18° = 54°

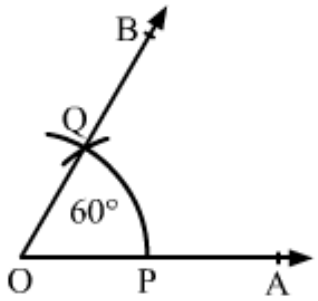
Therefore, ∠AOY is the required angle of 54°.

Exercise 19.6

Question: 1

Construct an angle of 60° with the help of compasses and bisect it by paper folding.

Solution:

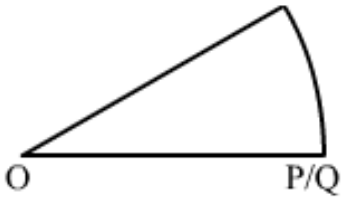


Draw a ray OA.

With convenient radius and centre O, draw an arc cutting the ray OA at P.

With the same radius and centre at P, draw another arc cutting the previous arc at Q.

Draw OQ and extend it to B.



∠AOB is the required angle of 60°.

We cut the part of paper as sector OPQ.

Now, fold the part of paper such that line segments OP and OQ get coincided.

Angle made at point O is the required angle, which is half of angle ∠AOB.

Question: 2

Construct the following angles with the help of ruler and compasses only.

(i) 30°

(ii) 90°

(iii) 45°

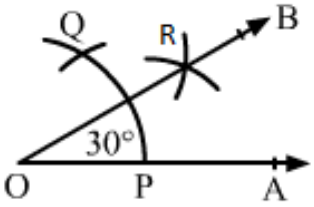
(iv) 135°

(v) 150°

(vi) 105°

Solution:

(i) 30°



Draw a ray OA.

With a convenient radius and centre at O, draw an arc, which cuts OA at P.

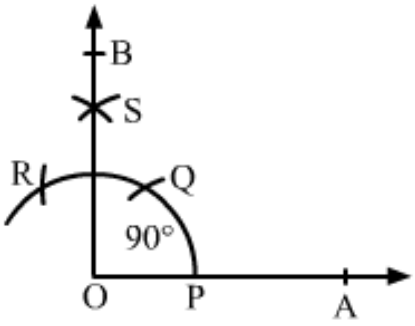
With the same radius and centre at P, draw an arc cutting the previous arc at P.

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

Draw OR and extend it to B.

∠AOB is the required angle of 30°.

(ii) 90°



Draw a ray OA.

With a convenient radius and centre at O, draw an arc cutting the ray OA at P.

With the same radius and centre at P, draw another arc, which cuts the first arc at Q.

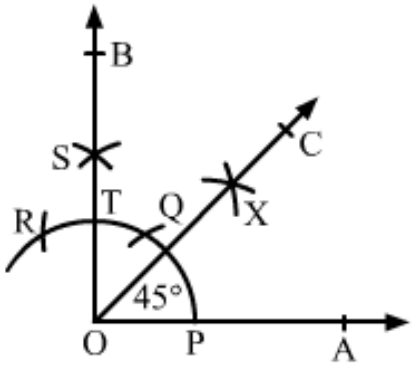
With the same radius and centre at Q, draw another arc, which cuts the first arc at R.

With Q and R as centres and radius more than half of QR, which cuts each other at S.

Draw OS and extend it to B from the ray OB.

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

(iii) 45°



To construct an angle of 45°, construct an angle of 90^0 and bisect it.

Construct the angle $\angle AOB = 90^\circ$, where rays OA and OB intersect the arc at points P and T as shown in figure.

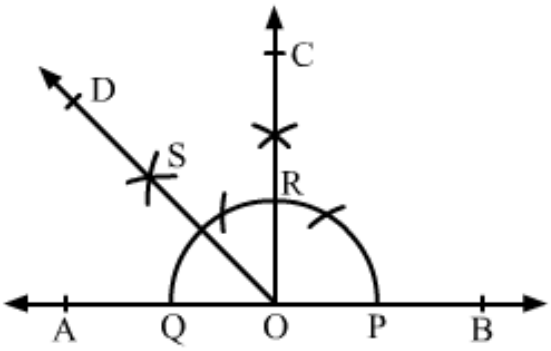
With P and T as centres and radius more than half of PT, draw two arcs, which cut each other at X

Draw OX and extend it to C to form the ray OC.

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

(iv) 135°

Draw the line AB and take the point O at the middle of AB.



With a convenient radius and centre at O, draw an arc, which cuts AB at P and Q, respectively.

Draw an angle of 90° on the ray OB as $\angle BOC = 90^\circ$, where ray OC cuts the arc at R.

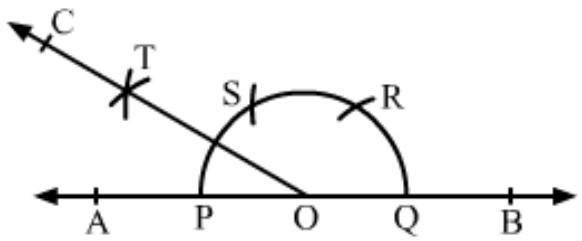
With Q and R as centres and radius more than half of QR, draw two arcs, which cuts each other at S.

Draw OS and extend it to form the ray OD.

$\angle BOD$ is required angle of 135°.

(v) 150°

Draw a line AB and take point O at the middle of AB.



With a convenient radius and centre at O, draw an arc, which cuts the line AB at P and Q.

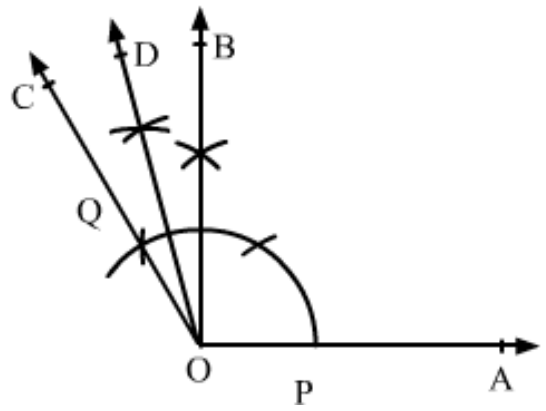
With the same radius and centre at Q, draw an arc, which cuts the first arc at R.

With the same radius and centre at R, draw an arc, which cuts the first arc at S.

With the centres P and S and radius more than half of PS, draw two arcs, which cut each other at T.

Draw OT and extend it to C to form the ray OC.

$\angle BOC$ is required angle of 150°.



(vi) 105°

Draw a ray OA and make an angle $\angle AOB = 90^\circ$ and $\angle AOC = 120^\circ$

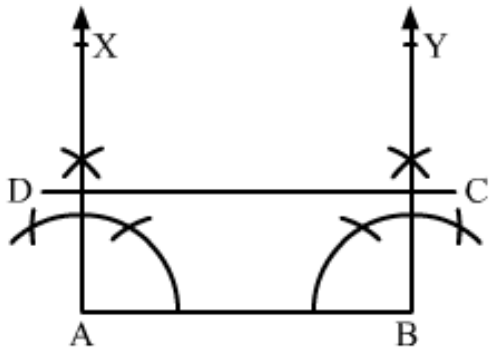
Now bisect ∠BOC and get the ray OD.

∠AOD is the required angle of 105°

Question: 3

Construct a rectangle whose adjacent sides are 8 cm and 3 cm.

Solution:



Draw a line segment AB of length 8 cm.

Construct ∠BAX = 90° at point A and ∠ABY = 90° at point B.

Using a compass and ruler, mark a point D on the ray AX such that AD = 3 cm.

Similarly mark the point C on the ray Y such that BC = 3 cm.

Draw the line segment CD.

ABCD is the required rectangle.