Class –VI Mathematics (Ex. 14.1)
Questions

1. Draw a circle of radius 3.2 cm.
2. With the same centre O, draw two circles of radii 4 cm and 2.5 cm.
3. Draw a circle and any two of its diameters. If you join the ends of these diameters, what is the figure obtained if the diameters are perpendicular to each other? How do you check your answer?
4. Draw any circle and mark points A, B and C such that:
   (a) A is on the circle.
   (b) B is in the interior of the circle.
   (c) C is in the exterior of the circle.
5. Let A, B be the centres of two circles of equal radii; draw them so that each one of them passes through the centre of the other. Let them intersect at C and D. Examine whether $\overline{AB}$ and $\overline{CD}$ are at right angles.

Answers

1. **Steps of construction**:

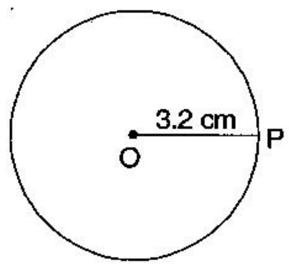
(a) Open the compass for the required radius of 3.2 cm.

(b) Make a point with a sharp pencil where we want the centre of circle to be.

(c) Name it O.

(d) Place the pointer of compasses on O.

(e) Turn the compasses slowly to draw the circle.



It is required circle.

2. **Steps of construction**:

(a) Marks a point 'O' with a sharp pencil where we want the centre of the circle.

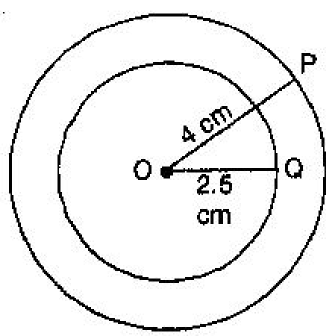
(b) Open the compasses 4 cm.

(c) Place the pointer of the compasses on O.

(d) Turn the compasses slowly to draw the circle.

(e) Again open the compasses 2.5 cm and place the pointer of the compasses on D.

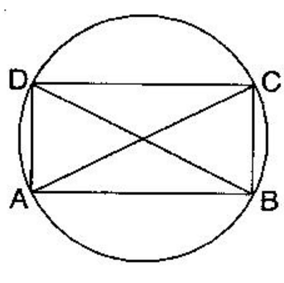
(f) Turn the compasses slowly to draw the second circle.



It is the required figure.

3. (i) By joining the ends of two diameters, we get a rectangle. By measuring, we find AB = CD = 3 cm, BC = AD = 2 cm, i.e., pairs of opposite sides are equal and also $\angle A = \angle B = \angle C = \angle D = 90^\circ$, , i.e. each angle is of 90°.

Henc,e it is a rectangle.

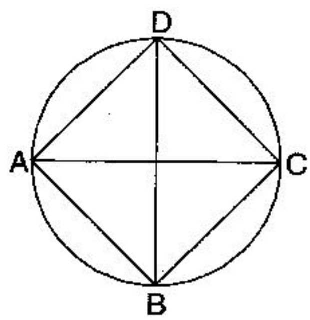


(ii) If the diameters are perpendicular to each other, then by joining the ends of two diameters, we get a square.

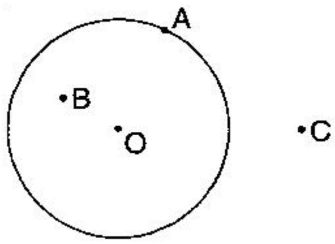
By measuring, we find that AB = BC = CD = DA = 2.5 cm, i.e., all four sides are equal.

Also $\angle A = \angle B = \angle C = \angle D = 90^\circ$, , i.e. each angle is of 90°.

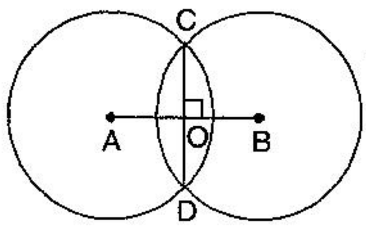
Hence, it is a square.



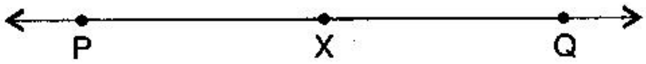
4. (i) Mark a point 'O' with sharp pencil where we want centre of the circle.
(ii) Place the pointer of the compasses at 'O'. Then move the compasses slowly to draw a circle.
(a) Point A is on the circle.
(b) Point B is in interior of the circle.
(c) Point C is in the exterior of the circle.



5. Draw two circles of equal radii taking A and B as their centre such that one of them passes through the centre of the other. They intersect at C and D. Join AB and CD.
Yes, AB and CD intersect at right angle as $\angle COB$ is 90°.



1. Draw a line segment of length 7.3 cm, using a ruler.
2. Construct a line segment of length 5.6 cm using ruler and compasses.
3. Construct $\overline{AB}$ of length 7.8 cm. From this cut off $\overline{AC}$ of length 4.7 cm. Measure $\overline{BC}$.
4. Given $\overline{AB}$ of length 3.9 cm, construct $\overline{PQ}$ such that the length $\overline{PQ}$ is twice that of $\overline{AB}$. Verify by measurement.



(**Hint**: Construct $\overline{PX}$ such that length of $\overline{PX}$ = length of $\overline{AB}$; then cut off $\overline{XQ}$ such that $\overline{XQ}$ also has the length of $\overline{AB}$.

5. Given $\overline{AB}$ of length 7.3 cm and $\overline{CD}$ of length 3.4 cm, construct a line segment $\overline{XY}$ such that the length of $\overline{XY}$ is equal to the difference between the lengths of $\overline{AB}$ and $\overline{CD}$. Verify by measurement.

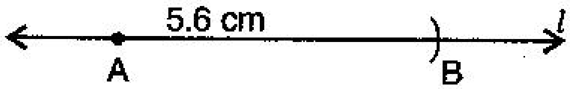
Answers

1. **Steps of construction**:

(i) Place the zero mark of the ruler at a point A.
(ii) Mark a point B at a distance of 7.3 cm from A.
(iii) Join AB.

$\overline{AB}$ is the required line segment of length 7.3 cm.

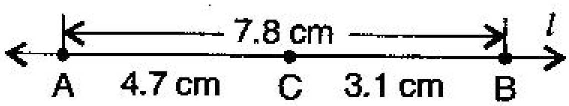
2. **Steps of construction**:



(i) Draw a line $'l'$. Mark a point A on this line.
(ii) Place the compasses pointer on zero mark of the ruler. Open it to place the pencil point up to 5.6 cm mark.
(iii) Without changing the opening of the compasses. Place the pointer on A and cut an arc $'l'$ at B.

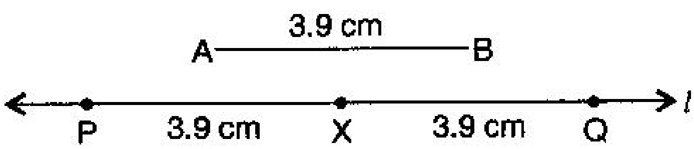
$\overline{AB}$ is the required line segment of length 5.6 cm.

3. **Steps of construction**:



(i) Place the zero mark of the ruler at A.
(ii) Mark a point B at a distance 7.8 cm from A.
(iii) Again, mark a point C at a distance 4.7 from A.
(iv) By measuring $\overline{BC}$, we find that BC = 3.1 cm

4. **Steps of construction**:



(i) Draw a line $'l'$.

(ii) Construct $\overline{PX}$ such that length of $\overline{PX}$ = length of $\overline{AB}$

(iii) Then cut of $\overline{XQ}$ such that $\overline{XQ}$ also has the length of $\overline{AB}$.

(iv) Thus the length of $\overline{PX}$ and the length of $\overline{XQ}$ added together make twice the length of $\overline{AB}$.

Verification:

By measurement we find that PQ = 7.8 cm

= 3.9 cm + 3.9 cm = $\overline{AB} + \overline{AB} = 2 \times \overline{AB}$

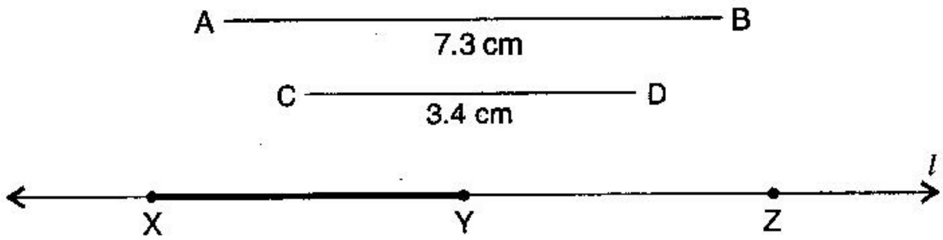
5. **Steps of construction**:

(i) Draw a line 'l' and take a point X on it.

(ii) Construct $\overline{XZ}$ such that length $\overline{XZ}$ = length of $\overline{AB}$ = 7.3 cm

(iii) Then cut off $\overline{ZY}$ = length of $\overline{CD}$ = 3.4 cm

(iv) Thus the length of $\overline{XY}$ = length of $\overline{AB}$ – length of $\overline{CD}$



Verification:

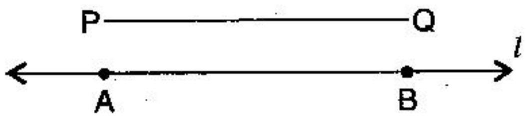
By measurement we find that length of $\overline{XY}$ = 3.9 cm

= 73. Cm – 3.4 cm = $\overline{AB} - \overline{CD}$

1. Draw any line segment $\overline{PQ}$. Without measuring $\overline{PQ}$, construct a copy of $\overline{PQ}$.
2. Given some line segment $\overline{AB}$, whose length you do not know, construct $\overline{PQ}$ such that the length of $\overline{PQ}$ is twice that of $\overline{AB}$.

Answers

1. **Steps of construction**:



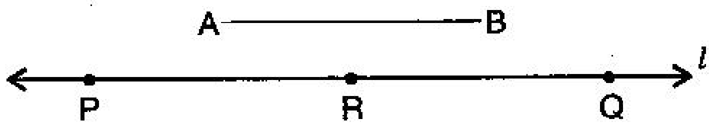
(i) Given $\overline{PQ}$ whose length is not known.

(ii) Fix the compasses pointer on P and the pencil end on Q. The opening of the instrument now gives the length of $\overline{PQ}$.

(iii) Draw any line 'l'. Choose a point A on 'l'. Without changing the compasses setting, place the pointer on A.

(iv) Draw an arc that cuts 'l' at a point, say B. Now $\overline{AB}$ is a copy of $\overline{PQ}$.

2. Steps of construction:



(i) Given $\overline{AB}$ whose length is not known.

(ii) Fix the compasses pointer on A and the pencil end on B. The opening of the instrument now gives the length of $\overline{AB}$.

(iii) Draw any line 'l'. Choose a point P on 'l'. Without changing the compasses setting, place the pointer on Q.

(iv) Draw an arc that cuts 'l' at a point R.

(v) Now place the pointer on R and without changing the compasses setting, draw another arc that cuts 'l' at a point Q.

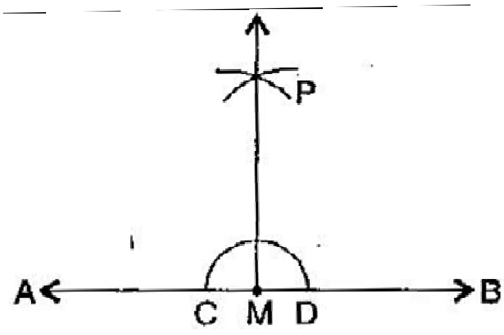
(vi) Thus $\overline{PQ}$ is the required line segment whose length is twice that of AB.

Questions

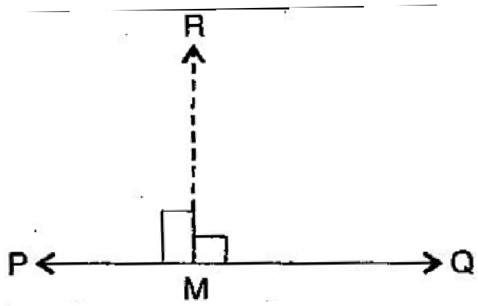
1. Draw any line segment $\overline{AB}$. Mark any point M on it. Through M, draw a perpendicular to $\overline{AB}$. (Use ruler and compasses)
2. Draw any line segment $\overline{PQ}$. Take any point R not on it. Through R, draw a perpendicular to $\overline{PQ}$. (Use ruler and set-square)
3. Draw a line l and a point X on it. Through X, draw a line segment $\overline{XY}$ perpendicular to l. Now draw a perpendicular to $\overline{XY}$ to Y. (use ruler and compasses)

Answers

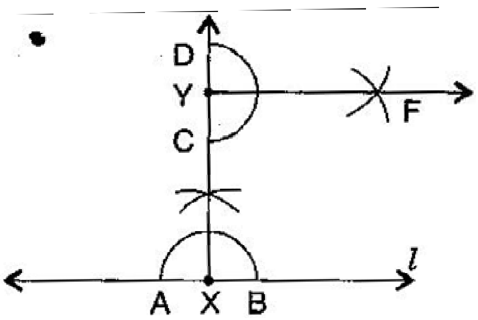
1. **Steps of construction**:
   (i) With M as centre and a convenient radius, draw an arc intersecting the line AB at two points C and B.
   (ii) With C and D as centres and a radius greater than MC, draw two arcs, which cut each other at P.
   (iii) Join PM. Then PM is perpendicular to AB through the point M.



2. **Steps of construction**:
   (i) Place a set-square on $\overleftrightarrow{PQ}$ such that one arm of its right angle aligns along $\overleftrightarrow{PQ}$.
   (ii) Place a ruler along the edge opposite to the right angle of the set-square.
   (iii) Hold the ruler fixed. Slide the set square along the ruler till the point R touches the other arm of the set square.
   (iv) Join RM along the edge through R meeting $\overleftrightarrow{PQ}$ at M. Then RM $\perp$ PQ.



3. Steps of construction:
   (i) Draw a line 'l' and take point X on it.
   (ii) With X as centre and a convenient radius, draw an arc intersecting the line 'l' at two points A and B.
   (iii) With A and B as centres and a radius greater than XA, draw two arcs, which cut each other at C.
   (iv) Join AC and produce it to Y. Then XY is perpendicular to 'l'.
   (v) With D as centre and a convenient radius, draw an arc intersecting XY at two points C and D.
   (vi) With C and D as centres and radius greater than YD, draw two arcs which cut each other at F.
   (vii) Join YF, then YF is perpendicular to XY at Y.

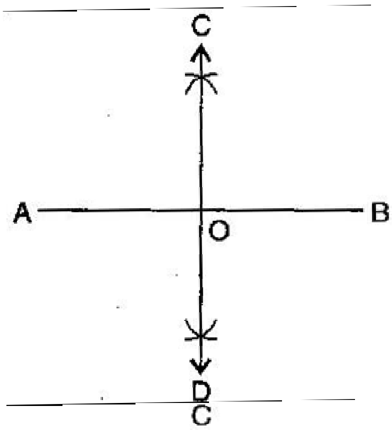


Questions

1. Draw $\overline{AB}$ of length 7.3 cm and find its axis of symmetry.
2. Draw a line segment of length 9.5 cm and construct its perpendicular bisector.
3. Draw the perpendicular bisector of $\overline{XY}$ whose length is 10.3 cm.
   (a) Take any point P on the bisector drawn. Examine whether PX = PY.
   (b) If M is the mid-point of $\overline{XY}$, what can you say about the lengths MX and XY?
4. Draw a line segment of length 12.8 cm. Using compasses, divide it into four equal parts. Verify by actual measurement.
5. With $\overline{PQ}$ of length 6.1 cm as diameter, draw a circle.
6. Draw a circle with centre C and radius 3.4 cm. Draw any chord $\overline{AB}$. Construct the perpendicular bisector $\overline{AB}$ and examine if it passes through C.
7. Repeat Question 6, if $\overline{AB}$ happens to be a diameter.
8. Draw a circle of radius 4 cm. Draw any two of its chords. Construct the perpendicular bisectors of these chords. Where do they meet?
9. Draw any angle with vertex O. Take a point A on one of its arms and B on another such that OA = OB. Draw the perpendicular bisectors of $\overline{OA}$ and $\overline{OB}$. Let them meet at P. Is PA = PB?

Answers

1. Axis of symmetry of line segment $\overline{AB}$ will be the perpendicular bisector of $\overline{AB}$. So, draw the perpendicular bisector of AB.



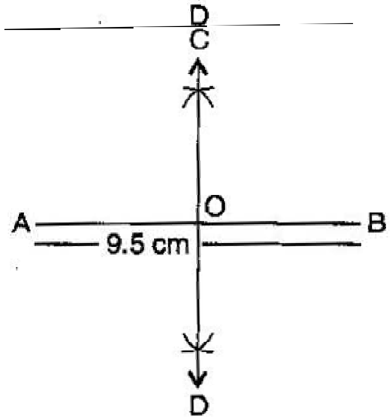
Steps of construction:

(i) Draw a line segment $\overline{AB}$ = 7.3 cm

(ii) Taking A and B as centres and radius more than half of AB, draw two arcs which intersect each other at C and D.

(iii) Join CD. Then CD is the axis of symmetry of the line segment AB.

2. **Steps of construction**:

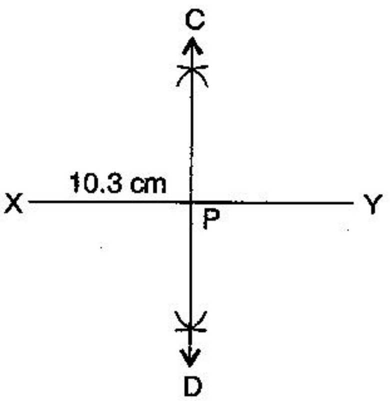


(i) Draw a line segment $\overline{AB}$ = 9.5 cm

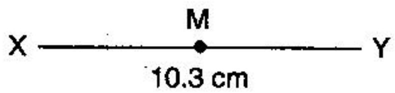
(ii) Taking A and B as centres and radius more than half of AB, draw two arcs which intersect each other at C and D.

(iii) Join CD. Then CD is the perpendicular bisector of $\overline{AB}$.

3. **Steps of construction**:



(*i*)



(*ii*)

(i) Draw a line segment $\overline{XY}$ = 10.3 cm

(ii) Taking X and Y as centres and radius more than half of AB, draw two arcs which intersect each other at C and D.

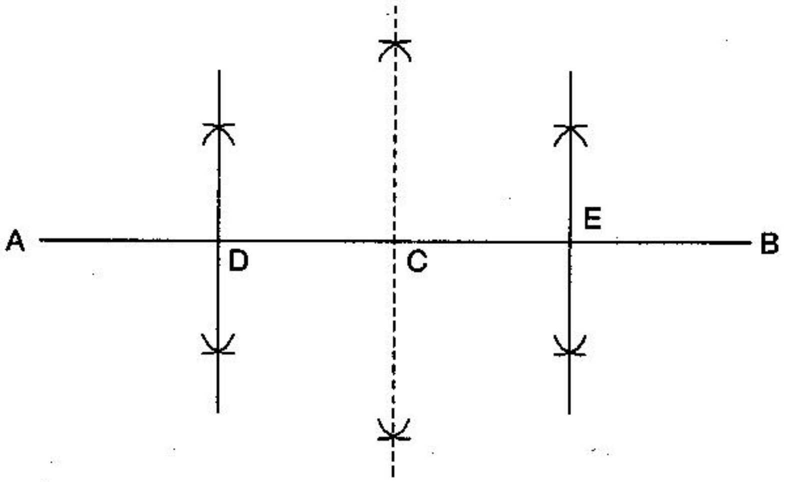
(iii) Join CD. Then CD is the required perpendicular bisector of $\overline{XY}$.

Now:

(a) Take any point P on the bisector drawn. With the help of divider we can check that $\overline{PX} = \overline{PY}$.

(b) If M is the mid-point of $\overline{XY}$, then $\overline{MX} = \frac{1}{2}\overline{XY}$.

4. **Steps of construction**:



(i) Draw a line segment AB = 12.8 cm

(ii) Draw the perpendicular bisector of $\overline{AB}$ which cuts it at C. Thus, C is the mid-point of $\overline{AB}$.

(iii) Draw the perpendicular bisector of $\overline{AC}$ which cuts it at D. Thus D is the mid-point of .

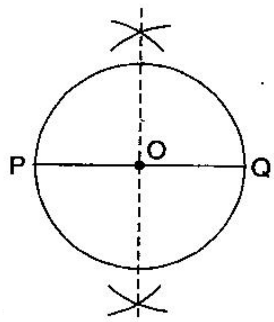
(iv) Again, draw the perpendicular bisector of $\overline{CB}$ which cuts it at E. Thus, E is the mid-point of $\overline{CB}$.

(v) Now, point C, D and E divide the line segment $\overline{AB}$ in the four equal parts.

(vi) By actual measurement, we find that

$\overline{AD} = \overline{DC} = \overline{CE} = \overline{EB} = 3.2$ cm

5. **Steps of construction**:

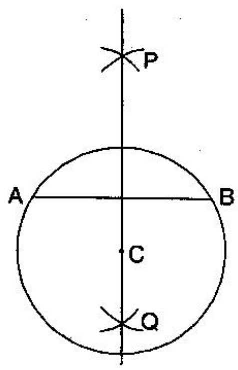


(i) Draw a line segment $\overline{PQ}$ = 6.1 cm.

(ii) Draw the perpendicular bisector of PQ which cuts, it at O. Thus O is the mid-point of $\overline{PQ}$.

(iii) Taking O as centre and OP or OQ as radius draw a circle where diameter is the line segment $\overline{PQ}$.

6. **Steps of construction**:



(i) Draw a circle with centre C and radius 3.4 cm.

(ii) Draw any chord $\overline{AB}$.

(iii) Taking A and B as centers and radius more than half of $\overline{AB}$, draw two arcs which cut each other at P and Q.

(iv) Join PQ. Then PQ is the perpendicular bisector of $\overline{AB}$.

(v) This perpendicular bisector of $\overline{AB}$ passes through the centre C of the circle.

7. **Steps of construction**:

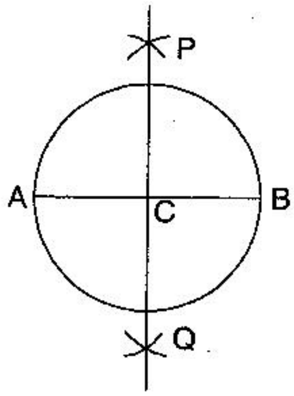
(i) Draw a circle with centre C and radius 3.4 cm.

(ii) Draw its diameter $\overline{AB}$.

(iii) Taking A and B as centers and radius more than half of it, draw two arcs which intersect each other at P and Q.

(iv) Join PQ. Then PQ is the perpendicular bisector of $\overline{AB}$.

(v) We observe that this perpendicular bisector of $\overline{AB}$ passes through the centre C of the circle.



8. **Steps of construction**:

(i) Draw the circle with O and radius 4 cm.

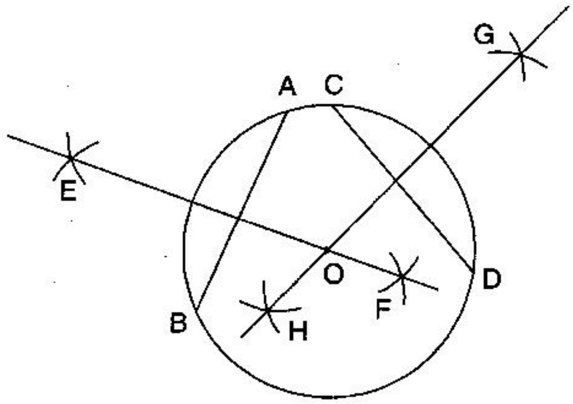
(ii) Draw any two chords $\overline{AB}$ and $\overline{CD}$ in this circle.

(iii) Taking A and B as centers and radius more than half AB, draw two arcs which intersect each other at E and F.

(iv) Join EF. Thus EF is the perpendicular bisector of chord $\overline{CD}$.

(v) Similarly draw GH the perpendicular bisector of chord $\overline{CD}$.

(vi) These two perpendicular bisectors meet at O, the centre of the circle.



9. **Steps of construction**:

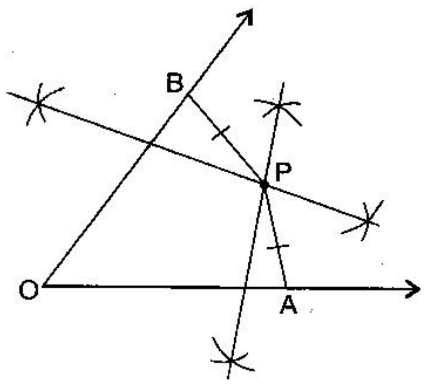
(i) Draw any angle with vertex O.

(ii) Take a point A on one of its arms and B on another such that $\overset{\frown}{OA} = \overset{\frown}{OB}$.

(iii) Draw perpendicular bisector of $\overline{OA}$ and $\overline{OB}$.

(iv) Let them meet at P. Join PA and PB.

(v) With the help of divider, we check that $\overline{PA} = \overline{PB}$.

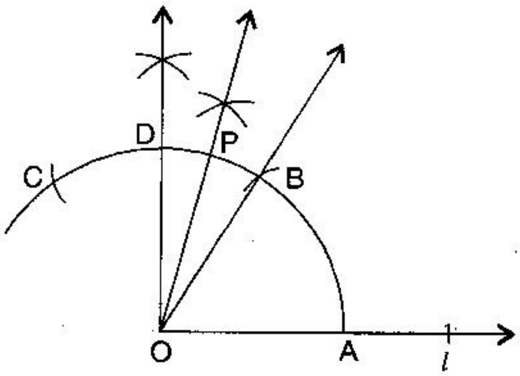


Class –VI Mathematics (Ex. 14.6)
Questions

1. Draw $\angle POQ$ of measure $75°$ and find its line of symmetry.
2. Draw an angle of measure $147°$ and construct its bisector.
3. Draw a right angle and construct its bisector.
4. Draw an angle of measure $153°$ and divide it into four equal parts.
5. Construct with ruler and compasses, angles of following measures:
   (a) 60° (b) 30° (c) 90° (d) 120° (e) 45° (f) 135°
6. Draw an angle of measure 45° and bisect it.
7. Draw an angle of measure 135° and bisect it.
8. Draw an angle of $70°$. Make a copy of it using only a straight edge and compasses.
9. Draw an angle of $40°$. Copy its supplementary angle.

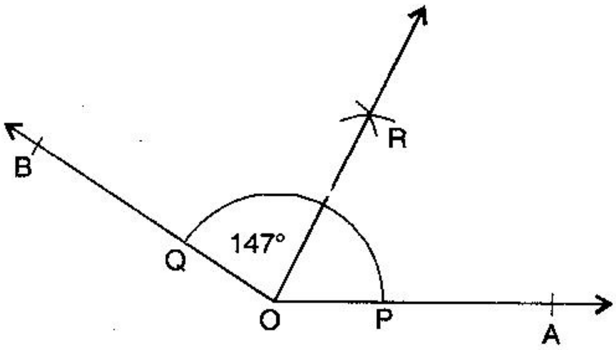
Answers

1. **Steps of construction**:



(a) Draw a line l and mark a point O on it.
(b) Place the pointer of the compasses at O and draw an arc of any radius which intersects the line l at A.
(c) Taking same radius, with centre A, cut the previous arc at B.
(d) Join OB, then $\angle BOA = 60^\circ$.
(e) Taking same radius, with centre B, cut the previous arc at C.
(f) Draw bisector of $\angle BOC$. The angle is of 90°. Mark it at D. Thus, $\angle DOA = 90^\circ$
(g) Draw $\overline{OP}$ as bisector of $\angle DOB$.
Thus, $\angle POA = 75°$

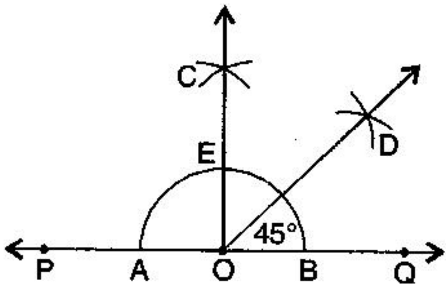
2. **Steps of construction**:



(a) Draw a ray $\overleftrightarrow{OA}$.
(b) With the help of protractor, construct $\angle AOB = 147°$.
(c) Taking centre O and any convenient radius, draw an arc which intersects the arms $\overline{OA}$ and $\overline{OB}$ at P and Q respectively.
(d) Taking P as centre and radius more than half of PQ, draw an arc.
(e) Taking Q as centre and with the same radius, draw another arc which intersects the previous at R.
(f) Join OR and produce it.

Thus, $\overline{OR}$ is the required bisector of $\angle AOB$.

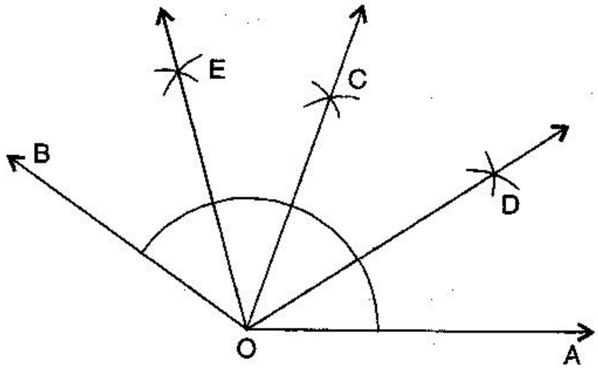
3. **Steps of construction**:



(a) Draw a line PQ and take a point O on it.
(b) Taking O as centre and convenient radius, draw an arc which intersects PQ at A and B.
(c) Taking A and B as centers and radius more than half of AB, draw two arcs which intersect each other at C.
(d) Join OC. Thus, $\angle COQ$ is the required right angle.
(e) Taking B and E as centre and radius more than half of BE, draw two arcs which intersect each other at the point D.

(f) Join OD. Thus, $\overline{OD}$ is the required bisector of $\angle COQ$.

4. **Steps of construction**:



(a) Draw a ray $\overleftrightarrow{OA}$.

(b) At O, with the help of a protractor, construct $\angle AOB = 153°$.

(c) Draw $\overline{OC}$ as the bisector of $\angle AOB$.

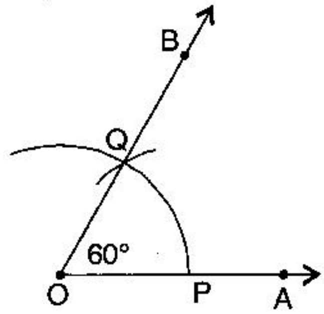
(d) Again, draw $\overline{OD}$ as bisector of $\angle AOC$.

(e) Again, draw $\overline{OE}$ as bisector of $\angle BOC$.

(f) Thus, $\overline{OC}$, $\overline{OD}$ and $\overline{OE}$ divide $\angle AOB$ in four equal arts.

5. **Steps of construction**:

(a) 60°



(i) Draw a ray $\overleftrightarrow{OA}$.

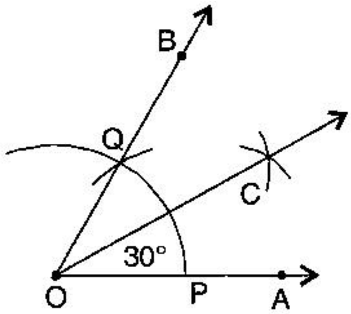
(ii) Taking O as centre and convenient radius, mark an arc, which intersects $\overleftrightarrow{OA}$ at P.

(iii) Taking P as centre and same radius, cut previous arc at Q.

(iv) Join OQ.

Thus, $\angle BOA$ is required angle of 60°.

(b) 30°



(i) Draw a ray $\overleftrightarrow{OA}$.

(ii) Taking O as centre and convenient radius, mark an arc, which intersects $\overleftrightarrow{OA}$ at P.

(iii) Taking P as centre and same radius, cut previous arc at Q.

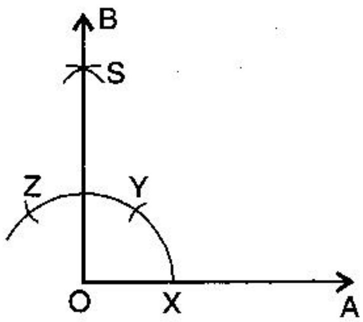
(iv) Join OQ. Thus, $\angle BOA$ is required angle of 60°.

(v) Put the pointer on P and mark an arc.

(vi) Put the pointer on Q and with same radius, cut the previous arc at C.

Thus, $\angle COA$ is required angle of 30°.

(c) 90°



(i) Draw a ray $\overleftrightarrow{OA}$.

(ii) Taking O as centre and convenient radius, mark an arc, which intersects $\overleftrightarrow{OA}$ at X.

(iii) Taking X as centre and same radius, cut previous arc at Y.

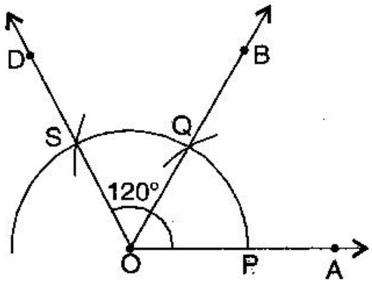
(iv) Taking Y as centre and same radius, draw another arc intersecting the same arc at Z.

(v) Taking Y and Z as centers and same radius, draw two arcs intersecting each other at S.

(vi) Join OS and produce it to form a ray OB.

Thus, $\angle BOA$ is required angle of 90°.

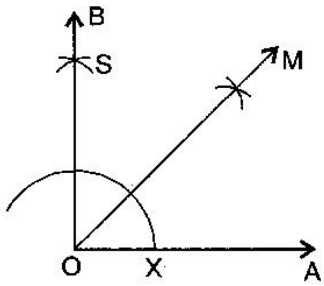
(d) 120°



(i) Draw a ray $\overleftrightarrow{OA}$.
(ii) Taking O as centre and convenient radius, mark an arc, which intersects $\overleftrightarrow{OA}$ at P.
(iii) Taking P as centre and same radius, cut previous arc at Q.
(iv) Taking Q as centre and same radius cut the arc at S.
(v) Join OS.

Thus, $\angle AOD$ is required angle of 120°.

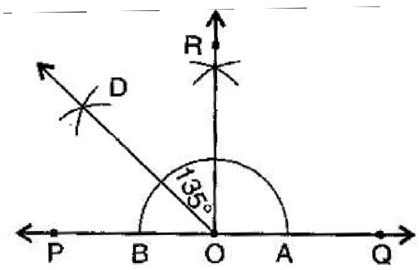
(e) 45°



(i) Draw a ray $\overleftrightarrow{OA}$.
(ii) Taking O as centre and convenient radius, mark an arc, which intersects $\overleftrightarrow{OA}$ at X.
(iii) Taking X as centre and same radius, cut previous arc at Y.
(iv) Taking Y as centre and same radius, draw another arc intersecting the same arc at Z.
(v) Taking Y and Z as centers and same radius, draw two arcs intersecting each other at S.
(vi) Join OS and produce it to form a ray OB. Thus, $\angle BOA$ is required angle of 90°.
(vii) Draw the bisector of $\angle BOA$.

Thus, $\angle MOA$ is required angle of 45°.

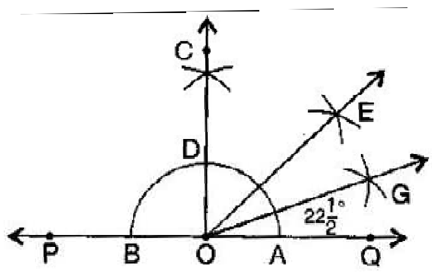
(f) 135°



(i) Draw a line PQ and take a point O on it.
(ii) Taking O as centre and convenient radius, mark an arc, which intersects PQ at A and B.
(iii) Taking A and B as centers and radius more than half of AB, draw two arcs intersecting each other at R.
(iv) Join OR. Thus, $\angle QOR = \angle POQ = 90^\circ$.
(v) Draw $\overrightarrow{OD}$ the bisector of $\angle POR$.

Thus, $\angle QOD$ is required angle of 135°.

6. **Steps of construction**:



(a) Draw a line PQ and take a point O on it.
(b) Taking O as centre and a convenient radius, draw an arc which intersects PQ at two points A and B.
(c) Taking A and B as centers and radius more than half of

AB, draw two arcs which intersect each other at C.

(d) Join OC. Then $\angle COQ$ is an angle of 90°

(e) Draw $\overrightarrow{OE}$ as the bisector of $\angle COE$. Thus, $\angle QOE = 45^\circ$

(f) Again draw $\overrightarrow{OG}$ as the bisector of $\angle QOE$.

Thus, $\angle QOG = \angle EOG = 22\frac{1}{2}°$.

7. **Steps of construction**:

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

(b) Taking O as centre and convenient radius, mark an arc, which intersects PQ at A and B.

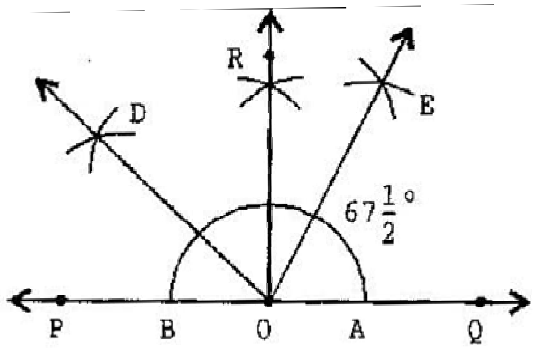
(c) Taking A and B as centers and radius more than half of AB, draw two arcs intersecting each other at R.

(d) Join OR. Thus, $\angle QOR = \angle POQ = 90^\circ$.

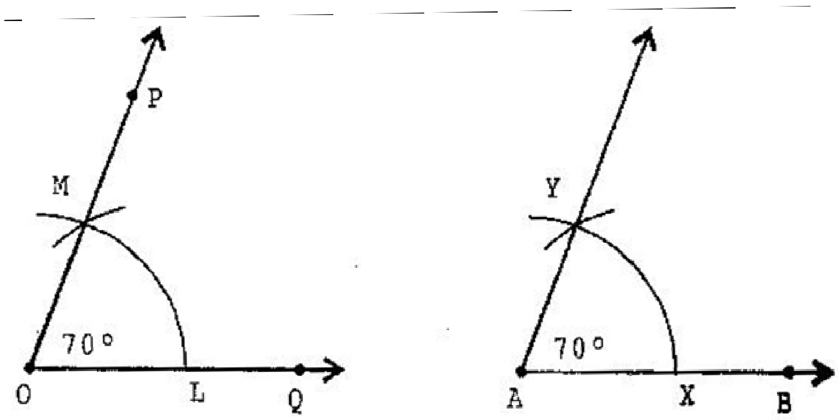
(e) Draw $\overrightarrow{OD}$ the bisector of $\angle POR$. Thus, $\angle QOD$ is required angle of 135°.

(f) Now, draw $\overrightarrow{OE}$ as the bisector of $\angle QOD$.

Thus, $\angle QOE = \angle DOE = 67\frac{1}{2}°$



8. **Steps of construction**:



(a) Draw an angle $70°$ with protractor, i.e., $\angle POQ = 70°$

(b) Draw a ray $\overrightarrow{AB}$.

(c) Place the compasses at O and draw an arc to cut the rays of $\angle POQ$ at L and M.

(d) Use the same compasses, setting to draw an arc with A as centre, cutting AB at X.

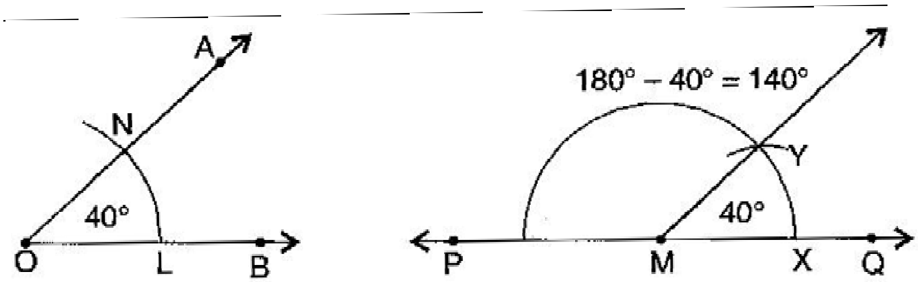
(e) Set your compasses setting to the length LM with the same radius.

(f) Place the compasses pointer at X and draw the arc to cut the arc drawn earlier at Y.

(g) Join AY.

Thus, $\angle YAX = 70°$

9. Steps of construction:



(a) Draw an angle of $40°$ with the help of protractor, naming $\angle$AOB.
(b) Draw a line PQ.
(c) Take any point M on PQ.
(d) Place the compasses at O and draw an arc to cut the rays of $\angle$AOB at L and N.
(e) Use the same compasses setting to draw an arc O as centre, cutting MQ at X.
(f) Set your compasses to length LN with the same radius.
(g) Place the compasses at X and draw the arc to cut the arc drawn earlier Y.
(h) Join MY.
(i) Thus, $\angle$QMY = $40°$ and $\angle$PMY is supplementary of it.