CHAPTER – 14

PRACTICAL GEOMETRY

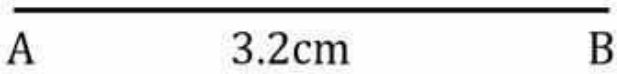
EXERCISE – 14.1

Q. 1 Draw a circle of radius 3.2 cm.

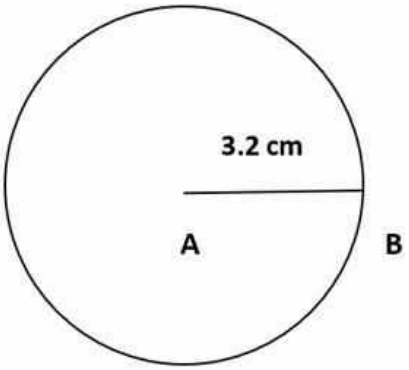
Answer:

Steps of Construction-

1. Draw a line segment AB of length 3.2 cm using a ruler.



2. Now, taking A as center and AB as radius draw a circle.



This is the required circle with radius 3.2 cm.

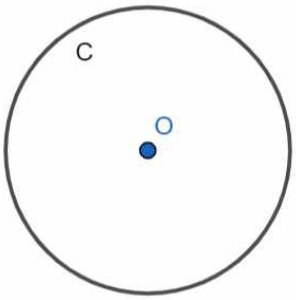
Q. 2 With the same centre O, draw two circles of radii 4 cm and 2.5 cm.

Answer:

Steps of Construction:

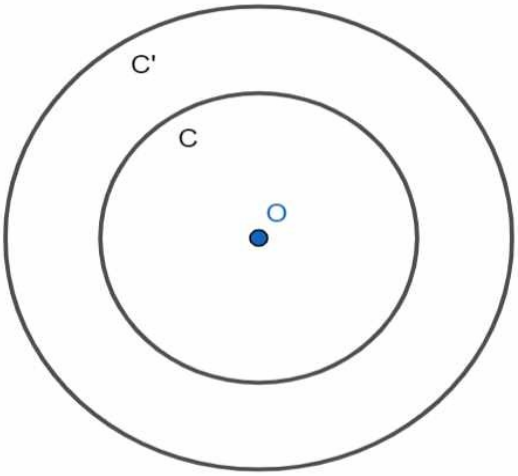
1) Mark a point O on the paper, taking O as center and with a measure of 2.5 cm in the

compass, Draw a circle say C.



2) With the same center O and with a measure of 4 cm in the compass, Draw another circle

say C.



3) C and C' are required circles with same center and radii 2.5 cm and 4 cm respectively.

Q. 3 Draw a circle and any two of its diameters. If you join the ends of these diameters, what is the figure obtaines?

What figure is obtained, if the diameters are perpendicular to each other? How do you check your answer?

Answer:

Steps of Construction-

1. Draw a circle with any radius and O as a center using compass. Draw two diameters of it.

2. Join the ends of these diameters.

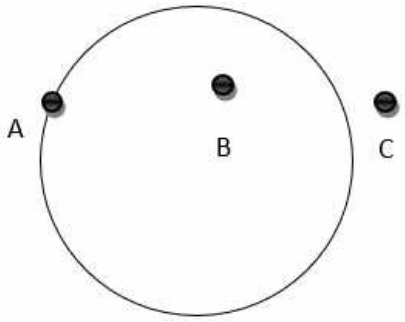
3. Measure the edges of the formed figure. All the edges are equal. So the figure is a SQUARE.

Q. 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.

Answer:

Steps of Construction-

1. Draw a circle with some radius using a compass.



Point A is on the circle. Point B is in the interior of the circle. Point C is in the exterior of the circle.

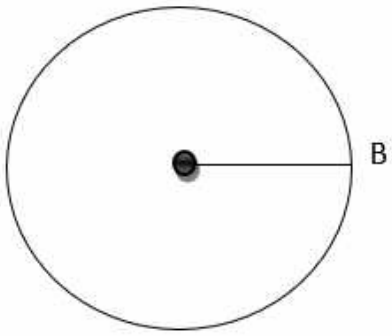
Q. 5 Let A, B be the centres of two circles of equal radii; draw them so that each one of them passes through the centre of the other. Let them intersect at C and D.

Examine whether $\overline{AB}$ and $\overline{CD}$ are at right angles.

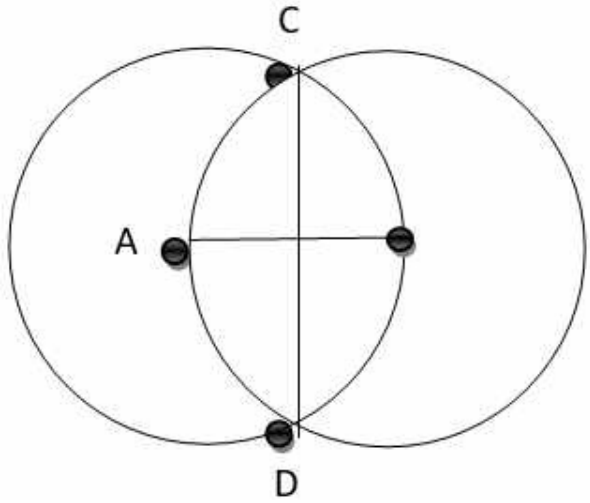
Answer:

Steps of Construction-

1. Draw a circle with some radius; let it be 2 cm with center O.



2. Extend O to A such that OA = 2 cm. Take A as a center and OA as a radius, draw a circle. C



3. On measuring with protactor, we find AB is perpendicular to CD which means their intersection makes 90° angle.

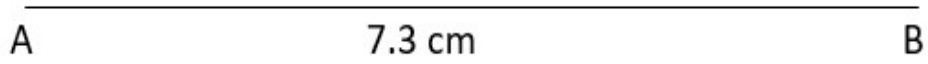
EXERCISE – 14.2

Q. 1 Draw a line segment of length 7.3 cm, using a ruler.

Answer:

Steps of Construction-

Find 7.3 cm in the ruler and draw a line of its length. Name it as AB.



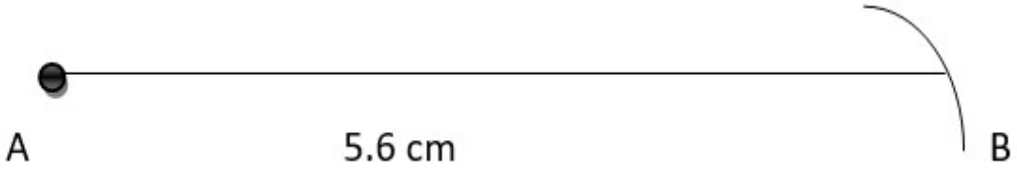
Q. 2 Construct a line segment of length 5.6 cm, using ruler and compasses.

Answer:

Steps of Construction-

1. Take a measure of 5.6 cm in a compass using ruler.

2. Draw a point A. Keeping needle of compass on A, draw an arc and mark it as B. Connect A and B.



Q. 3 Construct $\overline{AB}$ of length 7.8 cm. From this, cut off $\overline{AC}$ of length 4.7 cm. Measure $\overline{BC}$.

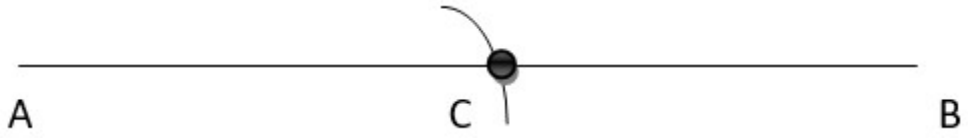
Answer:

Steps of Construction-

1. Draw a line segment AB of length 7.8 cm using a ruler.

2. Take a measure of 4.7 cm from a ruler on compass and draw an arc on AB naming it as C.

3. Measure BC. BC = 3.1 cm

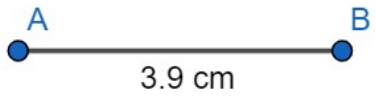


Q. 4 Given $\overline{AB}$ of length 3.9 cm, construct $\overline{PQ}$ such that the length of $\overline{PQ}$ is twice that of $\overline{AB}$. Verify by measurement.

Answer:

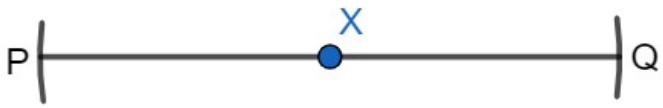
Steps of Construction-

1. Draw a line segment AB of length 3.9 cm using a ruler.



2. Take a measure of it on the compass and mark a point X.

3. Draw arcs on both sides of X with the same measure in compass and join them named as P and Q.



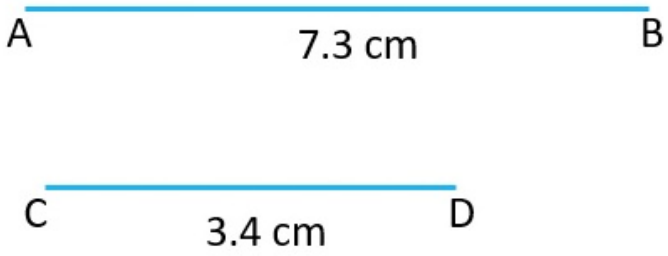
4. Measure PQ. PQ = 7.8 cm

Q. 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$\overline{AB}$. $\overline{AB}$ and $\overline{CD}$. Verify by measurement.

Answer:

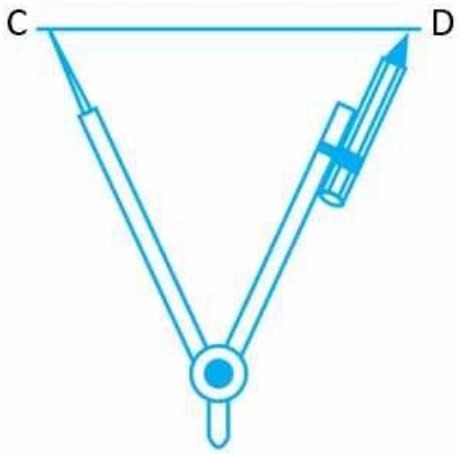
Steps of Construction-

1. Draw two lines AB and CD such that AB = 7.3 cm and CD = 3.4 cm

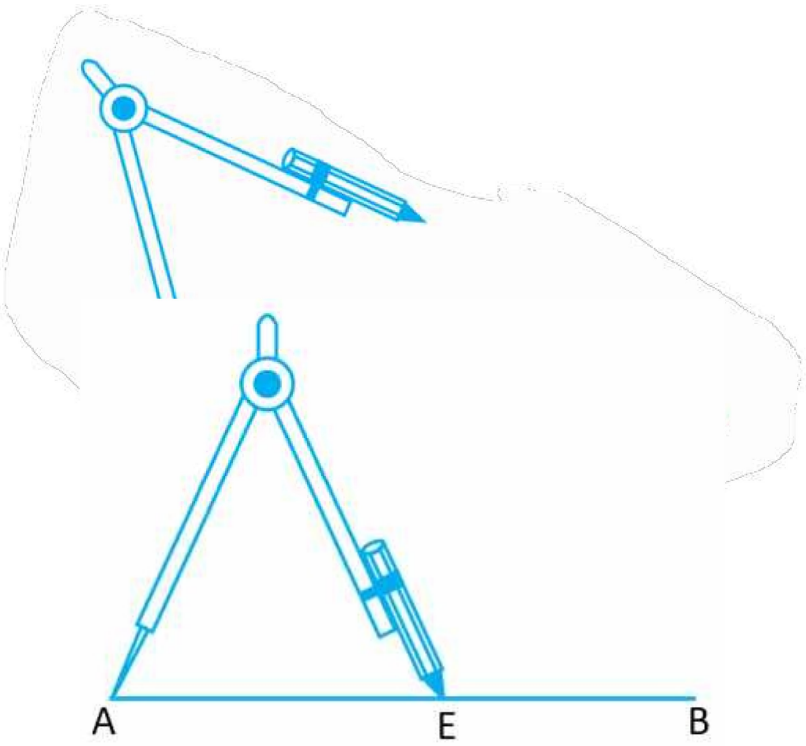


2. Fix the compass pointer on C and the pencil end on D, the compass now has length

of CD



3. Fix the compass pointer on A and swing an arc that cuts AB at E



4. EB is the difference of AB and CD Verification: AB - CD = 7.3 - 3.4 = 3.9 cm On measuring EB = 3.9 cm

EXERCISE – 14.3

Q. 1 Draw any line segment PQ. Without measuring $\overline{PQ}$, construct a copy of $\overline{PQ}$.

Answer:

Steps of Construction-

1. Draw a line segment PQ.

2. Keep the needle of compass on P and other end of it on Q.

3. Draw point A. Put the needle of compass on A and draw an arc, naming it as B. Join A and B.

4. Hence, AB is the copy of PQ.

Q. 2 Given some line segment AB, whose length you do not know, construct $\overline{PQ}$ such that the length of $\overline{PQ}$ is twice that of $\overline{AB}$.

Answer:

Steps of Construction-

1. Draw a line segment AB.

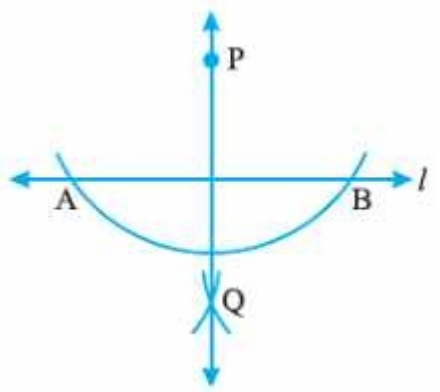
2. Keep the needle of compass on A and other end of it on B.

3. Draw point P. Put the needle of compass on P and draw an arc, naming it as R. Again draw an arc by putting the needle on R such that PR extends to Q.

4. Hence, PQ is the twice of AB.

EXERCISE – 14.4

Q. 1 Draw any line segment AB. Mark any point M on it. Through M, draw a perpendicular to $\overline{AB}$. (Use ruler and compasses)



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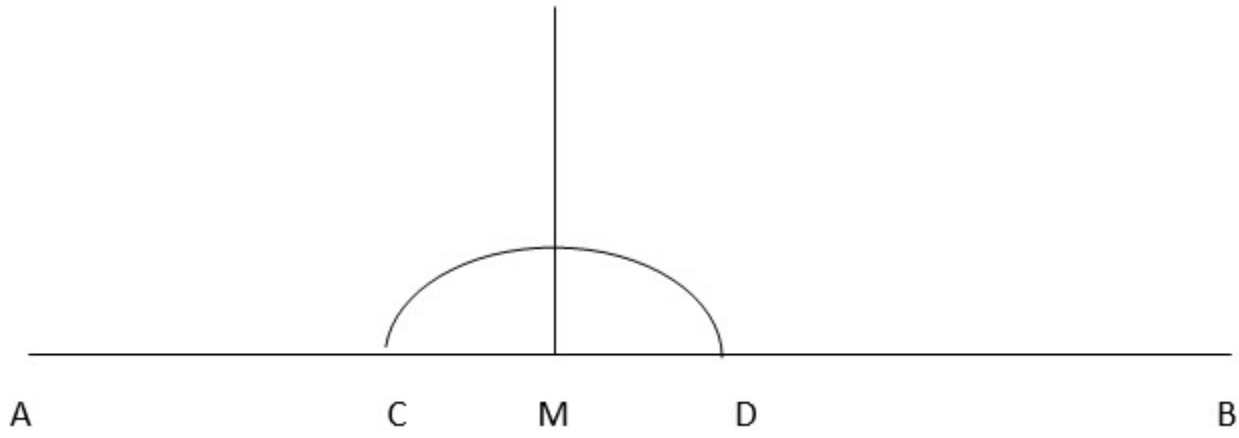
Answer:

Steps of Construction-

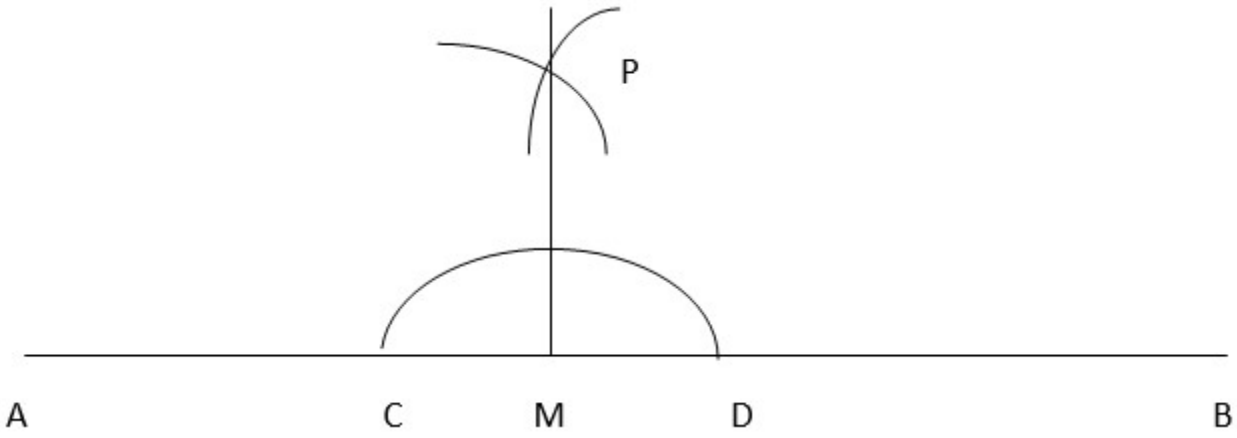
1. Draw a line segment AB. Mark a point M on it.

2. With M as centre and a convenient radius, draw an arc intersecting the line AB at two points C and D



3. With C and D as centres and a radius greater than MC, draw two arcs, which cut each other at P.

4. Join PM. Then PM is perpendicular to AB through the point M.



Q. 2 Draw any line segment PQ. Take any point R not lying on it. Through R, draw a perpendicular to $\overline{PQ}$. (use ruler and set square)

Answer:

Steps of Construction-

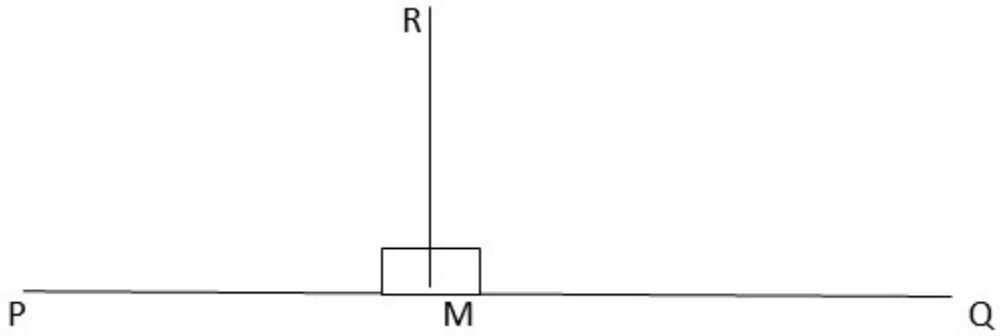
1. Draw a line segment PQ. Mark a point R not lying on it.

2. Place a set square on PQ such that one arm of its right angle aligns along PQ.

3. Place a ruler along the edge opposite to the right angle of the set-square.

4. Hold the ruler fixed. Slide the set square along the ruler till the point R touches the other arm of the set square.

5. Join RM along the edge through R meeting PQ at M. Then RM is perpendicular to PQ.



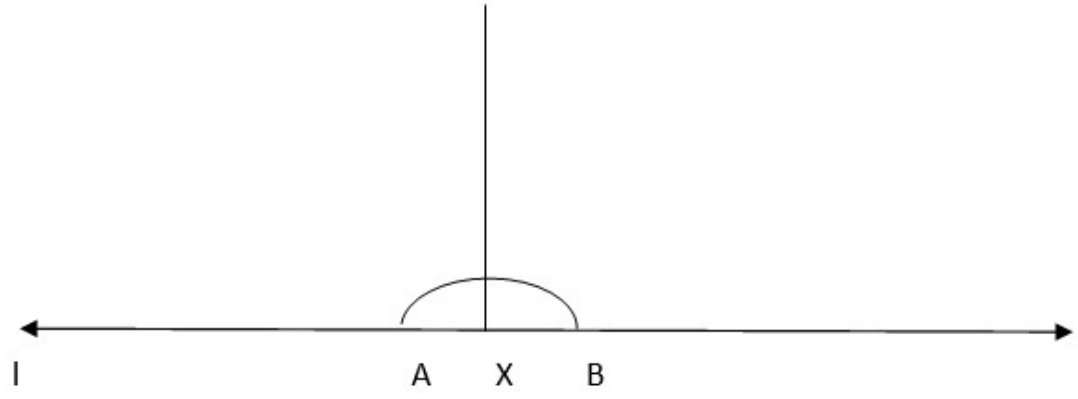
Q. 3 Draw a line l and a point X on it. Through X, draw a line segment XY perpendicular to l.
Now draw a perpendicular to $\overline{XY}$ at Y. (use ruler and compasses)

Answer:

Steps of Construction-

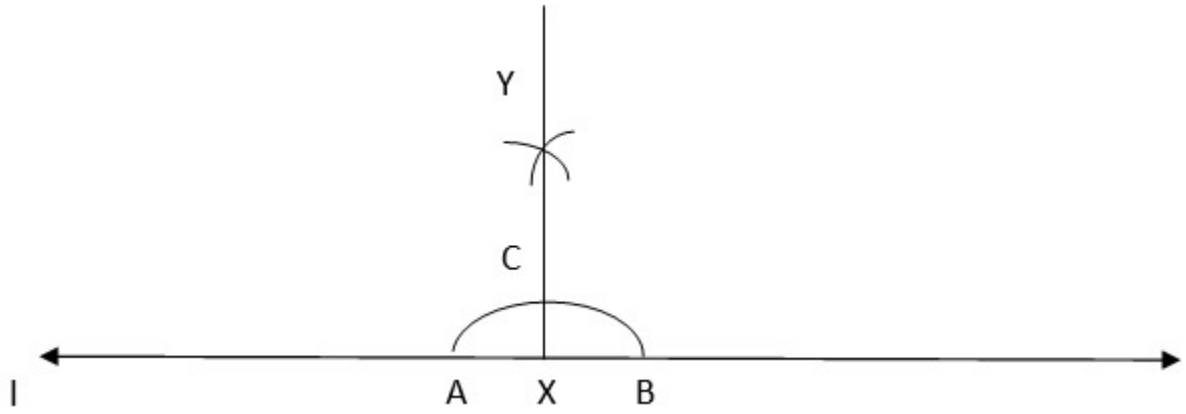
1. Draw a line l and take point X on it.

2. With X as the centre and a convenient radius, draw an arc intersecting the line l at two points A and B.



3. With A and B as centres and a radius greater than XA, draw two arcs, which cut each other at C.

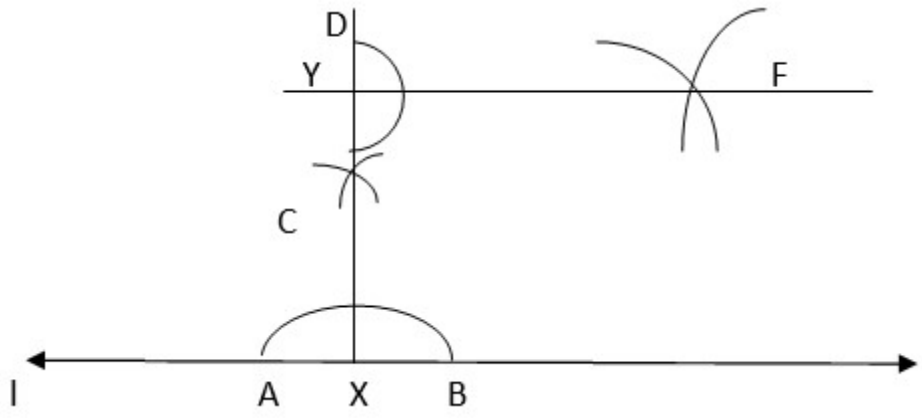
4. Join XC and produce it to Y. Then XY is perpendicular to l.



5. With Y as the centre and a convenient radius, draw an arc intersecting XY at two points C and D.

6. With C and D as centres and radius greater than YD, draw two arcs which cut each other at F.

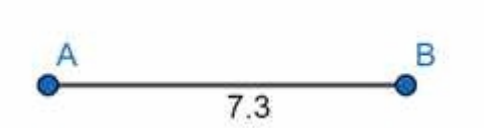
7. Join YF, then YF is perpendicular to XY at Y. The final figure is given below:



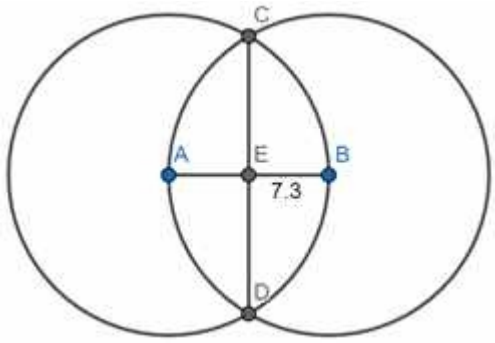
EXERCISE – 14.5

Q. 1 Draw $\overline{AB}$ of length 7.3 cm and find its axis of symmetry.

Step 1: Draw a line segment of length 7.3cm using a ruler



Step 2: With A as center and radius AB draw a circle. With B as a center and same radius draw another circle. Join the point of intersections.

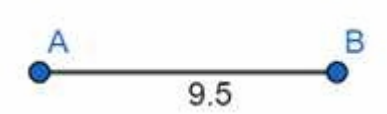


CD is the axis of symmetry

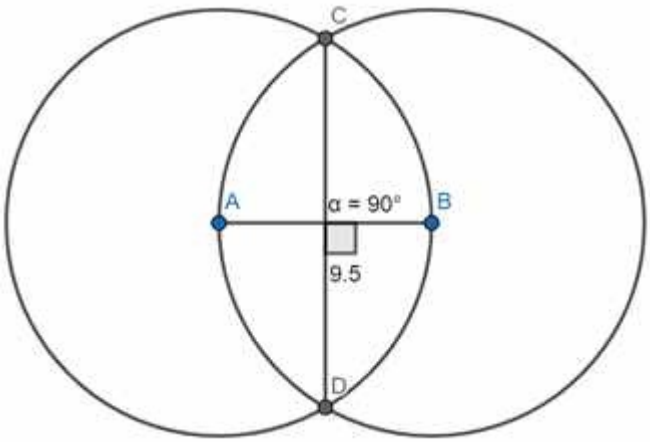
Q. 2 Draw a line segment of length 9.5 cm and construct its perpendicular bisector.

Answer:

Step 1: Draw a line segment 9.5cm using a ruler



Step 2: With A as center and radius AB draw a circle. With B as a center and same radius draw another circle. Join the point of intersections.



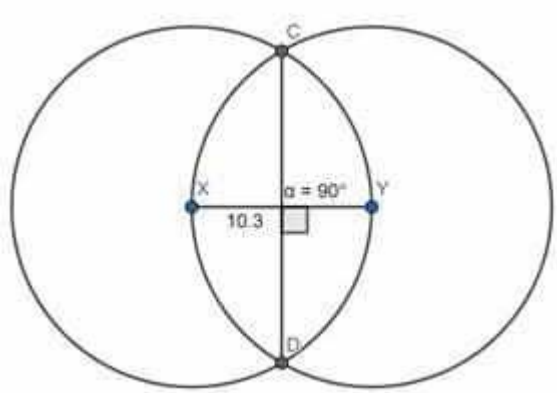
CD is the perpendicular bisector.

Q. 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?

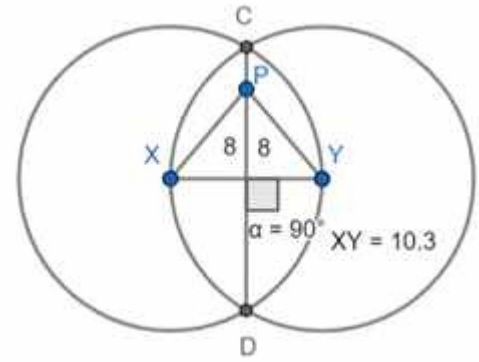
Answer:

Step 1: Draw line segment XY using a ruler

Step 2: With X as center and radius XY draw a circle. With Y as a center and same radius draw another circle. Join the point of intersections



Step 3: Take any point P on CD. Join PX and PY. Measure PX and PY and show they are equal and is equal to 8cm.



Step 4: Measure MX and XY using a ruler

MX=5.15

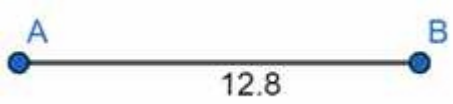
XY=10.3

XY=2MX

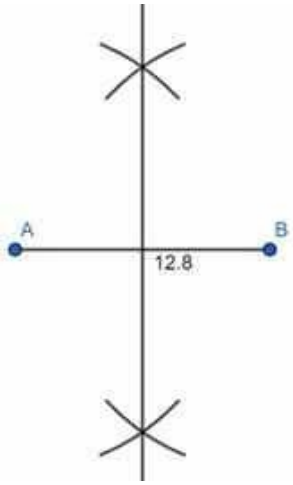
Q. 4 Draw a line segment of length 12.8 cm. Using compasses, divide it into four equal parts. Verify by actual measurement.

Answer:

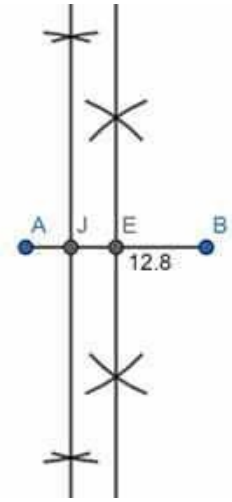
Step 1: Draw a line segment of length 12.8cm using a ruler



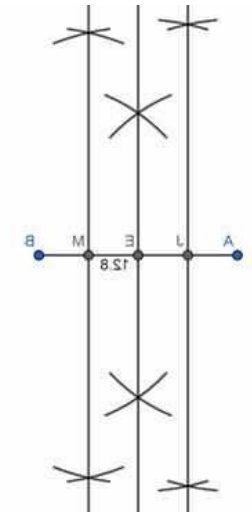
Step 2: With A as centre and radius AB draw an arc. With B as a centre and same radius draw another arc. Draw a line through their point of intersections.



Step 3: With A as centre and radius AE draw an arc. With E as a centre and same radius draw another arc. Draw a line through their point of intersections



Step 4: With E as centre and radius EB draw an arc. With B as a centre and same radius draw another arc. Draw a line through their point of intersections



AJ, JE, EM, MB are 4 equal parts of AB

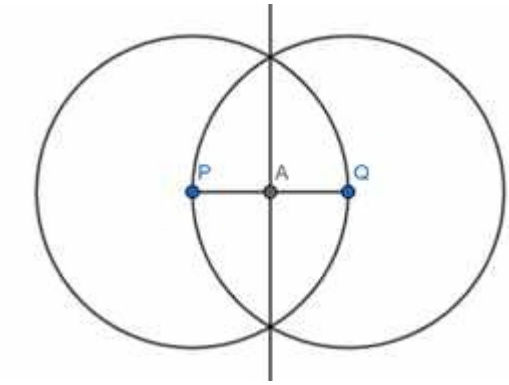
Step 5: Measure AJ, JE, EM, MB

Q. 5 With $\overline{PQ}$ of length 6.1 cm as diameter, draw a circle.

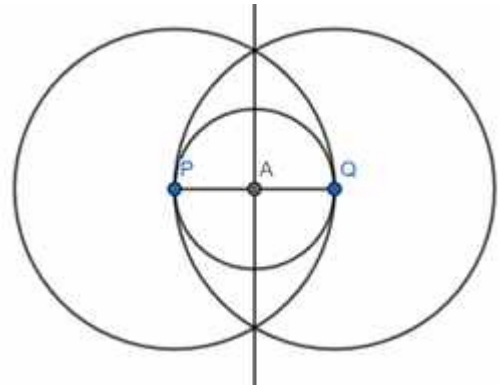
Answer:

Step 1: Draw a line segment of length 6.1 cm using a ruler

Step 2: With P as centre and radius PQ draw a circle. With Q as a centre and same radius draw another circle. Join their point of intersections

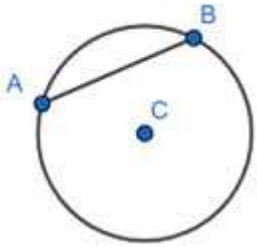


Step 3: Through A draw a circle with radius AP

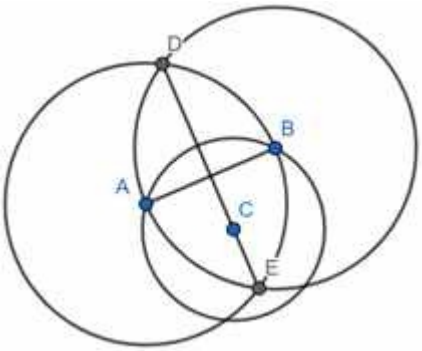


Q. 6 Draw a circle with centre C and radius 3.4 cm. Draw any chord $\overline{AB}$. Construct the perpendicular bisector of $\overline{AB}$ and examine if it passes through C.

Step 1: Using compass draw a circle of radius 3.4cm and draw any chord AB.



Step 2: With A as centre and radius AB draw a circle. With B as a centre and same radius draw another circle. Join their point of intersection and extend it on either side

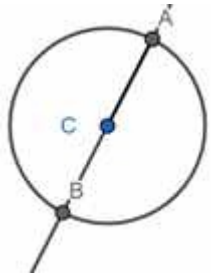


Line DE passes through centre C

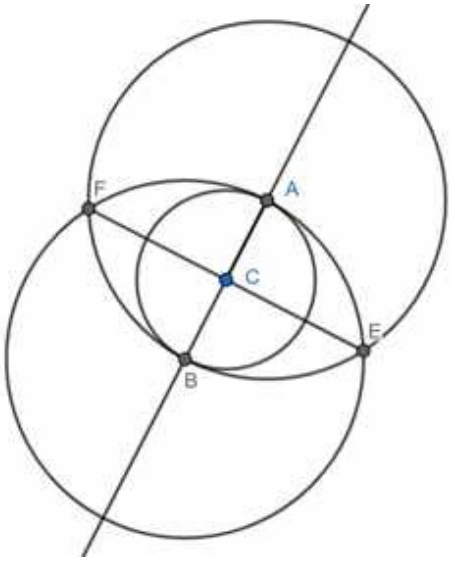
Q. 7 Repeat question 6, if $\overline{AB}$ happens to be a diameter.

Answer:

Step 1: Draw a circle of radius of 3.4 cm and draw any diameter.



Step 2: With A as centre and radius AB draw a circle. With B as a centre and same radius draw another circle. Join their point of intersection and extend it on either side

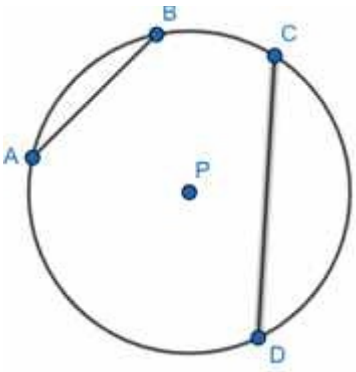


Thus EF passes through centre C

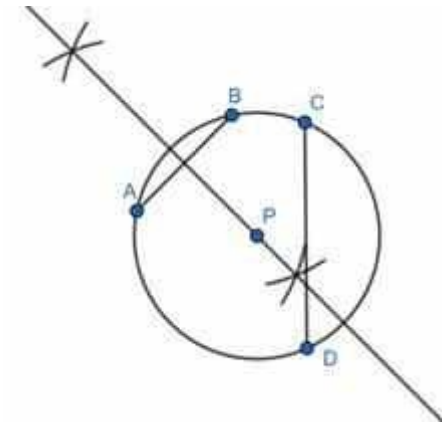
Q. 8 Draw a circle of radius 4 cm. Draw any two of its chords. Construct the perpendicular bisectors of these chords. Where do they meet?

Answer:

Step 1: Draw a circle of radius 4cm using a compass and draw arbitrary two chords AB and CD

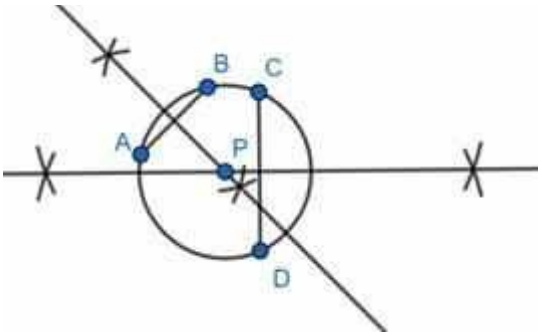


Step 2: With A as centre and radius AB draw An arc. With B as a centre and same radius draw another. Join the point of intersections.



Step 3: With D as centre and radius CD draw a circle. With C as a centre and same radius draw a circle. Join the point of intersections

Step 2 and 3 give the perpendicular bisectors of the chords

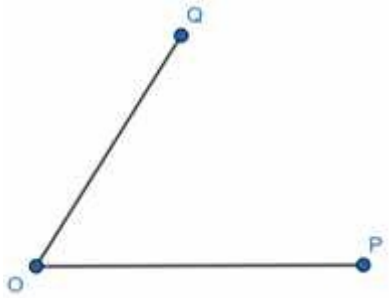


So the perpendicular bisectors pass through the centre

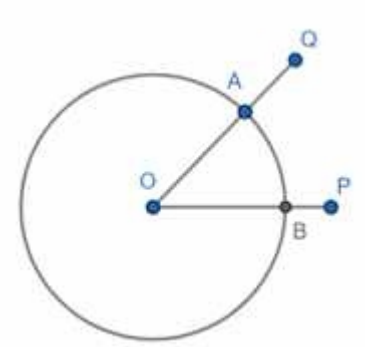
Q. 9 Draw any angle with vertex O. Take a point A on one of its arms and B on another such that OA = OB. Draw the perpendicular bisectors of $\overline{OA}$ and $\overline{OB}$. Let them meet at P. Is PA = PB.

Answer:

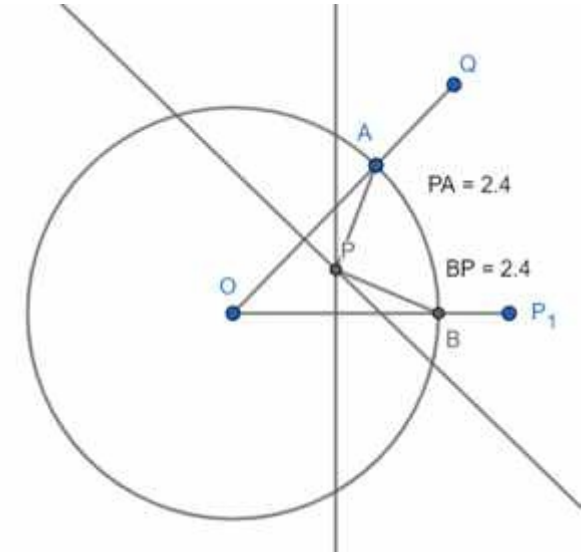
Step 1: Draw a horizontal line and another line inclined arbitrarily to it



Step 2: With O as centre draw a circle to cut OQ at A and OP at B



Step 3: Construct the perpendicular bisectors of OA and OB by constructing circles. Here only the bisector is shown to avoid congestion.



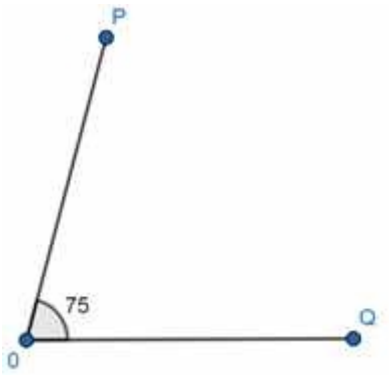
Step 4: Measure PA and PB using a ruler to show that PA=PB.

EXERCISE – 14.6

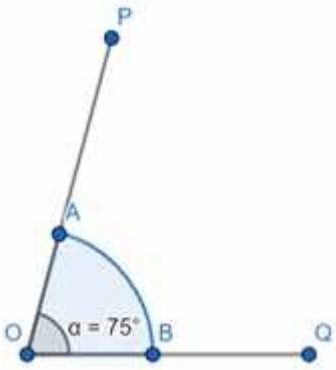
Q. 1 Draw ∠POQ of measure 75° and find its line of symmetry.

Answer:

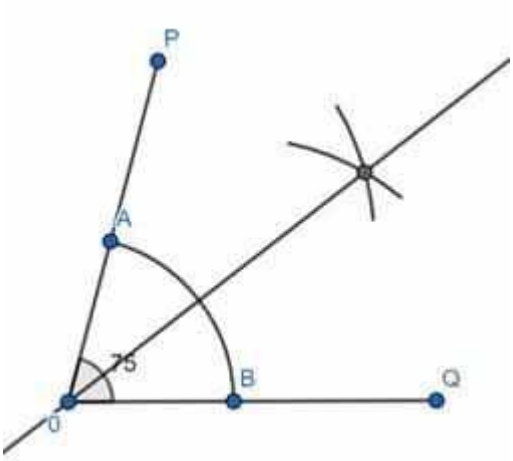
Step 1: Draw an angle of 75 °s using a ruler and protractor



Step 2: With 0 as centre draw an arc to intersect OP and OQ at A and B



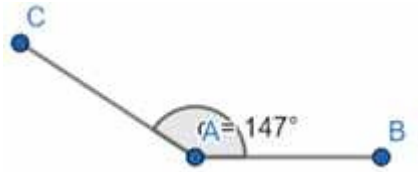
Step 3: With centre A and radius more than AB draw an arc. With B as a centre and same radius draw another arc. Join O with the point of intersection.



Q. 2 Draw an angle of measure 147° and construct its bisector.

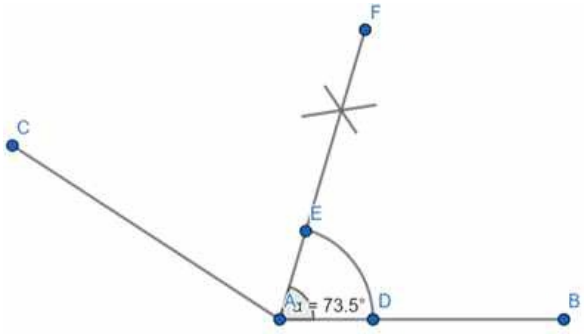
Answer:

Step 1: Draw a line AB. Place the centre of the protractor on point A. Coincide AB with the protractor line. Mark C=147°.



Step 2: Draw an arc cutting the lines at D and E. Take a radius greater than the arc and from D and E cut to smaller arcs.

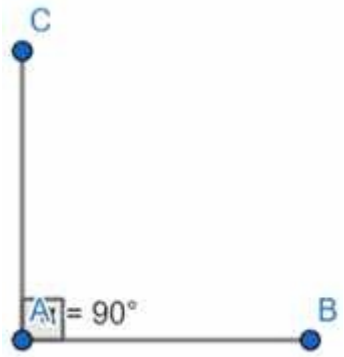
Join to form AF being the angle bisector of 147°.



Q. 3 Draw a right angle and construct its bisector.

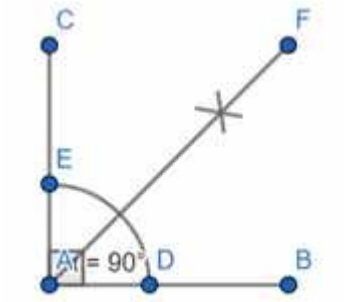
Answer:

Step 1: Draw a line AB. Place the centre of the protractor on point A. Coincide AB with the protractor line. Mark C=90°.



Step 2: Take any radius with the compass and draw an arc DE with centre A. From D and E cut 2 arcs with a larger radius.

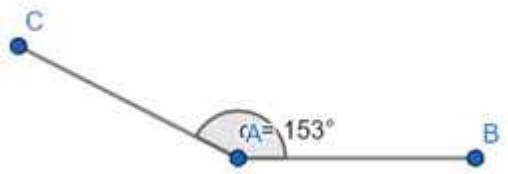
Join to form AF being the angle bisector of 90°.



Q. 4 Draw an angle of measure 153° and divide it into four equal parts.

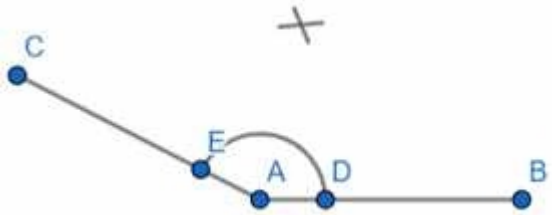
Answer:

Step 1: Draw a line AB. Place the centre of the protractor on point A. Coincide AB with the protractor line. Mark C=153°.

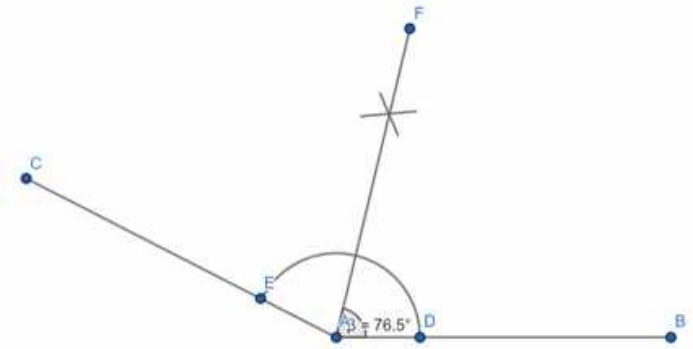


Step 2: Draw an arc cutting AB at D and AC at E.

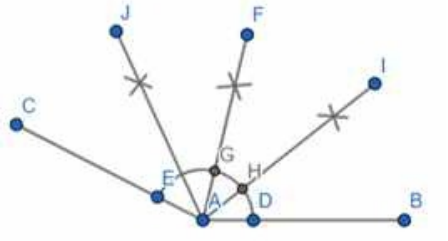
Taking D as centre and length more than the arc DE cut an arc. Repeat for E.



Step 3: Draw a line through the intersection and extend it to F.



Step 4: Repeat steps 2 and 3 with angle FAB and angle CAF to get the desired answer.



153° is divided into 38.25° each.

Q. 5 Construct with ruler and compasses, angles of following measures:
(a) 60° (b) 30°
(c) 90° (d) 120°
(e) 45° (f) 135°

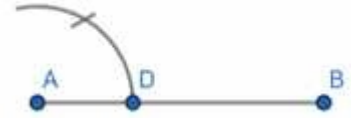
Answer:

(a) Steps of Construction-

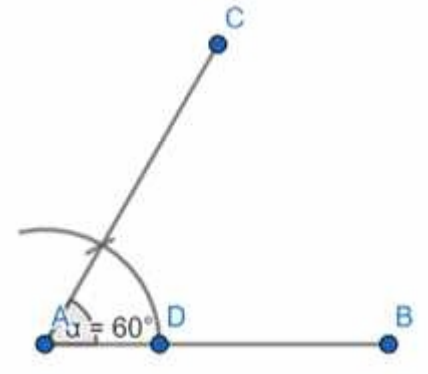
(a) Construction of 60°.

Step 1: Draw a line AB using a ruler.

Step 2: Draw an arc of some radius using a compass. Using the same length cut another arc placing the compass on D as centre.



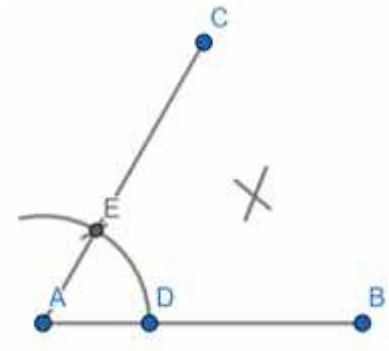
Step 3: Draw a line passing through this point to form AC. Measure angle CAB=60°.



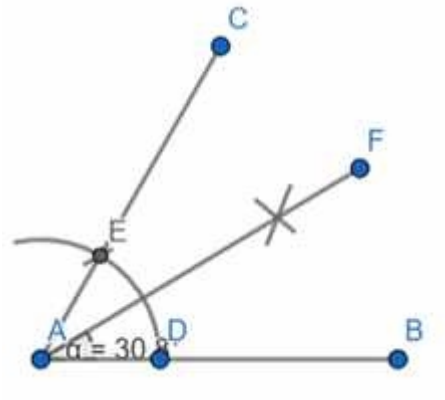
(b) Construction of 30°.

Construct 60° using the above steps. Bisect the angle as follows:

Step 1: With D as centre draw an arc. With E as centre and same radius draw another arc.



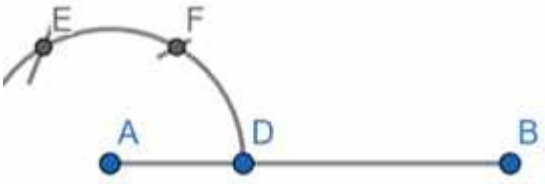
Step 2: Draw a line through their point of intersection.



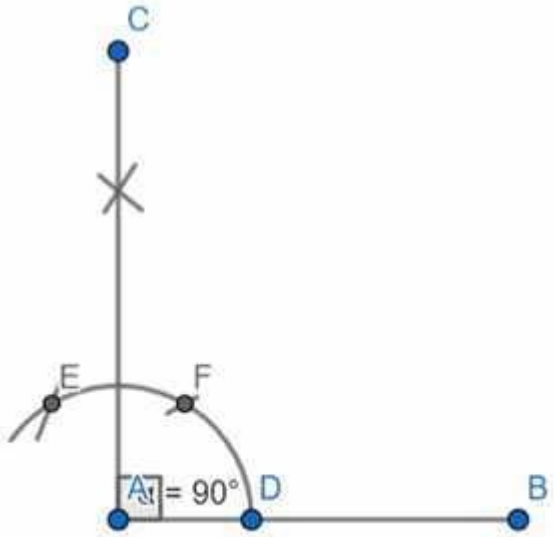
(c) Construction of 90°.

Step 1: Draw a line AB using a ruler.

Step 2: Draw an arc of some radius using a compass. Using the same length cut another arc placing the compass on D as centre. Repeat with the previous arc.



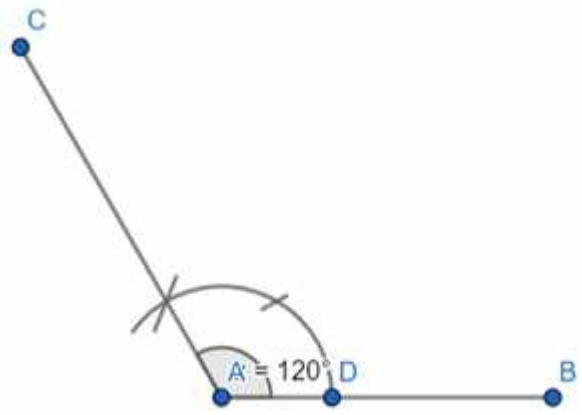
Step 3: Draw an arc with D and E as centres to get the intersection. Draw a line through their point of intersection.



(d) Construction of 120°.

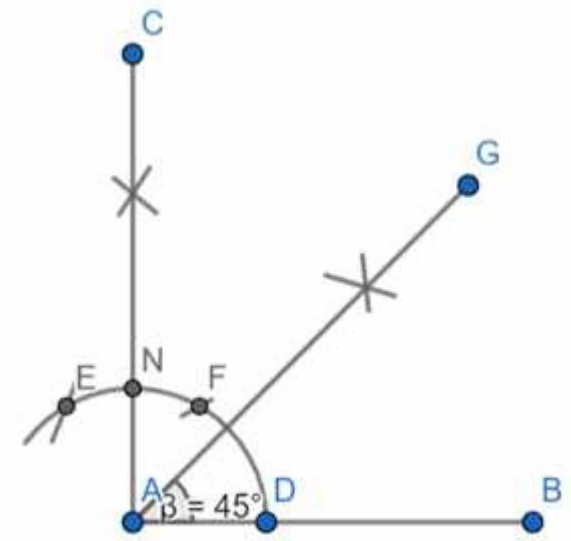
Step 1: Draw a line AB using a ruler.

Step 2: Draw an arc of some radius using a compass. Using the same length cut another arc placing the compass on D as centre. Repeat with the previous arc. Draw a line through the point of intersection to get CA.



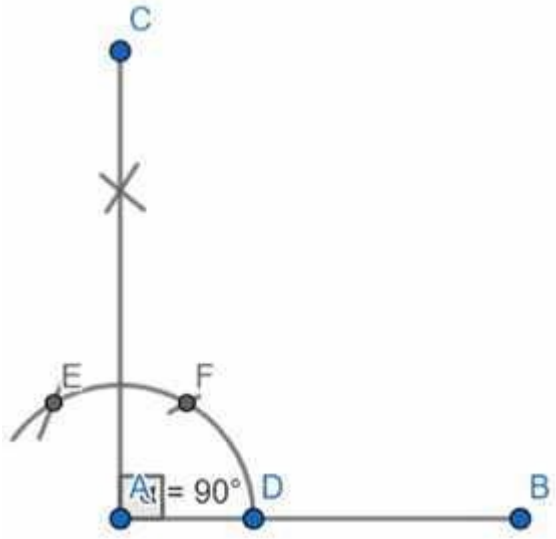
(e) Construction of 45°.

Follow the steps in 5(c) to get 90°. Bisect it to get 45°.

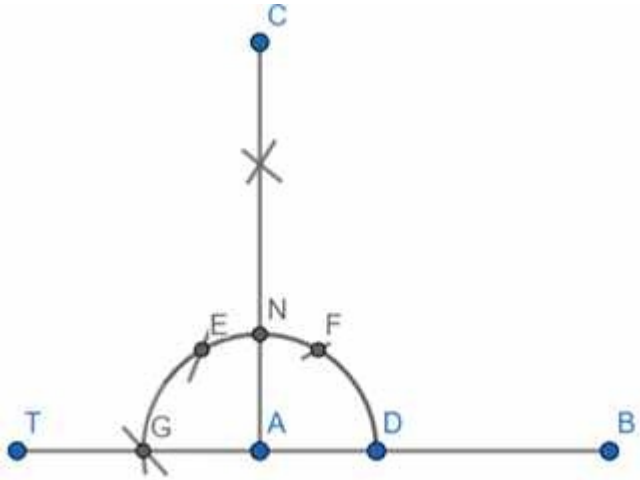


(f) Construction of 135°.

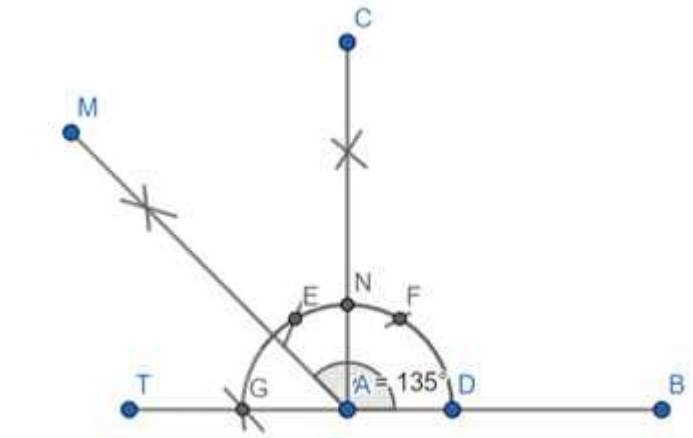
Step 1: Construct 90°.



Step 2: Extend BA to T. With AD as radius draw an arc with centre N and cut AT at G.



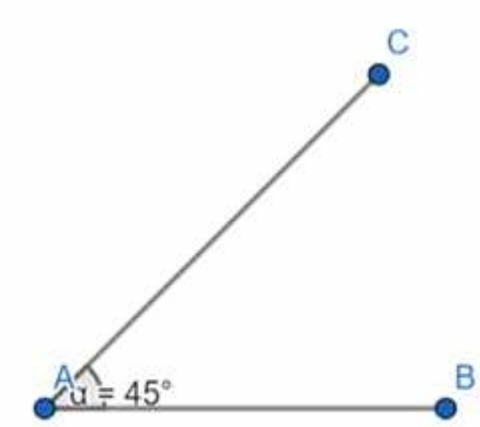
Step 3: With G and N as centres draw 2 arcs. Join AM.



Q. 6 Draw an angle of measure 45° and bisect it.

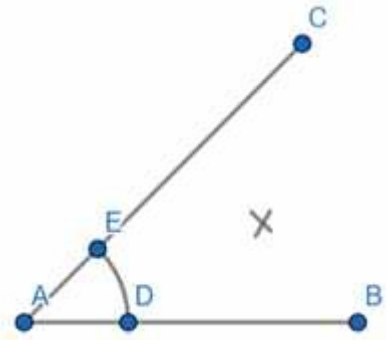
Answer:

Step 1: Draw a line AB. Place the centre of the protractor on point A. Coincide AB with the protractor line. Mark C=45°. Join AC.

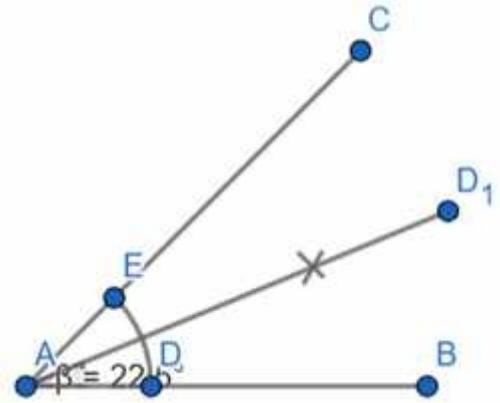


Step 2: Draw an arc cutting AB at D and AC at E.

Taking D as centre and length more than the arc DE cut an arc. Repeat for E.



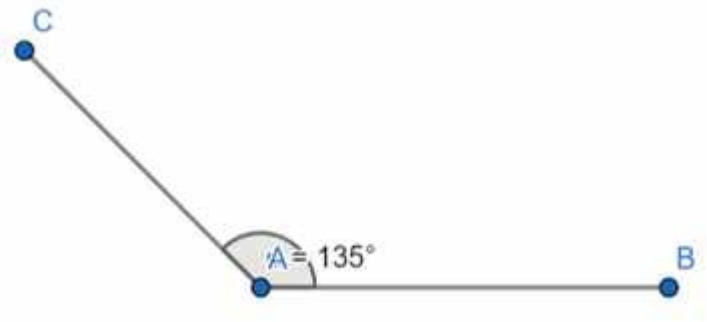
Step 3: let they intersect at point X. Draw a line joining AX aand extend it to F. Measure angle FAB.



Q. 7 Draw an angle of measure 135° and bisect it.

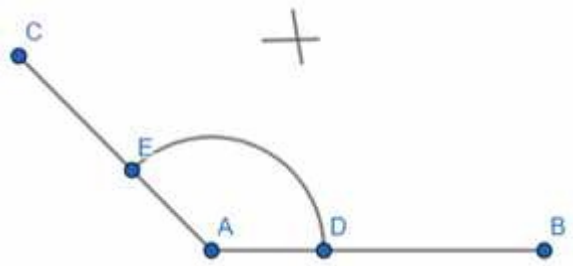
Answer:

Step 1: Draw a line AB. Place the centre of the protractor on point A. Coincide AB with the protractor line. Mark C=130°. Join AC.

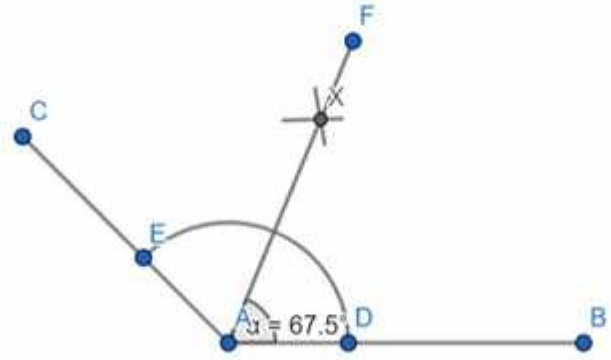


Step 2: Draw an arc cutting AB at D and AC at E.

Taking D as centre and length more than the arc DE cut an arc. Repeat for E.



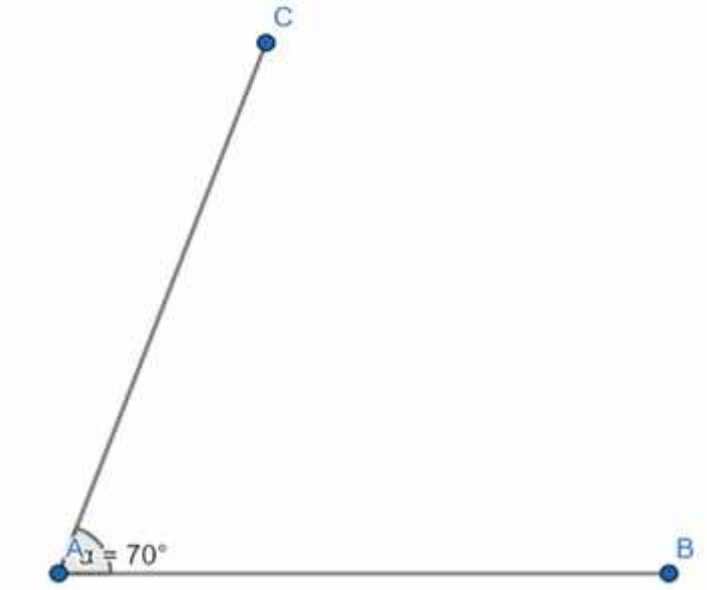
Step 3: Let they intersect at point X. Draw a line joining AX and extend it to F. Measure angle FAB.



Q. 8 Draw an angle of 70°. Make a copy of it using only a straight edge and compasses.

Answer:

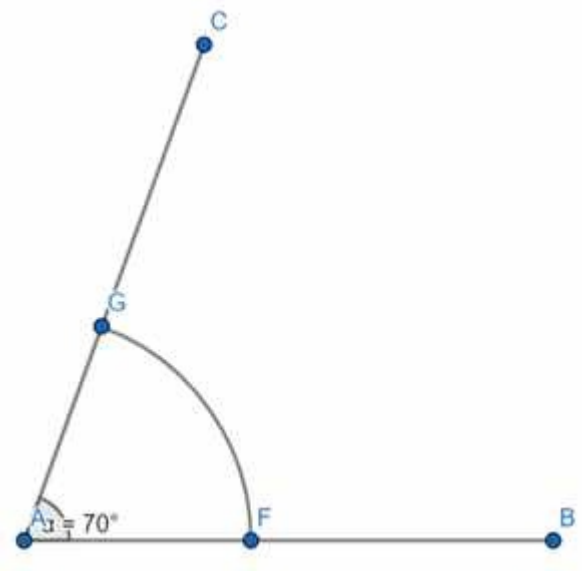
Draw a line AB. Place the centre of the protractor on point A. Coincide AB with the protractor line. Mark C=70°. Join AC.



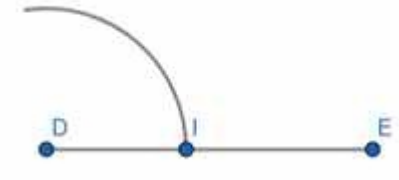
Constructing its copy:

Step 1: Draw another line DE.

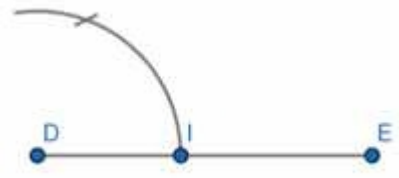
Step 2: From O, draw an arc cutting at F and G.



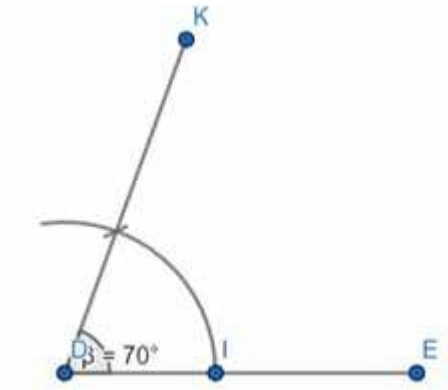
Step 3: Draw arc using the compass with the above arc length, placed at D as centre.



Step 4: Measure GF. Using the same compass length place the point at I and cut the arc.



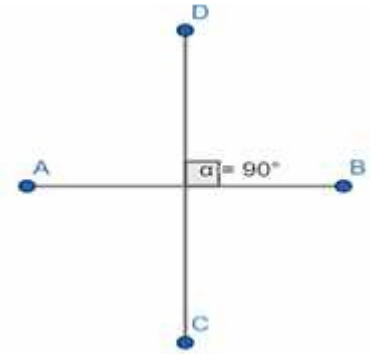
Step 5: using a ruler draw a line through the cut to get DK. Measure angle KDE using a protractor.



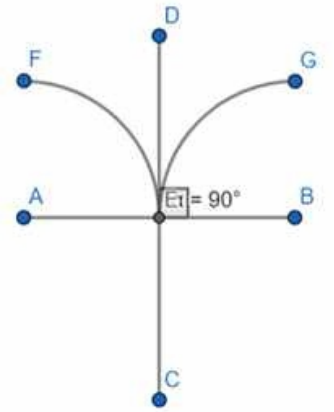
Q. 9 Draw an angle of 40°. Copy its supplementary angle.

Answer:

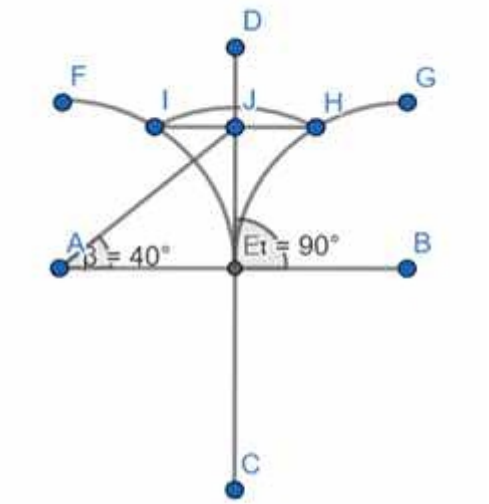
Step 1: Draw any arbitrary line AB and with the help of a compass draw its bisector CD.



Step 2: Measure AE and draw a quarter arc with the compass placing on A. Repeat for EB.

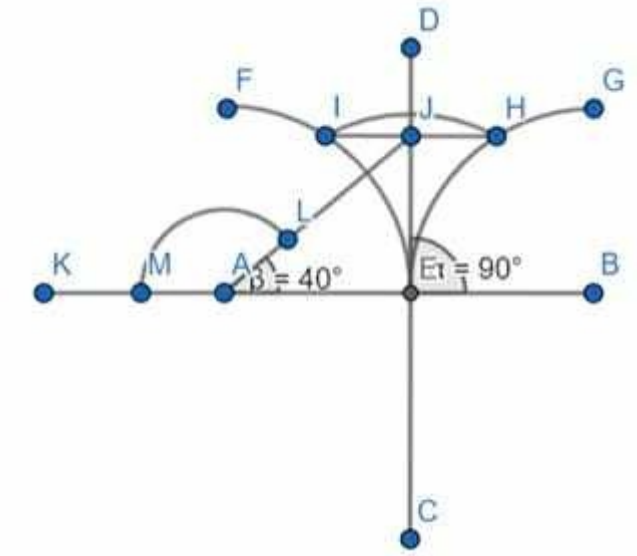


Step 3: With the same measurement draw an arc from E. Join H and I. Mark the intersection of CD and HI as J. Join AJ. Measure angle JAB.



Supplementary angle:

Step 1: Extend BA to K. From E, draw an arc of any radius on the supplement of 40°.



Step 2: Draw another line OP and using the compass with the above length draw an arc with O as centre.

Step 3: Measure ML. Draw an arc from Q with the measurement of ML. Join to form OT. Measure angle TOP=135°.