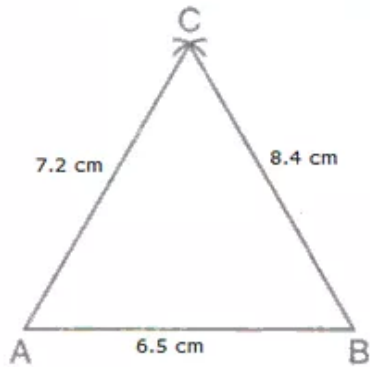


Chapter 14. Constructions of Triangles

Ex 14.1

Answer 1.

(i) $AB = 6.5\text{ cm}$, $BC = 8.4\text{ cm}$ and $AC = 7.2\text{ cm}$

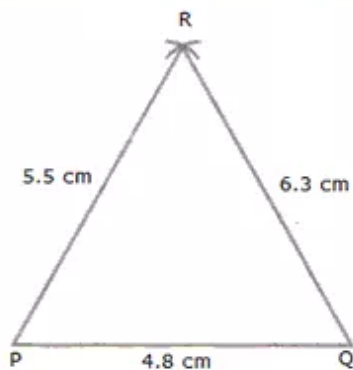


Steps of Construction:

1. Draw $AB = 6.5\text{ cm}$
2. With A as centre and radius 7.2 cm , draw an arc.
3. With B as centre and radius 8.4 cm , draw another arc to cut the first arc at C.
4. Join AC and BC.

Thus, ABC is the required triangle.

(ii) $PQ = 4.8\text{ cm}$, $QR = 6.3\text{ cm}$ and $PR = 5.5\text{ cm}$

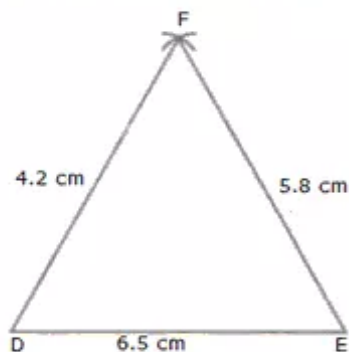


Steps of Construction:

1. Draw $PQ = 4.8\text{ cm}$
2. With P as centre and radius 5.5 cm , draw an arc.
3. With Q as centre and radius 6.3 cm , draw another arc to cut the first arc at R.
4. Join PR and QR.

Thus, PQR is the required triangle.

(iii) $DE = 6.5\text{cm}$, $EF = 5.8\text{cm}$ and $DF = 4.2\text{cm}$



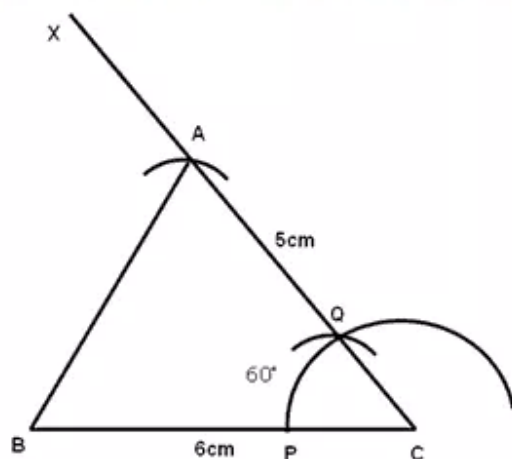
Steps of Construction:

1. Draw $DE = 6.5\text{ cm}$
2. With D as centre and radius 4.2 cm , draw an arc.
3. With E as centre and radius 5.8 cm , draw another arc to cut the first arc at F.
4. Join DF and EF.

Thus, DEF is the required triangle.

Answer 2.

(i) $BC = 6\text{cm}$, $AC = 5.0\text{cm}$ and $\angle C = 60^\circ$

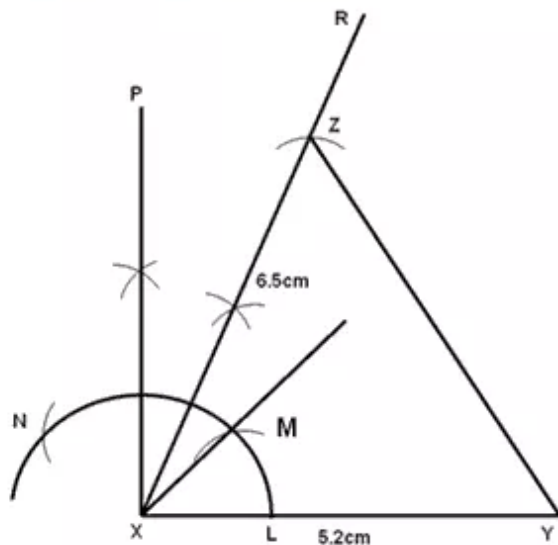


Steps of Construction:

1. Draw a line segment $BC = 6\text{ cm}$.
2. With C as centre, draw an arc to cut BC at P.
3. With P as centre and the same radius, cut the arc at Q.
4. Draw a ray CX passing Q. CX makes an angle of 60° with BC.
5. With C as centre and radius 5 cm cut an arc on CX and mark the point as A.
6. Join AB.

Thus, ABC is the required triangle.

(ii) $XY = 5.2$ cm, $XZ = 6.5$ cm and $\angle X = 75^\circ$

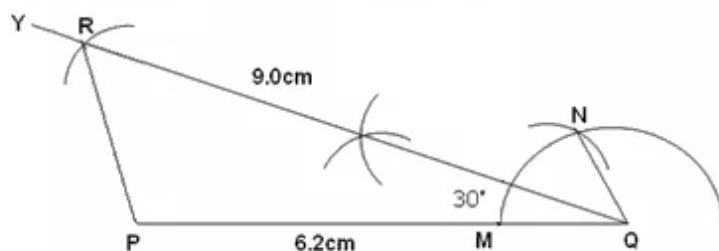


Steps of Construction:

1. Draw a line segment $XY = 5.2$ cm
2. With X as centre, draw an arc cutting XY at L.
3. With L as centre and same radius, cut the arc at M and then from M, with same radius, cut the arc at N.
4. With M and N as centre bisect $\angle MXN$ thus formed to draw a ray XP .
5. Again bisect the $\angle MXP$. Let XR be the bisector. XR makes an angle of 75° with XY .
6. With X as centre and radius 6.5 cm cut an arc on XR and mark the point as Z.
7. Join YZ

Thus, XYZ is the required triangle.

(iii) $PQ = 6.2$ cm, $QR = 9.0$ cm and $\angle Q = 30^\circ$



Steps of Construction:

1. Draw a line segment $PQ = 6.2$ cm
2. With Q as centre, draw an arc cutting PQ at M.
3. With M as centre and same radius, cut the arc at N. Join QN .
4. Bisect $\angle NQP$. Let QY be the bisector. QY makes an angle of 30° with PQ .

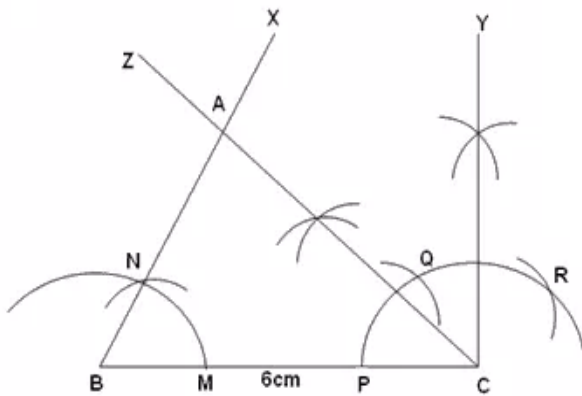
5. With Q as centre and radius 9 cm cut an arc on QY. Mark the point as R.

6. Join PR.

Thus, PQR is the required triangle.

Answer 3.

(i) $BC = 6.0$ cm, $\angle B = 60^\circ$ and $\angle C = 45^\circ$

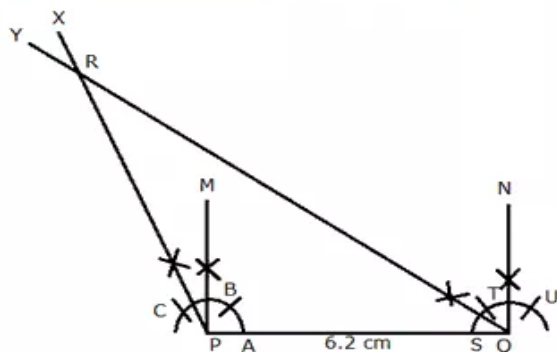


Steps of Construction:

1. Draw a line segment $BC = 6$ cm.
2. With B as centre, draw an arc meeting BC at M.
3. With M as centre and same radius, cut the arc at N.
4. Produce BN to BX. BX makes an angle of 60° with BC.
5. With C as centre, draw an arc meeting BC at P.
6. With P as centre and same radius, cut the arc at Q and with Q as centre and same radius, cut the arc at R.
7. With Q and R as centre, cut arcs and draw CY perpendicular to BC.
8. Bisect $\angle YCB$. Let CZ be the bisector. CZ makes an angle of 45° with BC.
9. Mark the point as A, where CZ and BX cut each other.

Thus, ABC is the required triangle.

(ii) $PQ = 6.2$ cm, $\angle P = 105^\circ$ and $\angle Q = 45^\circ$



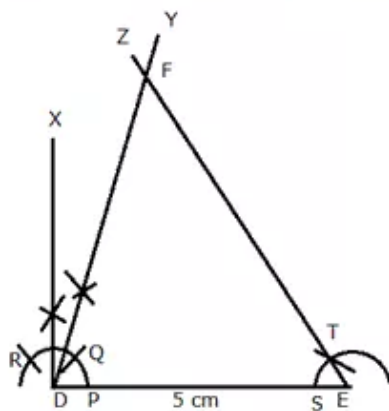
Steps of Construction:

1. Draw a line segment $PQ = 6.2$ cm.
2. With P as centre, draw an arc meeting PQ at A.
3. With A as centre and same radius, cut the arc at B and with BQ as centre and same radius, cut the arc at C.

4. With B and C as centre, cut arcs and draw PM perpendicular to PQ.
5. Bisect $\angle MPC$. Let PX be the bisector. PX makes an angle of 105° with PQ.
6. With Q as centre, draw an arc meeting PQ at S.
7. With S as centre and same radius, cut the arc at T and with T as centre and same radius, cut the arc at U.
8. With T and U as centre, cut arcs and draw QN perpendicular to PQ.
9. Bisect $\angle NQP$. Let QY be the bisector. QY makes an angle of 45° with PQ.
10. Mark the point as R, where PX and QY cut each other.

Thus, PQR is the required triangle.

(iii) $DE = 5$ cm, $\angle D = 75^\circ$ and $\angle E = 60^\circ$



Steps of Construction:

1. Draw a line segment $DE = 5$ cm
2. With D as centre, draw an arc cutting DE at P.
3. With P as centre and same radius, cut the arc at Q and then from Q, with same radius, cut the arc at R.
4. With Q and R as centre bisect $\angle RDQ$ thus formed to draw a ray XD.
5. Again bisect the $\angle XDQ$. Let DY be the bisector. DY makes an angle of 75° with DE.
6. With E as centre, draw an arc meeting DE at S.
7. With S as centre and same radius, cut the arc at T.
8. Produce ET to EZ. EZ makes an angle of 60° with DE.
9. Mark the point as F, where DY and EZ cut each other.

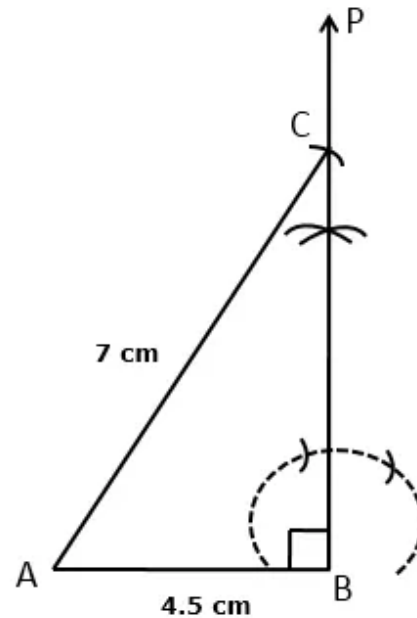
Thus, DEF is the required triangle.

Answer 4A.

Steps :

1. Draw $AB = 4.5$ cm
2. At B construct a ray BP such as $\angle ABP = 90^\circ$
3. With A as a centre and radius 7 cm, draw an arc to cut BP at C.
4. Join AC.

Thus, ABC is the required triangle.

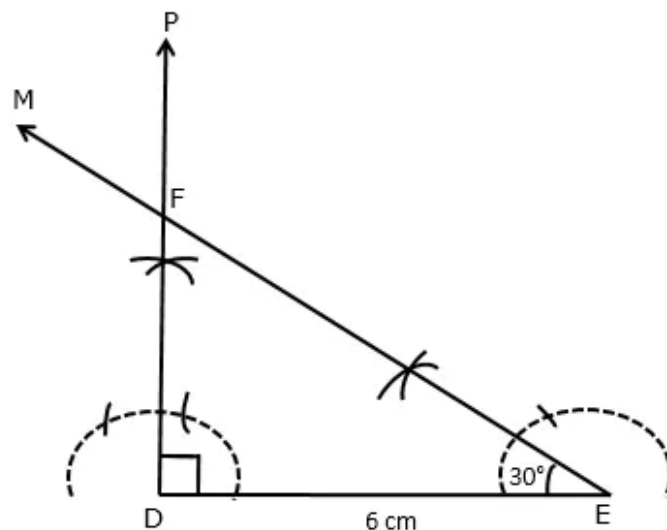


Answer 4B.

Steps :

1. Draw $DE = 6$ cm.
2. At D, construct $\angle PDE = 90^\circ$
3. With E as centre, draw $\angle DEM = 30^\circ$
4. Ray DP and ray EM intersect at F.

Thus, DEF is the required triangle.



Answer 4C.

In $\triangle PQR$,

$QP = QR$ (given)

$\Rightarrow \angle QPR = \angle QRP$

Since hypotenuse $PR = 7$ cm, $\angle PQR = 90^\circ$

$\therefore \angle QPR + \angle QRP = 90^\circ$

$\Rightarrow \angle QPR = \angle QRP = 45^\circ$

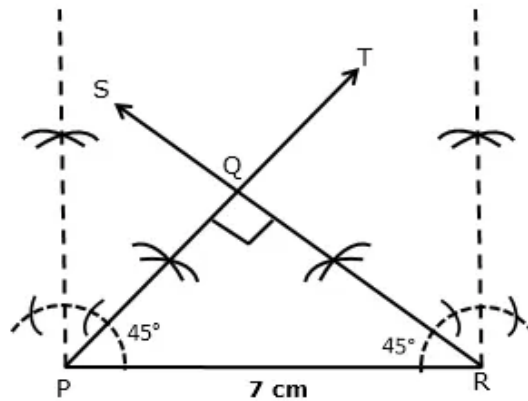
Steps :

1. Draw $PR = 7$ cm.

2. Draw a ray PT such as $\angle RPT = 45^\circ$ and ray RS such as $\angle PRS = 45^\circ$

3. Ray RS and ray PT meets at Q .

Thus, PQR is the required triangle.



Answer 5A.

In $\triangle ABC$,

$AB = AC$ (given)

$\Rightarrow \angle ACB = \angle ABC = 75^\circ$

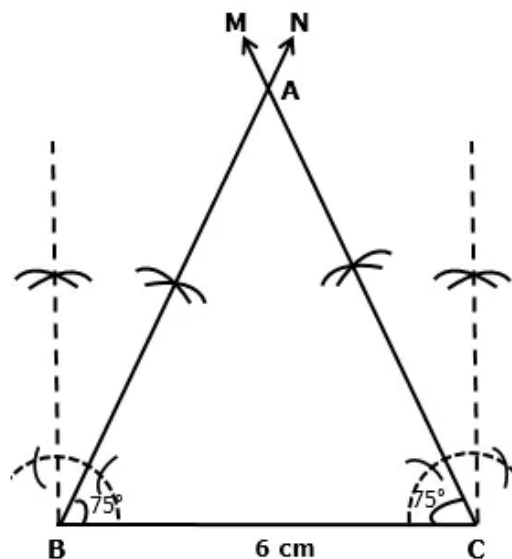
Steps :

1. Draw $BC = 6$ cm.

2. Construct angle $\angle BCM = 75^\circ$ and $\angle CBN = 75^\circ$

3. Ray CM and ray BN meets at A .

Thus, ABC is required angle.



Answer 5B.

In $\triangle XYZ$,

$XY = XZ$ (given)

$\Rightarrow \angle XZY = \angle XYZ$ (i)

$\angle X = 60^\circ$ (given)

Now, $\angle X + \angle Y + \angle Z = 180^\circ$

$60^\circ + \angle Y + \angle Y = 180^\circ$ [From (i)]

$2\angle Y = 120^\circ$

$\Rightarrow \angle Y = 60^\circ = \angle Z$

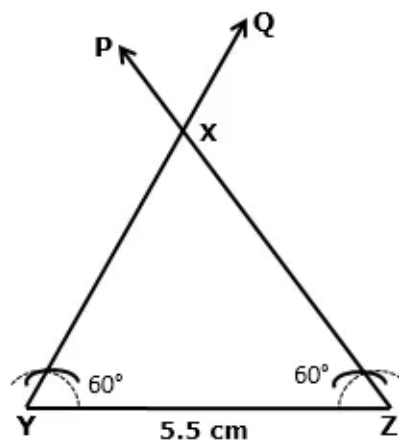
Steps :

1. Draw $YZ = 5.5$ cm.

2. Construct $\angle YZP = 60^\circ$ and $\angle ZYQ = 60^\circ$

3. Ray ZP and YQ meet at X .

Thus, XYZ is the required triangle.



Answer 5C.

In $\triangle PQR$,

$PQ = QR$ (given)

$\Rightarrow \angle PRQ = \angle RPQ = 60^\circ$

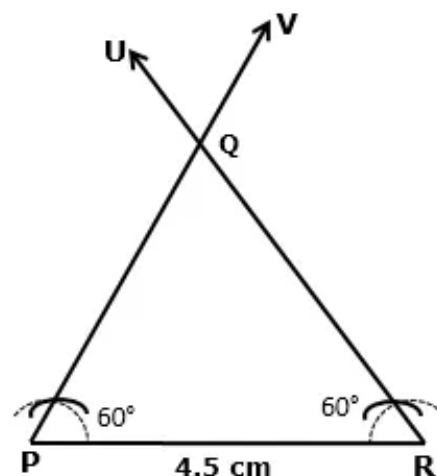
Steps :

1. Draw $PR = 4.5$ cm.

2. Construct $\angle PRU = 60^\circ$ and $\angle RPV = 60^\circ$

3. Ray RU and PV meet at Q .

Thus, PQR is the required triangle.

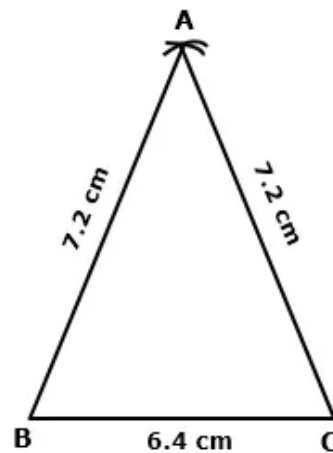


Answer 6A.

In the given isosceles $\triangle ABC$,
Base $BC = 6.4$ cm, Side $AB = 7.2$ cm
 $\Rightarrow AB = AC = 7.2$ cm

Steps :

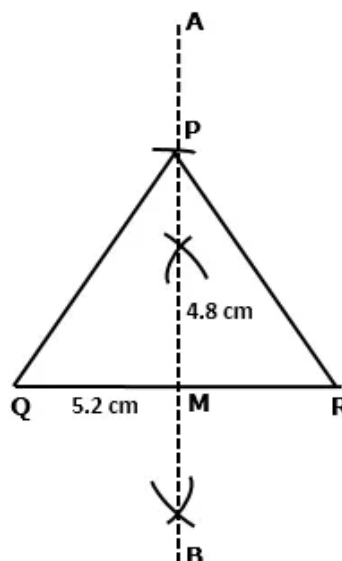
1. Draw $BC = 6.4$ cm.
 2. With B as centre and radius 7.2 cm, draw an arc.
 3. With C as centre and radius 7.2 cm, draw another arc to cut the first arc at A.
 3. Join AB and AC
- Thus, ABC is required triangle.



Answer 6B.

Steps :

1. Draw $QR = 5.2$ cm.
 2. Draw AMB, a perpendicular bisector of QR.
 3. With M as centre and radius 4.8 cm, draw an arc to cut MN at P.
 4. Join PQ and PR.
- Thus, PQR is required triangle.



Answer 6C.

In isosceles $\triangle DEF$,

Base $DE = 6$ cm

$\angle F = 45^\circ$ (given)

$\Rightarrow \angle D = \angle E$ (DEF is isosceles triangle)

Now, $\angle D + \angle E + \angle F = 180^\circ$

$2\angle D + 45^\circ = 180^\circ$

$2\angle D = 135^\circ$

$\Rightarrow \angle D = \angle E = 67.5^\circ$

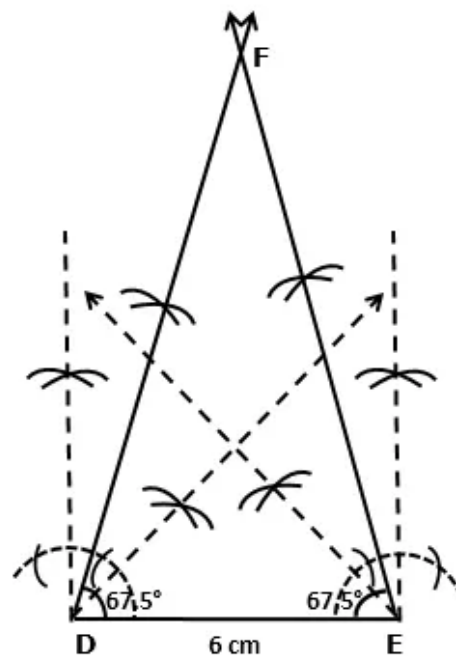
Steps :

1. Draw $DE = 6$ cm.

2. Construct $\angle DEP = 67.5^\circ$ and $\angle EDQ = 67.5^\circ$

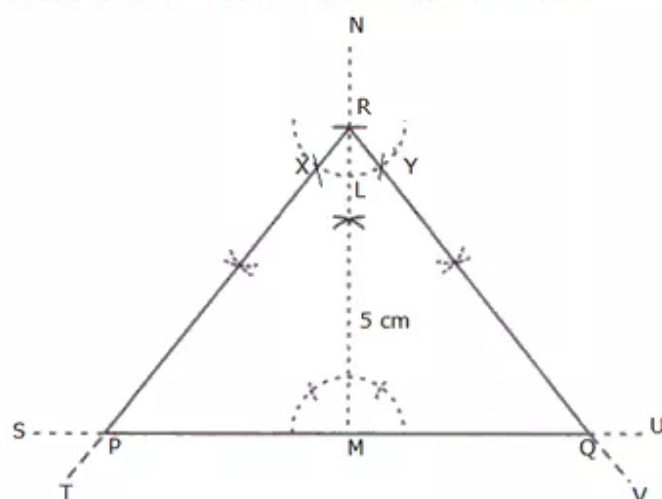
3. Ray EP and ray DQ meets at F.

Thus, DEF is the required triangle.



Answer 7.

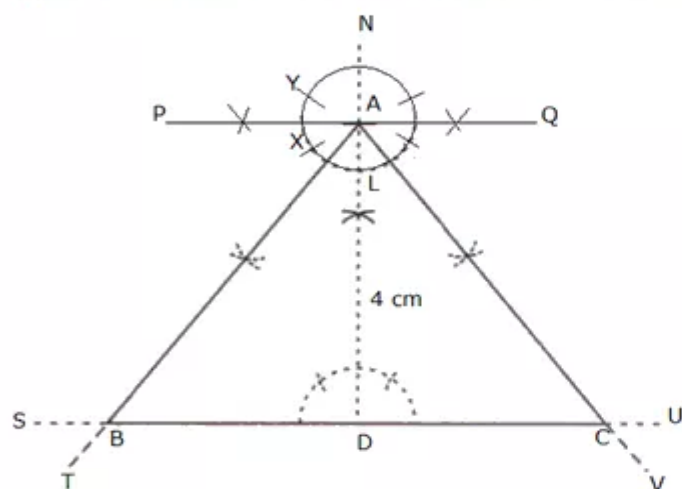
(i) Altitude $RM = 5$ cm and vertex $\angle R = 120^\circ$



Steps of construction:

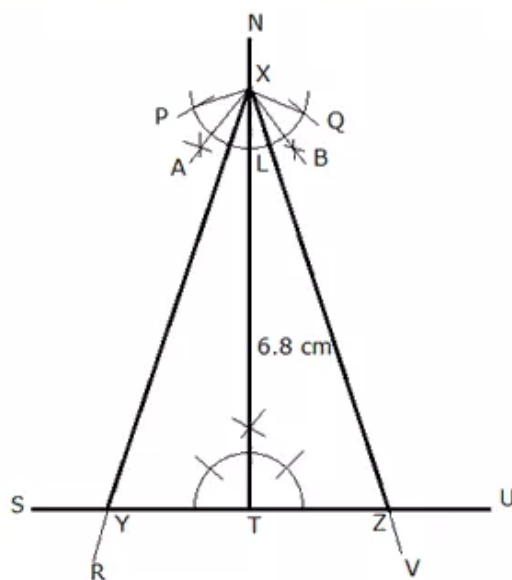
1. Draw a line SU of any length.
 2. Take a point M on SU .
 3. Through the point M on SU draw NM perpendicular to SU .
 4. With M as centre and radius 5 cm, draw an arc to cut NM at R .
 5. Construct $\angle MRP = \angle MRQ = \frac{1}{2} \times 120^\circ = 60^\circ$.
 - (a) With R as centre, draw an arc cutting RM at L .
 - (b) With L as centre and same radius, cut the arc at X and Y .
 - (c) Join RX and RY and produce them to T and V respectively. RT and RV make an angle of 60° with RM .
 - (d) Mark the points as P and Q where RT and RV meet SU .
- Thus, PQR is the required triangle.

(ii) Altitude $AD = 4$ cm and vertex $\angle A = 90^\circ$



Steps of construction:

1. Draw a line SU of any length.
 2. Take a point D on SU.
 3. Through the point D on SU draw ND perpendicular to SU.
 4. With D as centre and radius 4 cm, draw an arc to cut ND at A.
 5. Construct $\angle DAB = \angle DAC = \frac{1}{2} \times 90^\circ = 45^\circ$.
 - (a) With A as centre, draw an arc cutting AD at L.
 - (b) With L as centre and same radius, cut the arc at X and Y.
 - (c) Using X and Y, draw PQ perpendicular to AD.
 - (d) Bisect $\angle PAD$ and $\angle QAD$. Let AT and AV are the bisectors. AT and AV make an angle of 45° with AD.
 - (e) Mark the points as B and C where AT and AV meet SU.
- Thus, ABC is the required triangle.
- (iii) Altitude XT = 6.8 cm and vertex $\angle X = 30^\circ$



Steps of construction:

1. Draw a line SU of any length.
2. Take a point T on SU.
3. Through the point T on SU draw NT perpendicular to SU.
4. With T as centre and radius 6.8 cm, draw an arc to cut NT at X.
5. Construct $\angle TXY = \angle TXZ = \frac{1}{2} \times 30^\circ = 15^\circ$.
- (a) With X as centre, draw an arc cutting XT at L.
- (b) With L as centre and same radius, cut the arc at P and Q.
- (c) Join PX and QX.
- (d) Bisect $\angle PXT$ and $\angle QXT$. Let XA and XB be the bisectors.
- (e) Again bisect $\angle AXT$ and $\angle BXT$. Let XR and XV be the bisectors. XR and XV make an angle of 15° with XT.
- (f) Mark the points as Y and Z where XR and XV meet SU.

Thus, XYZ is the required triangle.

Answer 8.

Let, $\triangle UVW$ be the isosceles right-angled triangle,
right-angled at U.

Hypotenuse $VW = 6$ cm

$UV = UW$

$\Rightarrow \angle UWV = \angle UVW$

$\angle U = 90^\circ$

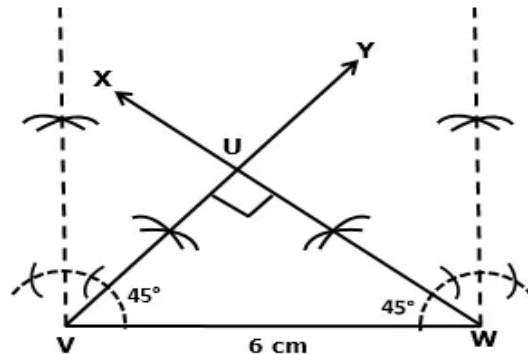
$\Rightarrow \angle UWV + \angle UVW = 90^\circ$

$\Rightarrow 2\angle UWV = 90^\circ$

$\Rightarrow \angle UWV = \angle UVW = 45^\circ$

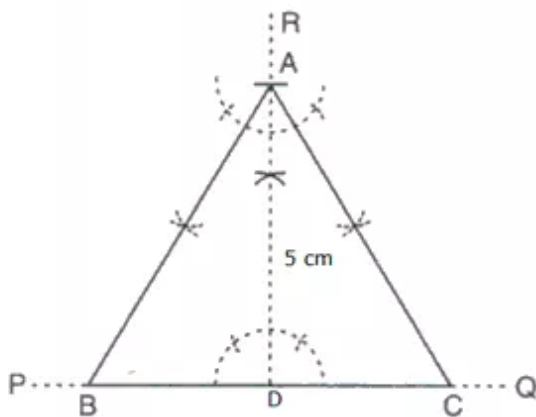
Steps :

1. Draw $VW = 6$ cm.
 2. Construct $\angle WVY = 45^\circ$ and $\angle VWX = 45^\circ$
 3. Ray VY and ray WX meet at U.
- Thus, UVW is the required triangle.



Answer 9.

(i) Altitude $AD = 5$ cm

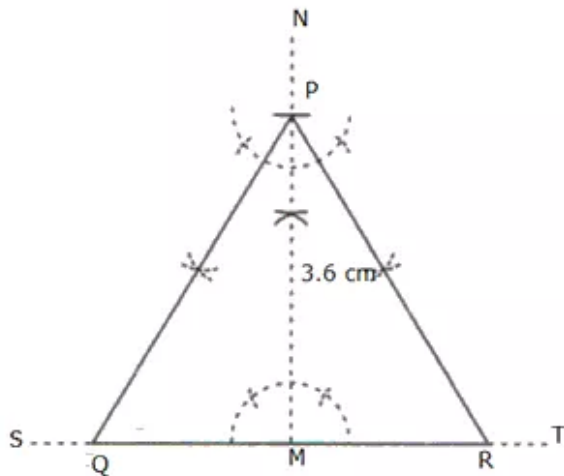


Steps of construction:

1. Draw a line segment PQ of any length.
2. Through a point D on PQ , draw AD perpendicular to PQ such that $AD = 5$ cm.
3. Through A , draw AB and AC making angles equal to 30° with AD and meeting PQ at B and C respectively.

Thus, ABC is the required triangle.

(ii) Altitude $PM = 3.6$ cm

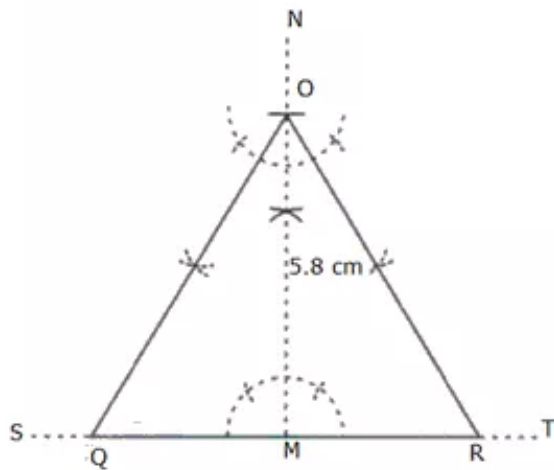


Steps of construction:

1. Draw a line segment ST of any length.
2. Through a point M on ST , draw PM perpendicular to ST such that $PM = 3.6$ cm.
3. Through P , draw PQ and PR making angles equal to 30° with PM and meeting ST at Q and R respectively.

Thus, PQR is the required triangle.

(iii) Altitude $OM = 5.8$ cm



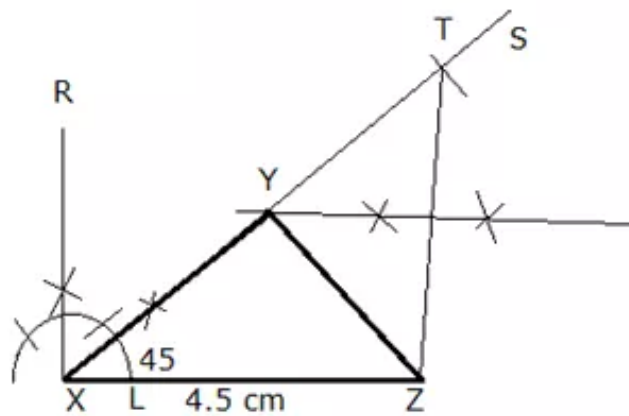
Steps of construction:

1. Draw a line segment ST of any length.
2. Through a point M on ST , draw PM perpendicular to ST such that $OM = 5.8$ cm.
3. Through O , draw OQ and OR making angles equal to 30° with OM and meeting ST at Q and R respectively.

Thus, OQR is the required triangle.

Answer 10.

(i) $XY + YZ = 5.6$ cm, $XZ = 4.5$ cm and $\angle X = 45^\circ$

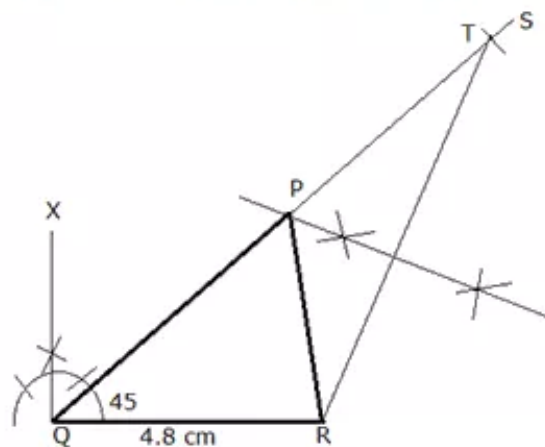


Steps of construction:

1. Draw a line segment $XZ = 4.5$ cm
2. With X as centre, construct $\angle SXZ = 45^\circ$
3. Cut $XT = 5.6$ cm on XS.
4. Join TZ.
5. Draw perpendicular bisector of TZ which cuts XT at Y.
6. Join YZ.

Thus XYZ is the required triangle.

(ii) $PQ + PR = 10.6$ cm, $QR = 4.8$ cm and $\angle R = 45^\circ$

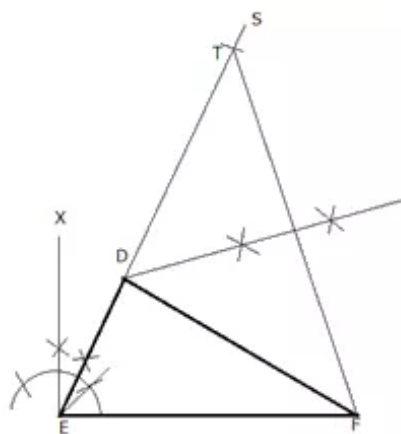


Steps of construction:

1. Draw a line segment $QR = 4.8$ cm
2. With Q as centre, construct $\angle SQR = 45^\circ$
3. Cut $QT = 10.6$ cm on QS.
4. Join TR.
5. Draw perpendicular bisector of TR which cuts QT at P.
6. Join PR.

Thus PQR is the required triangle

(iii) $DE + DF = 10.3$ cm, $EF = 6.4$ cm and $\angle E = 75^\circ$



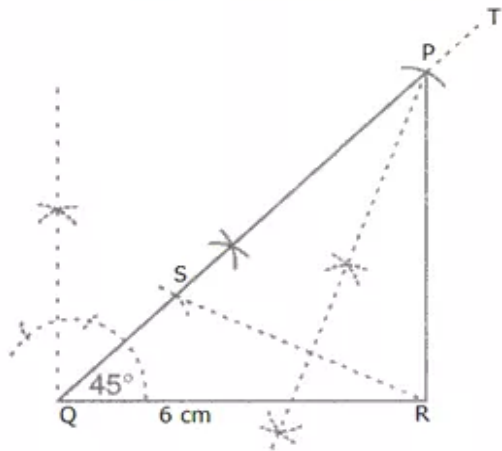
Steps of construction:

1. Draw a line segment $EF = 6.4$ cm
2. With E as centre, construct $\angle SEF = 75^\circ$
3. Cut $ET = 10.3$ cm on ES.
4. Join TF.
5. Draw perpendicular bisector of TF which cuts ET at D.
6. Join DF.

Thus DEF is the required triangle.

Answer 11.

(i) $PQ - PR = 1.5$ cm, $QR = 6.0$ cm and $\angle Q = 45^\circ$

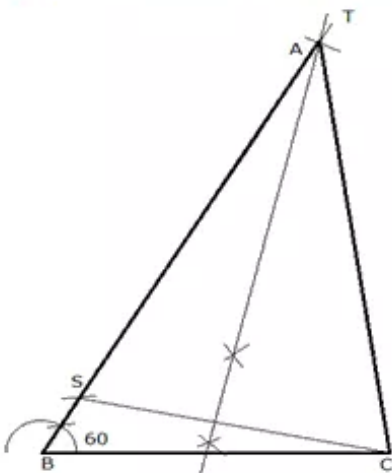


Steps of Construction:

1. Draw a line segment $QR = 6$ cm.
2. With Q as centre, draw $\angle TQR = 45^\circ$
3. From QT , cut $QS = 1.5$ cm
4. Join S and R
5. Draw perpendicular bisector of SR which cuts QT at P
6. Join PR .

Thus, PQR is the required triangle.

(ii) $AB - AC = 1.2$ cm, $BC = 6.0$ cm and $\angle B = 60^\circ$

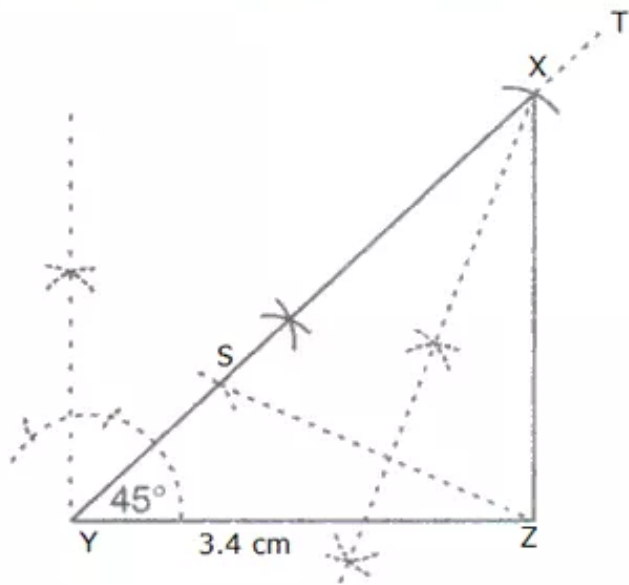


Steps of Construction:

1. Draw a line segment $BC = 6$ cm.
2. With B as centre, draw $\angle TBC = 60^\circ$
3. From BT , cut $BS = 1.2$ cm
4. Join S and C
5. Draw perpendicular bisector of SC which cuts BT at A
6. Join AC .

Thus, ABC is the required triangle.

(iii) $XY - XZ = 1.5$ cm, $YZ = 3.4$ cm and $\angle X = 45^\circ$



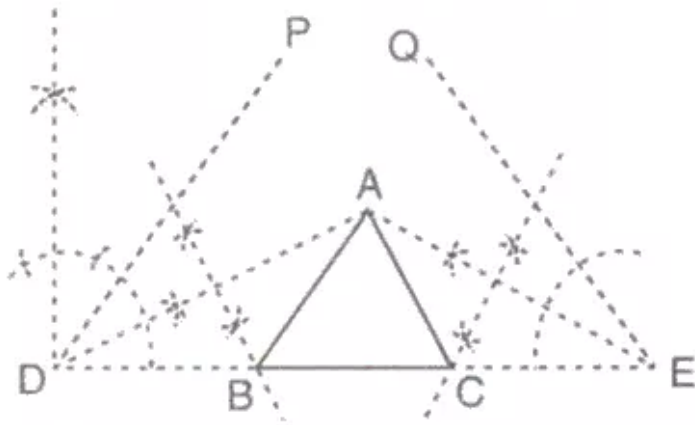
Steps of Construction:

1. Draw a line segment $YZ = 3.4$ cm.
2. With Y as centre, draw $\angle TYZ = 45^\circ$
3. From YT, cut $YS = 1.5$ cm
4. Join S and Z
5. Draw perpendicular bisector of SZ which cuts YT at X
6. Join XZ.

Thus, XYZ is the required triangle.

Answer 12.

(i) Perimeter of triangle is 6.4 cm, and the base angles are 60° and 45°

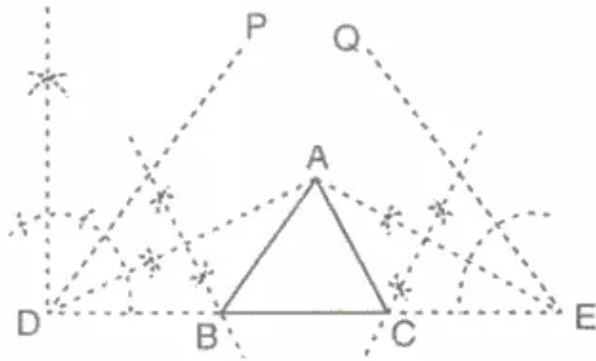


Steps of construction:

1. Draw $DE = 6.4$ cm.
2. Draw DP and EQ such that $\angle PDE = 45^\circ$ and $\angle QED = 60^\circ$
3. Draw AD and AE , the bisectors of angles PDE and QED respectively, intersecting each other at A .
4. Draw perpendicular bisectors of AD and AE , intersecting DE at points B and C respectively.
- 5 Join AB and AC .

Thus, ABC is the required triangle.

(ii) Perimeter of triangle is 9 cm, and the base angles are 60° and 45°

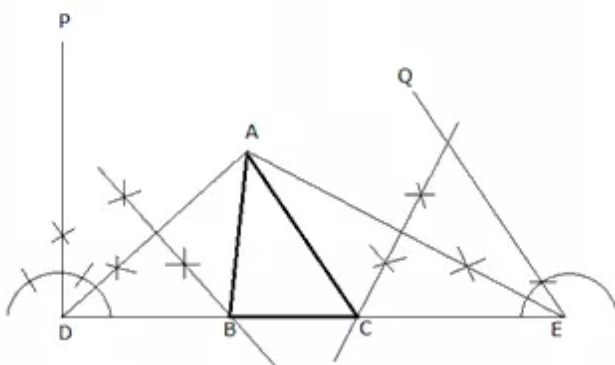


Steps of construction:

1. Draw $DE = 9$ cm.
2. Draw DP and EQ such that $\angle PDE = 45^\circ$ and $\angle QED = 60^\circ$
3. Draw AD and AE , the bisectors of angles PDE and QED respectively, intersecting each other at A .
4. Draw perpendicular bisectors of AD and AE , intersecting DE at points B and C respectively.
- 5 Join AB and AC .

Thus, ABC is the required triangle.

(iii) Perimeter of triangle is 10.6 cm, and the base angles are 60° and 90°

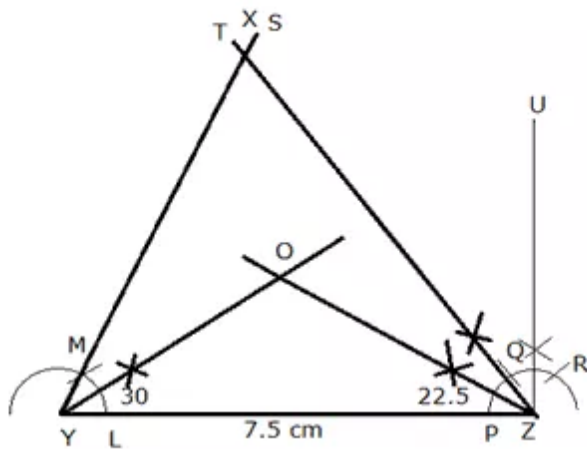


Steps of construction:

1. Draw $DE = 10.6$ cm.
2. Draw DP and EQ such that $\angle PDE = 90^\circ$ and $\angle QED = 60^\circ$
3. Draw AD and AE , the bisectors of angles PDE and QED respectively, intersecting each other at A .
4. Draw perpendicular bisectors of AD and AE , intersecting DE at points B and C respectively.
5. Join AB and AC .

Thus, ABC is the required triangle.

Answer 13.



Steps of construction:

1. Draw a line segment $YZ = 7.5$ cm
2. With Y as centre, draw an arc cutting YZ at L.
3. With L as centre and same radius, cut the arc at M.
4. Join Y and M. Produce YM to S. YS makes an angle of 60° with YZ.
5. With Z as centre, draw an arc cutting YZ at P.
6. With P as centre and same radius, cut the arc at Q, and with Q as centre and same radius cut the arc at R. Using Q and R, draw UZ perpendicular to YZ.
7. Bisect $\angle UZY$. Let TZ be the bisector. TZ makes an angle of 45° with YZ.
8. Bisect $\angle SYZ$ and $\angle TZY$.
9. Mark the point as O where the bisectors of $\angle SYZ$ and $\angle TZY$ meet.
10. On measuring $\angle YOZ = 127.5^\circ$

Answer 14.

Steps :

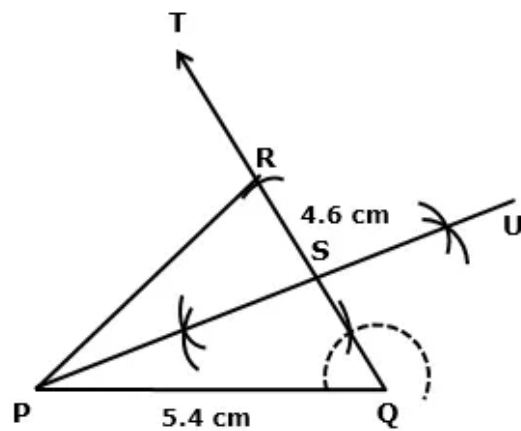
1. Draw $PQ = 5.4$ cm.
2. At P, construct $\angle PQT = 60^\circ$.
3. With Q as centre and radius 4.6 cm, draw an arc intersecting ray QT at R.
4. Join PR.

Thus, PQR is the required triangle.

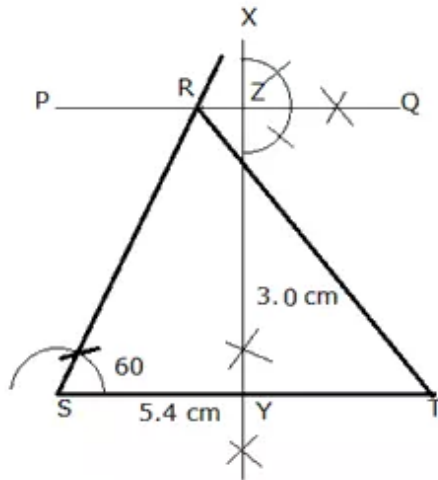
Draw PU, the perpendicular bisector of QR intersecting QR at S.

Then, we have

$SQ = 2.3$ cm and $SP = 4.8$ cm



Answer 15.

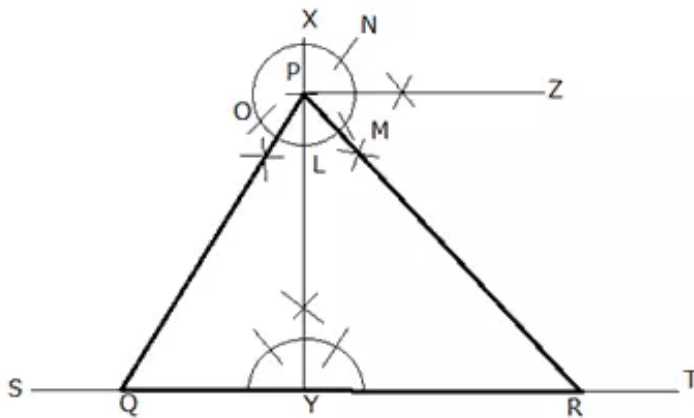


Steps of construction:

1. Draw a line segment $ST = 5.4\text{ cm}$
2. With S as centre, draw SX making an angle of 60° with ST i.e. $\angle XST = 60^\circ$
3. Draw a straight line PQ parallel to ST at a distance of 3 cm from ST .
4. PQ meets SX at R .
5. Join RT .

Thus, RST is the required triangle with angle $RST = 60^\circ$.

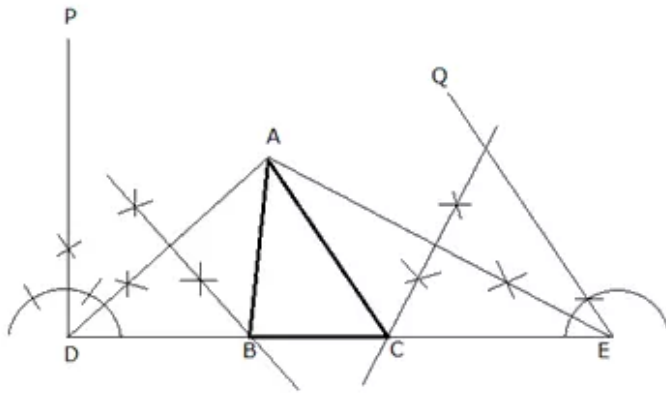
Answer 16.



Steps of construction:

1. Draw a line segment ST of any length.
2. From any point Y on ST, draw XY perpendicular to ST.
3. With Y as centre and radius 3.5 cm mark a point P on XY.
4. With P as centre, draw an arc cutting XY at L.
5. With L as centre and same radius, cut the arc at O and M. With M as centre and same radius cut the arc at N.
6. Draw PZ perpendicular to XY using M and N.
7. Bisect angles OPY and ZPY making 30° and 45° angles with PY respectively.
(In triangle PQY, $\angle PQY = 60^\circ$, $\angle QYP = 90^\circ$; therefore $\angle QPY = 30^\circ$ and in triangle PYR, $\angle YRP = 45^\circ$, $\angle RYP = 90^\circ$; therefore $\angle YPR = 45^\circ$)
8. Join PQ and PR. PQR is the required triangle.
9. On measuring, $PQ = 4.1$ cm.

Answer 17.



Steps of construction:

1. Draw $DE = 10 \text{ cm}$.
2. Draw DP and EQ such that $\angle PDE = 90^\circ$ and $\angle QED = 60^\circ$
3. Draw AD and AE , the bisectors of angles PDE and QED respectively, intersecting each other at A .
4. Draw perpendicular bisectors of AD and AE , intersecting DE at points B and C respectively.
- 5 Join AB and AC .

Thus, ABC is the required triangle.