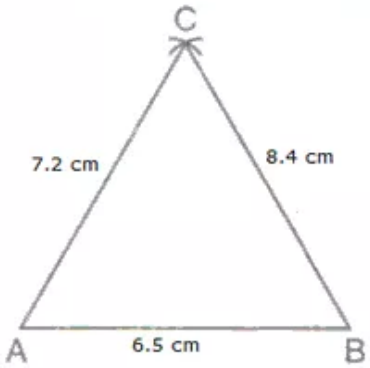
Chapter 14. Constructions of Triangles

Ex 14.1

Answer 1.

(i) AB = 6.5cm, BC = 8.4cm and AC = 7.2cm



Steps of Construction:

1. Draw AB = 6.5 cm

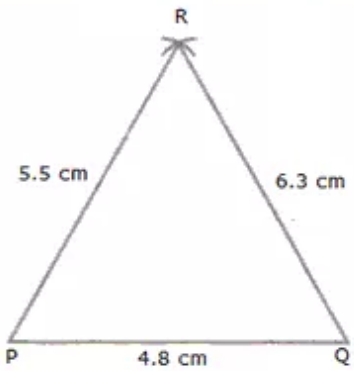
2. With A as centre and radius 7.2 cm, draw an arc.

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 = 4.8cm, QR = 6.3cm and PR = 5.5cm



Steps of Construction:

1. Draw PQ = 4.8 cm

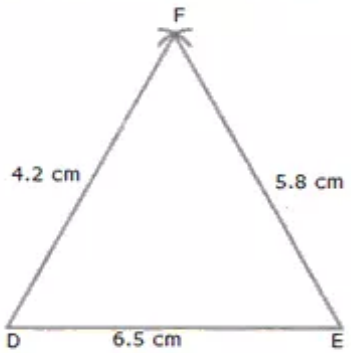
2. With P as centre and radius 5.5 cm, draw an arc.

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 = 6.5cm, EF = 5.8cm and DF = 4.2cm



Steps of Construction:

1. Draw DE = 6.5 cm

2. With D as centre and radius 4.2 cm, draw an arc.

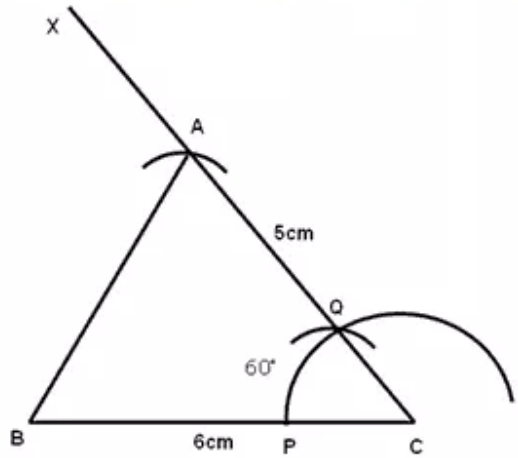
3. With E as centre and radius 5.8 cm, draw another arc to cut the first arc at F.

4. Join DF and EF.

Thus, DEF is the required triangle.

Answer 2.

(i) BC = 6cm, AC = 5.0cm and ∠C = 60°



Steps of Construction:

1. Draw a line segment BC = 6 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.

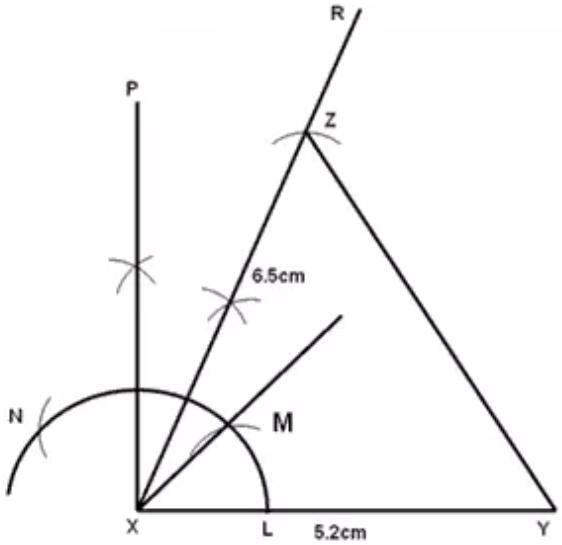
4. Draw a ray CX passing Q. CX makes an angle of 60° with BC.

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 ∠X = 75°

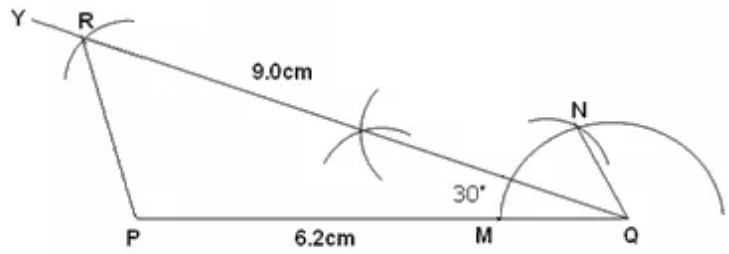


Steps of Construction:

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 ∠MXN thus formed to draw a ray XP.
5. Again bisect the ∠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 ∠Q = 30°



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 ∠NQP. Let QY be the bisector. QY makes an angle of 30° with PQ.

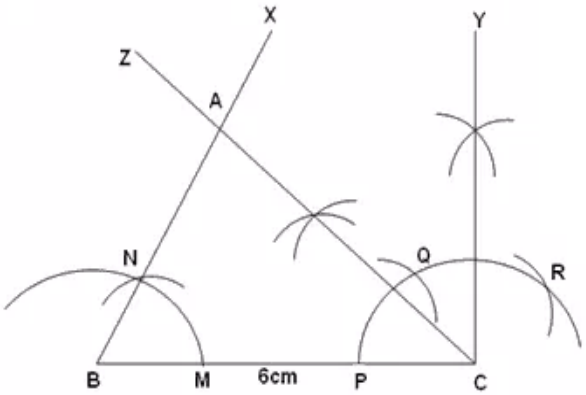
5. With Q as centre and radius 9 cm cut an arc on QY. Mark the point as R.

6. Join PR.

Thus, PQR is the required triangle.

Answer 3.

(i) BC = 6.0 cm, ∠B = 60° and ∠C = 45°



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.

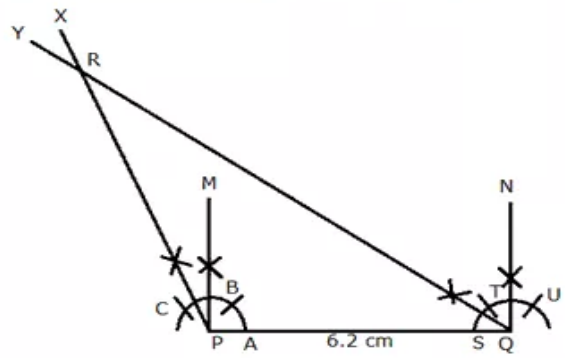
7. With Q and R as centre, cut arcs and draw CY perpendicular to BC.

8. Bisect ∠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, ∠P = 105° and ∠Q = 45°



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 ∠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.

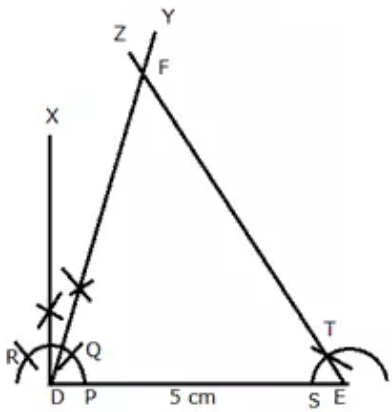
8. With T and U as centre, cut arcs and draw QN perpendicular to PQ.

9. Bisect ∠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, ∠D = 75° and ∠E = 60°



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 ∠RDQ thus formed to draw a ray XD.

5. Again bisect the ∠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.

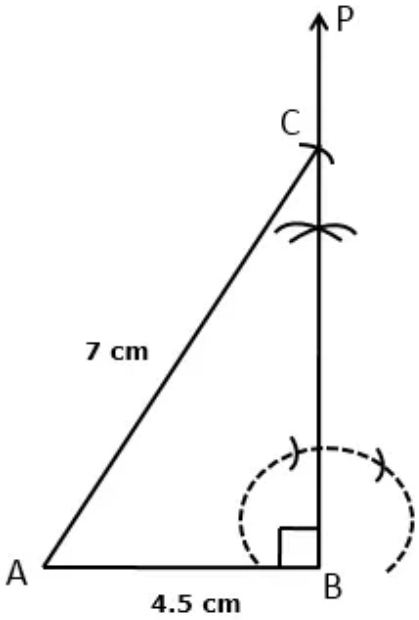
Thus, DEF is the required triangle.

Answer 4A.

Steps :

1. Draw AB = 4.5 cm
2. At B construct a ray BP such as ∠ABP = 90°
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.

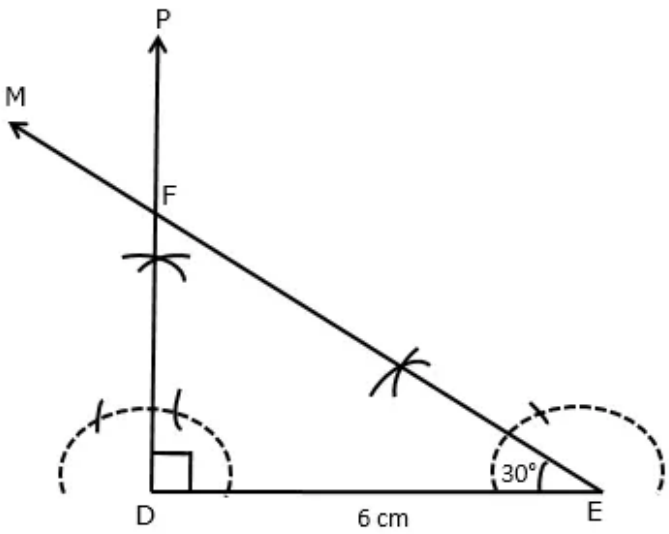


Answer 4B.

Steps :

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

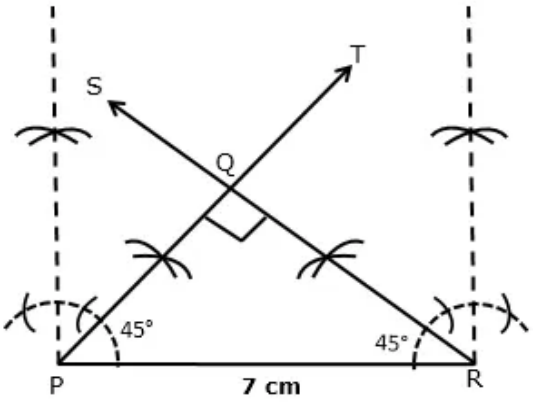
Thus, DEF is the required triangle.



Answer 4C.

In ΔPQR,
QP = QR ....(given)
⇒∠QPR = ∠QRP ....
Since hypotenuse PR = 7 cm, ∠PQR = 90°
∴ ∠QPR + ∠QRP = 90°
⇒ ∠QPR = ∠QRP = 45°

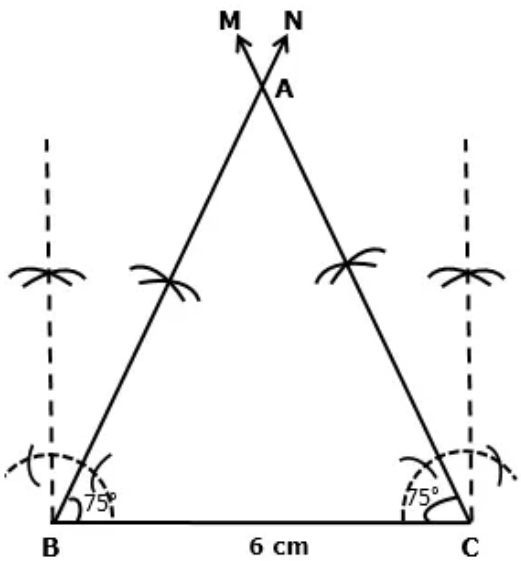
Steps :
1. Draw PR = 7 cm.
2. Draw a ray PT such as ∠RPT = 45° and ray RS such as ∠PRS = 45°
3. Ray RS and ray PT meets at Q.
Thus, PQR is the required triangle.



Answer 5A.

In ΔABC,
AB = AC ....(given)
⇒ ∠ACB = ∠ABC = 75°

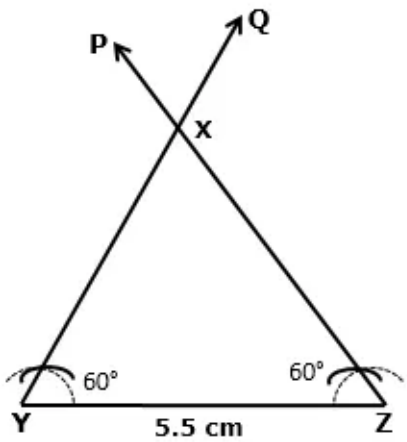
Steps :
1. Draw BC = 6 cm.
2. Construct angle ∠BCM = 75° and ∠CBN = 75°
3. Ray CM and ray BN meets at A.
Thus, ABC is required angle.



Answer 5B.

In ΔXYZ,
$XY = XZ$ ....(given)
$\Rightarrow \angle XZY = \angle XYZ$ ....(i)
$\angle X = 60°$ ....(given)
Now, $\angle X + \angle Y + \angle Z = 180°$
$60° + \angle Y + \angle Y = 180°$ ....[From (i)]
$2\angle Y = 120°$
$\Rightarrow \angle Y = 60° = \angle Z$

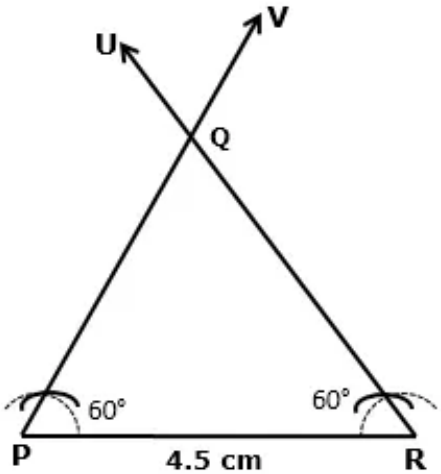
Steps :
1. Draw YZ = 5.5 cm.
2. Construct $\angle YZP = 60°$ and $\angle ZYQ = 60°$
3. Ray ZP and YQ meet at X.
Thus, XYZ is the required triangle.



Answer 5C.

In ΔPQR,
$PQ = QR$ ....(given)
$\Rightarrow \angle PRQ = \angle RPQ = 60°$

Steps :
1. Draw PR = 4.5 cm.
2. Construct $\angle PRU = 60°$ and $\angle RPV = 60°$
3. Ray RU and PV meet at Q.
Thus, PQR is the required triangle.

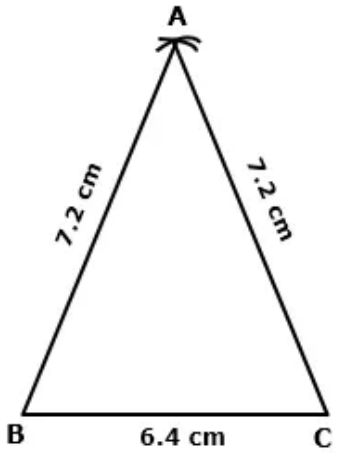


Answer 6A.

In the given isosceles ΔABC,
Base BC = 6.4 cm, Side AB = 7.2 cm
⇒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 C.
3. Join AB and AC

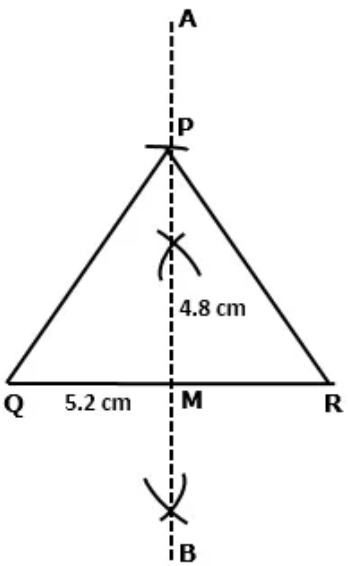
Thus, ABC is required triangle.



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 ΔDEF,

Base DE = 6 cm

$\angle F = 45°$ ....(given)

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

Now, $\angle D + \angle E + \angle F = 180°$

$2\angle D + 45° = 180°$

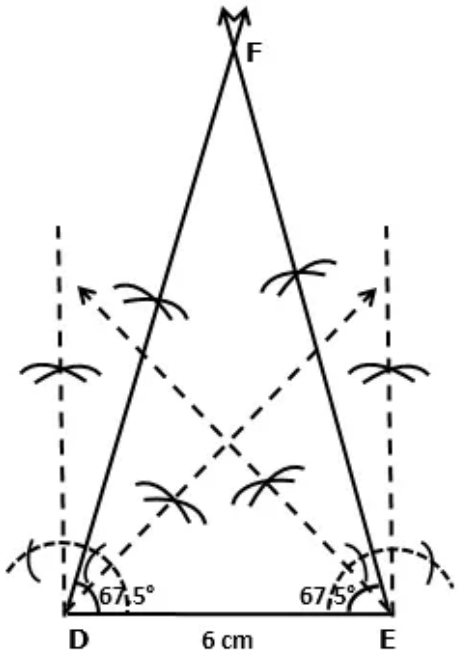
$2\angle D = 135°$

$\Rightarrow \angle D = \angle E = 67.5°$

Steps :

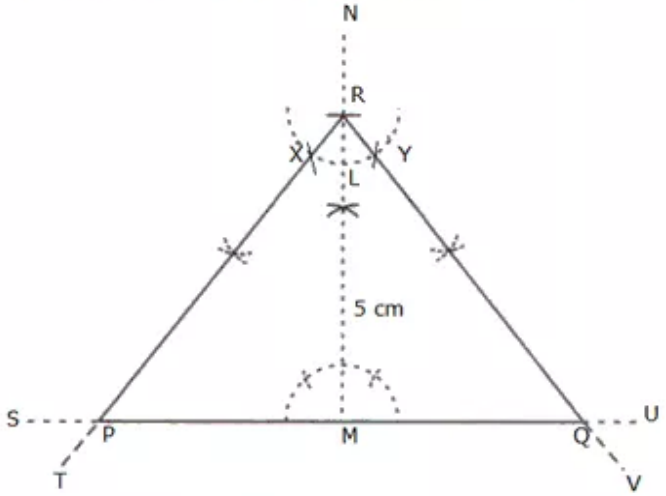
1. Draw DE = 6 cm.
2. Construct $\angle DEP = 67.5°$ and $\angle EDQ = 67.5°$
3. Ray EP and ray DQ meets atF.

Thus, DEF is the required triangle.



Answer 7.

(i) Altitude RM = 5 cm and vertex ∠R = 120°



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 $\angle MRP = \angle MRQ = \frac{1}{2} \times 120° = 60°$.

(a) With R as centre, draw an arc cutting RM at L.

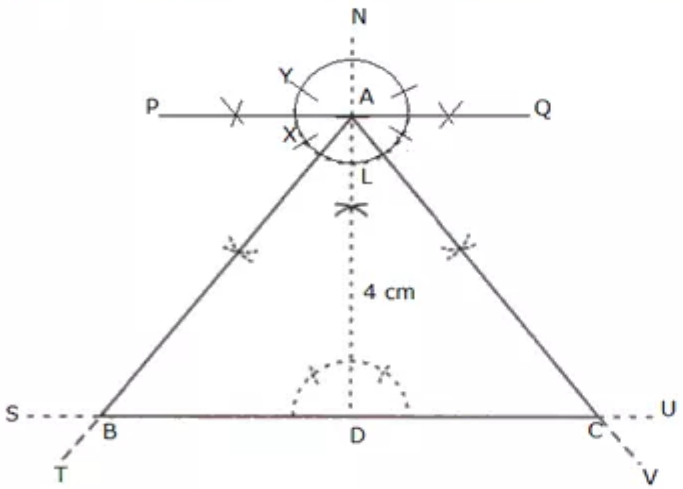
(b) With L as centre and same radius, cut the arc at X and Y.

(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 ∠A = 90°



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 $\angle DAB = \angle DAC = \frac{1}{2} \times 90° = 45°$.

(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.

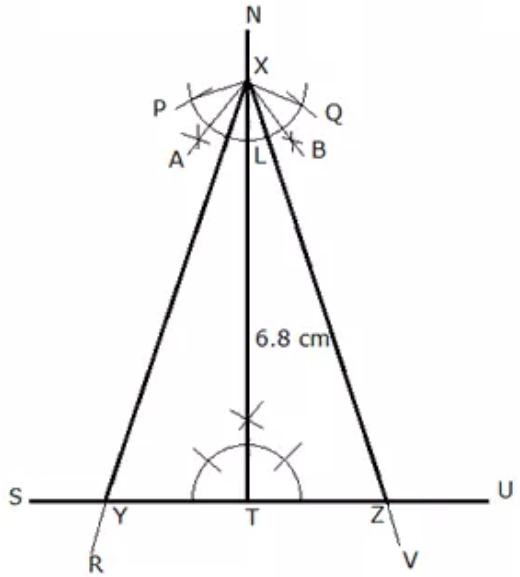
(c) Using X and Y, draw PQ perpendicular to AD.

(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 $\angle X = 30°$



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 $\angle TXY = \angle TXZ = \frac{1}{2} \times 30° = 15°$.

(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.

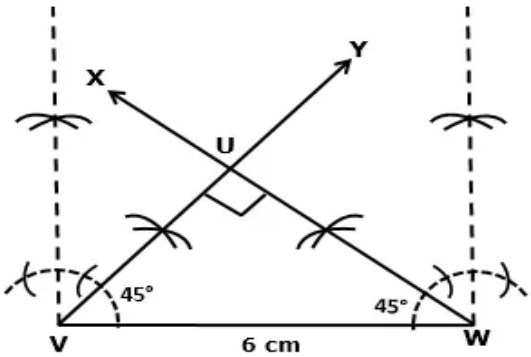
Thus, XYZ is the required triangle.

Answer 8.

Let, ΔUVW be the isosceles right-angled triangle,
right-angled at U.
Hypotenuse VW = 6 cm
UV = UW
$\Rightarrow \angle UWV = \angle UVW$
$\angle U = 90°$
$\Rightarrow \angle UWV + \angle UVW = 90°$
$\Rightarrow 2\angle UWV = 90°$
$\Rightarrow \angle UWV = \angle UVW = 45°$

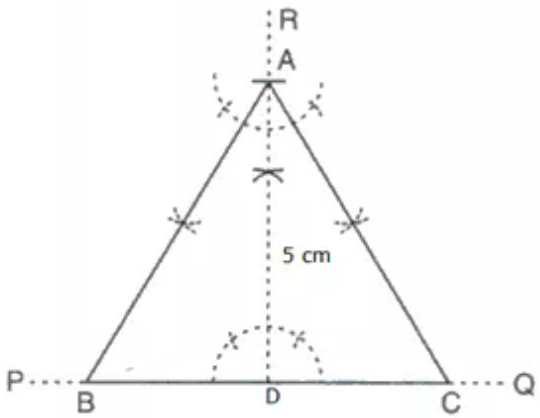
Steps :
1. Draw VW = 6 cm.
2. Construct $\angle WVY = 45°$ and $\angle VWX = 45°$
3. Ray VY and ray WX meet at U.

Thus, UVW is the required triangle.



Answer 9.

(i) Altitude AD = 5 cm

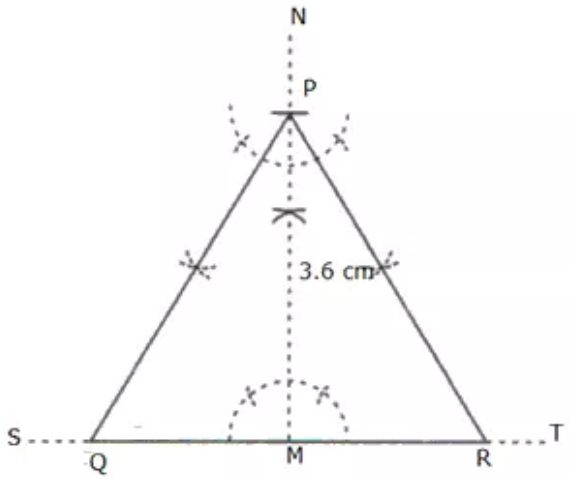


Steps of construction:

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

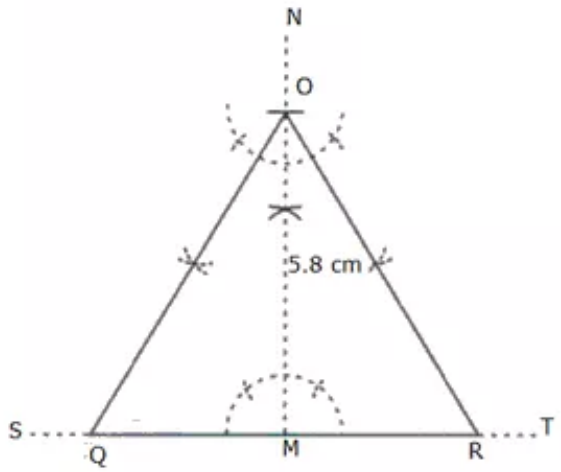


Steps of construction:

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



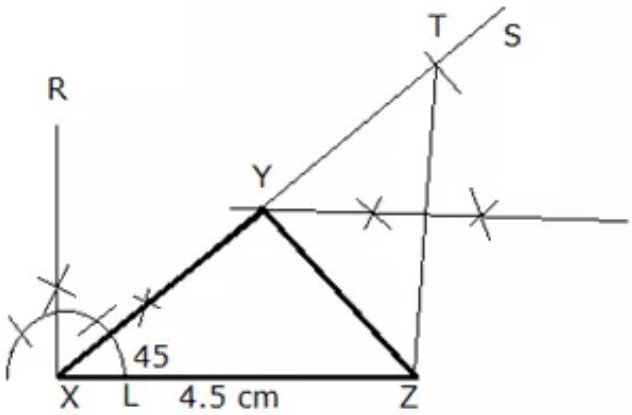
Steps of construction:

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 ∠X = 45°

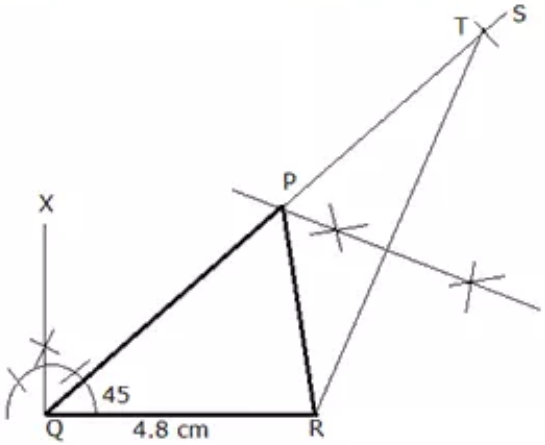


Steps of construction:

1. Draw a line segment XZ = 4.5 cm
2. With X as centre, construct ∠SXZ = 45°
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 ∠R = 45°

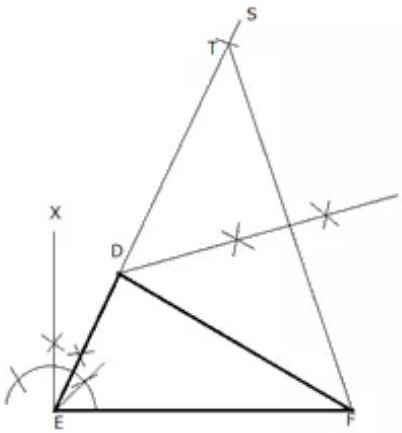


Steps of construction:

1. Draw a line segment QR = 4.8 cm
2. With Q as centre, construct ∠SQR = 45°
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 ∠E = 75°



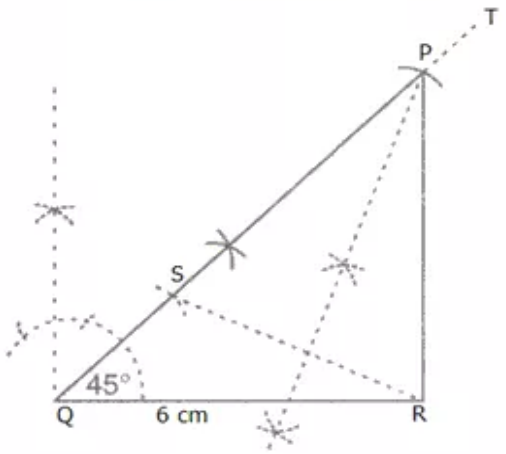
Steps of construction:

1. Draw a line segment EF = 6.4 cm
2. With E as centre, construct ∠SEF = 75°
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 ∠Q = 45°

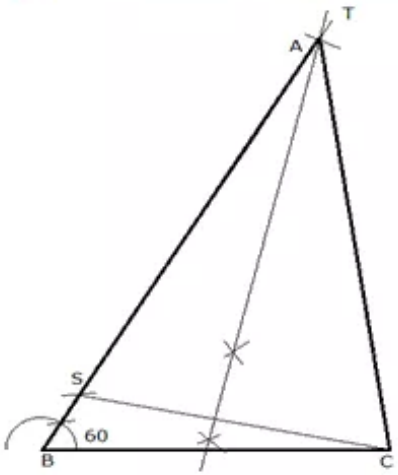


Steps of Construction:

1. Draw a line segment QR = 6 cm.
2. With Q as centre, draw ∠TQR = 45°
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 ∠B = 60°

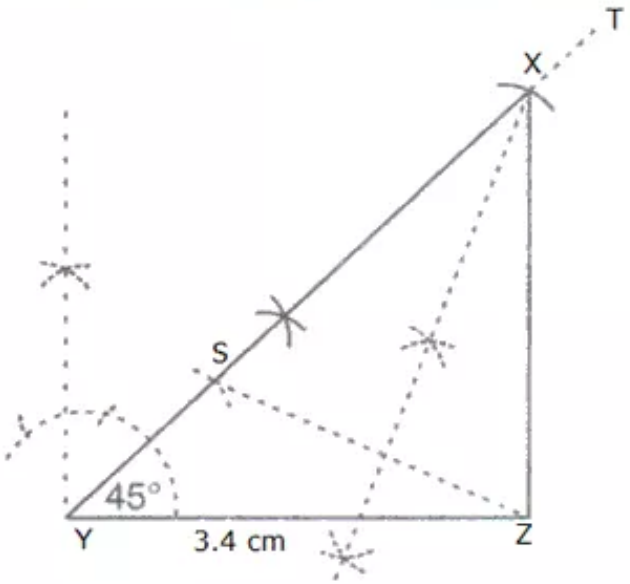


Steps of Construction:

1. Draw a line segment BC = 6 cm.
2. With B as centre, draw ∠TBC = 60°
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 ∠X = 45°



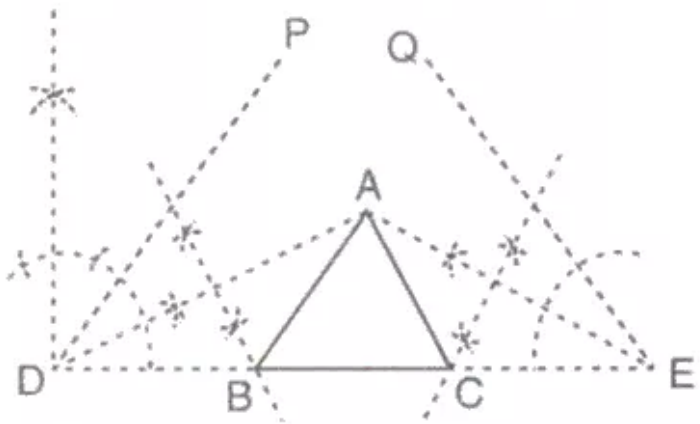
Steps of Construction:

1. Draw a line segment YZ = 3.4 cm.
2. With Y as centre, draw ∠TYZ = 45°
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°



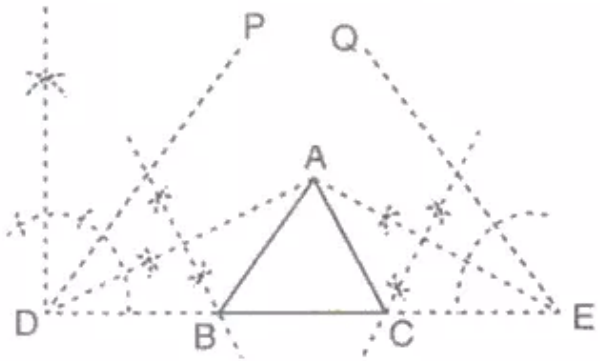
Steps of construction:

1. Draw DE = 6.4 cm.
2. Draw DP and EQ such that ∠PDE = 45° and ∠QED = 60°
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°



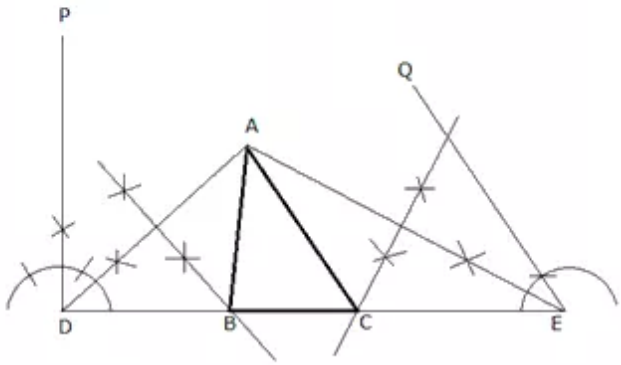
Steps of construction:

1. Draw DE = 9 cm.
2. Draw DP and EQ such that ∠PDE = 45° and ∠QED = 60°
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°

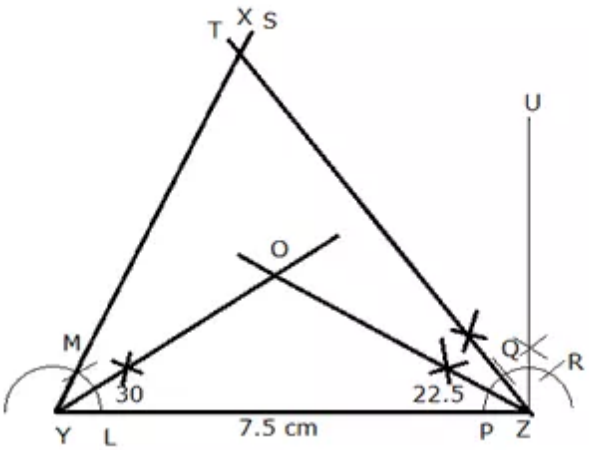


Steps of construction:

1. Draw DE = 10.6 cm.
2. Draw DP and EQ such that ∠PDE = 90° and ∠QED = 60°
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 ∠UZY. Let TZ be the bisector. TZ makes an angle of 45° with YZ.
8. Bisect ∠SYZ and ∠TZY.
9. Mark the point as O where the bisectors of ∠SYZ and ∠TZY meet.
10. On measuring ∠YOZ = 127.5°

Answer 14.

Steps :

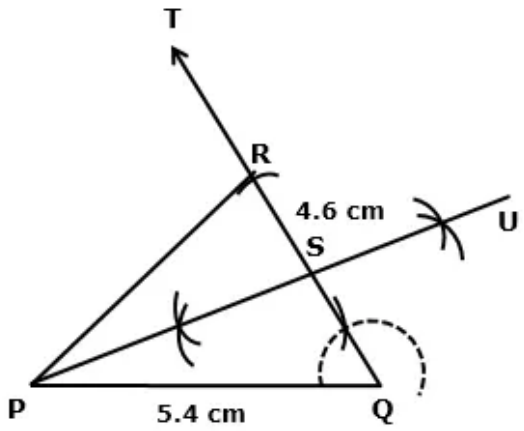
1. Draw PQ = 5.4 cm.
2. At P, construct ∠PQT = 60°.
3. With Q as centre and radius 4.6 cm, draw an arc intersecting ray QT at R
4. Join PR.

Thus, PQR is the required triangle.

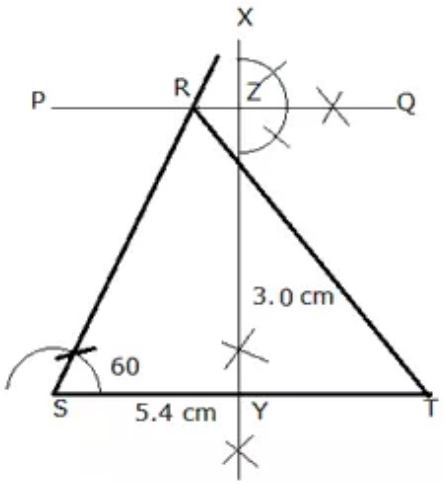
Draw PU, the perpendicular bisector of QR intersecting QR at S.

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 cm

2. With S as centre, draw XS making an angle of 60° with ST i.e. ∠XST = 60°

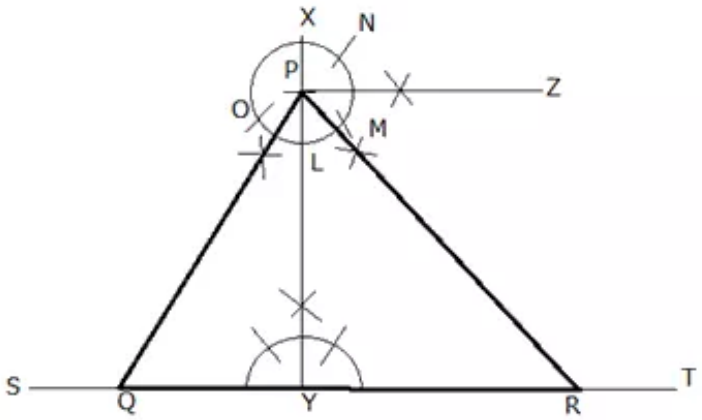
3. Draw a straight line PQ parallel to ST at a distance of 3 cm from ST.

4. PQ meets XS at R.

5. Join RT.

Thus, RST is the required triangle with angle RST = 60°.

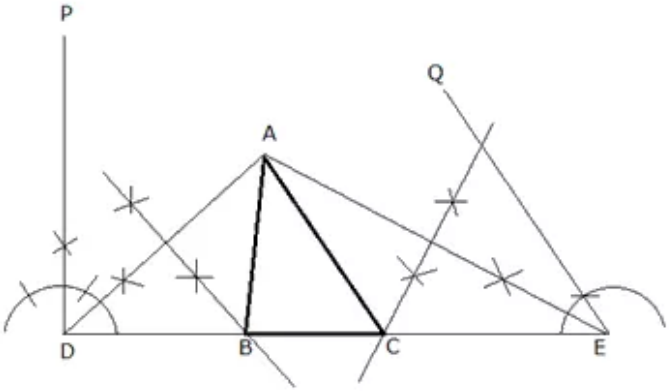
Answer 16.



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, ∠PQY = 60°, ∠QYP = 90°; therefore ∠QPY = 30° and in triangle PYR, ∠YRP = 45°, ∠RYP = 90°; therefore ∠YPR = 45°)
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 cm.
2. Draw DP and EQ such that ∠PDE = 90° and ∠QED = 60°
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.