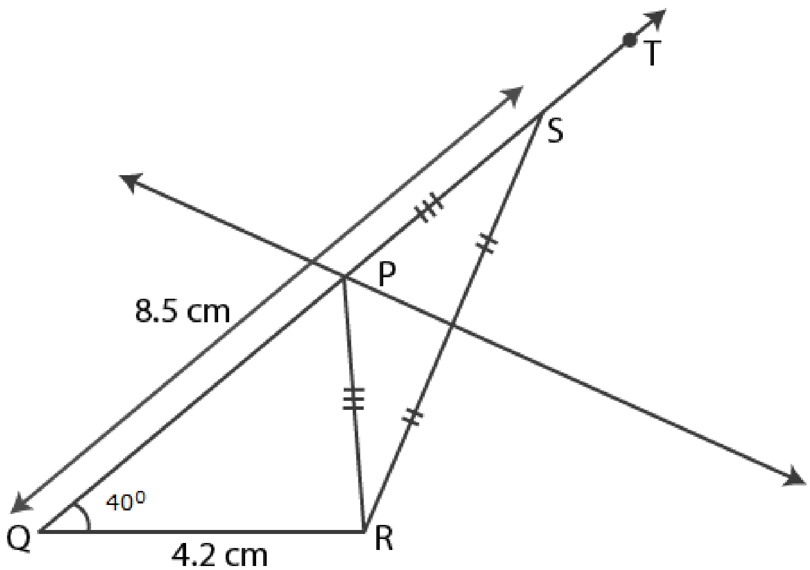
Practice Set 4.1 Page 53

1. Construct △ PQR, in which QR = 4.2 cm, m∠Q = 40° and PQ + PR = 8.5 cm

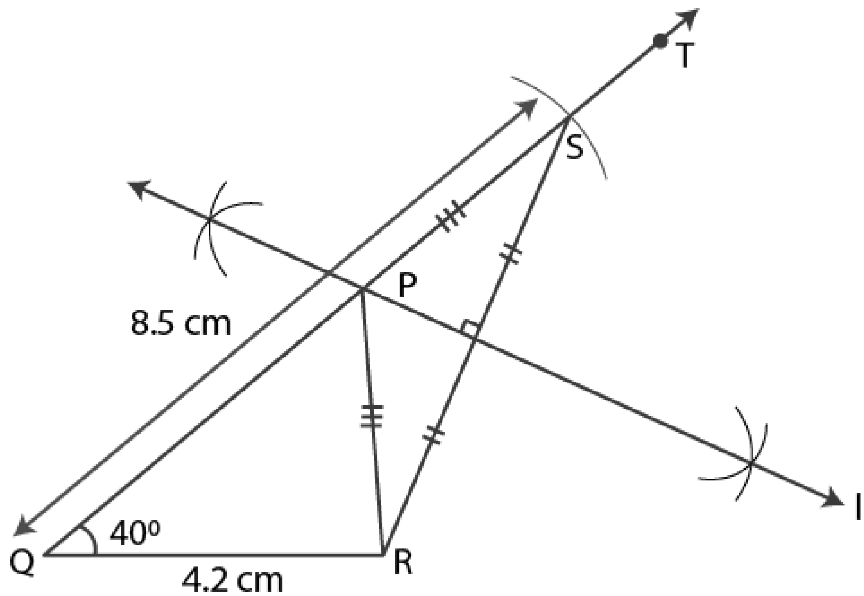
Solution :
Let us first draw a rough figure of expected triangle.



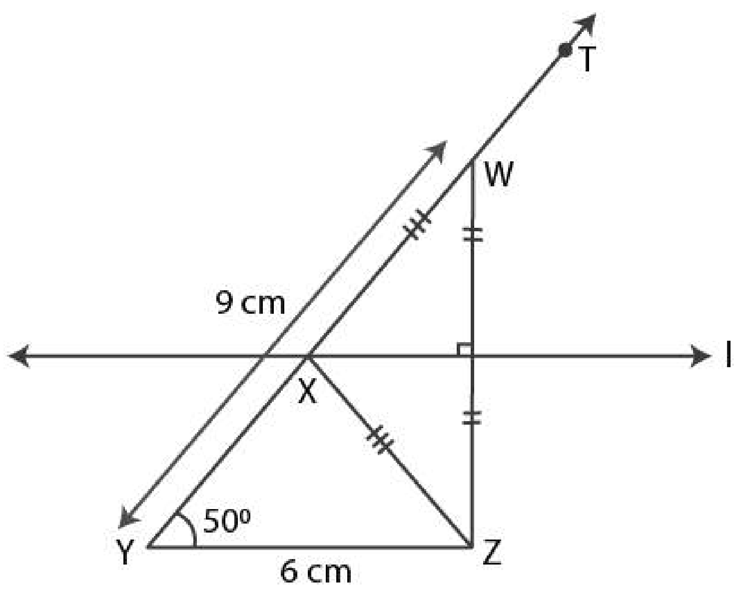
Rough figure

Explanation :
As shown in the rough figure, first we draw seg QR = 4.2 cm of length.
Draw a ray QT making an angle of 40° with seg QR.
Mark point S on QT such that QS = 8.5cm
Now QP+PS = QS [Q-P-S]
∴QP+PS = 8.5 cm ….(i)
Given PQ+PR = 8.5 cm ……(ii)
∴ QP+PS = PQ+PR [From (i) and (ii)]
⇒ PS = PR
∴P is on perpendicular bisector of SR.
∴The point of intersection of ray QT and perpendicular bisector of ray SR is point P.

Steps of construction:
(1)Draw segment QR of length 4.2 cm.
(2)Draw ray QT such that m∠TQR = 40°.
(3)Mark point S on ray QT such that d(Q,S) = 8.5 cm.
(4)Draw seg SR.
(5)Draw perpendicular bisector of SR which intersect ray QT. Mark the point as P.
(6)Draw seg PR.
△PQR is the required triangle.



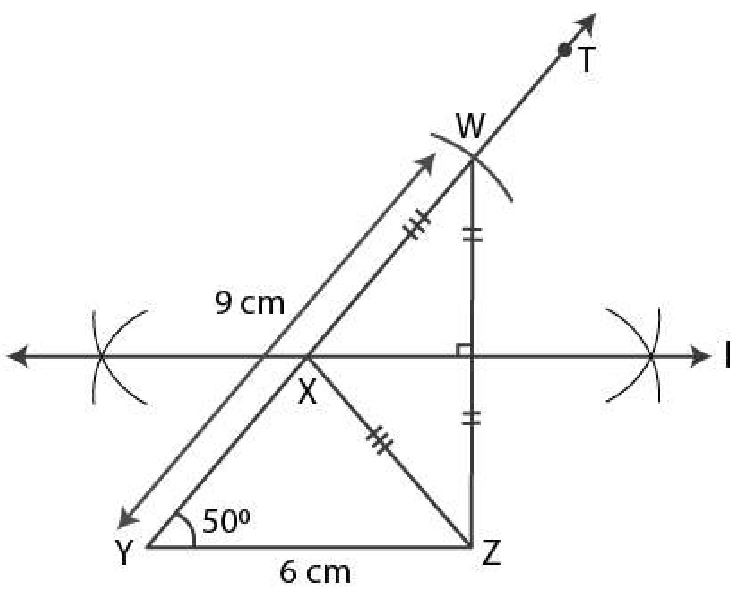
2. Construct △ XYZ, in which YZ = 6 cm, XY + XZ = 9 cm. ∠XYZ = 50°
Solution:
Let us first draw a rough figure of expected triangle.



Rough figure

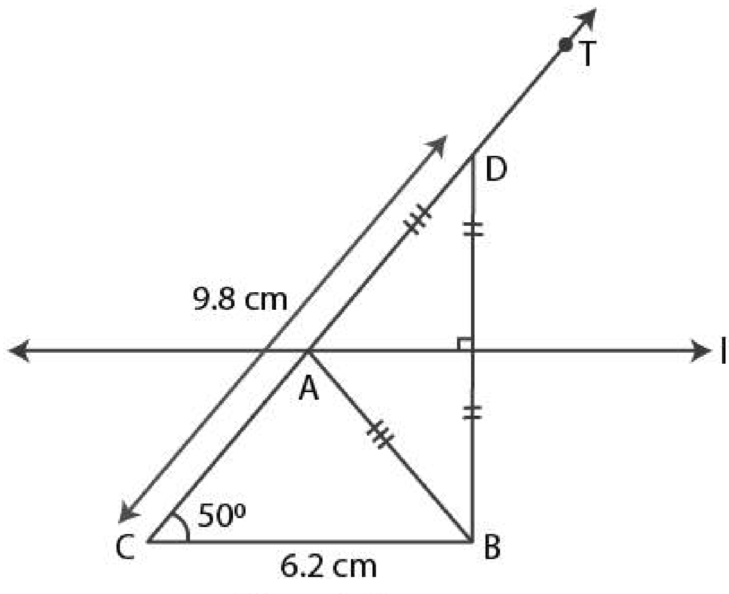
Explanation :
As shown in the rough figure, first we draw seg YZ = 6 cm of length.
Draw a ray YT making an angle of 50° with seg YZ.
Mark point W on YT such that YW = 9 cm
Now, YX+XW = YW [Y-X-W]
∴ YX+XW = 9 cm ….(i)
Given XY + XZ = 9 cm …(ii)
∴ YX+XW = XY + XZ [From (i) and (ii)]
⇒ XW = XZ
∴ X is on perpendicular bisector of seg WZ.
∴The point of intersection of ray YT and perpendicular bisector of ray WZ is point X.

Steps of construction:
(1)Draw segment YZ of length 6 cm.
(2)Draw ray YT such that m∠ZYT = 50°.
(3)Mark point W on ray YT such that d(Y,W) = 9 cm.
(4)Draw seg WZ.
(5)Draw perpendicular bisector of WZ which intersect ray YT. Mark the point as X.
(6)Draw seg XZ.
△XYZ is the required triangle.



3. Construct △ ABC, in which BC = 6.2 cm, ∠ACB = 50°, AB + AC = 9.8 cm.

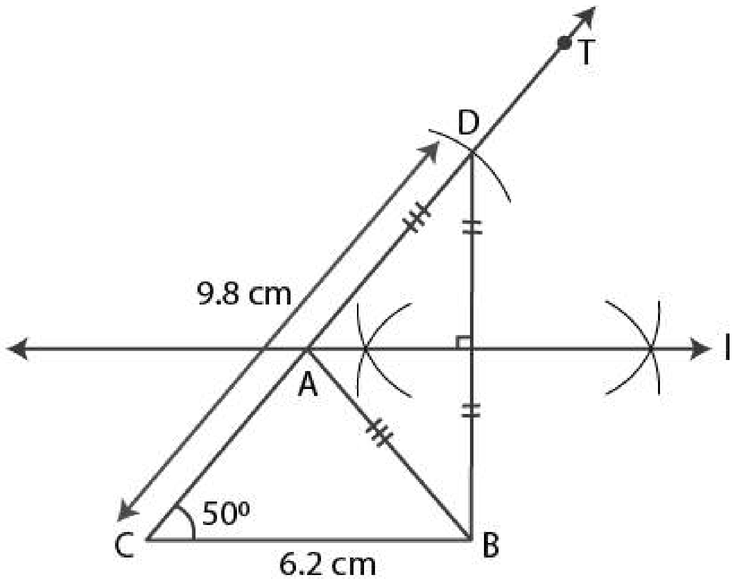
Solution:
Let us first draw a rough figure of expected triangle.



Rough figure

Explanation :
As shown in the rough figure, first we draw seg CB = 6.2 cm of length.
Draw a ray CT making an angle of 50° with seg CB.
Mark point D on CT such that CD = 9.8 cm
Now, CA+AD = CD [C-A-D]
∴ CA+AD = 9.8 cm ….(i)
Given AB+AC = 9.8 cm …(ii)
∴ CA+AD = AB+AC [From (i) and (ii)]
⇒ AD = AB
∴ A is on perpendicular bisector of seg BD.
∴The point of intersection of ray CT and perpendicular bisector of ray BD is point A.

Steps of construction:
(1)Draw segment CB of length 6.2 cm.
(2)Draw ray CT such that m∠BCT = 50°.
(3)Mark point D on ray CT such that d(C,D) = 9.8 cm.
(4)Draw seg DB.
(5)Draw perpendicular bisector of BD which intersect ray CT. Mark the point as A.
(6)Draw seg AB.
△ABC is the required triangle.



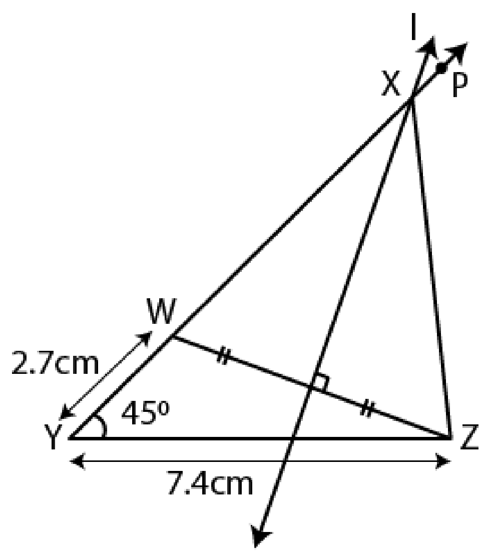
4. Construct △ ABC, in which BC = 5.2 cm, ∠ACB = 45° and perimeter of △ ABC is 10 cm.

Solution:
Given perimeter of ABC = 10 cm
i.e, AB+BC+AC = 10 cm
AB+5.2+AC = 10 [Given BC = 5.2]
∴AB+AC = 10-5.2 = 4.8 cm.
The sum of two sides of a triangle is greater than the third side.
Here the sum of two sides is less than third side.
AB+AC < BC
So the construction is not possible.

Practice Set 4.2

1. Construct △ XYZ, such that YZ = 7.4 cm, ∠XYZ = 45° and XY - XZ = 2.7 cm.

Solution:
Let us draw a rough figure.

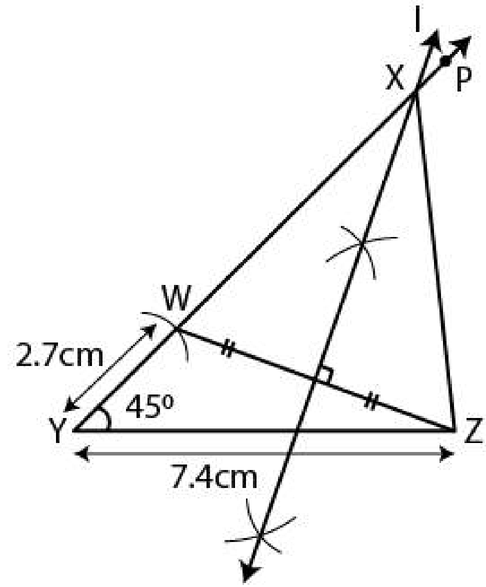


Rough figure

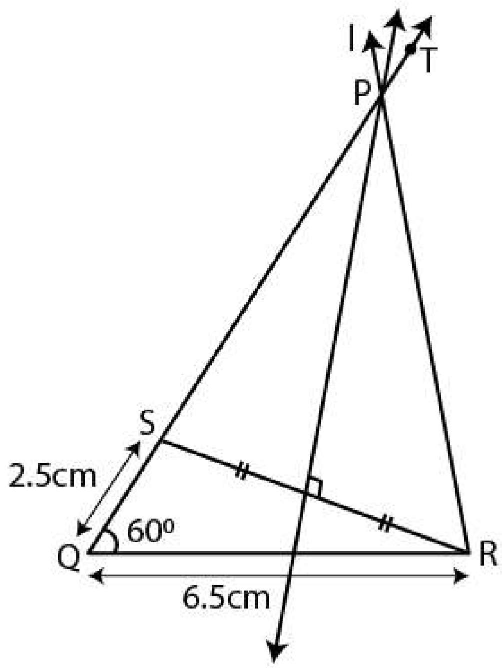
Explanation :
XY-XZ = 2.7 cm
∴XY > XZ.
Draw seg YZ = 7.4 cm.
We can draw the ray YP such that ∠ PYZ = 45°.
We have to locate point W on ray YP.
Take point W on ray YP such that YW = 2.7 cm.
Now , Y-W-X and
YW = XY-XW = 2.7 cm …(i)
Given XY-XZ = 2.7 cm ..(ii)
∴ XY-XW = XY-XZ [From (i) and (ii)]
⇒ XW = XZ
Point X is on the perpendicular bisector of seg ZW.
∴Point X is the intersection of ray YP and the perpendicular bisector of seg ZW.

Steps of construction:
(1)Draw segment YZ of length 7.4 cm.
(2)Draw ray YP such that m∠PYZ = 45°.
(3)Mark point W on ray YP such that d(Y,W) = 2.7 cm.
(4)Draw seg ZW.
(5)Draw perpendicular bisector of WZ which intersect ray YP. Mark the point as X.

(6)Draw seg XZ.
△XYZ is the required triangle.



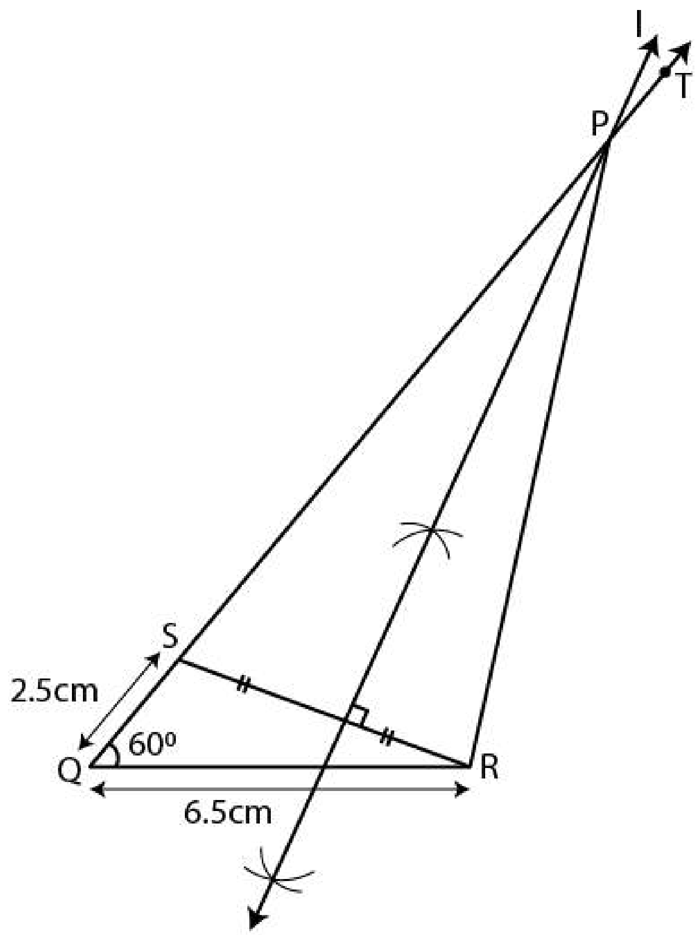
2. Construct △ PQR, such that QR = 6.5 cm, ∠PQR = 60° and PQ - PR = 2.5 cm.
Solution:
Let us draw a rough figure.



Rough figure

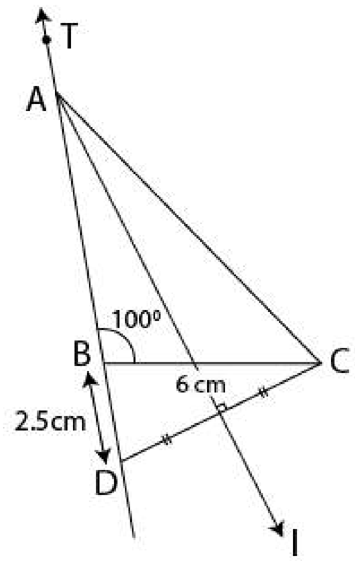
Explanation :
PQ-PR = 2.5 cm.
∴PQ > PR.
Draw seg QR = 6.5 cm.
We can draw the ray QT such that ∠ TQR = 60°.
We have to locate point S on ray QT.
Take point S on ray QT such that QS = 2.5 cm.
Now , Q-S-P and
QS = PQ-PS = 2.5 cm …(i)
Given PQ-PR = 2.5 cm. ..(ii)
∴ PQ-PS = PQ-PR [From (i) and (ii)]
⇒ PS = PR
Point P is on the perpendicular bisector of seg RS.
∴Point P is the intersection of ray QT and the perpendicular bisector of seg RS.

Steps of construction:
(1)Draw segment QR of length 6.5 cm.
(2)Draw ray QT such that m∠TQR = 60°.
(3)Mark point S on ray QT such that d(Q,S) = 2.5 cm.
(4)Draw seg SR.
(5)Draw perpendicular bisector of SR which intersect ray QT. Mark the point as P.
(6)Draw seg PR.
△PQR is the required triangle.



3. Construct △ABC, such that BC = 6 cm, ∠ABC = 100° and AC - AB = 2.5 cm.

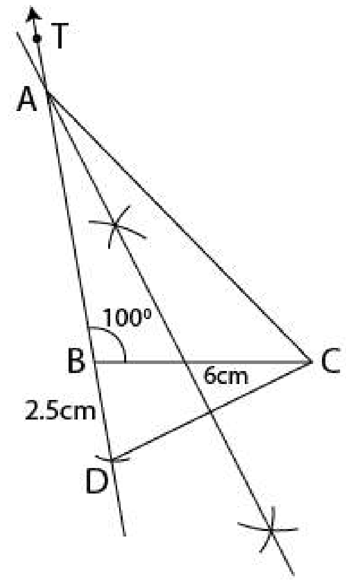
Solution:
Let us draw a rough figure.



Rough figure

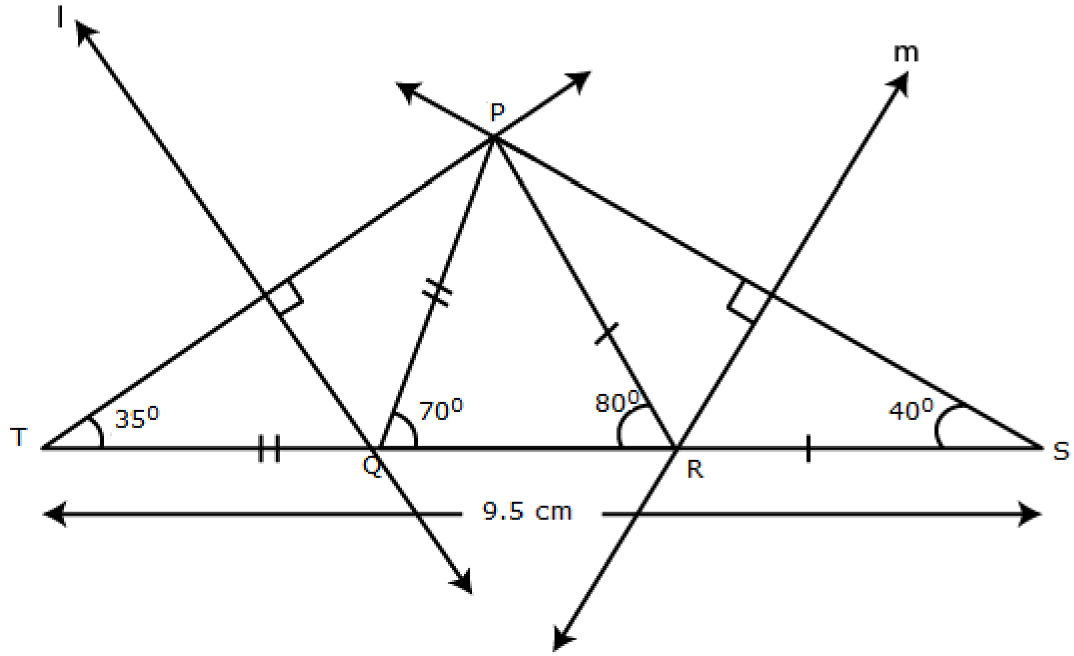
Explanation :
AC-AB = 2.5 cm.
∴AC> AB.
Draw seg BC = 6 cm.
We can draw the ray BT such that ∠ TBC = 100°.
We have to locate point D on opposite ray BT.
Take point D on opposite ray BT such that BD = 2.5 cm.
Now , A-B-D and
BD = AD-AB = 2.5 cm …(i)
Given AC-AB = 2.5 cm. ..(ii)
∴ AD-AB = AC-AB [From (i) and (ii)]
⇒ AD = AC
Point A is on the perpendicular bisector of seg DC.
∴Point A is the intersection of ray BT and the perpendicular bisector of seg DC.

Steps of construction:
(1)Draw segment BC of length 6 cm.
(2)Draw ray BT such that m∠TBC = 100°.
(3)Mark point D on opposite ray BT such that d(B,D) = 2.5 cm.
(4)Draw seg DC.
(5)Draw perpendicular bisector of DC which intersect ray BT. Mark the point as A.
(6)Draw seg AC.
△ABC is the required triangle.


T
A
100°
B
6cm
C
2.5cm
D

Practice Set 4.3 Page 56

1. Construct △ PQR, in which ∠Q = 70°, ∠R = 80° and PQ + QR + PR = 9.5 cm.
Solution :
Let us draw a rough figure.



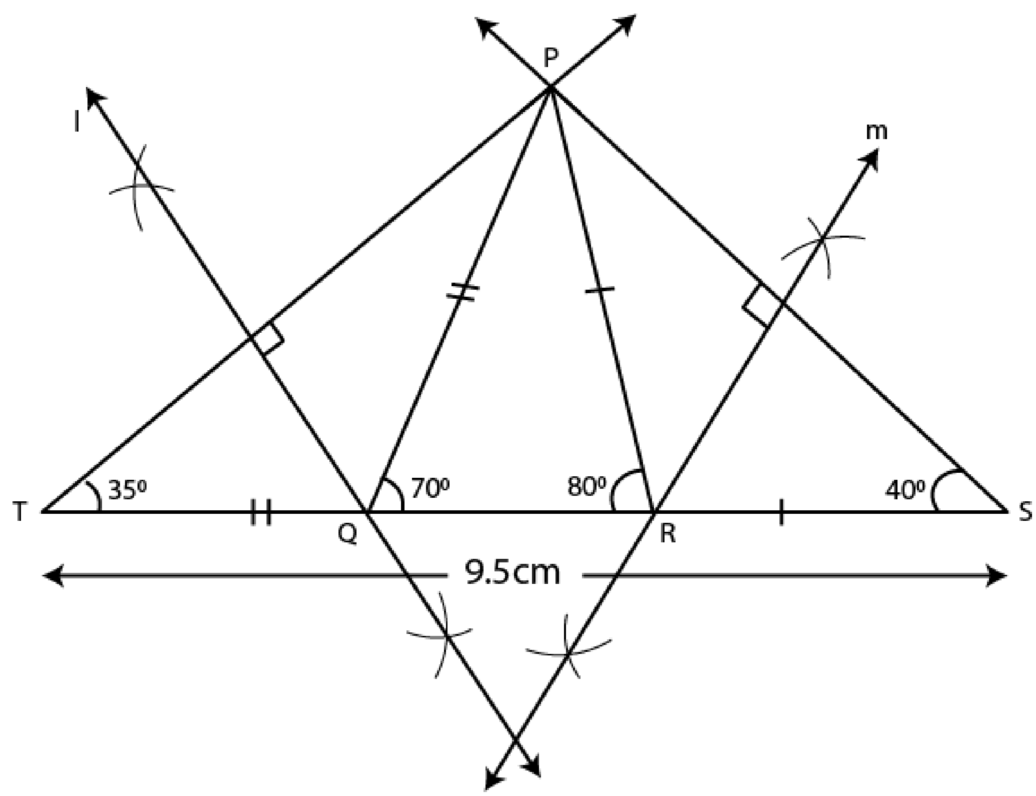
Rough figure

Explanation :
As shown in the figure, points T and S are taken on line QR such that,
QT = PQ, and PR = RS …(i)
∴TS = TQ+QR+RS
∴TS = PQ+QR+PR ….(ii) [from (i)]
Given PQ + QR + PR = 9.5 cm. …(iii)
∴TS = 9.5cm [from (ii) and (iii)]

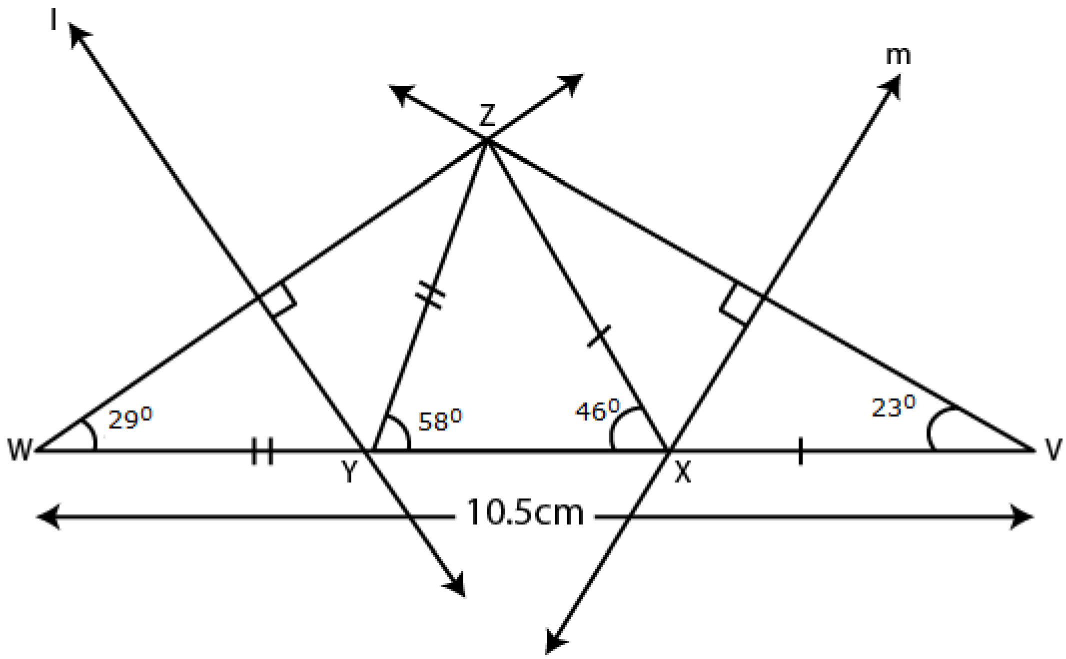
Now in △PTQ, TQ = QP [from (i)]
∴∠QPT = ∠QTP = x˚ …(iv) [Isoceles triangle theorem]
In △PQT, ∠PQR is the exterior angle.
∴∠QPT+∠QTP = ∠PQR [Remote interior angle theorem]
∴x+x = 70˚ [From (iv)]
∴ 2x = 70˚
⇒ x = 70/2 = 35˚
∴∠PTQ = 35 ˚
∠T = 35˚
Similarly, ∠S = 40˚.

Now in △PTS
∠T = 35°, ∠S = 40° and TS = 9.5 cm
Hence, we can draw △PTS .
Since, PQ = TQ,
Point Q lies on perpendicular bisector of seg PT.
Also, RP = RS
∴Point R lies on perpendicular bisector of seg PS.
Points Q and R can be located by drawing the perpendicular bisector of PT and PS respectively.
∴△PQR can be drawn.

Steps of construction:
1. Draw seg TS of length 9.5 cm.
2. From point T draw ray making angle of 35°.
3. From point S draw ray making angle of 40°.
4. Mark the point of intersection of two rays as P.
5. Draw the perpendicular bisector of seg PT and seg PS intersecting seg TS in Q and R respectively.
6. Join PQ and PR.
Hence, △PQR is the required triangle.



2. Construct △ XYZ, in which ∠Y = 58°, ∠X = 46° and perimeter of triangle is 10.5 cm.
Solution:
Let us draw a rough figure.



Rough figure

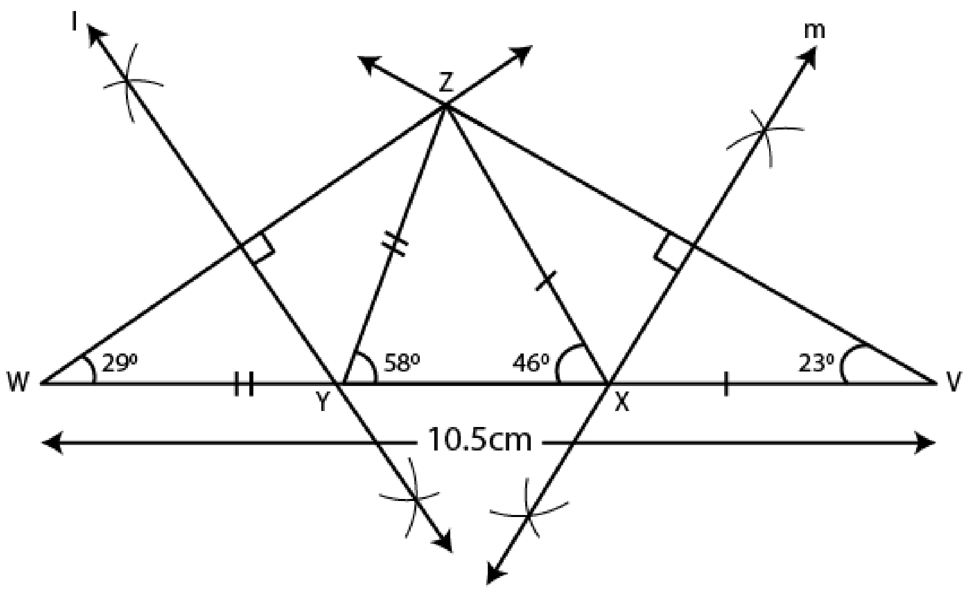
Explanation :
As shown in the figure, points W and V are taken on line YX such that,
YW = ZY and XV = ZX ……(i)
YW+YX+XV = WV [W-Y-X, Y-X-V]
ZY+YX+XZ = WV ……(ii) [From (i)]
Also,
ZY+YX +XZ = 10.5 cm …..(iii) [Given perimeter is 10.5 cm]
∴WV = 10.5 cm [From (ii) and (iii)]

In △ZWY
YZ = YW [From (i)]
∴∠YZW = ∠YWZ = x° …..(iv) [Isosceles triangle theorem]
In △ZYW, ∠ZYX is the exterior angle.
∴∠YZW +∠YWZ = ∠ZYX [Remote interior angles theorem]
∴ x+x = 58° [From (iv)]
∴2x = 58°
⇒x = 58/2 = 29°
∴∠ ZWY = 29°
∴∠ YZW = 29°
Similarly, ∠V = 23°

Now, in △ZWV
∠W = 29°, ∠V = 23° and
WV= 10.5 cm
Hence, we can draw △ZWV .

Since, ZY = YW
∴Point Y lies on perpendicular bisector of seg ZW.
Also, ZX = XV
∴Point X lies on perpendicular bisector of seg ZV.
∴Points Y and X can be located by drawing the perpendicular bisector of ZW and ZV respectively.
∴△ XYZ can be drawn.

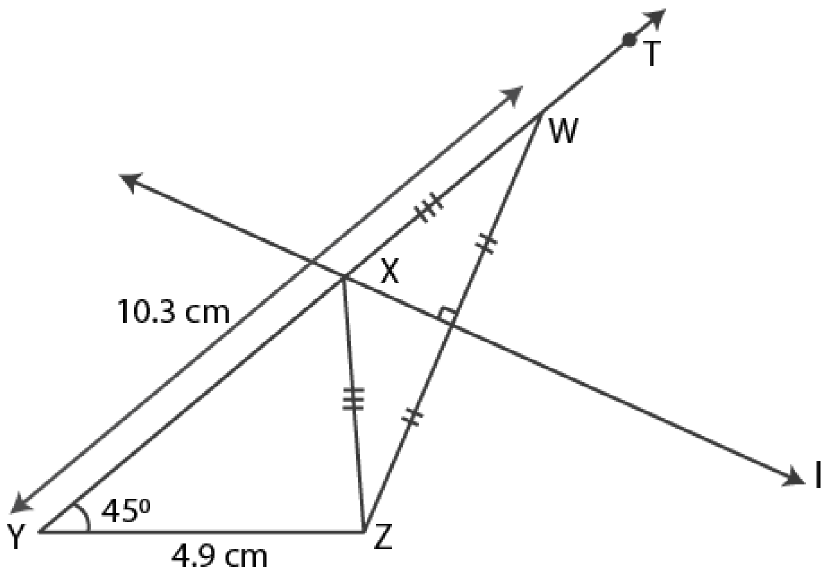
Steps of construction:
1. Draw seg WV of length 10.5 cm.
2. From point W draw ray making angle of 29°.
3. From point V draw ray making angle of 23°.
4. Mark the point of intersection of two rays as Z.
5. Draw the perpendicular bisector of seg WZ and seg VZ intersecting seg WV in Y and X respectively.
6. Join XY and XX.
Hence, △XYX is the required triangle.



Problem Set 4 Page 56

1. Construct △ XYZ, such that XY + XZ = 10.3 cm, YZ = 4.9 cm, ∠XYZ = 45°.

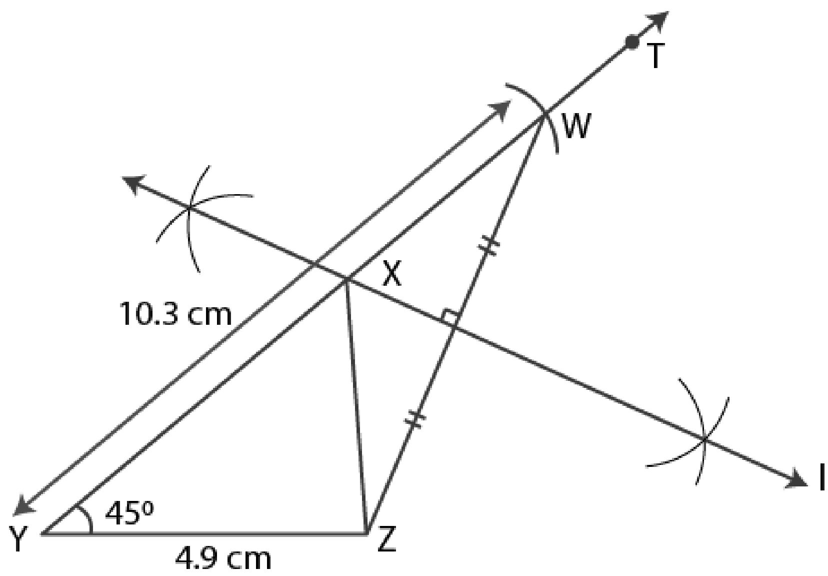
Solution:
Let us draw a rough figure.



Rough figure

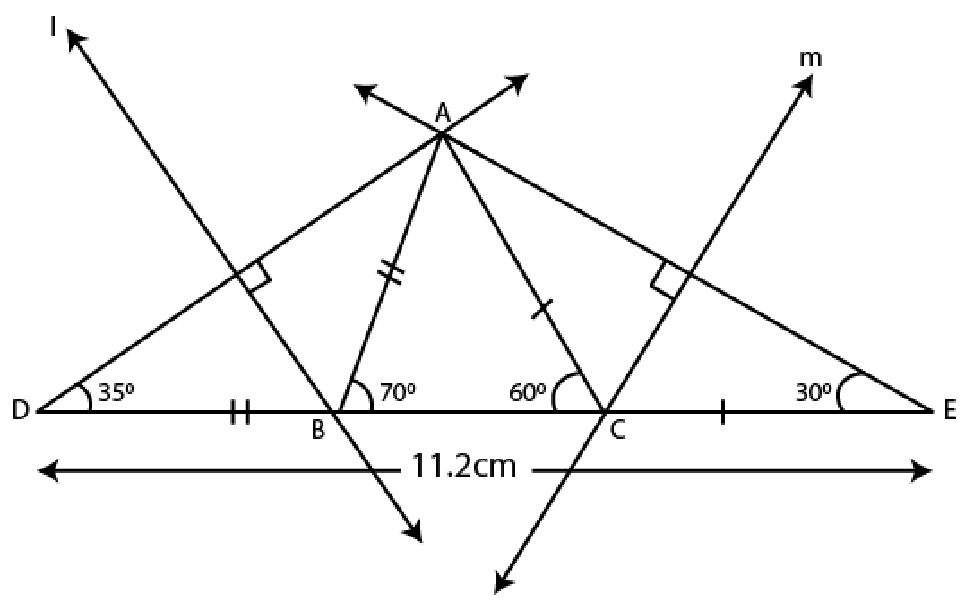
As shown in the rough figure draw segYZ = 4.9cm
Draw a ray YT that makes an angle of 45° with YZ.
Mark a point W on ray YT,
so that YW= 10.3 cm
Now,YX + XW = YW [Y-X-W]
∴YX + XW=10.3cm …..(i)
Given, XY + XZ = 10.3cm ……(ii)
∴ YX + XW = XY + XZ [From (i) and (ii)]
∴XW = XZ
∴Point X is on the perpendicular bisector of seg WZ
∴The point of intersection of ray YT and perpendicular bisector of seg WZ is point X.

Steps of construction:
1. Draw seg YZ of length 4.9 cm.
2. Draw ray YT, so that ZYT = 45°.
3. Mark point W on ray YT such that *l*(YW) = 10.3 cm.
4. Draw seg WZ.
5. Draw perpendicular bisector of seg WZ intersecting ray YT. Mark the point as X.
6. Draw seg XZ.
∴ △XYZ is the required triangle.



2. Construct △ ABC, in which ∠B = 70°, ∠C = 60°, AB + BC + AC = 11.2 cm

Solution:
Let us draw a rough figure.



Rough figure

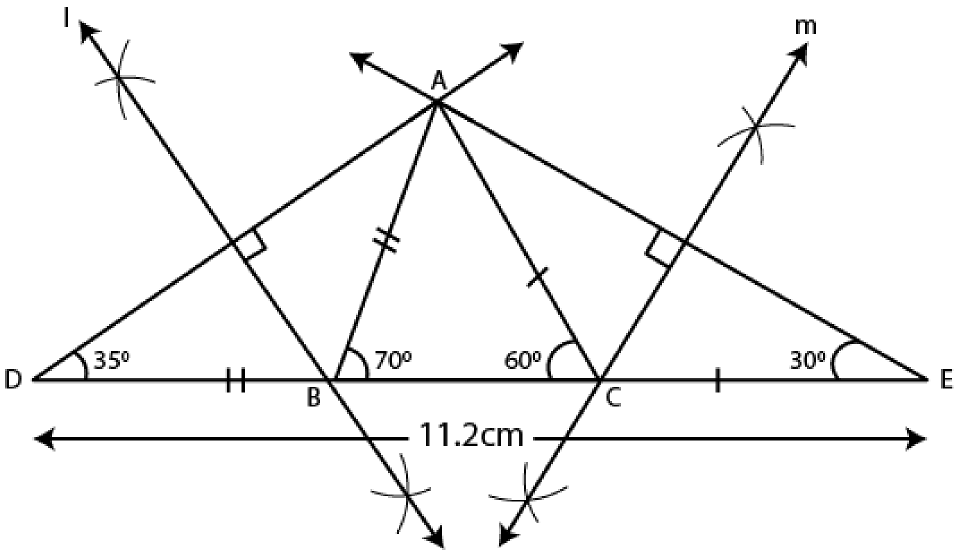
As shown in the figure, take point D and E on line BC, so that
BD = AB and CE = AC ……(i)

BD+BC+CE = DE [D-B-C, B-C-E]
$\therefore$ AB+BC+AC = DE …..(ii)
Given AB+BC+AC= 11.2 cm ….(iii)
$\therefore$ DE = 11.2 cm [From (ii) and (iii)]

In $\triangle$ADB
AB = BD [From (i)]
$\therefore \angle BAD = \angle BDA = x°$ ….(iv) [Isosceles triangle theorem]
In $\triangle$ABD, $\angle$ABC is the exterior angle.
$\therefore \angle BAD + \angle BDA = \angle ABC$ [Remote interior angle theorem]
x+x = 70° [From (iv)]
$\therefore$ 2x = 70°
x = 70/2 = 35°
$\therefore \angle ADB = 35°$
$\therefore \angle D = 35°$
Similarly, $\angle E = 30°$
Now, in $\triangle$ADE
$\angle D = 35°$, $\angle E = 30°$ and DE = 11.2 cm
So, $\triangle$ADE can be drawn.

Since, AB = BD
$\therefore$ Point B lies on perpendicular bisector of seg AD.
Also AC = CE
$\therefore$ Point C lies on perpendicular bisector of seg AE.
$\therefore$ Points B and C can be located by drawing the perpendicular bisector of AD and AE respectively.
So, $\triangle$ABC can be drawn.

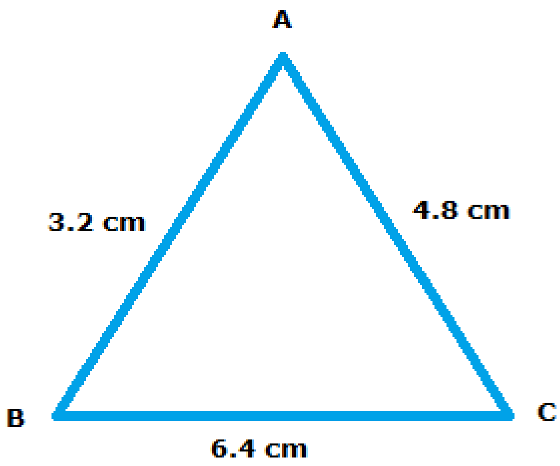
Steps of construction:
1. Draw seg DE of length 11.2 cm.
2. From point D draw ray making angle of 35°.
3. From point E draw ray making angle of 30°.
4.Mark the point of intersection of two rays as A.
5. Draw the perpendicular bisector of seg DA and seg EA intersecting seg DE in B and C respectively.
6. Draw seg AB and seg AC.
$\therefore \triangle$ABC is the required triangle.



3. The perimeter of a triangle is 14.4 cm and the ratio of lengths of its side is 2 : 3 : 4. Construct the triangle.

Solution:

Let us draw a rough figure.



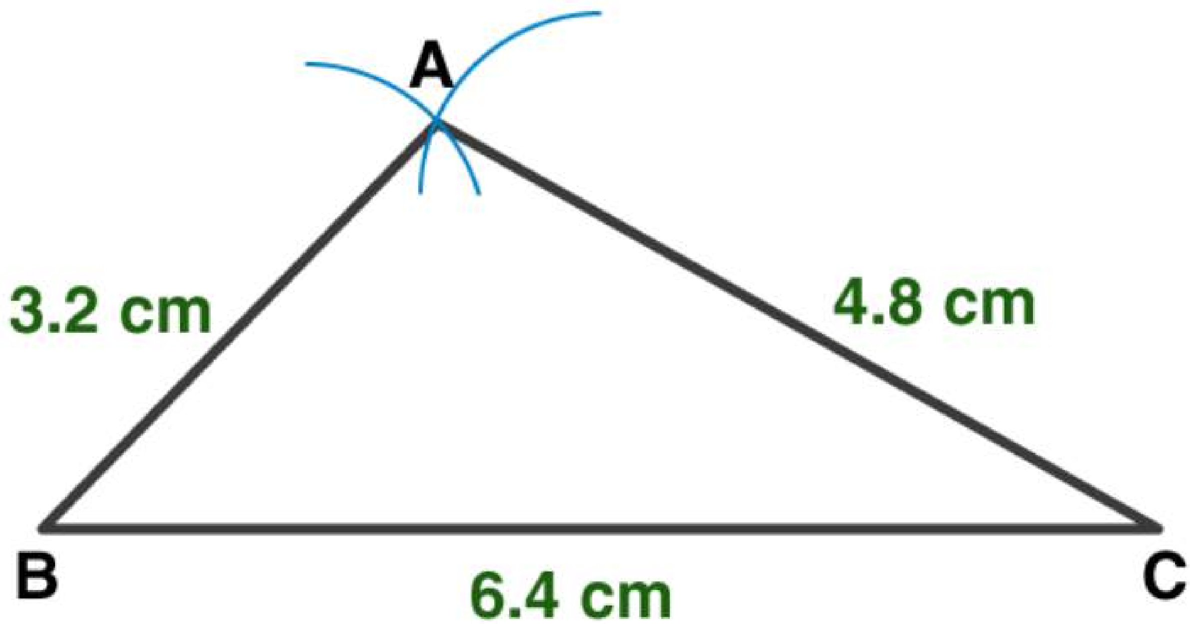
Rough figure

Let the common multiple be k

∴In △ABC,

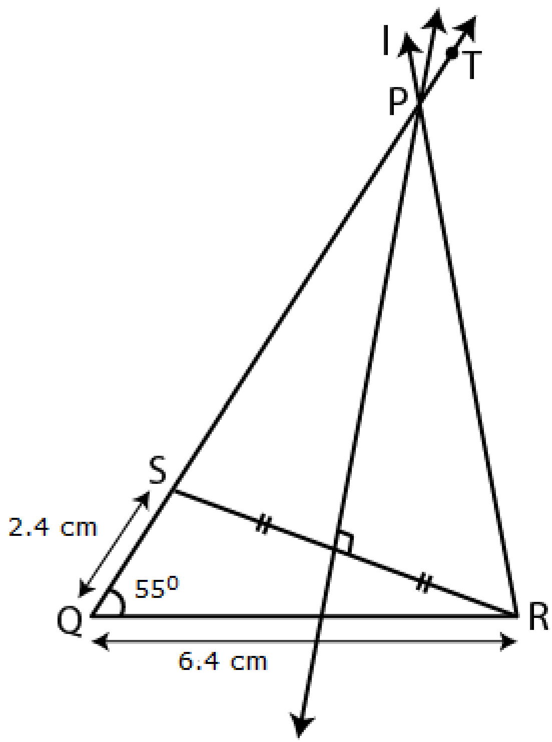
AB = 2k cm, AC = 3k cm, BC = 4k cm
Given the perimeter of triangle = 14.4 cm
∴AB+BC+AC = 14.4
2k+3k+4k = 9k
∴9k = 14.4
⇒ k = 14.4/9
⇒ k = 1.6
∴ AB = 2k = 2×1.6 = 3.2 cm
∴ AC = 3k = 3×1.6 = 4.8 cm
∴ BC = 4k = 4×1.6 = 6.4 cm

Steps of construction:
1.Draw seg BD = 6.4 cm.
2.With B as centre, draw an arc of radius 3.2 cm.
3.With C as centre, draw an arc of radius 4.8 cm so that it intersects the previous arc at point A.
4.Join AB and AC.
So △ABC is the required triangle.



4. Construct △ PQR, in which PQ - PR = 2.4 cm, QR = 6.4 cm and ∠PQR = 55°.

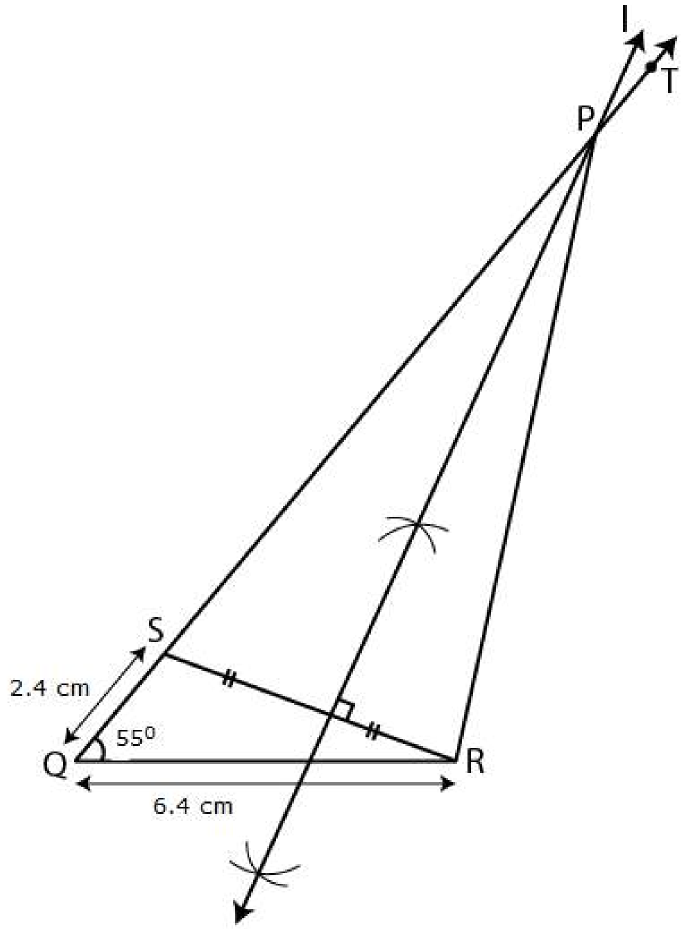
Solution:
Let us draw a rough figure.



Rough figure

Explanation :
PQ-PR = 2.4 cm.
∴PQ > PR.
Draw seg QR = 6.4 cm.
We can draw the ray QT such that ∠ TQR = 55°.
We have to locate point S on ray QT.
Take point S on ray QT such that QS = 2.4 cm.
Now , Q-S-P and
QS = PQ-PS = 2.4 cm …(i)
Given PQ-PR = 2.4 cm. ..(ii)
∴ PQ-PS = PQ-PR [From (i) and (ii)]
⇒ PS = PR
Point P is on the perpendicular bisector of seg RS.
∴Point P is the intersection of ray QT and the perpendicular bisector of seg RS.

Steps of construction:
(1)Draw segment QR of length 6.4 cm.
(2)Draw ray QT such that m∠TQR = 55°.
(3)Mark point S on ray QT such that d(Q,S) = 2.4 cm.
(4)Draw seg SR.
(5)Draw perpendicular bisector of SR which intersect ray QT. Mark the point as P.
(6)Draw seg PR.
△PQR is the required triangle.


I
T
P
S
2.4 cm
55⁰
Q
R
6.4 cm