Practice Set 4.1 Geometry 10th Std Maths Part 2 Answers Chapter 4 Geometric Constructions

Question 1.
ΔABC ~ ΔLMN. In ΔABC, AB = 5.5 cm, BC = 6 cm, CA = 4.5 cm. Construct ΔABC and ΔLMN such that BCMN = 54
Solution:
Analysis:

$\Delta ABC \sim \Delta LMN$ …[Given]

$\therefore \quad \frac{AB}{LM} = \frac{BC}{MN} = \frac{CA}{LN}$ …(i)[Corresponding sides of similar triangles]

But, $\frac{BC}{MN} = \frac{5}{4}$ …(ii)[Given]

$\therefore \quad \frac{AB}{LM} = \frac{BC}{MN} = \frac{CA}{LN} = \frac{5}{4}$ …[From (i) and (ii)]

$\therefore \quad \frac{5.5}{LM} = \frac{6}{MN} = \frac{4.5}{LN} = \frac{5}{4}$

$\therefore \quad \frac{5.5}{LM} = \frac{5}{4}$

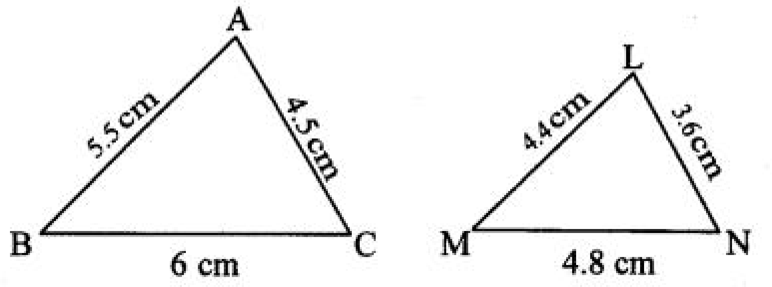
$\therefore \quad LM = \frac{5.5 \times 4}{5} = 4.4 \text{ cm}$

Also, $\frac{6}{MN} = \frac{5}{4}$

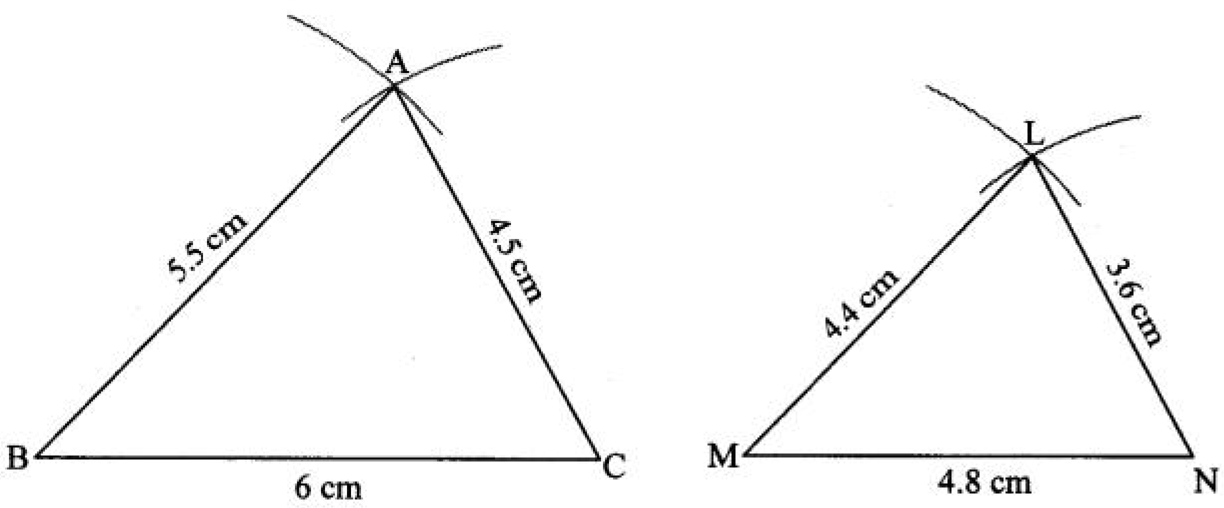
$\therefore \quad MN = \frac{6 \times 4}{5} = 4.8 \text{ cm}$

and, $\frac{4.5}{LN} = \frac{5}{4}$

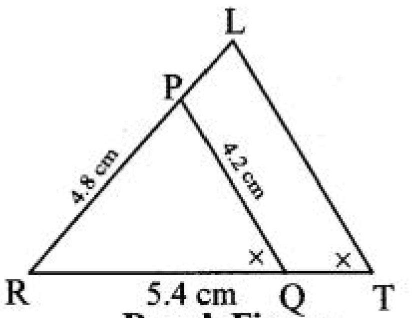
$\therefore \quad LN = \frac{4.5 \times 4}{5} = 3.6 \text{ cm}$



Rough Figure

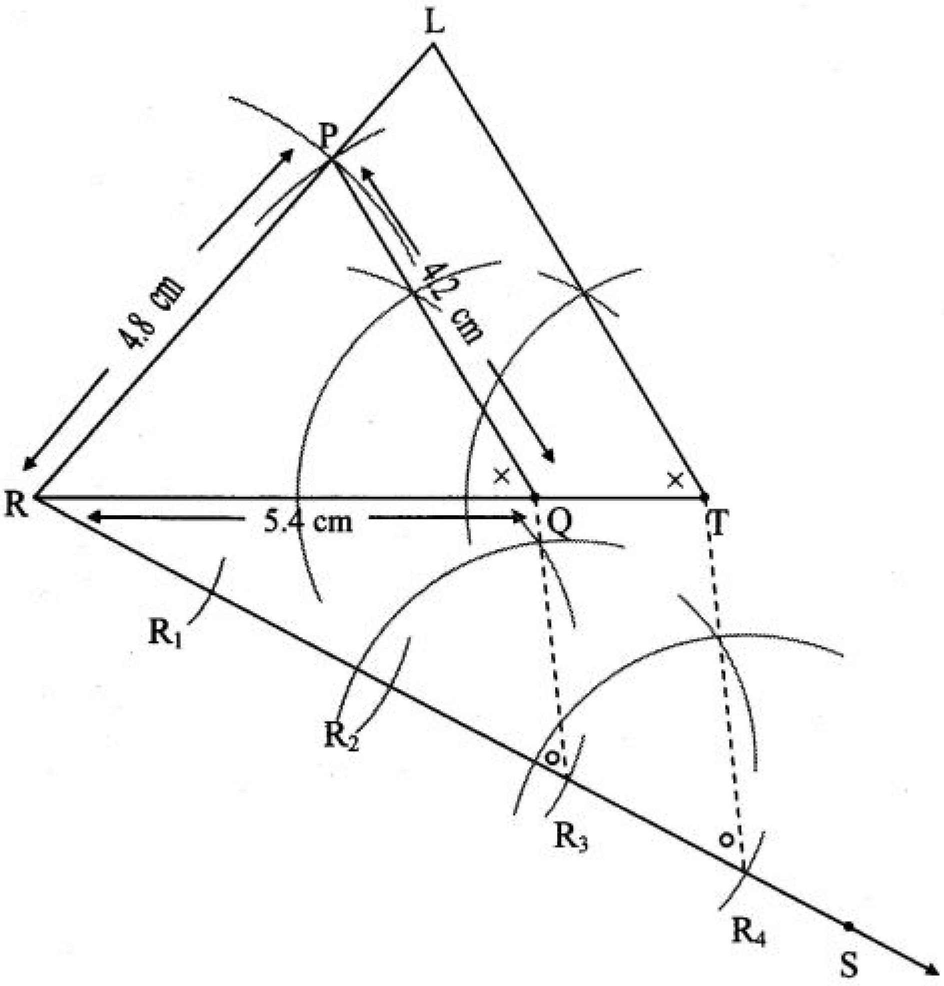


Question 2.
ΔPQR ~ ΔLTR. In ΔPQR, PQ = 4.2 cm, QR = 5.4 cm, PR = 4.8 cm. Construct ΔPQR and ΔLTR, such that PQLT = 34
Solution:
Analysis:
As shown in the figure, Let R – P – L and R – Q – T.
ΔPQR ~ ΔLTR … [Given]
∴ ∠PRQ ≅ ∠LRT … [Corresponding angles of similar triangles]



Rough Figure

$PQLT = QRTR = PRLR$ ...(i)[Corresponding sides of similar triangles]
But, $PQLT = 34$ ....(ii) [Given]
∴ $PQLT = QRTR = PRLR = 34$ ...[From (i) and (ii)]
∴ sides of LTR are longer than corresponding sides of ΔPQR.
If seg QR is divided into 3 equal parts, then seg TR will be 4 times each part of seg QR.
So, if we construct ΔPQR, point T will be on side RQ, at a distance equal to 4 parts from R.
Now, point L is the point of intersection of ray RP and a line through T, parallel to PQ.
ΔLTR is the required triangle similar to ΔPQR.



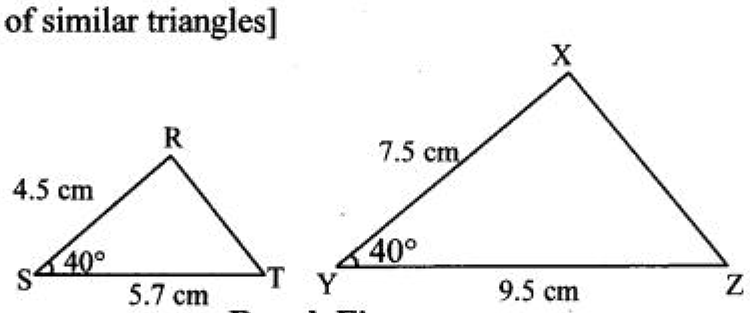
Steps of construction:
i. Draw ΔPQR of given measure. Draw ray RS making an acute angle with side RQ.
ii. Taking convenient distance on the compass, mark 4 points R_1, R_2, R_3, and R_4, such that $RR_1 = R_1R_2 = R_2R_3 = R_3R_4$.
iii. Join R_3Q. Draw line parallel to R_3Q through R_4 to intersects ray RQ at T.
iv. Draw a line parallel to side PQ through T. Name the point of intersection of this line and ray RP as L.
ΔLTR is the required triangle similar to ΔPQR.

Question 3.
ΔRST ~ ΔXYZ. In ΔRST, RS = 4.5 cm, ∠RST = 40°, ST = 5.7 cm. Construct ΔRST and ΔXYZ, such that $RSXY = 35$.
Solution:
Analysis:
ΔRST ~ ΔXYZ ... [Given]
∴ ∠RST ≅ ∠XYZ = 40° ... [Corresponding angles of similar triangles]

Also, $\frac{RS}{XY} = \frac{ST}{YZ} = \frac{RT}{XZ}$ …(i) [Corresponding sides of similar triangles]

But, $\frac{RS}{XY} = \frac{3}{5}$ …(ii) [Given]

$\therefore \quad \frac{RS}{XY} = \frac{ST}{YZ} = \frac{3}{5}$ …[From (i) and (ii)]



Rough Figure

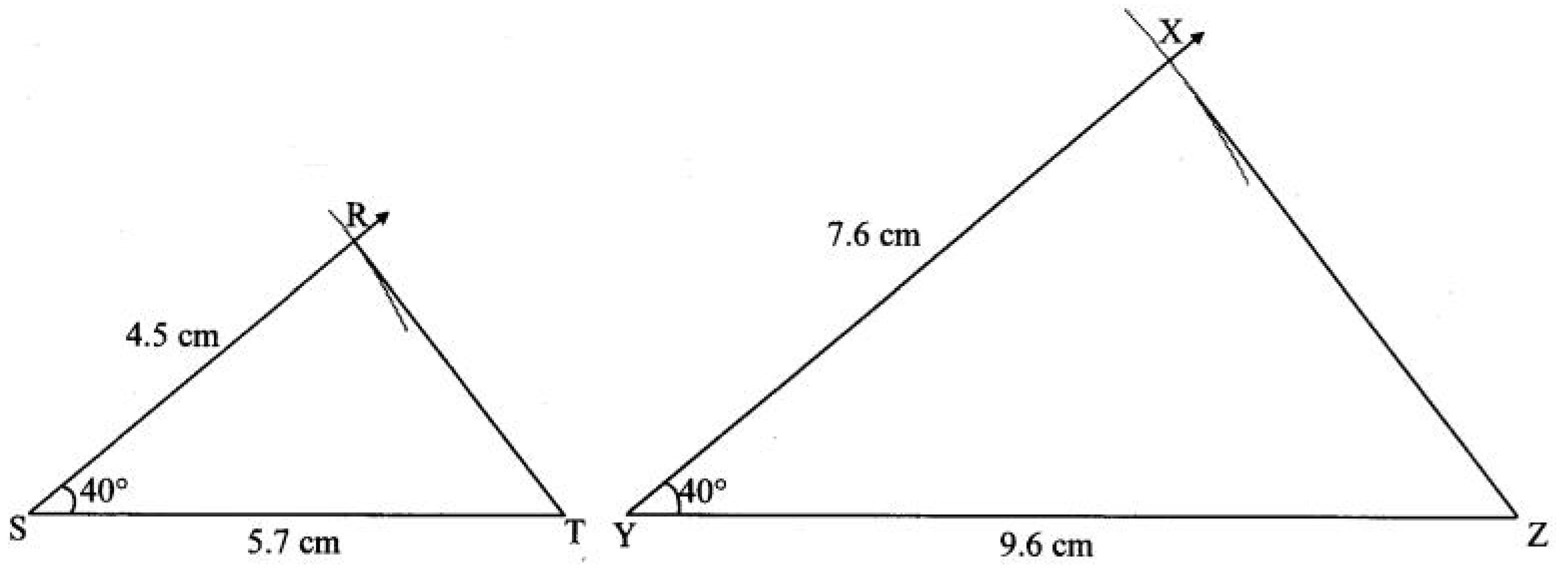
$\therefore \quad \frac{4.5}{XY} = \frac{5.7}{YZ} = \frac{3}{5}$

$\therefore \quad \frac{4.5}{XY} = \frac{3}{5}$

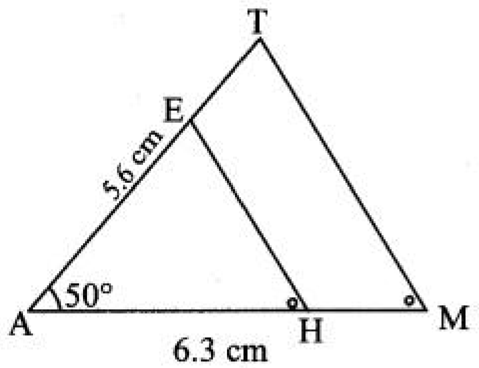
$\therefore \quad XY = \frac{4.5 \times 5}{3} = 7.5 \text{ cm}$

Also, $\frac{5.7}{YZ} = \frac{3}{5}$

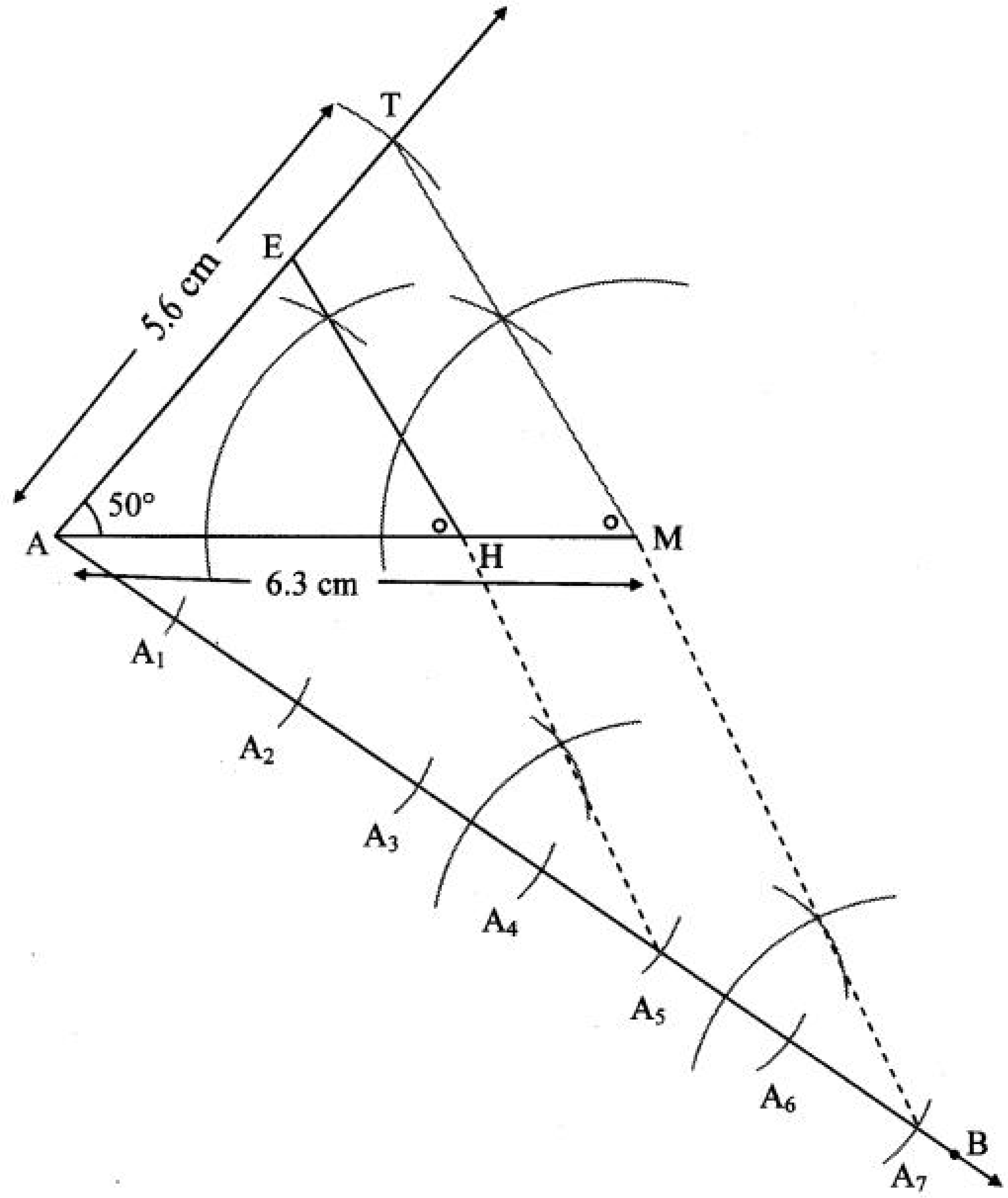
$\therefore \quad YZ = \frac{5.7 \times 5}{3} = 9.5 \text{ cm}$



Question 4.
ΔAMT ~ ΔANE. In ΔAMT, AM = 6.3 cm, ∠TAM = 500, AT = 5.6 cm. AMAH = 75 Construct ΔAHE.
Solution:
Analysis:
As shown in the figure,
Let A – H – M and A – E – T.
ΔAMT ~ ΔAHE … [Given]
∴ ∠TAM ≅ ∠EAH … [Corresponding angles of similar triangles]



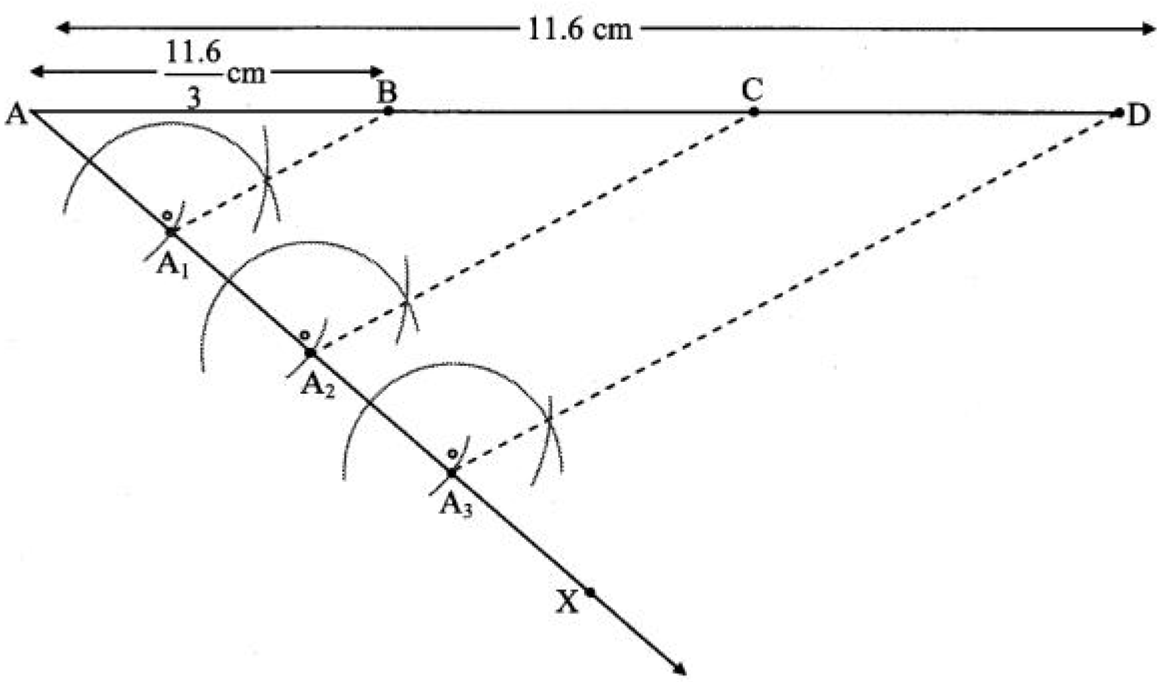
AMAH = MTHE = ATAE ….. (i)[Corresponding sides of similar triangles]
But, AMAH = 75 …(ii)[Given]
∴ AMAH = MTHE = ATAH = 75 …[From (i) and (ii)]
∴ Sides of AAMT are longer than corresponding sides of ΔAHE.
∴ The length of side AH will be equal to 5 parts out of 7 equal parts of side AM.
So, if we construct AAMT, point H will be on side AM, at a distance equal to 5 parts from A.
Now, point E is the point of intersection of ray AT and a line through H, parallel to MT.
ΔAHE is the required triangle similar to ΔAMT.



Steps of construction:
i. Draw ΔAMT of given measure. Draw ray AB making an acute angle with side AM.
ii. Taking convenient distance on the compass, mark 7 points A1, A2, A3, A4, A5, Ag and A7, such that
$AA_1 = A_1A_2 = A_2A_3 = A_3A_4 = A_4A_5 = A_5A_6 = A_6A_7$.
iii. Join A_7M. Draw line parallel to A_7M through A_5 to intersects seg AM at H.
iv. Draw a line parallel to side TM through H. Name the point of intersection of this line and seg AT as E.
ΔAHE is the required triangle similar to ΔAMT.

Maharashtra Board Class 10 Maths Chapter 4 Geometric Constructions Intext Questions and Activities

Question 1.
If length of side AB is 11.62 cm, then by dividing the line segment of length 11.6 cm in three equal parts, draw segment AB. (Textbook pg. no. 93)
Solution:



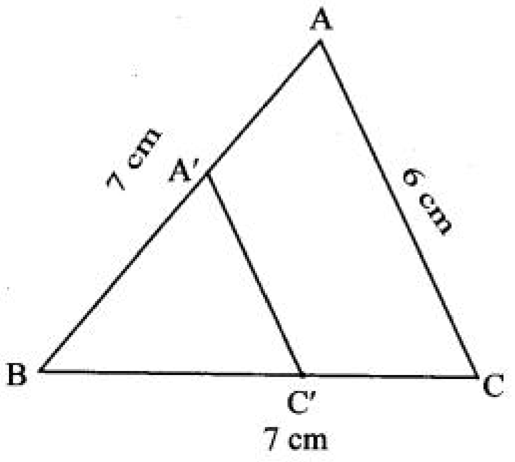
Steps of construction:
i. Draw seg AD of 11.6 cm.
ii. Draw ray AX such that ∠DAX is an acute angle.
iii. Locate points A_1, A_2 and A_3 on ray AX such that $AA_1 = A_1A_2 = A_2A_3$
iv. Join A_3D.
v. Through A_1, A_2 draw lines parallel to A_3D intersecting AD at B and C, wherein
AB = 11.63 cm

Question 2.
Construct any ΔABC. Construct Δ A'BC' such that AB : A'B = 5:3 and Δ ABC ~ Δ A'BC'. (Textbook pg. no. 93)
Analysis:
As shown in the figure,
Let B – A' – A and B – C' -C
Δ ABC – A'BC' ... [Given]
∴ ∠ABC ≅ ∠A'BC' ...[Corresponding angles of similar trianglesi

$\frac{AB}{A'B} = \frac{BC}{BC'} = \frac{AC}{A'C'}$ …(i)[Corresponding sides of similar triangles]

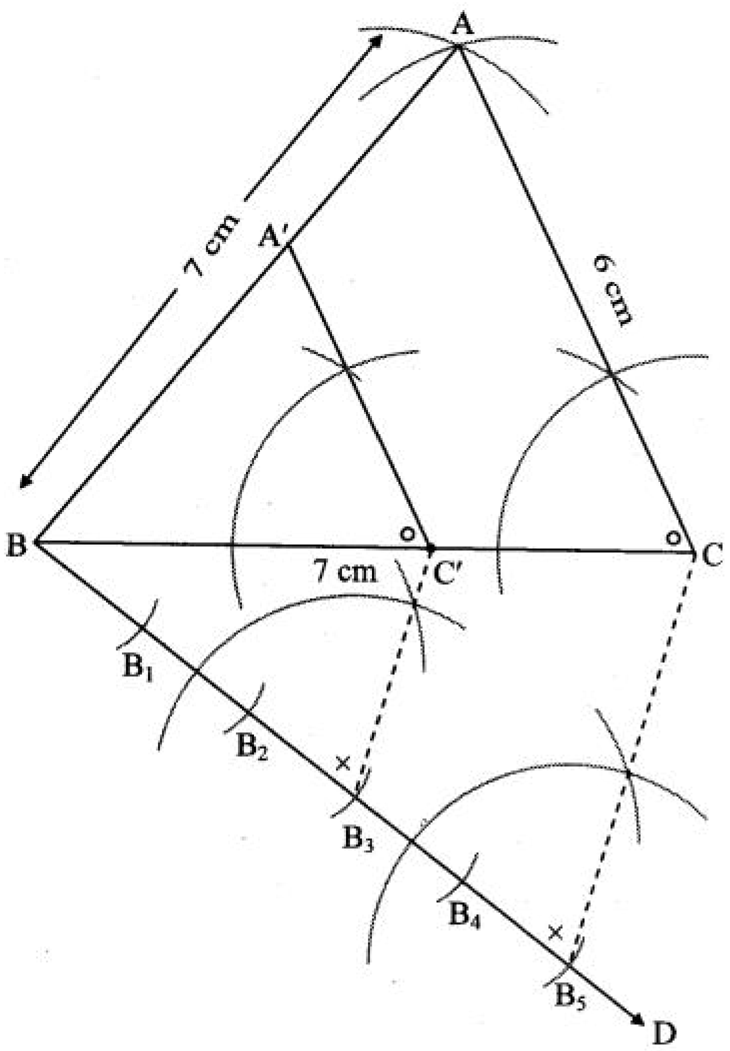
But, $\frac{AB}{A'B} = \frac{5}{3}$ …(ii)[Given]

$\frac{AB}{A'B} = \frac{BC}{BC'} = \frac{AC}{A'C'} = \frac{5}{3}$ …[From (i) and (ii)]

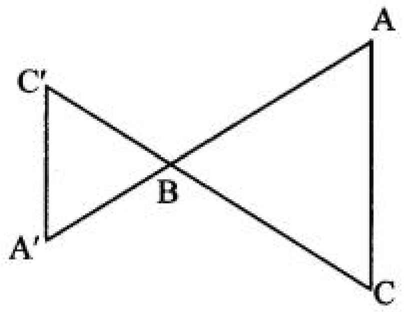


Rough figure

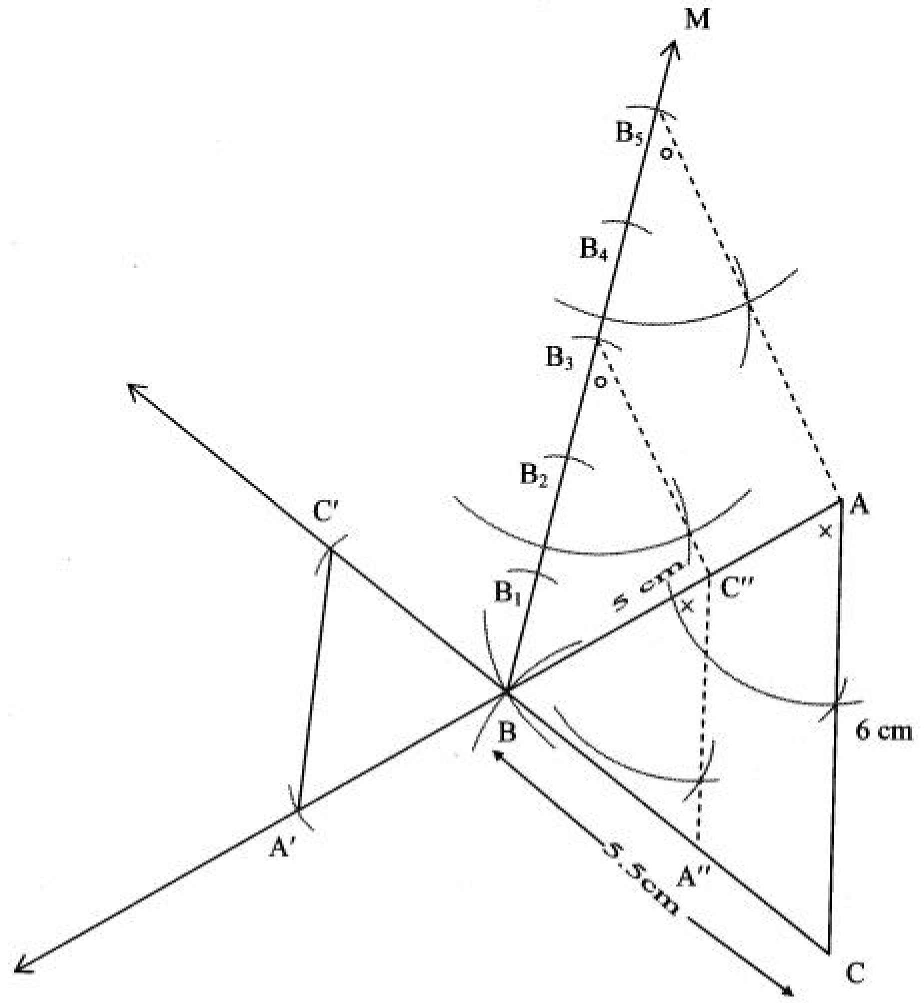
∴ Sides of ΔABC are longer than corresponding sides of ΔA'BC'. Rough figure
∴ the length of side BC' will be equal to 3 parts out of 5 equal parts of side BC.
So if we construct ΔABC, point C' will be on side BC, at a distance equal to 3 parts from B.
Now A' is the point of intersection of AB and a line through C', parallel to CA.
Solution:
Let ΔABC be any triangle constructed such that AB = 7 cm, BC = 7 cm and AC = 6 cm.



Question 3.
Construct any ΔABC. Construct ΔA'BC' such that AB: A'B = 5:3 and ΔABC ~ ΔA'BC'.
ΔA'BC' can also be constructed as shown in the adjoining figure. What changes do we have to make in steps of construction in that case? (Textbook pg. no. 94)



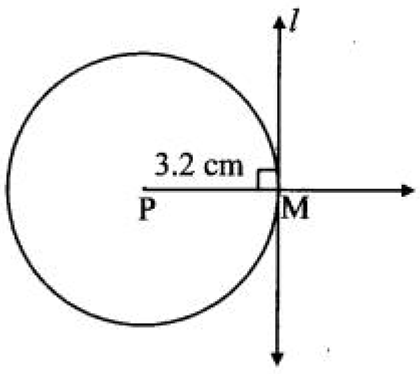
Solution:
Let ΔABC be any triangle constructed such that AB = 5cm,
BC = 5.5 cm and AC = 6 cm.



i. Steps of construction:
Construct ΔABC, extend rays AB and CB.
Draw line BM making an acute angle with side AB.
Mark 5 points B_1, B_2, B_3, B_4, B_5 starting from B at equal distance.
Join B_3C″ (ie 3rd part)
Draw a line parallel to AB_5 through B_3 to intersect line AB at C″
Draw a line parallel to AC through C″ to intersect line BC at A″
ii. Extra construction:
With radius BC″ cut an arc on extended ray CB at C′ [C′ – B – C]
With radius BA″ cut an arc on extended ray AB at A′ [A′ – B – A]
ΔA′BC′ is the required triangle.

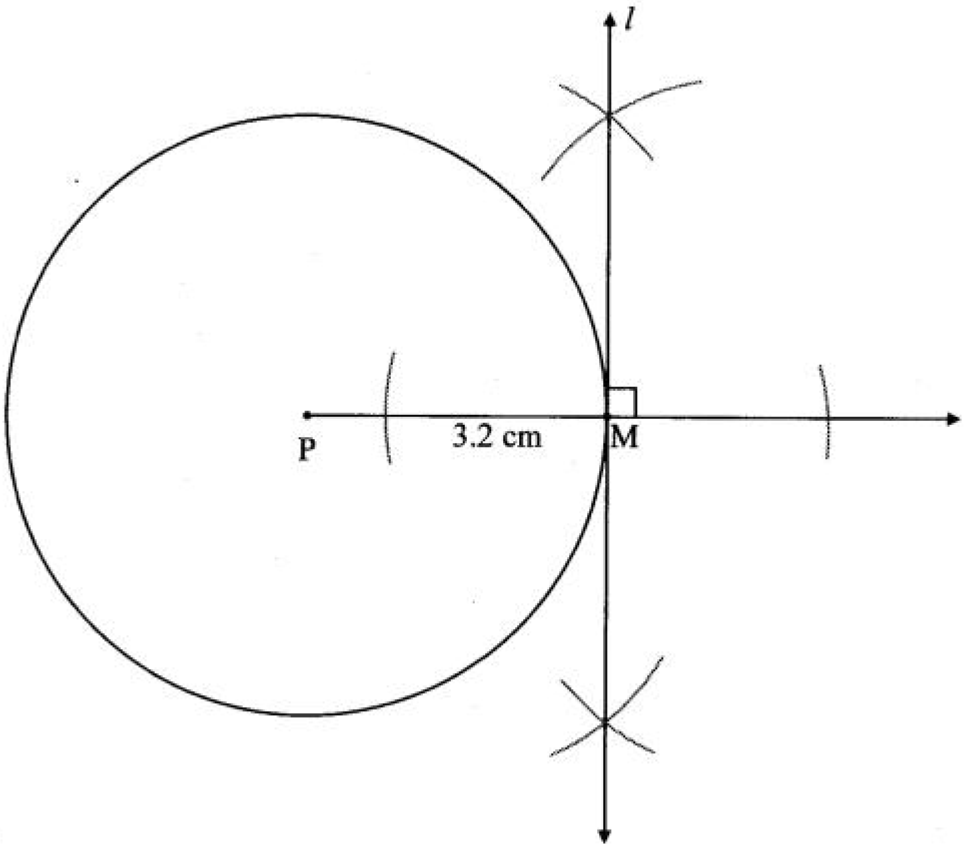
Practice Set 4.2 Geometry 10th Std Maths Part 2 Answers Chapter 4 Geometric Constructions

Question 1.
Construct a tangent to a circle with centre P and radius 3.2 cm at any point M on it.
Solution:
Analysis:
seg PM ⊥ line l ….[Tangent is perpendicular to radius]

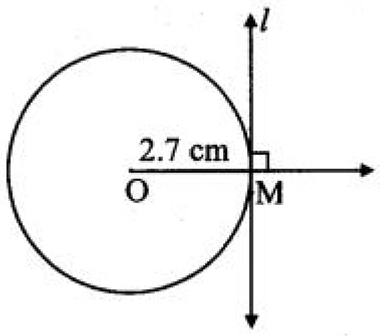


Rough Figure

The perpendicular to seg PM at point M will give the required tangent at M.

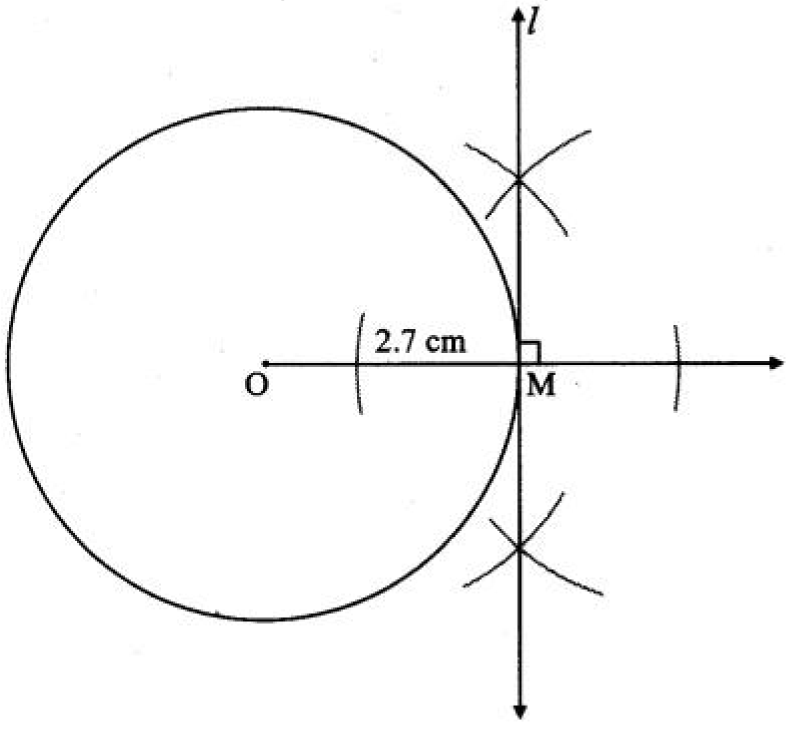


Question 2.
Draw a circle of radius 2.7 cm. Draw a tangent to the circle at any point on it.
Solution:
Analysis:
seg OM ⊥ line l ...[Tangent is perpendicular to radius]

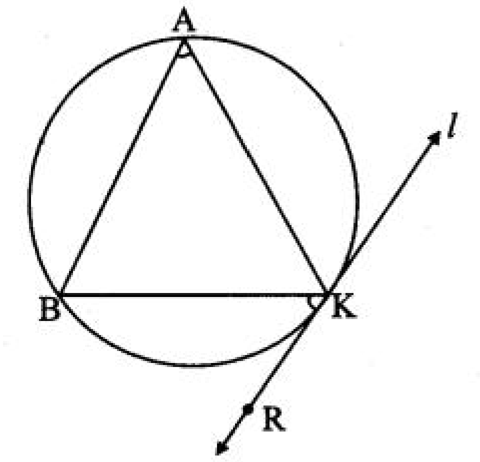


Rough Figure

The perpendicular to seg OM at point M will give the required tangent at M.

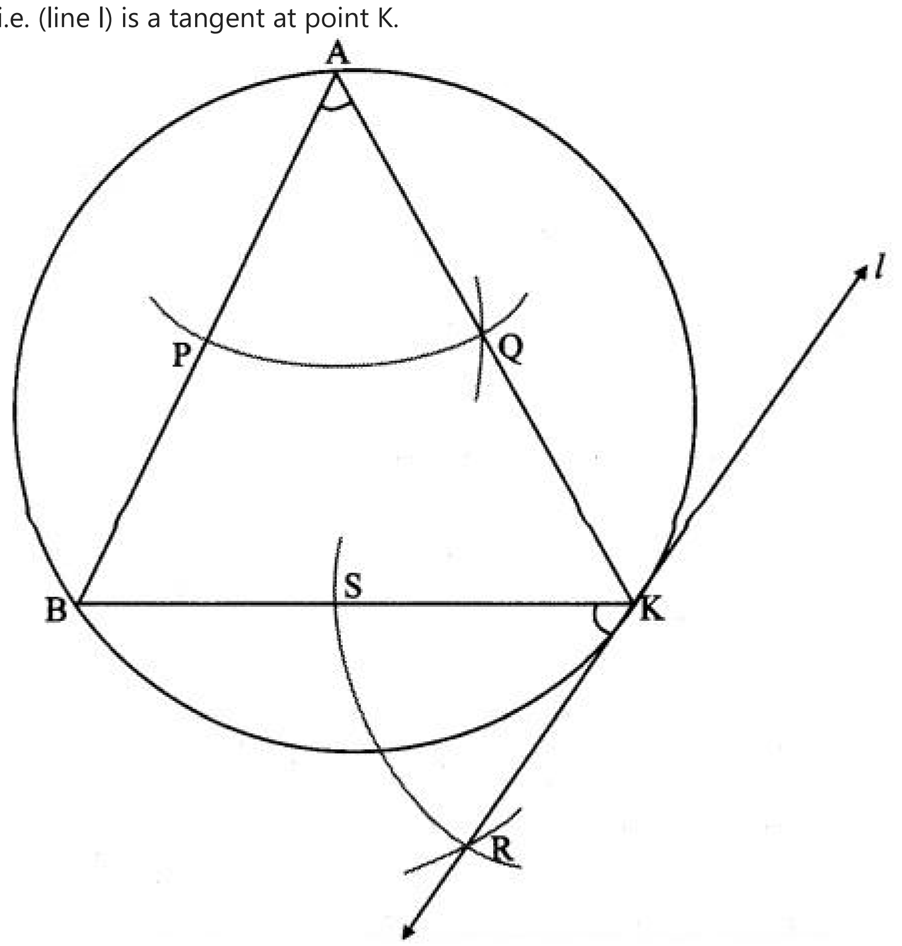


Question 3.
Draw a circle of radius 3.6 cm. Draw a tangent to the circle at any point on it without using the centre.
Solution:
Analysis:
As shown in the figure, line lis a tangent to the circle at point K.
seg BK is a chord of the circle and LBAK is an inscribed angle.
By tangent secant angle theorem,
∠BAK = ∠BKR

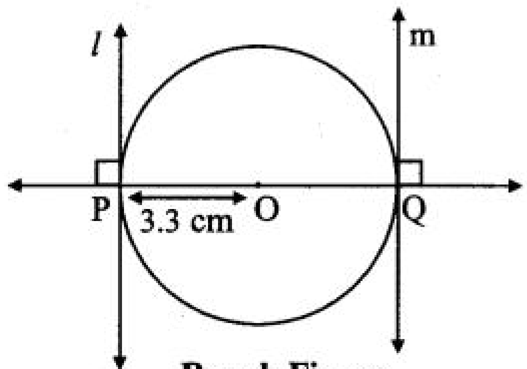


Rough figure

By converse of tangent secant angle theorem,
If we draw ∠BKR such that ∠BKR = ∠BAK, then ray KR
i.e. (line l) is a tangent at point K.

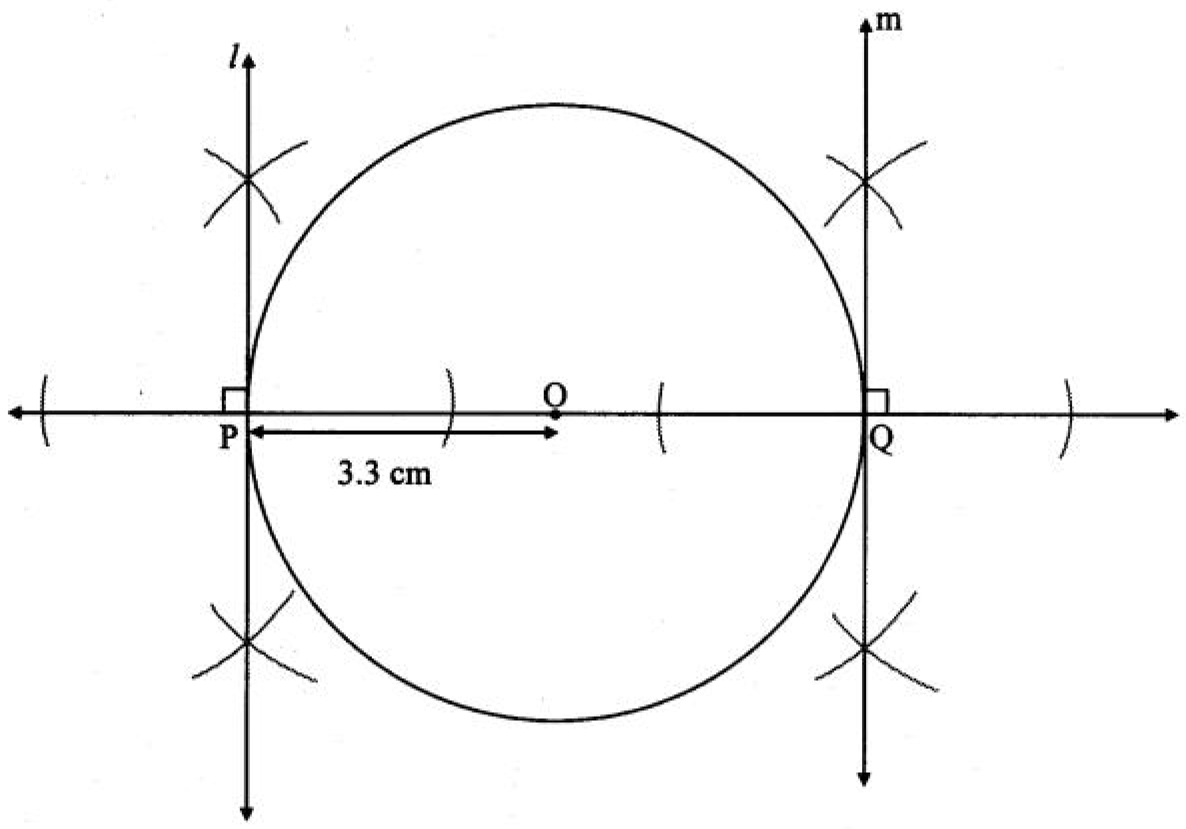


Question 4.
Draw a circle of radius 3.3 cm. Draw a chord PQ of length 6.6 cm. Draw tangents to the circle at points P and Q. Write your observation about the tangents.
Solution:
Analysis:
seg OP ⊥ line l ...[Tangent is perpendicular to radius]
seg OQ ⊥ line m



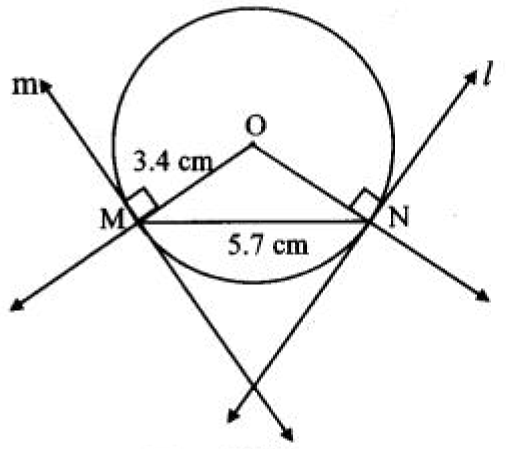
Rough Figure

The perpendicular to seg OP and seg OQ at points P and Q
respectively will give the required tangents at P and Q.



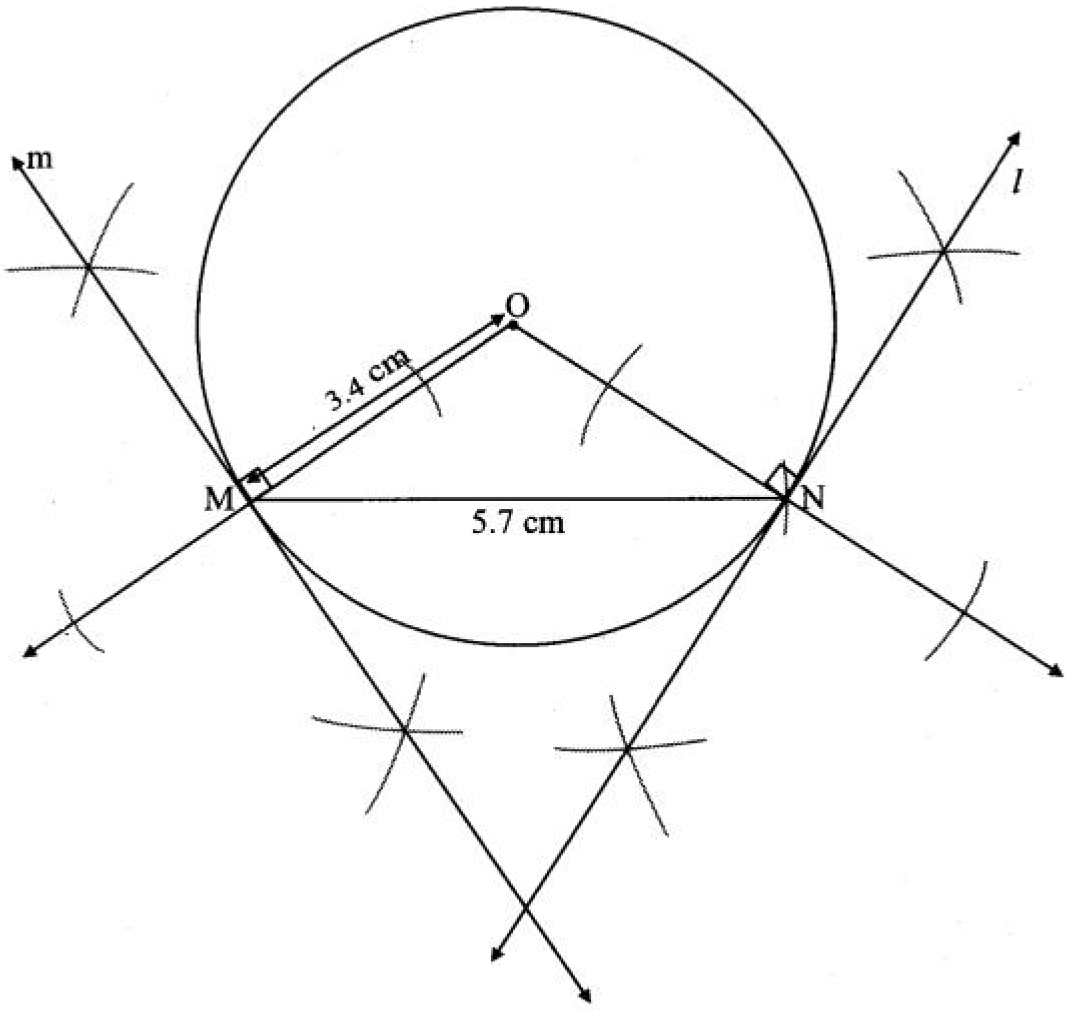
Radius = 3.3 cm
∴ Diameter = 2 × 3.3 = 6.6 cm
∴ Chord PQ is the diameter of the circle.
∴ The tangents through points P and Q (endpoints of diameter) are parallel to each other.

Question 5.
Draw a circle with radius 3.4 cm. Draw a chord MN of length 5.7 cm in it. Construct tangents at points M and N to the circle.
Solution:
Analysis:
seg ON ⊥ linel l
seg OM ⊥ line m …….[Tangent is perpendicular to radius]

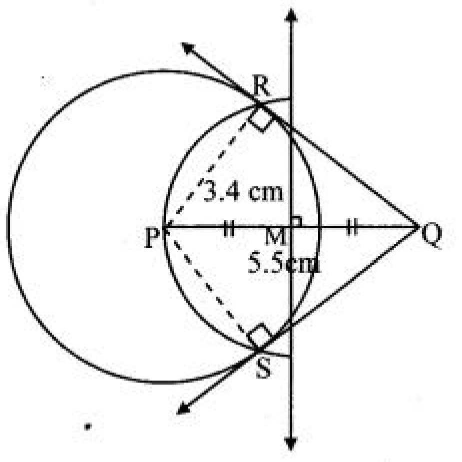


Rough Figure

The perpendicular to seg ON and seg 0M at points N and M respectively will give the required tangents at N and M.



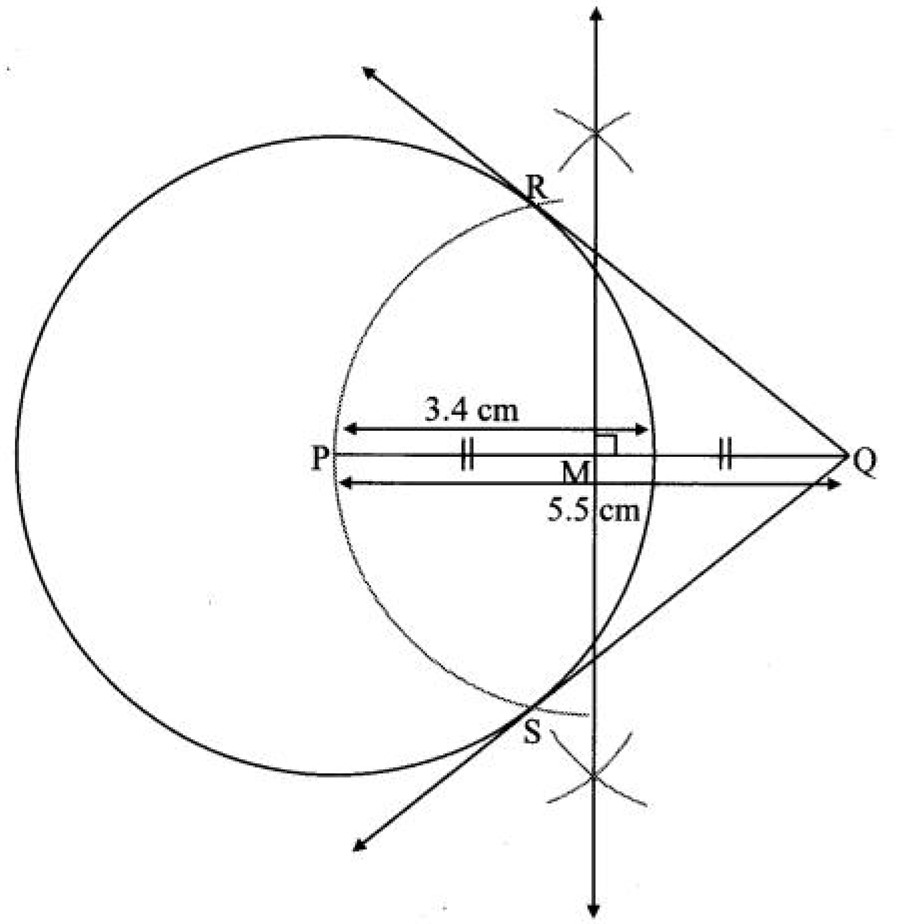
Question 6.
Draw a circle with centre P and radius 3.4 cm. Take point Q at a distance 5.5 cm from the centre. Construct tangents to the circle from point Q.
Solution:
Analysis:
As shown in the figure, let Q be a point in the exterior of circle at a distance of 5.5 cm.
Let QR and QS be the tangents to the circle at points R and S respectively.



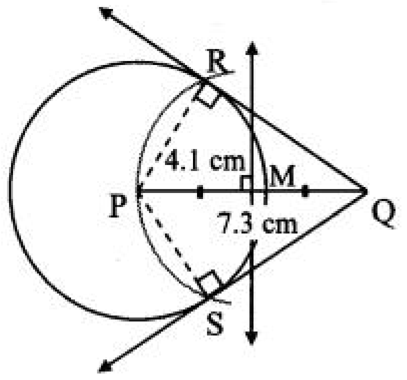
Rough figure

∴ seg PR ⊥ tangent QR ...[Tangent is perpendicular to radius]
∴ ∠PRQ = 90°
∴ point R is on the circle having PQ as diameter. ...[Angle inscribed in a semicircle is a right angle]
Similarly, point S also lies on the circle having PQ as diameter.
∴ Points R and S lie on the circle with PQ as diameter.
On drawing a circle with PQ as diameter, the points where it intersects the circle with centre P, will be the positions of points R and S respectively.

Ray QR and QS are the required tangents to the circle from point Q.



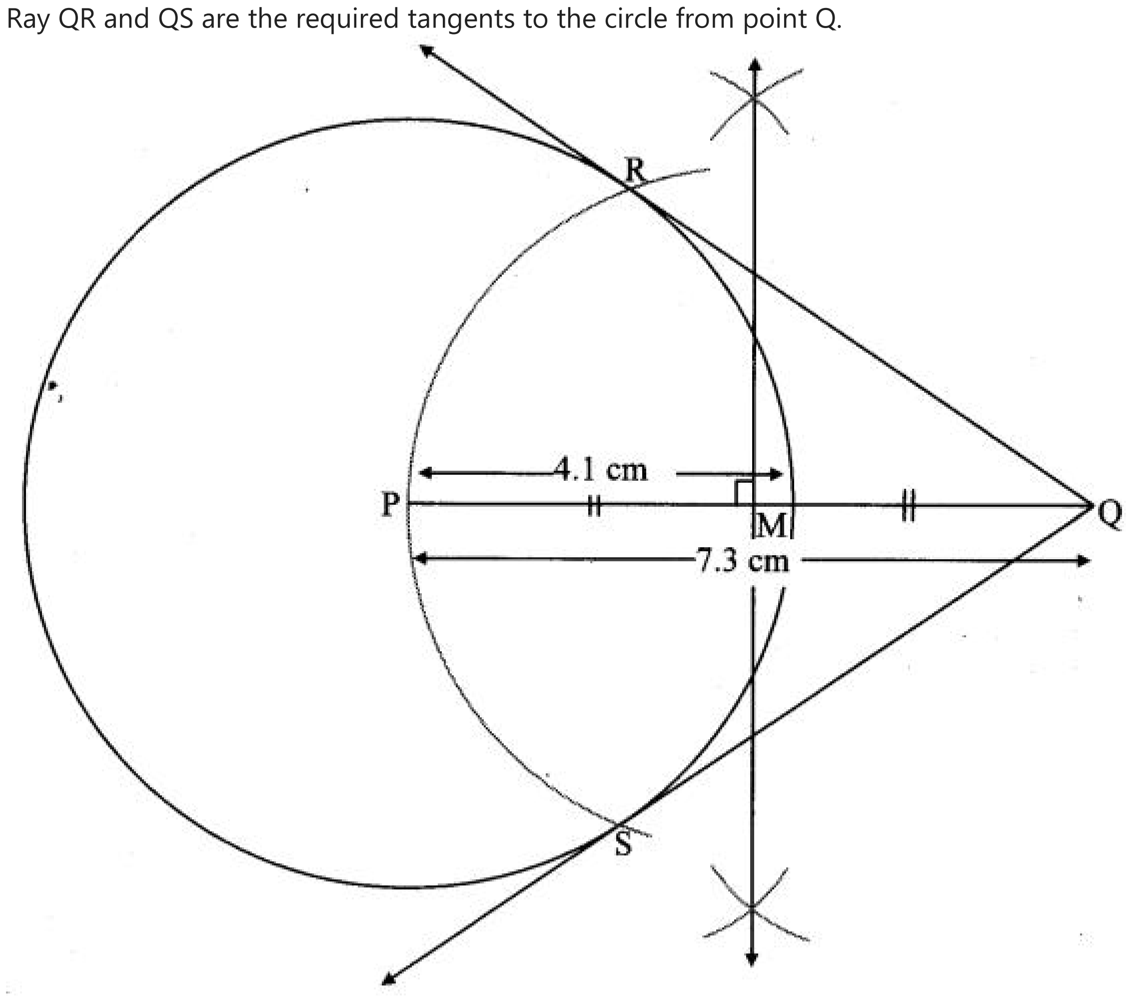
Question 7.
Draw a circle with radius 4.1 cm. Construct tangents to the circle from a point at a distance 7.3 cm from the centre.
Solution:
Analysis:
As shown in the figure, let Q be a point in the exterior of circle at a distance of 5.5 cm.
Let QR and QS be the tangents to the circle at points R and S respectively.
∴ seg PR ⊥ tangent QR …[Tangent is perpendicular to radius]
∴ ∠PRQ = 90°



Rough Figure

∴ point R is on the circle having PQ as diameter. …[Angle inscribed in a semicircle is a right angle]
Similarly, point S also lies on the circle having PQ as diameter.
∴ Points R and S lie on the circle with PQ as diameter.
On drawing a circle with PQ as diameter, the points where it intersects the circle with centre P, will be the positions of points R and S respectively.

Ray QR and QS are the required tangents to the circle from point Q.



Problem Set 4 Geometry 10th Std Maths Part 2 Answers Chapter 4 Geometric Constructions

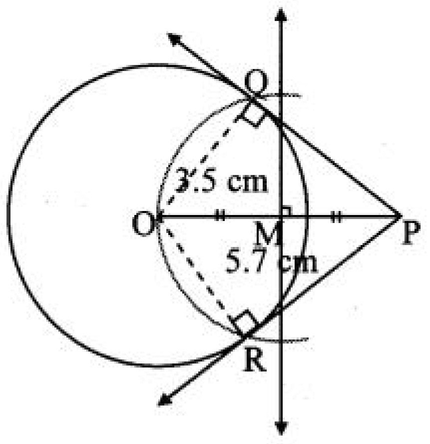
Question 1.
Select the correct alternative for each of the following questions.

i. The number of tangents that can be drawn to a circle at a point on the circle is ______
(A) 3
(B) 2
(C) 1
(D) 0
Answer:
(C)

ii. The maximum number of tangents that can be drawn to a circle from a point outside it is ______
(A) 2
(B) 1
(C) one and only one
(D) 0
Answer:
(A)

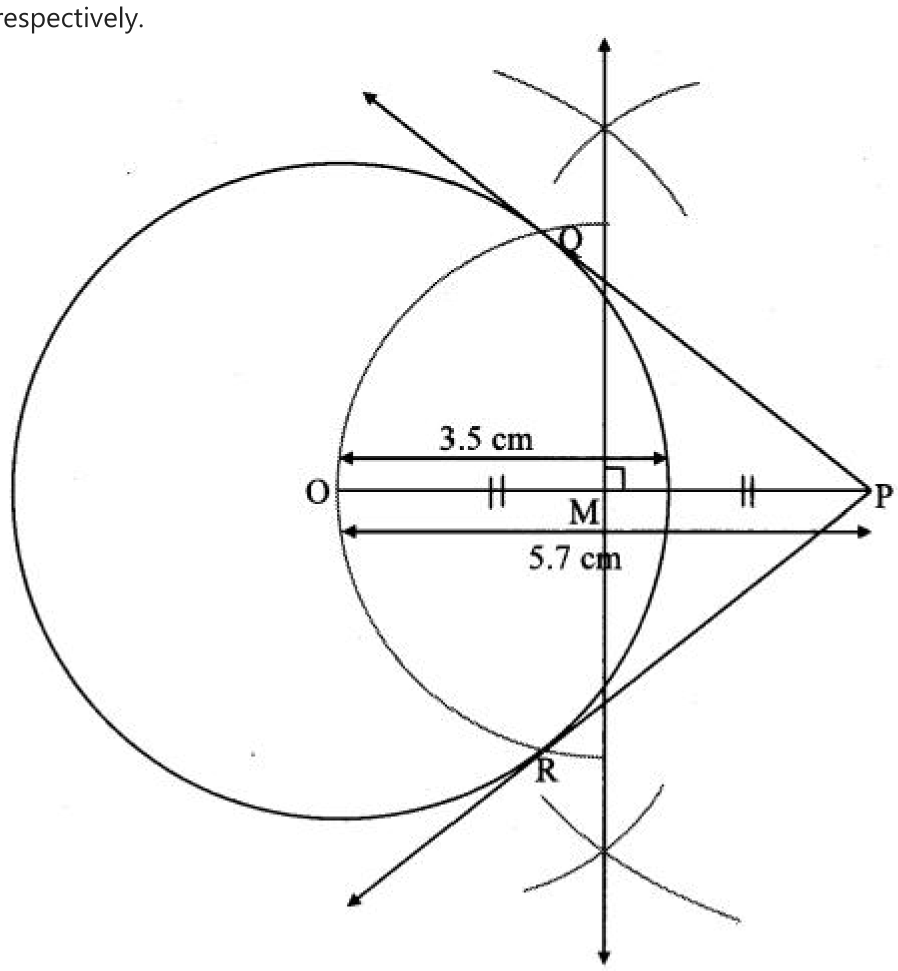
iii. If ΔABC ~ ΔPQR and $ABPQ = 75$, then ______
(A) AABC is bigger.
(B) APQR is bigger.
(C) both triangles will be equal
(D) can not be decided
Answer:
(A)

Question 2.
Draw a circle with centre O and radius 3.5 cm. Take point P at a distance 5.7 cm from the centre. Draw tangents to the circle from point P.
Solution:
Analysis:
As shown in the figure, let P be a point in the exterior of circle at a distance of 5.7 cm.
Let PQ and PR be the tangents to the circle at points Q and R respectively.
∴ seg OQ ⊥ tangent PQ ...[Tangent is perpendicular to radius]
∴ ∠OQP = 90°

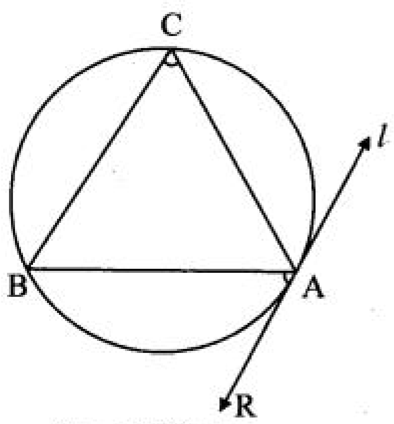


Rough Figure

∴ point Q is on the circle having OP as diameter. ...[Angle inscribed in a semicircle is a right angle]
Similarly, point R also lies on the circle having OP as diameter.
∴ Points Q and R lie on the circle with OP as diameter.
On drawing a circle with OP as diameter, the points where it intersects the circle with centre O, will be the positions of points Q and R respectively.

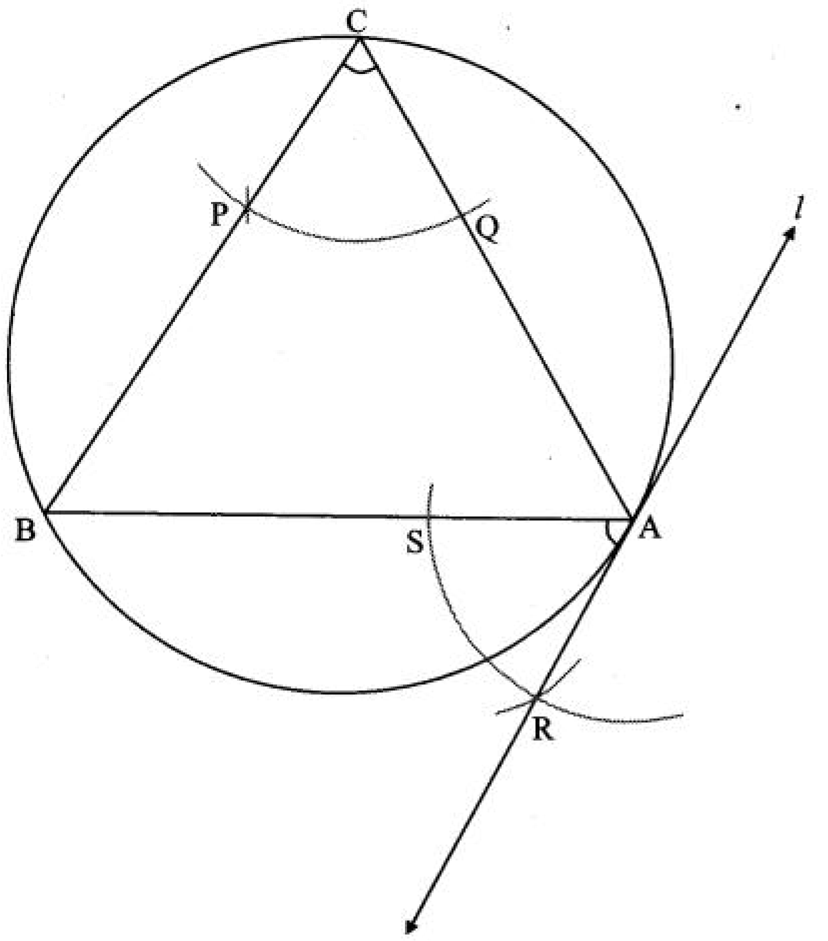


Question 3.
Draw any circle. Take any point A on it and construct tangent at A without using the centre of the circle.
Solution:
Analysis:
As shown in the figure, line l is a tangent to the circle at point A.
seg BA is a chord of the circle and ∠BCA is an inscribed angle.
By tangent secant angle theorem,
∠BCA = ∠BAR

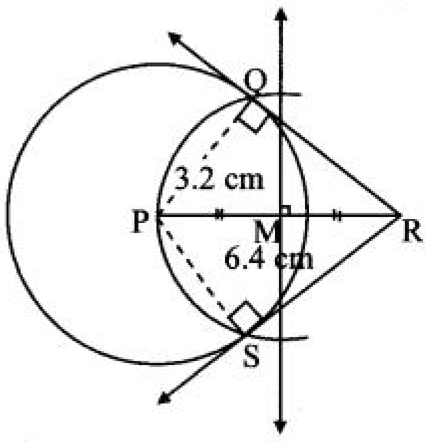


Rough Figure

By converse of tangent secant angle theorem, If we draw ∠BAR such that ∠BAR = ∠BCA, then ray AR (i.e. line l) is a tangent at point A.



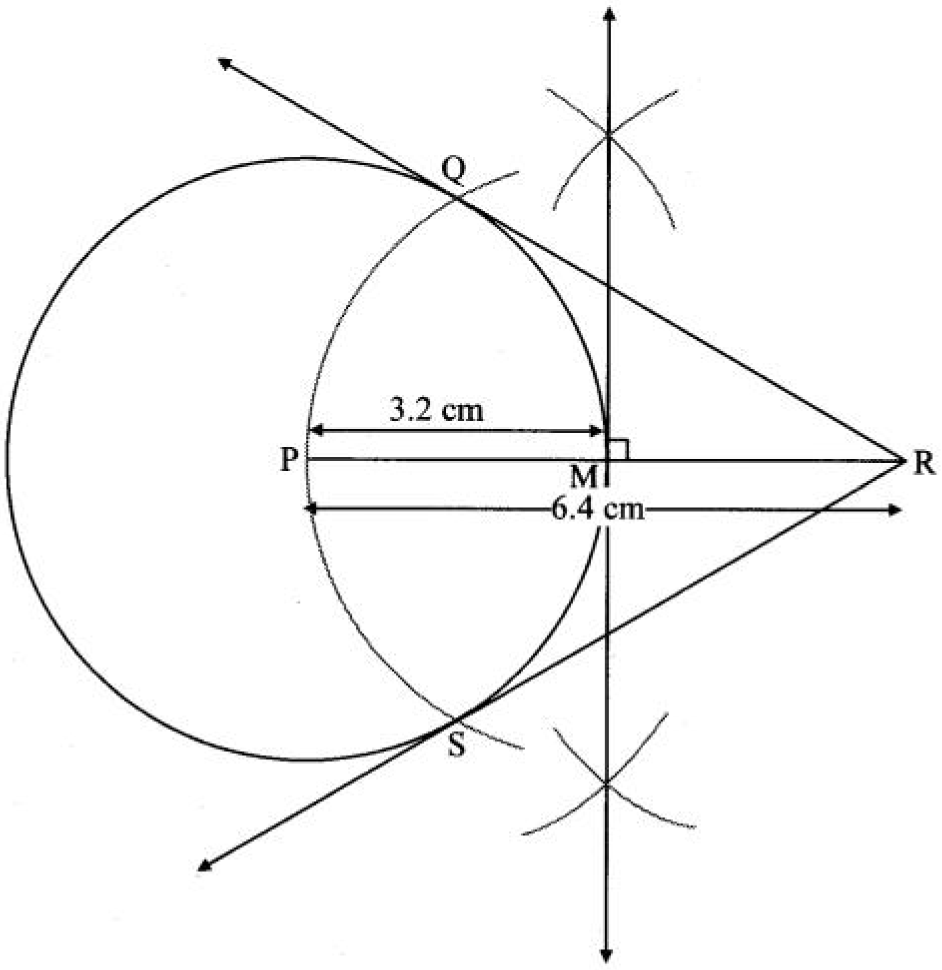
Question 4.
Draw a circle of diameter 6.4 cm. Take a point R at a distance equal to its diameter from the centre. Draw tangents from point R.
Solution:
Diameter of circle = 6.4 cm 6.4
Radius of circle = $\frac{6.4}{2}$ = 3.2 cm
Analysis:
As shown in the figure, let R be a point in the exterior of circle at a distance of 6.4 cm.
Let RQ and RS be the tangents to the circle at points Q and S respectively.



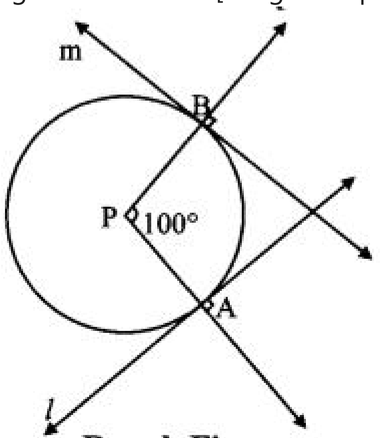
Rough Figure

∴ seg PQ ⊥ tangent RQ ...[Tangent is perpendicular to radius]
∴ ∠PQR = 90°
∴ point Q is on the circle having PR as diameter. ...[Angle inscribed in a semicircle is a right angle]
Similarly,
Point S also lies on the circle having PR as diameter.
∴ Points Q and S lie on the circle with PR as diameter.
On drawing a circle with PR as diameter, the points where it intersects the circle with centre P, will be the positions of points Q and S

respectively.

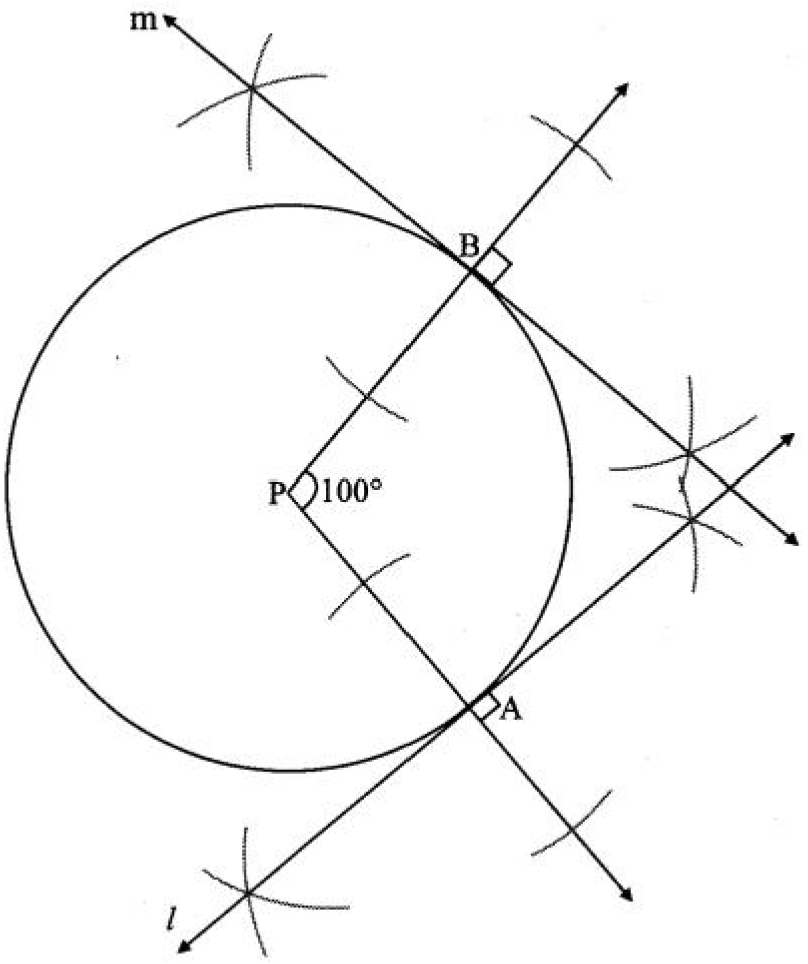


Question 5.
Draw a circle with centre P. Draw an arc AB of 100° measure. Draw tangents to the circle at point A and point B.
Solution:
m(arc AB) = ∠APB = 100°
Analysis:
seg PA ⊥ line l
seg PB ⊥ line m ... [Tangent is perpendicular to radius]



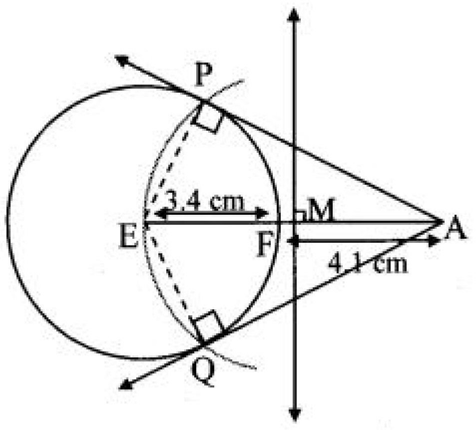
Rough Figure

The perpendicular to seg PA and seg PB at points A and B respectively will give the required tangents at A and B.



Steps of construction:
i. With centre P, draw a circle of any radius and take any point A on it.
ii. Draw ray PA.
iii. Draw ray PB such that ∠APB = 100°.
iv. Draw line l ⊥ ray PA at point A.
v. Draw line m ⊥ ray PB at point B.
Lines l and m are tangents at points A and B to the circle.

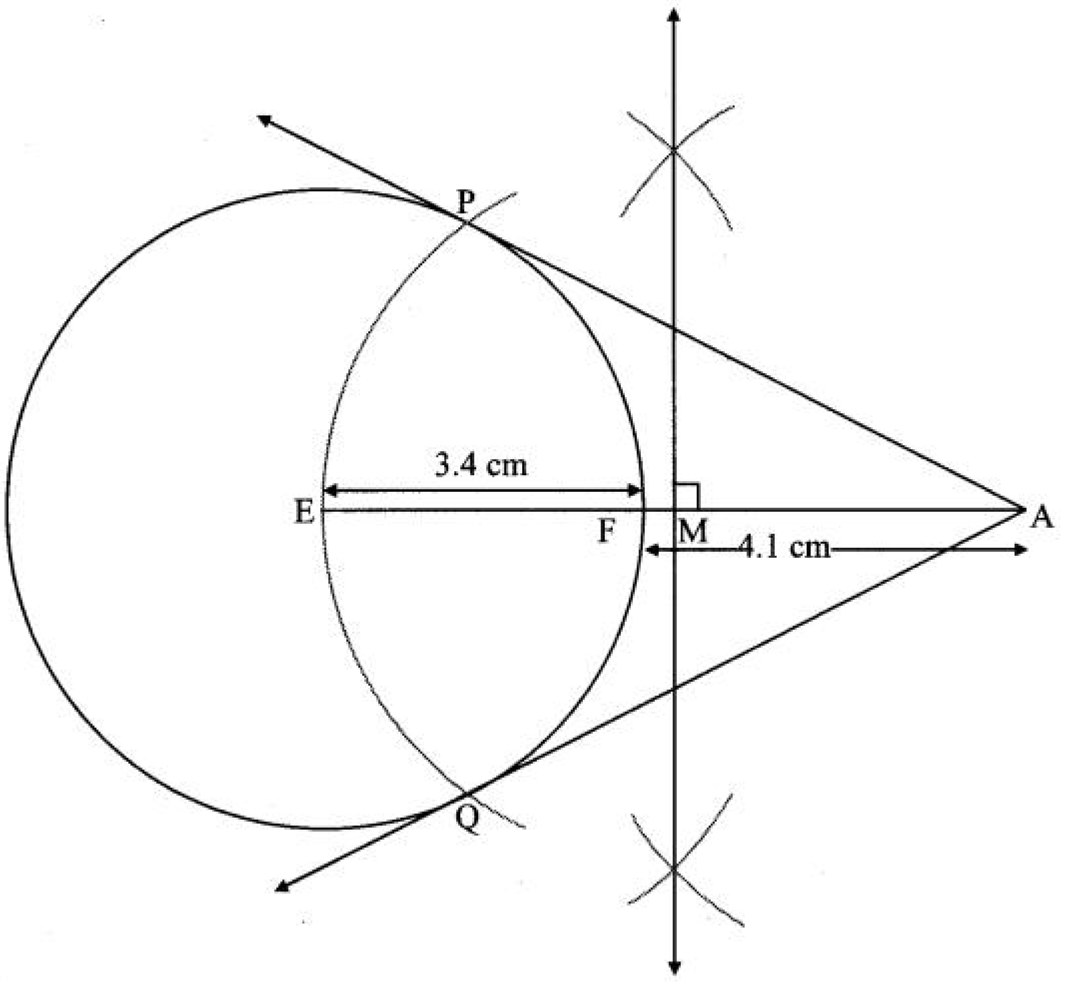
Question 6.
Draw a circle of radius 3.4 cm and centre E. Take a point F on the circle. Take another point A such that E – F – A and FA = 4.1 cm. Draw tangents to the circle from point A.
Solution:
Analysis:
Draw a circle of radius 3.4 cm
As shown in the figure, let A be a point in the exterior of circle at a distance of (3.4 + 4.1) = 7.5 cm.
Let AP and AQ be the tangents to the circle at points P and Q respectively.
∴ seg EP ⊥ tangent PA ... [Tangent is perpendicular to radius]



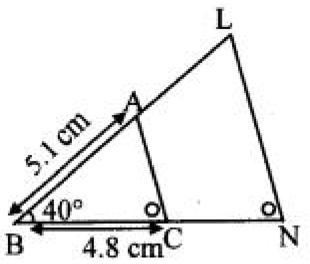
Rough Figure

∴ ∠EPA = 90°
∴ point P is on the circle having EA as diameter. ...[Angle inscribed in a semicircle is a right angle]
Similarly, point Q also lies on the circle having EA as diameter.
∴ Points P and Q lie on the circle with EA as diameter.
On drawing a circle with EA as diameter, the points where it intersects the circle with centre E, will be the positions of points P and Q

respectively.

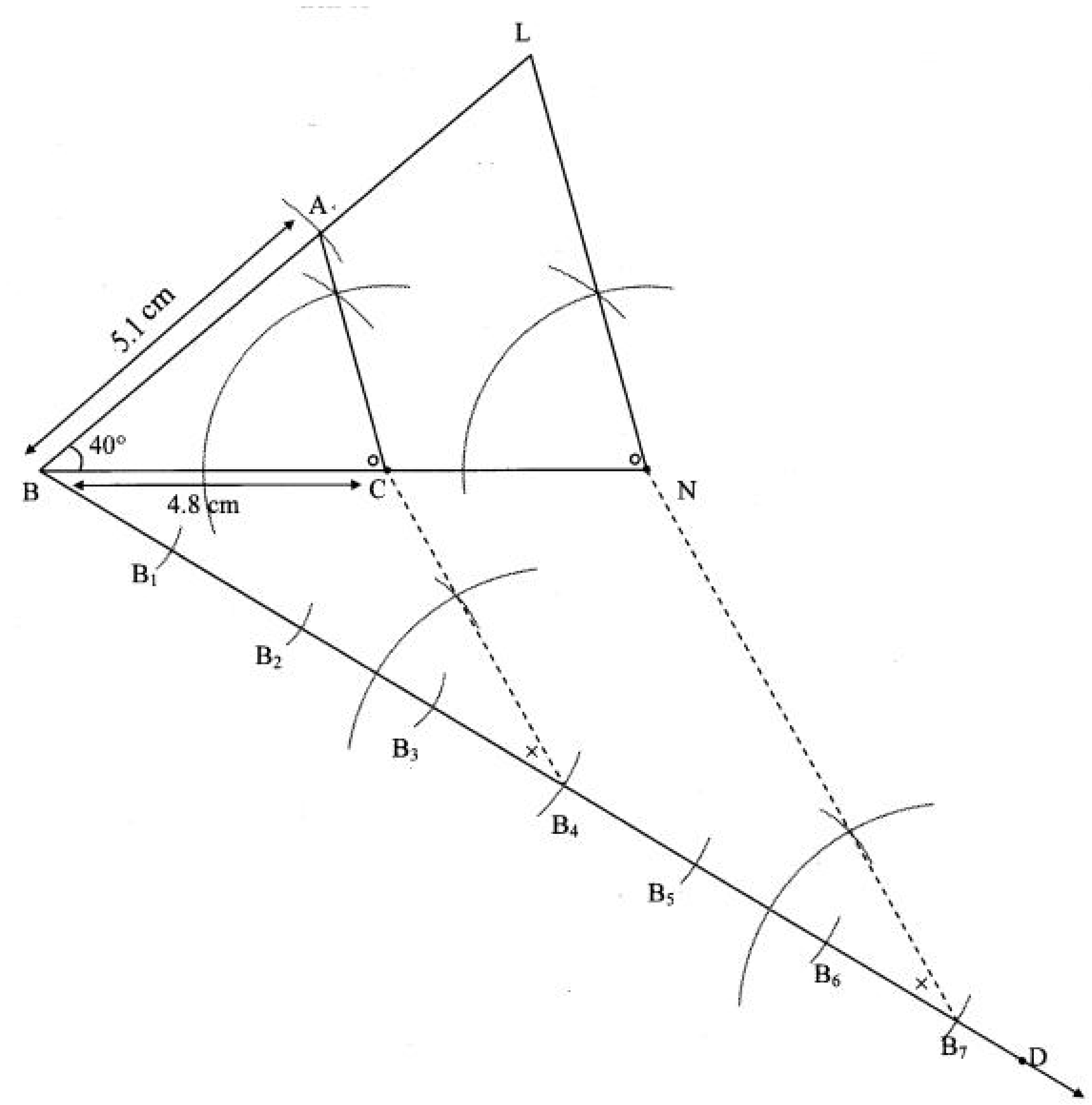


Question 7.
ΔABC ~ ΔLBN. In ΔABC, AB = 5.1 cm, ∠B = 40°, BC = 4.8 cm, $\frac{AC}{LN} = \frac{4}{7}$. Construct ΔABC and ΔLBN.
Solution:
Analysis:
As shown in the figure,
Let B – C – N and B – A – L.



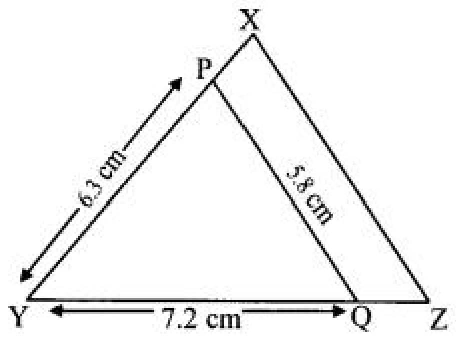
Rough Figure

ΔABC ~ ΔLBN …[Given]
∴ ∠ABC ≅ ∠LBN …[Corresponding angles of similar triangles]
$\frac{AB}{LB} = \frac{BC}{BN} = \frac{AC}{LN}$ …(i)[Corresponding sides of similar triangles]
But. $\frac{AC}{LN} = \frac{4}{7}$ …(ii)[Given]
∴ $\frac{AB}{LB} = \frac{BC}{BN} = \frac{AC}{LN} = \frac{4}{7}$ …[From(i)and(ii)]
∴ sides of ΔLBN are longer than corresponding sides of ΔABC.
∴ If seg BC is divided into 4 equal parts, then seg BN will be 7 times each part of seg BC.
So, if we construct ΔABC, point N will be on side BC, at a distance equal to 7 parts from B.
Now, point L is the point of intersection of ray BA and a line through N, parallel to AC.
ΔLBN is the required triangle similar to ΔABC.



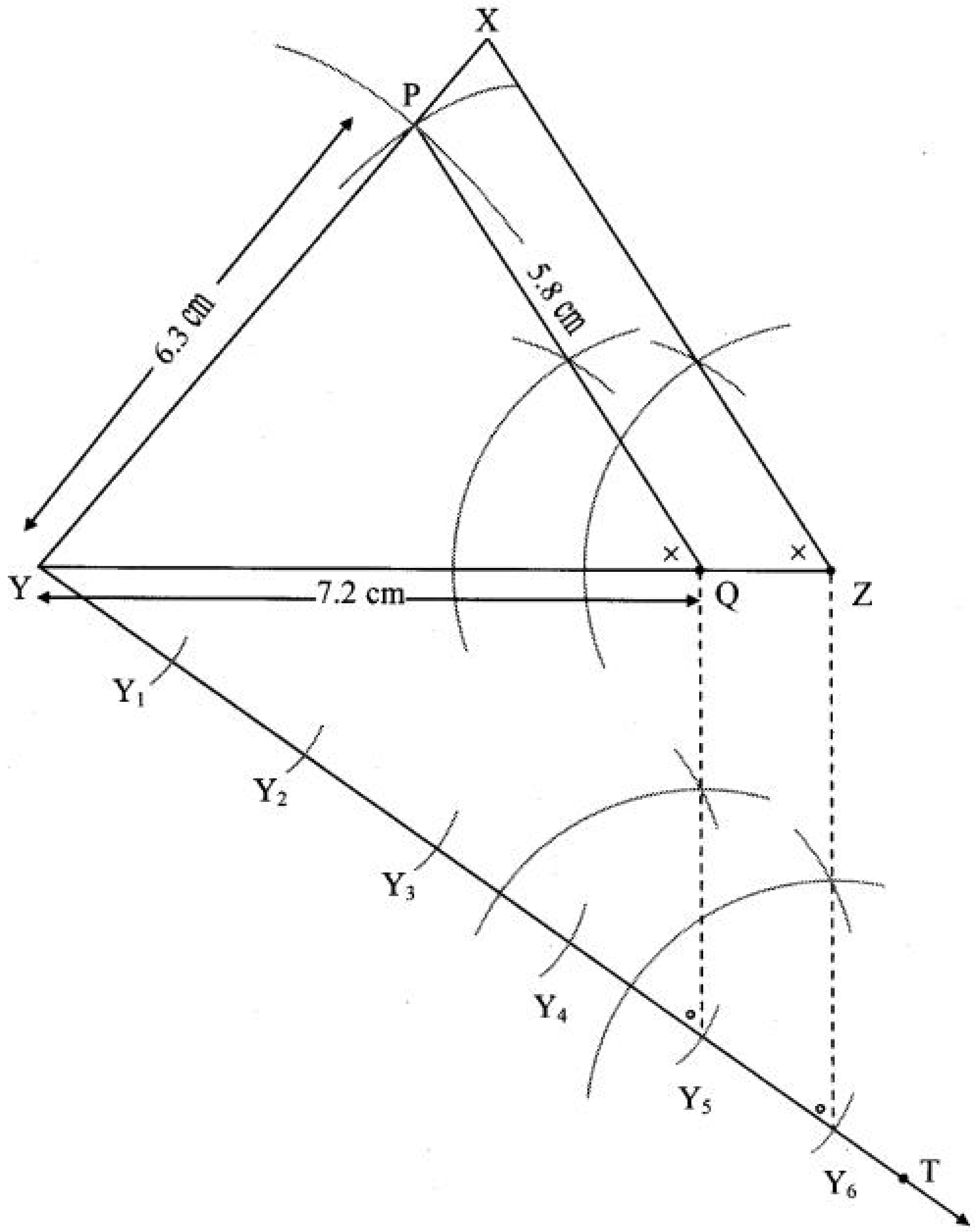
Steps of construction:
i. Draw ΔABC of given measure. Draw ray BD making an acute angle with side BC.
ii. Taking convenient distance on compass, mark 7 points B_1, B_2, B_3, B_4, B_5, B_6 and B_7 such that
$BB_1 = B_1B_2 = B_2B_3$ B_3= $B_44 = B_4B_5 = B_5B_6 = B_6B_7$.
iii. Join B_4C. Draw line parallel to B_4C through B_7 to intersects ray BC at N.
iv. Draw a line parallel to side AC through N. Name the point of intersection of this line and ray BA as L.
ΔLBN is the required triangle similar to ΔABC.

Question 8.
Construct ΔPYQ such that, PY = 6.3 cm, YQ = 7.2 cm, PQ = 5.8 cm. If = $\frac{YZ}{YQ} = \frac{6}{5}$ then construct ΔXYZ similar to ΔPYQ.
Solution:



Rough Figure

Analysis:
As shown in the figure,
Let Y – Q – Z and Y – P – X.
ΔXYZ ~ ΔPYQ ...[Given]
∴ ∠XYZ ≅ ∠PYQ ...[Corresponding angles of similar triangles]
$\frac{XY}{PY} = \frac{YZ}{YQ} = \frac{XZ}{PQ}$ ...(i)[Corresponding sides of similar triangles]
But, $\frac{YZ}{YQ} = \frac{6}{5}$,..(ii)[Given]
∴ $\frac{XY}{PY} = \frac{YZ}{YQ} = \frac{XZ}{PQ} = \frac{6}{5}$ ...[From (i) and (ii)]
∴ sides of ΔXYZ are longer than corresponding sides of ΔPYQ.
∴ If seg YQ is divided into 5 equal parts, then seg YZ will be 6 times each part of seg YQ.
So, if we construct ΔPYQ, point Z will be on side YQ, at a distance equal to 6 parts from Y.
Now, point X is the point of intersection of ray YP and a line through Z, parallel to PQ.
ΔXYZ is the required triangle similar to ΔPYQ.



Steps of construction:
i. Draw Δ PYQ of given measure. Draw ray YT making an acute angle with side YQ.
ii. Taking convenient distance on compass, mark 6 points Y_1, Y_2, Y_3, Y_4, Y_5 and Y_6 such that
$YY_1 = Y_1Y_2 = Y_2Y_3 = Y_3Y_4 = Y_4Y_5 = Y_5Y_6$.
iii. Join Y_5Q. Draw line parallel to Y_5Q through Y_6 to intersects ray YQ at Z.
iv. Draw a line parallel to side PQ through Z. Name the point of intersection of this line and ray YP as X.
ΔXYZ is the required triangle similar to ΔPYQ.