Constructions

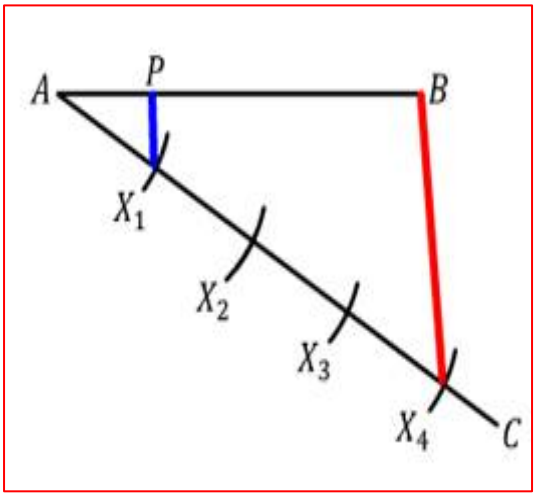
Construction 1

To divide the line segment in a given ratio.

First Method :

Let AB be the given line segment

Step 1: Draw a segment AC of any convenient length making an acute angle with the given line segment AB. Mark a few points at an equal distance from each other on AC. The number of points depends on the ratio in which you have to divide the given line segment. If the ratio is x is to y, the number of points is x plus y.



Step 2: Now, using compass to any small convenient length mark four points say X1, X2, X3 and X4 on AC, so that $AX_1 = X_1X_2 = X_2X_3 = X_3X_4$. Make sure that the distance to which the compass is open is not disturbed as you mark the points.

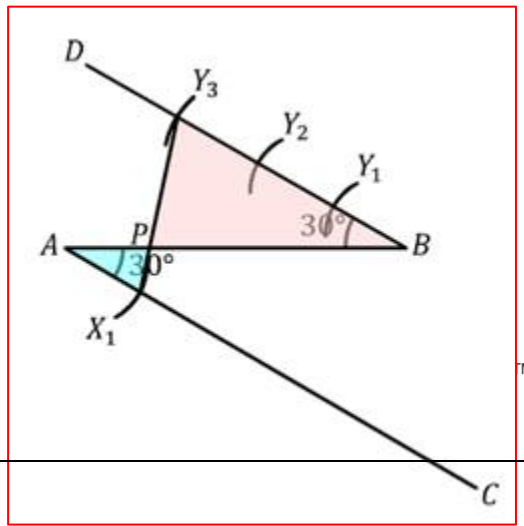
Step 3: Draw a line to join the points X_4 and B.

Step 4: Using a pair of set-squares draw a line parallel to X4B from the point X_1 to intersect the given line segment AB at point P.
Now the point P divides the line segment AB in the ratio x is to y.

Second Method :

Let AB be the given line segment

Step1:Draw a segment AC of a convenient length, making an acute angle with the given line segment AB



Step2: Draw a segment BD of any convenient length making the same angle with AB as AC on the opposite side of AC.

Step 3: Now, using compass to any small convenient length mark x number points on AC and y number points on BD or vice versa such that $AX_1 = X_1 X_2 = X_2X_3 = --- = BY_1 = Y_1Y_2 = Y_2Y_3 = ---$

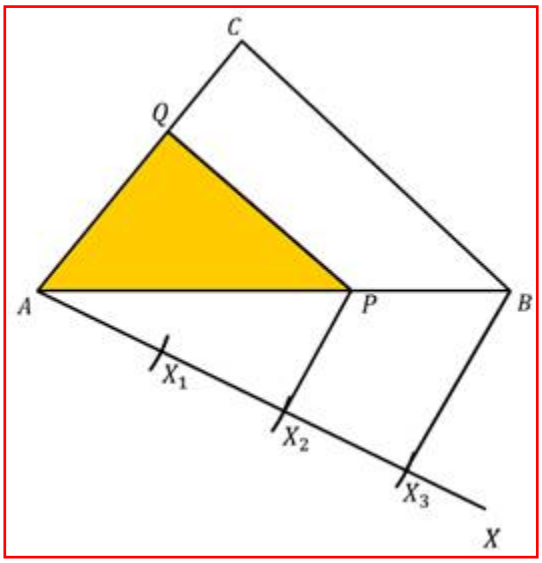
Step4: Join X_x to Y_y to intersect AB at point P. Now Point P divides the line segment AB in the ratio x is to y.

Construction 2

To construction a triangle similar to a given triangle as per given scale factor.

Steps for Construction

Step1: Draw a segment of a convenient length AX making an acute angle, with a side AB of the given triangle.



Step2: Now, using compass you have to mark a few points say X_1, X_2, X_3 ... at an equal distance from each other on AX. The number of points depends on the given scale factor. If the scale factor is x by y, the number of points is equal to the larger value amongst x and y.

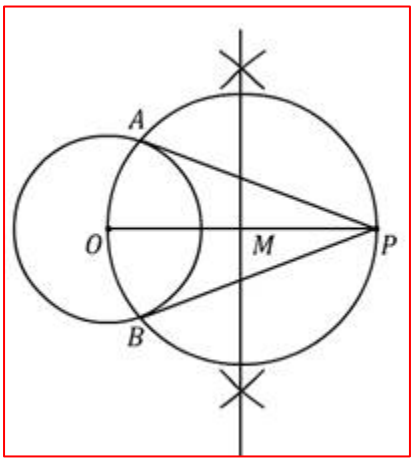
Step 3: Draw a line to join the points Xy and B.

Step 4: Draw a line parallel to XyB from Xx to intersect AB at P.

Step 5: Draw a line parallel to side BC at P to intersect side AC at Q.
Now, the triangle APQ is similar to the given triangle ABC.

Construction 3

To Construction of Tangents from an External Point to a Circle



Let P be a point outside the circle having centre O.

Step 1: Join OP.

Step 2: Draw perpendicular bisector of OP.

Step 3: Draw a circle with a centre M and radius MO to intersect the given circle at points A and B.

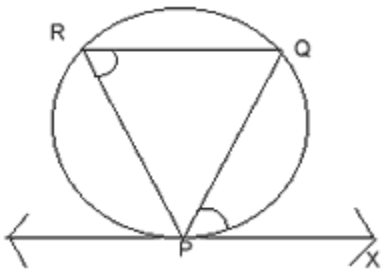
Step 4: Join AP and BP.

These are the two required tangents

Construction 4.

To construct a tangent to a circle at a point P on it without using the centre of the circle.

Procedure: -



Step 1: A chord PQ through P is drawn.

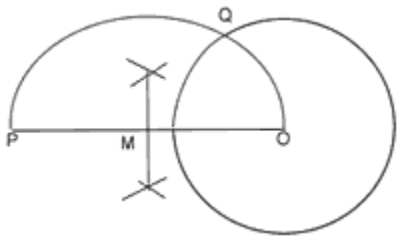
Step 2: Any point R is taken on the major arc PQ. PR and QR are joined.

Step 3: $\angle QPX$ Equal to $\angle PRQ$ is constructed. PX is required tangent to the circle at P.

Construction 5.

To construct a tangent to circle from a point P outside the circle using its centre O.

Procedure:-



Step 1: OP is joined and is bisected at M.

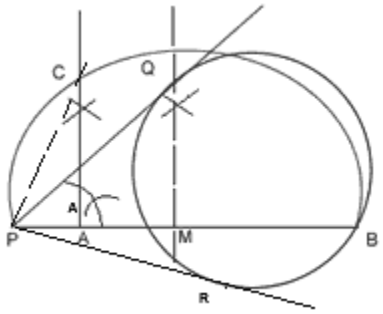
Step 2: Taking M as centre and MO as radius a semicircle is drawn which intersect the given circle at Q.

Step 3: PQ is the required tangent from P to the circle.

Construction 6.

To construction a tangent to a circle from a point out side the circle without using its centre.

Procedure



Step 1: A secant PAB to the circle is drawn.

Step 2: PB is bisected at M.

Step 3: Taking M as a centre and PM as a radius, a semicircle is drawn.

Step 4: Through A is drawn perpendicular to AB which intersect the semicircle at C.

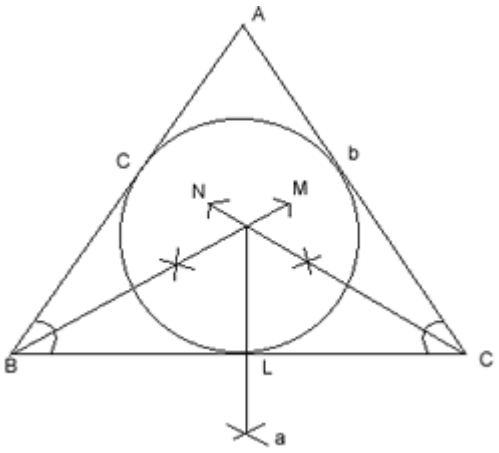
Step 5: Taking P as centre and PC as radius, arcs are drawn to intersect the given circle at Q and R.

Step 6: PQ and PR are joined which is the required tangent.

Construction 7.

To construct incircle of a triangle ABC whose sides are BC = a, CA = b and AB = c.

Procedure



Step 1: Triangle ABC in which BC = a, CA = b and AB = c is constructed.

Step 2: BM and CN is constructed angle bisectors of $\angle B \text{ and } \angle C$ which intersect at I.

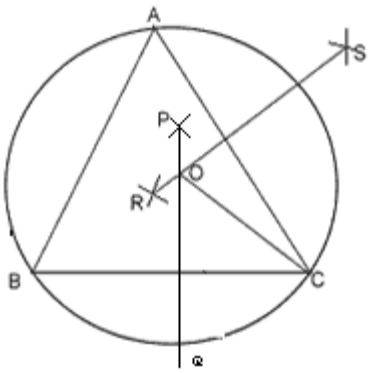
Step 3: $IL \perp BC$ is drawn

Step 4: Taking I as centre and IL as radius, circle is drawn. This is the required incircle.

Construction 8.

To construct a circumcircle of a triangle ABC where a = BC, b = CA and c = AB.

Proceture



Step 1: A triangle ABC is constructed with BC = a, CA = b and AB = c.

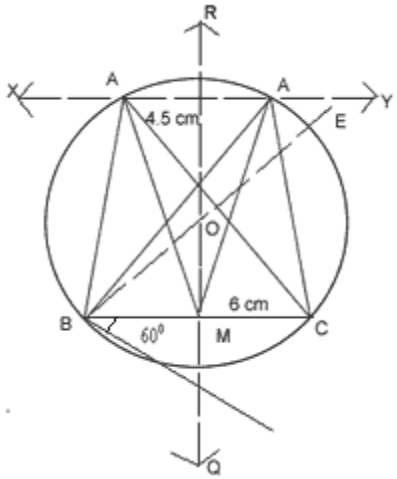
Step 2: Perpendicular bisector PQ of BC and RS of CA is constructed. They intersect at O.

Step 3: Taking O as centre and OC as a radius circle is drawn which passes through A, B and C.

Construction 9.

Construct a triangle ABC in which BC = 6cm, $\angle A = 60^0$ and the attitude through A is 4.5cm. Measure the length of median through A. Write the steps of construction.

Procedure



Step 1: BC = 6cm is drawn and $\angle CBP = 60^0$ is made downwards with BC of any length.

Step 2: $\angle PBE = 90^0$ is drawn

Step 3: Perpendicular bisector RQ of BC is drawn which cut BC at M. and intersect BE at O.

Step 4: Taking O as centre and OB as radius, a circle is drawn.

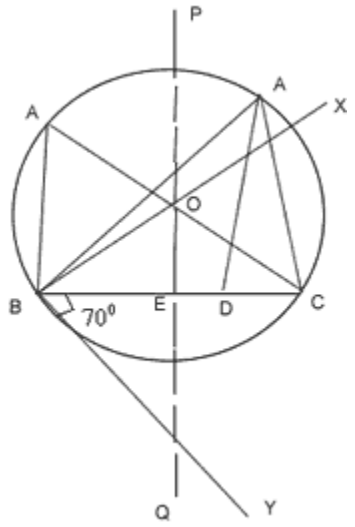
Step 5: ML = 4.5cm is cut from RQ.

Step 6: A line XY, parallel to BC is drawn through L to intersect the circle at A and A'. AB, AC, A'B and A'C are joined.
ABC and A'BC are the required triangle
Medium AM = A'M = 5.5cm (app.)

Construction 10.

Construct a triangle ABC in which BC = 5cm, $\angle A = 70^0$ and median AD through A is of length 3.5cm. Also, determine the length of the altitude drawn from A on the side BC (Write the steps of construction also).

Procedure:-



Step 1: BC = 5cm is drawn and is constructed downwards.

Step 2: BX is drawn perpendicular to BY.

Step 3: Q is drawn perpendicular bisector if BC intersecting BX at O and cutting BC at E.

Step 4: Taking O as a centre and OB as radius, a circle is drawn.

Step 5: Taking E as centre and radius equal to 3.5cm, arc is drawn to cut the circle at A.

Step 6: AC and AB are joined

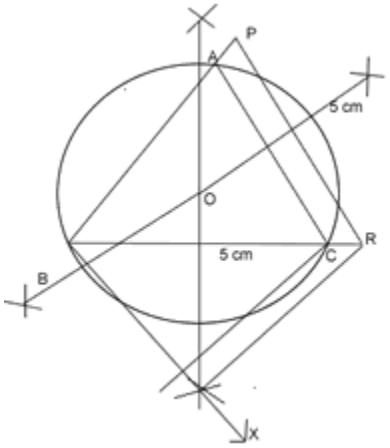
Step 7: AD is drawn perpendicular to BC from A to cut BC at D.

Step 8: By measuring we find that AD = 3cm.

Construction 11.

Construction a $\Delta ABC \sim$ to a equilateral ΔPQR with side 5cm such that each its sides is 6/7th of the corresponding side of ΔPQR Also draw the circumcircle of ΔABC.

Procedure:-



Step 1: A ray QX is drawn making any angle with QR and opposite to P.

Step 2: Starting from Q, seven equal line segments QQ_1, Q_1R_2, Q_2Q_3, Q_3Q_4, Q_4Q_5, Q_5Q_6, Q_6Q_7 are cut of from QX.

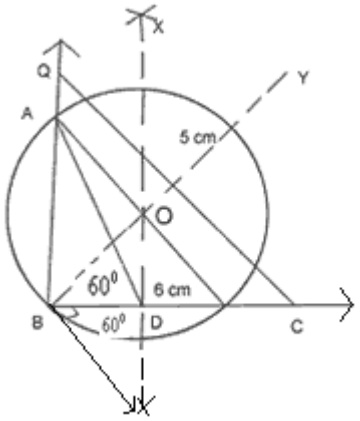
Step 3: RQ_7 is joined and a line CQ_6 is drawn parallel to RQ_4 to intersect QR at C.

Step 4: Line CA is drawn parallel to PR.
ABC is the required triangle.

Construction 12.

Construct a triangle ABC in which BC = 6cm, $\angle A = 60^0$ and median AD = 5cm. Also construct another triangle BPQ similar to triangle BCA such that the side BP = 3/2BC.

Procedure:-



Step 1: A line segment BC of length 6cm is drawn.

Step 2: At B, $\angle CBX = 60^0$ is drawn on downwards.

Step 3: At B, $BY \perp BX$ is drawn

Step 4: Perpendicular bisector of BC is drawn which intersect BY at O and BC at D.

Step 5: Taking O as a center and OB as a radius a circle passing through B and C is drawn.

Step 6: Taking D as a centre and radius 5cm an arc is drawn to intersect the circle at A.

Step 7: AB and AC are joined. The required triangle is ABC.

Step 8: Taking C as centre and CD as radius an arc is drawn to intersect BC produced at P such that BP = 3/2BC.

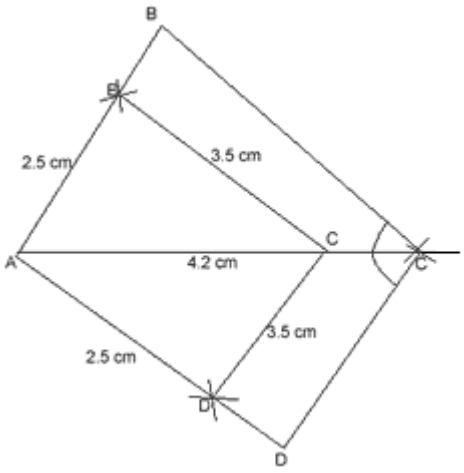
Step 9: Through P, PQ is drawn parallel to CA meeting BA produced at Q.

Step 10: BPQ is the required triangle similar to triangle BCA.

Construction 13.

Construct a quadrilateral ABCD in which AB = 2.5cm, BC = 3.5cm, AC = 4.2cm, CD = 3.5cm and AD = 2.5cm. Construct another quadrilateral AB'C'D' with diagonal AC' = 6.3cm such that it is similar to quadrilateral ABCD.

Procedure



Step 1: A line segment Ac = 4.2cm is drawn.

Step 2: With A as a centre and radius 2.5cm, two arcs, one above AC and one below AC are drawn.

Step 3: With C as centre and radius 3.5cm, two arcs arc drawn intersecting previous arcs at B and D./li>

Step 4: AB, AD, BC and CD are joined ABCD is the required quadrilateral.

Step 5: Taking A as a centre and radius 6.3cm an arc is drawn to intersect AC produced at C'.

Step 6: Through C', C'B' and C'D' are drawn parallel to CB and CD respectively. AB'C'D' is the required quadrilateral similar to ABCD.