Constructions

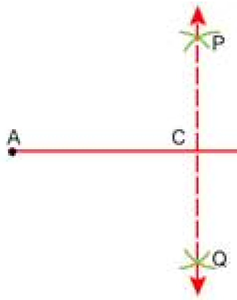
Dividing a Line Segment

Division of a Line Segment

1) Bisecting a Line Segment

Step 1: With a radius more than half the length of the line-segment, draw arcs centred at either **ends** of the line segment so that they intersect on either **sides** of the line segment.

Step 2: Join the points of intersection. The line segment is bisected by the line segment joining the points of intersection.



PQ is the perpendicular bisector of AB

2) Given a line segment AB, divide it in the ratio **m:n**, where both m and n are positive integers.

Suppose we want to divide AB in the ratio 3:2 (m=3, n=2)

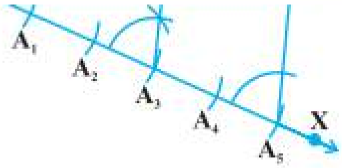
Step 1: Draw any ray $\overrightarrow{AX}$, making an acute angle with $\overline{AB}$.

Step 2: Locate 5 (= m + n) points A_1, A_2, A_3, A_4 *and* A_5 on AX such that $AA_1 = A_1A_2 = A_2A_3 = A_3A_4 = A_4A_5$

Step 3: Join BA_5. $(A_{(m+n)} = A_5)$

Step 4: Through the point $A_3 (m = 3)$, draw a line parallel to BA_5 (by making an angle equal to $\angle AA_5B$) at A_3 intersecting AB at the point C.

Then, AC : CB = 3 : 2.

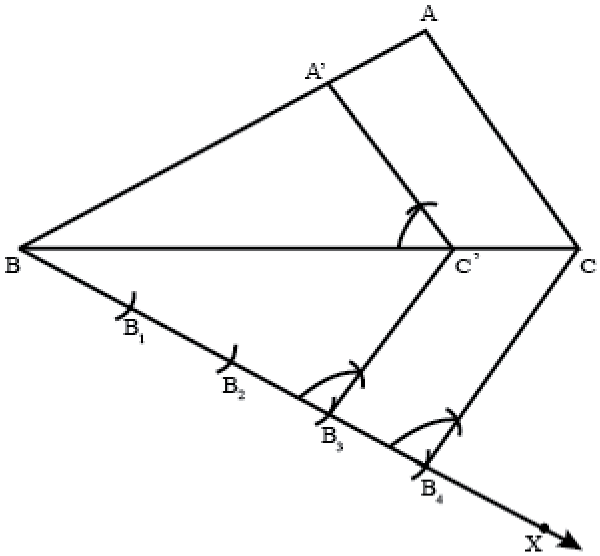


Division of a line segment

Constructing Similar Triangles

Constructing a Similar Triangle with a scale factor

Suppose we want to construct a triangle whose sides are $\frac{3}{4}$ times the corresponding sides of a given triangle



Caption

Step 1: Draw any ray $\overrightarrow{BX}$ making an acute angle with side $\overline{BC}$ (on the side opposite to the vertex A).

Step 2: Mark 4 consecutive distances(since the denominator of the required ratio is 4) on $\overline{BX}$ as shown.

Step 3: Join B_4C as shown in the figure.

Step 4: Draw a line through B_3 parallel to B_4C to intersect BC at C'.

Step 5: Draw a line through C' parallel to AC to intersect AB at A'. $\Delta A'BC'$ is the required triangle.

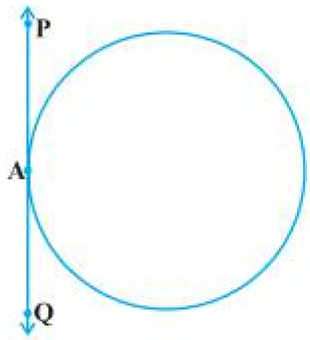
Same procedure can be followed when scale factor > 1.

Drawing Tangents to a Circle

Tangents: Definition

A **tangent** to a circle is a line which **touches the circle at exactly one point**.

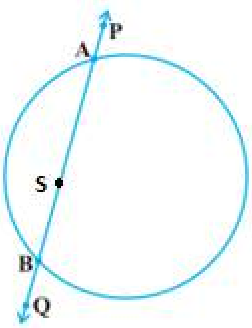
For every point on the circle, there is a unique tangent passing through it.



PQ is the tangent, touching the circle at A

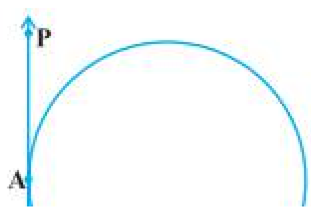
No. of Tangents to a circle from a given point

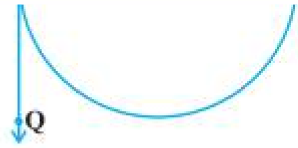
i) If the point in **interior region of the circle**, any line through that point will be a secant. So, **no tangent** can be drawn to a circle passing through a point lying inside it.



AB is a secant drawn through the point S

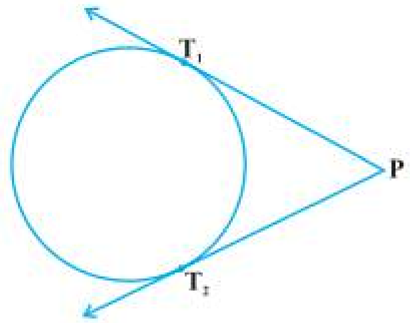
ii) There is **one and only one tangent** to a circle passing through a point lying **on the circle**.





PQ is the tangent touching the circle at A

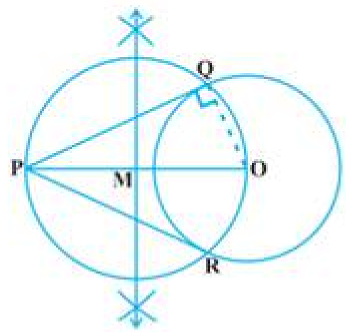
iii) There are **exactly two tangents** to a circle through a point lying **outside the circle.**



PT_1 and (\PT_2\) are tangents touching the circle at T_1 and T_2

Drawing tangents to a circle from a point outside the circle

To construct the tangents to a circle from a point outside it.



Consider a circle with center O and let P be the exterior point from which the tangents to be drawn.

Step 1: Join $\overline{PO}$ and bisect it. Let M be the midpoint of $\overline{PO}$.

Step 2: Taking M as centre and MO(or MP) as radius, draw a circle. Let it intersect the given circle at the points Q and R.

Step 3: Join PQ and PR

Step 3: $\overline{PQ}$ and $\overline{PR}$ are the required tangents to the circle.

Drawing Tangents to a circle from a point on the circle

To draw a tangent to a circle through a point on it.

Step 1: Draw the radius of the circle through the required point.
Step 2: Draw a line perpendicular to the radius through this point. This will be tangent to the circle.