

11. Constructions

INTRODUCTION : Construction is very important chapter of geometry. One of the aims of the studying construction is to acquire the skill of drawing figures accurately.

In the previous classes you have learn how to construct angles of 30° , 45° , 60° , 90° and 120° . You have also learn how to construct some geometrical figures like triangles, quadrilateral and circles, etc with the help of ruler and compass.

In this chapter, you will learn how to divide a line segment in a given ration (both internally and externally). You will also learn how to draw a triangle similar to a given triangle with some given scale and to draw tangents from an interior point to a circle.

DIVISION OF A LINE SEGMENT

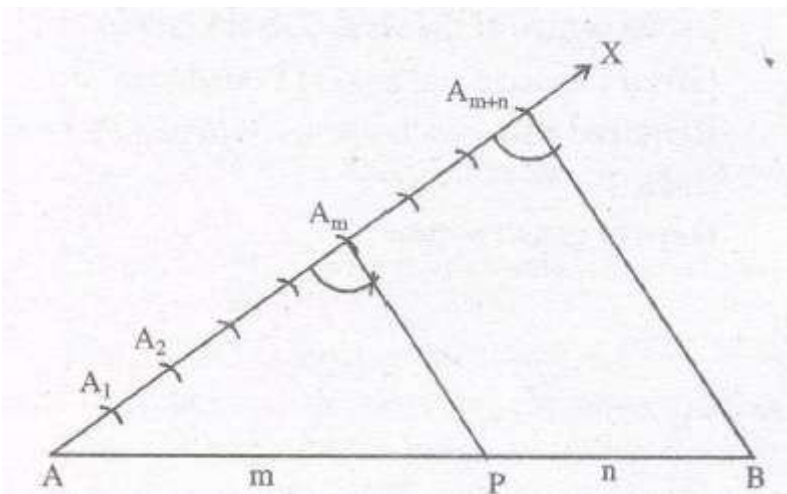
In order to divide a line segment internally in a given ratio $m : n$, where both m and n are positive integers, we follow the following steps :

Given : A line segment AB and a ratio $m : n$.

Required : To divide line segment AB in the ratio $m : n$.

Steps of construction :

- (i) Draw a line segment AB of given length by using a ruler
- (ii) Draw any ray AX making a suitable acute angle with AB.
- (iii) Along AX draw $(m + n)$ arcs intersecting the rays AX at $A_1, A_2, \dots, A_m, A_{m+1}, \dots, A_{m+n}$ such that $AA_1 = A_1A_2 = \dots = A_{m+n-1}A_{m+n}$



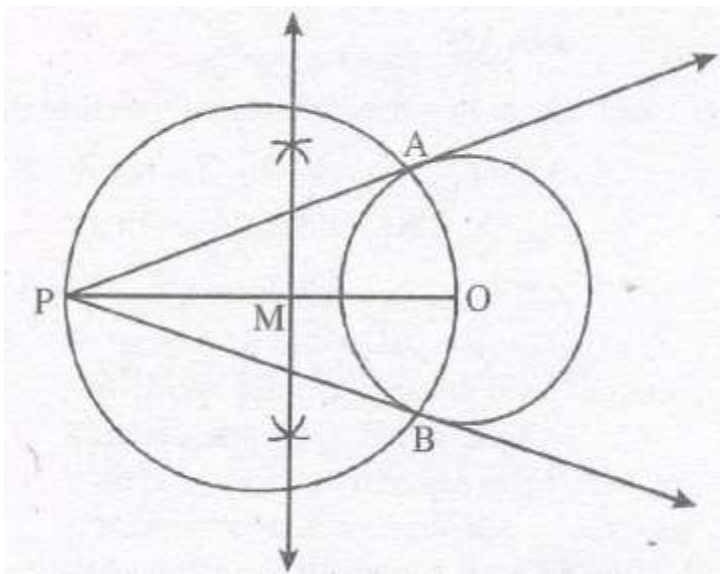
(iv) Join $B A_{m+n}$

(v) Through the point A_m draw a line parallel to $A_{m+n} B$ by making' $\angle AA_m P = \angle AA_{m+n} B$. Suppose this line meets AB at point P . The point P so obtained is the required point which divides AB internally in the ratio $m: n$.

TO DRAW TANGENTS TO A CIRCLE FROM A POINT OUTSIDE IT, WHEN CENTRE OF THE CIRCLE IS KNOWN:

Given : A circle with centre O and a point P outside it.

Required : To construct the tangents to the circle from point P .



Steps of construction :

(1) Join OP and bisect it. Let M be the mid-point of OP .

(ii) Taking M as centre and MO as radius, draw a circle to intersect the given circle in two points, say A and B .

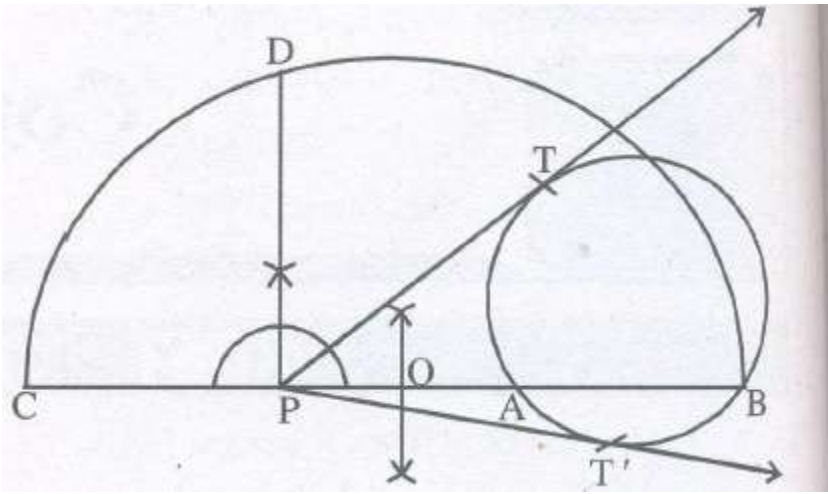
(iii) Draw rays PA and PB .

Ray PA and PB are the required tangents from P to given circle.

To draw tangents to a circle from a point outside it (when centre of the circle is not known)

Given : A circle and a point P outside it.

Required : To draw tangents from point P to the circle.

Steps of construction :

- (i) Draw a secant PAB to intersect the circle at two points A and B.
- (ii) Produce AP to a point C, such that $PA = PC$.
- (iii) With BC as a diameter, draw a semi-circle.
- (iv) Draw $PD \perp CB$, intersecting the semi-circle drawn in step (iii) at D.
- (v) Taking PD as radius and P as centre, draw arcs to intersect the given circle at T and T'.
- (vi) Draw rays PT and VT'. Rays PT and PT' are the required tangents.