

# Constructions Guided Notes

## Constructions

In Geometry "**Construction**" means to draw shapes, angles or lines accurately.

**Constructions:** The drawing of various lines, angles, and shapes using only pencil, compasses and straightedge. There are no numbers involved. No measurement of lengths or angles is allowed.

**Use of Construction:** It is useful to draw lines and angles without measuring anything.

### Tools needed for construction:

Constructions use only pencil, compass, and a straightedge.

**Pencil:** A pencil is a writing medium having narrow construction with a solid pigment inside. Pencil creates marks that can be easily erased by an eraser.

**Compasses:** Compasses are a drawing instrument used for drawing circles and arcs. It has two legs, one with a point and the other with a pencil. Distance between the point and the pencil can be adjusted according to need.

**Straightedge:** A straightedge is simply a guide for the pencil when drawing straight lines. Straightedge is the basic form of geometric construction which has no numbers. Most common straight edge is ruler.

### Geometric Constructions

There are **seven** basic geometric constructions.

1. Bisect a line segment.
2. Construct congruent segments
3. Construct a line perpendicular to a given line through a point on the line.
4. Construct a line perpendicular to a given line through a point not on the line.
5. Construct a line parallel to a given line through a point not on the line.
6. Construct a Congruent angle.
7. Construct an angle bisector.

Other geometric shapes such as **equilateral triangles or right triangles** can be constructed using above seven basic constructions.

#### 1. Bisect a line segment

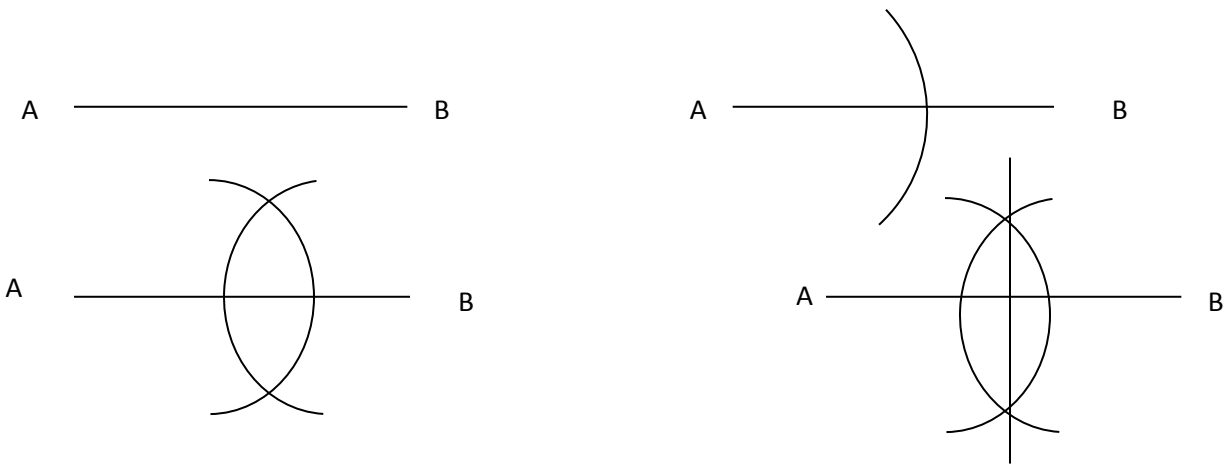
**Step1.** Draw a line

**Step2.** With compass set more than half the length and draw an arc with center A.

**Step3.** With compass set another arc with center B such as two arcs meet each other.

**Step4.** Join the intersection points of arcs with straightedge; this line bisects the line AB.

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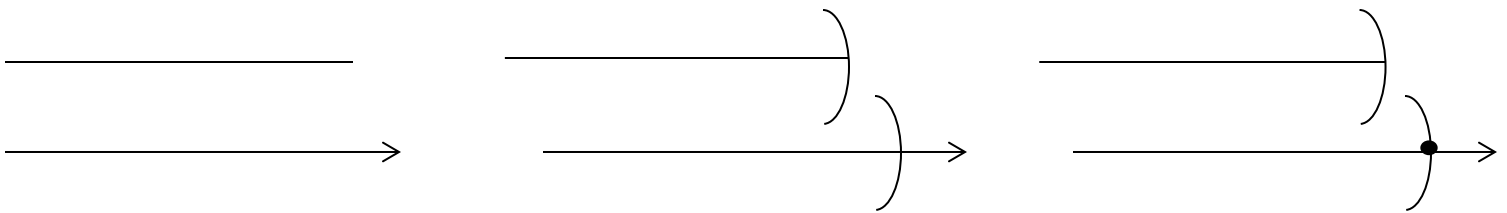
## 2. Construct congruent segments

**Step1.** Draw a ray.

**Step2.** Through compass measure the length of the original line segment.

**Step3.** Mark the length on the ray.

**Step4.** To make a congruent line segment mark the intersection of the arc and ray.



## 3. Construct a line perpendicular to a given line through a point on the line.

**Step1.** Draw a Line segment

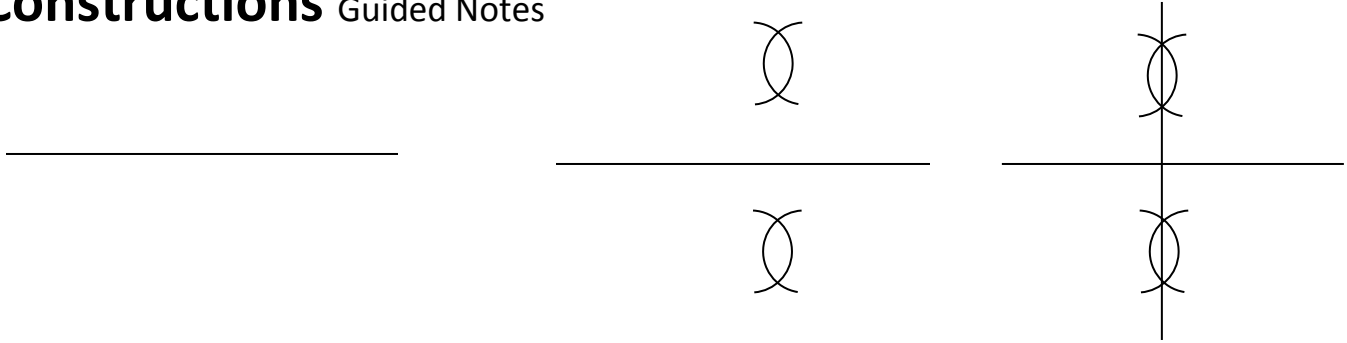
**Step2.** With compass set more than half the length of line segment.

**Step3.** Put the point of the compass on one end of the segment and construct an arc above or below the segment.

**Step4.** With same measure of compass put the point of the compass on the other end of the segment and construct an arc above or below the segment.

**Step5.** Draw a segment connecting the intersection of the arcs.

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## 4. Construct a line perpendicular to a given line through a point not on the line.

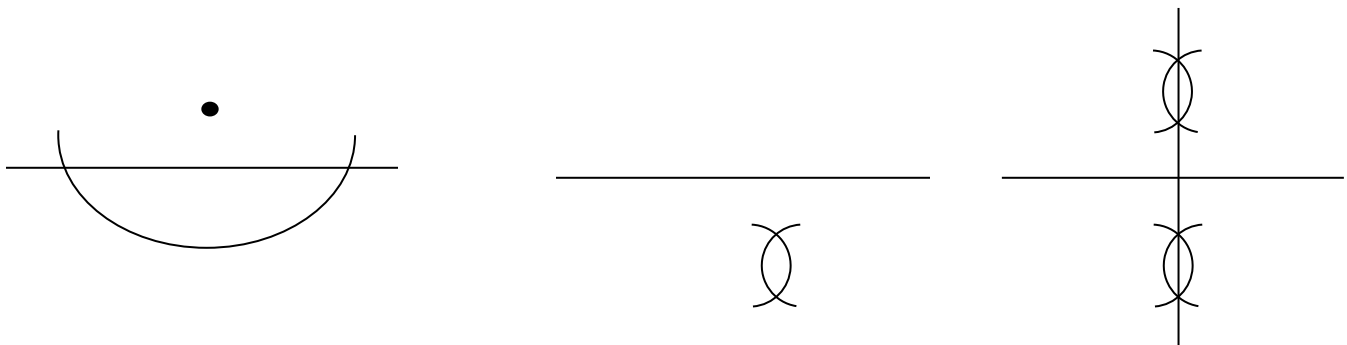
**Step1** – Put the point of the compass on the point and construct an arc crossing the line twice once on each side of the point. Construct a perpendicular bisector of the line segment.

**Step2.** With compass set more than half the length of line segment.

**Step3.** Put the point of the compass on one end of the segment and construct an arc above or below the segment.

**Step4.** With same measure of compass put the point of the compass on the other end of the segment and construct an arc above or below the segment.

**Step5.** Draw a segment connecting the intersection of the arcs.



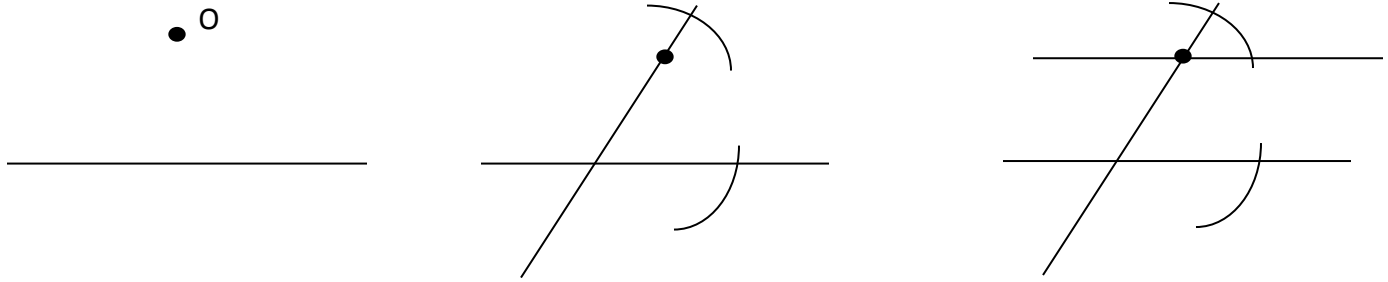
## 5. Construct a line parallel to a given line through a point not on the line.

**Step1.** Draw any line through point O that meets the line.

**Step2.** Copy the angle at point P on the other side of the line drawn with vertex O.

**Step3.** Extend the side of the new angle through O that will give parallel line.

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## 6. Construct a Congruent angle.

**Step1.** Draw a ray.

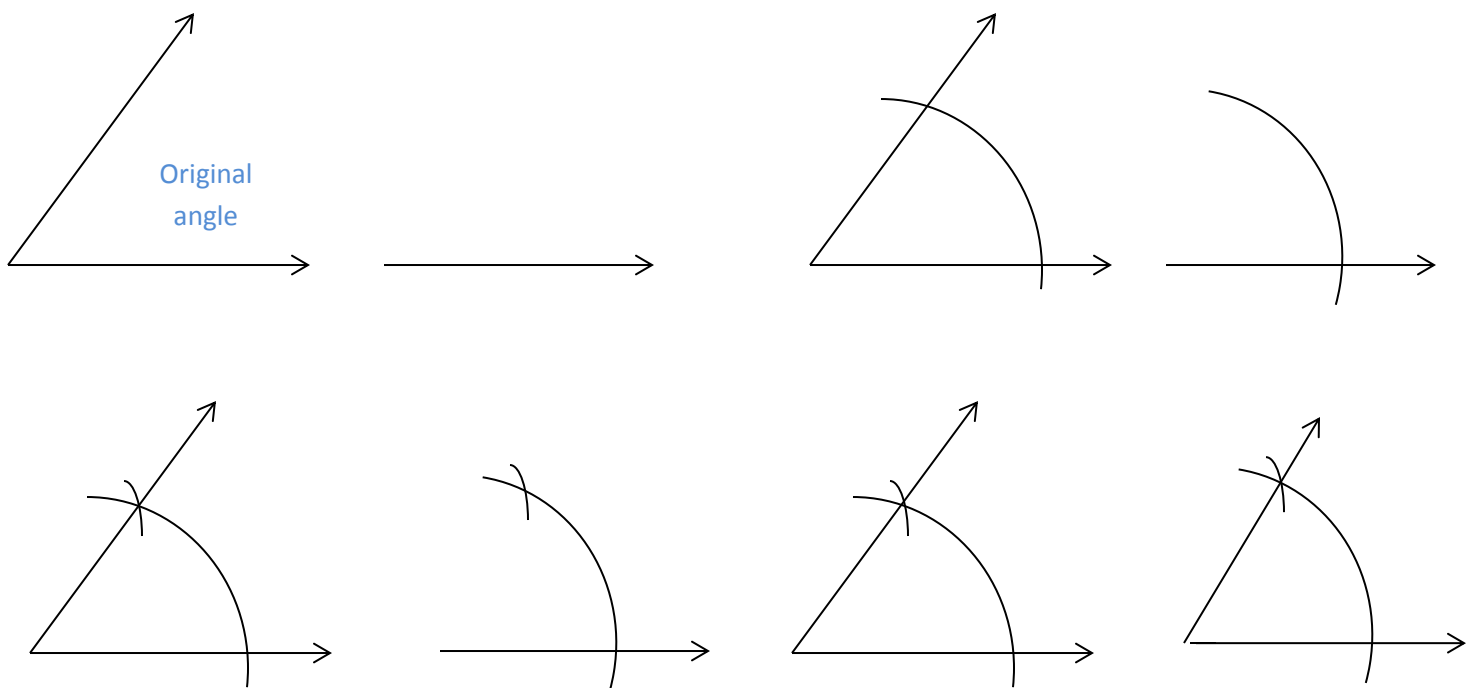
**Step2.** Construct an arc on the original angle with the vertex of the angle A.

**Step3.** With the same measure of compass, construct the same arc on the ray putting the point of the compass on the point B of ray.

**Step4.** Measure the width of the original angle using the compass.

**Step5.** With the same measure of compass, mark width on ray.

**Step6.** Join the mark with point B.



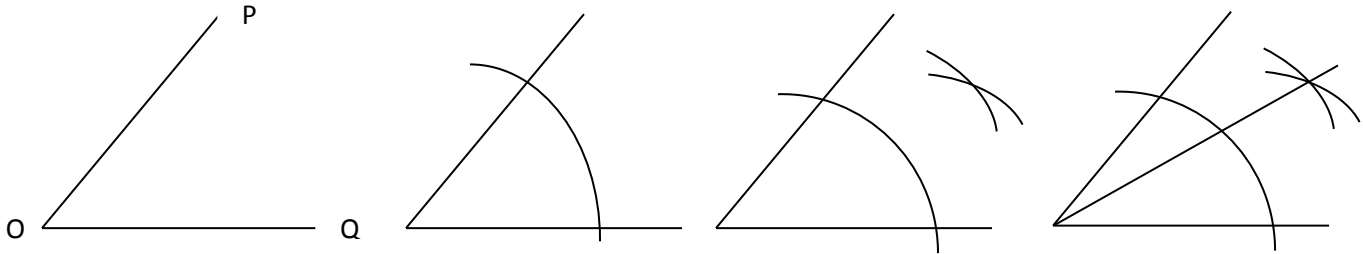
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## 7. Construct an angle bisector.

**Step1.** Draw an arc with center O of any radius.

**Step2.** Draw an arc with center P of any radius greater than half of PQ. Repeat this with center Q using same radius such as arc crosses.

**Step3.** Join O to the point where arc crosses.



### EXERCISE

1. Write steps to bisect an angle.
2. Write steps to construct a parallel line through point.