

In class we found there is a minimum number of requirements necessary for proving two triangles are congruent. Specifically, we showed two triangles are congruent if:


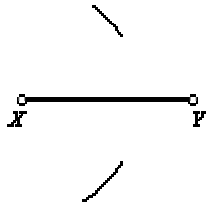
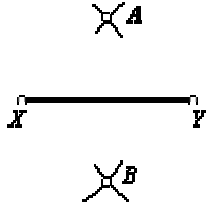
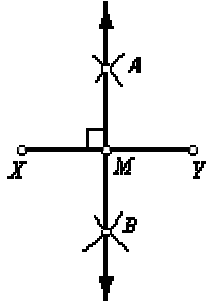
- a) the three sides of one triangle are congruent to the 3 sides of the other triangle (SSS)
- b) two sides and an included angle of one triangle are congruent to two sides and an included angle of the other triangle (SAS)
- c) two angles and an included side of one triangle are congruent to two angles and an included side of the other triangle (ASA).

The basic compass and straightedge constructions studied at the beginning of the semester can be justified—frequently using congruent triangles. In class we justified that the construction for bisecting an angle does indeed give 2 congruent angles (because we showed that congruent triangles were constructed). YOU SHOULD REVIEW THIS JUSTIFICATION.

Shown below are the steps for constructing the perpendicular bisector of a line segment (taken from the website <http://whistleralley.com/construction/reference.htm>). Your task is to explain why these steps make M the midpoint of segment XY and make angle AMX (or AMY or XMB or YMB) right angles. By performing the steps, are any congruent triangles constructed? Which ones? How do you know? And if you have congruent triangles, what conclusions can you make?

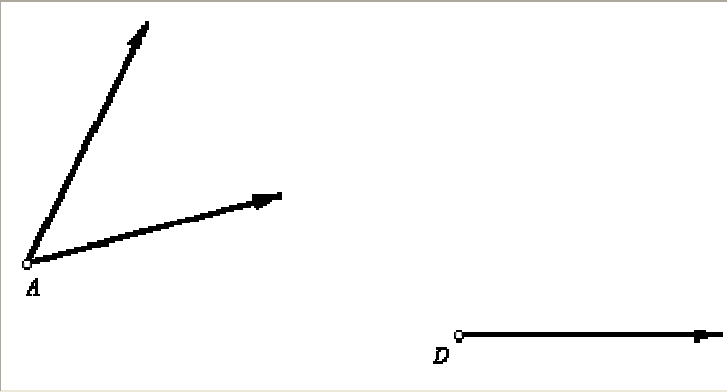
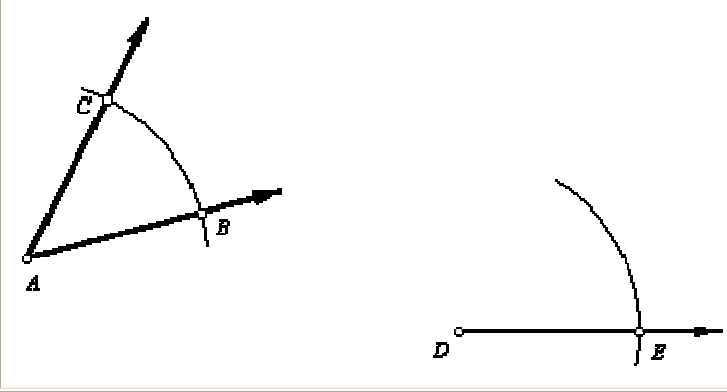
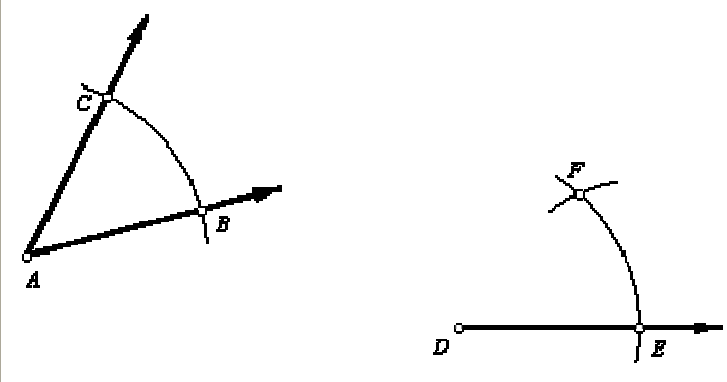
Construction 1: Construct the perpendicular bisector of a line segment.

Or, construct the midpoint of a line segment.

1. Begin with line segment XY .	
2. Place the compass at point X . Adjust the compass radius so that it is more than $(1/2)XY$. Draw two arcs as shown here.	
3. Without changing the compass radius, place the compass on point Y . Draw two arcs intersecting the previously drawn arcs. Label the intersection points A and B .	
4. Using the straightedge, draw line AB . Label the intersection point M . Point M is the midpoint of line segment XY , and line AB is perpendicular to line segment XY .	

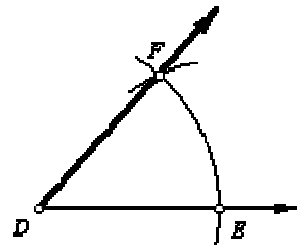
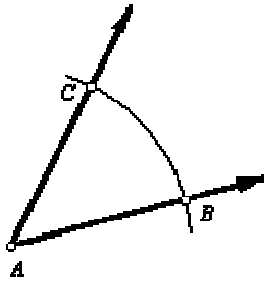
Consider the following construction. How do you know the construction guarantees angle EDF is congruent to angle BAC ?

Construction 5: Construct an angle congruent to a given angle.

<p>1. To draw an angle congruent to angle A, begin by drawing a ray with endpoint D.</p>	
<p>2. Place the compass on point A and draw an arc across both sides of the angle. Without changing the compass radius, place the compass on point D and draw a long arc crossing the ray. Label the three intersection points as shown.</p>	
<p>3. Set the compass so that its radius is BC. Place the compass on point E and draw an arc intersecting the one drawn in the previous step. Label the intersection point F.</p>	

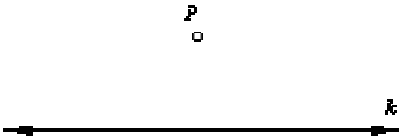
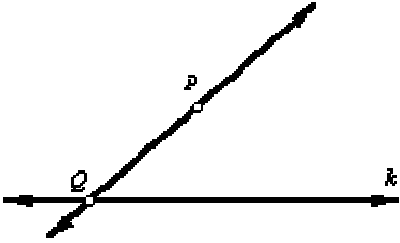
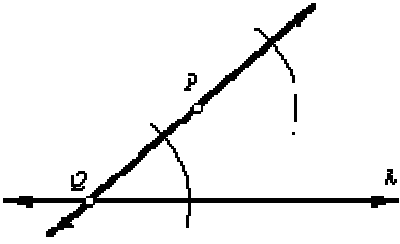
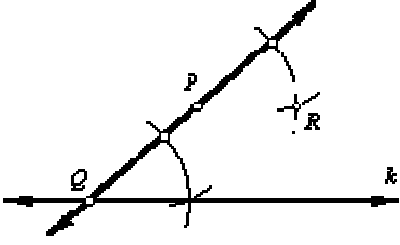
4. Use the straightedge to draw ray DF .

Angle EDF is then congruent to angle BAC



Explain why the construction below guarantees line PR is parallel to line k .

Construction 6: *Given a line and a point, construct a line through the point, parallel to the given line.*

1. Begin with point P and line k .	
2. Draw an arbitrary line through point P , intersecting line k . Call the intersection point Q . Now the task is to construct an angle with vertex P , congruent to the angle of intersection.	
3. Center the compass at point Q and draw an arc intersecting both lines. Without changing the radius of the compass, center it at point P and draw another arc.	
4. Set the compass radius to the distance between the two intersection points of the first arc. Now center the compass at the point where the second arc intersects line PQ . Mark the arc intersection point R .	
5. Line PR is parallel to line k .	