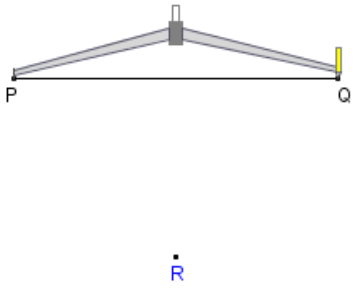
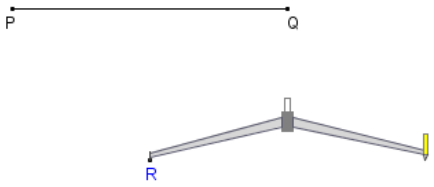
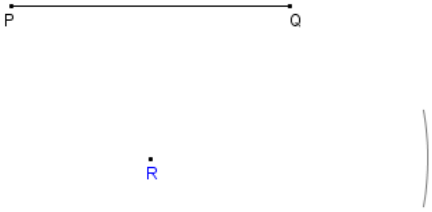
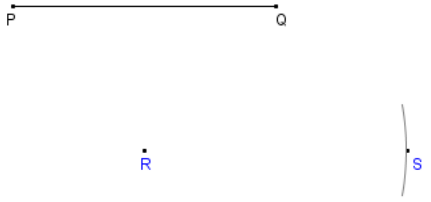
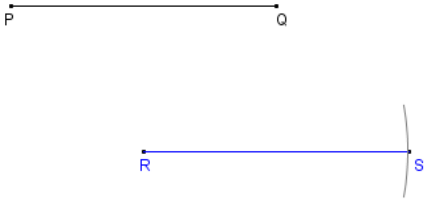
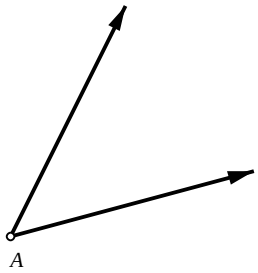
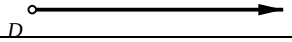
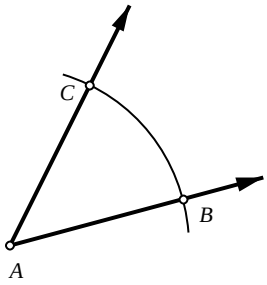
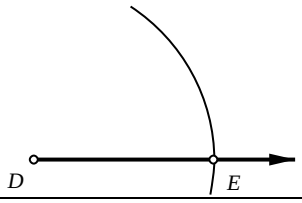
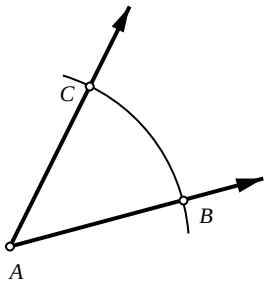
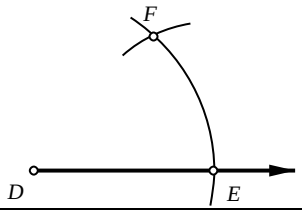
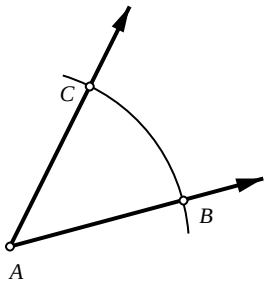
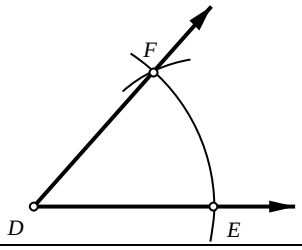
Geometry ~ Day 22, 3/2/2017 **Constructions Day 1 ~ NOTES**

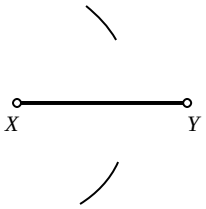
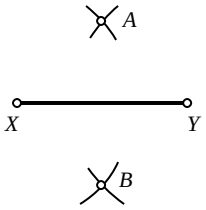
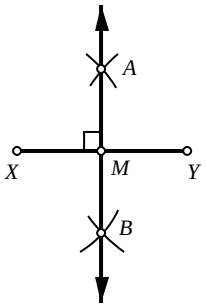
Challenge #1: Copy a Segment

1. Set the compass point on the point P of the line segment to be copied. Adjust the compass width to the point Q. The compass width is now equal to the length of the line segment PQ.	
2. Without changing the compass width, place the compass point on point R.	
3. Without changing the compass width, Draw an arc roughly where the other endpoint will be.	
4. Pick a point S on the arc that will be the other endpoint of the new line segment.	
5. Draw a segment from R to S.	

Challenge #2: Copy an Angle

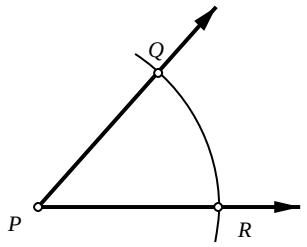
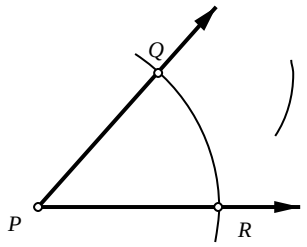
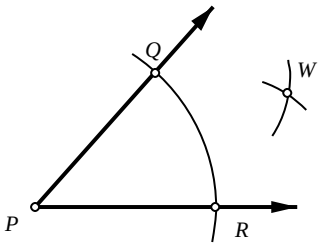
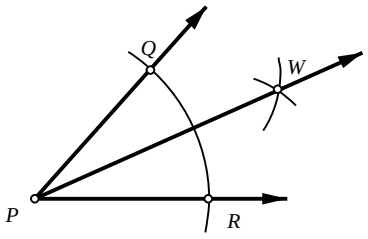
1. To draw an angle congruent to $\angle A$, begin by drawing a ray with endpoint D.	 
2. Place the compass on point A and draw an arc across both sides of the angle. Without changing the compass radius, place the compass on point D and draw a long arc crossing the ray. Label the three intersection points as shown.	 
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.	 
4. Use the straightedge to draw ray DF. $\angle EDF \cong \angle BAC$	 

Challenge #3: Bisect a Segment (Find midpoint of segment)

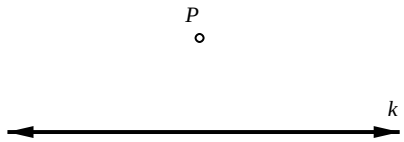
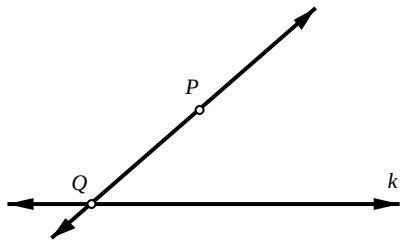
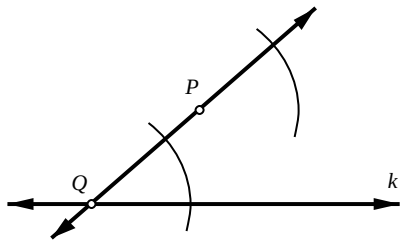
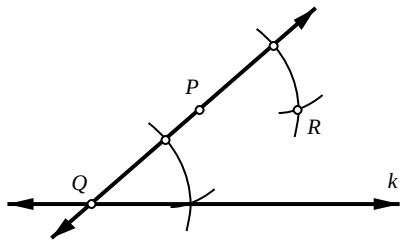
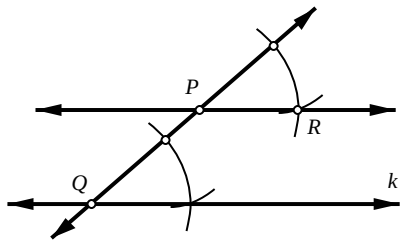
1. Begin with line segment *XY*.	
2. Place the compass at point *X*. Adjust the compass radius so that it is more than (½)*XY*. Draw two arcs as shown here.	
3. Without changing the compass radius, place the compass on point *Y*. Draw two arcs intersecting the previously drawn arcs. Label the intersection 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*.	

Challenge #4: Construct Perpendicular Bisector of a Segment (Based on Challenge #3)

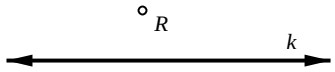
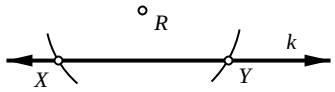
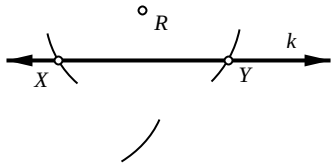
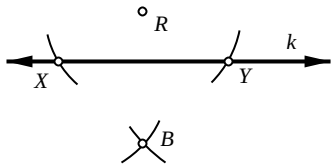
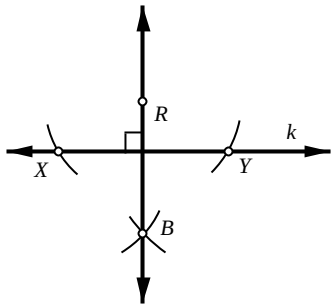
Challenge #5: Bisect an Angle

1. Let point *P* be the vertex of the angle. Place the compass on point *P* and draw an arc across both sides of the angle. Label the intersection points *Q* and *R*.	
2. Place the compass on point *Q* and draw an arc across the interior of the angle.	
3. Without changing the radius of the compass, place it on point *R* and draw an arc intersecting the one drawn in the previous step. Label the intersection point *W*.	
4. Using the straightedge, draw ray *PW*. This is the bisector of $\angle QPR$.	

Challenge #6: Construct a Line Parallel to another Line through a Given Point

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*.	

Challenge #7: Construct a Line Perpendicular to another Line through a Given Point

1. Begin with point line *k* and point *R*, not on the line.	
2. Place the compass on point *R*. Using an arbitrary radius, draw arcs intersecting line *k* at two points. Label the intersection points *X* and *Y*.	
3. Place the compass at point *X*. Adjust the compass radius so that it is more than (½)*XY*. Draw an arc as shown here.	
4. Without changing the compass radius, place the compass on point *Y*. Draw an arc intersecting the previously drawn arc. Label the intersection point *B*.	
5. Use the straightedge to draw line *RB*. Line *RB* is perpendicular to line *k*.