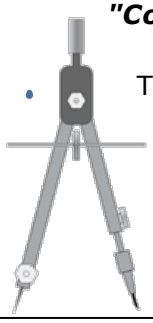
CCSS Geometry Name:_____

G8: Constructions, The Basics Date:_____



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

These constructions use **only** compass, straightedge (i.e. ruler) and a pencil.

This is the "pure" form of geometric construction: no numbers involved!

Constructions Basics:

1. Draw a circle using only a compass.
   Step 1: Use your pencil to make a point in the space to the right.
   Step 2: Adjust your compass so that your pencil will still be inside the box when the sharp point is on the point you made in Step 1.
   Step 3: Spin the compass around to make a circle with the pencil end, while keeping the sharp point of the compass on the center.

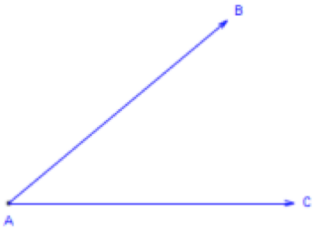
Draw a circle:

2. Copy a line segment. Use Line PQ in the box to the right to copy.
   Step 1: Mark a point R that will be one endpoint of the new line segment.
   Step 2: Set the compasses' point on the point P of the line segment to be copied.
   Step 3: Adjust the compasses' width to the point Q. The compasses' width is now equal to the length of the line segment PQ.
   Step 4: Without changing the compasses' width, place the compasses' point on the the point R on the line you drew in step 1.
   Step 5: Without changing the compasses' width, Draw an arc roughly where the other endpoint will be.
   Step 6: Pick a point S on the arc that will be the other endpoint of the new line segment.
   Step 7: Draw a line from R to S.

Copy line segment PQ

3. Copy an angle. Use angle BAC in the box to the right to copy.
   Step 1: Make a point P that will be the vertex of the new angle.
   Step 2: From P, draw a ray PQ. This will become one side of the new angle. This can go in any direction and be any length inside the box.
   Step 3: Place the compasses on point A, set to any convenient width.
   Step 4: Draw an arc across both sides of the angle. Label the points J and K where arc intersects AB and AC.
   Step 5: Without changing the compasses' width, place the compasses' point on P and draw a similar arc there, making point M the intersection.
   Step 6: Set the compasses on K and adjust its width to point J.
   Step 7: Without changing the compasses' width, move the compasses to M and draw an arc across the first one, creating point L where they cross.
   Step 8: Draw a ray PL from P through L and onwards a little further. The exact length is not important. You have now copied angle BAC.

Copy angle BAC

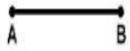


Construction Basics, continued:

4. Double a line segment

   Step 1: Mark a point C in the middle of the box below line AB.
   Step 2: Set the compasses' point on the point A of the line segment to be doubled (AB).
   Step 3: Adjust the compasses' width to the point B. The compasses' width is now equal to the length of the line segment AB.
   Step 4: Without changing the compasses' width, place the compasses' point on the the point C you drew in step 1.
   Step 5: Without changing the compasses' width, draw a circle around point C.
   Step 6: Place a point D anywhere on the circle.
   Step 7: Draw a straight line (using a straight edge) from point D, through point C (the center) to the opposite side of the circle.
   Step 8: Place point E at the end of the line segment you just made.
   Step 9: Line segment DE is now twice as long as line segment AB.

Double line segment PQ



5. Create a perpendicular bisector of a line

   Step 1: Place the compass at one end of line CD.
   Step 2: Adjust the compass to slightly longer than half the line length.
   Step 3: Draw arcs above and below the line.
   Step 4: Keeping the same compass width, draw arcs from other end of line.
   Step 5: Place ruler where the arcs cross, and draw the line. This line is perpendicular to CD, and bisects it.

Perpendicular bisector of CD

6. Bisect an angle

   Step 1: Place the compasses' point on the angle's vertex Q.
   Step 2: Adjust the compasses to a medium wide setting. The exact width is not important.
   Step 3: Without changing the compasses' width, draw an arc across each leg of the angle.
   Step 4: Place the compasses on the point where one arc crosses a leg and draw an arc in the interior of the angle. (Note: you can either change the compass width or not in this step)
   Step 5: Without changing the compasses setting repeat for the other leg so that the two arcs cross.
   Step 6: Using a straightedge or ruler, draw a line from the vertex to the point where the arcs cross. The line you just drew bisects angle PQR.

Bisect angle PQR