.OMETRY CONSTRUCTIONS Name Key

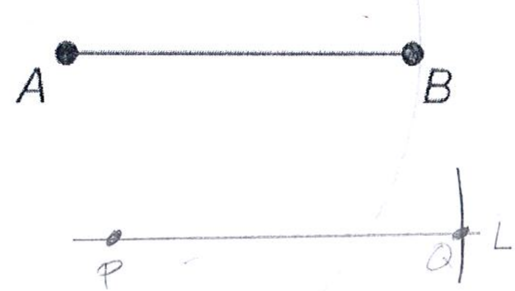
I DO. *We DO,* YOU DO: CONSTRUCTIONS

I DO: Sit back, relax, and watch how to construct a copy of a segment

We DO: Follow along and perform the same steps

YOU DO:

1. Use a straightedge to draw a line, L.
2. Choose a point on line L and label it point P.
3. Place the point of a compass on point A.
4. Adjust the compass width to the length of $\overline{AB}$.
5. Without changing the compass, place the compass point on point P and draw an arc intersecting line L. Label the point of intersection as point Q.
6. PQ ≅ AB



But WHY does it work? ("...it just does" doesn't work! I need reasons!)

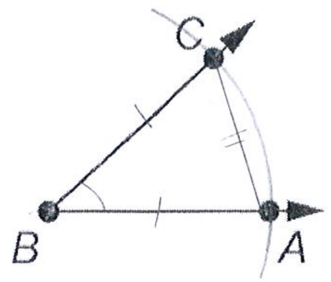
What shape does the compass make? Circle

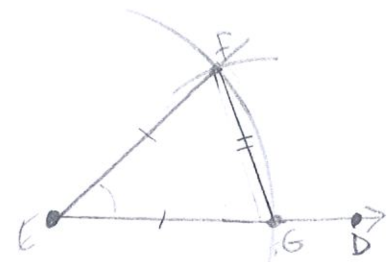
So, what is another name for the length $\overline{AB}$? radius

We can say PQ ≅ AB because they are both radii of congruent circles

I DO: Sit back, relax, and watch how to construct a copy of an angle

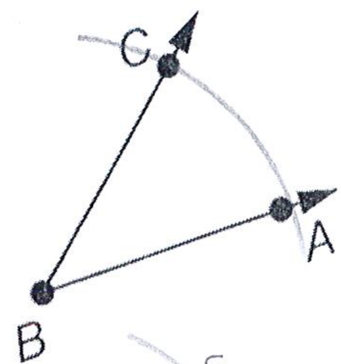
We DO: Follow along and perform the same steps

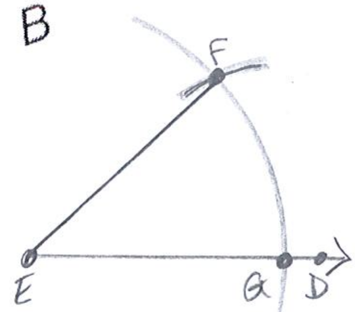




YOU DO:

1. Draw a new ray, $\overrightarrow{ED}$, to be the base of our new angle.
2. Place the point of a compass on vertex B and extend to the length of BA.
   - draw an arc through points A and C
3. Without changing the compass, place the compass point on point E, and draw an arc that intersects ED. Mark the intersection on line ED as point G.
4. Place the compass point on point A and adjust its width to point C.
5. Without changing the compass width, place the compass point on point G and draw another arc across the first arc. Label the point where both arcs intersect as point F.
6. Use a straightedge to connect points E and F.
7. $\angle DEF \cong \angle ABC$





But why does that work??

If we continued drawing ~~$\overline{CB}$~~ $\overset{\frown}{CA}$ and ~~$\overline{EF}$~~ $\overset{\frown}{FG}$ using our compass, what shape would we create?

Circles

How do we know these 2 shapes are equal?

Same radii

So what kind of angle is $\angle ABC$ and $\angle GEF$?

congruent angles

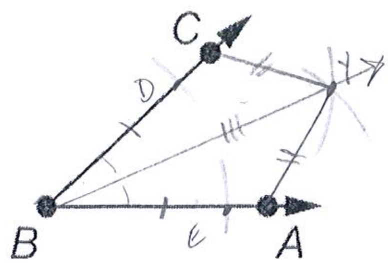
We measured $\overline{CB}$ and $\overline{EF}$ using our compass, so we know they are the same distance. But how does that help us knowing $\angle ABC$ is equal to $\angle GEF$? Explain using your knowledge about congruent triangles.

$\triangle BCA \cong \triangle EFG$ by SSS

$\overline{CA} \cong \overline{FG}$

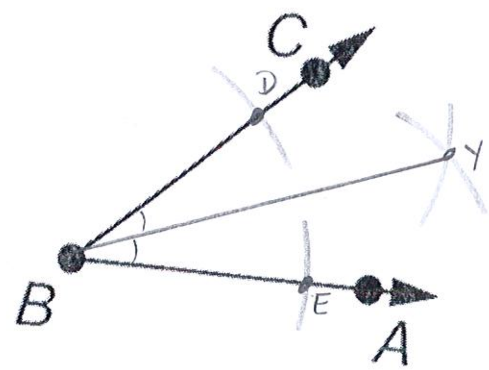
I DO: Sit back, relax, and watch how to construct an angle bisector

We DO: Follow along and perform the same steps



YOU DO:

1. Place the point of a compass on vertex B.
2. Open the compass and draw an arc that crosses both sides of the angle.
Label these intersections D & E
3. Set the compass width to more than half the distance from point B to point D/E. Place the compass point on D and draw an arc in the angle's interior.
4. Without changing the compass width, place the compass point on E and draw an arc so that it crosses the previous arc. Label the intersection point Y.
5. Using a straightedge, draw a ray from vertex B through point Y.
6. $\angle ABY \cong \angle YBC$.



But how does that work??

with your ruler, measure $\overline{BD}$, $\overline{BE}$, $\overline{DY}$, $\overline{EY}$, and $\overline{BY}$

Answers will vary but

$\overline{BD} =$ } congruent

$\overline{BE} =$

$\overline{DY} =$ congruent

$\overline{EY} =$

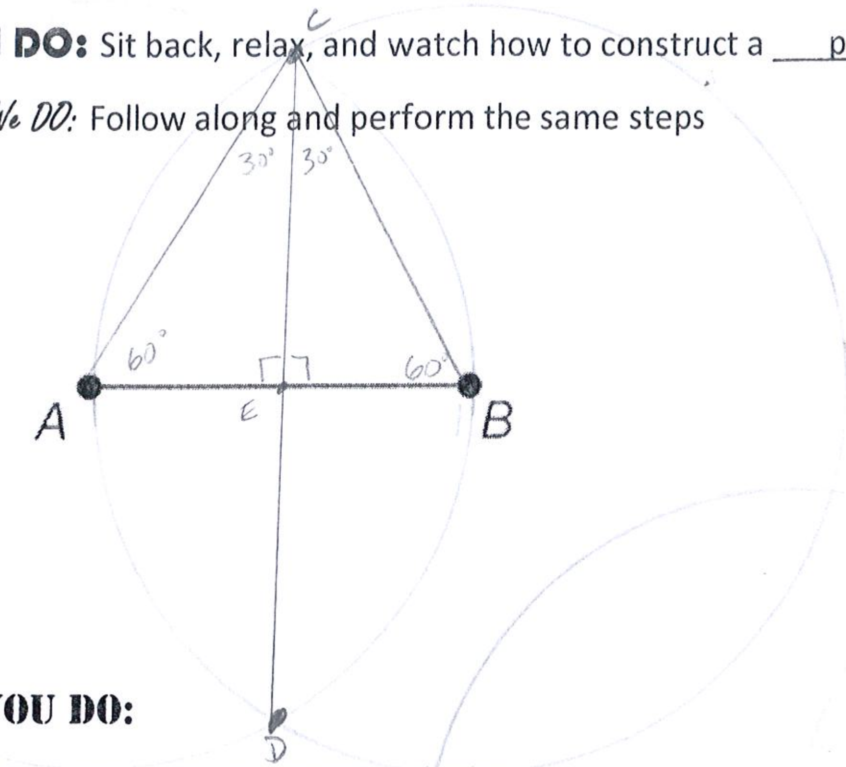
$\overline{BY} =$ $\overline{BY}$ by reflexive property

What do you notice about triangle BDY and triangle BEY?

They are congruent by SSS so $\measuredangle CBY \cong \measuredangle ABY$ by CPCTC

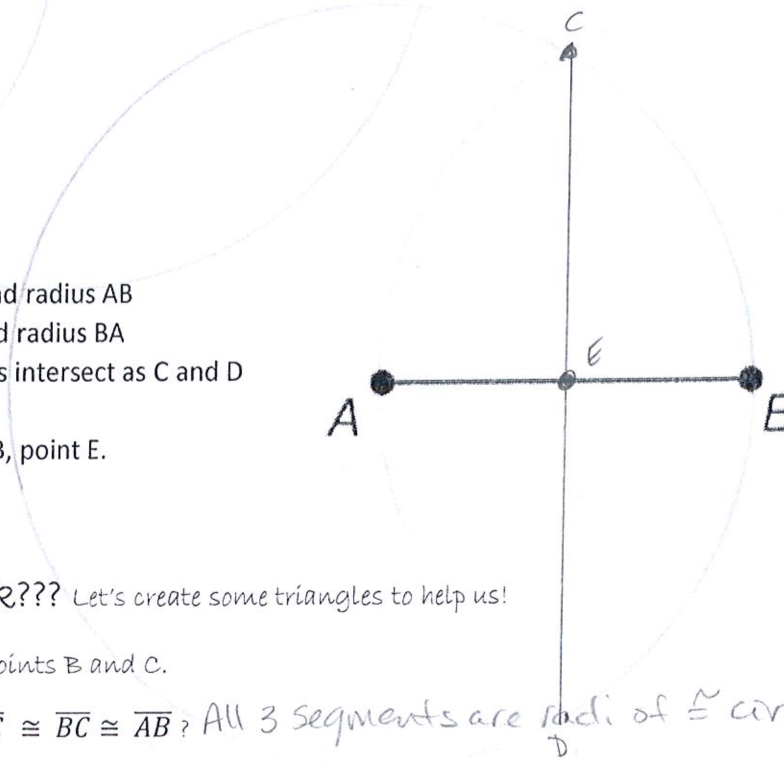
I DO: Sit back, relax, and watch how to construct a perpendicular bisector

We DO: Follow along and perform the same steps



YOU DO:

1. Construct a circle with center A, and radius AB
2. Construct a circle with center B and radius BA
3. Label the points where the 2 circles intersect as C and D
4. Connect points C and D.
5. Label the intersection of CD and AB, point E.



BUT WHY does that work??? Let's create some triangles to help us!

Connect points A and C, as well as points B and C.

- why do we know $\overline{AC} \cong \overline{BC} \cong \overline{AB}$? All 3 segments are radii of ≅ circles

So, these 3 lines create what kind of triangle? equilateral triangle

- meaning... what are all the angle measures? 60°

IF CD is the perpendicular bisector, then we know ∠CEA and ∠CEB must be ≅ 90°

Lets see if triangle congruence will help us see more clearly.

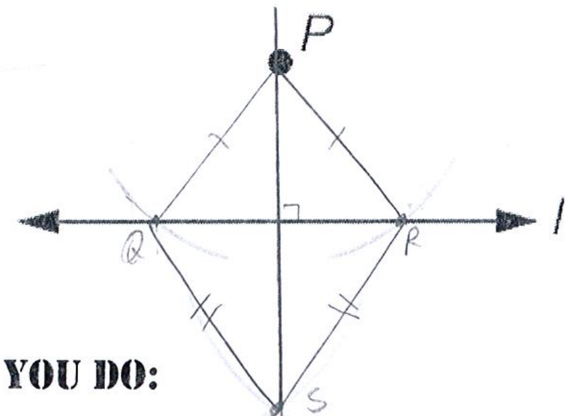
∠CAE = 60°	∠ACE = 30°	∠CEA = 90°
∠CBE = 60°	∠BCE = 30°	∠CEB = 90°

Lastly, what property could we use to prove the 2 triangles are congruent? – thus proving CD bisects AB.

Resulting triangle congruence theorem = 30° 60° 90° proves perpendicular lines.

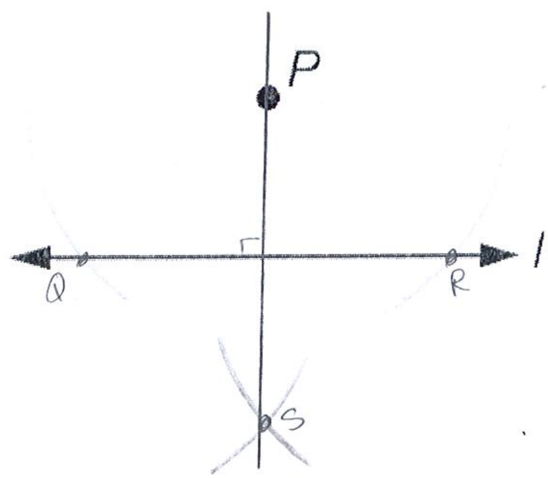
I DO: Sit back, relax, and watch how to construct a <u>perpendicular line through a point not on a line</u>

We DO: Follow along and perform the same steps



YOU DO:

1. Place the point of a compass on point P.
2. Open the compass to a distance that is wide enough to draw two arcs across line l, one on each side of point P. Label these points Q and R.
3. From points Q **and** R, set compass to any width and draw arcs on the opposite side of line l (across from point P) so that the arcs intersect. Label the intersection point S.
4. Using a straightedge, draw $\overline{PS}$.
5. PS is perpendicular to line l.



But WHY does that work???

What kind of triangles do PQR and SQR create? Isoceles Triangle

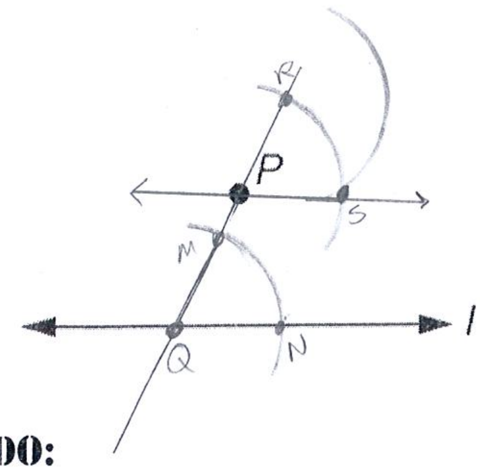
When we look at quadrilateral QPRS, what kind of quadrilateral do you see being formed with these two isosceles triangles? Kite

What do you know about the diagonals that are formed by this quadrilateral?

The diagonals of a kite are perpendicular.

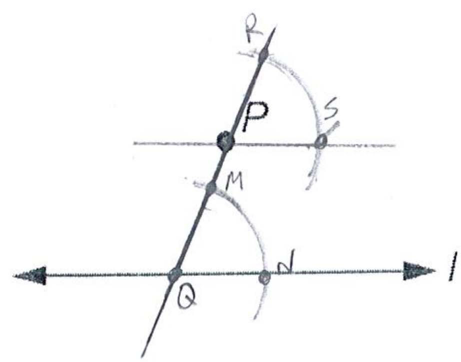
I DO: Sit back, relax, and watch how to construct a <u>parallel line through a point not on a line</u>

We DO: Follow along and perform the same steps



YOU DO:

1. Draw a line through point P crossing line l at a point. Label the point of intersection Q.
2. Open a compass to a width about half the distance from point P to point Q. Place the compass point on point Q and draw an arc that intersects both lines. Label the intersection of the arc and $\overline{PQ}$ as point M and the intersection of the arc and line l as point N.
3. Without changing the compass width, place the compass point on point P and draw an arc that crosses $\overline{PQ}$ above point P. Note that this arc must have the same orientation as the arc drawn from point M to point N. Label the point of intersection R.
4. Set the compass width to the distance from point M to point N.
5. Place the compass point on point R and draw an arc that crosses the upper arc. Label the point of intersection S.
6. Using a straightedge, draw a line through points P and S.



But WHY does it work?

We are essentially just creating 2 congruent circles whose radii are along the same line.

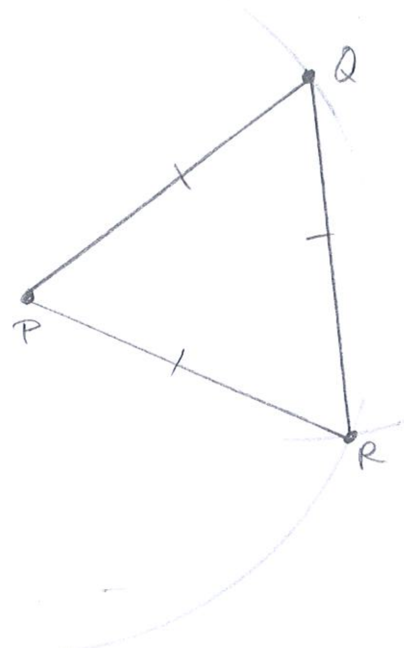
How do we know the 2 circles are the same size?

$\widehat{MN}$ and $\widehat{RS}$ are equivalent arcs, thus making ∠MQN and ∠RPS congruent

So what we have ACTUALLY created is just a set of corresponding angles from our parallel lines unit.

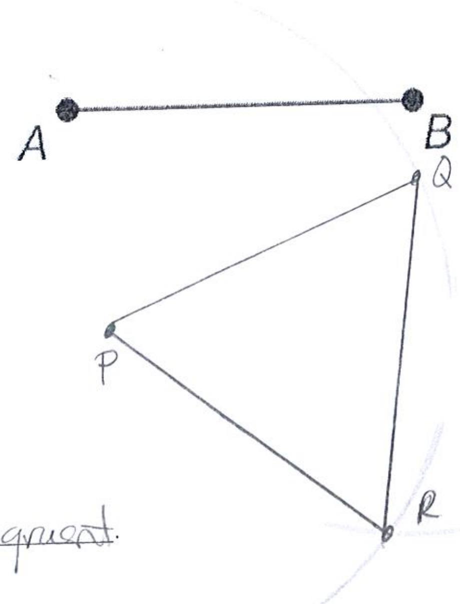
I DO: Sit back, relax, and watch how to construct an <u>equilateral triangle</u>

We DO: Follow along and perform the same steps



YOU DO:

1. Make a point P that will become one vertex of the triangle.
2. Set the compass width to the size of line AB.
3. With that width, move to Point P and create two arcs. Mark a point Q on either arc to be the next vertex.
4. Without changing the width from #2, move to point Q and draw an arc across the other creating point R.
5. Using a straightedge, draw three lines linking P, Q, and R.

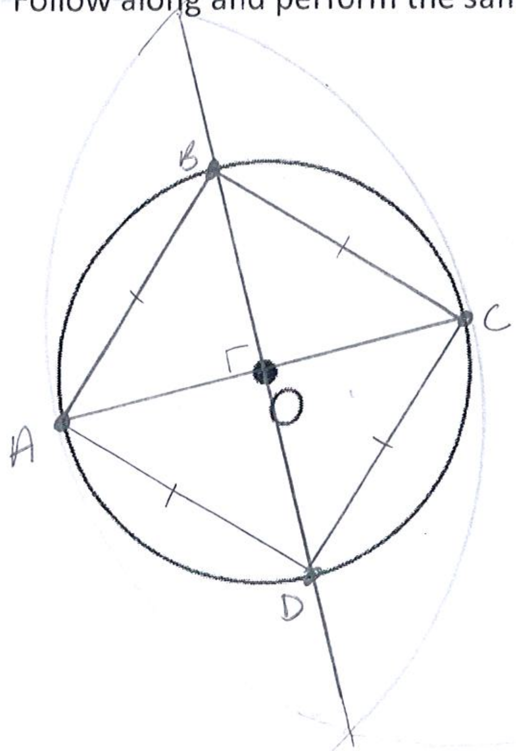


But WHY does it work?

$\overline{AB} = \overline{PQ} = \overline{QR} = \overline{RP}$ because they are all Congruent.

I DO: Sit back, relax, and watch how to construct a square inscribed in a circle

We DO: Follow along and perform the same steps



YOU DO:

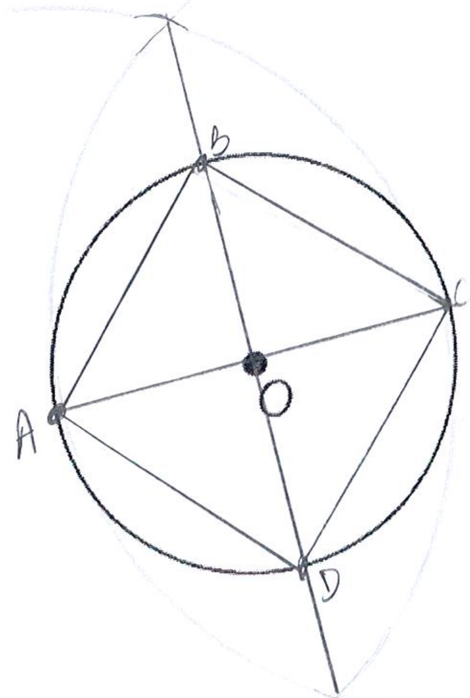
1. Mark a point anywhere on the circle and label it point A.

2. Using a straightedge, draw a diameter from point A. Label the other endpoint of the diameter as point C. This is diameter AC

3. Construct a perpendicular bisector of AC through the center of circle O. Label the points where it intersects the circle as point B and point D. example #4

4. Using a straightedge, draw AB, BC, CD, and AD

5. Square ABCD is inscribed in circle O.



But WHY?? Are you tired of this question yet?

Well good, because it's essentially just drawing a circle around a perpendicular bisector