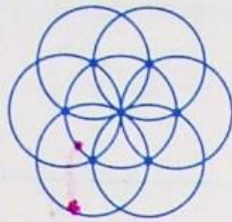


EXPLORE & REASON

Using a compass, make a design using only circles like the one shown.



Page 14

A. What instructions can you give to another student so they can make a copy of your design?

- 1) Draw one circle with a compass
- 2) Without changing the setting of the compass, place the point of the compass on the circle you just drew and make a second circle
- 3) Place the point of the compass on one of the places where the two circles intersect and make a third circle
- 4) Repeat this until you have seven circles in the correct pattern.

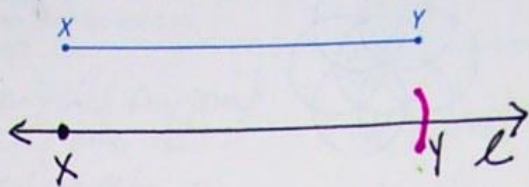
B. **Make Sense and Persevere** Use a ruler to draw straight line segments to connect points where the circles intersect. Are any of the segments that you drew the same length? If so, why do you think they are? © MP.1

All six segments appear to be the same length because the compass marked off the same distance around the center circle each time.

EXAMPLE 1 **Try It!** Copy a Segment

P. 14

1. How can you construct a copy of \overline{XY} ?



Step 1: Use a straight edge to draw working line, l .
Mark point X on line l .

Step 2: Place the compass point at X , and open the compass to length XY .

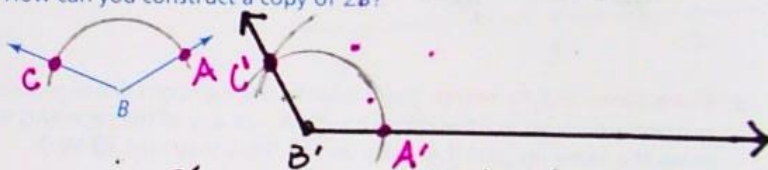
Step 3: Using the same setting, place the compass point at Y , and draw an arc striking line l .

Step 4: Mark point Y at the intersection.

EXAMPLE 2 **Try It!** Copy an Angle

P. 15

2. How can you construct a copy of $\angle B$?



Step 1: Mark a point B' . Use a straight edge to draw a ray with endpoint B' .

Step 2: Place the compass point at B . Draw an arc that intersects both rays of $\angle B$. Label intersection points A & C .

Step 3: Without changing the setting, place the compass point at B' and draw an arc intersecting the ray. Label the point A' at the intersection.

Step 4: Place the compass point at C and open to the distance between A and C .

Step 5: Keep setting, place compass point at A' and draw an arc.

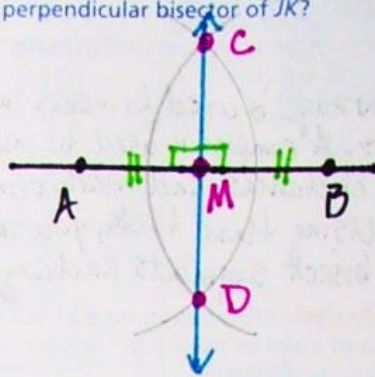
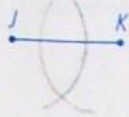
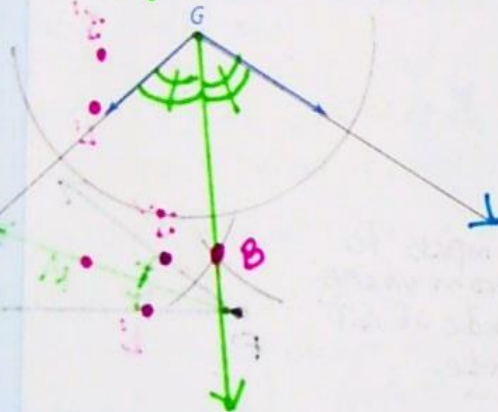
Label intersection of arcs point C' .
Use a straight edge to draw $\overline{B'C'}$.

HABITS OF MIND

Construct Arguments Leo says a copy of a segment or angle is always congruent to the original, even if the orientation of the copy is different from the orientation of the original. Construct an argument to support or refute Leo's statement. **MP.3**

Leo is correct. You can use rigid motions to superimpose the copy to the original.

* Rigid Motion (Transformations)

EXAMPLE 3 Try It! Construct a Perpendicular Bisector3. How can you construct the perpendicular bisector of JK ?**EXAMPLE 4** Try It! Construct an Angle Bisector4. How can you construct the angle bisector of $\angle G$?**EXAMPLE 5** Try It! Use Constructions

5. Where should the sculpture be placed if it is to be center-aligned with the museum entrance and the center of the ticket sales desk?

The sculpture should be placed at the intersection of the perpendicular bisector of the museum entrance and the perpendicular bisector of the ticket sales desk.

HABITS OF MIND

Look for Relationships How is constructing a perpendicular bisector similar to constructing an angle bisector? **MP.7**

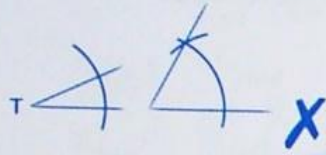
Both constructions require finding points that are equidistant from given points in order to determine the needed line.

Do You UNDERSTAND?

1. **ESSENTIAL QUESTION** How are a straightedge and compass used to make basic constructions?

A straightedge is used to make lines or segments. A compass is used to make arcs, measure distances, and mark congruent lengths. Using these tools, you can copy and bisect segments and angles.

2. **Error Analysis** Chris tries to copy $\angle T$ but is unable to make an exact copy. Explain Chris's error. **MP.3**

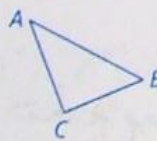


Chris did not use the compass to measure the distance from where the arc intersects one side of $\angle T$ to where it intersects the other side.

3. **Vocabulary** What is the difference between a line that is perpendicular to a segment and the perpendicular bisector of a segment?

A line that is perpendicular to a segment can intersect the segment at any point on the segment. A perpendicular bisector intersects the segment at the point that is the same distance from each end point of the segment.

4. **Look for Relationships** Darren is copying $\triangle ABC$. First, he constructs \overline{DE} as a copy of \overline{AB} . Next, he constructs $\angle D$ as a copy of $\angle A$, using \overline{DE} as one of the sides. Explain what he needs to do to complete the copy of the triangle. **MP.7**

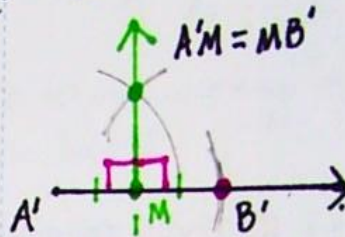


Copy \overline{AC} using D as one endpoint and using the side of $\angle D$ that is not \overline{DE} . Label the other endpoint F .
Connect points E and F .

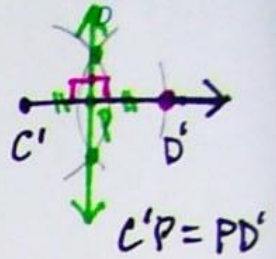
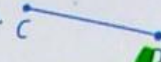
Do You KNOW HOW?

Construct a copy of each segment, and then construct its perpendicular bisector.

5.



6.

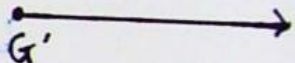
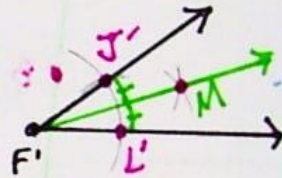
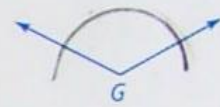


Construct a copy of each angle, and then construct its bisector.

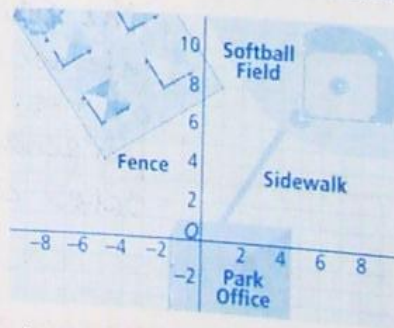
7.



8.



9. A new sidewalk is perpendicular to and bisecting the existing sidewalk. At the point where new sidewalk meets the fence around the farmer's market, a gate is needed. At about what point should the gate be placed?



at about $(-2, 4)$