Section

A line a and a point P are given. Point P is not on line a. A point A_1 is the shortest distance from point P

to line a. A line b is drawn through point P and point A_1. How is line a related to line b?

1.

   A. Lines a and b are parallel lines.

   B. Lines a and b are the same line.

   C. Lines a and b form a non-right angle.

   D. Lines a and b are perpendicular lines.

The set A contains all points on a plane that are distance d from a point p. Which of the following

describes set A?

2.

   A. a ray

   B. a circle

   C. an angle

   D. a line segment

Two rays extend from a common endpoint. Select all of the following that could describe the figure formed.

3.

   A. a line

   B. an angle

   C. parallel lines

   D. a line segment

   E. perpendicular lines

Juan came across the following proof in an old geometry textbook. The final line of the proof had been scuffed out and made illegible.

(0) **Given:** In $\triangle ABC$, $AC > AB$.
(1) D is drawn on $\overline{AC}$ such that $AD = AB$.
(2) $\triangle BAD$ is isosceles, so $m\angle ADB = m\angle ABD$.
(3) $\angle ADB$ is an exterior angle of $\triangle DBC$.
(4) By Lemma, $m\angle ADB = m\angle DBC + m\angle BCD$.
(5) By substitution,
$\quad m\angle ABD = m\angle DBC + m\angle BCD$.
(6) $m\angle ABD - m\angle DBC = m\angle BCD$.
(7) Since angle measures are positive,
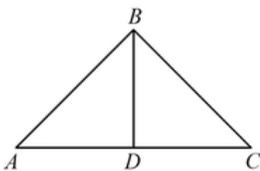$\quad m\angle ABD - m\angle DBC < m\angle ABD + m\angle DBC$.
(8) By substitution,
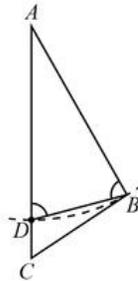
Which of the following could complete the illegible last line of the proof?

4.

   A. m ∠ BCD < m ∠ ABC

   B. m ∠ BCD < m ∠ ADB

   C. m ∠ BCD = m ∠ ABD

   D. m ∠ BCD = m ∠ BAC + m ∠ DBC

In the accompanying diagram, Δ*ABC* is equilateral and *D* is any point on *AC*.

Which statement **must** be true?

5.

   A. *CD* > *DB*

   B. m ∠ ABC > m ∠ BDC
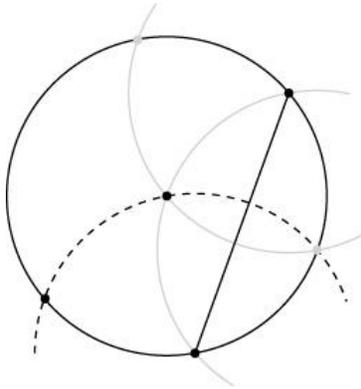
   C. m ∠ A > m ∠ ADB

   D. *DB* > *CD*

Patrick is using a compass and straightedge to construct an equilateral triangle inscribed in a circle. The steps Patrick has completed so far are shown below.
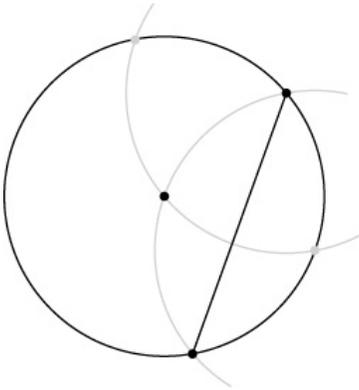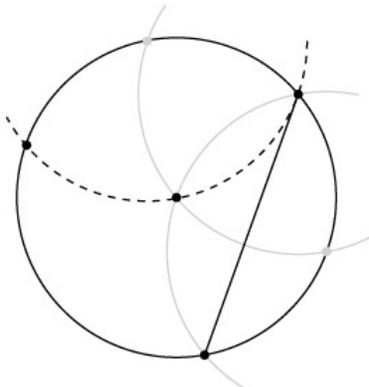
Select all of the following that would be a reasonable next step for Patrick to take in the construction.
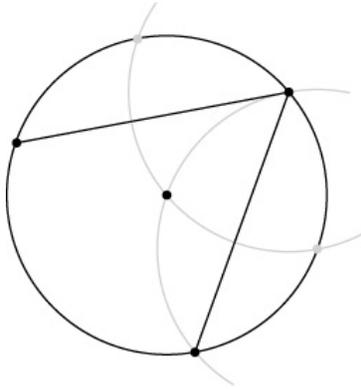
6.

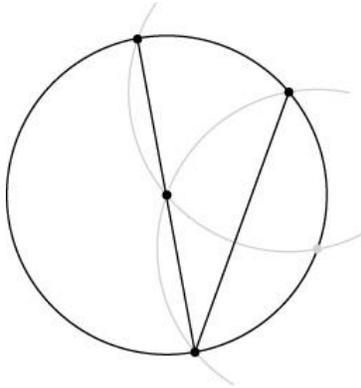   **A.** Draw an arc to find the third vertex of the triangle.

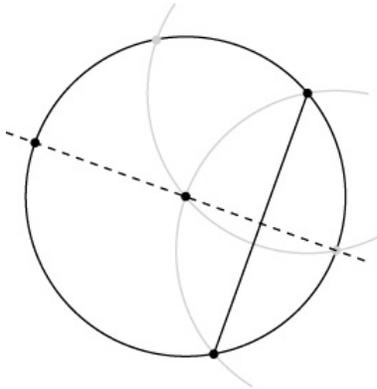   **B.** Draw an arc to find the third vertex of the triangle.
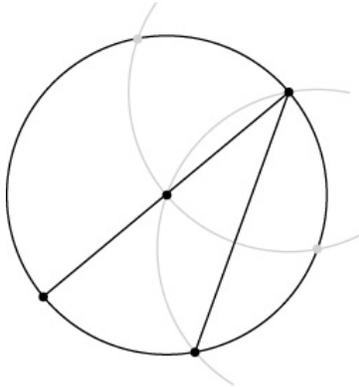
C. Draw the second side of the triangle.

D. Draw the second side of the triangle.

E. Draw a diameter to find the third vertex of the triangle.
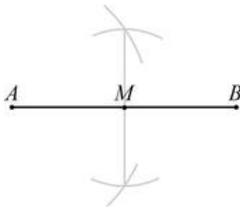
F. Draw a diameter to find the third vertex of the triangle.

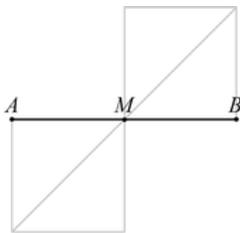Lourdes believes that point *M* is the midpoint of line segment *AB*. Which construction could she use to prove her conjecture?
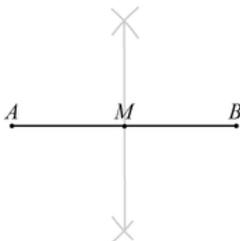
7.

A.

B.

C.

D.
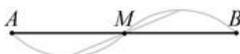
Mikayla is constructing ∠*SCD*. She wants ∠*SCD* to be congruent to ∠*FRT*.
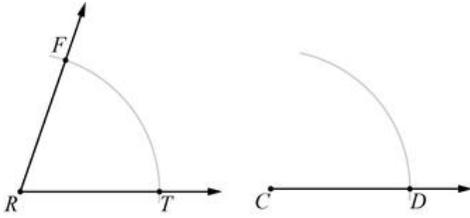
Mikayla needs to find where to draw point *S*. She does so by drawing a second arc that intersects the arc shown passing through point *D*. The second arc that she draws is part of a circle. What are the center and radius of this circle?

8.

    A. Center: *D*
       Radius: *RT*

    B. Center: *D*
       Radius: *FT*

    C. Center: *C*
       Radius: *FT*

    D. Center: *C*
       Radius: *FR*

Rudy used a straightedge and a compass to construct a square inside circle *c*, as shown below.
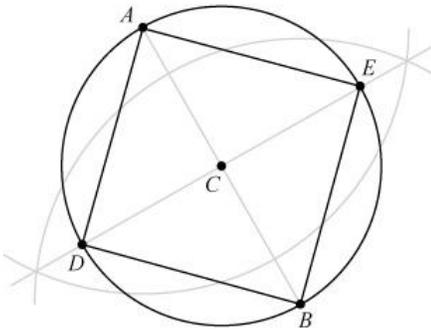
Select all of the following steps that Rudy took to construct the inscribed square.

9.

   A. Construct a perpendicular bisector of the diameter $\overline{AB}$.

   B. Construct a perpendicular bisector of the diameter $\overline{DE}$.

   C. Construct a bisector of $\angle ADB$ to find the location of point E.

   D. Use the compass to draw a circle centered at point C.

   E. Use the compass to draw two arcs of the same radius centered at point C.

   F. Use the straightedge to draw diameter $\overline{AB}$ of the circle.

   G. Use the straightedge to draw lines connecting the endpoints of the two diameters.

Luisa is using a compass and straightedge to construct a regular hexagon inscribed in a circle. The steps Luisa has taken so far are shown below.
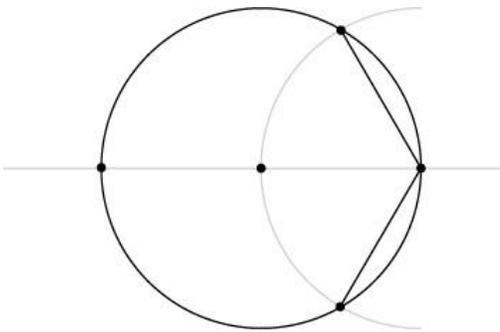
Select all of the following that would be a reasonable next step for Luisa to take in the construction.

10.

A. Draw the opposite sides parallel to the two sides already drawn.
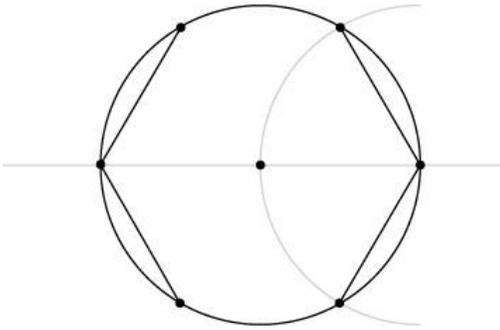
B. Draw an arc to find the other two vertices of the hexagon.
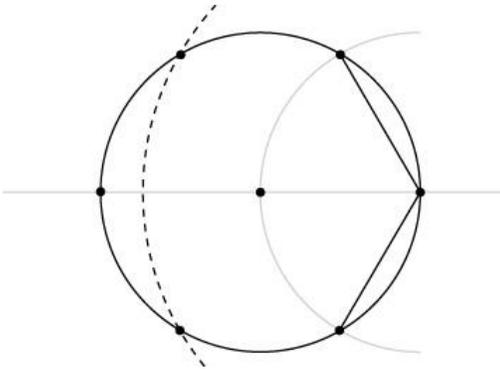
C. Draw the opposite sides parallel to the drawn diameter.
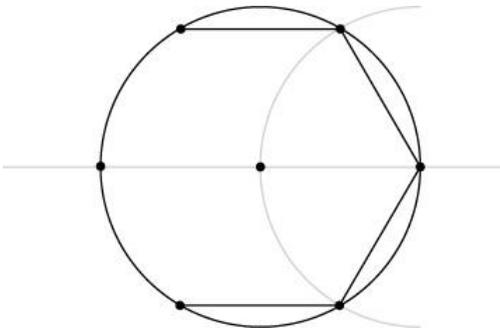
D. Draw an arc to find the other two vertices of the hexagon.
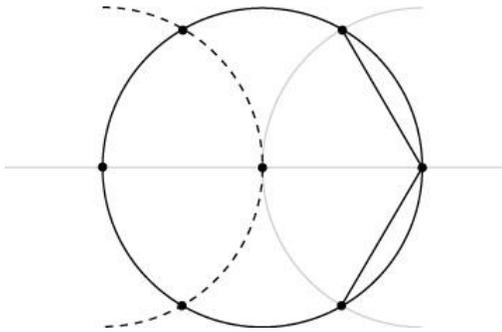
E. Draw an arc to find one of the other vertices of the hexagon.
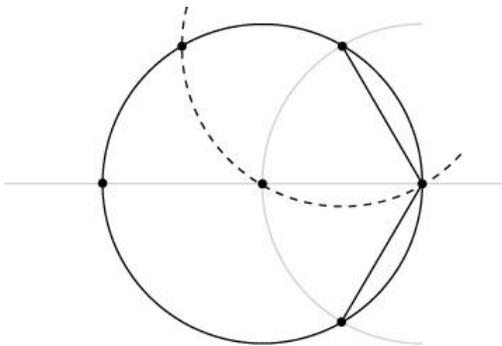
F. Construct a perpendicular bisector of the radius to find the other two vertices of the hexagon.
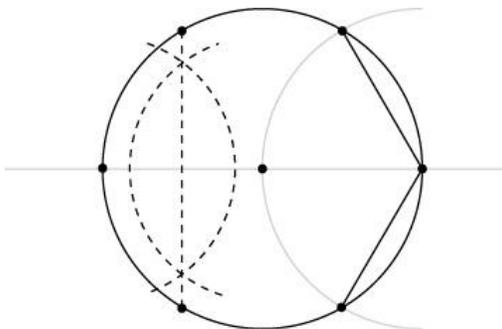
Robin used a compass to draw two arcs through the vertices of △*ABC*.
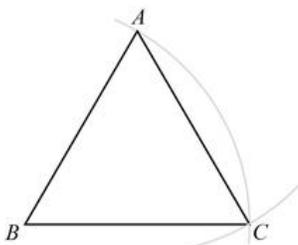
Robin concluded from his drawing that △*ABC* is equilateral. What must be true for Robin's conclusion

to be justified by his drawing?

11.

    A. Robin centered his compass at the midpoint of *AC* to draw the short arc.

    B. Robin set the compass at *AB* for one arc and at *AC* for the other.

    C. Robin used a ruler to measure the compass setting for both arcs.

    D. Robin used the same compass setting to draw both arcs.

Dax is inscribing a regular hexagon inside of a circle, and has made the geometric construction below.
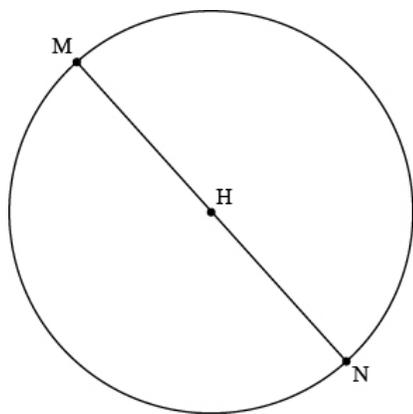
Dax continues the construction with the following steps:

1. He creates a semicircle centered at *M* with radius *MH* and labels the points where it intersects the

circle as *A* and *B*.

2. He creates a semicircle centered at *N* with radius *NH* and labels the points where it intersects the

circle as *C* and *D*.

What was the purpose of these two steps?

12.

    A. to find the perpendicular bisector of *MN*

   **B.** to find the vertices of the regular hexagon

    C. to create another line segment that is a radius of the circle

    D. to create another line segment that is a diameter of the circle

Mel constructed a square inscribed in a circle by using a straightedge and a compass. Mel's finished construction is shown below.
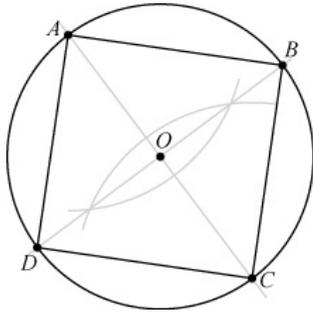
The table below gives the steps Mel took to construct the inscribed square, but in no particular order.

Construction Step	Sequence Number
Mark a point and label it O. Use the compass to draw a circle centered at the point.	1
Use the compass to draw an arc centered at A with the same radius as the other arc.	
Use the compass to measure a right angle at A. Label the points where the angle intersects the circle B and D.	
Use the compass to draw an arc centered at C with radius greater than the radius of the circle.	
Use the straightedge to draw a line through the intersection points of the two arcs. Mark where the line intersects the circle. Label the endpoints B and D.	
Use the straightedge to draw line segments connecting points A, B, C, and D.	
Use the straightedge to draw a diameter of the circle. Label the endpoints A and C.	

Complete the table by providing the order in which each step was performed, for example "1", "2", "3", and so on. If Mel did not perform a step, write "n/a".

13.

On the coordinate grid below, the dashed figure is the image of a dilation applied to the larger solid figure.
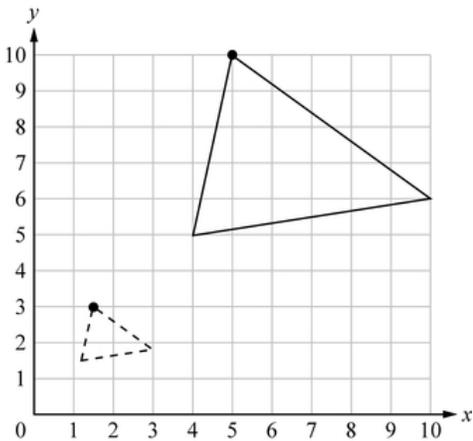
Which of the following represents this dilation?

14.

A.

$(x, y) \rightarrow (\frac{3}{2} x, 3 y)$

B.

$(x, y) \rightarrow (\frac{3}{10} x, \frac{3}{10} y)$

C.

$(x, y) \rightarrow (- \frac{7}{10} x, - \frac{7}{10} y)$

D.

$(x, y) \rightarrow (x - \frac{7}{2}, y - 7)$

Triangle *FGH* is shown below.
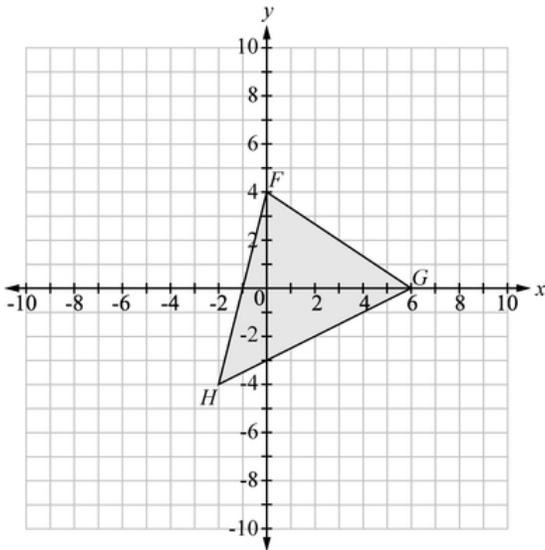
Triangle *FGH* is transformed using the rule $(x, y) \rightarrow (x - 3, y + 6)$ to create triangle *F'G'H'*. Which statement describes the location of triangle *F'G'H'*?

15.

    A.   Triangle *F'G'H'* is located 3 units to the right and 6 units above triangle *FGH*.

    B.   Triangle *F'G'H'* is located 3 units to the left and 6 units above triangle *FGH*.

    C.   Triangle *F'G'H'* is located 6 units to the right and 3 units below triangle *FGH*.

    D.   Triangle *F'G'H'* is located 6 units to the left and 3 units below triangle *FGH*.

Select all the transformations that preserve distance and angle measure.

16.

    A.
$$(x,y) \rightarrow \left(\frac{x}{2}, \frac{y}{2} + 2\right)$$

    B.
$$(x,y) \rightarrow (y, -x)$$

    C.
$$(x,y) \rightarrow (y - 3, x + 6)$$

    D.
$$(x,y) \rightarrow (2x + 3, y + 3)$$

    E.
$$(x,y) \rightarrow (x, 1 - y)$$

Triangle *ABC* is shown in the graph below.
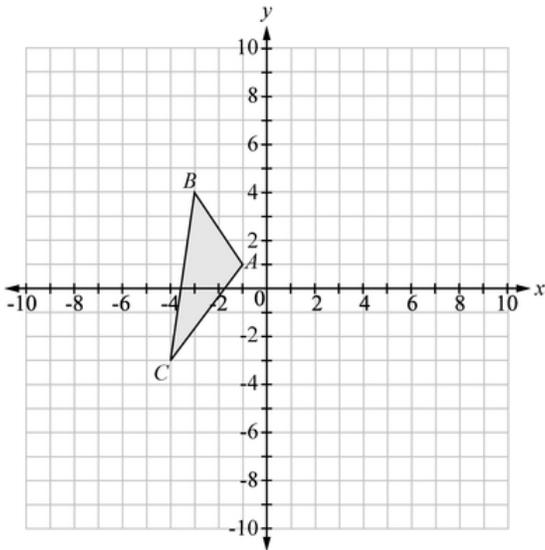
Triangle *ABC* is reflected over the *y*-axis to create triangle *A'B'C'*. Which of the following rules describes this transformation?

17.

    A. $(x, y) \rightarrow (y, -x)$

    B. $(x, y) \rightarrow (x, -y)$

    C. $(x, y) \rightarrow (-x, y)$

    D. $(x, y) \rightarrow (-y, x)$

Cece rotated square *EFGH* $90°$ counterclockwise about the point $(1,3)$ on a coordinate plane and

produced image *E'F'G'H'*. Which of the following describes this transformation?

18.

    A. $(x,y) \rightarrow (-y,x)$

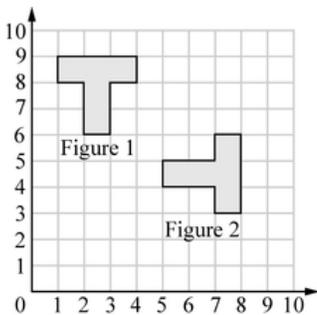   **B.** $(x,y) \rightarrow (6-y,x)$

    C. $(x,y) \rightarrow (4-y,x+2)$

    D. $(x,y) \rightarrow (3-y,x-1)$

The image of the graph of function $f(x)$ is found by mapping each point on the graph (x, y) to the point (y, x). This image is a reflection of $f(x)$ in which line?

19.

    A. the line $y = x$

    B. the line $y = -x$

    C. the y-axis

    D. the x-axis

On the grid below, Figure 2 was created by applying a transformation to Figure 1.

Which transformation could have been applied to Figure 1?

20.

    A. 90° counterclockwise rotation around (3, 4)

    B. Horizontal reflection

    C. Translation 2 units right and 2 units down

    D. 90° clockwise rotation around (3, 4)

Collin formulated the definition of a translation in the coordinate plane shown below.

A figure F' is the translation of a figure F if and only if there exists a distance d, such that for each

point A on F there exists a point A' on F', where the distance between A and A' is d.

Which of the following **best** evaluates Collin's definition?

21.

    A. The condition is both necessary and sufficient for being a translation.

    B. The condition is necessary but not sufficient for being a translation.

    C. The condition is sufficient but not necessary for being a translation.

    D. The condition is neither necessary nor sufficient for being a translation.

A figure F' is the reflection of figure F. A point P on figure F is mapped onto itself after the reflection.

Which of the following statements is true?

22.

    A. Point P is on the line of reflection.

    B. Figure F is identical to figure F'.

    C. The line of reflection is a vertical line.

    D. Point P is distance d from the x-axis and distance d from the y-axis.

Jaelyn formulated the following definition of a reflection on the coordinate plane.

Figure F' is the reflection of figure F across line l if and only if for any point L on l and any point A on F,

a circle centered at L that passes through A also passes through the corresponding point A' on F'.

Which of the following **best** evaluates Jaelyn's definition?

23.

    A. The condition is both necessary and sufficient for being a reflection.

    B. The condition is necessary but not sufficient for being a reflection.

    C. The condition is sufficient but not necessary for being a reflection.

    D. The condition is neither necessary nor sufficient for being a reflection.

If a translation maps point $A(-3, 1)$ to point $A'(5, 5)$, what is the image of (x, y) after this translation?

24.

    A. $(x + 8,\ y + 4)$

    B. $(x + 8,\ y + 6)$

    C. $(x + 2,\ y + 4)$

    D. $(x + 2,\ y + 6)$

The image of the origin under a certain translation is the point $(2, -6)$. At what coordinates is the image of point $(-3, -2)$ located under the same translation?

25.

    A. (-5, 4)

    B. (-1, -8)

    C.

        $(-\frac{3}{2}, \frac{1}{3})$

    D. (-6, 12)

A translation maps $A(1, 2)$ onto $A'(-1, 3)$. What are the coordinates of the image of the origin under the same translation?

26.

    A. (-1, 2)

    B. (2, -1)

    C. (-2, 1)

    D. (0, 0)

A translation moves $A(2, 3)$ onto $A'(4, 8)$. What are the coordinates of B', the image of $B(4, 6)$ under the same translation?

27.

    A. (6, 11)

    B. (8, 12)

    C. (6, 8)

    D. (12, 18)

You have reached the end of this section.