Sec. 9.1 Answers

Tell whether the transformation appears to be a rigid motion. Explain.

1. yes; preserves distance and angle measures
2. no; does not preserve distance
3. yes; preserves distance and angle measures
4. yes; preserves distance and angle measures

In each diagram, the dashed-line figure is an image of the solid-line figure.
(a) Choose an angle or point from the preimage and name its image.
(b) List all pairs of corresponding sides.

5. (a) Sample: \( A' \) is image of \( A \).
   (b) \( AB \) and \( A'B' \), \( BC \) and \( B'C' \), \( CA \) and \( C'A' \)

6. (a) Sample: \( M \) is image of \( V \).
   (b) \( VW \) and \( MJ \), \( WX \) and \( JK \), \( XU \) and \( KL \), \( UV \) and \( LM \)

Graph the image of each figure under the given translation.

7. \( T_{<1,4>}(\triangle ABC) \)

8. \( T_{<3,3>}(MNOP) \)

The dashed-line figure is a translation image of the solid-line figure. Write a rule to describe each translation.

9. \( T_{<-3,-4>}(ABCD) \)

10. \( T_{<4,-3>}(UVWX) \)

11. You are visiting Washington, D.C. From the American History Museum you walk 5 blocks east and 1 block south to the Air and Space Museum. Then you walk 8 blocks west to the Washington Monument. Where is the Washington Monument in relation to the American History Museum? 1 block south and 3 blocks west.

13. Reasoning If \( T_{<10,15>}(PQRS) = P'Q'R'S' \), what translation maps \( P'Q'R'S' \) onto \( PQRS \)? \( T_{<-10,-15>}(P'Q'R'S') = PQRS \)

Graph the image of each figure under the given translation.

17. \( T_{<-3,4>}(\triangle DEF) \)

18. \( T_{<-5,1>}(KLMN) \)
Sec. 9.2 Answers

9-2 Practice Form G

Reflections

Find the coordinates of each image.

1. \( R_{x\text{-axis}}(A) \) \( (2, -2) \)
2. \( R_{y\text{-axis}}(B) \) \( (-4, 4) \)
3. \( R_{y=1}(C) \) \( (2, 4) \)
4. \( R_{x=-1}(D) \) \( (0, 2) \)
5. \( R_{y=-1}(E) \) \( (-3, 0) \)
6. \( R_{x=2}(F) \) \( (5, -3) \)

Coordinate Geometry Given points \( M(3, 3) \), \( N(5, 2) \), and \( O(4, 4) \), graph \( \triangle MNO \) and its reflection image as indicated.

7. \( R_{y\text{-axis}} \)
8. \( R_{x\text{-axis}} \)
9. \( R_{x=1} \)
10. \( R_{y=-2} \)

Copy each figure and line \( \ell \). Draw each figure's reflection image across line \( \ell \).

11.

12.

13.

14.

Find the image of \( Z(1, 1) \) after two reflections, first across line \( \ell_1 \), and then across line \( \ell_2 \).

17. \( \ell_1 : x = 2, \ell_2 : y\text{-axis} \) \((-3, 1)\)
18. \( \ell_1 : x = -2, \ell_2 : x\text{-axis} \) \((-5, -1)\)
19. \( \ell_1 : y = 2, \ell_2 : x\text{-axis} \) \((1, -3)\)
20. \( \ell_1 : y = -3, \ell_2 : y\text{-axis} \) \((-1, -7)\)
21. \( \ell_1 : x = 3, \ell_2 : y = 2 \) \((5, 3)\)
22. \( \ell_1 : x = -1, \ell_2 : y = -3 \) \((-3, -7)\)

25. Point \( A \) on a coordinate grid is at \((3, 4)\). What are the coordinates of \( R_{y=4}(A) \)? \((4, 3)\)
Sec. 9.3 Answers

Point $O$ is the center of regular hexagon $BCDEFG$. Find the image of the given point or segment for the given rotation.

7. $r_{(120^\circ)}(O)(F) = D$
8. $r_{(180^\circ)}(O)(B) = E$
9. $r_{(300^\circ)}(O)(BG) = CB$
10. $r_{(360^\circ)}(O)(CD) = CD$
11. $r_{(60^\circ)}(O)(E) = D$
12. $r_{(240^\circ)}(O)(FE) = BG$

For Exercises 13–15, $\triangle ABC$ has vertices $A(2, 2)$, $B(3, -2)$, and $C(-1, 3)$.

13. Graph $r_{(90^\circ)}(O)(\triangle ABC)$.
14. Graph $r_{(180^\circ)}(O)(\triangle ABC)$.
15. Graph $r_{(270^\circ)}(O)(\triangle ABC)$.

16. The vertices of $PQRS$ have coordinates $P(-1, 5)$, $Q(3, 4)$, $R(2, -4)$, and $S(-3, -2)$. What are the coordinates of the vertices of $r_{(270^\circ)}(O)(PQRS)$?
   - $P'(5, 1)$, $Q'(4, -3)$, $R'(-4, -2)$, $S'(-2, 3)$

17. The vertices of $r_{(90^\circ)}(O)(KLMN)$ have coordinates $K'(-3, 2)$, $L'(2, 3)$, $M'(4, -2)$, and $N'(-2, -4)$. What are the coordinates of the vertices of $KLMN$?
   - $K(2, 3)$, $L(3, -2)$, $M(-2, -4)$, $N(-4, 2)$

21. A pie is cut into 12 equal slices. What is the angle of rotation about the center that will map a piece of pie to a piece that is two slices away from it? $60^\circ$

22. $\triangle RST$ has vertices at $R(0, 3)$, $S(4, 0)$, and $T(0, 0)$. What are the coordinates of the vertices of $r_{(-90^\circ)}(T)(\triangle RST)$?
   - $R'(3, 0)$, $S'(0, -4)$, $T'(0, 0)$

23. $\triangle FGH$ has vertices $F(-1, 2)$, $G(0, 0)$, and $H(3, -1)$. What are the coordinates of the vertices of $r_{(-90^\circ)}(G)(\triangle FGH)$?
   - $F'(-2, -1)$, $G'(0, 0)$, and $H'(1, 3)$
Sec. 9.6 Answers

The solid-line figure is a dilation of the dashed-line figure. The labeled point is the center of dilation. Tell whether the dilation is an enlargement or a reduction. Then find the scale factor of the dilation.

1. 

2. 

3. 

4. 

You look at each object described in Exercises 9–11 under a magnifying glass. Find the actual dimension of each object.

9. The image of a ribbon is 10 times the ribbon’s actual size and has a width of 1 cm. 0.1 cm

10. The image of a caterpillar is three times the caterpillar’s actual size and has a width of 4 in. $\frac{4}{3}$ in.

11. The image of a beetle is five times the beetle’s actual size and has a length of 1.75 cm. 0.35 cm

12. $\triangle P’Q’R’$ is a dilation image of $\triangle PQR$. The scale factor for the dilation is 0.12. Is the dilation an enlargement or a reduction? reduction

A dilation has center $(0, 0)$. Find the image of each point for the given scale factor.

13. $X(3, 4); D_{\frac{1}{2}}(X) (21, 28)$

14. $P(-3, 5); D_{1.2}(P) (-3.6, 6)$

15. $Q(0, 4); D_{3.4}(Q) (0, 13.6)$

16. $T(-2, -1); D_{4}(T) (-8, -4)$

17. $S(5, -6); D_{\frac{2}{3}}(S) \left(\frac{-25}{3}, -10\right)$

18. $M(2, 2); D_{3}(M) (10, 10)$

19. A square has 16-cm sides. Describe its image for a dilation with center at one of the vertices and scale factor 0.8. The dilation image will be a square with 12.8-cm sides that shares the vertex that is the dilation center with the original square. The sides will be parallel to or along the original sides.

20. Graph pentagon $ABCDE$ and its image $A’B’C’D’E’$ for a dilation with center $(0, 0)$ and a scale factor of 1.5. The vertices of $ABCDE$ are: $A(0, 3), B(3, 3), C(3, 0), D(0, -3), E(-1, 0)$.

Copy $\triangle BCD$ and point $X$ for each of Exercises 21–23. Draw the dilation image $\triangle B’C’D’$.

21. $D_{1.5}(X)(\triangle BCD)$
Sec. 10.1 Answers

Find the area of each parallelogram.

1. \( 42 \text{ ft}^2 \)
2. \( 45 \text{ m}^2 \)
3. \( 80 \text{ in}^2 \)
4. \( 96 \text{ mm}^2 \)

Find the value of \( h \) for each parallelogram.

7. \( 6 \text{ units} \)
8. \( 7.2 \text{ units} \)
9. \( 1.6 \text{ units} \)

Find the area of each triangle.

10. \( 16.5 \text{ in}^2 \)
11. \( 7.2 \text{ cm} \)
12. \( 39 \text{ ft}^2 \)
13. \( 27 \text{ yd}^2 \)
14. \( 28.8 \text{ cm}^2 \)
15. \( 28.6 \text{ m}^2 \)

16. Algebra In a parallelogram, a base, \( b \), and its corresponding height, \( h \), are in the ratio of 5 : 3. The area is 135 \( \text{mm}^2 \). Find \( b \) and \( h \). \( b = 15 \text{ mm}; \ h = 9 \text{ mm} \)

17. Reasoning A triangle has an area of 18 \( \text{ft}^2 \). List all the possible positive integers that could represent its base and height.
1 ft and 36 ft; 2 ft and 18 ft; 3 ft and 12 ft; 4 ft and 9 ft; 6 ft and 6 ft; 9 ft and 4 ft; 12 ft and 3 ft; 18 ft and 2 ft; 36 ft and 1 ft

18. A company wants to paint its logo on the side of a building. The entire area needs to be covered with a primer. The two triangular areas will be painted red, the rectangle containing the company’s name will be white, and the rest of the parallelogram will be yellow.
   a. Find the area for each different color: red: 16 \( \text{ft}^2 \); white: 32 \( \text{ft}^2 \); yellow: 80 \( \text{ft}^2 \)
   b. Find the area that must be painted with primer. 128 \( \text{ft}^2 \)

19. A scale drawing of the side view of a house is shown at the right. Find the total area (in square inches) of the side of the house in the drawing. 144 \( \text{in}^2 \)

20. Open-Ended Using graph paper, draw a figure with area 42 \( \text{units}^2 \) made up of a parallelogram and a triangle. Check students’ work.

Coordinate Geometry Find the area of a polygon with the given vertices.

21. \( A(2, 2), B(5, 2), C(3, -1), D(0, -1) \) 9 \( \text{units}^2 \)
22. \( A(1, 4), B(-2, -2), C(-7, -1), D(-4, 4) \) 30 \( \text{units}^2 \)
23. \( A(5, -3), B(-1, -3), C(-1, 2), D(5, 6) \) 42 \( \text{units}^2 \)
24. \( A(5, 0), B(5, 8), C(-1, 7), D(-1, -6) \) 63 \( \text{units}^2 \)

Find the area of each figure.

25. 98 \( \text{ft}^2 \)
26. 170 \( \text{in}^2 \)
27. 122.75 \( \text{m}^2 \)