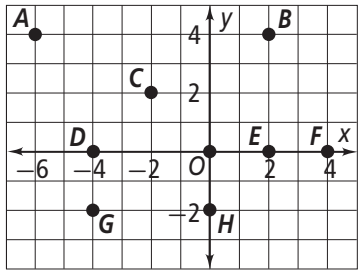
Name _____ Class _____ Date _____

Extra Practice

Chapter 9

Lesson 9-1

In Exercises 1–6, refer to the figure at the right.



1. What is the image of C under $(x, y) \rightarrow (x + 4, y - 2)$? ***E***

2. What rule describes the translation $F \rightarrow B$? ***(x, y) → (x − 2, y + 4)***

3. What is the image of H under $(x, y) \rightarrow (x - 2, y + 4)$? ***C***

4. What rule describes the translation $D \rightarrow H$? ***(x, y) → (x + 4, y − 2)***

5. What is the image of C under $(x, y) \rightarrow (x - 2, y - 4)$? ***G***

6. What rule describes the translation $B \rightarrow A$? ***(x, y) → (x − 8, y)***

Find the image of each figure under the given translation.

7. $\triangle ABC$ with vertices $A(-3, 4)$, $B(-1, -2)$, $C(1, 5)$; translation: $(x, y) \rightarrow (x - 2, y + 5)$
A′(−5, 9), B′(−3, 3), C′(−1, 10)

8. $\triangle EFG$ with vertices $E(0, 3)$, $F(6, -1)$, $G(4, 2)$; translation: $(x, y) \rightarrow (x + 1, y - 3)$
E′(1, 0), F′(7, −4), G′(5, −1)

9. $\triangle PQR$ with vertices $P(-9, -4)$, $Q(-5, 1)$, $R(2, 8)$; translation: $(x, y) \rightarrow (x - 6, y - 7)$
P′(−15, −11), Q′(−11, −6), R′(−4, 1)

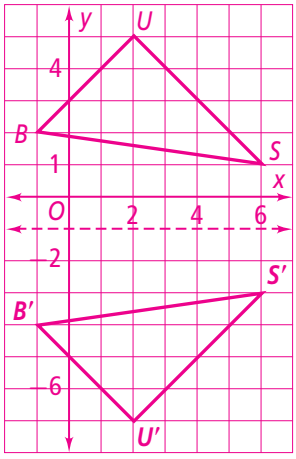
10. Write two translation rules of the form $(x, y) \rightarrow (x + a, y + b)$ that map the line $y = x - 1$ to the line $y = x + 3$. ***Sample: (x, y) → (x, y + 4), (x, y) → (x − 4, y)***

11. A triangle has vertices at $A(-3, -1)$, $B(-2, 2)$, $C(-1, -2)$. Following a transformation, the triangle's image has vertices at $(1, 1)$ and $(2, 5)$. If the transformation is an isometry, what are the coordinates of the image's third vertex? ***(3, 2)***

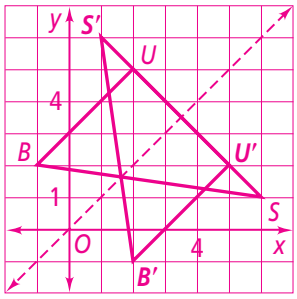
Lesson 9-2

Given points $S(6, 1)$, $U(2, 5)$, and $B(-1, 2)$, draw $\triangle SUB$ and its reflection image across each line.

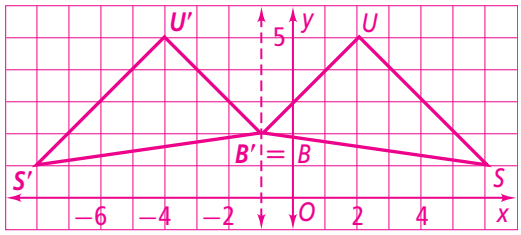
12. $y = -1$



13. $y = x$



14. $x = -1$

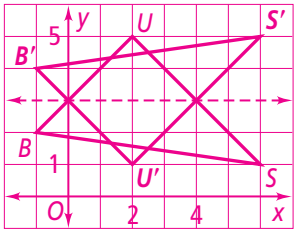


Name _____ Class _____ Date _____

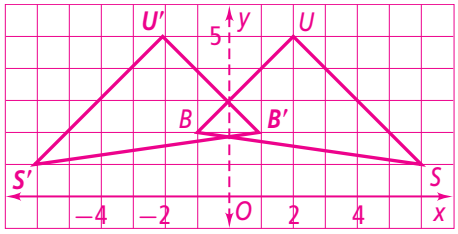
Extra Practice (continued)

Chapter 9

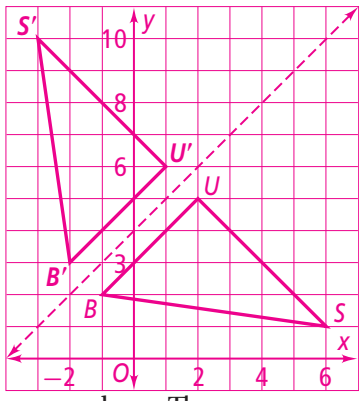
15. $y = 3$



16. the y-axis



17. $y = x + 4$



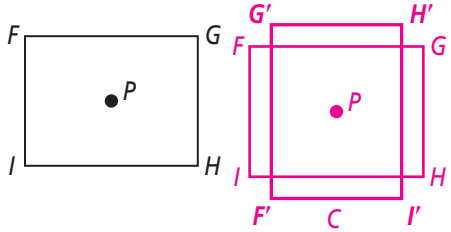
18. What are the two shortest words in the English language that you can write with capital letters so that each word looks like its own reflection across a line? **A and I**

19. The segments $\overline{AB}$ and $\overline{A'B'}$ are two different segments in the same plane. There is a translation such that $\overline{A'B'}$ is the translation image of $\overline{AB}$. There is also a line k in the plane such that $\overline{A'B'}$ is the reflection image of $\overline{AB}$ across line k. If $\overline{AB}$ and $\overline{A'B'}$ are opposite sides of a quadrilateral, what kind of quadrilateral is it? **rectangle**

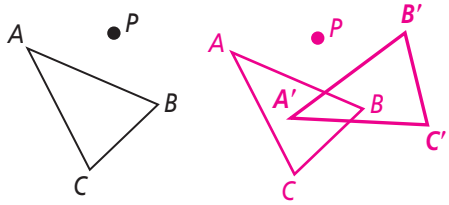
Lesson 9-3

Copy each figure and point *P*. Draw the image of each figure for the given rotation about *P*. Label the vertices of the image.

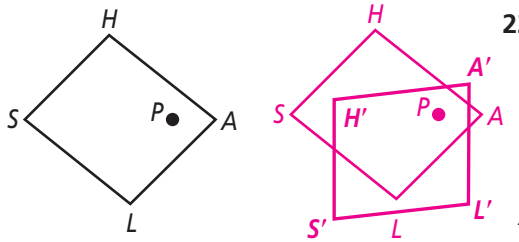
20. 90°



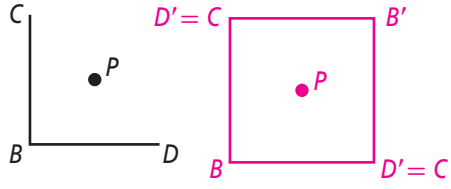
21. 60°



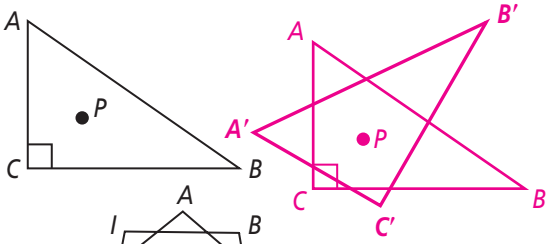
22. 45°



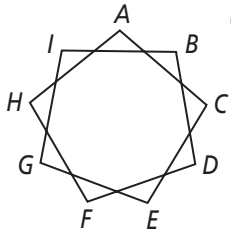
23. 180°



24. The right triangle ABC shown here has side lengths 3, 4, and 5. Point P is the incenter of the triangle. Copy the triangle and draw the image of the triangle for a 60° counterclockwise rotation about P.



25. What is the smallest angle of rotation you can use to have the rotation image of the figure below exactly overlap the original figure? **40°**

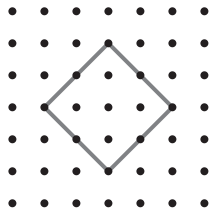


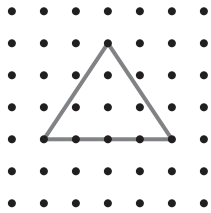
Extra Practice (continued)

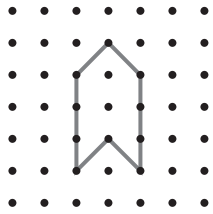
Chapter 9

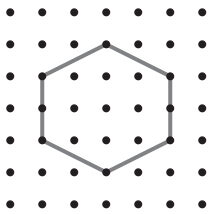
Lesson 9-4

State what kind of symmetry each figure has.

26.  line, rotation, point

27.  line

28.  line

29.  line, rotation, point

30. Armando is going to draw a triangle that he will put on his backpack.
- **a.** If the triangle has a line of symmetry, what kind of triangle must it be? isosceles
- **b.** If the triangle has two lines of symmetry, what kind of triangle must it be? equilateral

Lessons 9-5 and 9-6

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

31. $D(2, 2)$; 3 **(6, 6)**

32. $M(-3, 0)$; 2 **(−6, 0)**

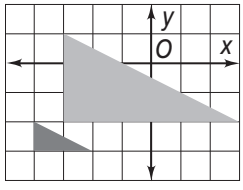
33. $X(2, -4)$; 0.25 **(0.5, −1)**

34. $C(4, 7)$; $\frac{2}{7}$ $\left(\frac{8}{7}, 2\right)$

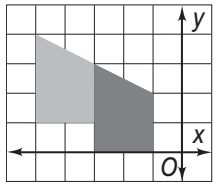
35. $G\left(\frac{15}{16}, \frac{9}{12}\right)$; $\frac{4}{3}$ $\left(\frac{5}{4}, 1\right)$

36. $N\left(\frac{2\sqrt{3}}{5}, \frac{4}{5}\right)$; $\sqrt{3}$ $\left(\frac{6}{5}, \frac{4\sqrt{3}}{5}\right)$

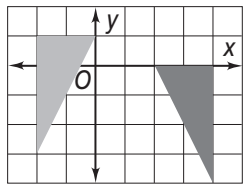
The darker shaded figure is the image of the gray figure. State whether the mapping is a reflection, rotation, translation, glide reflection, or dilation.

37. 

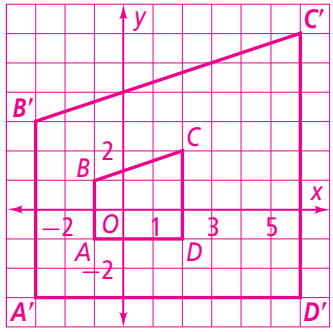
dilation

38. 

translation

39. glide reflection


40. The vertices of trapezoid $ABCD$ are $A(-1, -1)$, $B(-1, 1)$, $C(2, 2)$, and $D(2, -1)$. Draw the trapezoid and its dilation image for a dilation with center $(0, 0)$ and scale factor 3.



Extra Practice (continued)

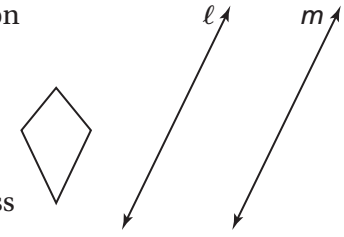
Chapter 9

41. A triangle has an area of 40 cm^2. Following a dilation, the new area of the triangle is 360 cm^2. What is the scale factor of the dilation? **3**

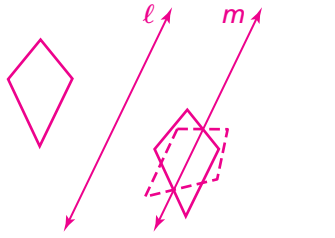
42. Suppose you know the coordinates of the vertices of a polygon. Describe how you can use what you know about translations and dilations with respect to the origin to find the coordinates of the vertices of the image polygon if the center for the dilation is (2, 5) and the scale factor is 3.

Translate the polygon using $(x, y) \rightarrow (x - 2, y - 5)$. Then dilate with center (0, 0) and scale factor 3. Then translate using $(x, y) \rightarrow (x + 2, y + 5)$.

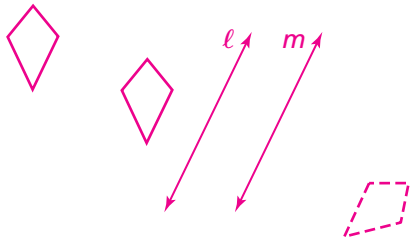
43. Find the image of the polygon for a reflection across line ℓ followed by a reflection across line m. Then use a separate diagram to repeat the process, but reflect across line m first and then across line ℓ. Each time, draw the intermediate image with dashed segments.



Reflect over ℓ, then over m.



Reflect over m, then over ℓ.



Lesson 9-7

44. Which of the four figures in Exercises 26–29 will tessellate a plane? **all of them**

45. Use a square and an equilateral triangle to make a tessellation. The square and equilateral triangle should have congruent sides.