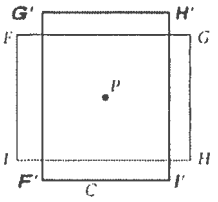
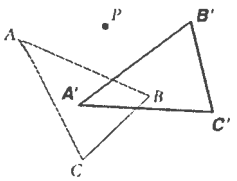
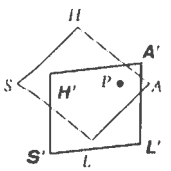
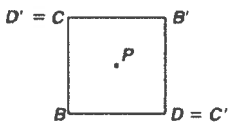
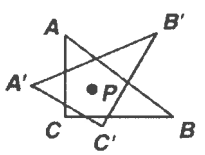
21. 

22. 

23. 

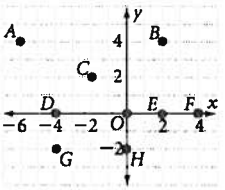
24. 

25. 

Chapter 9 Extra Practice: Skills, Word Problems, and Proof

Lesson 9-1

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



1. What is the image of C under $(x, y) \rightarrow (4, -2)$? **E**
2. What rule describes the translation $F \rightarrow B$? **⟨−2, 4⟩**
3. What is the image of H under $(x, y) \rightarrow (-2, 4)$? **C**
4. What rule describes the translation $D \rightarrow H$? **⟨4, −2⟩**
5. What is the image of C under $(x, y) \rightarrow (-2, -4)$? **G**
6. What rule describes the translation $B \rightarrow A$? **⟨−8, 0⟩**

Use matrices to 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: $(x, y) \rightarrow (-2, 5)$ **A′(−5, 9), B′(−3, 3), C′(−1, 10)**
8. $\triangle EFG$ with vertices $E(0, 3)$, $F(6, -1)$, $G(4, 2)$; translation: $(x, y) \rightarrow (1, -2)$ **E′(1, 0), F′(7, −4), G′(5, −1)**
9. $\triangle PQR$ with vertices $P(-9, -4)$, $Q(-5, 1)$, $R(2, 8)$; translation: $(x, y) \rightarrow (-6, -7)$ **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)

Lesson 9-2

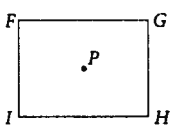
Given points $S(6, 1)$, $U(2, 5)$, and $B(-1, 2)$, draw $\triangle SUB$ and its reflection image across each line. **11–18. See back of book.**

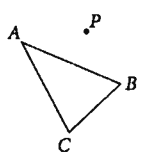
11. $y = 5$
12. $x = 7$
13. $y = -1$
14. the x-axis
15. $y = x$
16. $x = -1$
17. $y = 3$
18. the y-axis

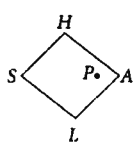
19. What are the two shortest words in the English language that you can write with capital letters so that each word looks like its own reflection across a line? **A and I**
20. The segments $\overline{AB}$ and $\overline{A'B'}$ are two different segments in the same plane. There is a translation such 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**

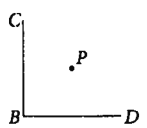
Lesson 9-3

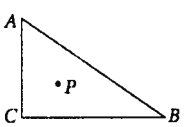
Copy each figure and point P. Draw the image of each figure for the given rotation about P. Label the vertices of the image. 21–24. See margin.

21. 60°


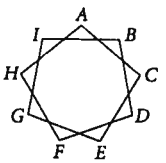
22. 90°


23. 45°


24. 180°


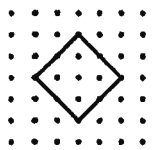
25. The right triangle ABC shown here has side lengths 3, 4, and 5. Point P is the incenter of the triangle. Copy the triangle and draw the image of the triangle for a 60° counterclockwise rotation about P. **See margin.**


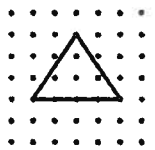
26. What is the smallest angle of rotation you can use to have the rotation image of the figure below exactly overlap the original figure? **40°**



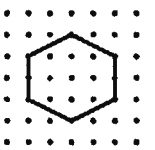
Lesson 9-4

State what kind of symmetry each figure has.

27.  line, rotation, point

28.  line

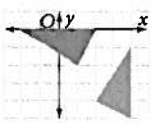
29.  line

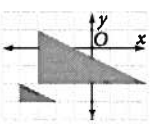
30.  line, point

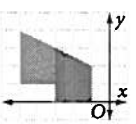
31. Armando is going to draw a triangle that he will put on his backpack.
a. If the triangle has a line of symmetry, what kind of triangle must it be? **isosceles**
b. If the triangle has two lines of symmetry, what kind of triangle must it be? **equilateral**

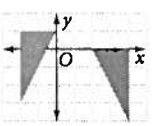
Lessons 9-5 and 9-6

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

32.  rotation

33.  dilation

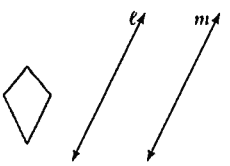
34.  translation

35.  glide reflection

36. 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. **See margin.**

37. 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. **See margin.**

38. 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. **See margin.**

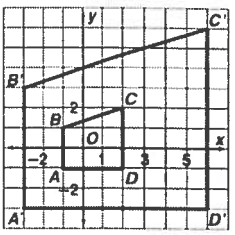


Lesson 9-7

39. Which of the four figures in Exercises 27–30 will tessellate a plane? **all of them**

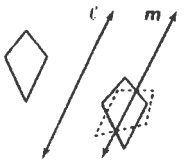
40. Use a square and an equilateral triangle to make a tessellation. The square and equilateral triangle should have congruent sides. **See margin.**

Skills, Word Problems, and Proof

36. 

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

38. Reflect over ℓ, then over m.



40. Reflect over m, then over ℓ.