Answers for 9.3

9.3 Skill Practice

1. a line which acts like a mirror to reflect an image across the line

2. Multiply it by 2 because the distance from a point to the line of reflection is the same as the distance from the point's image to the line of reflection.
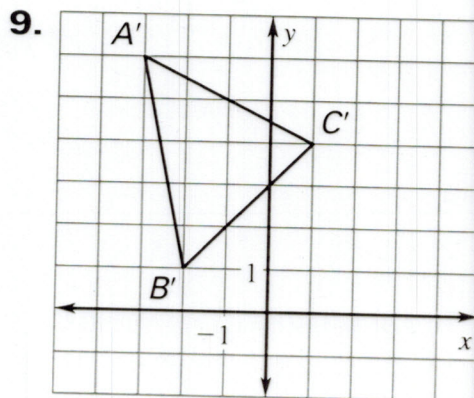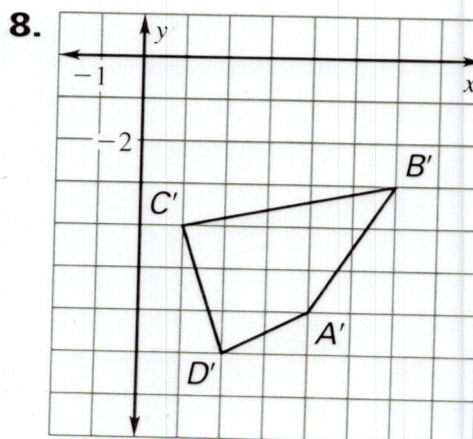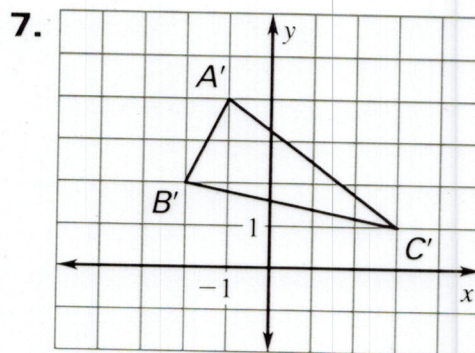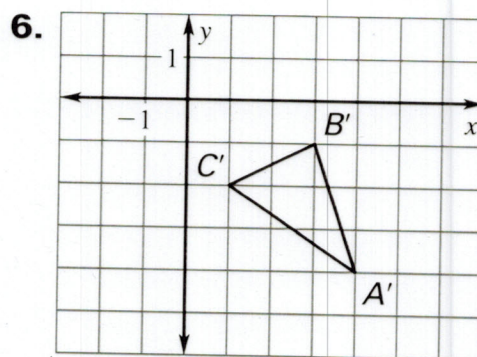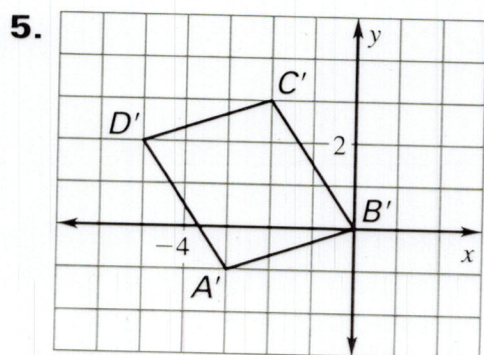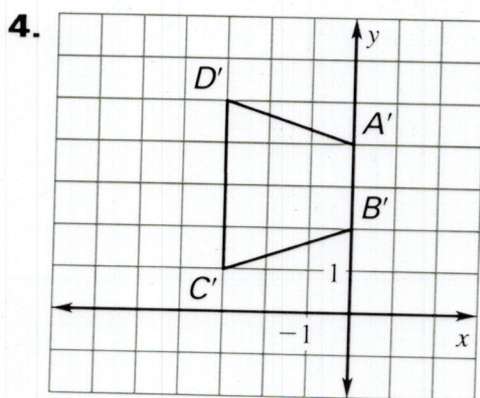
3.

4.

5.

6.

7.

8.

9.

10.

11.

12. D

13.

14.

15.

$$\begin{array}{ccc} A & B & C \end{array} \qquad \begin{array}{ccc} A' & B' & C' \end{array}$$
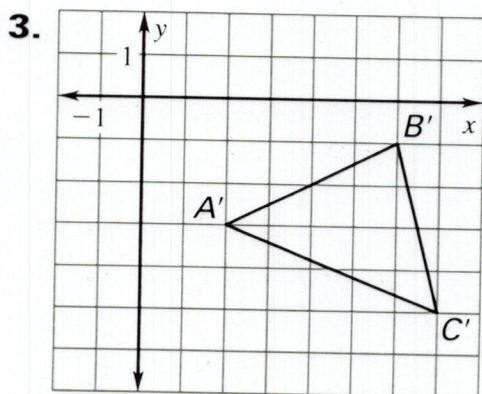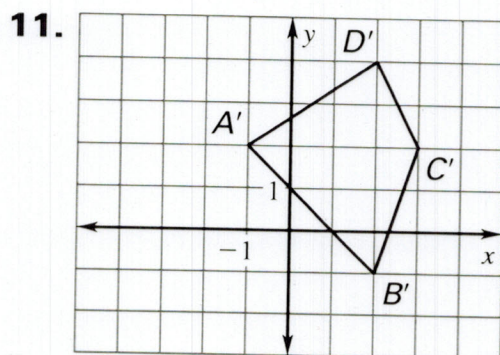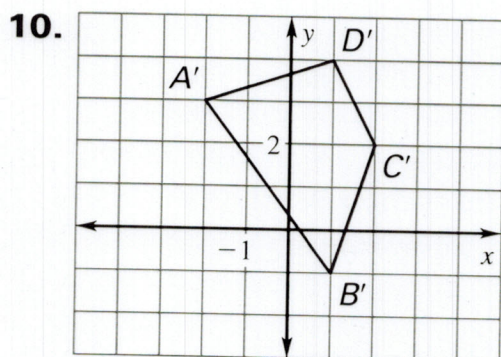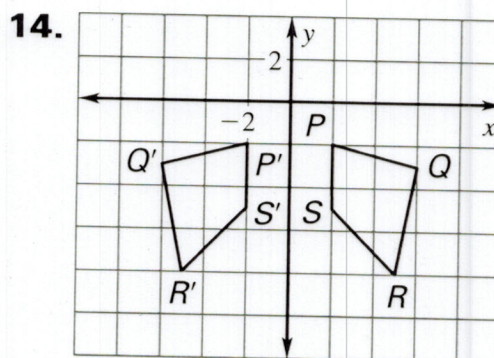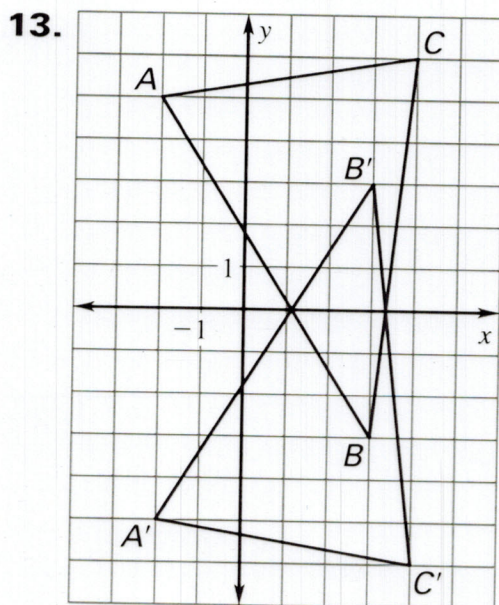$$\begin{bmatrix} 1 & 4 & 3 \\ 2 & 2 & -2 \end{bmatrix}; \begin{bmatrix} -1 & -4 & -3 \\ 2 & 2 & -2 \end{bmatrix}$$

16.

$$\begin{array}{cccc} A & B & C & D \end{array}$$
$$\begin{bmatrix} -2 & 4 & 3 & 0 \\ 1 & 1 & -2 & -1 \end{bmatrix}$$

$$\begin{array}{cccc} A' & B' & C' & D' \end{array}$$
$$\begin{bmatrix} -2 & 4 & 3 & 0 \\ -1 & -1 & 2 & 1 \end{bmatrix}$$

17.

$$\begin{array}{ccc} A & B & C \end{array} \qquad \begin{array}{ccc} A' & B' & C' \end{array}$$
$$\begin{bmatrix} -4 & 3 & 2 \\ -2 & 1 & -3 \end{bmatrix}; \begin{bmatrix} 4 & -3 & -2 \\ -2 & 1 & -3 \end{bmatrix}$$

18. The reflection matrix should be

$$\begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix}, \text{not} \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$$

$$\begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix}\begin{bmatrix} -5 & 4 & 2 \\ 4 & 8 & -1 \end{bmatrix} =$$

$$\begin{bmatrix} 5 & -4 & 2 \\ 4 & 8 & -1 \end{bmatrix}.$$

19. $C(5, 0)$ **20.** $C(7, 0)$

21. $C(-4, 0)$

22.

23.

24.
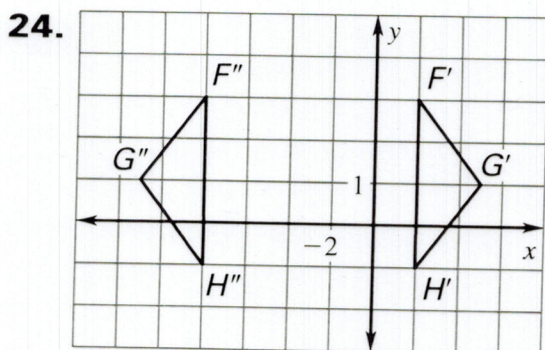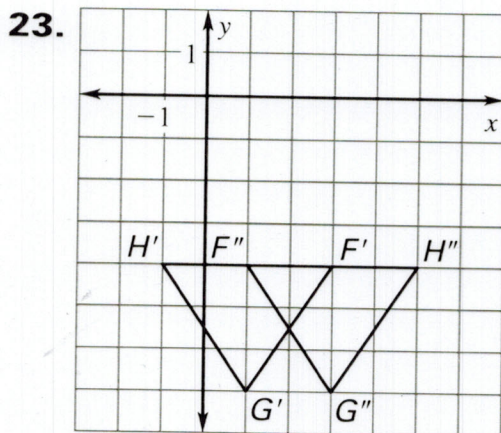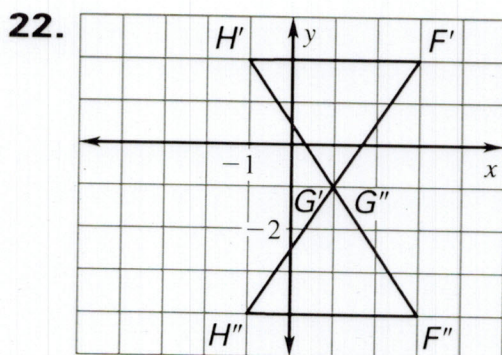
25. The order is reversed.

26. Steps 1–3:

27. $y = -3x - 4$

28. $y = -2x^2 + 5$

29.
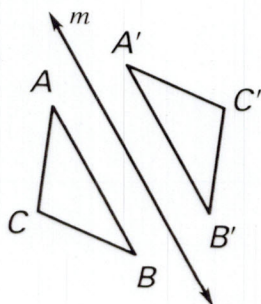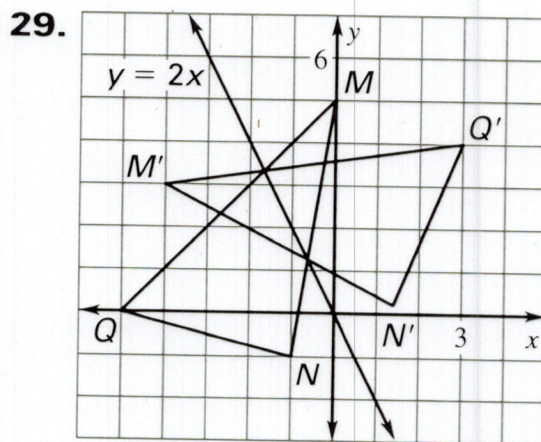
30. $y = x + 1$

31. Case 4   **32.** Case 3

33. Case 1

34. *Sample answer:* Reflect point H across line n and label it H'. Draw $\overline{JH'}$. Label the point where line n intersects at P. Park the car at P.

35. a.

35. a. (cont.)

Given: A reflection in m maps P to P' and Q to Q'. Using the definition of a line of reflection, $\overline{QS} \cong \overline{Q'S}$ and $\angle QSR \cong \angle Q'SR$. Using the Reflexive Property of Segment Congruence, $\overline{RS} \cong \overline{RS}$. Using the SAS Congruence Postulate, $\triangle RSQ \cong \triangle RSQ'$.

b. Using corresponding parts of congruent triangles are congruent, $\overline{RQ} \cong \overline{RQ'}$. Using the definition of a line of reflection, $\overline{PR} \cong \overline{P'R}$.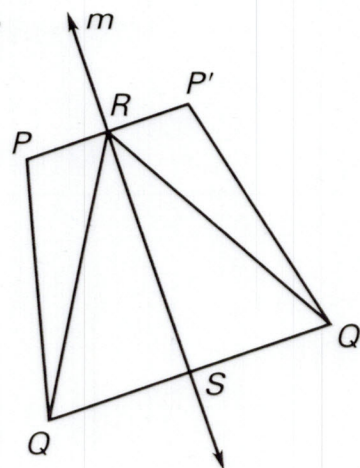 Since $\overline{PP'}$ and $\overline{QQ'}$ are both perpendicular to m, they are parallel. Using the Alternate Interior Angles Theorem, $\angle SQ'R \cong \angle P'RQ'$ and $\angle SQR \cong \angle PRQ$. Using corresponding parts of congruent triangles are congruent, $\angle SQ'R \cong \angle SQR$. Using the Transitive Property of Angle Congruence, $\angle P'RQ' \cong \angle PRQ$. $\triangle PRQ \cong \triangle P'RQ'$ using the SAS Congruence Postulate. Using corresponding parts of congruent triangles are congruent, $\overline{PQ} \cong \overline{P'Q'}$ which implies $PQ = P'Q'$.

9.3 Problem Solving

36. Given: A reflection in m maps P to P' and Q to Q'. $\overline{PQ}$ intersects m at point R. Using the definition of a line of reflection, m is the perpendicular bisector of $\overline{PP'}$ at point S and of $\overline{QQ'}$ at point T. From this you know that $\overline{P'S} \cong \overline{PS}$, $\overline{Q'T} \cong \overline{QT}$, $\angle P'SR \cong \angle PSR$ and $\angle QTR \cong \angle Q'TR$. The Reflexive Property of Segment Congruence says $\overline{RS} \cong \overline{RS}$ and $\overline{RT} \cong \overline{RT}$. Using the SAS Congruence Postulate, $\triangle P'RS \cong \triangle PRS$ and $\triangle QRT \cong \triangle Q'RT$. Using corresponding parts of congruent triangles are congruent, $\overline{P'R} \cong \overline{PR}$ and $\overline{RQ} \cong \overline{RQ'}$. From this it follows the $P'R + RQ' = PR + RQ$, which implies $P'Q' = PQ$.

37. Given: A reflection in *m* maps *P* to *P'* and *Q* to *Q'*. Also, *P* lies on *m*, and $\overline{PQ}$ is not perpendicular to *m*. Draw $\overline{Q'Q}$ intersecting *m* at point *R*. Using the definition of a line of reflection, *m* is the perpendicular bisector of $\overline{Q'Q}$, which implies $\overline{Q'R} \cong \overline{QR}$, $\angle Q'RP' \cong \angle QRP$, and *P* and *P'* are the same point. Using the Reflexive Property of Segment Congruence, $\overline{RP} \cong \overline{RP}$. Using the SAS Congruence Postulate, $\triangle Q'RP' \cong QRP$. Using corresponding parts of congruent triangles are congruent, $\overline{Q'P'} \cong \overline{QP}$ which implies $Q'P' = QP$.

38. Given: A reflection in *m* maps *P* to *P'* and *Q* to *Q'*. Also, *Q* lies on *m*, and $\overline{PQ}$ is perpendicular to *m*. Using the definition of a line of reflection, point *Q* remains in the same location and is also known as *Q'*. Furthermore, *m* is the perpendicular bisector of $\overline{PP'}$ at point *Q* which makes $PQ = P'Q'$.

39. a. *B*(3, 5)

b. *H*(0, 6); *J*(−1, 4)

c. In each case point *C* bisects each line segment.

40. Yes, *Sample answer:* Starting at (3, 0) the ball would follow the following path: (1, 4), (5, 0), (8, 3), (7, 4), (3, 0) and end up at (0, 3).

41. a. at a point that is directly across from the midpoint of the distance between your eye and your foot

b. at a point that is directly across from the midpoint of the distance between your eye and the top of your head

c. The top of the mirror *F* is directly across from the point that is halfway between the top of your head and your eye, and the bottom of the mirror *E* is directly across from the point that is halfway between your eye and your foot. So, the height of the mirror *EF* is half your height.

9.3 Mixed Review

42. Perpendicular; Line 1 is horizontal and Line 2 is vertical.

43. Parallel; both slopes are $\frac{3}{4}$.

44. 102.5°   **45.** 105°

46. 100°