**Enrichment 12-1**

**Lines of Reflection**

A line of reflection is the line in which the preimage is reflected to create the image. When a reflection is shown on a grid, you can use algebra to locate and give the equation of the line of reflection.

Use the figure at the right to complete Exercises 1–6.

1. What point is halfway between $J$ and $J'$?
2. What point is halfway between $K$ and $K'$?
3. What point is halfway between $L$ and $L'$?
4. What formula did you use in Exercises 1–3?
5. Use the points found in Exercises 1–3 to draw the line of reflection.
6. What is the equation of the line of reflection?

Draw the line of reflection on each grid. Then give the equation of the line of reflection.

7. [Diagram of grid with points J, K, and L]
8. [Diagram of grid with points D, E, F, and G]
9. [Diagram of grid with points A, B, C, and D]
10. [Diagram of grid with points M, N, P, and Q]
11. [Diagram of grid with points U, V, W, and X]
12. [Diagram of grid with points H, I, J, and K]
5. line symmetry in the dashed lines, rotational symmetry around points, translational symmetry, glide reflectional symmetry

Reteaching 12-7
1. Check students' work.
2. Check students' work.

Enrichment 12-1
1. (−3, −1) 2. (−1, 0) 3. (5, 3) 4. the midpoint formula: \( M = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) \)
Enrichment 12-2
1. $(-7, -2)$  2. $(4, -7)$  3. $(-10, 5)$  4. $(-3, -9)$  

Enrichment 12-3
1. $(0, -2, 3)$  2. $(-2, -2, 3)$  3. $(-2, -2, 0)$  
4. $(0, -2, 0)$  5. $(0, -6, 0)$  6. $(0, -6, 3)$  
7. $(-2, -6, 3)$  8. $(-2, -6, 0)$  9. $(2, 0, 3)$  
10. $(2, -2, 3)$  11. $(2, -2, 0)$  12. $(2, 0, 0)$  
13. $(6, 0, 0)$  14. $(6, 0, 3)$  15. $(6, -2, 3)$  
16. $(6, -2, 0)$

Enrichment 12-4
1. $y = -2x - 2$  
2. $y = 3x + 2$  
3. $y = -\frac{1}{2}x - 1$

Enrichment 12-5
1. yes; rotational and point symmetry  
2. no  3. yes; rotational and point symmetry  
4. yes; rotational and point symmetry  5. no  6. no  7. diamonds  8. 12  
9. Seven of diamonds; this does not have symmetry because the diamond in the middle is toward either the bottom or top of the card, and when you rotate the card 180°, the position will be reversed.  
10. All the face cards have symmetry.  
11. yes; 2, 4, 10  12. No; Sample: When you look at the card one way, three of the points of the hearts are pointing down, and five are pointing up. When you rotate the card 180°, five of the points of the hearts are pointing down, and three are pointing up.  
13. No; because the number and suit of each card are placed in opposite corners, none of the cards have line symmetry.  
14. You can add a backward 3 with the small club below it to the two empty corners to create line symmetry, or you can remove the 3 with the small club below it from each of the two corners.

Enrichment 12-6

Enrichment 12-7
1a. $(2, 0, 2)$  1b. $(0, 0, 2)$  1c. $(0, 2, 2)$  1d. $(2, 2, 2)$  
1e. $(2, 0, 0)$  1f. $(0, 0, 0)$  1g. $(0, 2, 0)$  1h. $(2, 2, 0)$  
2a. $(4, 0, 4)$  2b. $(0, 0, 4)$  2c. $(0, 4, 4)$  2d. $(4, 4, 4)$  
2e. $(4, 0, 0)$  2f. $(0, 0, 0)$  2g. $(0, 4, 0)$  2h. $(4, 4, 0)$  
3. $(0, 0, 0)$  4. 2  5. Each edge in the image is double that in the preimage.  
6. Samples: Three faces are coplanar for image and preimage; three faces are parallel;