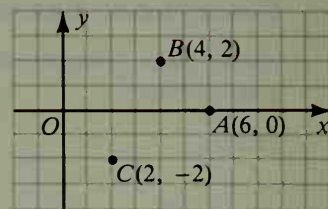


## Written Exercises

Find the coordinates of the images of  $A$ ,  $B$ , and  $C$  by the given dilation.



- A**
- |                |               |                          |                          |
|----------------|---------------|--------------------------|--------------------------|
| 1. $D_{O, 2}$  | 2. $D_{O, 3}$ | 3. $D_{O, \frac{1}{2}}$  | 4. $D_{O, -\frac{1}{2}}$ |
| 5. $D_{O, -2}$ | 6. $D_{O, 1}$ | 7. $D_{A, -\frac{1}{2}}$ | 8. $D_{A, 2}$            |

A dilation with the origin,  $O$ , as center maps the given point to the image point named. Find the scale factor of the dilation. Is the dilation an expansion or a contraction?

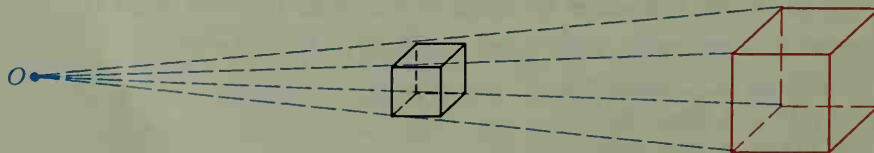
- |                                    |   |                                    |
|------------------------------------|---|------------------------------------|
| 9. $(2, 0) \rightarrow (8, 0)$     | 10. $(2, 3) \rightarrow (4, 6)$                     | 11. $(3, 9) \rightarrow (1, 3)$    |
| 12. $(4, 10) \rightarrow (-2, -5)$ | 13. $(0, \frac{1}{6}) \rightarrow (0, \frac{2}{3})$ | 14. $(-6, 2) \rightarrow (18, -6)$ |

- B**
15. Which of the following properties are invariant under any dilation?  
 a. distance                      b. angle measure                      c. area                      d. orientation
16. Is parallelism invariant under a dilation? (*Hint*: See Exercise 23 on page 581.)
17. If  $A'$ ,  $B'$ ,  $C'$ , and  $D'$  are the images of any four points  $A$ ,  $B$ ,  $C$ , and  $D$ , then we say the ratio of distances is invariant under the transformation if  $\frac{AB}{CD} = \frac{A'B'}{C'D'}$ . For which of the following transformations is the ratio of distances invariant?  
 a. reflection                      b. rotation                      c. dilation

Graph quad.  $PQRS$  and its image by the dilation given. Find the ratio of the perimeters and the ratio of the areas of the two quadrilaterals.

- |                 |            |            |            |                       |
|-----------------|------------|------------|------------|-----------------------|
| 18. $P(-1, 1)$  | $Q(0, -1)$ | $R(4, 0)$  | $S(2, 2)$  | $D_{O, 3}$            |
| 19. $P(12, 0)$  | $Q(0, 15)$ | $R(-9, 6)$ | $S(3, -9)$ | $D_{O, \frac{2}{3}}$  |
| 20. $P(3, 0)$   | $Q(3, 4)$  | $R(6, 6)$  | $S(5, -1)$ | $D_{O, -2}$           |
| 21. $P(-2, -2)$ | $Q(0, 0)$  | $R(4, 0)$  | $S(6, -2)$ | $D_{O, -\frac{1}{2}}$ |

22. The diagram illustrates a dilation of three-dimensional space.  $D_{O, 2}$  maps the smaller cube to the larger cube.
- a. What is the ratio of the surface areas of these cubes?  
 b. What is the ratio of the volumes of these cubes?



23. A dilation with scale factor  $\frac{3}{4}$  maps a sphere with center  $C$  to a concentric sphere.
- a. What is the ratio of the surface areas of these spheres?  
 b. What is the ratio of the volumes of these spheres?