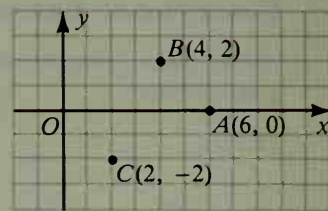


Written Exercises

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?

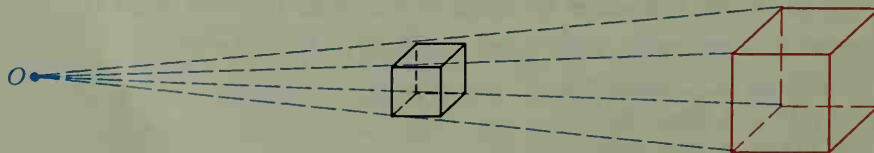
- | | | |
|------------------------------------|---|------------------------------------|
| 9. $(2, 0) \rightarrow (8, 0)$ | 10. $(2, 3) \rightarrow (4, 6)$ | 11. $(3, 9) \rightarrow (1, 3)$ |
| 12. $(4, 10) \rightarrow (-2, -5)$ | 13. $(0, \frac{1}{6}) \rightarrow (0, \frac{2}{3})$ | 14. $(-6, 2) \rightarrow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

- 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?