

Challenge: Skills and Applications

For use with pages 745–750

In Exercises 1–5, find the value of k to fit the given conditions.

- $\left(\frac{5}{2}, \frac{1}{2}\right)$ is the midpoint of $(8, 5)$ and $(k, -4)$.
- $(3k, -5)$ is the midpoint of $(k, -8)$ and $(3, -2)$.
- The distance between $(k, -3)$ and $(4, -1)$ is $\sqrt{85}$.
- The distance between $(7, k)$ and $(-3, 5)$ is $\sqrt{149}$.
- The distance between $(2, k)$ and $(k, -5)$ is $\sqrt{137}$.

In Exercises 6–8, find the values of a and b to fit the given conditions.

- $\left(5, -\frac{5}{2}\right)$ is the midpoint of (a, b) and $(7, 4)$.
- $\left(0, \frac{b-3}{2}\right)$ is the midpoint of $(3a, -5)$ and $(2b, -a)$.
- $\left(-19, \frac{b}{2}\right)$ is the midpoint of $\left(-12a, \frac{2}{3}\right)$ and $\left(5b, \frac{a}{3}\right)$.

In Exercises 9–12, use the following information.

At 12:00 noon, Isabel started walking east from her house along a straight road at 2 miles per hour. Her sister left the house to go running at 1:00 P.M., heading south at 8 miles per hour, also along a straight road. Let the house be at the origin of a coordinate system with north up.

- Give the coordinates of Isabel's position t hours after noon. Give the coordinates of her sister's position at the same time.
- Use the distance formula to write an expression for the distance between Isabel and her sister t hours after noon, assuming $t > 1$. Simplify the expression.
- Find the distance between the sisters at 2:00 P.M.
- At what time are the sisters 5 miles apart?