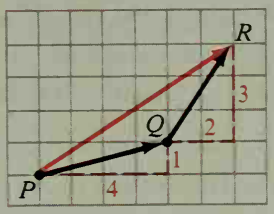
Vectors can be added by the following simple rule:

$$(a, b) + (c, d) = (a + c, b + d)$$

To see an application of adding vectors, suppose that a jet travels from P to Q and then from Q to R. The jet could have made the same journey by flying directly from P to R. $\overrightarrow{PR}$ is the **sum** of $\overrightarrow{PQ}$ and $\overrightarrow{QR}$. We abbreviate this fact by writing

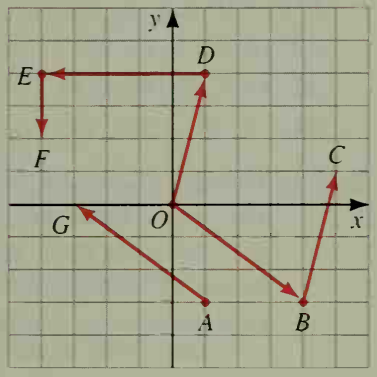


$$\overrightarrow{PQ} + \overrightarrow{QR} = \overrightarrow{PR}$$

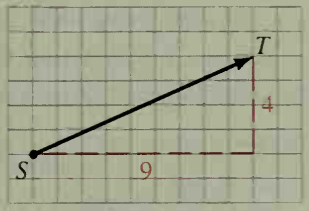
$$(4, 1) + (2, 3) = (6, 4)$$

Classroom Exercises

Exercises 1–4 refer to the figure at the right.



1. Name each vector as an ordered pair.
   a. $\overrightarrow{OB}$ **b.** $\overrightarrow{OD}$ **c.** $\overrightarrow{DE}$
   d. $\overrightarrow{EF}$ **e.** $\overrightarrow{BC}$ **f.** $\overrightarrow{AG}$
2. Find the magnitude of each vector in Exercise 1.
3. **a.** Is $\overrightarrow{BC}$ parallel to $\overrightarrow{OD}$? Explain.
   b. Is $\overrightarrow{BC} = \overrightarrow{OD}$? Explain.
   c. What kind of figure is $OBCD$? Explain.
4. **a.** Is $\overrightarrow{AG}$ parallel to $\overrightarrow{OB}$? Explain.
   b. Is $\overrightarrow{AG} = \overrightarrow{OB}$? Explain.



5. Refer to the diagram. Find $|\overrightarrow{ST}|$ and $\tan \angle S$.
6. Find each sum.
   a. $(3, 1) + (5, 6)$
   b. $(0, -6) + (7, 4)$
   c. $(-3, 10) + (-5, -12)$
7. Find each scalar multiple.
   a. $2(3, 1)$ **b.** $3(-5, 1)$ **c.** $-\frac{1}{2}(-6, 0)$
8. If $\overrightarrow{PQ}$ represents a wind blowing 45 km/h from the north, state two ways you could name the vector representing a wind blowing 45 km/h from the south.

Written Exercises

In Exercises 1–9 points A and B are given. Make a sketch. Then find $\overrightarrow{AB}$ and $|\overrightarrow{AB}|$.

A

1. $A(1, 1), B(5, 4)$
2. $A(2, 0), B(8, 8)$
3. $A(6, 1), B(4, 3)$
4. $A(0, 5), B(-3, 2)$
5. $A(3, 5), B(-1, 7)$
6. $A(4, -2), B(0, 0)$
7. $A(0, 0), B(5, -9)$
8. $A(-3, 5), B(3, 0)$
9. $A(-1, -1), B(-4, -7)$