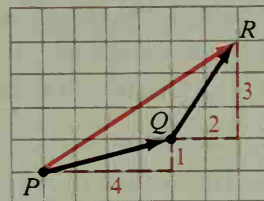


Vectors can be added by the following simple rule:

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

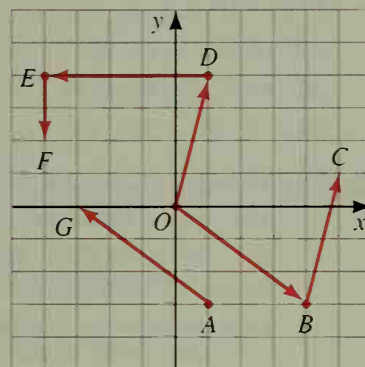
To see an application of adding vectors, suppose that a jet travels from  $P$  to  $Q$  and then from  $Q$  to  $R$ . The jet could have made the same journey by flying directly from  $P$  to  $R$ .  $\overrightarrow{PR}$  is the **sum** of  $\overrightarrow{PQ}$  and  $\overrightarrow{QR}$ . We abbreviate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

$$\begin{aligned}\overrightarrow{PQ} + \overrightarrow{QR} &= \overrightarrow{PR} \\ (4, 1) + (2, 3) &= (6, 4)\end{aligned}$$

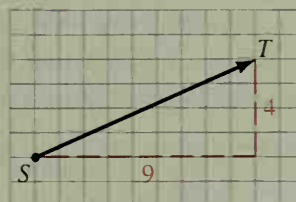


## Classroom Exercises

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



- Name each vector as an ordered pair.
  - $\overrightarrow{OB}$
  - $\overrightarrow{OD}$
  - $\overrightarrow{DE}$
  - $\overrightarrow{EF}$
  - $\overrightarrow{BC}$
  - $\overrightarrow{AG}$
- Find the magnitude of each vector in Exercise 1.
- Is  $\overrightarrow{BC}$  parallel to  $\overrightarrow{OD}$ ? Explain.
  - Is  $\overrightarrow{BC} = \overrightarrow{OD}$ ? Explain.
  - What kind of figure is  $OBCD$ ? Explain.
- Is  $\overrightarrow{AG}$  parallel to  $\overrightarrow{OB}$ ? Explain.
  - Is  $\overrightarrow{AG} = \overrightarrow{OB}$ ? Explain.
- Refer to the diagram. Find  $|\overrightarrow{ST}|$  and  $\tan \angle S$ .
- Find each sum.
  - $(3, 1) + (5, 6)$
  - $(0, -6) + (7, 4)$
  - $(-3, 10) + (-5, -12)$
- Find each scalar multiple.
  - $2(3, 1)$
  - $3(-5, 1)$
  - $-\frac{1}{2}(-6, 0)$
- 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  $|\overrightarrow{AB}|$ .

- |                                |                        |                           |
|--------------------------------|------------------------|---------------------------|
| <b>A</b> 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. $A(-1, -1), B(-4, -7)$ |