

An Important Property of Vectors

Take another look at the directed line segments representing the vectors in the examples 1, 2, 5, and 6 above. In statement 2 about the wind, many directed line segments were drawn, although there is only one 'wind'! This indicated that the wind does not blow on only one point. The directed line segments all represent the *same vector*.

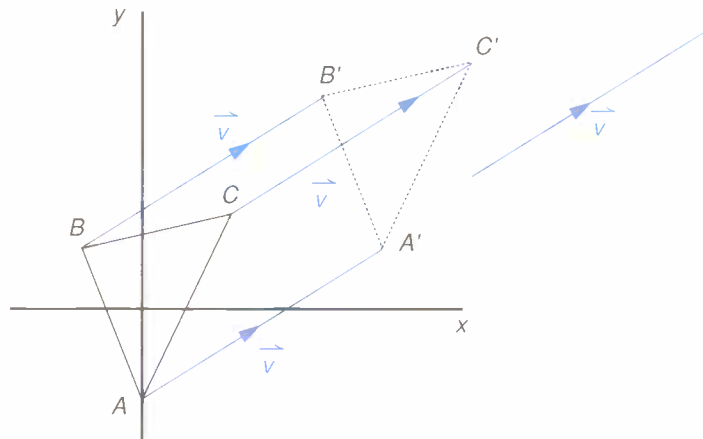
Indeed, one of the most important attributes of a vector is that it has magnitude and direction *only*. It does *not* have a particular *place*. Because a vector can be represented by any one of a family of directed line segments having the same length and direction, the following is true.

A vector is everywhere. A directed line segment representing a vector can be drawn where you want.

Translations and Vectors

You have studied translations before, and you will be seeing them again in more detail in chapter 8.

A translation is a transformation in which a figure or an object is moved to any other position, without altering its shape or size and *without turning*. (Instead of saying that an object is *translated*, you can say that it is *shifted* or *displaced*.)



For example, the triangle ABC is translated to the triangle $A'B'C'$ in the xy -plane above. The translation is depicted by the vector \vec{v} .

Indeed, there is a one-to-one correspondence between translations and vectors. It may help you to understand better that a vector \vec{v} is everywhere if you imagine translating the entire plane with the vector \vec{v} , then drawing the infinite number of equal directed line segments showing the translation of every point in the plane.

Here, $\vec{v} = \overrightarrow{AA'} = \overrightarrow{BB'} = \overrightarrow{CC'}$, etc.