# STEM Sims™

Vectors

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Do you need an idea for a scientific study?
Try out one of our ideas or make one of your own.

Vector resolution is one of the main tools students use to solve many physics problems. Take the following brief quiz to see how much you already know about vectors. See the bottom of page 4 to check your answers.

1. Who is credited with the first use of vectors to solve problems?
    a. Isaac Newton
    b. Gibbs and Heaviside
    c. Aristotle
    d. Hawkins and Smith

2. In what year were the terms "vector" and "scalar" first introduced in an official paper?
    a. 1805
    b. 1820
    c. 1844
    d. 1866

3. The term "vector" comes from a Latin root. What was the meaning of the Latin word "vehere" from which the term vector originated?
    a. to show
    b. to live
    c. to drive
    d. to carry

4. For which graphic application is a vector image much better than a raster image?
    a. large billboard image
    b. digital photograph
    c. detailed color brochure
    d. complex color image

5. Which digital file type would generally be expected to be the *smallest*?
    a. GIF
    b. JPEG
    c. PNG
    d. SVG
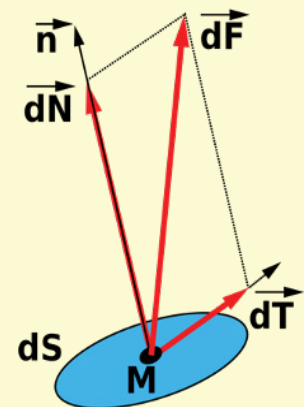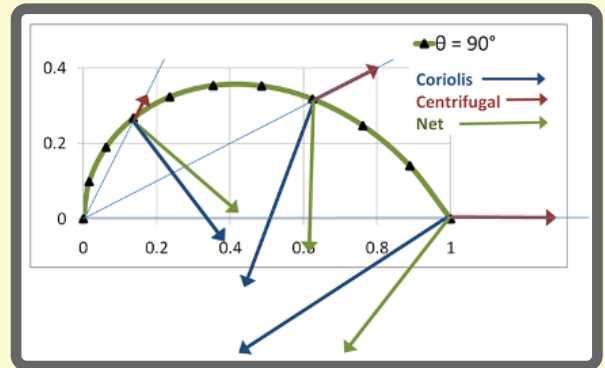
Where Will I Land?

Travel from Spain to North America used to require sailing across the ocean. Sailors were not only affected by winds, but also by ocean currents that sometimes did not push their ships in the intended direction of travel. In this activity, you'll use vectors to map the travel path of a ship leaving from Spain and traveling to North America. Get ready to sail away now.

<u>Materials Required</u>
Printout of Map (below)
3-different colors of pencils or markers (red, blue, green)

Procedure

1. Make a copy of the map below.
2. Use the red marker to show the ship's monthly progress due to its sail. Use the blue marker to show the ocean current's motion, and the green marker to show the monthly resultant path of the ship. The ship starts from Spain and travels due west at a rate of ten (10) squares each month. The ocean current pushes the ship according to Table 1 below.

Table 1.

Month	Ocean Current Vector
1	2 squares south
2	4 diagonal squares SE
3	2 squares west
4	No wind or current
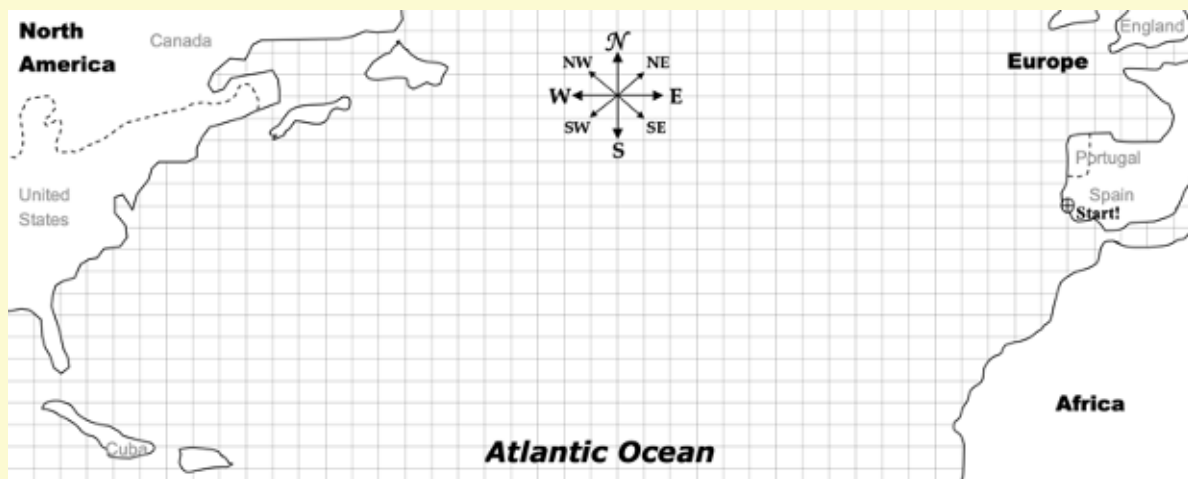
Question

1. How long will the ship's trip take?

2. Where will the ship land?

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It's All About Image

Graphic artists must make several decisions prior to creating a piece of art. One of the first is which type of image is required. Images come in two make types, raster images and vector images. Raster images consist of many tiny dots called pixels that use color and tone to make the image. The quality of the image is determined by the number of pixels that are used to create the image. The more pixels, the better the image quality or resolution. However, since the image is based on pixels, scaling the image to a larger size can cause the pixels to appear as small blocks instead of a smooth-looking image.

Vector images consist of dots that are connected by lines and curves. These images are not pixel-based and are therefore resolution independent. This factor allows vector images to be scalable with no limitations on size. Since vector images consist of lines and anchor points rather than independent pixels, they also tend to be much smaller file sizes when saved on a device.

So the question is, which type of image should be used? Vector images should be used when scalability and small file sizes are desired, such as when images need to be greatly enlarged. Raster images are often used when final image quality is important and larger file sizes are acceptable, such as for digital photography and detailed small print materials. Solid color images should use vector images, while complex blends of color require raster images.

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