1. Find a unit vector in the same direction as $v = 4i - 3j$. Also sketch the unit vector.

2. Let $v = 2i + 3j$ and $w = 3i - 4j$. Draw **2v**, **3w**, and **2v-3w** on the same grid. Count by 2's on the grid squares.
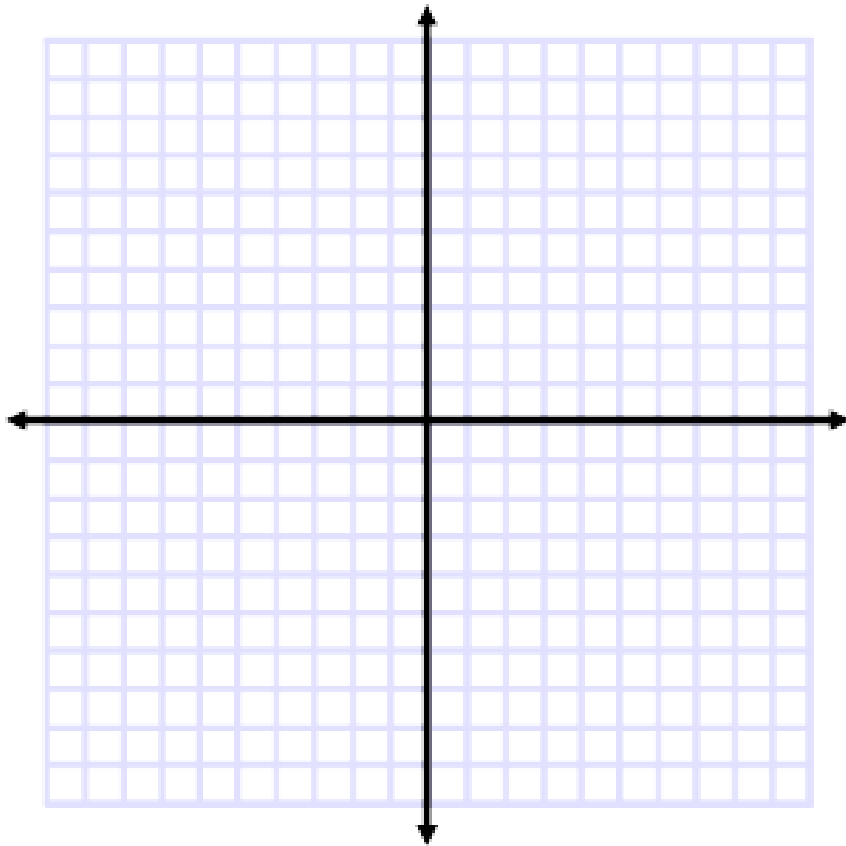


3. A ball is thrown with an initial speed of 25 miles per hour in a direction that makes an angle of 30 degrees with the positive x-axis.

a) Express the velocity vector **v** in terms of **i** and **j**.

b) What is the initial speed in the horizontal direction?

c) What is the initial speed in the vertical direction?

4. A child pulls a wagon with a force of 40 pounds. The handle of the wagon makes an angle of 30° with the ground. Express the force vector **F** in terms of **i** and **j.**

5. A weight of 1000 pounds is suspended from two cables as shown in the figure. What is the tension in each cable?
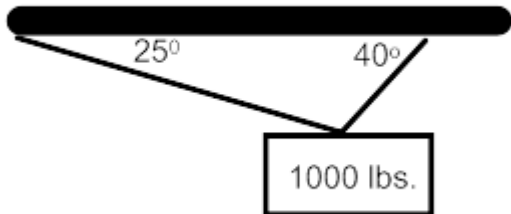


*A bearing is used in air navigation to express direction. Bearings are angles measured in degrees clockwise from the north. That means you would have to take a bearing angle and rewrite it as a counter-clockwise angle from the positive x-axis.*

6. An airplane is flying with a bearing of 148° and an airspeed of 860 kilometers per hour. Because of the wind, its groundspeed and direction are 800 km/h and 140°, respectively. Find the direction and speed of the wind.

7. A commercial jet is flying from Miami to Seattle. The jet's velocity with respect to the air is 580 miles per hour, and its bearing is 332°. The wind, at the altitude of the plane, is blowing from the southwest with a velocity of 60 miles per hour.

a) Draw a figure that gives a visual representation of the problem.

b) Write the velocity of the wind as a vector in component form.

c) Write the velocity of the het relative to the air as a vector in component form.

d) What is the speed of the jet with respect to the ground?

e) What is the true direction of the jet?

8. A 300-Newton weight rests on a smooth (friction negligible) inclined plane that makes an angle of 30 degrees with the horizontal. What force parallel to the plane will just keep the weight from sliding down the plane? (Hint: Consider the downward force of 300 newtons to be the sum of two forces, one parallel to the plane and one perpendicular to it. Sketch a diagram and then rotate your picture so that the inclined plane represents the x-axis.)