

## 5.1 Vectors

**Vocabulary**

- components (p. 122)
- vector resolution (p. 122)

**Key Concepts**

- When two vectors are at right angles, you can use the Pythagorean theorem to determine the magnitude of the resultant vector.

$$R^2 = A^2 + B^2$$

- The law of cosines and law of sines can be used to find the magnitude of the resultant of any two vectors.

$$R^2 = A^2 + B^2 - 2AB \cos \theta$$

$$\frac{R}{\sin \theta} = \frac{A}{\sin a} = \frac{B}{\sin b}$$

- The components of a vector are projections of the component vectors.

$$\cos \theta = \frac{\text{adjacent side}}{\text{hypotenuse}} = \frac{A_x}{A}; \text{ therefore, } A_x = A \cos \theta$$

$$\sin \theta = \frac{\text{opposite side}}{\text{hypotenuse}} = \frac{A_y}{A}; \text{ therefore, } A_y = A \sin \theta$$

$$\theta = \tan^{-1} \left( \frac{R_y}{R_x} \right)$$

- Vectors can be summed by separately adding the  $x$ - and  $y$ -components.

## 5.2 Friction

**Vocabulary**

- kinetic friction (p. 126)
- static friction (p. 126)
- coefficient of kinetic friction (p. 127)
- coefficient of static friction (p. 127)

**Key Concepts**

- A frictional force acts when two surfaces touch.
- The frictional force is proportional to the force pushing the surfaces together.
- The kinetic friction force is equal to the coefficient of kinetic friction times the normal force.

$$F_{L, \text{kinetic}} = \mu_k F_N$$

- The static friction force is less than or equal to the coefficient of static friction times the normal force.

$$F_{L, \text{static}} \leq \mu_s F_N$$

## 5.3 Force and Motion in Two Dimensions

**Vocabulary**

- equilibrant (p. 131)

**Key Concepts**

- The force that must be exerted on an object to cause it to be in equilibrium is called the equilibrant.
- The equilibrant is found by finding the net force on an object, then applying a force with the same magnitude but opposite direction.
- An object on an inclined plane has a component of the force of gravity in a direction parallel to the plane; the component can accelerate the object down the plane.

# Vector Physics Study Guide

**E Staff**



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