

4: Vectors and Forces

Name: _____

Score: _____

1. The resultant of two vectors is the smallest when the angle between them is:

- a) 0°
- b) 45°
- c) 90°
- d) 180°

← opposite directions

2. Which of the following is an accurate statement?

- a) A vector cannot have zero magnitude if one of its components is not zero.
- b) The magnitude of a vector can be less than the magnitude of one of its components.
- c) If the magnitude of vector A is less than the magnitude of vector B, then the x-component of A is less than the x-component of B.
- d) The magnitude of a vector can be positive or negative.

3. You are traveling at 55 mi/h in the +x axis relative to a straight, level road and pass a car traveling at 45 mi/h in the same direction. The relative velocity of your car as viewed from the other car is

- a) -10 mi/h.
- b) 10 mi/h.
- c) 65 mi/h.
- d) 100 mi/h.

You \longrightarrow 55 mi/h
other \longrightarrow 45 mi/h

4. A swimmer heading directly across a river 200 m wide reaches the opposite bank in 6 min 40 s. She is swept downstream 480 m. How fast can she swim in still water?

- a) 1.8 m/s
- b) 1.4 m/s
- c) 1.2 m/s
- d) 0.50 m/s

- across information is speed in still water
- down stream information is the current

$$t = 400 \text{ s}$$

$$x = 200 \text{ m}$$

$$v = \frac{x}{t}$$

1. A 120 Newton object hangs from two ropes. The force vectors add together to form a resultant. The two vectors need to be added together to get a resultant that points straight North with a magnitude of 120 N. Two of the vectors are given below. (10 points)

A: 120 @ 60

B:

R: 120 N @ North

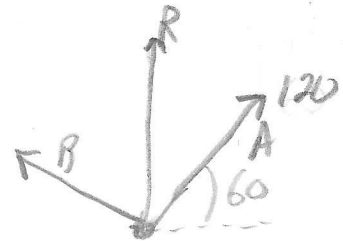
- a. Find the x and y components of vector A. (2 points)

$$A_x = 120 \cos(60) = 60 \text{ N}$$

$$A_y = 120 \sin(60) = 104 \text{ N}$$

- b. Determine the x and y components of vector B so that when A and B are added you get the resultant R. (5 points)

	x	y
A	60	104
B	60	16
R	0	120



$$B_x = 60 \text{ N}$$

$$B_y = 16 \text{ N}$$

- c. Write vector B in magnitude and direction form. (3 points)

$$B = \sqrt{B_x^2 + B_y^2}$$

$$= \sqrt{60^2 + 16^2}$$

$$\theta = \tan^{-1}\left(\frac{16}{60}\right)$$

$$\theta = 15^\circ$$

$$\boxed{B = 62 \text{ @ } 15^\circ \text{ N of W}}$$