**Vector Subtraction (“Change in” vectors)**

Vector subtraction occurs when we are looking for the change from one vector to the next.

**Remember:**

To solve a vector subtraction, or to find the change between two vectors:

Use the “\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_” method

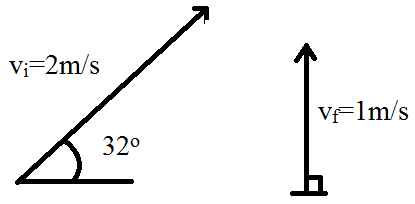
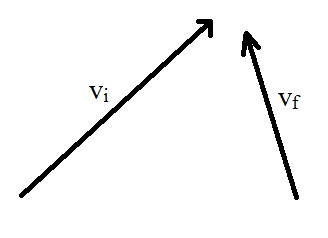
**BUT**

the subtracted vector is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Examples:**

1. Find the change between the velocity vectors:

a) With a vector diagram only b) Solve for the change as a number with direction

Jim is initially biking 3m/s East but turns a corner and is now biking at 4.3m/s at 21° East of North. What is Jim’s change in velocity?

**Relative Velocity**

Each object has its own reference frame, and other things will move relative to that object.

A common example is a boat which is moving on a river, which has a current relative to an observer standing on the shore. This relative motion follows the **Principle of Superposition**

**Principle of Superposition:**

**Examples**

1. A motorboat traveling 4 m/s, East encounters a current traveling 7.0 m/s, North.
   1. What is the resultant velocity of the motorboat?
   2. If the width of the river is 80 meters wide, then how much time does it take the boat to travel shore to shore?
   3. What distance downstream does the boat reach the opposite shore?
2. An airplane flying at 33m/s must move due North to reach its destination. If a tailwind is blowing at 12m/s at 24° South of West, what heading must the plane make?