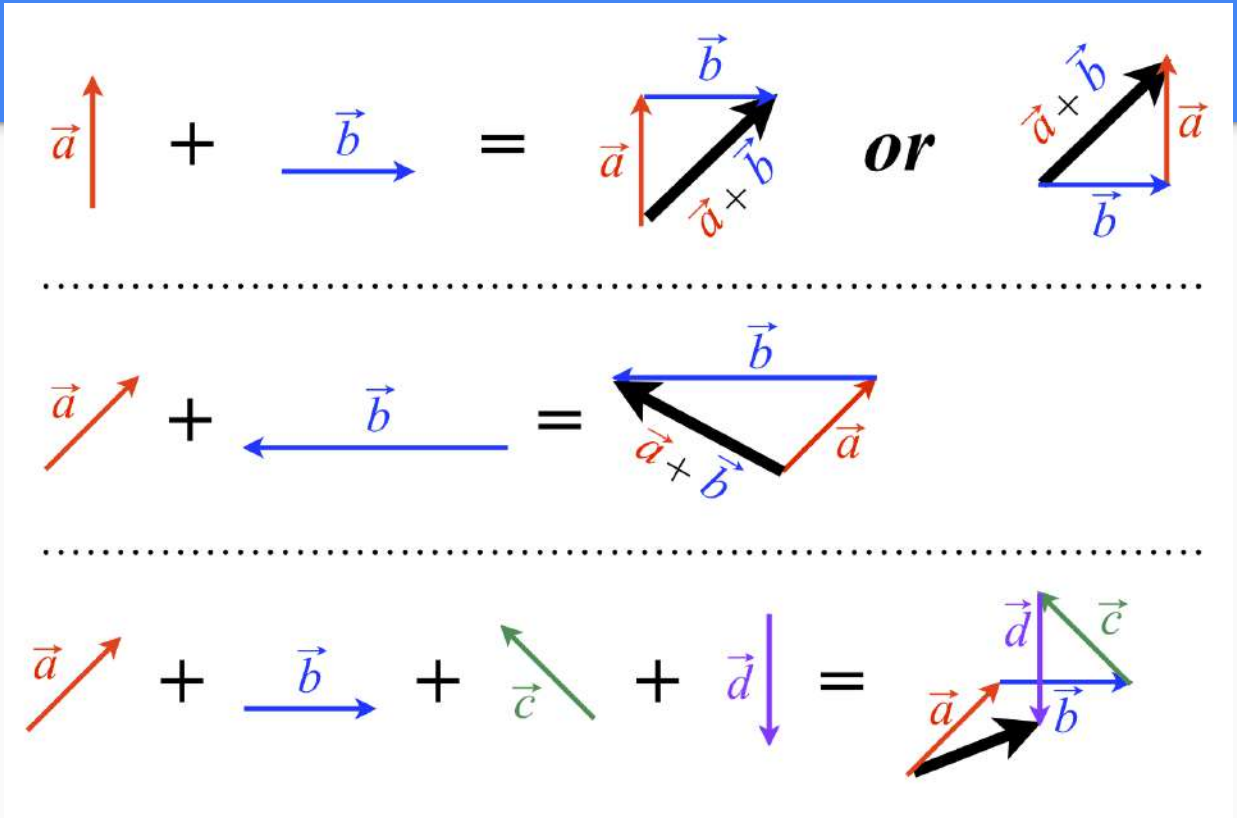
Vectors

Brainstorm

Think back to the bowling ball lab- what did you have to do to make the bowling ball stop? To turn left sharply?
Describe and draw both on your board.

The diagrams below are called "vector diagrams". We use them when we study forces.



What do you think the rules are for drawing vector diagrams?

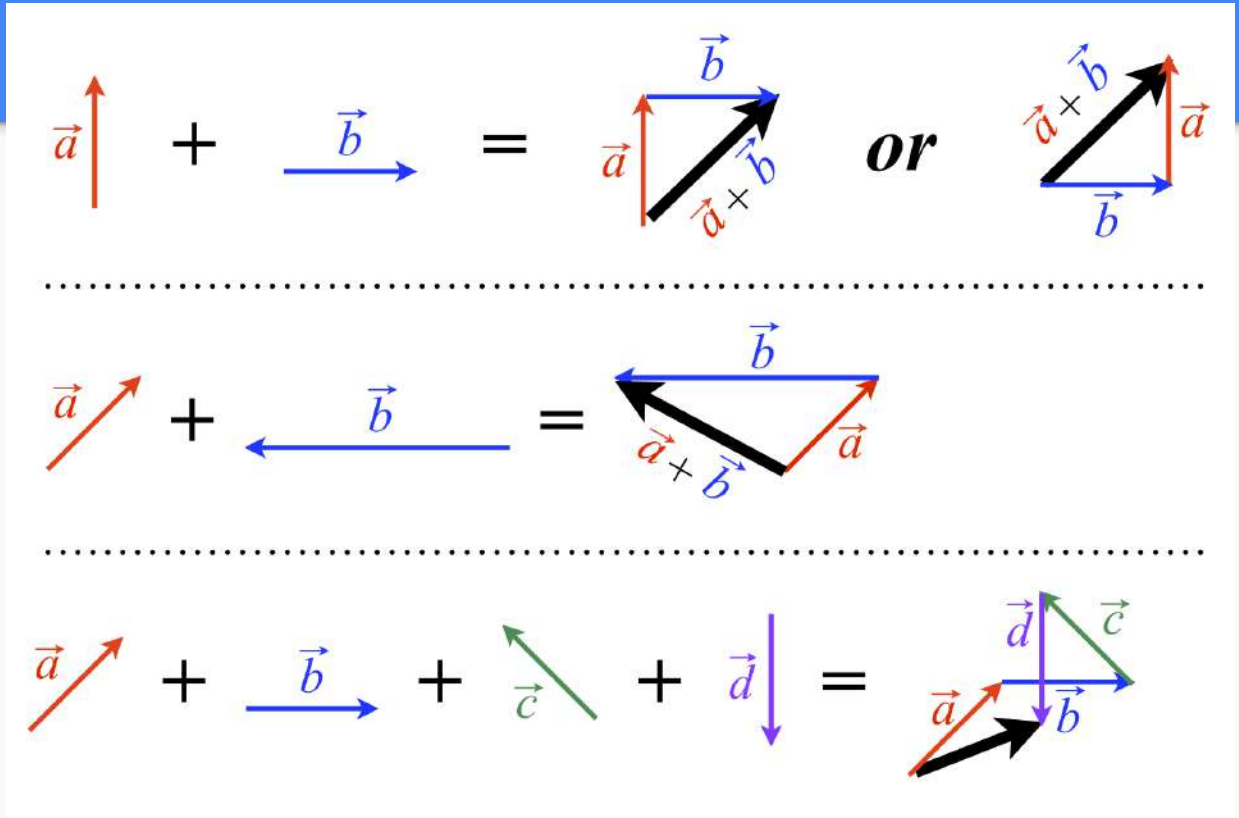


Diagram Rules

1. Draw all vectors as arrows. The size of the arrow should match the size of the quantity (small arrows for small quantities and larger arrows for large quantities).

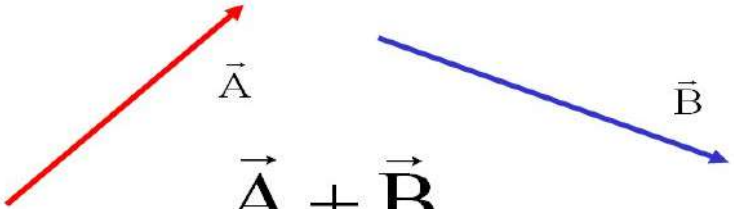
Diagram Rules

2. Draw all component vectors from head to tail. Some problems are very complex with more than two vectors. Just keep drawing the vectors according to the directions.

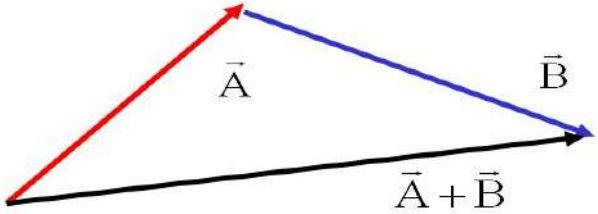
Diagram Rules

3. Draw the resultant from the tail of the first vector drawn to the head of the last vector drawn.

Vector addition – Tip to tail method



$$\vec{A} + \vec{B}$$



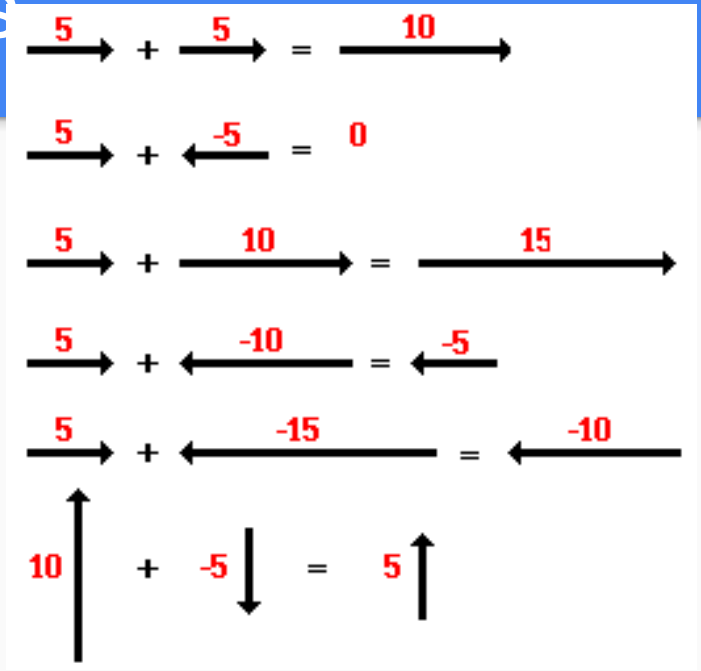
Math Rules

1) When the component vectors go in the same direction, you simply ADD them together to get the resultant. The direction is the same (south components mean a south resultant).

Math Rules

2. When the component vectors are in the opposite direction, you SUBTRACT them to get the resultant. The direction of the larger vector is the direction of the resultant.

Examples



Lets Try It

A pumpkin is speeding up down a hill with a Force of 10 N. A spooky ghost comes and pushes it, causing it to roll down the hill even faster, with a force of 6 N. What is the resultant Force on the pumpkin?

Lets add some friction.

The hill is very bumpy, with lots of overgrown grass and ruts. There is a frictional force of 4 N acting on the pumpkin. What is the resultant Force accounting for friction?

You try it!

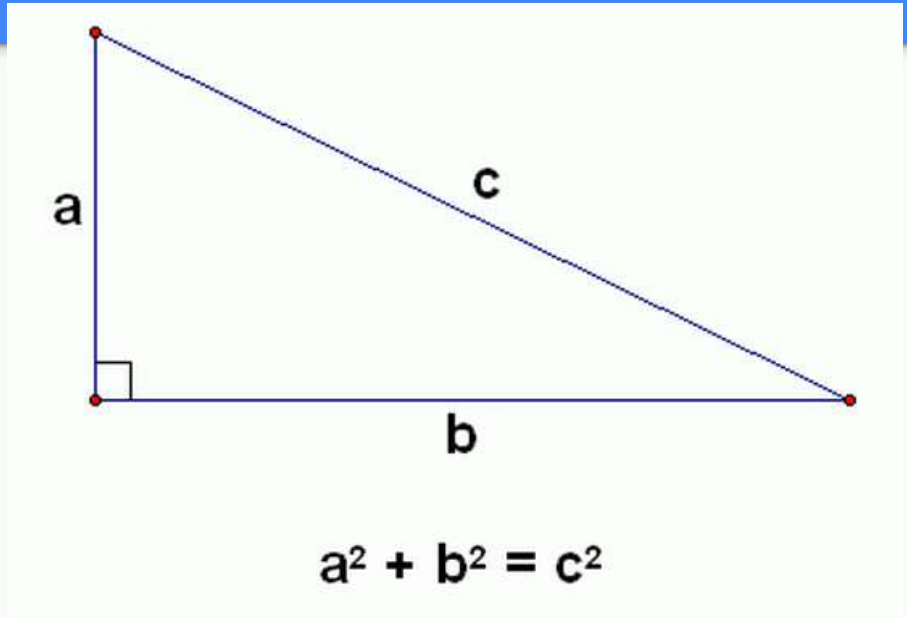
1) A spooky haunted boat's engines exert 500 N of force to the east. If water produces 125 N of friction against the hull of the boat, what is the resultant force?

1) A zombie bicyclist rides due north at a speed of 8 m/s. What is the resultant speed of the bicyclist if she experiences a southward wind of 5 m/s?

Let’s try it

A bicyclist (still a zombie FYI) rides due north at a speed of 8 m/s. What is the resultant speed of the bicyclist if she experiences a westward wind of 5 m/s?

Omg what is this? Oh, it is a triangle. You got this!



More Rules

3) When the component vectors are at right angles to each other, you use the pythagorean theorem to solve for the resultant. The direction is a combination of the two component directions (north and east components give a north-east resultant).

4) Be sure to include both units and direction in your answers.

You try it

A haunted bowling ball is traveling eastward at a speed of 11 m/s. A scary witch hits it in a southward direction with a mallet at a speed of 8 m/s. What is the resultant speed of the haunted bowling ball?

Don’t Panic, we can do this.

1) A black cat walks 15 m to the south, 8 meters to the west, 3 meters north, and 6 meters east. How far away, and in what direction, is the cat from where it started?