Physics 11

**Section 3.3: Relative Velocity (Boat-River)**

What’s your velocity right now?  
  
  
  
  
  
  
  
  
So, all velocities are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. When it’s not obvious where a velocity is being observed from, we need to say it explicitly.

**Example:** In still water (e.g. on a lake), a student can paddle a canoe at 3 m/s.

If they are paddling down a river that flows at 7 m/s, what is their velocity relative to the shore?

What is their velocity relative to the shore if they paddle *up* the river?

Here’s the equation we just used, without even knowing it…

Fun fact: This doesn’t just work for , it works for and as well!

**Example:** A bullet whizzes past your head at 500 m/s north, fired from a car which soon whizzes past you at 50 m/s north. How fast was the bullet going, as viewed from the car?

**2D Problems**

Remember, for problems that are 2D (things not moving in a straight line) we use our equations with

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ instead of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Example:** You see an airplane fly overhead, moving at 90 m/s east. But the wind is blowing at 10 m/s north. What is the airplane’s heading and airspeed (speed relative to the air)?