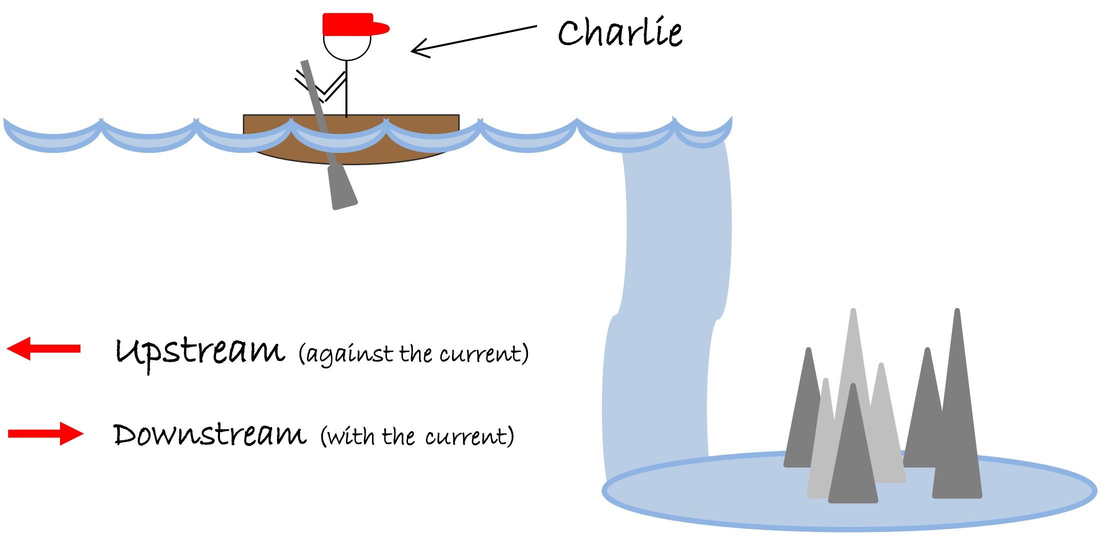
Application of Linear Systems:
Distance Problems



Consider the picture above:

In order for Charlie to stay in the same position in the river, his boat must have the same rate as the current. If Charlie's boat is **SLOWER** than the current, eventually Charlie will crash into the spikey rocks below.

Remember: Downstream means **with** the current, upstream means **against** the current.

When traveling downstream, your total rate is the sum of the rate of the boat and the rate of the current.

$$(Rate_{Total}) = (Rate_{Boat}) + (Rate_{Current})$$

When traveling upstream, your total rate is the difference between the rate of the boat and the rate of the current.

$$(Rate_{Total}) = (Rate_{Boat}) - (Rate_{Current})$$

Example 1:

Charlie travels 30 miles downstream in 2 hours and can travel 27 miles upstream in 3 hours. How fast is Charlie's boat? How fast is the current?

Let $\boldsymbol{x}$ represent Charlie's speed and $\boldsymbol{y}$ represent the rate of the current.

This means Charlie really travels $\boldsymbol{x+y}$ going downstream and $\boldsymbol{x-y}$ going upstream.

	Rate (mph)	Time (hrs)	Distance (mi)
Downstream			
Upstream			

<u>Recall</u>: $(\boldsymbol{Rate}) \times (\boldsymbol{Time}) = \boldsymbol{Distance}$

Now that the table is filled out, you can write a system of equations and solve.

Applications of Linear Systems:

Distance Problems

Practice Problems

An airplane can travel 408 miles in 3 hours flying with the wind and 128 miles in 2 hours against the wind. How fast is the airplane? How fast is the wind?

	Rate (mph)	Time (hrs)	Distance (mi)
With wind			
Against wind			