

Shedding Light on Motion Episode 3: Relative Motion Extension Questions Name: _____

1. A certain plane's maximum speed (relative to the air) is 300 km/hr. What is its maximum speed **relative to the ground** when...
 - (a) it's flying into a head wind that has a speed of 40 km/hr.
 - (b) it's flying with a tail wind that has a speed of 40 km/hr.

2. The water in a river is flowing with a velocity of 3 m/s. The river is 30 metres wide. A certain swimmer can swim at a speed of 2 m/s.

DIAGRAM SPACE

- (a) What is the swimmer's velocity (relative to the Earth) when swimming upstream?
- (b) What is the swimmer's velocity (relative to the Earth) when swimming downstream?
- (c) How much time will it take the swimmer to swim across the river? (Some students get confused by this, but the speed of the current makes absolutely no difference when you are moving at right angles to it!!)
- (d) How far down downstream will the swimmer be once the other side is reached?
- (e) What will have been the total distance that the swimmer covered?
- (f) Using your answers to (c) and (e) above, calculate the velocity that the swimmer was moving relative to the Earth.



- (g) You can also calculate the swimmer's velocity when swimming across the river by adding the velocities of the river and the swimmer and by recognising that velocity has a direction. You will need to add two velocities that are at right angles to each other! Can you do it?