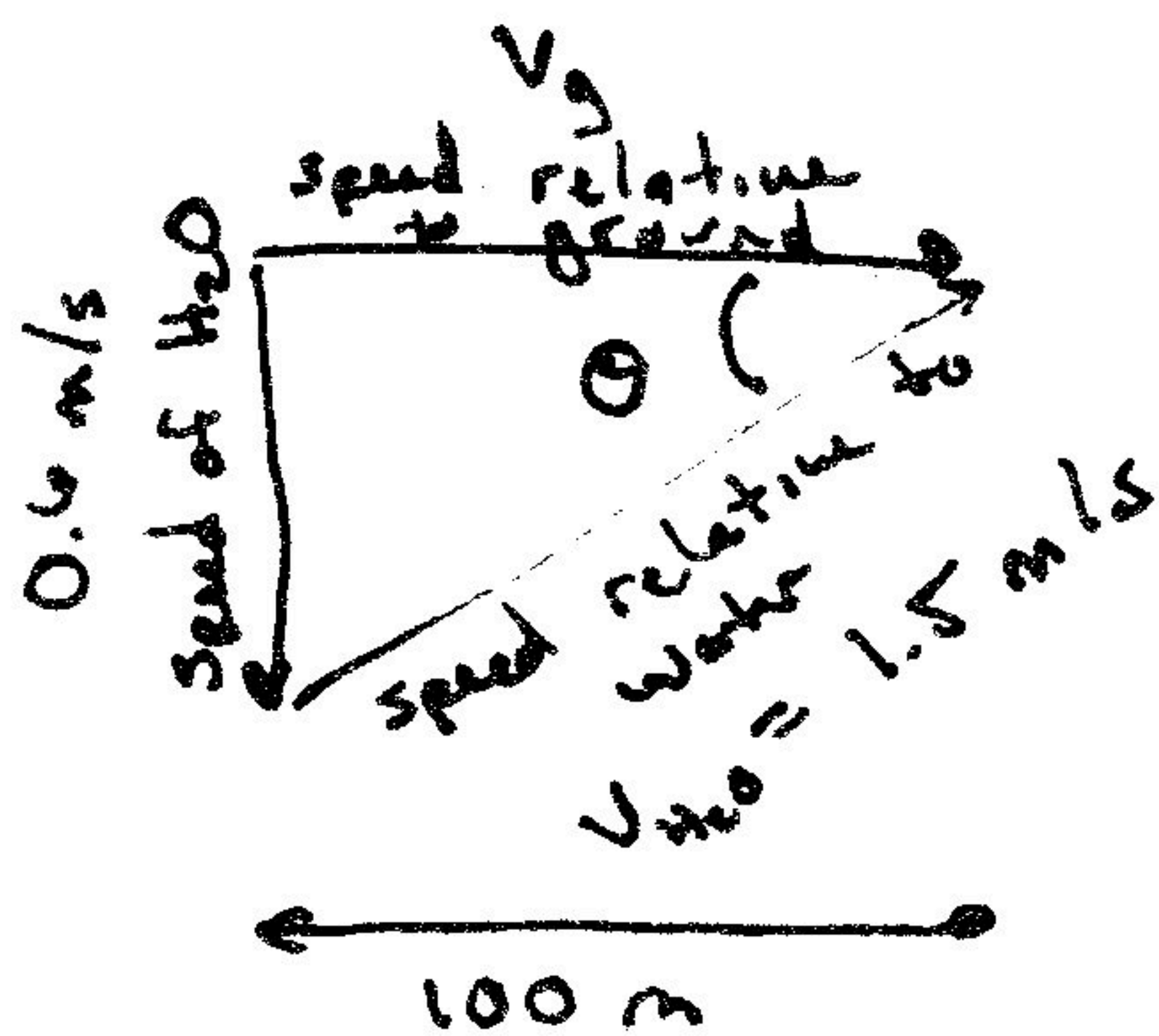


You avoid hitting the boys, and they introduce themselves as the Fog brothers and tell you that they are vampire hunters. You've heard the people in San Cruzan are a little different, but ask them to show you proof anyway. They tell you they will take you to the vampire's lair.

2a – 12 pts) To get there, you need to row your boat from the local wharf directly west across the 100 m wide bay to arrive at the caves buried in the hillside. You and the Fog brothers row at a velocity of 1.5 m/s relative to the water and the water is moving at a velocity relative to the ground of 0.6 m/s^2 to the north. How long will it take for you to cross the bay?



$$\sin \theta = \frac{0.6}{1.5} \Rightarrow \theta = 23.6^\circ$$

$$V_g = V_{H_2O} \cos \theta = 1.5 \text{ m/s} \cdot \cos 23.6^\circ = 1.37 \text{ m/s}$$

$$t = \frac{d}{V_g} = \frac{100 \text{ m}}{1.37 \text{ m/s}} = 73 \text{ seconds}$$

2b – 13 pts) To get to the entrance of the caves you have to do some rock climbing. One of the Fog brothers climbs up the cave entrance and lowers a rope down for you to use, which he ties around his waist. The fog brother (mass = 65 kg) is on a slope that is 10 degrees from horizontal and you (mass = 60 kg) are on a slope that is 60 degrees from the horizontal. Unfortunately, the cave floor is slippery and the Fog brother starts to slide once you are half way up. What is your acceleration, assuming the surface is frictionless?

$$F_{net} = m_1 g \sin \theta_1 + T_1 - T_2 + m_2 g \sin \theta_2 = m_{total} a$$

$$a = \frac{65 \text{ kg} \cdot 9.8 \text{ m/s}^2 \cdot \sin 10^\circ + 60 \text{ kg} \cdot 9.8 \text{ m/s}^2 \cdot \sin 60^\circ}{60 \text{ kg} + 65 \text{ kg}}$$

$$= 4.96 \text{ m/s}^2$$