

Advance Relative Velocity

Solve:

1. A plane that is capable of flying North at 200 m/s encounters a crosswind blowing east that has a speed of 20 m/s.

Part A.

- i. What is the velocity of the plane relative to the ground written in polar form?
- ii. What is the velocity of the plane relative to the ground written in rectangular form?
- iii. What is the speed of the plane relative to the ground?
- iv. If the plane flies for 30 minutes, what will be its displacement in rectangular form?
- v. If the plane flies for 30 minutes, what will be its displacement in polar form?
- vi. What is the distance the plane will have traveled?

Part B.

- vii. What angle should the pilot point the plane if he wants to fly due North?
- viii. What is the velocity of the plane relative to the ground written in polar form?
- ix. What is the velocity of the plane relative to the ground written in rectangular form?
- x. What is the speed of the plane relative to the ground?
- xi. If the plane flies for 30 minutes, what will be its displacement in rectangular form?
- xii. If the plane flies for 30 minutes, what will be its displacement in polar form?
- xiii. What is the distance the plane will have traveled?

2. A person can swim at a speed of 4 m/s in still water. That same person attempts to cross a river that has a current of 2 m/s.

Part A.

- i. What is the velocity of the person relative to the shore in polar form?
- ii. What is the velocity of the person relative to the shore in rectangular form?
- iii. What is the speed of the person relative to the shore?
- iv. If the river is 100m wide how long does it take to cross the river?
- v. What is the displacement of the person when they reach the other side, in polar form?
- vi. What is the displacement of the person when they reach the other side, in rectangular form?
- vii. What is the distance the person will have traveled when they reach the other side?

Part B.

- viii. What angle upstream should the person point if they want to swim to a point directly across the river?
- ix. What is the velocity of the person relative to the shore in polar form?
- x. What is the velocity of the person relative to the shore in rectangular form?
- xi. What is the speed of the person relative to the shore?
- xii. If the river is 100m wide how long does it take to cross the river?
- xiii. What is the displacement of the person when they reach the other side, in polar form?
- xiv. What is the displacement of the person when they reach the other side, in rectangular form?
- xv. What is the distance the person will have traveled when they reach the other side?

3. A pilot points the plane at an angle of 30 degrees NE. If there isn't any wind the plane can fly at 200 m/s. If the plane encounters wind that has a velocity of 10 m/s @ 30 degrees SE answer the questions below.

Part A.

- i. What is the velocity of the plane relative to the ground written in polar form?
- ii. What is the velocity of the plane relative to the ground written in rectangular form?
- iii. What is the speed of the plane relative to the ground?
- iv. If the plane flies for 30 minutes, what will be its displacement in rectangular form?
- v. If the plane flies for 30 minutes, what will be its displacement in polar form?
- vi. What is the distance the plane will have traveled?