

HOMWORK - RELATIVE MOTION - DAY #3

Name: _____

Period: _____ Date: _____

1.)

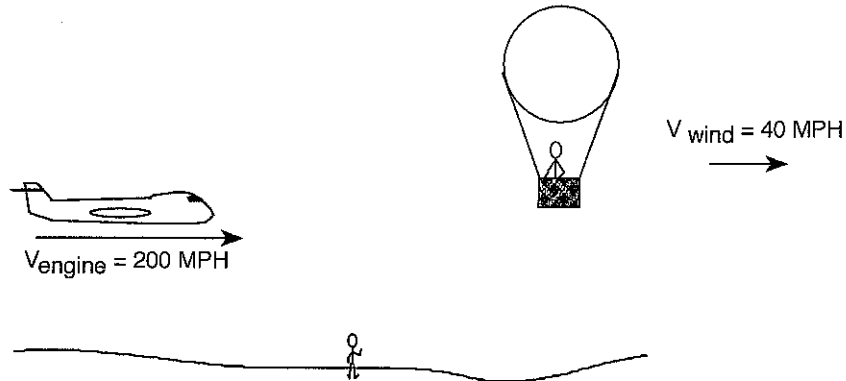


Figure 2.30

An airplane is flying pointed directly East with a speed of 200 mph relative to the air. That is, it would be going 200 mph in still air. If the wind is blowing toward the East at 40 mph find each of the following:

- a.) Velocity of the plane with respect to the air. _____
- b.) Speed of the plane with respect to the ground. _____
- c.) Velocity of the plane with respect to the balloon. _____
- d.) Displacement of the plane with respect to the ground in 2.5 hours. _____

2.) If the wind remains unchanged but the plane in Question 1 turns and flies straight West at the same 200 mph air speed, find each of the following:

- a.) Reading of the plane's air speed indicator. _____
- b.) Velocity of the plane with respect to the ground. _____
- c.) Velocity of the plane with respect to the balloon. _____
- d.) Distance the plane travels with respect to the ground in 5.0 hours. _____
- e.) Velocity of the balloon with respect to the air. _____

3.) The plane from Question 1 flies pointed straight *North* at an air speed of 200 mph and the wind is unchanged (toward the East at 40 mph), find each of the following:

- a.) Velocity of the plane relative to the air. _____
- b.) Speed of the plane relative to the ground. _____
- c.) Velocity of the balloon with respect to the ground. _____
- d.) Displacement of the plane relative to the ground during 3.5 hours. _____

4.)

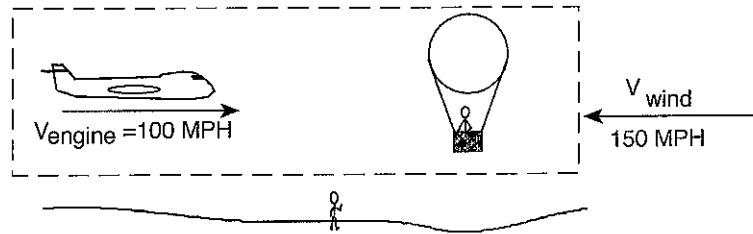


Figure 2.31

The pilot decides to slow down her engines to save fuel so the plane is now going only 100 mph East with respect to the air. Unfortunately the wind picks up to 150 mph West as shown above. Determine the following:

- a.) Velocity of the plane with respect to the air. _____
- b.) Velocity of the plane with respect to the ground. _____
- c.) Speed with which the pilot sees the balloon approaching, that is, velocity of the balloon with respect to the plane. _____
- d.) Displacement of the plane with respect to the ground in 2.5 hours. _____
- e.) Describe what this looks like to our observer on the ground. Will the plane fall down?

5.) When you are in the balloon and the wind is still 150 mph toward the West;

a.) How fast do you feel the air is going by? _____

b.) How would a flag fly from the balloon? (What direction would it blow toward?) _____

c.) If you were going for a balloon ride, would you wear a thick, fluffy coat for warmth or a tight wind breaker to keep out the wind? _____

6.) If the plane shown below flies at the same 100 mph air speed with a bearing of 20 degrees (20 degrees East of North) and the wind is now from the East at 100 mph, answer the following. Include a neat and clearly labeled vector diagram.

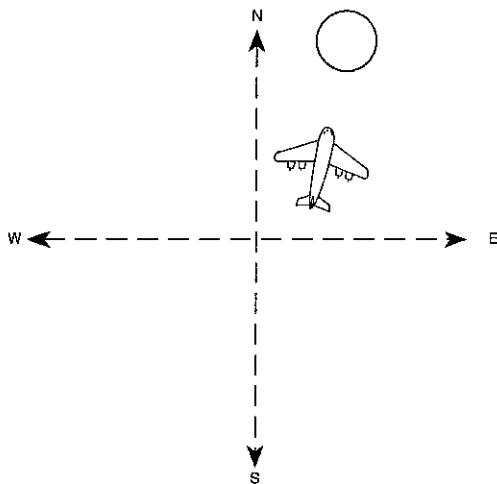


Figure 2.32

a.) Velocity of the plane with respect to the air. _____

b.) Velocity of the plane with respect to the ground. _____

c.) Speed with which the pilot sees the balloon approaching. _____

d.) Displacement of the plane with respect to the ground in 2.5 hours. _____

e.) Draw a "box of air" around the plane and the balloon. If the pilot sees the balloon straight ahead and 50 miles away, should the pilot turn a little right, a little left, or go straight in order to meet the balloon? _____

7.) If your plane is traveling with a velocity of 140 mph through the air pointed at a bearing of 320 degrees and the wind is blowing 50 mph toward a bearing of 80 degrees, answer the following. Include a neat and clearly labeled vector diagram.

a.) Speed of the plane relative to a balloon. _____

b.) Velocity of an air molecule (pink) with respect to the plane. _____

c.) Speed of the plane with respect to the ground. _____

d.) Displacement of the plane with respect to the ground in 1.8 hours. _____

8.) A pilot wished to fly to an airport located *due North* of his present location. The plane is flying at 150 mph relative to the air and the wind is from the East (toward the West) at 60 mph. Answer the following. Include a neat and clearly labeled vector diagram.

a.) Bearing at which the plane is pointed. _____

b.) Velocity of the plane with respect to the ground. _____

c.) Velocity of the balloon with respect to the plane. _____

d.) Displacement of the plane with respect to the ground during a 2.5 hour trip. _____

e.) Explain why this problem is harder than the earlier problems.