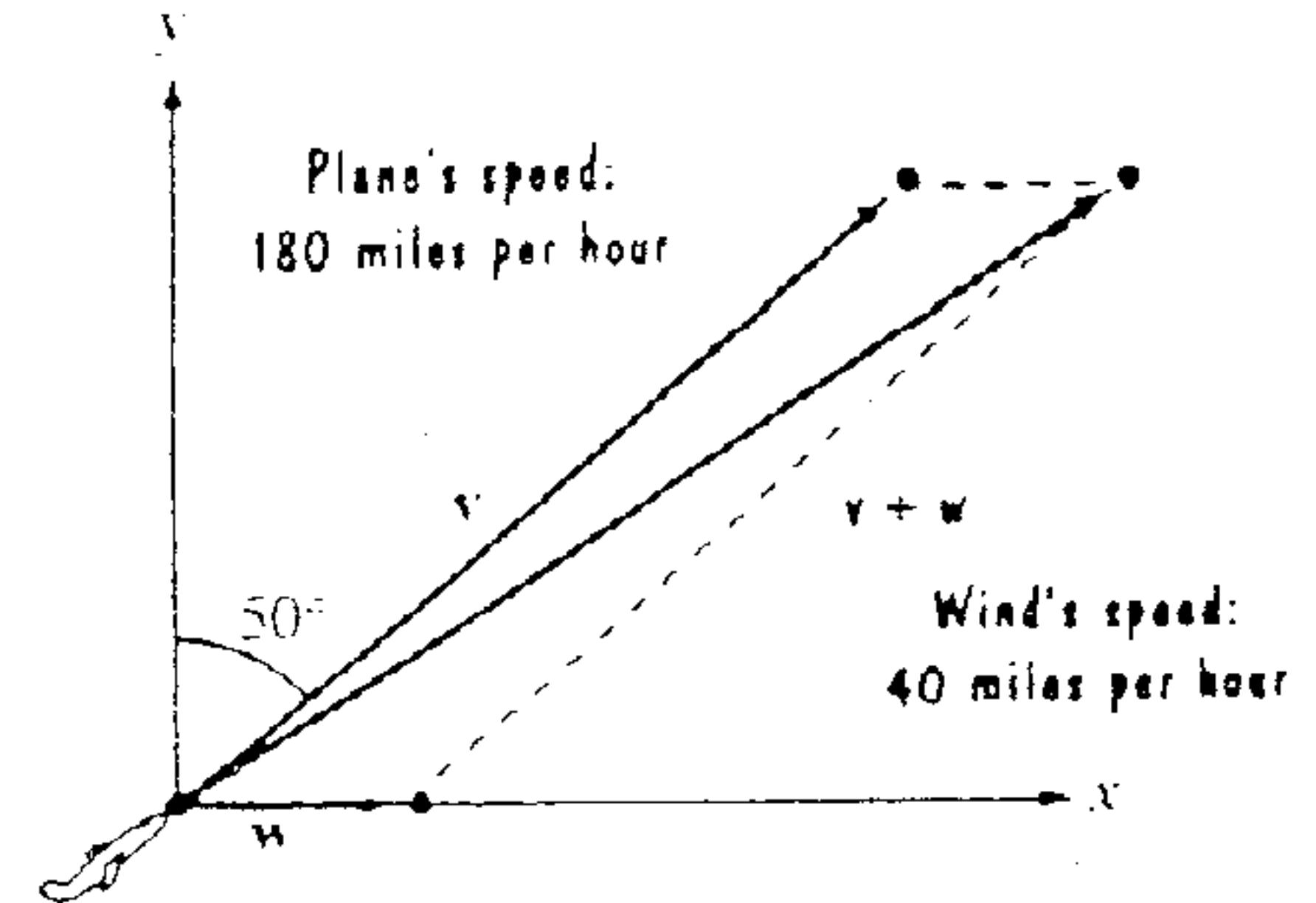


**Pre Calculus Vector Worksheet**  
**Round all answers to the nearest tenth.**

1. The figure shows a small plane flying at a speed of 180 mph on a bearing of  $N 50^\circ E$ . The wind is blowing from west to east at 40 mph.  $\mathbf{v}$  represents the velocity of the plane in still air and  $\mathbf{w}$  represents the velocity of the wind.

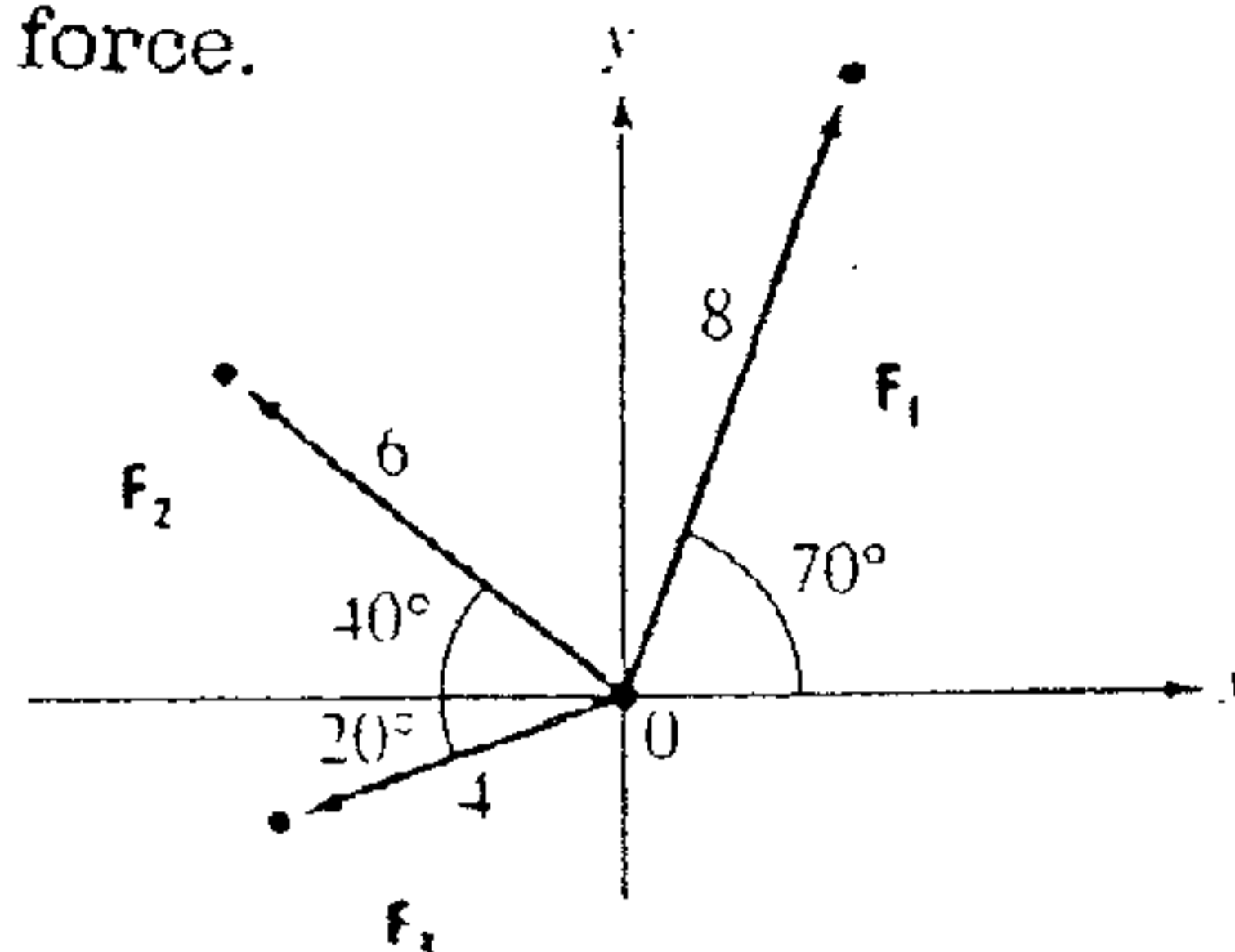
- a. Express  $\mathbf{v}$  and  $\mathbf{w}$  in component form
- b. Find the resultant vector,  $\mathbf{v} + \mathbf{w}$ .
- c. The magnitude of  $\mathbf{v} + \mathbf{w}$  is called the ground speed of the plane, given its speed relative to the ground. Find the ground speed.
- d. The direction angle of  $\mathbf{v} + \mathbf{w}$  gives the plane's true course relative to the ground. What is the plane's true direction?



2. An airplane is traveling at a fixed altitude with negligible wind factor. The airplane is headed  $N 30^\circ W$  at a speed of 500 miles per hour. As the airplane reaches a certain point, it encounters a wind with a velocity of 70 mph in the direction  $N 45^\circ E$ . What are the resultant speed and direction of the airplane?
  
3. An airplane's velocity with respect to the air is 580 mph and it is headed  $N 58^\circ W$ . The wind, at the altitude of the plane, is from the southwest and has a velocity of 60 mph. What is the true direction of the plane, and what is its speed with respect to the ground?
  
4. Two forces, one of 35 pounds and the other 50 pounds, act on the same object. The angle between the forces is  $30^\circ$ . Find the magnitude of the resultant vector of these two forces.
  
5. Two forces, one of 100 pounds and the other 150 pounds act on the same object, at angles of  $20^\circ$  and  $60^\circ$ , respectively, with the positive x-axis. Find the direction and magnitude of the resultant of these forces.
  
6. Lisa and Gina are pulling Aaron in his little red wagon. Gina pulls  $10^\circ E$  of  $N$  with a force of 160 N. Lisa pulls  $30^\circ W$  of  $N$  with a force of 190 N. What is the magnitude and direction of the resultant?

- \*7. A plane is flying at a speed of 320 mph on a bearing N  $70^\circ$  E. Its **ground speed** is 370 mph and its true course is  $60^\circ$ . Find the speed and the direction angle of the wind.

8. The given forces are acting on an object. Find the resultant force.

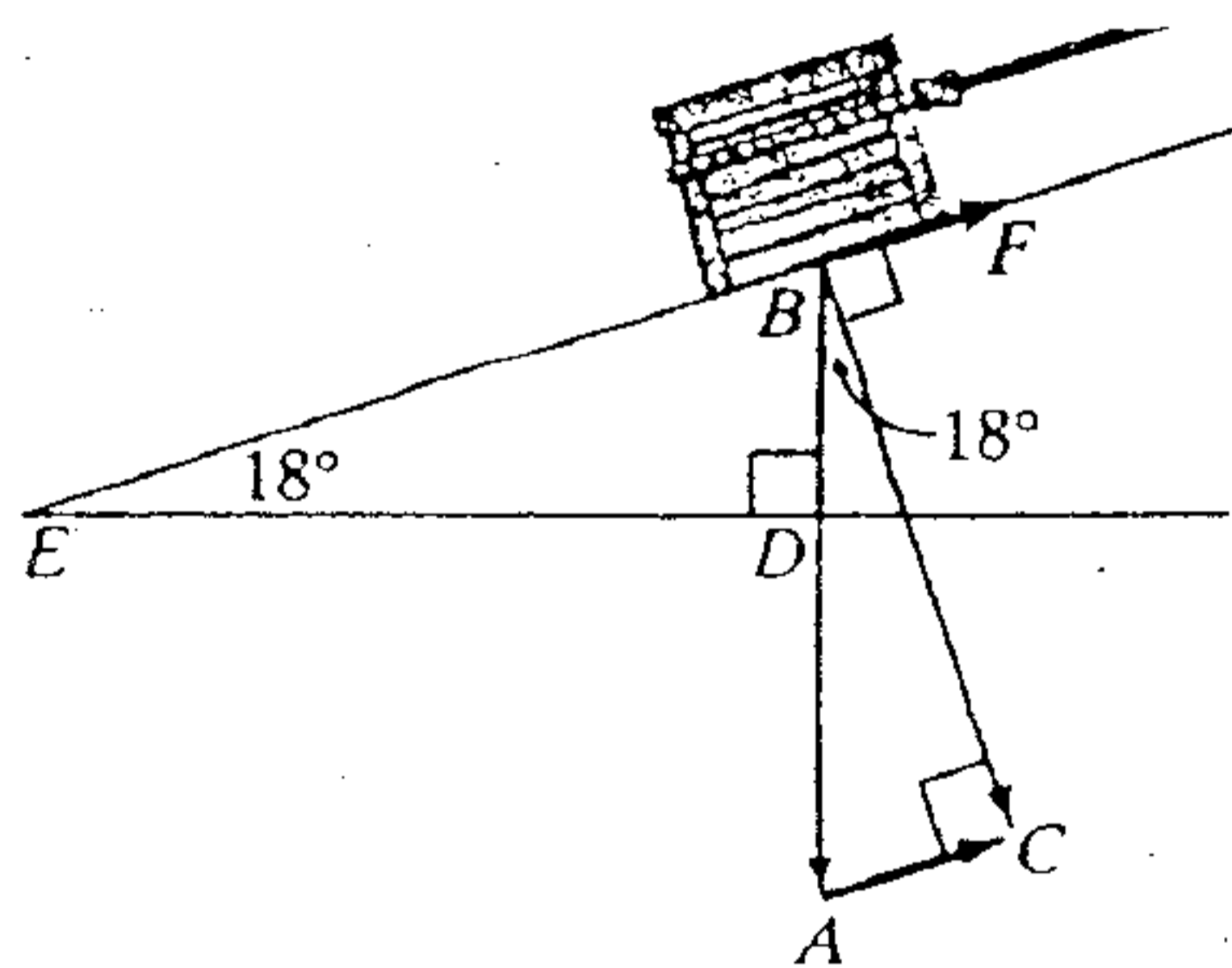


9. Three forces of 75 pounds, 100 pounds, and 125 pounds act on the same object at angles of  $-30^\circ$ ,  $45^\circ$ , and  $135^\circ$  respectively, with the positive x-axis. Find the direction and magnitude of the resultant of these forces.

For # 10 and #11, use the formula for work:  $W = F \cdot d \cdot \cos\theta$

10. A heavy implement is dragged 10 feet across the floor, using a force of 85 pounds. Find the work done if the direction of the force is  $60^\circ$  above the horizontal.
11. A wagon is pulled along level ground by exerting a force of 25 pounds on a handle that makes an angle of  $32^\circ$  with the horizontal. How much work is done pulling the wagon 100 feet?

Use the following information to solve 12 - 13.



- $\overline{BA}$  = force of gravity
- $\|\overline{BA}\|$  = weight of the box
- $\|\overline{AC}\|$  = magnitude of the force needed to pull the box up the ramp
- $\|\overline{BC}\|$  = magnitude of the force of the box against the ramp

12. If the box weighs 100 pounds, find the magnitude of the force needed to pull it up the ramp.
13. If a force of 30 pounds is needed to pull the box up the ramp, find the weight of the box.
14. Melanie and Amy are trying to push a 40 N box up a  $23^\circ$  ramp. Find the minimum amount of force that they needed to use in order to keep the box from sliding down the ramp.
15. A force of 600 pounds is required to pull a boat and trailer up a ramp inclined at  $15^\circ$  from horizontal. Find the combined weight of the boat and trailer. Assume no friction is involved.