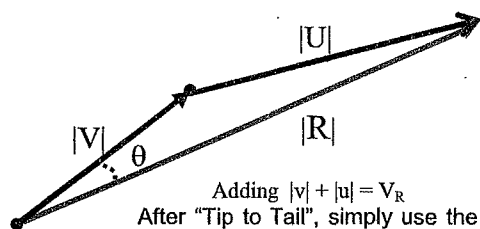


Honors Precalculus. More Vector Problems.

Please show work on separate paper.

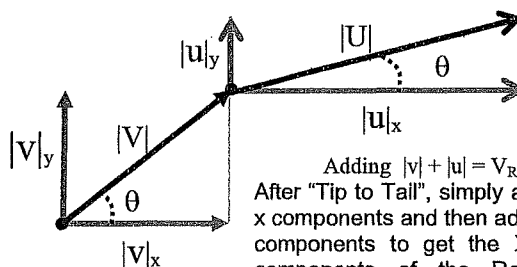
Before you solve problems, a reminder about the two methods we've studied:

Geometric Method



Adding $|v| + |u| = V_R$
After "Tip to Tail", simply use the Law of Cosines to get the Magnitude of the Resultant Vector $|R|$, then use the Law of Sines to find the direction.

Component Method.



Adding $|v| + |u| = V_R$
After "Tip to Tail", simply add the x components and then add the y components to get the X & Y components of the Resultant Vector $|R|$

1. Finding the Actual Speed and Distance of an Aircraft

A DC-10 jumbo jet maintains an airspeed of 550 miles per hour at a bearing of 225° . The velocity of the jet stream is a constant 80 miles per hour from the West. Find the actual speed and direction (as a bearing) of the aircraft.

2. Finding the Correct Compass Heading

The pilot of an aircraft heads directly Due East but is faced with a wind speed of 40 miles per hour pushing against him a bearing of 315° . If the pilot maintains an airspeed of 250 miles per hour, what compass heading will he actually maintain? What is the actual speed of the aircraft?

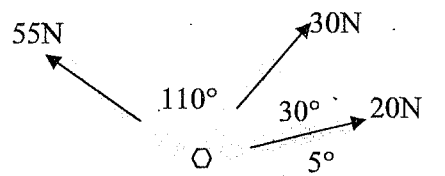
3. Correct Direction for Crossing a River

A motorboat travels at 8.5 m/s. It heads straight across a river 110 m wide.

- If the water flows downstream at a rate of 3.8 m/s, what is the boat's resultant velocity?
- How long does it take the boat to reach the opposite shore?

4. Finding the Resultant of Multiple Forces

A Bridge has three steel girders all joined at one location as shown on the right. If the tensions forces all pull on a single bolt, what resultant force does the bolt have to withstand.



5. Correct Direction for Crossing a River

A river is 500 meters wide and has a current of 1 kilometer per hour. If Tom can swim at a rate of 2 kilometers per hour, at what angle to the shore should he swim if he wishes to cross the river to a point directly opposite? How long will it take to swim across the river? (hint: think this one through carefully and make a good sketch first!)

6. A boat heads directly across a river 41 m wide at 3.8 m/s. The current is flowing downstream at 2.2 m/s.
- What is the resultant velocity of the boat?
 - How much time does it take the boat to cross the river?
 - How far downstream is the boat when it reaches the other side?

7. Three teenagers push a heavy crate across the floor. Dion pushes with a force of 185 N at 0° . Shirley exerts a force of 165 N at 30° , while Joan pushes with 195 N force at 300° . What is the resultant force on the crate?

8. A heavy box is pulled across a wooden floor with a rope. The rope makes an angle of 60° with the floor. A force of 75 N is exerted on the rope. What is the component of the force parallel to the floor?

9. A 62-N force acts at 30° and a second 62-N force acts at 60° .

a) Determine the resultant force.

b) What is the magnitude and direction of the force that produces equilibrium?

10. Two forces act on an object. A 36-N force acts at 225° . A 48-N force acts at 315° . What would be the magnitude and direction of their equilibrant?

11. The 562-N trunk is placed on an inclined plane that forms a 66° angle with the horizontal.

a) Calculate the values of F_n and F_p .

b) Compare your results with those given above for the same trunk on a 30° incline.

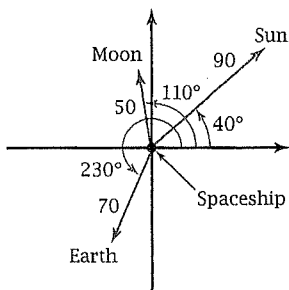
12. A car weighing 12000 N is parked on a 36° slope.

a) Find the force tending to cause the car to roll down the hill.

b) What is the force the car exerts perpendicular to the hill?

13. Three people are pulling on a tree. The first person pulls with 15 N at 65° ; the second with 16 N at 135° ; the third with 11 N at 195° . What is the magnitude and direction of the resultant force on the tree?

14. *Spaceship Problem:* A spaceship is moving in the plane of the Sun, the Moon, and Earth. It is being acted upon by three forces (Figure 6-6m). The Sun pulls with a force of 90 newtons at 40° . The Moon pulls with a force of 50 newtons at 110° . Earth pulls with a force of 70 newtons at 230° . What is the resultant force as a sum of two components? What is the magnitude of this force? In what direction will the spaceship move as a result of these forces?



15. *Detour Problem:* Suppose that you are the pilot of an airliner. You find it necessary to detour around a group of thundershowers, as shown in Figure 6-7c. You turn your plane at an angle of 21° to your original path, fly for a while, turn, and then rejoin your original path at an angle of 35° , 70 km from where you left it.

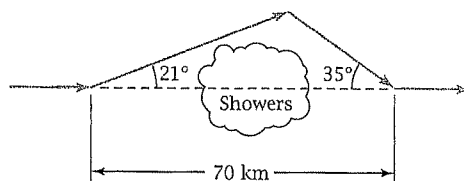


Figure 6-7c

a. How much farther did you have to fly because of the detour?

b. What is the area of the region enclosed by the triangle?