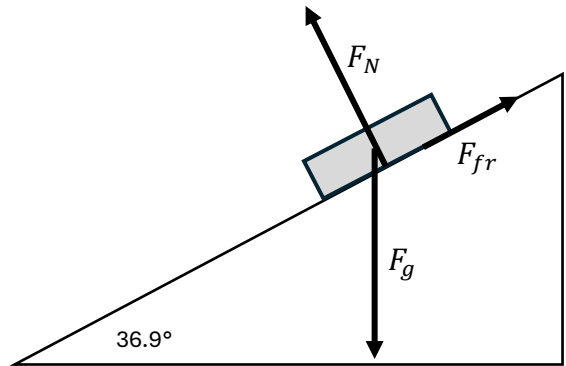
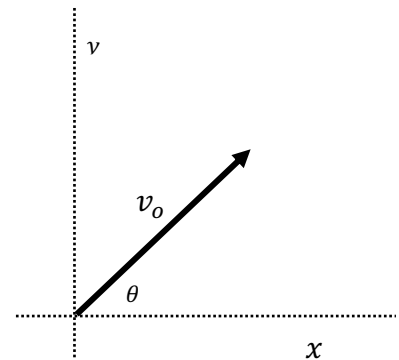


Mastering Physics Prerequisites
Manipulating Vectors
Problems 11-15

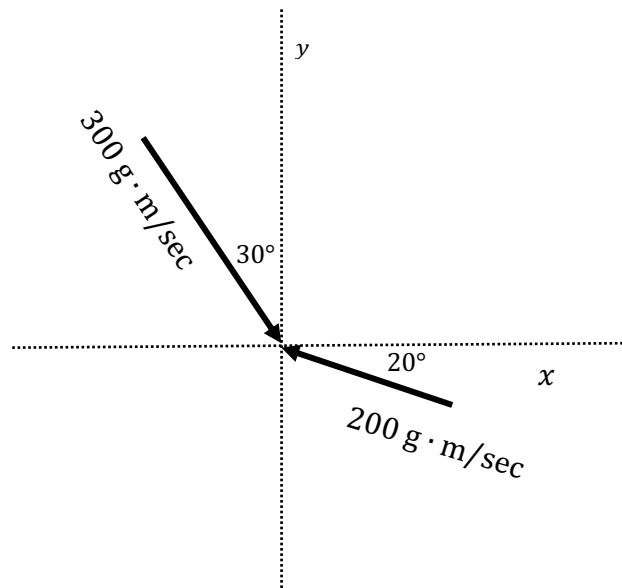
11. A block is sliding down a plane that is inclined at an angle of 36.9° above the horizontal. The frictional force on it is 5 newtons, the gravitational force on it is 15 newtons, and the normal force is 12 newtons. What is the net force on the block? Of course, since force is a vector, you should give the magnitude and the direction.



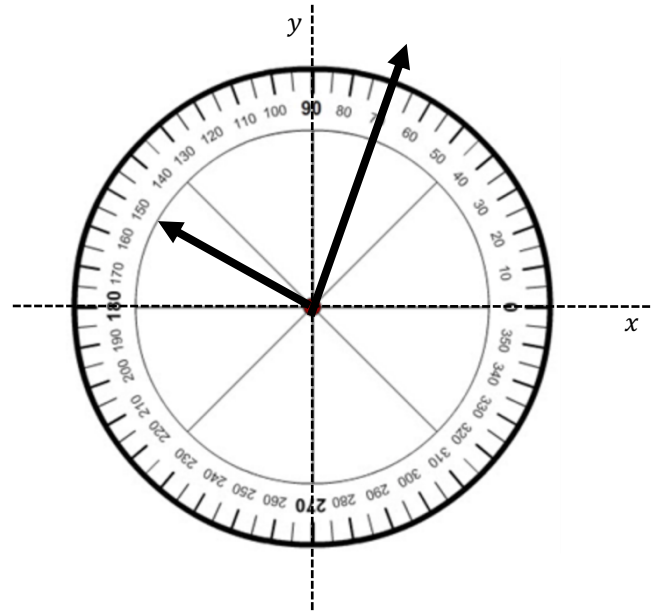
12. An arrow is shot from ground level at an initial speed v_o at an angle θ above the horizontal. Three seconds later, it is at its peak and a horizontal distance of 60 meters from the shooter. Find v_o and θ using 10 m/sec^2 for the acceleration due to gravity.



13. Three pieces of clay are on a collision course. One has a momentum of $300 \text{ g} \cdot \text{m/sec}$ @ 30° to the left of the positive y axis and the other has a momentum of $200 \text{ g} \cdot \text{m/sec}$ @ 20° below the positive x axis. The other, which we'll call the third piece, has an unknown momentum. They all collide at a point, stick together, and stop. What was the momentum of the unknown piece of clay before the collision?



14. A common exercise in a first-year physics lab is to calculate the magnitude and direction of a third force that will balance two known forces on a force table. A top view of the apparatus is shown to the right. If there is a 20-newton force at 70° and a 14-newton force at 150° , what is the magnitude and direction of the force that will balance these two?



15. Two long straight wires pierce the $x - y$ plane as shown in the figure. The wire located at $(+1 \text{ cm}, +3 \text{ cm})$ produces a clockwise magnetic field around it that has a magnitude of 300 mT at the point $(0, +1 \text{ cm})$. The wire at $(+1 \text{ cm}, +1 \text{ cm})$ produces a counterclockwise magnetic field around it that has a magnitude of 500 mT at the point $(0, +1 \text{ cm})$. What is the magnitude and direction of the magnetic field at the point $(0, +1 \text{ cm})$?

