Worksheet 7: Newton's Second Law

- 1. A person pulls on a rope attached to an initially motionless 25-kg box on a frictionless plane inclined 30° to the horizontal. She pulls upward with a force of 20 N parallel to the plane of the ramp.
 - a. Draw a diagram of the situation.

- b. List the forces acting on the block.
- c. Make a free body diagram of the forces.
- d. Identify useful coordinate axes for the problem. Mark them on the diagram.
- e. Find the forces' components in the coordinate directions.

- f. Find the net force acting on the box.
- g. Find the speed and position of the box after 5 s.

- 3. A 1,500-kg car full of clowns rides on rubber tires that have a coefficient of kinetic friction on dry pavement of $\mu_k = 0.80$.
 - a. The car locks wheels and skids on dry pavement. What is the magnitude of the force of friction acting on the car?
 - b. What is the car's acceleration?
 - c. A 20,000-kg truck carrying circus elephants also rides on rubber tires with the same μ_k . When the truck locks wheels and skids, what is *its* acceleration?
- 3. A paper weight rests on an inclined surface. The coefficient of static friction between the paper weight and the surface is μ_s . At what incline angle will static friction *just* keep the paper weight from sliding down the incline?