1. Two spaceships, creatively named "A" and "B", are initially at rest. Spaceship A has twice the mass of spaceship B. At time t=0, they both fire their engines, which both exert the same amount of force on the ships. The engines fire for 5 seconds.

   Answer the questions below on paper. In Canvas just enter "done". Credit is given for complete, rigorous explanations: answers without explanations will not receive credit.
      a. Which spaceship travels the longer distance after 5 seconds? Explain your answer.
      b. Which spaceship has more kinetic energy after 5 seconds? Explain your answer. Hint: do NOT use the equation $K=1/2\ mv^2$!
      c. Which spaceship has more momentum after 5 seconds? Explain your answer. Hint: do NOT use the equation p=mv!

2. A 3.0 kg box is initially moving to the right with a speed of 4.0 m/s. The coefficient of kinetic friction between the box and the ground is 0.30. The box slides for a distance d = 0.50 m, then hits an uncompressed spring with spring constant k = 1000 N/m. The surface below the spring is covered in frictionless ice (yes, this is a very realistic scenario). What maximum distance x will the spring compress?

   Show all your work and explain your reasoning on paper. Enter just your final answer on Canvas.
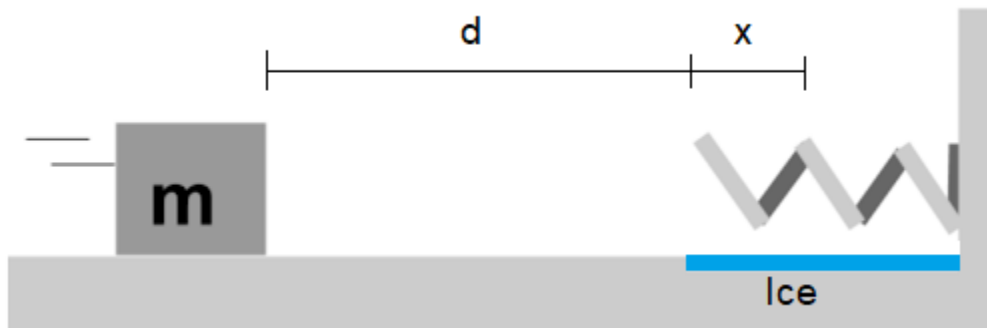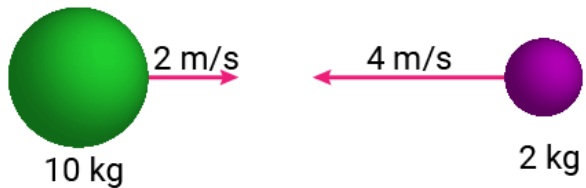
3. A 70 kg skateboarder starts at rest at the top of an 18-m high ramp. He rolls down the ramp and then up a 10-m high rise on the other side. One of the wheels on his skateboard is faulty, so it exerts a constant 50 N force that opposes his motion as he moves. All other friction and drag forces are negligible. The total distance traveled by the skateboarder is 45 m. What is his speed when he reaches the top of the 10-m rise?
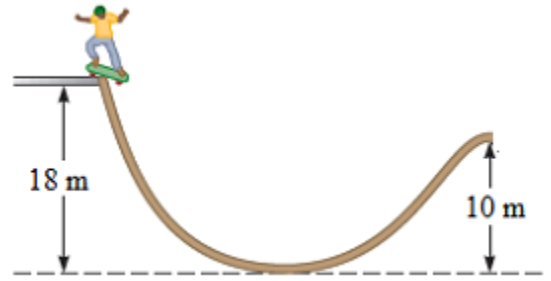
18 m

10 m

Show all your work and explain your reasoning on paper. Enter just your final answer on Canvas.

4. A 10-kg green ball and a 2-kg purple ball collide. Before the collision, the green ball's velocity is +2.0 m/s, and the purple ball's is -4.0 m/s. After the collision, the purple ball's velocity is +4.0 m/s. What is the velocity of the green ball after the collision? Note that you CANNOT assume the collision is perfectly elastic.

Show all your work and explain your reasoning on paper. Enter just your final answer on Canvas.

Before Collision

2 m/s   4 m/s

10 kg   2 kg

After Collision

4 m/s

10 kg   2 kg