ΣF = ma Fg = mg Fk = μkFn

Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Normal Force Challenge

1. A 0.15 kg apple is sitting on a desk. Draw an FBD and write *ΣFy*. Find the weight and normal force.

2. The apple is pushed off of the desk (0.80 m high) and falls to the floor. When it hits the floor, it slows to a stop over 0.10 s. Assume it does not rebound.

1. Draw velocity and acceleration vectors for the

time period when the apple is slowing down.

b) Calculate the acceleration (magnitude and direction) of the apple while it is slowing down using kinematics.

c) Draw the new FBD and write *ΣFy*. Which force has changed, the normal force or the weight? Find the value of the changed force.

3. Now consider that in actuality the apple does rebound so that has a velocity of 1.0 m/s upward.

Draw new **v** and **a** vectors; calculate the new acceleration; find the new normal force.

4. Discuss why the normal force is different in #2c and #3.

5. Place a spring toy on a force probe. Record the force of the toy on the probe before the toy jumps and when it is accelerating off of the probe.

6. Before the toy jumps, the forces are in equilibrium. Draw an FBD with agent-object notation

(i.e. Fground on person). Draw a second FBD with regular force notation.

7. Name the other force in the Newton’s Third Law force pair for each force in the previous question.

8. When the toy accelerates upwards, is there another force acting on it beyond the two forces already identified? Explain.

9. Draw the FBD and write *ΣFy* for the moment the toy begins to accelerate upwards. Is it in equilibrium?

10. Find the normal force. Is this force Fprobe on toy or Ftoy on probe? Explain.