

**Work and Energy  
Video Analysis**

Write your answers on white, unlined paper. Show all work, including formulas used and substitutions with units. Written explanations may be no more than three sentences.

1. Watch the commercial for the 2019 Honda Civic Sport entitled *Palindrome*. Advance to the time stamp, 0:03, where the man in orange skateboards on the letter C. The same motion is repeated at 0:25.

The Honda Civic Sport is 1.44 m tall. The skateboarder starts at an initial height of 1.73 m.



- a. Based on your observation of the video, explain why the surface of the curve is (relatively) frictionless.
- b. Now assume the curved surface has friction. Using conservation of energy, derive an equation by which you will calculate  $\mu_k$ , the effective coefficient of kinetic friction between the curved surface and the skateboard wheels.
- c. State how you will determine or calculate each variable in your equation. (Note: Do not just write: Use Logger Pro)
- d. Describe how you would calculate the change in temperature of the curved surface and the wheels of the skateboard.

2. Watch the clip from the classic 1930s short *Beer Barrel Polecats*, featuring the famous comedy act, The Three Stooges. **Video Needed: Three Stooges Springs.**



At the 1:11 mark, Curly (the one in the chef's hat) sends a plate of alleged pancakes down the counter. They conveniently come to a stop in front of Moe and the customer.

The system works by compressing the spring on the counter, storing elastic potential energy. The elastic potential energy is released when the spring is released, with that energy being converted to other forms of energy.

The mass of the plate and the "pancakes" = 0.694 kg

Coefficient of kinetic friction between the plate and the table,  $\mu_k = 0.450$

Compression of spring to move plate forward,  $x = 0.314 \text{ m}$

Spring constant,  $k = 0.201 \text{ Nt/m}$

- a. Calculate the distance it takes the plate of pancakes to come to a stop.

At the 2:51 mark, Curly sends the bowl of chicken soup (affectionately known as cackle soup) down the counter. It flies off the counter and lands on Moe's back.

For both scenarios, the spring is compressed the same amount. However, the pancakes stop in front of the customer while the soup goes off the edge of the counter.

- b. Based on your understanding of conservation of energy, explain how this is possible in the real world.

