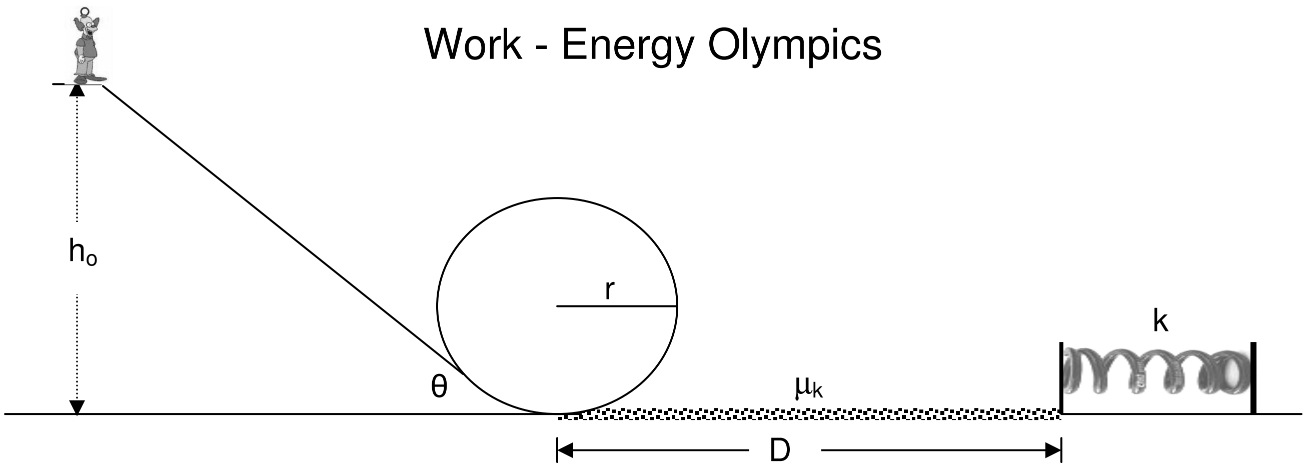
Work - Energy Olympics



1. Consider some crazed (m = 70.0 kg) circus clown sitting at rest above a frictionless linear (θ = 42.0°) incine connected to a frictionless circular (r = 6.80m) vertical loop. Beyond the loop is a "rough" (μ_k = 0.340) horizontal surface (D = 8.50 m) ending in an ideal spring bumber system which compresses 1.25 m before stopping the clown. If the clown starts from rest, use the work-kinetic energy theorem to:

A. Predict and calculate the minimum starting height such that the clown can "safely" turn the loop. (h_o = 17.0m)

B. Predict and calculate the spring constant k. (k = 12.4 KN/m)

2. Consider a crazed (m = 110.kg) circus clown hanging from rest at the end of a (L=32.0m) long pendulum cable initially displaced (θ_A = 56.0°) from the vertical. The clown swings to the lowest point in it's swing, lets go of the cable and skids 15.5m along a rough horizontal surface (μ_k = 0.340) towards an elastic spring (k = 482 n/m) bumper system. Use the work-kinetic energy theorem to:

A. Predict and calculate the maximum compression of the spring after the elastic collision with the clown. (Δx = 6.28 m)

B. Predict and calculate the maximum angular displacement θ_B after the clown "springs" away from the bumper system, grabs the cable and pendulum swings upward. (θ_B = 27.3°, according to Alex)