SPH4U – Friction – 1 and 2 Dimensions

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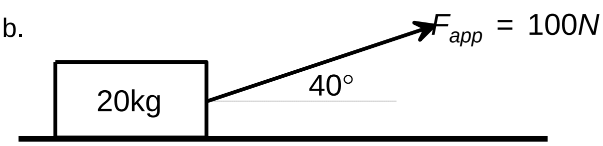
1. A horizontal force of 50.0N is required to pull a 8.0kg block of aluminum at a <u>uniform</u> velocity across a horizontal wooden desk. What is the coefficient of kinetic friction between the block and the desk?
2. A 125kg block of steel is being pushed across a wooden floor. If the coefficient of static friction (μ_s)is 0.45 and the coefficient of kinetic friction (μ_k)is 0.25 calculate the minimum force required to get the steel block moving and the force required to keep it moving once it is moving at a constant speed.
3. The driver of a 2.00×10^3 kg car applies the brakes on a dry concrete roadway. Calculate the force of friction between the tires and the road surface if μ_k=1.02.
4. A 2.0×10^1 kg box is dragged across a level floor with a force of 1.00×10^2N. The coefficient of kinetic friction between the box and the floor is 0.32.
   a. If the force is applied parallel to the floor (see diagram below), what is the acceleration of the box?
   b. If the force is applied at an angle of 40° above the horizontal, what is the acceleration of the box?

a.

b.



5. A boy on a toboggan is sliding down a snow-covered hillside. The boy and the toboggan together have a mass of 50kg, and the slope is at an angle of 30° to the horizontal.
   a. Find the boy's acceleration if there is no friction.
   b. Find the boy's acceleration if the coefficient of kinetic friction is 0.15.
6. A 10 kg block of ice slides down a ramp 20m long inclined at 10° to the horizontal.
   a. If the ramp is frictionless, what is the acceleration of the block of ice?
   b. If the coefficient of kinetic friction is 0.10, how long will it take the block to slide down the ramp, if it starts from rest?
7. A skier has just begun descending a 20° slope. Assuming that the coefficient of kinetic friction is 0.10, calculate
   a. The acceleration of the skier
   b. Her final velocity after 8.0s (assume she starts from rest).
8. A skier skiing downhill reaches the bottom of a hollow with velocity of 20m/s and then coasts up a hill with a 30° slope. If the coefficient of kinetic friction is 0.10, how far up the slope will she travel before she stops?

Answers :

1. μ_k=0.64 2. F_f=551 (to get it moving), F_f=306N to keep it moving 3. F_f=19992N
4. a. a=1.9m/s^2[right] b. a=1.7 m/s^2 [right] 5. a. a=4.9m/s^2 b. a=3.6m/s^2
6. a. a=1.7 m/s^2 b. t=7.4s 7. a. a=2.4 m/s^2 b. v_2=19m/s 8. d=35m