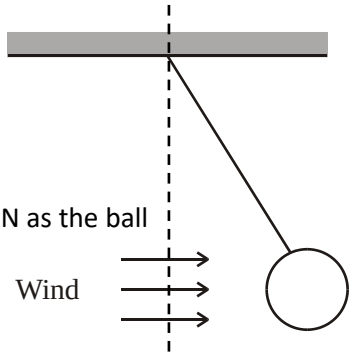
Name: _____ Phys 12

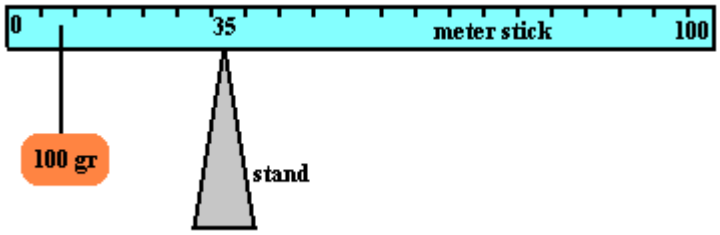
Year End Review: Dynamics and Statics

1) A 5.0kg box was pushed up an incline at a constant velocity of 1.0m/s. The incline makes a 24.0° angle with the horizontal and has a coefficient of friction of 0.39. The pushing force was directed parallel with the incline.
   a. What is the magnitude of the normal force acting on the box?
   b. What is the magnitude of the pushing force?
   c. If the box was released, what is its acceleration down the incline?

2) Wind blows on a ball bearing tied to a ceiling. If the wind exerts a constant force of 330 N as the ball bearing makes a 32.0° angle with the vertical, calculate the mass of the ball bearing



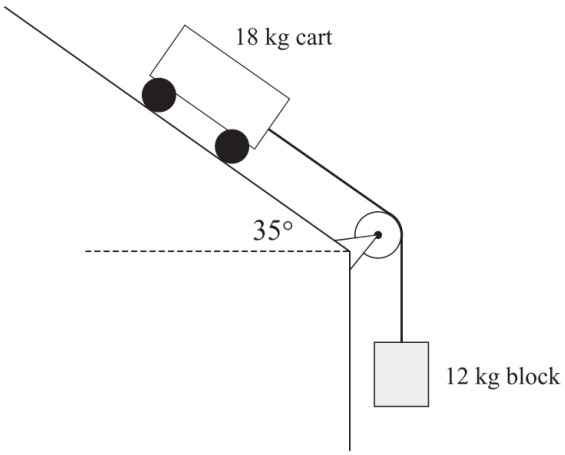
3) A meter stick with a mass of 0.115kg was balanced on a pivot (stand) at the 35.0cm position.
   a. What is the torque produced by the meter stick's mass relative to this pivot?
   b. Where should a 100.0g mass be placed so that the meter stick perfectly balances on its pivot?
   c. The 100.0g mass is now placed at the 0.25cm position, where should the new pivot be on the meter stick?

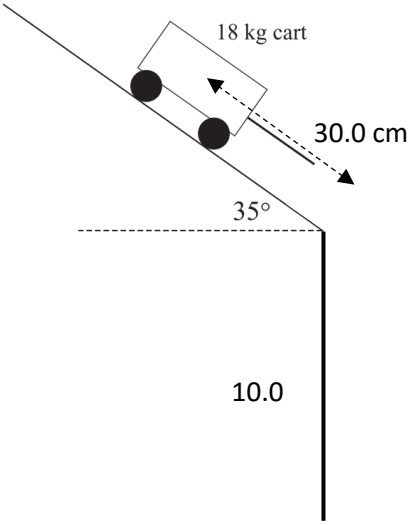


4) Challenge! An 18 kg cart is connected to a 12 kg hanging block as shown. The coefficient of rolling friction for the cart is μ = 0.43.

   a. What is the magnitude of acceleration of the 18 kg cart?

   b. If the string connecting the 18 kg cart and the 12 kg block is cut, what is the acceleration of the 18 kg cart down the incline?
   c. Assume the 18kg cart started from rest and covered 30.0cm on the ramp before falling off a 10.0m cliff in b. Calculate the time it takes the cart to crash land on the ground.





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Answer Key

1)
    a. 45 N
    b. 37 N
    c. 0.49 m/s^2 down the incline
2) 54 kg
3)
    a. 0.17 Nm
    b. At the 17.75 cm (~ 18 cm position), so the 100.0g mass would be 17.25cm from the pivot
    c. At the 38.37 cm position (~38 cm)
4)
    a. 5.2 m/s^2 down on the right
    b. 2.2 m/s^2 down on the right
    c. 1.4 s