FORCES TEST: REVIEW PROBLEMS (PART 2)

TOPICS TO BE COVERED:

Review Part 1

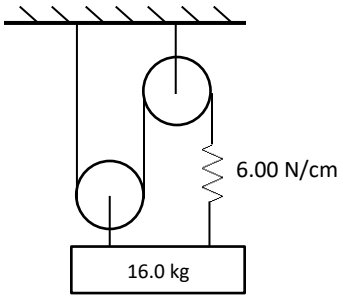
- The difference between weight and mass
- Units of force
- Freebody diagrams
- PULLEYS
- TORQUE = (F) x (lever arm)
- STATICS:
  - Translational Equilibrium: Forces in the x-direction sum to zero, and forces in the y-direction sum to zero.
  - Rotational Equilibrium: Sum of the torques taken about any pivot equal zero.

Review Part 2

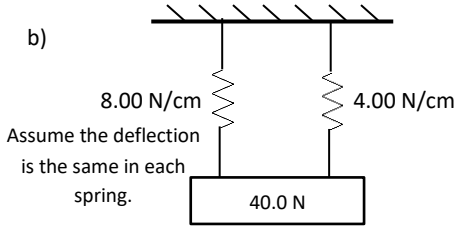
- SPRINGS
- FRICTION (Kinetic and Static and the difference between the two); $F_f = \mu N$
- DYNAMICS:
  - Sum of all forces = net force = $\Sigma \mathbf{F} = m\mathbf{a}$
  - Direction of the acceleration of an object is in the direction of the net force.
  - Problems involving inclines (acceleration of gravity down an incline is a fraction of the acceleration of gravity)

PROBLEMS

12. Find the stretch in each spring: a)

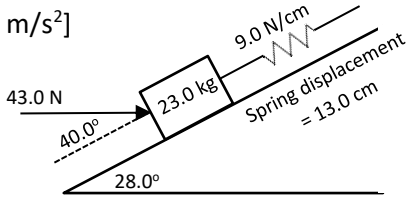


b)



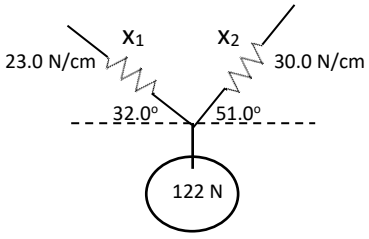
[Answers: a) x = 8.71 cm; b) x = 3.33 cm]

13. Find the acceleration of the mass. [a = 1.92 m/s^2]



14. A macho-crazed mountaineer slides down a rope. If his weight is 815 N, and he applies a constant force of 55.0 N upward to the rope, what is his downward acceleration? [9.14 m/sec^2]

15. Find the stretch in each spring below. [x_1 = 3.36 cm; x_2 = 3.47 cm]

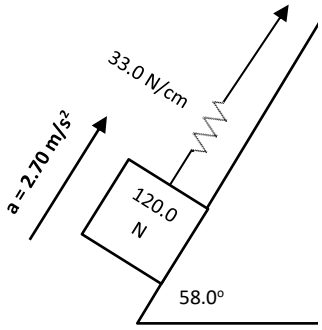


16. Scotty Beameup presses a mass 19.0 cm into a 680.0 N/m spring oriented horizontally. Upon release its initial acceleration is a breathtaking 13.1 m /sec^2. Ignore gravity.

a) What is the mass of the mass? . [9.86 kg]
b) What will happen to the velocity as the spring expands? [increases]
c) What will happen to the acceleration? [decreases]

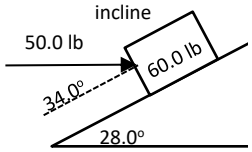
17. Find the missing quantities in each case. Assume no friction. [a) x = 4.09 cm; b) a = 7.13 ft/sec^2; c) a = 14.5 m/sec^2]

a)

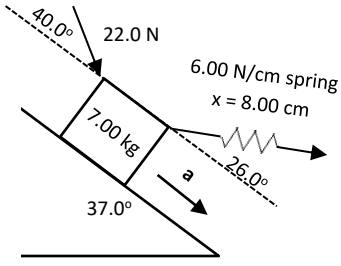


Find the stretch in the spring

b) Find the acceleration of the object up the incline

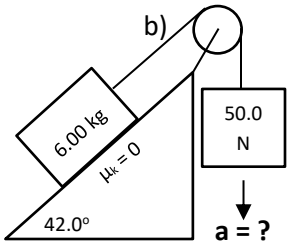


c) Find the acceleration of the object

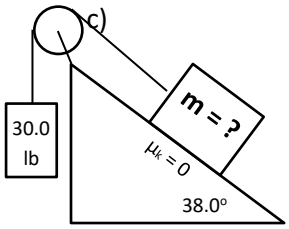


18. Find the missing quantities.

a) b)



c)



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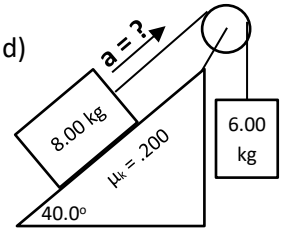

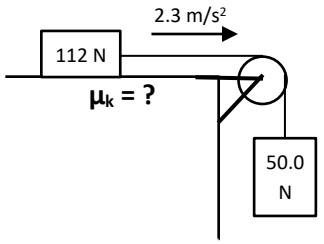

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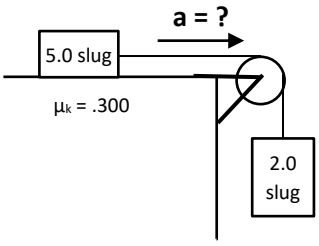

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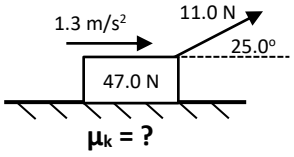
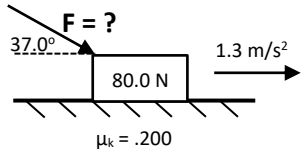
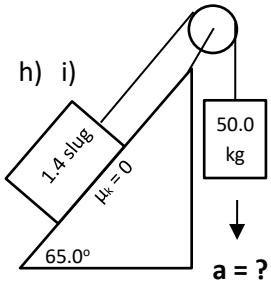
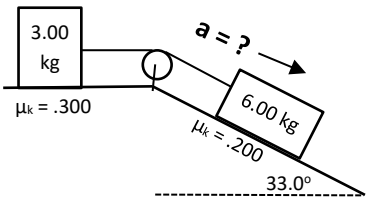


g)



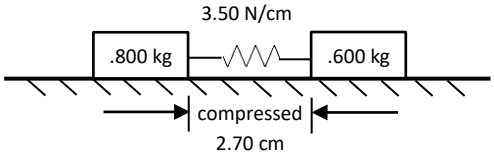
h) i)



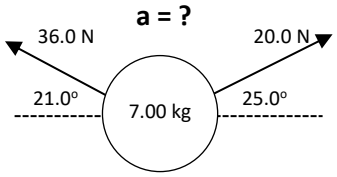


[a) a = .960 m/sec^2; b) m = 3.2 slugs; c) a = -0.258 m/s^2; d) μ_k = 0.107; e) 2.3 ft/s^2; f) μ_k = 0.0882; g) F = 54.9 N; h) 14.37 ft/s^2; i) 1.48 m/s^2]

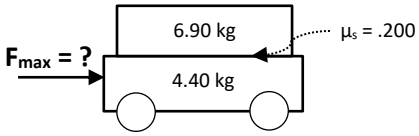
19. Two masses are scrunched 2.70 cm together against a 3.50 N/cm spring. What is the acceleration of each immediately after their release? Assume no friction. [11.8 m/sec^2, 15.8 m/sec^2]



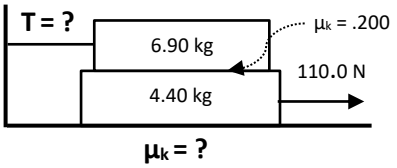
20. Find the magnitude and direction of the acceleration of the mass below. Ignore gravity. [3.77 m/sec^2, 54.1° above the horizontal to the left]



21. The cart shown has frictionless wheels. What is the maximum force that can be applied to it without causing the block to slip? [22.2 N]



22. A 110.0 N force is applied to the bottom block. This block accelerates at 4.0 m/sec^2. What is μ_k? What is T? [.326, 11.8 N]

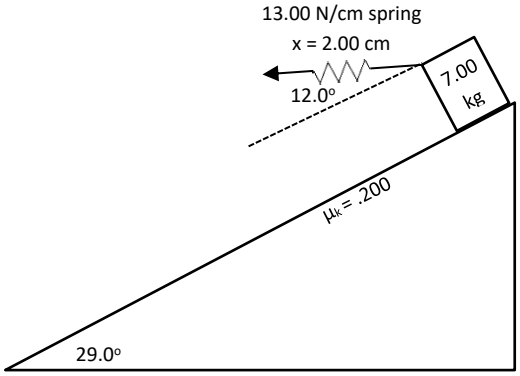


22. A 140.0 kg refrigerator is on the bed of a pickup, μ_s = 0.530. What maximum acceleration can the pickup have without the refrigerator sliding? [5.19 m/sec^2]

24. A 94 lb crate, 3.0-feet wide and 5.0 feet high, cruises serenely across a frictionless icy surface. When it strikes a frictional region, it tips over. What is the minimum μ that will tip it? (Think rotation). [.60]

25. For the masses shown, what are the masses final velocities and how long does it take each mass to slide down the inclines if both masses start from rest and both inclines are 48.0 meters in length? [a) 25.6 m/s, 3.75 s; b) 26.3 m/s, 3.65 s]

a)



b)