NAME _____ PERIOD ____

UNIT 7 PRACTICE PROBLEMS PHYSICS 1

7.1 NORMAL FORCES

1. An ant climbs at a steady speed up the side of its anthill, which is inclined 30.0° from the vertical. Sketch a free-body diagram for the ant.
2. A 23-kg suitcase is being pulled with constant speed by a handle that is at an angle of 25° above the horizontal. If the normal force exerted on the suitcase is 180 N, what is the force ***F*** applied to the handle?
3. Fernando, who has a mass of 43.0 kg, slides down the banister at his grandparents' house. **(a)** If the banister makes an angle of 35.0° with the horizontal, what is the normal force between Fernando and the banister? **(b)** If the friction is negligible, what is Fernando's acceleration down the banister?

7.2 FRICTIONAL FORCES

4. You need to move a 105-kg sofa to a different location in the room. It takes a force of 102 N to start it moving. What is the coefficient of static friction between the sofa and the carpet?
5. You help your mom move a 41-kg bookcase to a different place in the living room. If you push with a force of 65 N and the bookcase accelerates at 0.12 m/s^2, what is the coefficient of kinetic friction between the bookcase and the carpet?
6. A baseball player slides into third base with an initial speed of 4.0 m/s. If the coefficient of kinetic friction between the player and the ground is 0.46, how far does the player slide before coming to rest?
7. A 45-kg crate is placed on an inclined ramp. When the angle the ramp makes with the horizontal is increased to 23°, the crate begins to slide downward. What is the coefficient of static friction between the crate and the ramp?
8. A child goes down a playground slide with an acceleration of 1.16 m/s^2. Find the coefficient of kinetic friction between the child and the slide if the slide is inclined at an angle of 31.0° below the horizontal.

7.3 SPRING FORCES

9. A spring has a spring constant of 56 N/m. How far will it stretch when a block weighing 18 N is hung from its end?
10. What is the spring constant of a spring that stretches 12 cm when an object weighing 24 N is hung from it?
11. When a 9.29-kg mass is placed on top of a vertical spring, the spring compresses 4.11 cm. Find the force constant of the spring.
12. A 110-kg box is loaded into the trunk of a car. If the height of the car's bumper decreases by 13 cm, what is the force constant of its rear suspension?

NAME _____ **PERIOD** ____

UNIT 7 PRACTICE PROBLEMS **PHYSICS 1**

7.4 TENSION FORCES

13. Pulling up on a rope, you lift a 4.25-kg bucket of water from a well with an acceleration of 1.80 m/s^2. What is the tension in the rope?
14. You are helping to repair a roof by loading equipment into a bucket that workers hoist to the rooftop. If the rope is guaranteed not to break as long as the tension does not exceed 450 N and you fill the bucket until it has a mass of 42 kg, what is the greatest acceleration that the workers can give the bucket as they pull it to the roof?

7.5 TRANSLATIONAL EQUILIBRIUM

15. An object in equilibrium has three forces exerted on it. A 33.0-N force acts at 90.0° from the x-axis and a 44.0-N force acts at 60.0° from the x-axis. What are the magnitude and direction of the third force?

16. Joe wishes to hang a sign weighing 7.50 x 10^2 N so that cable A, attached to the store, makes a 30.0° angle, as shown in Figure 5-20. Cable B is horizontal and attached to an adjoining building. What is the tension in cable B?

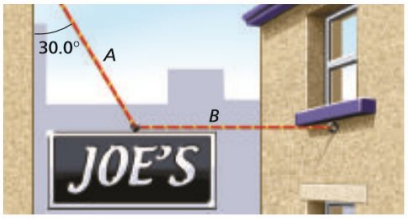

Figure 5-20

7.6 CONNECTED OBJECTS

17. Two blocks, one of mass 5.0 kg and the other of mass 3.0 kg, are tied together with a massless rope as in **Figure 4-24**. This rope is strung over a massless, resistance-free pulley. The blocks are released from rest. Find the **(a)** the tension in the rope and **(b)** the acceleration of the blocks.

Figure 4-24

18. A 3.50-kg block on a smooth tabletop is attached by a string to a hanging block of mass 2.80 kg, as shown in the figure below. The blocks are released from rest and allowed to move freely. Find the acceleration of the blocks and the tension in the string.