

## UNIT 12 PRACTICE PROBLEMS

## PHYSICS 1

**13.1 MACHINES**

1. A pulley system lifts a 1345-N weight a distance of 0.975 m. Paul pulls the rope a distance of 3.90 m, exerting a force of 375 N.
  - a. What is the ideal mechanical advantage of the system?
  - b. What is the mechanical advantage?
  - c. How efficient is the system?
2. A force of 1.4 N is exerted through a distance of 40.0 cm on a rope in a pulley system to lift a 0.50-kg mass 10.0 cm. Calculate the following.
  - a. the MA
  - b. the IMA
  - c. the efficiency
3. A student exerts a force of 250 N on a lever, through a distance of 1.6 m, as he lifts a 150-kg crate. If the efficiency of the lever is 90.0 percent, how far is the crate lifted?
4. What work is required to lift a 215-kg mass a distance of 5.65 m, using a machine that is 72.5 percent efficient?

**13.2 OSCILLATIONS AND PERIODIC MOTION**

5. While fishing for catfish, a fisherman suddenly notices that the bobber (a floating device) attached to his line is bobbing up and down with a frequency of 2.2 Hz. What is the period of the bobber's motion?
6. If you dribble a basketball with a frequency of 1.77 Hz, how long does it take for you to complete 12 dribbles?
7. You take your pulse and observe 74 heartbeats in a minute. What are the period and frequency of your heartbeat?
8. **(a)** Your heart beats with a frequency of 1.45 Hz. How many beats occur in a minute? **(b)** If the frequency of your heartbeat increases, will the number of beats in a minute increase, decrease, or stay the same? **(c)** How many beats occur in a minute if the frequency increases to 1.55 Hz?

**13.3 SIMPLE HARMONIC MOTION - SPRING OSCILLATORS**

9. A 0.42-kg mass attached to a spring undergoes simple harmonic motion with a period of 0.75 s. What is the force constant of the spring?
10. A 0.32 kg mass attached to a spring undergoes simple harmonic motion with a frequency of 1.6 Hz. What is the force constant of the spring?
11. You have a spring with a spring constant of 22 N/m. What mass should you attach to this spring so that its motion has a period of 0.95 s?
12. When a 0.50-kg mass is attached to a vertical spring, the spring stretches by 15 cm. How much mass must be attached to the spring to result in a 0.75-s period of oscillation?

NAME \_\_\_\_\_

PERIOD \_\_\_\_\_

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**13.4 SIMPLE HARMONIC MOTION - PENDULUMS**

13. The chains of a swing on a playground swing set are 3.0 m long. What is the period of this swing?
14. How long must a pendulum be to have a period of 1.0 s? Assume the acceleration due to gravity is  $9.81 \text{ m/s}^2$ .
15. How long must a pendulum be on the Moon, where  $g = 1.6 \text{ m/s}^2$ , to have a period of 2.0 s?
16. On a planet with an unknown value of  $g$ , the period of a 0.75-m-long pendulum is 1.8 s. What is  $g$  for this planet?
17. What is the frequency of a pendulum of length 1.25 m at a location where the acceleration due to gravity is  $9.82 \text{ m/s}^2$ ?