

**Chapter 15 Energy****Calculating Potential Energy**

A 60.0-kg person is standing on the edge of a pier that is 2.5 m above the surface of a lake. How much higher would the pier have to be to raise the gravitational potential energy of this person by 10 percent?

**1. Read and Understand**

*What information are you given?*

Mass of person =  $m = 60.0 \text{ kg}$

Height above lake level =  $h = 2.5 \text{ m}$

Acceleration due to gravity =  $g = 9.8 \text{ m/s}^2$

**2. Plan and Solve**

*What variable are you trying to determine?*

Gravitational potential energy = ?

*What formula contains the given variables?*

Gravitational potential energy (PE) =  $mgh$

Initial PE =  $(60.0 \text{ kg})(9.8 \text{ m/s}^2)(2.5 \text{ m}) = 1500 \text{ J}$

*Determine the 10-percent increase of PE.*

$(1500 \text{ J})(0.10) = 150 \text{ J}$

Final PE =  $1500 \text{ J} + 150 \text{ J} = 1650 \text{ J}$

*Rearrange the equation to determine the final height.*

$h = \text{PE}/mg = 1650 \text{ J}/(60.0 \text{ kg})(9.8 \text{ m/s}^2) = 2.8 \text{ m}$

The height increase for the pier would be  $2.8 \text{ m} - 2.5 \text{ m} = 0.3 \text{ m}$ .

**3. Look Back and Check**

*Is your answer reasonable?*

This is a reasonable answer because 0.3 m is about 10 percent of 2.5 m. A 10-percent increase in  $h$  should result in a 10-percent increase in the gravitational PE.

**Math Practice**

*On a separate sheet of paper, solve the following problems.*

1. A 300-gram toy car and a 500-gram toy car are sitting on a shelf that is 2 meters higher than the floor. By what percent is the PE of the 500-g car greater than the PE of the 300-g car?
2. An 80-kg rock climber is standing on a cliff so that his gravitational PE = 10,000 J. What percent increase in height is required to raise his PE by 3500 J?

**Math Skill:  
Percents and  
Decimals**

You may want to read more about this **Math Skill** in the **Skills and Reference Handbook** at the end of your textbook.