

PRACTICE

W = mg

Earth's "g" = 9.8 m/s<sup>2</sup>

- 1. A physical science textbook has a mass of 2.2 kilograms.
  - a. What is its weight on Earth?  $21.56\text{ N}$
  - b. What is its weight on Mars? ( $g = 3.7\text{ N/kg}$ )  $g = 3.7\text{ m/s}^2$   $8.14\text{ N}$
  - c. If the textbook weighs 19.6 newtons on Venus, what is the strength of gravity on that planet?  
 $g = W/m$   $19.6\text{ N} / 2.2\text{ kg} = 8.9\text{ m/s}^2$
- 2. An astronaut weighs 104 newtons on the moon, where the strength of gravity is 1.6 newtons per kilogram.
  - a. What is her mass?  $m = W/g$   $65\text{ kg}$
  - b. What is her weight on Earth?  $65\text{ kg} \cdot 9.8\text{ m/s}^2 = 637\text{ N}$
  - c. What would she weigh on Mars?  $240.5\text{ N}$
- 3. Of all the planets in our solar system, Jupiter has the greatest gravitational strength.
  - a. If a 0.500-kilogram pair of running shoes would weigh 11.55 newtons on Jupiter, what is the strength of gravity there?  $g = W/m$   $23.1\text{ m/s}^2$
  - b. If the same pair of shoes weighs 0.3 newtons on Pluto (a dwarf planet), what is the strength of gravity there?  $g = W/m = 0.6\text{ m/s}^2$
  - c. What does the pair of shoes weigh on Earth?  $(.500\text{ kg}) (9.8\text{ m/s}^2) = 4.9\text{ N}$
- 4. A tractor-trailer truck carrying boxes of toy rubber ducks stops at a weigh station on the highway. The driver is told that the truck weighs 44,000. pounds.
  - a. If there are 4.448 newtons in a pound, what is the weight of the toy-filled truck in newtons?
  - b. What is the mass of the toy-filled truck?
  - c. The truck drops off its load of toys, then stops at a second weigh station. Now the truck weighs 33,000. pounds. What is its weight in newtons?
  - d. Challenge! Find the total mass of the rubber duck-filled boxes that were carried by the truck.

a)  $44,000\text{ pounds} \times \frac{4.448\text{ N}}{1\text{ pound}} = 195,712\text{ N}$

b)  $m = \frac{W}{g} = 19,971\text{ kg}$   $g = 9.8\text{ m/s}^2$

c)  $33,000\text{ lbs} \times 4.448\text{ N/lb} = 146,784\text{ N}$

d)  $m = W/g$   $(195,712\text{ N} - 146,784\text{ N}) / 9.8\text{ m/s}^2 = 4,993\text{ kg}$