

Mass and Weight

Name: _____ Per. _____

Integrated Science: Physics/Design

1. A physical science textbook has a mass of 2.2 kilograms.

a. What is its weight on Earth?

$$W = mg = (2.2 \text{ kg})(9.8 \text{ N/kg}) = \underline{22 \text{ N}}$$

b. What is its weight on Mars? ($g = 3.7 \text{ N/kg}$)

$$W = mg = (2.2 \text{ kg})(3.7 \text{ N/kg}) = \underline{8.1 \text{ N}}$$

c. If the textbook weighs 19.6 newtons on Venus, what is the strength of gravity on that planet?

$$g = \frac{W}{m} = \frac{19.6 \text{ N}}{2.2 \text{ kg}} = \underline{8.9 \text{ N/kg}}$$

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?

$$m = \frac{W}{g} = \frac{104 \text{ N}}{1.6 \text{ N/kg}} = \underline{65 \text{ kg}}$$

b. What is her weight on Earth?

$$W = mg = (65 \text{ kg})(9.8 \text{ N/kg}) = \underline{640 \text{ N}}$$

c. What would she weigh on Mars?

$$W = mg = (65 \text{ kg})(3.7 \text{ N/kg}) = \underline{240 \text{ N}}$$

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?

$$g = \frac{W}{m} = \frac{11.55 \text{ N}}{0.500 \text{ kg}} = \underline{23.1 \text{ N/kg}}$$

b. If the same pair of shoes weighs 0.3 newtons on Pluto (a dwarf planet), what is the strength of gravity there?

$$g = \frac{0.3 \text{ N}}{0.500 \text{ kg}} = \underline{0.6 \text{ N/kg}}$$

c. What does the pair of shoes weigh on Earth?

$$W = mg = 0.500 \text{ kg} \cdot 9.8 \text{ N/kg} = \underline{4.9 \text{ N}}$$

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 250,000 N. (Be sure your answer has the correct number of significant digits.)

a. What is the mass of the toy-filled truck?

$$m = \frac{W}{g} = \frac{250,000 \text{ N}}{9.8 \text{ N/kg}} = \underline{26,000 \text{ kg}}$$

b. The truck drops off its load of toys, and then stops at a second weigh station. Now the truck weighs 147,000. N. What is the new mass of the truck?

$$m = \frac{W}{g} = \frac{147,000 \text{ N}}{9.8 \text{ N/kg}} = 15,000 \text{ kg}$$

c. Find the total mass of the rubber duck-filled boxes that were carried by the truck

$$\begin{array}{r} 26,000 \text{ kg} \\ - 15,000 \text{ kg} \\ \hline 11,000 \text{ kg} - \text{ducks} \end{array}$$

