

Mass in the Imperial System

4.2

NEW SKILLS: WORKING WITH WEIGHT

The **mass** of an object refers to the quantity of matter in it, and it remains constant, no matter where the object is located. The **weight** of an object is a measure of the force of gravity on the object. On earth, the mass and the weight of an object are essentially the same; on other planets where the pull of gravity is different, weight and mass will not be the same.

The basic units of weight in the imperial system are ton (tn), pound (lb), and ounce (oz).

$$1 \text{ ton (tn)} = 2000 \text{ pounds}$$

$$1 \text{ pound (lb)} = 16 \text{ ounces (oz)}$$

For more details, see page 146 of *MathWorks 10*.

mass: a measure of the quantity of matter in an object

weight: a measure of the force of gravity on an object

Example 1

Manuela needs 1 pound 2 ounces of Gruyère cheese, 12 ounces of cheddar cheese, and 11 ounces of Swiss cheese for a fondue recipe. How many pounds of cheese does she need in all?

SOLUTION

Add pounds to pounds and ounces to ounces.

Change ounces to pounds

Manuela needs _____ of cheese for her recipe

BUILD YOUR SKILLS

1. Rochelle gave birth to twin boys weighing 6 lb 5 oz and 5 lb 14 oz. What was their total weight?
2. The weight of water is approximately 2 pounds 3 ounces per litre. How much will 8 litres of water weigh?
3. If a basket of raspberries weighs 12 ounces and you need 4 pounds to make jam, how many baskets do you need to buy?

**Example 2**

The cab of Arthur's semi-trailer truck weighs 8.7 tons and the trailer weighs 6.4 tons. If the loaded gross weight of the truck is 21.3 tons, what is the weight of the load:

- a) in tons?
- b) in pounds?

SOLUTION

- a) The total weight of the truck is found by adding the weight of the cab and the trailer.

Subtract this amount from the gross weight to get the weight of the load.

- b) Since 1 ton equals 2000 pounds, find the weight in pounds by multiplying.

The weight of the load is _____ pounds.

BUILD YOUR SKILLS

1. An elevator has a maximum load restriction of 1.5 tons. Is it safe for two tile layers weighing 195 lb and 210 lb to load it with 65 boxes of tile weighing 42 lb each?

2. A small truck weighs approximately 1300 lb. It is loaded with cement slabs that weigh 150 lb each. If the maximum loaded weight of the truck is 2.75 tons, how many slabs can be loaded?

3. Kurt is planting wheat at the rate of 90 pounds per acre. If he plans to plant 320 acres of wheat, how many tons of wheat will he use?

Example 3

A 12-ounce can of vegetables costs \$1.49. A 1 lb 2-oz can of the same vegetables costs \$2.19. Which is the better buy?

SOLUTION

Use unit pricing to find the cost per ounce. 12 ounces cost \$1.49.

1lb 2oz costs \$2.19

_____ is a better buy.

BUILD YOUR SKILLS

4. An 18-oz jar of peanut butter costs \$3.29, a 28-oz jar costs \$4.79, and a 2.5-lb jar costs \$5.99. Which is the best buy?
5. If knitting yarn costs \$6.24 per 3-oz skein, how much will it cost to knit a sweater that requires 1 pound of yarn? (You cannot buy partial skeins.)
6. About 200 cocoa beans are used to make 1 lb of chocolate. Beans are shipped in 200-lb sacks, which contain about 88 000 beans. How many 1.5-oz chocolate bars can be made from one sack of beans?

Example 4

Valérie bought 4 pounds 6 ounces of steak for dinner at \$2.74/lb. After removing the excess fat, she had only 4 pounds of meat. What was her true cost per pound?

SOLUTION

Make 4lb 6 oz into pounds. Change 6 ounces to pounds.

$$1 \text{ lb} = 16 \text{ ounces so } 6 \div 16 = \underline{\hspace{2cm}}$$

She bought _____pounds of meat at \$2.74/lb. Total cost:

$$\underline{\hspace{2cm}} \times \$2.74 = \underline{\hspace{2cm}}$$

Since only 4 pounds were usable, calculate how much each pound cost her.

Valérie paid approximately _____/lb for the steaks.

BUILD YOUR SKILLS

7. Zara buys 8 pounds 12 ounces of strawberries at \$1.98/lb. What is her true cost per pound if 10% of the berries rot before she uses them?
8. Mark bought 8 bags of sand, each weighing 25 lb, for \$1.68/bag. One bag ripped and he lost all the sand. What was his true price per pound of sand?

9. Alyson paid \$28.45 for 24 ounces of coffee beans, but when she checked, the actual weight was 22 ounces. What was her true cost per ounce?

PRACTISE YOUR NEW SKILLS

1. Calculate the conversions.

a) 24 oz = _____ lb

b) 7890 lb = _____ tn

c) 54 oz = _____ lb _____ oz

d) 6 lb 2 oz = _____ oz

e) 4.54 tn = _____ lb

f) 654 oz = _____ lb _____ oz

2. What is the total weight, in pounds and ounces, of six books on a shelf if they weigh 12 oz, 1 lb 7 oz, 1 lb 2 oz, 15 oz, 9 oz, and 1 lb 3 oz?
3. A bakery uses a recipe for oatmeal cookies that calls for 1 lb 4 oz of flour to make 9 dozen cookies. How many ounces of flour are needed to make 3 dozen cookies?

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4. Kris needs to transport 5 slabs of concrete to an apartment work site. If each slab weighs 46 pounds, Kris weighs 195 pounds, and the truck weighs 1.5 tons, what is the total weight of the loaded truck in pounds?
5. Harinder is concerned about the weight that paint might add to a delicate structure he built. He estimates that he needs 1.5 gal of paint and that the structure can withstand 15 lb of weight. The weight of a particular paint is 9 lb/gal. When it dries, the weight is only 5.4 lb/gal. Can Harinder paint his structure without having it collapse?
6. U-pick organic blueberries sell for \$20.00 for a 12-pound box.
- a) How much would 1 pound cost?
 - b) How much would 12 ounces cost?
7. What is the true cost per pound of a 10-pound box of oranges if the original price of the box was \$12.99 and $\frac{1}{4}$ of the box had to be thrown away because the oranges were mouldy?

