Day 7: Multi-Step Dimensional Analysis

Measurement	Time	Capacity	Weight
1 foot = 12 inches	1 minute = 60 seconds	1 cup = 8 fl. oz	1 ton = 2000 lbs
1 yard = 3 feet	1 hour = 60 minutes	1 pint = 2 cups	1 lb = 16 oz
1 mile = 5,280 feet	1 day = 24 hours	1 quart = 2 pints	
1 mile = 1,760 yards	1 week = 7 days	1 gal = 4 quarts	
	1 year = 52 weeks		

How many seconds are in a day?

Most of us do not know how many seconds are in a day or hours in a year. However, most of us know that there are 60 seconds in a minute, 60 minutes in an hour, and 24 hours in a day. Some problems with converting units require multiple steps. When solving a problem that requires multiple conversions, it is helpful to create a flowchart of conversions you already know, set up your conversion factors, and solve your problem.

Sec / day

Flowchart: Days → Hours → Minutes → Seconds = 86400 sec / 1 day

Conversion Factors: 60 sec = 1 min, 60 min = 1 hr 24 hours = 1 day

$$\frac{60 \text{ sec}}{1 \text{ min}} \times \frac{60 \text{ min}}{1 \text{ hr}} \times \frac{24 \text{ hours}}{1 \text{ day}} = \frac{60 \times 60 \times 24 \text{ sec}}{1 \text{ day}}$$

Scenario: How many inches are in 3 miles? INCHES / MILES

Flowchart: miles → feet → inches

Possible Conversions: 12 inches = 1 foot, 1 mile = 5,280 feet

$$\frac{12 \text{ inches}}{1 \text{ foot}} \times \frac{5{,}280 \text{ feet}}{1 \text{ mile}} = \frac{63{,}360 \text{ inches} \times 3}{1 \text{ mile} \times 3} = \frac{190{,}080^{IN}}{3 \text{ miles}}$$

Scenario: How many centimeters are in 900 feet? (2.54 cm = 1 in) cm / FT

Flowchart: feet → inches → centimeters

Possible Conversions: 2.54 cm = 1 in, 12 in = 1 foot

$$\frac{2.54 \text{ cm}}{1 \text{ inch}} \times \frac{12 \text{ inches}}{1 \text{ foot}} = \frac{30.48 \text{ cm} \times 900}{1 \text{ foot} \times 900} = \frac{27{,}432 \text{ cm}}{900 \text{ ft}}$$

Foundations of Algebra

convert to mL ↑

KHDBDCM 3 right
3800

NB ____

Scenario: How many gallons are in 250 mL? (1 gal = 3.8 liters)

gallons / mL

Flowchart: mL → gallons

1 gal = 3,800 mL

Possible Conversions:

$\frac{1\text{ gal}}{3{,}800\text{ mL}} \times \frac{x\text{ gallons}}{250\text{ mL}}$

$\frac{3800x}{3800} = \frac{250}{3800}$

$x = \frac{0.066\text{ gallons}}{250\text{ mL}}$

Scenario: How many feet are in 5000 centimeters? (1 in = 2.54 cm)

ft / cm

Flowchart: Centimeters → inches → feet

$\frac{30.48x}{30.48} = \frac{5000}{30.48}$

Possible Conversions: 1 ft = 12 in, 1 in = 2.54 cm

$\frac{1\text{ ft}}{12\text{ in}} \times \frac{1\text{ in}}{2.54\text{ cm}} = \frac{1\text{ ft}}{30.48\text{ cm}} \times \frac{x\text{ ft}}{5000\text{ cm}}$

$x = \frac{164\text{ ft}}{5000\text{ cm}}$

Real World Applications

Scenario: One cereal bar has a mass of 37 grams. What is the mass of 6 cereal bars? ~~Is that more or less than 1 kilogram?~~

1 bar = 37 grams

$\frac{1\text{ bar}}{37\text{ grams}} \times 6 = \frac{6\text{ bars}}{x\text{ grams}}$

$x = 222$ grams

KHDBDCM 3 left

.222 .222 Kg < 1 Kg

Scenario: A rectangle has a length of 5 cm and 100 mm. What is the perimeter of the rectangle in millimeters?

width

5cm = 50mm

$P = 2l + 2w$

KHDBDCM

50 mm

100mm

$P = 2(50) + 2(100)$

$= 100 + 200 = 300$

Foundations of Algebra NB. ____

Scenario: You're throwing a pizza party for 15 people and figure that each person will eat 4 slices. Each pizza will cost $14.78 and will be cut up into 12 slices. pizzas / party

How many pizzas do you need for your party? How much will this cost?

$$\frac{15 \text{ people}}{1 \text{ party}} \times \frac{4 \text{ slices}}{1 \text{ people}} \times \frac{1 \text{ pizza}}{12 \text{ slices}} = \frac{15 \times 4 \text{ pizza}}{12 \text{ party}} = \frac{5 \text{ pizzas}}{1 \text{ party}}$$

$$\text{cost: } 5 \text{ pizzas} \times \frac{\$14.78}{1 \text{ pizza}} = 5 \times \$14.78 = \$73.90$$

Scenario: a. You find 13,406,190 pennies. How many dollars did you actually find? pennies → dollars

$$13,406,190 \text{ pennies} \times \frac{1 \text{ dollar}}{100 \text{ pennies}} = \$134,061.9 \text{ dollars}$$

b. If each penny weighs 4 grams, how much did all that loot weigh in lbs? (2.2 lbs = 1 kg) → convert to grams

1 penny = 4 grams

2.2 lbs = 1,000 g KHDBDCM 3 right

$$13,406,190 \text{ pennies} \times \frac{4 \text{ grams}}{1 \text{ penny}} \times \frac{2.2 \text{ lbs}}{1,000 \text{ g}} = 117,974.4721 \text{ lbs}$$

c. Assume a movie ticket costs $9. How many movie tickets could you buy with the pennies you found in part a?

$$\$134,061.9 \times \frac{1 \text{ ticket}}{\$9} = 14,896 \text{ tickets}$$

Scenario: Mrs. Dombrowski is approximately 254,040 hours old. How many years old is she? hours → years

$$254,040 \text{ hours} \times \frac{1 \text{ day}}{24 \text{ hours}} \times \frac{1 \text{ year}}{365 \text{ days}}$$

24 hours = 1 day

365 days = 1 year

$$\frac{254,040 \text{ years}}{8760} = 29 \text{ years old}$$