

Key

Multiple-Step Dimensional Analysis

Multiple-step dimensional analysis problems are solved in the same manner as one-step dimensional analysis problems. So, if you could do the one-step, you can do any dimensional analysis problem! All you have to do is set-up the problem so that your units continuously cancel out until you are left with the unit you want at the end.

Directions: Solve the following dimensional analysis problems. Show all work in your set-up to get full credit.

1. How many inches are there in a football field (100 yards)? 1 yard = 3 feet; 1 foot = 12 inches

$$100 \text{ yd} \times \frac{3 \text{ ft}}{1 \text{ yd}} \times \frac{12 \text{ in}}{1 \text{ ft}} = 3600 \text{ in.}$$

2. How many walking paces are there approximately as you walk down Main Street (0.25 miles)?
1 mile = 5280 feet; 1 foot = 12 inches; 22 inches = 1 walking pace

$$0.25 \text{ mi} \times \frac{5280 \text{ ft}}{1 \text{ mi}} \times \frac{12 \text{ in}}{1 \text{ ft}} \times \frac{1 \text{ WP}}{22 \text{ in}} = 720 \text{ walking paces}$$

3. How many feet are between the first and second story of a building (1 story)?
1 story = 3.33 meters; 100 centimeters = 1 meter; 1 inch = 2.54 cm; 1 foot = 12 inches

$$1 \text{ story} \times \frac{3.33 \text{ m}}{1 \text{ story}} \times \frac{100 \text{ cm}}{1 \text{ m}} \times \frac{1 \text{ in.}}{2.54 \text{ cm}} \times \frac{1 \text{ ft.}}{12 \text{ in.}} = 10.925 \text{ ft}$$

4. How many hours are in a fortnight (2 weeks)?
1 week = 7 days; 1 day = 24 hours

$$2 \text{ weeks} \times \frac{7 \text{ day}}{1 \text{ wk}} \times \frac{24 \text{ hr}}{1 \text{ day}} = 336 \text{ hours}$$

5. How many decades are equal to 1.7×10^{25} minutes?
60 min = 1 hour 24 hours = 1 day 7 days = 1 week 52 weeks = 1 year 10 years = 1 decade

$$1.7 \times 10^{25} \text{ min} \times \frac{1 \text{ hr}}{60 \text{ min}} \times \frac{1 \text{ day}}{24 \text{ hr}} \times \frac{1 \text{ wk}}{7 \text{ day}} \times \frac{1 \text{ yr}}{52 \text{ wk}} \times \frac{1 \text{ decade}}{10 \text{ yr}} = 3.2 \times 10^{18} \text{ decades}$$

6. On average, there are 3 pages in every chapter of a James Patterson novel. Each book has approximately 79 chapters. James Patterson has published 58 books. Approximately how many pages has James Patterson written?

$$58 \text{ books} \times \frac{79 \text{ chap}}{1 \text{ book}} \times \frac{3 \text{ page}}{1 \text{ chap}} = 13,746 \text{ pages} \rightarrow 14,000 \text{ pages}$$

7. Houston has approximately 2,210,000 million people. Each person has 2 hands and each hand has 5 fingers. How many fingers are in Houston? Answer in scientific notation.

$$2,210,000,000,000 \text{ people} \times \frac{2 \text{ hand}}{1 \text{ person}} \times \frac{5 \text{ fing.}}{1 \text{ hand}} = 2.21 \times 10^{13} \text{ fingers}$$

8. There are 2850.5 miles between Houston, TX and Vancouver, Canada, site of the 2010 Olympic Games. How many **meters** is that equal to if 1 mile is equal to 1.6 km? Express your answer in scientific notation.

$$2850.5 \text{ mi} \times \frac{1.6 \text{ km}}{1 \text{ mi}} \times \frac{1000 \text{ m}}{1 \text{ km}} = 4560800 \text{ m} \rightarrow 4.5608 \times 10^6 \text{ m}$$

9. A newborn baby eats 8 times a day. At each feeding, he eats 2.5 ounces of formula. How many days would it take for the baby to eat 1000 ounces?

$$1000 \text{ oz} \times \frac{1 \text{ feed}}{2.5 \text{ oz}} \times \frac{1 \text{ day}}{8 \text{ feed}} = 50 \text{ days}$$

10. Jonathan raised 60 goats, then entered into a series of business transactions. He traded all the goats for sheep at an exchange rate of 5 goats for 7 sheep. Next, he exchanged all the sheep for hogs at a rate of 4 sheep for 2 hogs. How many hogs did he get?

$$60 \text{ goats} \times \frac{7 \text{ sheep}}{5 \text{ goats}} \times \frac{2 \text{ hogs}}{4 \text{ sheep}} = 42 \text{ hogs}$$

11. Eggs are shipped from a poultry farm in trucks. Each carton of eggs holds 12 eggs. The cartons of eggs are then placed in a crate that holds 20 cartons. The cartons are packed in trucks that carry 3125 crates of eggs. How many truckloads will it take to carry 3.75×10^6 eggs?

$$3.75 \times 10^6 \text{ eggs} \times \frac{1 \text{ carton}}{12 \text{ eggs}} \times \frac{1 \text{ crate}}{20 \text{ cartons}} \times \frac{1 \text{ truck}}{3125 \text{ crate}} = 5 \text{ trucks}$$

12. A chemistry teacher spends 5 minutes grading 1 student's lab. She has 150 students who turn in lab papers for each lab. If we do 25 labs in class, how many minutes will I spend grading lab papers?

$$25 \text{ labs} \times \frac{150 \text{ student}}{1 \text{ lab}} \times \frac{5 \text{ min}}{1 \text{ student}} = 18750 \text{ min}$$

13. My son drinks 3 cups of milk a day. There are 8 ounces in a cup. How many ounces would he have drunk after 10 weeks?

$$10 \text{ wk} \times \frac{7 \text{ day}}{1 \text{ wk}} \times \frac{3 \text{ c}}{1 \text{ day}} \times \frac{8 \text{ oz}}{1 \text{ c}} = 16800 \text{ oz}$$

14. In the average US household, the television is on 6.75 hours a day! How many hours will have passed after 77.7 years (the average life expectancy of an American)?

$$77.7 \text{ yr} \times \frac{365 \text{ d}}{1 \text{ yr}} \times \frac{6.75 \text{ h}}{1 \text{ d}} = 1.91 \times 10^5 \text{ hours}$$

15. Each dimensional analysis problem has taken you 1.5 minutes to complete. How many dimensional analysis problems could you complete in 6 weeks of chemistry class (242 minutes a week)?

$$6 \text{ wk} \times \frac{242 \text{ min}}{1 \text{ wk}} \times \frac{1 \text{ problem}}{1.5 \text{ min}} = 9.68 \times 10^2 \text{ problems}$$

(968)