Key

Metric Conversions

1. 15.6 m = 0.0156 km

$$15.6\ m \left| \frac{1\ km}{10^3\ m} \right.$$

2. 1.78×10^{-2} kg = 1.78×10^{1} g = 17.8 g

$$1.78 \times 10^{-2}\ kg \left| \frac{10^3\ g}{1\ kg} \right.$$

3. 7.1×10^{3} mL = 7.1 L

$$7.1 \times 10^{3}\ mL \left| \frac{1\ L}{10^3\ mL} \right. = 7.1\ L$$

4. 3.47×10^{2} cm = 3.47 m

$$3.47 \times 10^{2}\ cm \left| \frac{1\ m}{10^2\ cm} \right. = 3.47\ m$$

5. 9 km = 9×10^{6} mm

$$9\ km \left| \frac{10^3\ m}{1\ km} \right| \frac{10^3\ mm}{1\ m}$$

6. 5.9×10^{4} mg = 5.9×10^{-2} kg

$$5.9 \times 10^{4}\ mg \left| \frac{1\ g}{10^3\ mg} \right| \frac{1\ kg}{10^3\ g}$$

7. 89 kL = 8.9×10^{7} mL

$$89\ kL \left| \frac{10^3\ L}{1\ kL} \right| \frac{10^3\ mL}{1\ L}$$

8. 2200 Mm = 2.2×10^{9} m

$$2200\ Mm \left| \frac{10^6\ m}{1\ Mm} \right.$$

9. 298 hg = 29800 g = 2.98×10^{4}

$$298\ hg \left| \frac{10^2\ g}{1\ hg} \right.$$

10. 4.69×10^{3} µm = 4.69 mm

$$4.69 \times 10^{3}\ \mu m \left| \frac{1\ mm}{10^3\ \mu m} \right.$$

11. 4×10^{2} daL = 4×10^{3} L

$$4 \times 10^{2}\ daL \left| \frac{10\ L}{1\ daL} \right.$$

12. 8.75 kg = 8.75×10^{5} cg

$$8.75\ kg \left| \frac{10^3\ g}{1\ kg} \right| \frac{10^2\ cg}{1\ g}$$

13. 3.5×10^{-1} m = 3.5 dm

$$3.5 \times 10^{-1}\ m \left| \frac{10\ dm}{1\ m} \right.$$

14. 9.6×10^{-2} cL = 9.6×10^{-6} hL

$$9.6 \times 10^{-2}\ cL \left| \frac{1\ L}{10^2\ cL} \right| \frac{1\ hL}{10^2\ L}$$

Key

Conversions Practice

Use Unit Analysis to convert the following units of measure. Round all answers (where applicable) to the nearest hundredth:

1. 6 miles to feet

$$6\text{ mi} \left| \frac{5280\text{ ft}}{1\text{ mi}} \right. = \boxed{31680\text{ ft}}$$

2. 33 feet to yards

$$33\text{ ft} \left| \frac{1\text{ yd}}{3\text{ ft}} \right. = \boxed{11\text{ yd.}}$$

3. 66 inches to feet

$$66\text{ in} \left| \frac{1\text{ ft.}}{12\text{ in}} \right. = \boxed{5.5\text{ ft}}$$

5 ft. 6 in

4. 5 meters to inches

$$5\text{ m} \left| \frac{10^2\text{ cm}}{1\text{ m}} \right| \frac{1\text{ in.}}{2.54\text{ cm}} = \boxed{196.85\text{ in.}}$$

5. 15 feet to meters

$$15\text{ ft.} \left| \frac{1\text{ yd}}{3\text{ ft}} \right| \frac{0.9144\text{ m}}{1\text{ yd.}} = \boxed{4.57\text{ m}}$$

6. 64 hours to minutes

$$64\text{ h} \left| \frac{60\text{ min}}{1\text{ h}} \right. = \boxed{3840\text{ min.}}$$

7. 56 hours to seconds

$$56\text{ h} \left| \frac{60\text{ min}}{1\text{ h}} \right| \frac{60\text{ s}}{1\text{ min}} = \boxed{201600\text{ s}}$$

8. 1.314×10^6 minutes to years

$$1.314 \times 10^6\text{ min} \left| \frac{1\text{ h}}{60\text{ min}} \right| \frac{1\text{ d}}{24\text{ h}} \left| \frac{1\text{ y}}{365\text{ d}} \right. = \boxed{2.5\text{ y}}$$

9. 1000 liters to quarts

$$1000\text{ L} \left| \frac{1\text{ gal}}{3.79\text{ L}} \right| \frac{4\text{ qt.}}{1\text{ gal}} = \boxed{1055.41\text{ qt.}}$$

10. 3 liters to gallons

$$3\text{ L} \left| \frac{1\text{ gal}}{3.79\text{ L}} \right. = \boxed{0.79\text{ gal}}$$

11. 5 kg to pounds

$$5\text{ kg} \left| \frac{2.2\text{ lb.}}{1\text{ kg}} \right. = \boxed{11\text{ lb.}}$$

12. 6 pounds 3 ounces to grams

$$6\text{ lb} \left| \frac{454\text{ g}}{1\text{ lb}} \right. = 2724\text{ g}$$

$$3\text{ oz} \left| \frac{28.35\text{ g}}{1\text{ oz}} \right. = 85.05\text{ g}$$

$\boxed{2809.05\text{ g}}$ (or 2806.65 g if done other way)

13. 7 pints to mL

$$7\text{ pt.} \left| \frac{2\text{ c}}{1\text{ pt}} \right| \frac{237\text{ mL}}{1\text{ c}} = \boxed{3318\text{ mL}}$$

14. 3.5 cups to liters

$$3.5\text{ c} \left| \frac{237\text{ mL}}{1\text{ c}} \right| \frac{1\text{ L}}{10^3\text{ mL}} = \boxed{0.83\text{ L}}$$

15. 1.25 liters to fluid ounces

$$1.25\text{ L} \left| \frac{10^3\text{ mL}}{1\text{ L}} \right| \frac{1\text{ oz}}{29.6\text{ mL}} = \boxed{42.23\text{ oz}}$$

16. 6 feet 4 inches to cm

$$6\text{ ft} \left| \frac{12\text{ in}}{1\text{ ft}} \right. = 72\text{ in} + 4\text{ in} = 76\text{ in.}$$

$$76\text{ in} \left| \frac{2.54\text{ cm}}{1\text{ in}} \right. = \boxed{193.04\text{ cm}}$$

Double Unit Conversions

Use Unit analysis to convert the following. Round decimal answers to the nearest hundredth. Assume a 40-hour workweek.

1. Change $35000 per year to dollars per hour.

$$\frac{\$35000}{1\text{ yr.}} \cdot \frac{1\text{ yr.}}{52\text{ wk.}} \cdot \frac{1\text{ wk.}}{40\text{ h}} = \boxed{\$16.83/\text{h.}}$$

2. Change $8.25 per hour to dollars per year.

$$\frac{\$8.25}{1\text{ h}} \cdot \frac{40\text{ h}}{1\text{ wk}} \cdot \frac{52\text{ wk.}}{1\text{ yr.}} = \boxed{\$17160/\text{yr.}}$$

3. Change 220 feet per second to miles per hour.

$$\frac{220\text{ ft.}}{\text{s}} \cdot \frac{1\text{ mi.}}{5280\text{ ft.}} \cdot \frac{60\text{ s.}}{1\text{ min.}} \cdot \frac{60\text{ min.}}{1\text{ h}} = \boxed{150\text{ mi./h}}$$

4. Change 44 miles per hour to feet per second.

$$\frac{44\text{ mi.}}{1\text{ h}} \cdot \frac{5280\text{ ft}}{1\text{ mi.}} \cdot \frac{1\text{ h}}{60\text{ min.}} \cdot \frac{1\text{ min.}}{60\text{ s}} = \boxed{64.53\text{ ft./s}}$$

5. You plan to take a 3-mile walking tour of Rome, Italy. At home, you pace yourself and find that you stroll 90 feet per minute. How many hours will it take you to walk the 3 miles?

$$\frac{90\text{ ft.}}{1\text{ min.}} \cdot \frac{1\text{ mi.}}{5280\text{ ft.}} \cdot \frac{60\text{ min.}}{1\text{ h}} = 1.02\text{ mi/h}$$

$$\frac{3\text{ mi.}}{1} \cdot \frac{1\text{ h}}{1.02\text{ mi.}} = \boxed{2.94\text{ h}}$$

6. James recently accepted a job at a retail store 17 miles from his house. Use the following information and unit analysis to answer the questions below:

Wage: $8.75 per hour

40-hour workweek

52 workweeks per year

5 days of work per week

Gas mileage: 21 miles per gallon

Gas costs: $4.26 per gallon

Average speed: 45 miles per hour

Daily round trip to work and back home: 34 miles

a. What is James' annual salary?

$$\frac{\$8.75}{1\ h} \cdot \frac{40\ h}{1\ wk.} \cdot \frac{52\ wk.}{1\ yr.} = \boxed{\$18200/yr.}$$

b. How much will James spend on fuel each week?

$$\frac{5\ d}{1\ wk} \cdot \frac{34\ mi.}{1\ d} \cdot \frac{1\ gal}{21\ mi.} \cdot \frac{\$4.26}{1\ gal} = \boxed{\$34.49/wk.}$$

c. How many hours will James spend commuting each week? (hours, minutes, seconds).

$$\frac{5\ d}{1\ wk} \cdot \frac{34\ mi.}{1\ d} \cdot \frac{1\ h}{45\ mi} = 3.78\ h$$

$$\frac{0.78\ h}{1} \cdot \frac{60\ min}{1\ h} = 46.8\ min$$

$$\frac{0.8\ min}{1} \cdot \frac{60\ s}{1\ min} = 48s$$

$\boxed{3\ h, 46\ min., 48\ s.}$

7. Light travels at a speed of 3×10^8 m/s (30 million meters per second).

a. It takes light 8.3 minutes to travel from the surface of the Sun to the Earth. What is the distance (in km) of the Earth to the Sun?

$$\frac{8.3 \text{ min}}{1} \cdot \frac{60 \text{ s}}{1 \text{ min.}} \cdot \frac{3 \times 10^8 \text{ m}}{1 \text{ s}} \cdot \frac{1 \text{ km}}{1000 \text{ m}} = 149\,400\,000 \text{ km}$$

b. The Moon is 3.8×10^5 km (380000 km) from the Earth. How many seconds pass between the instant an astronaut on the Moon speaks and the instant his voice is heard on Earth? (His voice travels by modulated laser beam at the speed of light).

$$\frac{380\,000 \text{ km}}{1} \cdot \frac{1000 \text{ m}}{1 \text{ km}} \cdot \frac{1 \text{ s}}{3 \times 10^8 \text{ m}} = 1.27 \text{ s}$$

c. A robot vehicle is traveling on the surface of Mars while Mars and Earth are at their closest approach (7.83×10^7 km = 78300000 km). Suddenly, a video camera on the robot shows a yawning crevasse dead ahead! How many minutes will it take for an electronic signal traveling at the speed of light to go from Earth to Mars in order to tell the robot to stop immediately?

$$\frac{78\,300\,000 \text{ km}}{1} \cdot \frac{1000 \text{ m}}{1 \text{ km}} \cdot \frac{1 \text{ s}}{3 \times 10^8 \text{ m}} \cdot \frac{1 \text{ min.}}{60 \text{ s}} = 4.35 \text{ min.}$$