

Unit Analysis: used to convert to different units

Example 1: Set up a unit analysis for each conversion.

a) Convert feet to inches. $1 \text{ ft} = 12 \text{ inch}$

$$\frac{\cancel{\text{ft}}}{1} \cdot \frac{12 \text{ inch}}{\cancel{1 \text{ ft}}}$$

b) Convert miles/hr to ft/min. $1 \text{ mile} = 5280 \text{ ft}$
 $1 \text{ hr} = 60 \text{ min}$

$$\frac{\cancel{\text{miles}}}{\cancel{\text{hr}}} \cdot \frac{5280 \cancel{\text{ft}}}{1 \cancel{\text{mile}}} \cdot \frac{1 \cancel{\text{hr}}}{60 \text{ min}}$$

c) Change lbs/ft to oz/in. $1 \text{ lb} = 16 \text{ oz}$
 $1 \text{ ft} = 12 \text{ inch}$

$$\frac{\cancel{\text{lbs}}}{\cancel{\text{ft}}} \cdot \frac{16 \text{ oz}}{\cancel{1 \text{ lb}}} \cdot \frac{1 \cancel{\text{ft}}}{12 \text{ inch}}$$

Example 2:

a) Convert 2 years to days. $1 \text{ yr} = 365 \text{ days}$

$$\frac{2 \cancel{\text{years}}}{1} \cdot \frac{365 \text{ days}}{\cancel{1 \text{ yr}}} = \boxed{730 \text{ days}}$$

b) Convert 3 miles to inches. $1 \text{ mile} = 5280 \text{ ft}$
 $1 \text{ ft} = 12 \text{ inch}$

$$\frac{3 \cancel{\text{miles}}}{1} \cdot \frac{5280 \cancel{\text{ft}}}{1 \cancel{\text{mile}}} \cdot \frac{12 \text{ inch}}{\cancel{1 \text{ ft}}} = \boxed{190,080 \text{ inch}}$$

c) Convert 7,200,000 seconds to days.

$$\frac{7200000 \cancel{\text{seconds}}}{1} \cdot \frac{1 \cancel{\text{min}}}{60 \text{ sec}} \cdot \frac{1 \cancel{\text{hr}}}{60 \cancel{\text{min}}} \cdot \frac{1 \text{ day}}{24 \cancel{\text{hrs}}}$$

$$\begin{array}{r} 5^3 \\ 864 \\ 8 \\ \times 2112 \\ \hline 7112 \end{array}$$

$1 \text{ min} = 60 \text{ sec}$
 $1 \text{ hr} = 60 \text{ min}$
 $1 \text{ day} = 24 \text{ hrs}$

$$= \frac{7200000}{60 \cdot 60 \cdot 24} = \frac{7200000}{86400}$$

$$= \frac{72000}{864} \approx \boxed{81 \text{ days}}$$

$$\begin{array}{r} 81.01 \\ 864 \overline{) 72000.00} \\ \underline{-71120} \\ 880 \\ \underline{-8640} \\ 1600 \\ \underline{-1600} \\ 0 \end{array}$$

Example 3: Convert 30 miles/hr to ft/sec.

$$\frac{30 \cancel{\text{miles}}}{1 \cancel{\text{hr}}} \cdot \frac{5280 \cancel{\text{ft}}}{1 \cancel{\text{mile}}} \cdot \frac{1 \cancel{\text{hr}}}{3600 \cancel{\text{sec}}} = \frac{30 \cdot 5280}{3600}$$

$$\begin{aligned} 1 \text{ mile} &= 5280 \text{ ft} \\ 1 \text{ hr} &= 3600 \text{ sec} \end{aligned}$$

$$\begin{array}{r} 44 \\ 36 \overline{) 1584} \\ \underline{-144} \\ 144 \\ \underline{-144} \\ 0 \end{array}$$

$$= \frac{158400}{3600}$$

$$= \frac{1584}{36}$$

$$= 44 \text{ ft/sec}$$

Example 4: Convert 176 ft/sec to miles/hr.

$$\frac{176 \cancel{\text{ft}}}{1 \cancel{\text{sec}}} \cdot \frac{1 \cancel{\text{mile}}}{5280 \cancel{\text{ft}}} \cdot \frac{3600 \cancel{\text{sec}}}{1 \cancel{\text{hr}}} = \frac{176 \cdot 3600}{5280}$$

$$\begin{aligned} 1 \text{ mile} &= 5280 \text{ ft} \\ 1 \text{ hr} &= 3600 \text{ sec} \end{aligned}$$

$$\begin{array}{r} 120 \\ 528 \overline{) 63360} \\ \underline{-528} \\ 1056 \\ \underline{-1056} \\ 00 \\ \underline{-0} \\ 0 \end{array}$$

$$= \frac{633600}{5280}$$

$$= \frac{63360}{528}$$

$$= 120 \text{ miles per hour}$$