## Chapter 1

1. The diameter of metal wire is often referred to by its American wire gauge number. A 16gauge wire has the diameter of 0.05082 in . What length of wire, in meters, is there in a 1.00 lb spool of 16 gauge copper wire? The density of copper is $8.92 \mathrm{~g} / \mathrm{mL}$.

2 A copper penny has a mass of 3.015 g and contains $95.0 \% \mathrm{Cu}$. What is the mass of the copper present in one penny? If Cu costs $80 \$$ per pound, what is the value of the Cu in 100 pennies ( $\$ 1.00$ )? How many pennies contain one dollars worth of Cu ?

3 The unit the furlong is used in horse racing. The units chain and link, are used in surveying. There are 8 furlongs in one mile, 10 chains in 1 furlong, and 100 links in a chain. To three significant figures, what is the length of 1 link in inches?

## Answers

1 Type of problem: density problem.
Information you will need for this problem:

- Conversion of $\mathrm{Ib} \rightarrow 9$
- Density of wire
- Conversion of in $\rightarrow \mathrm{cm} \rightarrow \mathrm{m}$
- Conversion of $\mathrm{mL} \rightarrow \mathrm{cm}^{3}$
- $V=r^{2} h r=d / 2$
$1.00 \mathrm{lb} \times \frac{453.592 \mathrm{~g}}{1 \mathrm{lb}} \times \frac{1 \mathrm{~mL}}{8.92 \mathrm{~g}} \times \frac{\mathrm{cm}^{3}}{1 \mathrm{~mL}}=50.8 \underline{5} \mathrm{~cm}^{3}$
$50.85 \mathrm{~cm}^{3}=(0.02541 \mathrm{in})^{2} \times\left(\frac{2.54 \mathrm{~cm}}{1 \mathrm{in}}\right)^{2} \times h$
$\mathrm{h}=388 \mathbf{8} 5.66 \mathrm{~cm} \times \frac{1 \mathrm{~m}}{100 \mathrm{~cm}}=38.9 \mathrm{~m}$


## 2 Type of problem: Mass percentage problem

Information you will need for this problem:

- Mass of 1 penny
- Number of pennies in 1 dollar
- Conversion of grams of copper in 1 penny
- conversion of $g \rightarrow \mathrm{lb}$
$\frac{3.015 \mathrm{~g}}{1 \text { penny }} \times \frac{95.0 \mathrm{~g} \mathrm{Cu}}{100 \mathrm{~g} \text { penny }}=\frac{2.86 \mathrm{~g} \mathrm{Cu}}{1 \text { penny }}$
100 penny $\times \frac{2.86 \mathrm{~g} \mathrm{Cu}}{1 \text { penny }} \times \frac{11 \mathrm{~b}}{453.592 \mathrm{~g}} \times \frac{80 \Phi}{1 \mathrm{lbCu}}=50.4 \Phi$ worth of Cu
$\$ 1.00$ worth of copper $\times \frac{100 \text { penny }}{50.4 \Phi \text { worth } \mathrm{Cu}}=198$ penny
3 Type of problem: Unit conversion/dimensional analysis
Information you will need for this problem:
- Conversion of in $\rightarrow \mathrm{mi}$

1 link $\times \frac{1 \text { chain }}{100 \text { link }} \times \frac{1 \text { furlong }}{10 \text { chains }} \times \frac{1 \text { mile }}{8 \text { furlongs }} \times \frac{5280 \mathrm{ft}}{1 \mathrm{mi}} \times \frac{12 \mathrm{in}}{1 \mathrm{ft}}=7.92$ in

