Solving Proportions

Two fractions with an equal sign in between is called a proportion.

$$\frac{a}{b} = \frac{c}{d}$$

To solve a proportion, cross multiply.

$a \cdot d = c \cdot b$

Step 1: Use cross-multiplication to remove the fractions.
Step 2: Use algebra to solve for the variable.

Directions: Solve each proportion. Express your answers as a mixed number or as a fraction in simplest terms.

1. $\frac{5}{8} = \frac{x}{32}$

$$\frac{8x}{8} = \frac{160}{8}$$

$$\boxed{x = 20}$$

2. $\frac{6}{25} = \frac{32}{x}$

$$\frac{6x}{6} = \frac{800}{6}$$

$$x = \frac{800}{6} \frac{\div 2}{\div 2} = \frac{400}{3}$$

$$\boxed{x = 133\tfrac{1}{3}}$$

$$\begin{array}{r} 133 \\ 3\overline{)400} \\ -3 \\ \hline 10 \\ -9 \\ \hline 10 \\ -9 \\ \hline 1 \end{array}$$

3. $\dfrac{1.2}{x} = \dfrac{24}{30}$

$\dfrac{24x}{24} = \dfrac{36}{24}$

$x = \dfrac{36}{24} \div \dfrac{12}{12} = \dfrac{3}{2}$

$\begin{array}{r} 1\frac{1}{2} \\ 2\overline{)3} \\ -2 \\ \hline 1 \end{array}$

$\boxed{x = 1\frac{1}{2}}$

4. A 6-foot tall man casts a shadow that is 9 feet long. At the same time, a nearby flagpole casts a shadow that is 60 feet long. How tall is the flagpole?
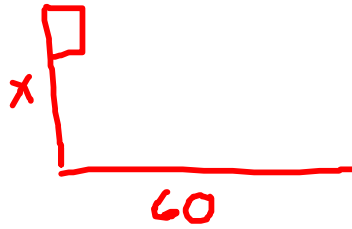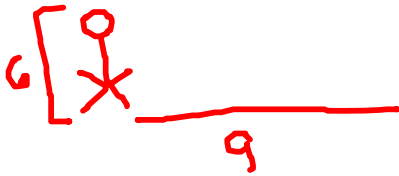
$\dfrac{6}{9} = \dfrac{x}{60}$

$\dfrac{9x}{9} = \dfrac{360}{9}$

$x = 40$

$\boxed{40 \text{ feet}}$

5. A recipe requires $\frac{2}{3}$ cup of brown sugar to make 20 cookies. How much brown sugar is required to make 35 cookies?

$\frac{2}{3}$ cup brown sugar   20 cookies

x 35 cookies

$$\frac{2}{3} = \frac{x}{20} \times 35$$

$$\frac{2}{3} \cdot \frac{35}{1} = \frac{70}{3}$$

$$\frac{20x}{20} = \frac{70}{3} \div 20$$

$$\frac{70}{3} \div \frac{20}{1} = \frac{70}{3} \cdot \frac{1}{20} = \frac{7}{6}$$
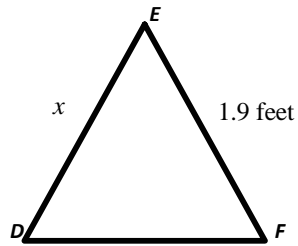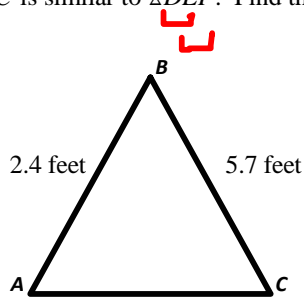
$$x = \frac{7}{6}$$

$$x = 1\frac{1}{6}$$

$1\frac{1}{6}$ cups of brown sugar

$$6 \overline{)\, 7 \atop \begin{array}{r} -6 \\ \hline 1 \end{array}} \quad 1\frac{1}{6}$$

6. △*ABC* is similar to △*DEF*. Find the value of *x*.

B

2.4 feet   5.7 feet

A _____ C

E

x   1.9 feet

D _____ F

$$\frac{2.4}{x} = \frac{5.7}{1.9}$$

$$\frac{5.7x}{5.7} = \frac{4.56}{5.7}$$

$$57 \overline{)45.6}$$
$$\quad\;\; 456$$
$$\quad\;\;\;\; 0$$
$$.8$$

$$x = \frac{45.6}{57}$$

$$x = .8$$

$$\boxed{.8 \text{ feet}}$$

7. $\frac{x+12}{9x} = \frac{5}{9}$

$$9(x+12) = 45x$$
$$9x + 108 = 45x$$
$$-9x \qquad\quad -9x$$

$$\frac{108}{36} = \frac{36x}{36}$$

$$3 = x$$

$$\boxed{x = 3}$$

8. $\dfrac{x}{20} = \dfrac{x-4}{5}$

$20(x-4) = 5x$

$20x - 80 = 5x$

$-20x \qquad\qquad -20x$

$\dfrac{-80}{-15} = \dfrac{-15x}{-15}$

$x = \dfrac{-80}{-15} = \dfrac{80 \div 5}{15 \div 5} = \dfrac{16}{3}$

$\boxed{x = 5\tfrac{1}{3}}$

$3\overline{)16}\;^{5\frac{1}{3}}$
$\;-15$
$\quad 1$

9. $\dfrac{18+x}{14-x} = \dfrac{3}{7}$

$3(14-x) = 7(18+x)$

$42 - 3x = 126 + 7x$

$\quad +3x \qquad\qquad +3x$

$42 = 126 + 10x$

$-126 \quad -126$

$\dfrac{-84}{10} = \dfrac{10x}{10}$

$x = \dfrac{-84 \div 2}{10 \div 2} = -\dfrac{42}{5}$

$\boxed{x = -8\tfrac{2}{5}}$

$5\overline{)42}\;^{8\frac{2}{3}}$
$\;-40$
$\quad 2$