1 Understand Ratios
Ratios provide a way to compare two numbers or quantities. The *ratio* of the number $a$ to the number $b$ may be written as:

$$\frac{a}{b} \quad a : b \quad a \text{ to } b$$

**Example 1** On an exam there were 6 A’s, 13 B’s, 6 C’s, 4 D’s, and 1 F. Find:

a) The ratio of the number of A’s to the number of D’s.

b) The ratio of the number of C’s to the total number of grades.

**Example 2** Cholesterol level is often measured in terms of the ratio of LDL to HDL where a ratio of 4:1 or less is desirable.

a. If Tom’s LDL measures 186 mg/dl and his HDL measures 48 mg/dl, is his cholesterol within the desired range?

b. If Joe’s LDL measures 179 mg/dl and his HDL measures 43 mg/dl, is his cholesterol within the desired range?

2 Solve Proportions Using Cross-Multiplication.

A nurse must administer a certain dosage of a drug to a patient. The drug not available in the dosage amount required. How can the nurse calculate how much of the drug to administer?

**Example:** The order is for “acetaminophen 650 mg p.o. q.i.d.” and the drug label indicates that the bottle contains acetaminophen 325 mg tablets.

A *proportion* is an equality between two ratios and is written:

$$\frac{a}{b} = \frac{c}{d}$$
One method used to solve a proportion is by using **cross-multiplication**.

If \( \frac{a}{b} = \frac{c}{d} \) then \( ad = bc \)

**Example 3** Solve each proportion for \( x \).

a) \( \frac{-12}{13} = \frac{36}{x} \)

b) \( \frac{1}{2.2} = \frac{15}{x} \)

c) \( \frac{7}{-5} = \frac{x}{25} \)

d) \( \frac{x}{0.3} = \frac{1.5}{0.9} \)

**Solve Applications**

**Example 4**

a. A nurse must administer 220 mg of a drug to a patient. The drug is only available in a solution whose concentration is 50 mg of the drug per 0.9 ml of solution. How many ml of solution should the nurse administer?

b. Karen is currently reading a John Grisham novel. If she reads 72 pages in 1.3 hours, how long will it take her to read the entire 656-page novel?

**Use Proportions to Change Units**

1. Write the conversion units as a ratio, it does not matter which is in the numerator and denominator.
   
   For example 1 foot = 12 inches can be written either \( \frac{1 \text{ ft}}{12 \text{ in}} \) or \( \frac{12 \text{ in}}{1 \text{ ft}} \)

2. Write the second ratio with the units in the **same relative position** as the first.

3. Solve the proportion.
Example 5

a. Convert 146.4 ounces to pounds.

b. Convert 50 mL to Tbsp. (1 Tbsp = 15 mL).

c. The male heart may be as large as 340 g. How many pounds is this? (1 kg = 2.2 lb)

5 Use Proportions to Solve Problems Involving Similar Figures

Two figures are said to be similar when their corresponding sides are proportional and their corresponding angles are equal.

Example 6 Set up a proportion and solve to find the length of the unknown side.

a.

\[ \frac{18 \text{ in.}}{24 \text{ in.}} = \frac{10 \text{ in.}}{x} \]

b.

\[ \frac{10 \text{ m}}{18 \text{ m}} = \frac{8 \text{ m}}{x} \]

c.

\[ \frac{8 \text{ ft}}{12 \text{ ft}} = \frac{6 \text{ ft}}{x} \]