RATIOS, PROPORTIONS, AND RATES

36. SETTING UP A RATIO

To find a ratio, put the number associated with the word *of* **on top** and the quantity associated with the word *to* **on the** bottom and reduce. The ratio of 20 oranges to 12 apples is $\frac{20}{12}$ which reduces to $\frac{5}{3}$.

37. PART-TO-PART AND PART-TO-WHOLE RATIOS

If the parts add up to the whole, a part-to-part ratio can be turned into two part-to-whole ratios by putting **each number in the original ratio over the sum of the numbers.** If the ratio of males to females is 1 to 2, then the males-to-people ratio is $\frac{1}{1+2} = \frac{1}{3}$ and the females-to-people ratio is $\frac{2}{1+2} = \frac{2}{3}$. Or, $\frac{2}{3}$ of all the people are female.

38. SOLVING A PROPORTION

To solve a proportion, **cross multiply:**

$$\frac{x}{5} = \frac{3}{4}$$
$$4x = 5 \times 3$$
$$x = \frac{15}{4} = 3.75$$

39. RATE

To solve a rates problem, **use the units** to keep things straight.

Example: If snow is falling at the rate of 1 foot every 4 hours, how many inches of snow will fall in 7 hours?

Setup:

$$\frac{1 \text{ foot}}{4 \text{ hours}} = \frac{x \text{ inches}}{7 \text{ hours}}$$
$$\frac{12 \text{ inches}}{4 \text{ hours}} = \frac{x \text{ inches}}{7 \text{ hours}}$$
$$4x = 12 \times 7$$
$$x = 21$$

40. AVERAGE RATE

Average rate is *not* simply the average of the rates.

$$\text{Average } A \text{ per } B = \frac{\text{Total } A}{\text{Total } B}$$
$$\text{Average Speed} = \frac{\text{Total distance}}{\text{Total time}}$$

To find the average speed for 120 miles at 40 mph and 120 miles at 60 mph, **don't just average the two speeds.** First figure out the total distance and the total time. The total distance is $120 + 120 = 240$ miles. The times are 3 hours for the first leg and 2 hours for the second leg, or 5 hours total. The average speed, then, is $\frac{240}{5} = 48$ miles per hour.