MATH 5: HANDOUT 7

RATIOS AND MORE WORD PROBLEMS

Ratios

Why do we need ratios?

Peter has \$10 more than Robert. Is that a big difference?

It depends on how much money they each have.

Peter	Robert	Ratio (Peter : Robert)
\$12	\$2	$\frac{12}{2} = 6:1$
\$112	\$102	$\frac{112}{102} \approx 1.10:1$
\$1,112	\$1,102	$\frac{1112}{1102} \approx 1.009:1$

In every case, the absolute difference is exactly \$10. But notice how *different* these situations feel:

- When Robert has only \$2, Peter's amount is **six times larger**, a huge difference.
- When Robert has \$102, Peter has about **10% more**, noticeable but not dramatic.
- When Robert has \$1,102, Peter has only about **1% more**, almost the same.

The reason is that our sense of "big" or "small" difference often depends not on the subtraction (\$10), but on the *ratio* between the two amounts. That ratio tells us how large one quantity is *relative to* another.

A **ratio** compares two quantities by division:

$$\text{ratio of } a \text{ to } b = \frac{a}{b} \quad \text{or} \quad a:b \quad \text{or} \quad \text{"a to b"}.$$

Peter has \$12, Robert has \$2. The ratio of Peter's money to Robert's money is

$$\frac{12}{2} = 6 \quad \text{or} \quad 6:1.$$

This means Peter has 6 times as much money as Robert.

Homework

1. **Simplify the following expressions:**
   (a) $\frac{2}{3}x + \frac{4}{3}(1 + x)$ (b) $2.5x - 1.5(4 - x)$ (c) $2\left(x - \frac{2}{3}\right) - \left(x + \frac{1}{2}\right)$
2. The ratio of roses to hibiscuses in a garden is $9 : 11$. If there are 99 rose bushes, how many hibiscus bushes are there? What is the total number of bushes?
3. Mary prepared a homemade dried fruit and nut mix using 6 parts of raisins, 5 parts of dried cranberries, and 3 parts of walnuts. The cranberries and walnuts together weighed 2 kg 400 g. Find the total weight of the mix.
4. Sea water contains 5% salt by weight. How many kilograms of fresh water must be added to 40 kg of sea water to obtain a solution with 2% salt?
5. Bronze is an alloy of tin and copper. The ratio of tin to copper in bronze is $3 : 17$. How much tin and how much copper are in an 80 kg piece of bronze?
6. Fresh watermelon weighs 10 kg and contains 99% water. After losing some water in the store, it now contains only 98% water. What is its new weight?

*7. Solve the following puzzle (different letters stand for different digits):

$$\begin{array}{r} \text{THIS} \\ +\ \text{IS} \\ \hline \text{EASY} \end{array}$$