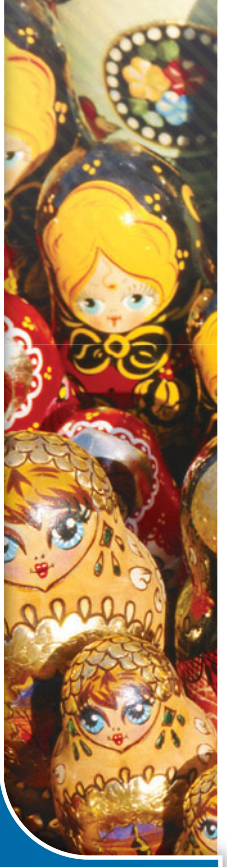
Chapter

5

Division and Proportions in Algebra



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In Chapter 1, we noted that division is related to multiplication by its algebraic definition: dividing by b is the same as multiplying by the reciprocal of b, or $a \div b = a \cdot \frac{1}{b}$.

In Chapter 2, you saw that division is also related to multiplication by related facts.

If a and b are not zero and $ab = c$, then $a = \frac{c}{b}$ and $b = \frac{c}{a}$.

Division is also an important operation in its own right. Three kinds of situations lead directly to division.

Splitting Up

If a quantity a is split into b equal parts, then each part has measure $\frac{a}{b}$. For this reason, every fraction can be viewed as a division $\left(\frac{a}{b} = a \div b\right)$.

The value of the fraction is the quotient of a and b.

Rate

If a and b are quantities with different units, then the quotient is a *rate.* For example, dividing 50 miles by 2 hours yields the rate 25 miles per hour: $\frac{50 \text{ mi}}{2 \text{ hr}} = \frac{25 \text{ mi}}{\text{hr}}$.

Ratio

If a and b have the same kind of units, then the quotient is a *ratio.* For example, if one doll weighs 36 grams and another weighs 4.5 grams, then the quotient $\frac{36 \text{ g}}{4.5 \text{ g}}$ equals 8, the ratio of the first weight to the second weight.

If two rates or ratios are equal, then the result is a *proportion.* For example, dividing 75 miles by 3 hours yields the same rate as dividing 50 miles by 2 hours. The equation $\frac{50 \text{ mi}}{2 \text{ hr}} = \frac{75 \text{ mi}}{3 \text{ hr}}$ is a proportion. In this chapter, you will study these and related topics.