Ratio and Proportion

6

SECTION 6.3

Proportions

Objectives

A Name the terms in a proportion.

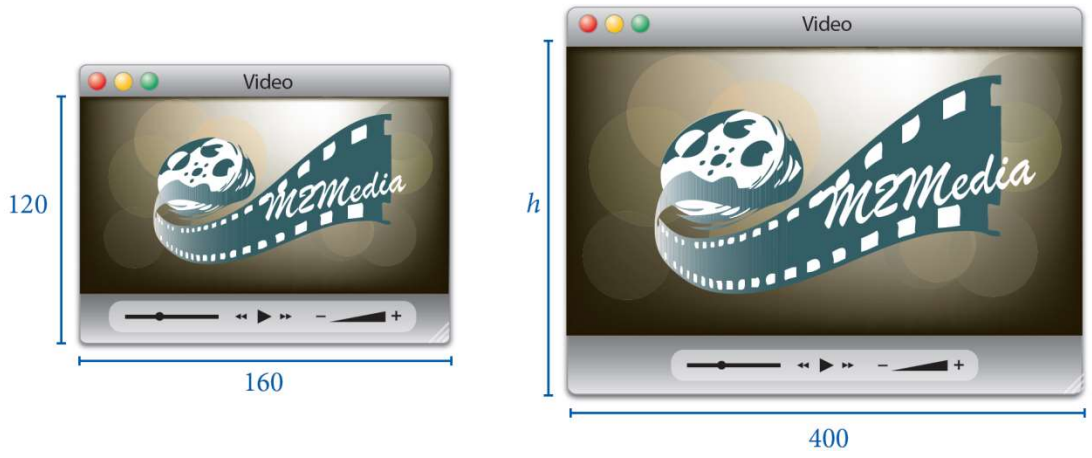
B Use the fundamental property of proportions to solve a proportion.

Proportions

Millions of people turn to the Internet to view music videos of their favorite musician.

Many Web sites offer different sizes of video based on the speed of a user's Internet connection.

Even though the figures below are not the same size, their sides are proportional.



Proportions

In this section we will solve problems using proportions.

Definition

A statement that two ratios are equal is called a **proportion**. If $\frac{a}{b}$ and $\frac{c}{d}$ are two equal ratios, then the statement

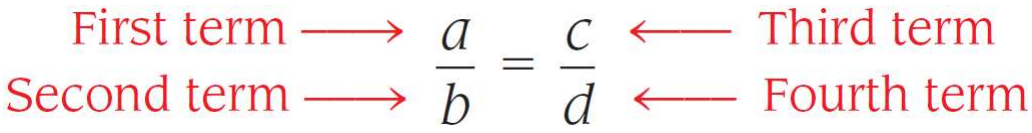
$$\frac{a}{b} = \frac{c}{d}$$

is called a proportion.

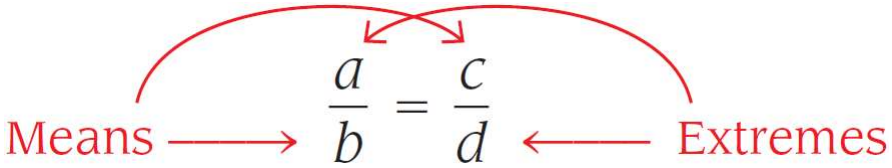
A Terms of a Proportion

Terms of a Proportion

Each of the four numbers in a proportion is called a *term* of the proportion. We number the terms of a proportion as follows:



The first and fourth terms of a proportion are called the *extremes*, and the second and third terms of a proportion are called the *means*.



Example 1

In the proportion $\frac{3}{4} = \frac{6}{8}$, name the four terms, the means, and the extremes.

Solution:

The terms are numbered as follows:

First term = 3	Third term = 6
Second term = 4	Fourth term = 8

The means are 4 and 6; the extremes are 3 and 8.

B The Fundamental Property of Proportions

The Fundamental Property of Proportions

Fundamental Property of Proportions

In any proportion, the product of the extremes is equal to the product of the means. This property is also referred to as the means/extremes property, and in symbols, it looks like this:

$$\text{If } \frac{a}{b} = \frac{c}{d} \quad \text{then} \quad ad = bc$$

Example 2

Verify the fundamental property of proportions for the following proportions.

a. $\frac{3}{4} = \frac{6}{8}$ **b.** $\frac{17}{34} = \frac{1}{2}$

Solution:

We verify the fundamental property by finding the product of the means and the product of the extremes in each case.

Proportion	Product of the Means	Product of the Extremes
a. $\frac{3}{4} = \frac{6}{8}$	$4 \cdot 6 = 24$	$3 \cdot 8 = 24$
b. $\frac{17}{34} = \frac{1}{2}$	$34 \cdot 1 = 34$	$17 \cdot 2 = 34$

Example 2 – *Solution* cont'd

For each proportion the product of the means is equal to the product of the extremes.

The Fundamental Property of Proportions

The procedure for finding a missing term in a proportion is always the same.

We first apply the fundamental property of proportions to find the product of the extremes and the product of the means.

Then we solve the resulting equation.