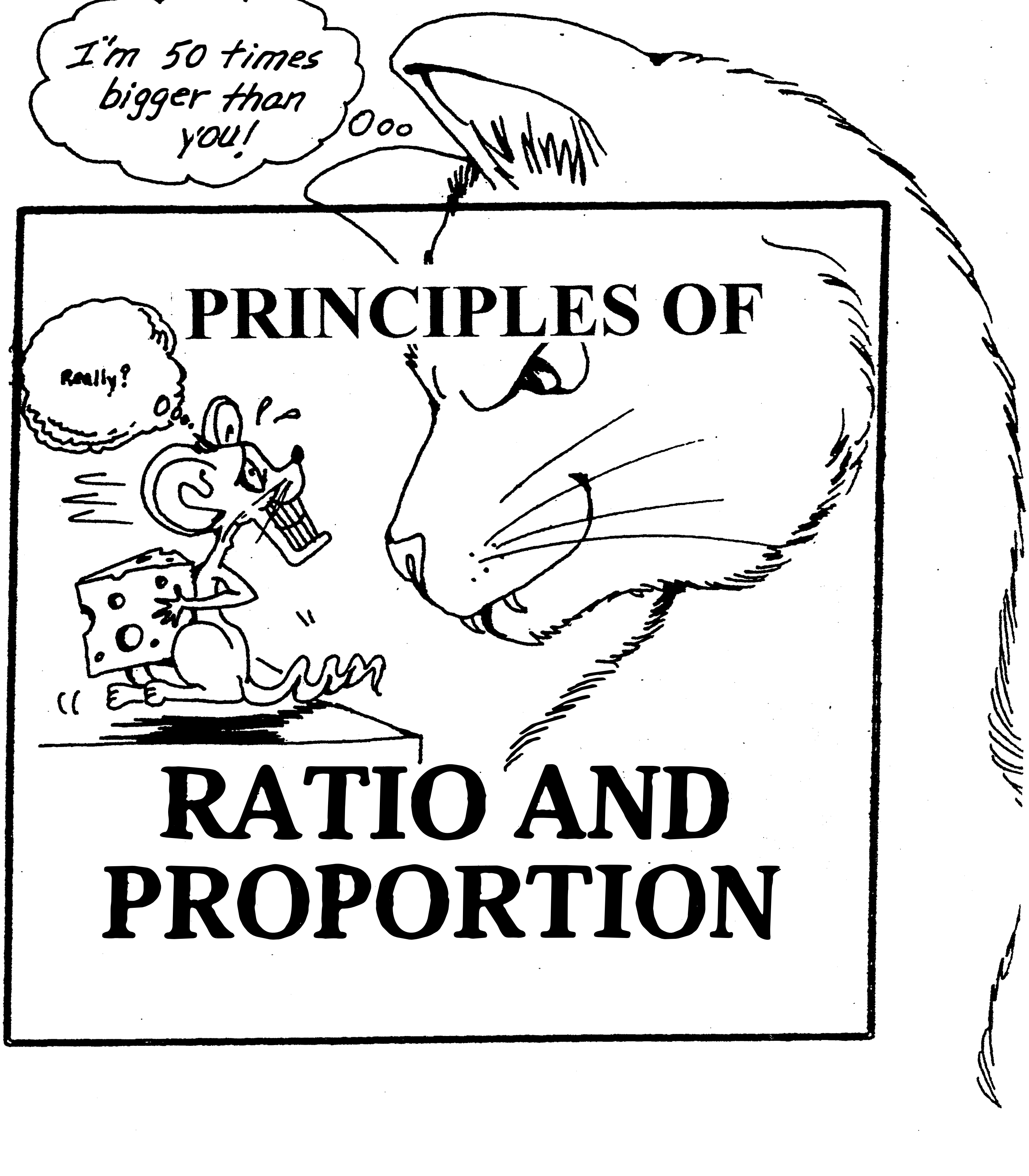
PRINCIPLES OF RATIO AND PROPORTION



textbook
PUBLISHERS
PO Box 910517
St George, UT 84791
1-435-238-7702

Principles of Ratio And Proportion

Textbook Publishers

Introduction to PRINCIPLES OF RATIO AND PROPORTION

Welcome to the study of mathematics -- *Ratio and Proportion*!

This math book by Textbook Publishers will be different from any other math book you have studied. Most conventional math books have pages and pages of problems to solve. This book has very few. Here is why.

Math is actually just a TOOL for you to learn an *intrinsic value*. "Intrinsic" means "something inside." An intrinsic value becomes part of your heart and mind. It becomes part of you. The intrinsic value of math is knowing how to THINK AND SELF-GOVERN. This intrinsic value will give you freedom of thought!

To help you learn how to think and self-govern, you will be creating and solving your OWN math problems. Here is why a knowledge of how to do that is so important:

1. When you create and solve your own problems, you are learning how to THINK. Math books which have worksheets created by someone else teach students how to follow instructions, but at the same time students are robbed of the ability to think and reason.

2. When you have learned how to think through math problems, you can then apply math principles in every-day life. For example, you will be able to give accurate change as a cashier, or balance your own check book. No matter what your life's profession is, you will be able to apply math intelligently. You will be GOVERNING YOURSELF.

3. When you create and solve your own math problems, you have not only learned how to think, but you will find that you learn math <u>ten times faster</u> than by filling in the blanks of someone else's problems. This fact has been proven by testing hundreds, even thousands, of students. By reasoning through each math process along the way, you will UNDERSTAND math.

4. When you create and solve your own problems, your individual attitudes of life magically appear. Students who create simple, boring problems for themselves find out that they are not motivated about math. When unmotivated students do the minimums in math, they may also be doing the minimums in other aspects of their lives as well. For them, life itself is often boring. Students who create challenging problems for themselves will excel in math and will become excited about learning to think. Their ATTITUDES about life also become motivational and exciting.

Understanding Principles of Ratio and Proportion

The study of Ratio and Proportion, although it is not used a lot in daily learning, can be a tool for observing and measuring. On the internet, a student asked a math professor for the correct definition of "ratio" in relationship to proportion, and this was the professor's answer:

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Date: 08/21/2003 at 17:07:19
From: Doctor Peterson
Subject: Re: What is the correct definition of "ratio"?

Hello, student.

[The word "ratio"] is as much an English language question as a math
question, and that [could make]it very confusing. Words like this are
not used as consistently as you might expect, even among math teachers
or mathematicians. (That's partly because mathematicians today don't
tend to pay much attention to ratios, and therefore don't have to
define them carefully.)

My first impression is that we TEND to think of ratios as comparisons
of, say, the number of boys to the number of girls, rather than of a
part to a whole, but that the term "ratio" does not necessarily
exclude the latter. So it might not be technically wrong to use it
that way, but depending on the context there might be clearer ways to
phrase what you want to say, so as to avoid suggesting that the
comparison is part to part.

Then I did a little searching.

For word questions, I like to see what a dictionary says, since
[those who study words] know how to make distinctions between words
(even though they often don't understand the mathematical
distinctions). Merriam-Webster (m-w.com) says

  ratio 1 a : the indicated quotient of two mathematical expressions
          b : the relationship in quantity, amount, or size between
              two or more things : PROPORTION

This agrees with [the] general sense of the word: any quotient can be
called a ratio, but in particular it tends to compare two distinct
things. But, of course, we make a distinction between ratio and
proportion, and they call them synonymous. So how do they define
"proportion"?

  proportion 3 : the relation of one part to another or to the whole
                 with respect to magnitude, quantity, or degree :
                 RATIO
             4 : SIZE, DIMENSION
             5 : a statement of equality between two ratios in which
                 the first of the four terms divided by the second
                 equals the third divided by the fourth (as in
                 4/2=10/5)
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The definition #5 is the one we use technically, in distinction to ratio. But look at definition #3: when the dictionary uses this synonymous with ratio, it specifically includes relations of part to *whole* as well as *part* to *part*. That would say that your example IS a ratio.

How about math sites? ... Here is one reference I found:

> Ratio. Fraction. What's the Difference?
> http://www.sci.tamucc.edu/txcetp/cr/math/rf/RatioFraction.pdf
>
> Due to common notation, students often improperly interchange the ideas of ratio and fraction. Through this lesson students will learn why the two are different ideas and when they actually can overlap.
>
> . . . Fractions always illustrate a "part to whole" relationship while ratios can be used to illustrate a much larger set of relationships; such as part to part and whole to part.

This seems to say that a fraction always refers to part of a whole, but a ratio can indicate a variety of relationships.

http://mathforum.org/library/drmath/view/63884.html

Introduction to RATIOS

The word "ratio" (pronounced RAY-show) comes from the Latin word "*reri*" meaning "to think, or reason."

A ratio compares two number values. We use ratios when we want to compare certain things, or show the relationship of numbers to each other. And that usually takes a lot of "thinking" and "reasoning"!

This chapter will guide you in gaining a more thorough understanding of how comparisons are written mathematically.

PRINCIPLE #1

ITEMS WHICH ARE BEING COMPARED IN A RATIO ARE CALLED "UNITS."

EXAMPLES OF UNITS

quarts, gallons, feet, inches, dollars, cents, cows, horses

Learning Exercise

Write ten units that could be compared in ratios .

PRINCIPLE #2

THE COMPARISON OF UNITS CAN BE SHOWN THREE DIFFERENT WAYS.

EXAMPLE:

Using "miles" as the unit, write the distance of the Church from your house--which is 12 miles, and the distance of the college from your house--which is 24 miles.

1. This ratio can be written as a fraction: $\frac{\text{12 MILES}}{\text{24 MILES}} = \frac{12}{24}$

2. This ratio can be written as two numbers separated by a colon (:) 12 miles: 24 miles = 12 : 24

3. This ratio can be written as two numbers separated by the word **to**: 12 miles to 24 miles = 12 to 24

Learning Exercise

Create five ratio problems and write them the three different ways.

PRINCIPLE #3

A RATIO IS IN <u>SIMPLEST FORM</u> WHEN THE TWO NUMBERS <u>DO NOT</u> HAVE A COMMON FACTOR.

EXAMPLES

$$\frac{12 \text{ MILES}}{24 \text{ MILES}} = \frac{12}{24} = \frac{1}{2}$$

12 miles: 24 miles = 12:24 = 1:2

12 miles to 24 miles = 12 TO 24 = 1 TO 2

Learning Exercise

Create ten ratio comparisons and reduce each to the simplest form.

PRINCIPLE #4

THE COMPARISON OF TWO QUANTITIES WHICH HAVE <u>DIFFERENT UNITS</u> IS CALLED A <u>RATE</u>.

EXAMPLE

An assembly line completes 60 <u>cars</u> every two <u>hours</u>.

Learning Exercise

Create 10 sentences with "rates," comparing two different quantities, as shown above.

PRINCIPLE #5

RATES ARE WRITTEN AS FRACTIONS.

EXAMPLE

An assembly line completes 60 cars every two hours.

$$\frac{60 \text{ CARS}}{2 \text{ HOURS}} = \frac{60}{2}$$

Learning Exercise

Create ten ratios with different units, and show the rates as fractions.

PRINCIPLE #6

WHEN THE NUMBERS WHICH FORM THE RATE HAVE <u>NO COMMON FACTORS</u>, THE RATE HAS BEEN REDUCED TO ITS <u>SIMPLEST FORM</u>.

EXAMPLE

The instructor corrected 63 G.E.D. tests in 12 hours.

$$\frac{63 \text{ test s}}{12 \text{ hours}} = \frac{63}{12} = \boxed{\frac{21 \text{ tests}}{4 \text{ hours}}}$$

(Notice that the units are written with the rate.)

Learning Exercise

Create five comparisons showing different units, and reduce to the simplest form.

Introduction to UNIT RATES

You have probably seen or heard advertisements which promote special prices using the word "per" as part of the explanation– such as "one **per** customer." Also, a car can get "35 miles **per** gallon." (But NOT "My cat likes to purr." That's a homonym!)

"Per" is also used in math, and means the same as the phrase **"for each."** Mathematically, "thirty-five miles per gallon" would be written like this: $^{35}/_{1}$

PRINCIPLE #7

A RATE IN WHICH THE NUMBER IN THE DENOMINATOR IS 1, IS CALLED A UNIT RATE.

EXAMPLE:

The standard freeway speed within city limits is 55 miles per hour.
"Per hour" gives "55 miles" a denominator of 1, and is the unit rate...$^{55}/_{1}$

Learning Exercise

Write ten comparative statements using the word "per" to show the unit rates.

*** Optional Review #1 ***