## LIFFEPAC Math



## MATHEMATICS 708 FORMULAS AND RATIOS

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## FORMULAS AND RATIOS

In this LIFEPAC ${ }^{\circledR}$ you will be introduced to a formal study of ratios and formulas. You have probably been following formulas all your life. A recipe, a set of instructions for playing a game, or an explanation of how to catch a fish all might be called formulas. Of course, these formulas are not mathematical formulas. A mathematical formula is expressed in mathematical symbols. You will learn how to work with formulas and how to create formulas of your own.

Formulas and equations are closely related, and you will move from the study of formulas to a study of equations. You will see how to solve equations. Look especially for the concept called "undoing," because this concept may be entirely new to you.

You will then be introduced to ratio and proportion. A proportion is an idea of relationship that helps us find an answer by comparing similar things, a technique we often use without even realizing it. This LIFEPAC will help you sharpen your skills in this area.

## OBJECTIVES

Read these objectives. The objectives tell you what you should be able to do when you have successfully completed this LIFEPAC.

When you have finished this LIFEPAC, you should be able to:

1. Use a given formula to find an unknown quantity.
2. Write several common formulas.
3. Write a formula from a rule.
4. Use a function machine.
5. Define and identify an equation.
6. Solve equations.
7. Use equations to solve word problems.
8. Define and write ratios.
9. Reduce ratios to lowest terms.
10. Define and write proportions.
11. Identify true proportions by comparing the product of the means to the product of the extremes.
12. Find the missing element in an open proportion.
13. Solve word problems using proportion.

Survey the LIFEPAC. Ask yourself some questions about this study. Write your questions here.
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## I. FORMULAS

## SECTION OBJECTIVES

Review these objectives. When you have completed this section, you should be able to:

1. Use a given formula to find an unknown quantity.
2. Write several common formulas.
3. Write a formula from a rule.
4. Use a function machine.

Mathematics is a symbolic language. One of the things that you can do using mathematics is to express a problem in symbols. One kind of symbolic writing is called a formula. We will be discussing formulas and their uses in this section.

## DEFINITION

A formula is a general rule expressed in mathematical symbols.

In a formula, instead of words, we use mathematical symbols. Some of these symbols are our old friends $+,-, \mathbf{x}, \div$, and $=$. In addition, we use letters, such as $A, R$, or $I$. Sometimes in a formula we might meet a special symbol, such as $\pi, \%$, or $\sqrt{ }$. These are just more of the mathematical symbols that we use to express rules. Let's see how to use formulas.


You will learn how to use four formulas in this section. The formulas will be for the area of a rectangle, for distance traveled, for price of an item, and for simple interest.

## AREA

Consider the rule for finding the area of a rectangle. In words we say:
To find the area of a rectangle, multiply the length times the width.

A shorter way to write the rule, closer to the symbols, but still in words, would be:

The area of a rectangle is equal to the length times the width.


Now, to find the area of a rectangle, the formula all by itself is not enough. We need a number to put in the formula for the length, and a number to put in the formula for the width. We usually say substitute instead of put in.

## DEFINITION

To substitute is to put in place of.

Model: Suppose the length of a rectangle is 12 and the width is 6 . Then, to find the area, we write the formula:
$A=L \times W$
Now, substitute into the formula the corresponding numbers, 12 for $L$ and 6 for $W$.
$A=12 \times 6$ Multiply:
$A=72$
The area of a rectangle with length of 12 and width of 6 is 72 .

Find the area of each of the following rectangles. Substitute in the formula.

$$
\text { Model: Length }=10 ; \text { width }=5 \quad \begin{array}{ll}
A & =L \times W \\
A & =10 \times 5 \\
& A=50
\end{array}
$$

1.1 Length $=47$; width $=12$
1.2 Length $=5 \frac{1}{2}$ width $=2 \frac{1}{2}$
1.3 Length $=19.3 ;$ width $=0.57$
1.4 Length $=13$; width $=12$

Now, suppose that we know the area of a rectangle, that we know its length, and that what we want to find is the width. We can use the formula to do that, too.

Model: Suppose we have a rectangle with area of 27 and width of 3 . What is the length?

Write the formula: $\quad A=L \times W$
Substitute: $\quad 27=L \times 3$

To find the width, think: "What number multiplied by 3 gives 27?" The answer, of course, is 9 ;
so we can say $L=9$.

