

HOLT ALGEBRA 1



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E. Henry Garland
Sylvia A. Hoffman
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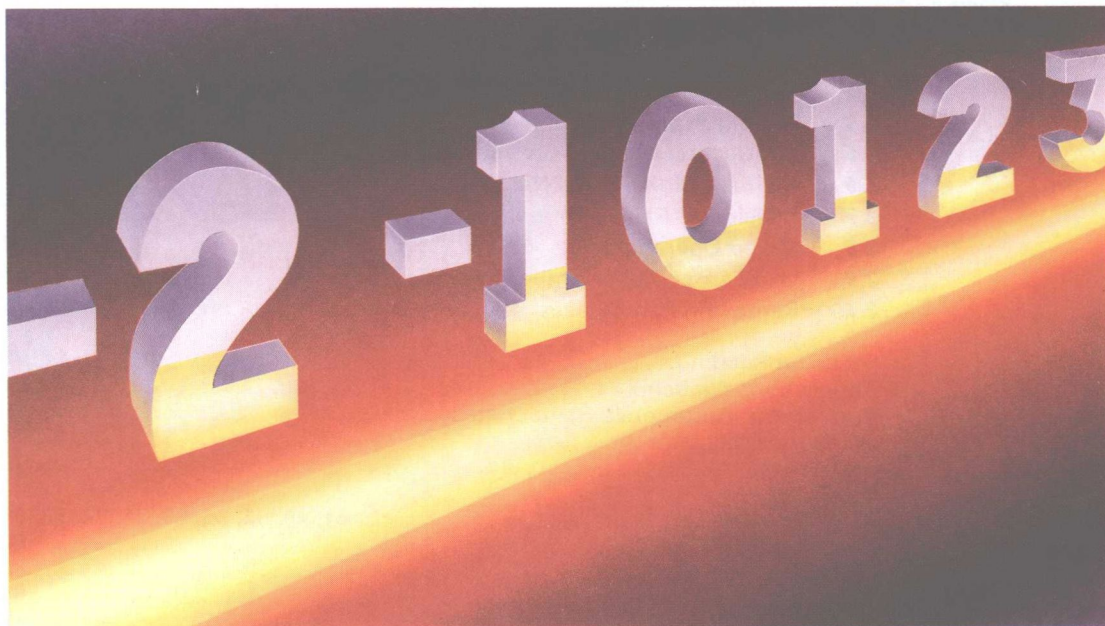
1

INTRODUCTION TO ALGEBRA



In very dry forest areas, fire spotters of the U.S. Forest Service watch for smoke from towers high above the trees. Using this firefinder table, they can relay the exact direction to the nearest firefighting unit.

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1.1 Algebraic Expressions

Objectives

To evaluate algebraic expressions for given values of the variables
To write algebraic expressions for word descriptions

The study of algebra involves numbers and operations. A **numerical expression** contains one or more numbers and may also contain one or more operations. The following are examples of numerical expressions.

$$12 \quad 7.6 \quad 5 + 9 \quad 14 - 7 \times 2$$

In algebra, letters are often used to represent numbers. For example, when you buy movie tickets at \$5 per ticket, the cost depends on the number of tickets you buy.

Number of tickets bought	Cost in dollars
1	5×1 , or 5
2	5×2 , or 10
3	5×3 , or 15
4	5×4 , or 20
5	5×5 , or 25
$\vdots$	$\vdots$
$\vdots$	$\vdots$
n	$5 \times n$

In the chart above, the letter n is a *variable* that represents the number of tickets. A **variable** is a symbol that represents ~~two~~^{one} or more numbers.

An **algebraic expression** contains one or more variables and usually one or more operations. It may also contain numbers. The algebraic expression $5 \times n$ can be written in several other ways:

$$5 \cdot n \quad 5(n) \quad (5)n \quad 5n$$

To **evaluate an expression**, replace each variable with a number and find the numerical value. To evaluate $5n$ for $n = 6$, substitute 6 for n . The result is

$$\begin{aligned} 5n &= 5(6) \\ &= 30 \end{aligned}$$

Thus, the value of $5n$ is 30 for $n = 6$.

EXAMPLE 1 Evaluate $2xy$ for $x = 4$ and $y = 3$.

Solution

$2 \cdot x \cdot y$ $\leftarrow$ The expression $2xy$ means $2 \cdot x \cdot y$.

$2 \cdot 4 \cdot 3$ $\leftarrow$ Substitute 4 for x and 3 for y .

$$\begin{array}{r} 8 \cdot 3 \\ \hline 24 \end{array}$$

TRY THIS

1. Evaluate $3mn$ for $m = \frac{2}{3}$ and $n = \frac{1}{2}$.

The chart below shows algebraic expressions with the variable x .

Algebraic expression	English expressions	Value for $x = 9$
$x + 28$	x plus 28 28 added to x x increased by 28 28 more than x the <i>sum</i> of x and 28	$x + 28$ $9 + 28$ 37
$42 - x$	42 minus x x subtracted from 42 x less than 42 the <i>difference</i> , 42 decreased by x	$42 - x$ $42 - 9$ 33
$16 \cdot x$, or $16x$	16 times x 16 multiplied by x the <i>product</i> of 16 and x	$16x$ $16 \cdot 9$ 144
$18 \div x$, or $\frac{18}{x}$	18 divided by x the <i>quotient</i> , $18 \div x$	$18 \div x$ $18 \div 9$ 2

Compare: x decreased by 16 and x less than 16

$$x - 16$$

$$16 - x$$

EXAMPLE 2 Evaluate $\frac{x}{y}$ for $x = 12.8$ and $y = 4$.

Solution

$$\frac{x}{y} = \frac{12.8}{4} = 3.2 \quad \leftarrow \text{Substitute 12.8 for } x \text{ and 4 for } y.$$

$$\text{Thus, } \frac{x}{y} = 3.2 \text{ for } x = 12.8 \text{ and } y = 4.$$

TRY THIS

2. Evaluate $\frac{2a}{b}$ for $a = 3.9$ and $b = 6$.