Introduction to Algebra

In algebra we use letters to represent numbers. A letter used to represent a number is called a variable. An algebraic expression is a combination of numbers and/or variables and symbols. An algebraic expression does not have an equal sign.

Example 1

The following are examples of algebraic expressions.

x+5
40-7+y
6+9
8÷4

Words and phrases are used to indicate addition, subtraction, multiplication, and division. Some of these words and phrases are listed below.

Key Words and Phrases

Addition	Subtraction	Multiplication	Division
sum	difference	product	quotient
total	less than or less	times	divided by
more	take away	of	per

Representing Multiplication in Algebra

Multiplication is represented in several different ways in algebra. The times sign "x" is not used to represent multiplication in algebra since it would be confused with the variable x. Multiplication is represented with parentheses or a dot. Writing variables next to each other or a number next to a variable is another way to represent multiplication.

Example 2

The following expressions all represent 5 times x.

5x, 5(x), (5)(x), (5)x, 5·x

Example 3

The following expressions all represent x times y.

xy, x(y), (x)(y), (x)y, x·y

Example 4

The word "twice" represents multiplication by 2.

Twice x= 2x

Representing Division in Algebra

Division is often represented as a fraction in algebra.

$x \div y = \frac{x}{y}$

Example 5

$3 \div 4 = \frac{3}{4}$

Translating Words and Phrases into Algebraic Expressions

In algebra we translate words and phrases into algebraic expressions.

Example 6

The sum of x and 7.	x+7	*Replace the word "and" with a plus sign.*
The sum of 4x and 9.	4x+9	

Example 7

The difference of 3x and 2y.	3x-2y	*Replace the word "and" with a minus sign.*
10 less than x	x-10	
5 less than 20	20-5	
20 less x	20-x	
x less 6	x-6	
30 less 4	30-4	

Example 8

-6 times y	-6y	
8 times x times y	8xy	
The product of 7 and y and z	7yz	*Numbers and letters together represent multiplication.*
$\frac{1}{2}$ of x	$\frac{1}{2}$x	

The product of x and y and z. xyz

Example 9

The quotient of y and 8 y/8 *Replace the word "and" with the division bar.*

The quotient of 8 and x 8/x

The quotient of (a+b) and c $\frac{(a+b)}{c}$

The quotient of x and (y+z) $\frac{x}{(y+z)}$

Evaluating Expressions

In order to evaluate an expression you must substitute a number for each variable in the expression.

Example 10

Evaluate the expression 2x+4 by substituting 3 for x.

Take x out of the expression and substitute 3. Place parentheses around 3.

2x+4
2(3)+4 *Multiply 2 and 3 to get 6.*
6+4
10

Answer: 10

Example 11

Evaluate the expression 5x-2y by substituting 4 for x and 3 for y.

Take x out of the expression and substitute 4. Place parentheses around 4.
Take y out of the expression and substitute 3. Place parentheses around 3.

5x-2y
5(4)-2(3) *Multiply 5 and 4. Multiply 2 and 3.*
20-6
14

Answer: 14

Example 12

Evaluate the following expression 9xy by substituting 4 for x and 3 for y.

Take x out of the expression and substitute 4. Place parentheses around 4.
Take y out of the expression and substitute 3. Place parentheses around 3.

9xy
9(4)(3) *Multiply 9 and 4 to get 36.*
36(3) *Now multiply 36 times 3.*
108

Answer: 108

Example 13

Evaluate the expression 15-x by substituting 4 for x.

Take x out of the expression and substitute 4.

15-x
15-4
11

Answer: 11

Example 14

Evaluate the expression x/y by substituting 24 for x and 8 for y.

$$\frac{x}{y}$$

$$\frac{24}{8} = 3$$

Answer: 3

Example 15

Evaluate the expression xyz by substituting 2 for x, 3 for y and 4 for z.

Take x out of the expression and substitute 2. Place parentheses around 2.
Take y out of the expression and substitute 3. Place parentheses around 3.
Take z out of the expression and substitute 4. Place parentheses around 4.

xyz

(2)(3)(4)	*Multiply 2 and 3 to get 6.*
6(4)	*Now multiply 6 and 4.*
24	

Answer: 24
