CCSS: 6.EE.1, 6.EE.2.a, 6.EE.2.b, 6.EE.6

Lesson 16: Writing Expressions

An **expression** is a phrase made up of numbers, operation symbols, and sometimes variables. A **variable** is a letter that represents an unknown number.

When you multiply a number by a variable, you do not need a multiplication sign between the two. You can write the number directly in front of the variable. This number multiplied by the variable is called the **coefficient.**

The following are four examples of expressions. The first two contain only numbers and symbols and are called **numerical expressions.** The last two expressions have variables and are called **algebraic expressions.** In the algebraic expressions, 8 and 4 are the coefficients of z and y.

$12 \div 3$ $\quad 3 \times 10 + 7$ $\quad 8z - 5$ $\quad z + 4y$

variables

A **term** is a part of an expression that is either a number, a variable, or the product of a number and a variable. In the expression $2x^2 + 8y - 5$, there are three terms: $2x^2$, $8y$, and 5. The operations are not part of the terms. **Like terms** have the same variable.

To translate a word expression into a mathematical expression, you need to identify the operations. Here are some related key words or phrases for addition, subtraction, multiplication, division, and exponents.

Addition: sum, more, more than, plus, increased by, gain

Subtraction: difference, less, less than, minus, decreased by, loss

Multiplication: product, multiplied by, times, double, triple

Division: quotient, divided by, per, ratio, half, third, fourth, into, equal groups

Exponents: times itself, squared, cubed

TIP: Keep in mind that some words are used for more than one operation in an expression. For example, the word *factor* can represent division (the factors of 10 are 1, 2, 5, and 10). It can also show multiplication by representing a number that is multiplied by another number. (The factors in 3×4 are 3 and 4.) You need to consider the context of the word problem.

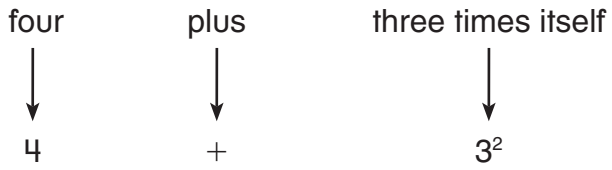
CCSS: 6.EE.1, 6.EE.2.a, 6.EE.2.b, 6.EE.6

You can translate words into a numerical or algebraic expression. When the expression includes either addition or multiplication only, the order in which the terms are written **does not matter.** (This is because the operations of addition and multiplication are **commutative.**)

Example

Write a numerical expression to represent "four plus three times itself."

The word *plus* indicates **addition.** The words *times itself* indicate an exponent.



The expression can be written as $4 + 3^2$. It can also be written as $3^2 + 4$.

When an expression includes subtraction or division, the order in which the terms are written **does matter.**

Example

Write an algebraic expression to represent "six less than twice a number." Let z = the number.

The phrase *less than* indicates **subtraction.** The two terms in the expression are 6 and $2z$.

Which of the following expressions is correct: $6 - 2z$ or $2z - 6$?

The phrase *less than* indicates that you have to change the order of the terms in the expression from the way they appear in the description.

The expression "six less than twice a number" can only be written as $2z - 6$.

Expressions can be represented using the distributive property.

Example

Write an algebraic expression to represent "a number multiplied by the sum of five and four." Let n = the number.

The words *multiplied by* indicate **multiplication.** The word *sum* indicates **addition.**

a number	multiplied by	the sum of five	and	four
↓	↓	↓	↓	↓
z	•	5	+	4

The sum is the result of the addition. Because the variable z is multiplied by the *sum of* 5 and 4, you must add before you can multiply. Parentheses can be used to separate the addition from the rest of the expression. The expression can be written as $z \cdot (5 + 4)$.

You do not need a multiplication sign between the variable and the expression in parentheses. Therefore, the expression can be written as $z(5 + 4)$.

Example

Write an expression to represent "six times the sum of seven plus three."

The word *times* indicates **multiplication.** The words *sum of* and *plus* indicate **addition.**

six	times	the sum of seven	plus	three
↓	↓	↓	↓	↓
6	•	7	+	3

Because 6 is multiplied by the *sum of* 7 and 3, you must first add before you can multiply. Use parentheses to separate the addition. The expression can be written as $6 \cdot (7 + 3)$, or $6(7 + 3)$.

The factor 6 can be multiplied by the combined sum of 7 and 3: $6(7 + 3)$, or $6 \cdot 10$. By the distributive property, it can also be multiplied by the 7 and 3 factors independently: $6 \cdot 7 + 6 \cdot 3$.