

Name: _____

Date: _____

VARIABLES AND ALGEBRAIC EXPRESSIONS

N-GEN MATH[®] 6



We now begin our study of **algebra**. Loosely defined, **algebra** is the use of the **properties** and **operations** of numbers on **variables**, **expressions**, and **equations**. First, let's make sure we understand what a **variable** is.

VARIABLES AND EXPRESSIONS

A **variable** is a **symbol**, most often a **letter**, used to represent a number (or quantity) that is either **unknown**, **unspecified**, or **changing**.

An **expression** is a combination of **variables** and normal **numbers** (called constants) using **operations** such as addition, subtraction, multiplication, division, and exponentiation.

Exercise #1: Let the letter n stand for some number that we have not specified. Write expressions using n for each of the following.

(a) four added to the number

(b) seven subtracted from the number

(c) five times the number
(don't use the \times or \cdot)

(d) the number subtracted from 10

(e) the number divided by 8
(use a fraction bar to show division)

(f) the number squared

Expressions that have variables in them are known as **algebraic expressions**. These expressions only have an overall value if the values of their **variables** have been **specified** (given to you).

Exercise #2: Evaluate each of the following algebraic expressions if $x = 6$. Show the substitution.

(a) $x + 4$

(b) $7x$

(c) $\frac{x}{2}$

(d) $14 - x$



Many times, algebraic expressions have more than one operation. It is important when **evaluating them** to remember your **order of operations**.

Exercise #3: Consider the expression $3n + 7$.

- (a) When evaluating this expression, which is done first: adding 7 to n or multiplying n by 3?
- (b) Evaluate this expression for $n = 2$ and for $n = 5$. Show your **substitution**.

Exercise #4: Evaluate each of the following expressions for the value of the variable given.

(a) $\frac{x}{2} - 6$ for $x = 20$

(b) $5 + n^2$ for $n = 10$

(c) $20 - 4y$ for $y = 2$

(d) $\frac{3}{4}x + 5$ for $x = 8$

(e) $3c^2$ for $c = 4$

(f) $1.25n + 3.50$ for $n = 7$

You will encounter expressions with variables in them in science, engineering, measurement, and many other areas.

Exercise #5: A rectangle has its length represented by L and its width represented by W . Evaluate the expression $2W + 2L$ if $W = 6$ ft and $L = 10$ ft.



What does the value of this expression tell us about the rectangle?



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VARIABLES AND ALGEBRAIC EXPRESSIONS
N-GEN MATH[®] 6 HOMEWORK

FLUENCY

1. Evaluate each of the following algebraic expressions for the given value of the variable. Show your **substitution** and any steps in your evaluation.

(a) $x + 12$ for $x = 4$

(b) $28 - n$ for $n = 17$

(c) $5c$ for $c = 8$

(d) $\frac{y}{3}$ for $y = 21$

(e) $\frac{5}{2}x$ for $x = 12$

(f) $|y|$ for $y = -15$

(g) $2n + 11$ for $n = 3$

(h) $\frac{y}{4} - 1$ for $y = 28$

(i) $6(x - 4)$ for $x = 12$

2. Expressions can certainly contain more than one **variable** as we saw in *Exercise #5*. Evaluate each of the following expressions using the values of the variables given.

(a) $2x + 3y$ for $x = 5$ and $y = 7$

(b) $xy - 8$ for $x = 3$ and $y = 5$

(remember xy means $x \times y$)

(c) $a^2 + b^2$ for $a = 3$ and $b = 4$

(d) $a - 2b + 3c$ for $a = 24$, $b = 7$, and $c = 5$



3. Which of the following is the correct value of the expression $2x^2 - 5$ when $x = 3$?

(1) 7

(3) 13

(2) 8

(4) 31

4. For which of the values of n below will the expression $1 + 3n$ be equal to 28?

(1) 1

(3) 7

(2) 5

(4) 9

USING YOUR MATH

5. Evie and Elliette are running a lemonade stand where they sell lemonade for \$1.25 per cup. They had to spend \$8.50 on supplies for the stand (cups, lemons, water, sugar, etc).

(a) They come up with the expression $1.25n$ to determine how much money they have made if n stands for how many cups of lemonade they have sold. Evaluate $1.25n$ for the following values of n .

$$n = 4$$

$$n = 10$$

$$n = 25$$

(b) Evie believes a better expression for how much money they have made would be $1.25n - 8.50$. Can you explain why this expression might be better?

(c) Evaluate the expression $1.25n - 8.50$ for $n = 15$. Give an interpretation of what your answer means.

