Name: _____ Date: _____

# EQUIVALENT EXPRESSIONS
# N-GEN MATH® ALGEBRA I

*The idea of **equivalent expressions**, or **equivalency**, is extremely important. It is the basis of many if not most of our **algebraic manipulations**. The definition of equivalent expressions is given below.*

**EQUIVALENT EXPRESSIONS**

Two (or more) algebraic expressions are **equivalent** if they have the same value for every value of the substitution variable (or variables). In other words, no matter what value you stick in for $x$ (or $y$ or $z$) the two expressions come out equal.

***Exercise* #1:** Consider the three expressions below. By substituting in the values of $x$ given, determine which two expressions are **equivalent**. Show your calculations and circle your final answers.

| | $5(x-3)$ | $5x-3$ | $5x-15$ |
|---|---|---|---|
| $x=7$ | | | |
| $x=0$ | | | |
| $x=-2$ | | | |

***Exercise* #2:** Which property, the commutative, associative, or distributive, justifies the **equivalency** of the two expressions you determined to be equivalent above? Illustrate.

***Exercise* #3:** Which of the following expressions is equivalent to $5(2x+1)-(x-3)$? Show your work to justify your response. Evaluate both expressions for $x=4$ to check to make sure you have the correct answer.

(1) $10x-3$ (3) $9x+8$

(2) $9x+2$ (4) $10x+7$

***Exercise* #4:** Which of the following expressions is equivalent to $\frac{4(3n+1)-2}{2}-5$? Show your work. Think carefully about order of operations and the properties we have learned about. Finally, check your answer by evaluating both the original expression and your answer when $n=1$. Show your check.

(1) $4n-3$ (3) $6n+3$

(2) $4n+1$ (4) $6n-4$

*Each exercise so far has involved the **distributive property**. We sometimes will want to use this property "in reverse" to write an expression as an equivalent product, which is known as **factoring**.*

***Exercise* #5:** Which of the following expressions is equivalent to $10x+15$? Explain how you made your choice in the space provided.

(1) $2(8x+13)$ (3) $5(5x+3)$

(2) $5(2x+3)$ (4) $10(x+5)$

## FACTORING EXPRESSIONS

**Factoring** is the process of writing an **equivalent expression** that is in the form of a **product**.

*There will be many ways that we learn how to factor an expression, but for now we will only concentrate on writing an expression as a product of its terms **greatest common factor** and another expression.*

***Exercise* #6:** Write each **binomial** below as an **equivalent** product of the binomial's g.c.f. and another binomial.

(a) $6x+21$ (b) $2y-10$ (c) $14w+14$

(d) $15n+10$ (e) $44x-77$ (f) $18c+6$

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# EQUIVALENT EXPRESSIONS
# N-GEN MATH® ALGEBRA I HOMEWORK

## FLUENCY

1. For the expression $5(4x+3)$ do the following.

   (a) Use the distributive property to write it in its simplest form.

   (b) Evaluate the original expression and your answer to (a) for $x=2$. Show the steps in your calculations.

   Original Expression: $5(4x+3)$ Answer from (a):

   (c) Do your calculations from (b) support the conclusion that these two expressions are equivalent? Explain your yes/no answer.

2. Which expression below is equivalent to $7(2x+1)-2(3x+4)$?

   (1) $5x+3$ (3) $5x-7$

   (2) $8x+5$ (4) $8x-1$ _____

3. Which of the following is *not* equivalent to the binomial $24x+40$?

   (1) $4(6x+10)$ (3) $40+24x$

   (2) $12(2x+28)$ (4) $8(3x+5)$ _____

4. The expression $2(x+3)+4(x-1)+10$ can be written as which of the following?

   (1) $6(x+2)$ (3) $6(x+6)$

   (2) $8(x+3)$ (4) $8(x-1)$ _____

5. Write each binomial below as an equivalent product of its greatest common factor and some other binomial.

(a) $5x+35$ (b) $24n+16$ (c) $10y-10$

(d) $18x-45$ (e) $4t+48$ (f) $21t-56$

## APPLICATIONS

6. Four friends have an assortment of Snack bars that cost $S$ dollars each, Munch bars that cost $M$ dollars each and Chewies that cost $C$ dollars each which they sell to raise money for a trip they are taking. They decide to split the money from the sales evenly between the four friends. They create an expression to make sure everyone gets the same amount. The amount each friend receives is given by the complicated expression

$$\frac{(5C+5S)+(2M+4S)+(10C+M)+(C+3S+M)}{4}$$

(a) Write an equivalent expression that simplifies the amount that each friend will earn in terms of the **unit costs** $S$, $M$, and $C$.

(b) If Snack bars cost \$3 each, Munch bars cost \$5 each and Chewies cost \$4.50 each, then how much does each friend earn?

## REASONING

7. The expression $5(2x+3)+9x$ is shown simplified below. Beside each step, state the property used (i.e. associative, commutative, distributive).

$5(2x+3)+9x = 5\cdot 2x+5\cdot 3+9x$ _____
$= 10x+15+9x$

$10x+15+9x = 10x+9x+15$ _____

$10x+9x+15 = (10+9)x+15$ _____
$= 19x+15$