Agenda: *"I know what we're going to do today."*

1) Bell Ringer: page 11 and 21

2) Go over Homework from lesson 1

3) Module 3:
Lesson 2:
- How do you add and subtract expressions?

4) Homework: lesson 2 (1,2,3,5)

5) Exit Ticket

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Homework

For Problems 1–9, write equivalent expressions by combining like terms.

1. $3a + 5a$
2. $8b - 4b$
3. $5c + 4c + c$
4. $3a + 6 + 5a$
5. $8b + 8 - 4b$
6. $5c - 4c + c$
7. $3a + 6 + 5a - 2$
8. $8b + 8 - 4b - 3$
9. $5c - 4c + c - 3c$

$4b + 5$

$2c - 3c$

$-1c$

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Use any order, any grouping to write equivalent expressions.

10. $3(6a)$ = 18a

11. $5d(4)$ = 20d

12. $(5r)(-2)$ -10r

13. $3b(8) + (-2)(7c)$ 24b + (-14c)

14. $-4(3s) + 2(-t)$ -12s + (-2t)

15. $9(4p) - 2(3q) + p$ 36p -6q +1p = 37p -6q

16. $7(4g) + 3(5h) + 2(-3g)$ 28g +15h +(-6g) 22g +15h

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The problems below are follow-up questions to Example 1, part (b) from Classwork: Find the sum of $2x + 1$ and $5x$.

16. Jack got the expression $7x + 1$ and then wrote his answer as $1 + 7x$. Is his answer an equivalent expression? How do you know?

17. Jill also got the expression $7x + 1$, and then wrote her answer as $1x + 7$. Is her expression an equivalent expression? How do you know?

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Lesson 2: Generating Equivalent Expressions

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Classwork

Opening Exercise

Additive inverses have a sum of zero. Multiplicative inverses have a product of 1. Fill in the center column of the table with the opposite of the given number or expression, then show the proof that they are opposites. The first row is completed for you.

Expression	Opposite?	Proof of Opposites
1	-1	$1+(-1)=0$
3	-3	$3+(-3)=0$
-7	7	$-7+7=0$
$-\frac{1}{2}$	$\frac{1}{2}$	$-\frac{1}{2}+\frac{1}{2}=0$

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x	$-x$	$x+(-x)=0$
$3x$	$-3x$	$3x+(-3x)=0$
$x+3$	$-x-3$	$(x+3)+(-x-3)$ $x+(-x)+3+(-3)=0$
$3x-7$	$-3x+7$	$(3x-7)+(-3x+7)$ $3x+(-3x)+(-7)+7=0$

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Example 1: Subtracting Expressions

a. Subtract: $(40+9)-(30+2)$.

$49-32=17$

$49+(-32)=17$

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b. Subtract: $(3x + 5y - 4) - (4x + 11)$.

$3x + 5y - 4 + (-4x) - 11$

$-1x + 5y - 15$

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What steps did you follow to subtract expressions?

1. change subtraction to adding opposites
2. combine like terms

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Example 2: Combining Expressions Vertically

a. Find the sum by aligning the expressions vertically.

$(5a + 3b - 6c) + (2a - 4b + 13c)$

$$\begin{array}{r} 5a + 3b - 6c \\ +\ 2a - 4b + 13c \\ \hline 7a - 1b + 7c \end{array}$$

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b. Find the difference by aligning the expressions vertically.

$(2x + 3y - 4) - (5x + 2)$

$+(-5x) + (-2)$

$$\begin{array}{r} 2x + 3y - 4 \\ -5x \qquad -2 \\ \hline -3x + 3y - 6 \end{array}$$

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Example 3: Using Expressions to Solve Problems

A stick is x meters long. A string is 4 times as long as the stick.

a. Express the length of the string in terms of x.

Stick = x

String = 4x

b. What is the total length of the string and the stick?

+

1x + 4x = 5x

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b. What is the total length of the string and the stick?

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Example 4: Expressions from Word Problems

m = months

It costs Margo a processing fee of $3 to rent a storage unit, plus $17 per month to keep her belongings in the unit. Her friend Carissa wants to store a box of her belongings in Margo's storage unit and tells her that she will pay her $1 toward the processing fee and $3 for every month that she keeps the box in storage. Write an expression in standard form that represents how much Margo will have to pay for the storage unit if Carissa contributes. Then, determine how much Margo will pay if she uses the storage unit for 6 months.

$$\begin{array}{r} 3 + 17m \\ -1 \quad - 3m \\ \hline 2 + 14m \end{array}$$

c.

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Example 5: Extending Use of the Inverse to Division

Find the multiplicative inverses of the terms in the first column. Show that the given number and its multiplicative inverse have a product of 1. Then, use the inverse to write each corresponding expression in standard form. The first row is completed for you.

Given	Multiplicative Inverse?	Proof – Show that their product is 1.	Use each inverse to write its corresponding expression below in standard form.
3	$\frac{1}{3}$	$3 \cdot \frac{1}{3}$ $\frac{3}{1} \cdot \frac{1}{3}$ $\frac{3}{3} = 1$	$12 \div 3$ $12 \cdot \frac{1}{3}$ 4
$\frac{5}{1}$	$\frac{1}{5}$	$\frac{5}{1} \cdot \frac{1}{5} = \frac{5}{5} = 1$	$65 \div 5$ $\frac{65}{1} \cdot \frac{1}{5} = \frac{65}{5} = 13$

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$\frac{-2}{1}$	$\frac{1}{-2}$		$18 \div (-2)$
$-\frac{3}{5}$	$-\frac{5}{3}$		$6 \div \left(-\frac{3}{5}\right)$
$\frac{x}{1}$	$\frac{1}{x}$		$5x \div x$

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x			$5x \div x$
$\frac{2x}{1}$	$\frac{1}{2x}$		$12x \div 2x$

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Exercise 1 (9 minutes): Sprint—Combining Like Terms

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Relevant Vocabulary

An Expression in Expanded Form: An expression that is written as sums (and/or differences) of products whose factors are numbers, variables, or variables raised to whole number powers is said to be in *expanded form.* A single number, variable, or a single product of numbers and/or variables is also considered to be in expanded form. Examples of expressions in expanded form include: 324, $3x$, $5x + 3 - 40$, $x + 2x + 3x$, etc.

Term: Each summand of an expression in expanded form is called a *term.* For example, the expression $2x + 3x + 5$ consists of 3 terms: $2x$, $3x$, and 5.

Coefficient of the Term: The number found by multiplying just the numbers in a term together. For example, given the product $2 \cdot x \cdot 4$, its equivalent term is $8x$. The number 8 is called the coefficient of the term $8x$.

An Expression in Standard Form: An expression in expanded form with all its like terms collected is said to be in *standard form. For example,* $2x + 3x + 5$ *is an expression written in expanded form; however, to be written in standard form, the like-terms* $2x$ *and* $3x$ *must be combined. The equivalent expression* $5x + 5$ *is written in standard form.*

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Lesson Summary

- Rewrite subtraction as adding the opposite before using any order, any grouping.
- Rewrite division as multiplying by the reciprocal before using any order, any grouping.
- The opposite of a sum is the sum of its opposites.
- Division is equivalent to multiplying by the reciprocal.

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Homework

1. Write each expression in standard form.

a. $3x + (2 - 4x)$	b. $3x + (-2 + 4x)$	c. $-3x + (2 + 4x)$
d. $3x + (-2 - 4x)$	e. $3x - (2 + 4x)$ $3x + (-2) - 4x$	f. $3x - (-2 + 4x)$ $3x + 2 - 4x = -1x + 2$
g. $3x - (-2 - 4x)$ $3x + 2 + 4x$	h. $3x - (2 - 4x)$ $3x + (-2) + 4x$	i. $-3x - (-2 - 4x)$ $-3x + 2 + 4x$

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2. Write each expression in standard form.

a. $4y-(3+y)$	b. $(2b+1)-b$	c. $(6c-4)-(c-3)$
d. $(d+3d)-(-d+2)$	e. $(-5x-4)-(-2-5x)$	f. $11f-(-2f+2)$
g. $-5g+(6g-4)$	h. $(8h-1)-(h+3)$	i. $(7+w)-(w+7)$
j. $(2g+9h-5)-(6g-4h+2)$		

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3. Write each expression in standard form.

a. $-3(8x)$	b. $5\cdot k\cdot(-7)$	c. $2(-6x)\cdot 2$
d. $-3(8x)+6(4x)$	e. $8(5m)+2(3m)$	f. $-6(2v)+3a(3)$

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4. Write each expression in standard form.

a. $8x \div 2$	b. $18w \div 6$	c. $25r \div 5r$
d. $33y \div 11y$	e. $56k \div 2k$	f. $24xy \div 6y$

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5. For each problem (a)–(e), write an expression in standard form.

a. Find the sum of $-3x$ and $8x$.

b. Find the sum of $-7g$ and $4g + 2$.

c. Find the difference when $6h$ is subtracted from $2h - 4$.

d. Find the difference when $-3n - 7$ is subtracted from $n + 4$.

e. Find the result when $13v + 2$ is subtracted from $11 + 5v$.

f. Find the result when $-18m - 4$ is added to $4m - 14$.

g. What is the result when $-2x + 9$ is taken away from $-7x + 2$?

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6. Marty and Stewart are stuffing envelopes with index cards. They are putting x index cards in each envelope. When they are finished, Marty has 15 stuffed envelopes and 4 extra index cards, and Stewart has 12 stuffed envelopes and 6 extra index cards. Write an expression in standard form that represents the number of index cards the boys started with. Explain what your expression means.

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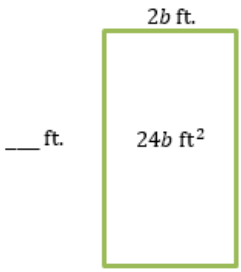
7. The area of the pictured rectangle below is $24b$ ft^2. Its width is $2b$ ft. Find the height of the rectangle and name any properties used with the appropriate step.



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