



NAME:

DATE:

Signed Number Expressions

Applying Signed Numbers

THROUGHOUT THIS MODULE you have been working with signed number operations, and some patterns have emerged. In this section we will explore those patterns.

You will discover several ways to represent a number. You will also use signed numbers to explore and solve number puzzles.

THE PURPOSE OF THIS SECTION IS TO:

- Use the operations of addition, subtraction, multiplication, and division to represent a signed number
- Solve number puzzles that include signed numbers

MATERIALS YOU WILL NEED:

- Calculator

Representing Numbers is Multiple Ways

There are many different ways to represent the same number using the operations of addition, subtraction, multiplication, and division.

For example, 3 can be represented in the following ways:

$$3 = 1 + 2$$

$$3 = -3(-1)$$

$$3 = -2 - (-5)$$

$$3 = \frac{12}{4}$$



Try representing the number 6 using:

Addition: $6 = \underline{\quad} + \underline{\quad}$

Multiplication: $6 = (\underline{\quad})(\underline{\quad})$

Subtraction: $6 = \underline{\quad} - \underline{\quad}$

Division: $6 = \frac{\boxed{\quad}}{\boxed{\quad}}$

Combining Signed Number Expressions

Before exploring different ways to represent the same number, review the operation of subtraction with signed numbers.

Fill in the number grid by subtracting the number in the top row from the number in the left column.



$7 - (-2) = 9$
and
 $-6 - (-4) = -2$

-	-2	3	-4	8
7	9			
8				
-6			-2	
0				

When you have completed the number grid, add the four values in the middle column (the one with 3 at the top).

Did you get -3?



1. Circle the two 4s in the number grid.
Write the expressions that resulted in this answer.

Different Paths to the Same Numbers



Create eight different combinations, two for each operation $+$, $-$, \times , and \div .



1. Create expressions that equal -5 .

$2 + (-7)$
 $4 + (-9)$

\times $+$ \div
 $-$

$-\frac{20}{4}$, $\frac{10}{-2}$

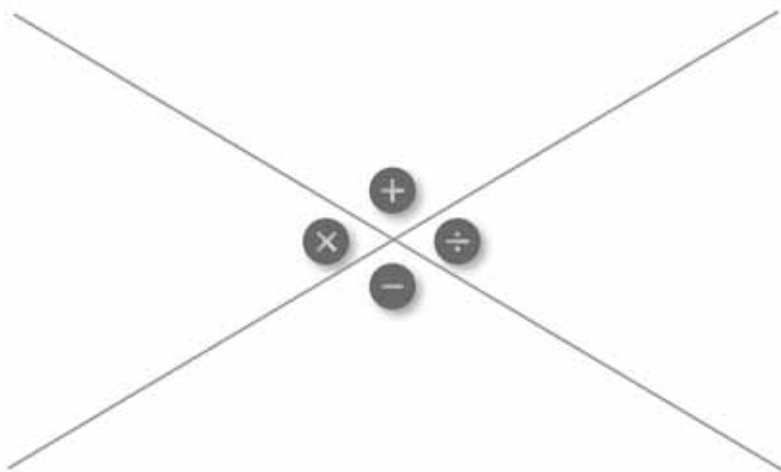
2. Create expressions that equal 8 .

$+$
 $-$
 \times \div

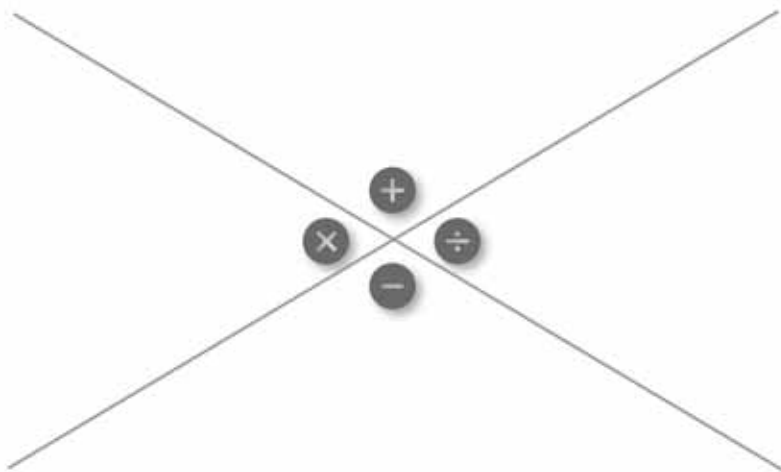
Different Paths to the Same Numbers, continued



3. Create expressions that equal **21**.



4. Create expressions that equal **-16**.



Practice Simplifying Expressions



Simplify these algebraic expressions. Use the rules for combining signed numbers. Show any regrouping you do with parentheses.

EXAMPLE

1. $-7x - 4x$

$$= (-7 - 4)x$$

$$= -11x$$

5. $3b - 3t + 6b$

2. $3y + (-4y) - 11y$

$$= [3 + (-4) - 11]y$$

$$= -12y$$

6. $-11z + (-11z) + 11z$



3. $9x + (-7x)$

7. $1w - 1w + 1w + (-1w)$

4. $-4n + 6n$

8. $99c - (-1c)$

Practice Evaluating with Signed Numbers



Evaluate the following expressions by substituting these values for the variables a , k , and m :

$$a = 7, \quad k = -4, \quad m = -1$$

EXAMPLE

1. $-5a - (-2a)$

$$= -5(7) - (-2)(7)$$

$$= -35 - (-14)$$

$$= -35 + 14$$

$$= -21$$



2. $8m - (-2a)$

3. $8k - (-5k) - (-2m) + 21a$

4. $14m + 7m - (-14m) - 7m$

POSITIVE OR NEGATIVE?

Think about what you have learned about signed numbers, and answer the following review questions.



1. If we start with a -4 and add a positive number, how big will that number need to be to get a positive value? Explain. Give examples to support your explanation.

2. Decide if the statements below are: **always**, **sometimes**, or **never** true. Provide an example to illustrate your answer.

EXAMPLE

STATEMENT	WHEN TRUE	EXAMPLE
Positive - Positive = Positive	Sometimes	$4 - 2 = 2$ $2 - 4 = -2$

Negative - Negative = Negative

Positive + Negative = Positive

Negative - Positive + Negative = Negative

Positive - Negative = Positive

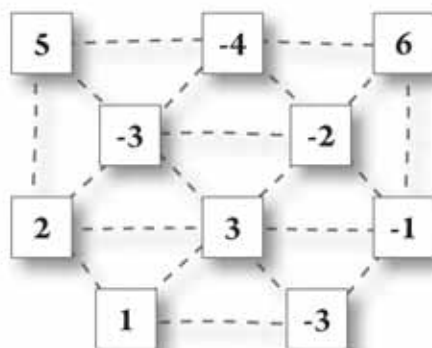
Negative - Negative + Positive = Negative

PATHWAYS



To do the puzzle below, follow these rules:

1. Begin at any value on the top row.
2. Use each operation at least once to combine values.
3. Use the dotted lines as your "path."
4. End at the bottom row.
5. You may only move down or across along the dotted lines (this includes diagonally).



Use the number grid above to find the following pathways.
Show your work for each.



EXAMPLE

1. A path that gives you a value greater than 2.

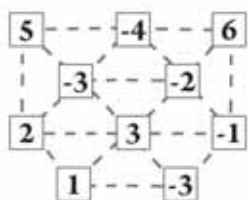
Move diagonally and down
Move diagonally and down
Move diagonally and down
Move horizontally and left

$$\begin{aligned} 5(-3) &= -15 \\ -15 - 3 &= -18 \\ -18 \div -3 &= 6 \\ 6 + 1 &= 7 \end{aligned}$$

Multiplication
Subtraction
Division
Addition

$$7 > 2$$

2. A path that gives you a value less than -1.



3. A path that gives you a value greater than 5.

