



NAME:

DATE:

Creating Number Games with Expressions

Creating Algebraic Expressions

WE CAN USE the order of operations and the properties of operations in many mathematical applications.

In this section, we investigate the algebra that is the foundation of number games.

THE PURPOSE OF THIS SECTION IS TO:

- Use order of operations and properties of operations to investigate number games

Number Games

I bet I can guess your secret number!

Try this number game:

1. Pick any number
2. Subtract 2
3. Multiply by 3
4. Add 15
5. Divide by 3
6. Subtract the original number

Is your final answer 3?

Try picking another number. Do you end up with 3? Show your work.

Does it work if you choose a negative number? Choose a negative number. Show your work.

Why it Works

We can use algebra to show why this number game on page 1 works for any number you choose.

Let the variable x represent any number.

Fill in the blanks below



Steps	Algebraic Notation
1. Pick any number	x
2. Subtract 2	$x - 2$
3. Multiply by 3	$3(x - 2)$
Simplify using the Distributive Property	= <input style="width: 150px; height: 20px; border: 1px dashed gray;" type="text"/>
4. Add 15	$3x - 6 + 15$
Simplify by combining like terms	= <input style="width: 150px; height: 20px; border: 1px dashed gray;" type="text"/>
5. Divide by 3	$\frac{3x + 9}{3}$
Simplify using the inverse of the Distributive Property	= $\frac{3(x + 3)}{3}$
	= $x + 3$
6. Subtract the original number	$(x + 3) - x$
Simplify	= <input style="width: 150px; height: 20px; border: 1px dashed gray;" type="text"/>

What is your final answer?

Number Game 1



Now, try this one:



1. Pick any number
2. Add it to the next larger number
3. Double your answer
4. Add 5
5. Subtract 4 times the original number



Is your final answer 7?

1. What is your final answer? _____
2. In the middle column below, complete "Another Example."
3. In the last column below, provide the algebraic notation describing each step for the above number game.

Steps	Another Example	Algebraic Notation
1. Pick any number	3	x
2. Add it to the next larger number	$3 + 4$	$x + (x + 1)$
	Simplify 7	$2x + 1$
3. Double your answer	$2 \cdot 7$	$2(2x + 1)$
	Simplify _____	_____
4. Add 5	_____	_____
	Simplify _____	_____
5. Subtract 4 times the original number	_____	_____
	Simplify _____	_____

Number Game 2



Now, try this one:



1. **Pick any number**
2. **Add it to the next smaller number**
3. **Multiply your answer by 3**
4. **Add 15**
5. **Divide your answer by 6**
6. **Subtract the original number**

1. What is your final answer? _____
2. Using algebraic notation, describe each step for the above number game to show why your final answer will always be the same number. Be sure to simplify each step. Use x to represent the number.

Steps	Algebraic Notation
1. Pick any number	_____
2. Add it to the next smaller number	_____
	Simplify
3. Multiply your answer by 3	_____
	Simplify
4. Add 15	_____
	Simplify
5. Divide your answer by 6	_____
	Simplify
6. Subtract the original number	_____
	Simplify

What is your final answer? _____

Number Game 3



Answer the following questions.

1. Jane knew a number game. She said:
 1. **Pick a secret number**
 2. **Add it to the numbers on either side of it**
 3. **Add 6**
 4. **Divide by 3**

Try it!
Pick a secret number.

Then Jane said,

“Tell me what you have and I’ll tell you what your secret number was!”

Explain how Jane knew your secret number.

2. Make up your own number game and use algebra to show how you know it will always work.

HINT
You might try working backwards from a result to create your steps.

