

# Writing Expressions

Introduction:

What is three plus five times two?

Try entering this problem on the home screen of the graphing calculator or any calculator where a string of numbers and operations can be printed on the screen. What is the result?

How many ways can you enter it on the home screen?

Is there an order for the operations when the problem is written horizontally?  
 $3+5*2$

Evaluate expressions within parentheses or other grouping symbols.

- Evaluate all powers.
- Multiply and divide from left to right.
- Add and subtract from left to right.

How would you have to write  $3 + 5 \cdot 2$  so the answer is 16?

Part I: Let's try performing a string of operations to see what we get.  
On paper:

Start with 6.

Multiply 2 times a starting number, then add 6, divide this result by 2, and then subtract your answer from 10.

Start with 20.

Multiply 2 times a starting number, then add 6, divide this result by 2, and then subtract your answer from 10.

Start with -4

Multiply 2 times a starting number, then add 6, divide this result by 2, and then subtract your answer from 10.

On the graphing calculator

Start with 6.

Multiply 2 times a starting number, then add 6, divide this result by 2, and then subtract your answer from 10.

Start with 20.

Multiply 2 times a starting number, then add 6, divide this result by 2, and then subtract your answer from 10.

Start with -4

Multiply 2 times a starting number, then add 6, divide this result by 2, and then subtract your answer from 10.

Do you understand what the calculator is doing?

Let's study several numbers.

On the home screen type three numbers in numerical order inside a brace.

{\_\_\_\_, \_\_\_\_, \_\_\_\_}

Using the same technique on the graphing calculator Multiply 2 times a starting number, then add 6, divide this result by 2, and then subtract your answer from 10.

Answer: {\_\_\_\_, \_\_\_\_, \_\_\_\_}

What do you think is happening to the numbers?

Try three more numbers in increasing order.

{\_\_\_\_, \_\_\_\_, \_\_\_\_}

Using the same technique on the graphing calculator Multiply 2 times a starting number, then add 6, divide this result by 2, and then subtract your answer from 10.

Answer: {\_\_\_\_, \_\_\_\_, \_\_\_\_}

Try to explain what is happening to the numbers.

INSERT EXPRESSION DESCRIPTION TEMPLATE

Use the Description/Expression Template to learn to write an expression that represents what this number trick was doing.

Once you have written an expression to represent the number trick, enter the following on your graphing calculator home screen:

$$6 \Rightarrow x: 10 - (2x + 6) / 2$$

Confirm 20, -4, and some of the other numbers you used in the expression. Did your expression generate the same numbers?

What do you understand about your expression?

Part II: Set up the expression for this problem:

Using the Description/Expression Template

Pick any number

Divide the number by 4

Add 7

Multiply the result by 2

Subtract 8

Find the value of your expression when  $x=2, -5, 8$

Does your expression make sense to you? Do your pairs of numbers make sense?

Part III: Number Tricks

Each person pick any number from 1 to 25.

Add 9 to it.

Multiply the result by 3.

Subtract 6 from the current answer.

Divide this answer by 3.

Now subtract your original number.

Compare your results.

Will the answer be the same regardless on the number you begin with?

Why is this?

Write out the algebraic expression for this number trick.

Part IV: You create a trick

Create your own trick that has at least 5 stages.

Test it on your calculator with at least four different numbers to make sure all the answers are the same.

When you think your trick works, test it on your other group members.

Part V: Writing Number Tricks

$$2\left(\frac{x+3}{2} + 5\right) - x + 8$$

Write in words the number trick that is described above.

Test the number trick to be sure you get the same result no matter what number you choose.

Can you explain why this number trick work?

$$\frac{4 - 2(x + 4)}{2} + x \text{ or } \frac{4 + -2(x + 4)}{2} + x$$

Given the expression on the left, you might want to think of subtraction as adding the opposite and re-write the expression

Write, in words, the number trick that is described above.

Test the number trick to be sure you get the same result no matter what number you choose.

Which operations that undo previous operations make this number trick work?