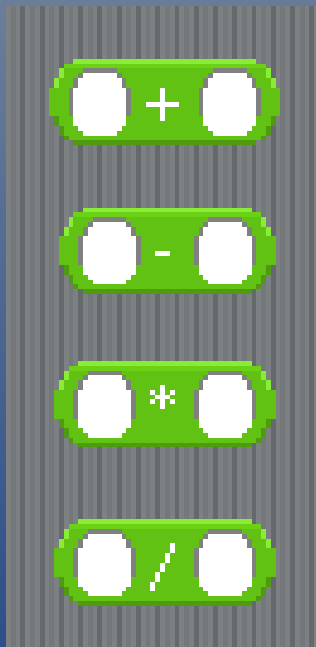


# Programming in Scratch

## Calculations & Assigning Values to Variables

# Mathematical Operations in Scratch

Basic arithmetic is available in Scratch:



addition

subtraction

multiplication

division

# Math using Scratch

Remember that Order of Operations (BEDMAS) applies to what you are doing. You can use brackets to ensure calculations are done in the order you want.

Consider the following:

$$2 - 3 + 4$$

$$(2 - 3) - 4$$

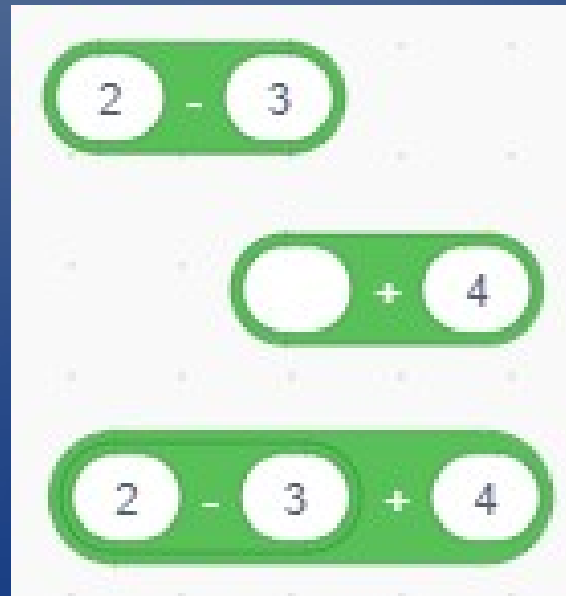
$$2 - (3 + 4)$$

# Math using Scratch

In Scratch, each of the operator "bubbles" is like a set of brackets.

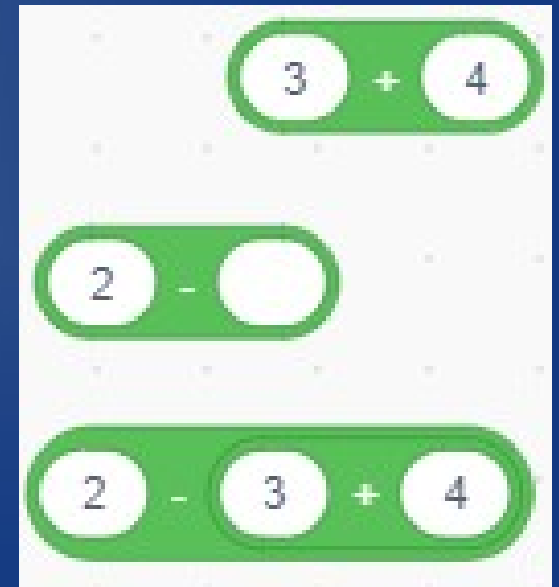
Consider the following:

$$2 - 3 + 4$$



$$(2 - 3) + 4$$

$$2 - (3 + 4)$$



# Example: Using Brackets for Order of Operations

$$\frac{3+4}{2-5}$$

What is the result of each calculation? Which is correct?

$$3 + 4 / 2 - 5$$

$$3 + (4 / 2) - 5$$

$$3 + 4 / (2 - 5)$$

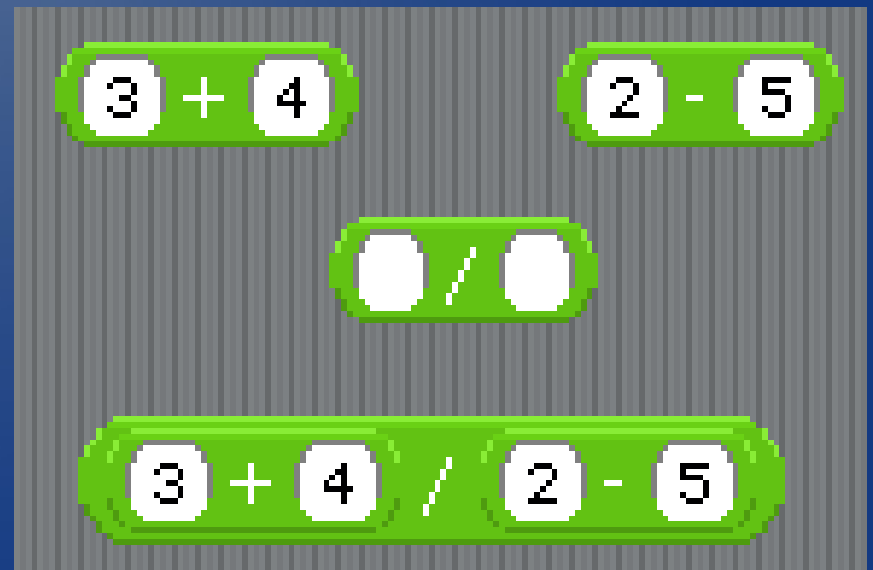
$$(3 + 4) / (2 - 5)$$

# Example: Using Brackets for Order of Operations

$$\frac{3+4}{2-5}$$

A fraction is treated like there are brackets around the numerator and denominator, so the correct calculation is:

$$(3 + 4) / (2 - 5)$$



# External & Internal Variables

When we use the ask command to assign a variable, the information is *external* – the user provides the data directly.

It is often useful to have variables that are used *internally* in the program.

As programs become more complicated, it becomes necessary to do extra calculations and store useful information.

Example: Ask the user to enter 2 numbers and then display the sum.

Make a variable

Delete a variable

- num1
- num2
- sum

```
ask [What is the first number?] and wait
set num1 to answer

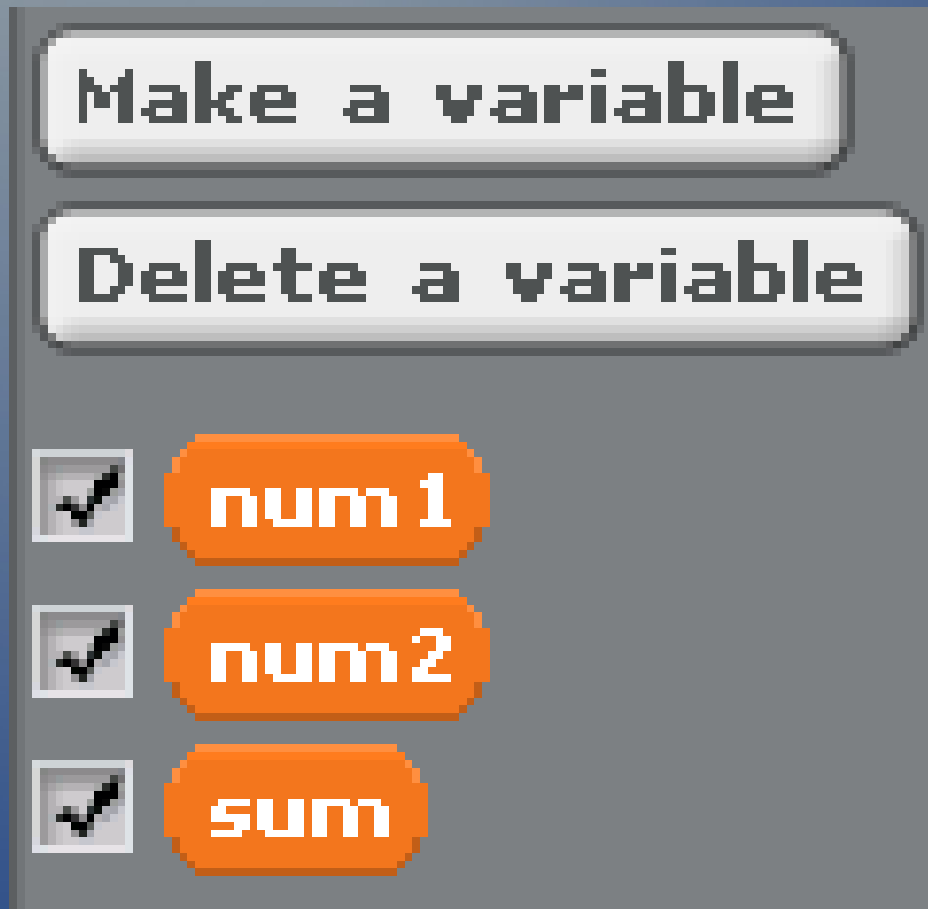
ask [What is the second number?] and wait
set num2 to answer

set sum to num1 + num2

say join [The sum is] sum
```



Example: Ask the user to enter 2 numbers and then display the sum.

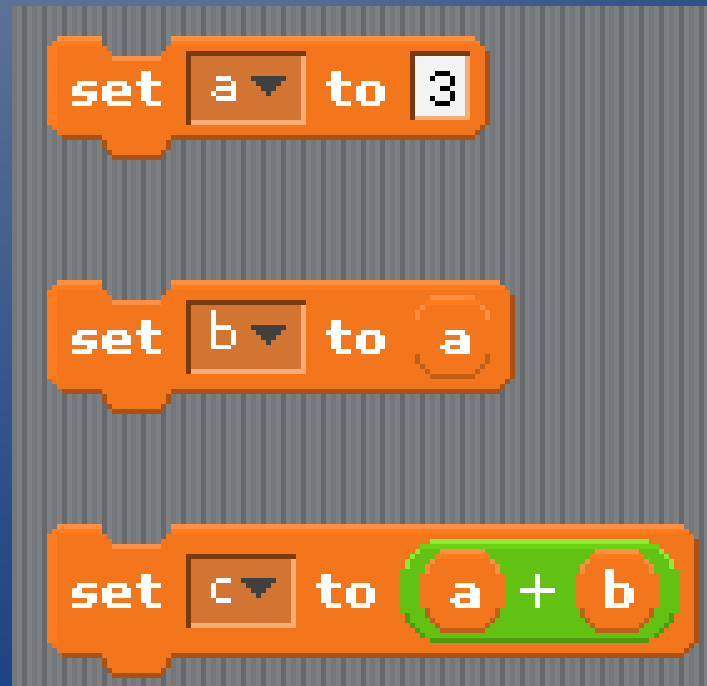


- num1 is an external variable, because we ask the user for this value
- num2 is external
- sum is an internal variable, because our program determines this value, not the user

# Assignment Operator

The assignment operator is the command where we assign a value to a variable.

The value can be a constant or the result of a calculation.



# Assigning to the Same Variable



- set x to zero
- calculate  $0 + 1$
- set x to result (1)

- it is possible to use the same variable in the assignment operation and the calculation
- this is self-assignment
- always do the calculation first (right side), then replace the variable with the new value