Data Types and Operators

Variables, Data Types & Arithmetic Operators

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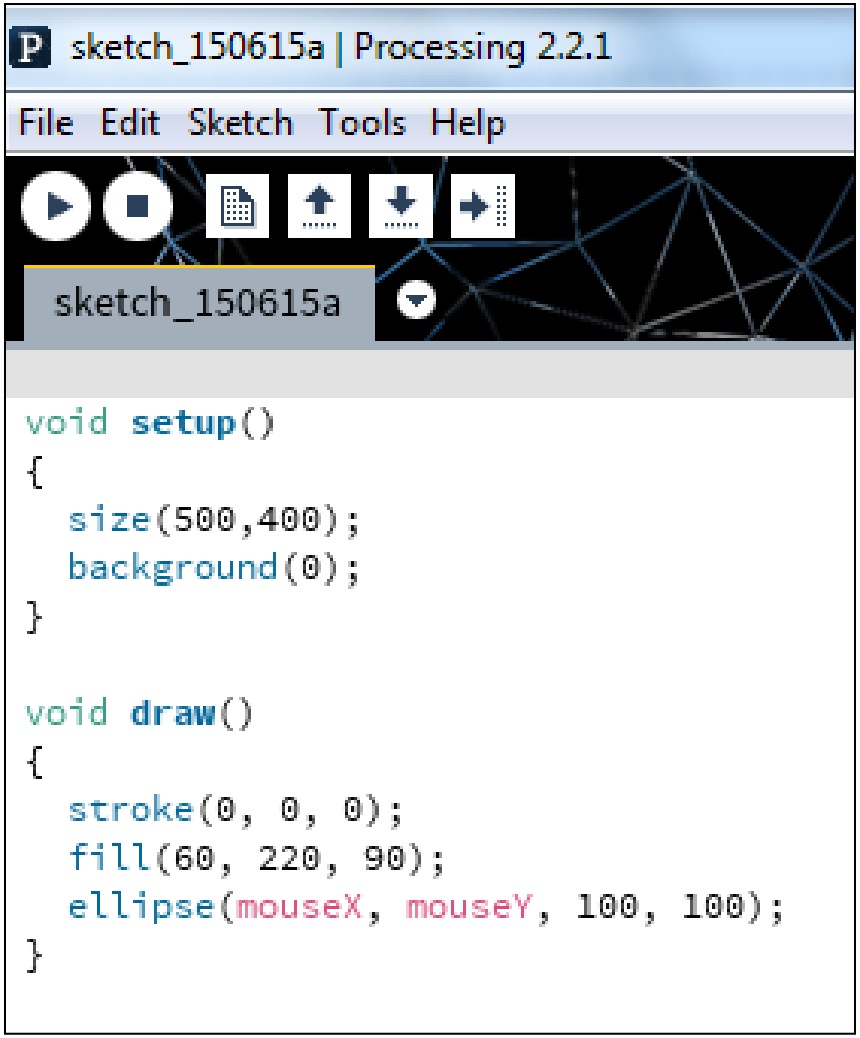
Variables

- You used mouseX and mouseY last week.
- These are “system variables”.



Variables

- We can create our own variables to store data.
- The data stored in the variable can change over time.
- Variables have a name and a data type.

Variable names

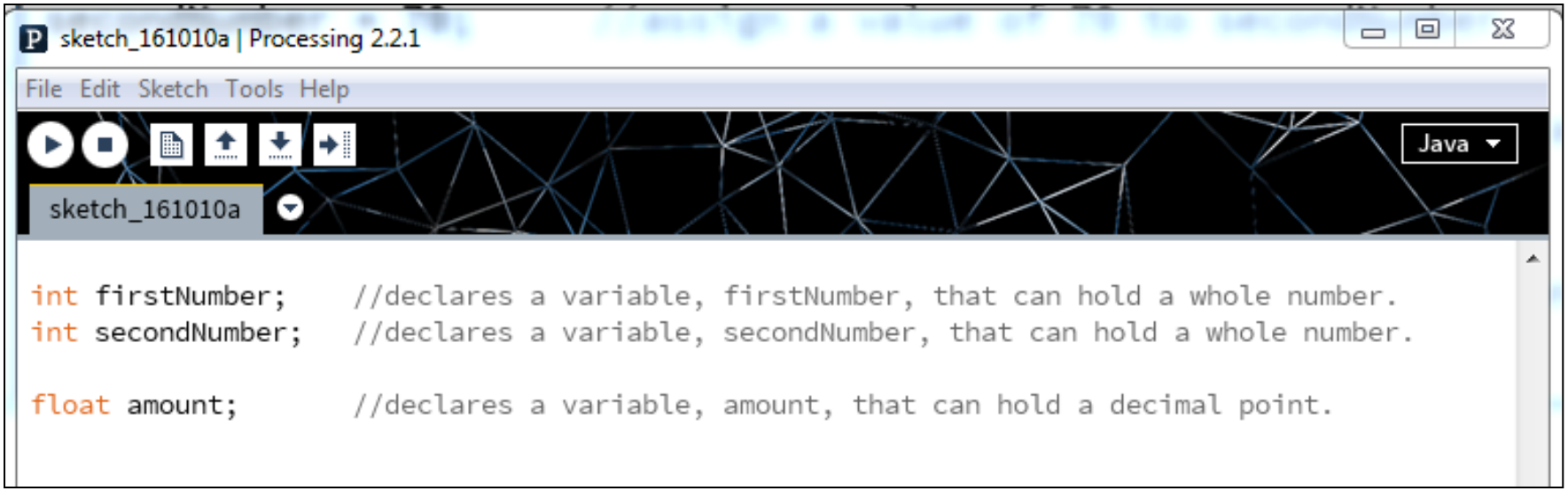
- Are case-sensitive.
- Can be any length you choose.
- Cannot contain spaces.
- Examples:
  - firstNumber
  - xCoordinate

Declaring variables (type)

- When creating a variable, we need to tell Java what kind of values will be stored in it.

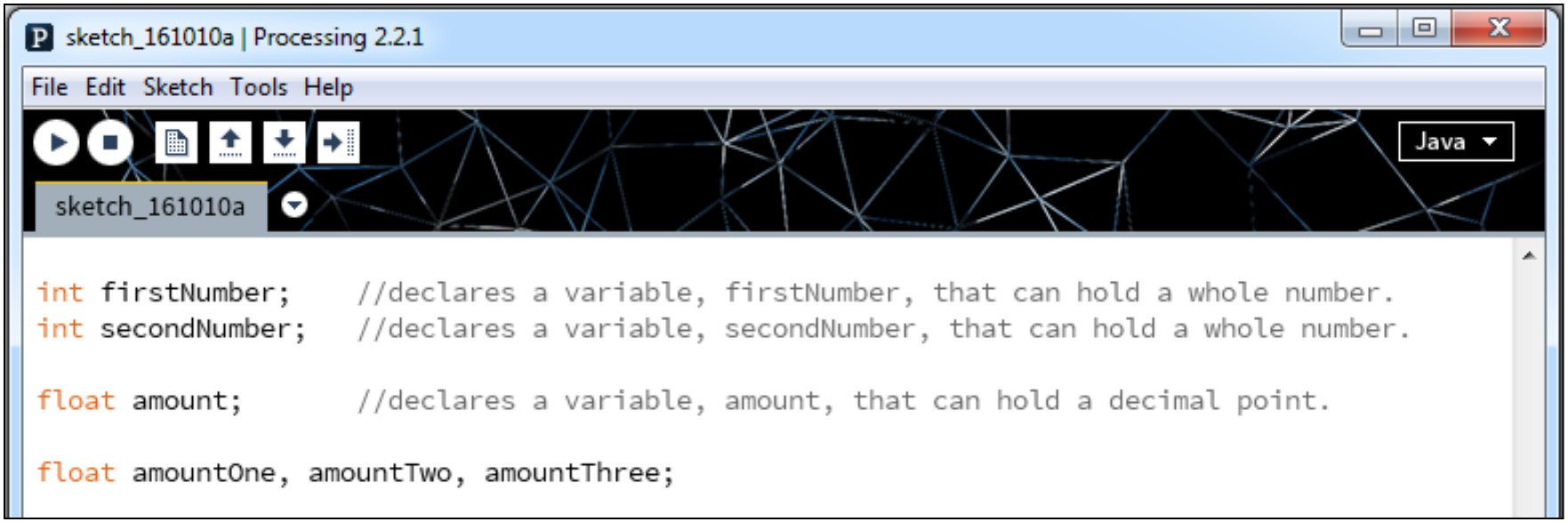
- We are going to learn how to create int and float variables.
  - int is a whole number e.g. 67
  - float is a decimal point number e.g. 67.8987

Declaring variables (type)



Note: the type is highlighted red when it is typed into Processing.

Declaring variables (type)



Note: several variables of the same type can be declared on one line.

Storing values in Variables

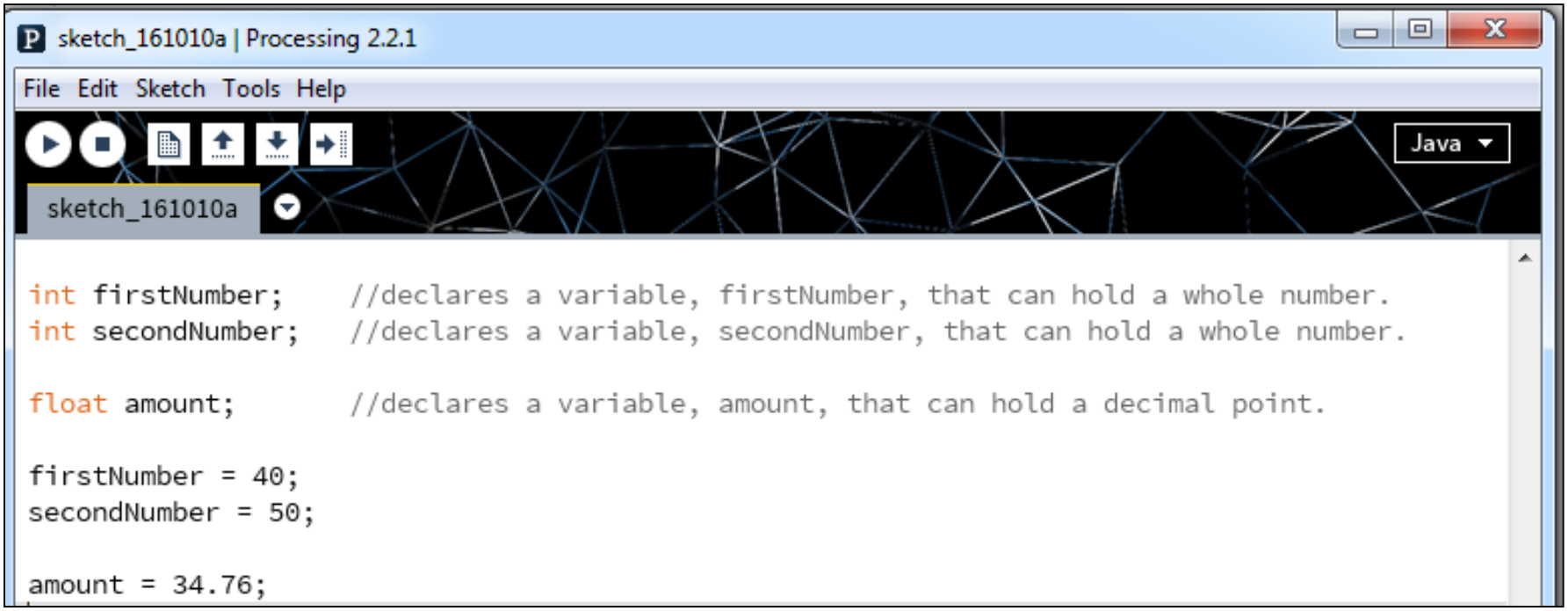
- Values are stored in variables using the = sign e.g.:

```
firstNumber = 40;
```

- The value of 40 is stored in the firstNumber variable.

- A variable stores a single value, so any previous value is lost.

Storing values in Variables



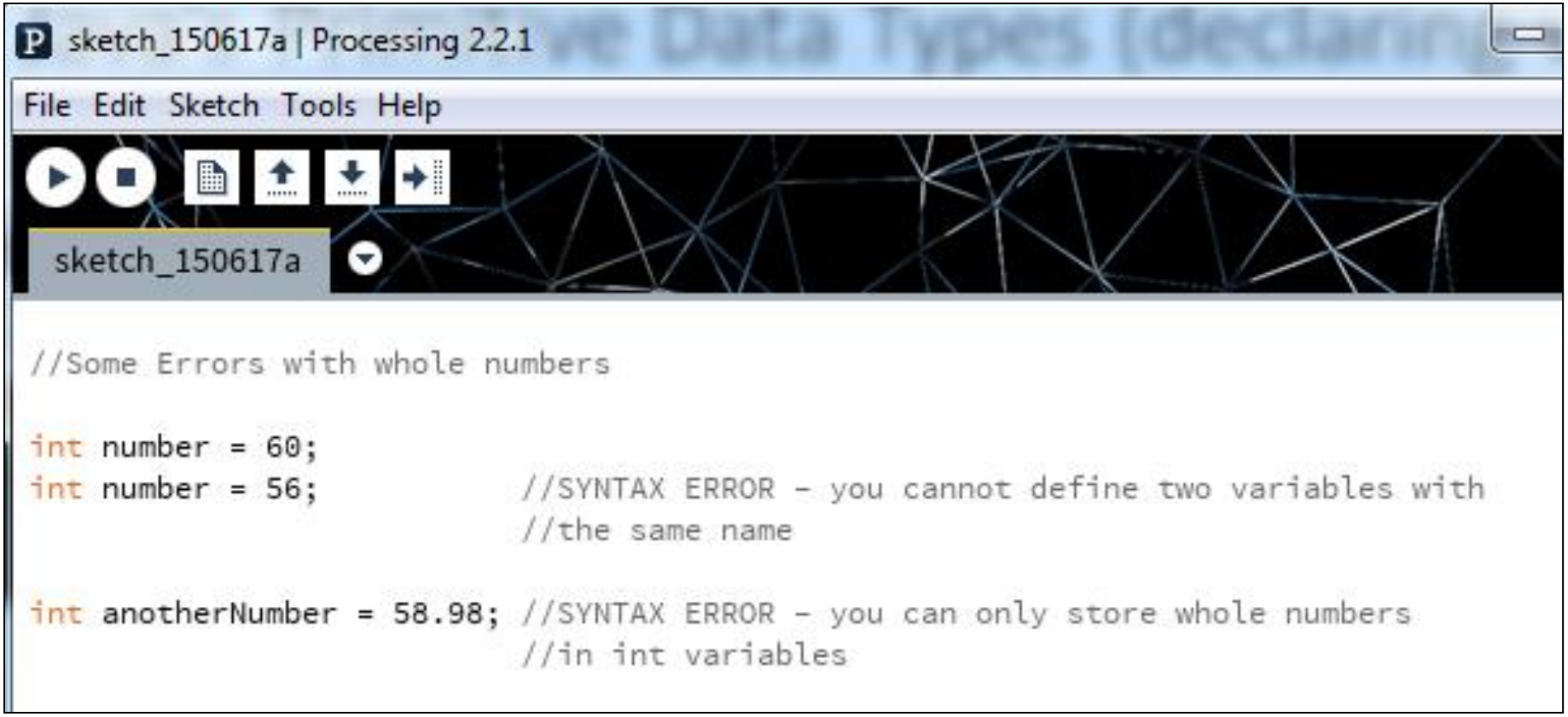
Declaring variables – some errors

Data types are case sensitive.

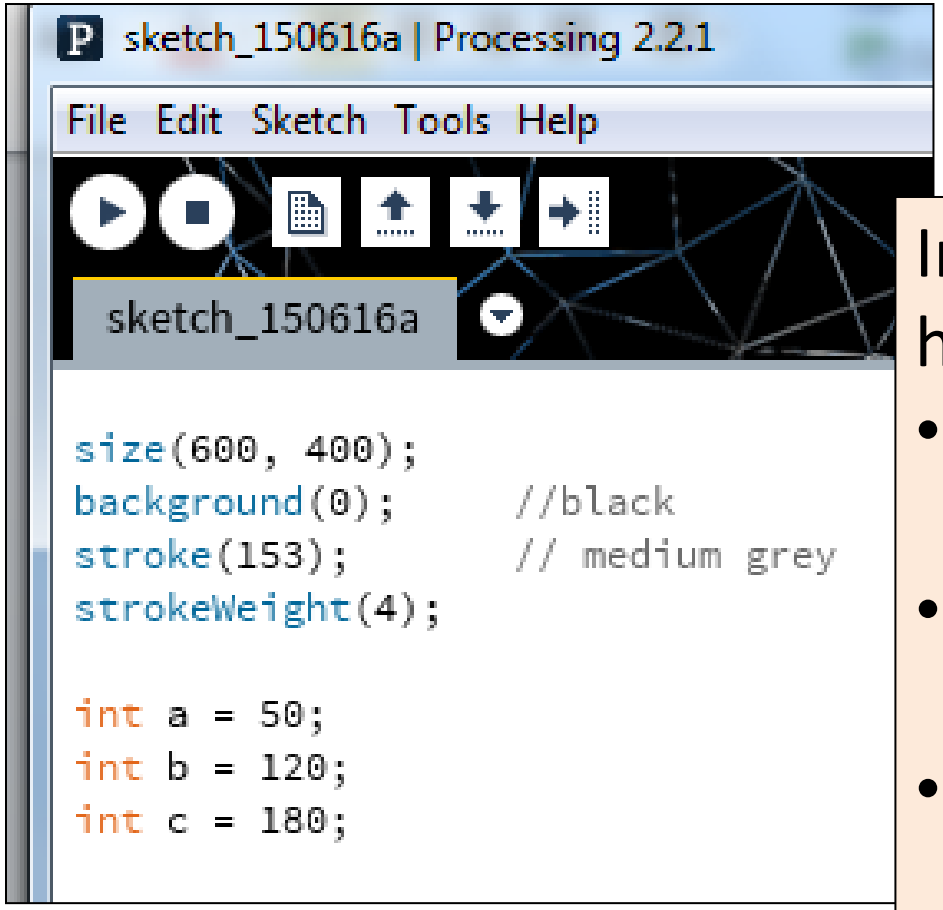
Int is not valid.

int is valid.

Declaring variables – some errors



int data type: Example 4.1



In this example, we have:

- defined three variables (a, b and c)
- that can hold whole numbers (int).
- and are set with a starting value.

Based on the Processing Example: Basics → Data → Variables

int data type: Example 4.2

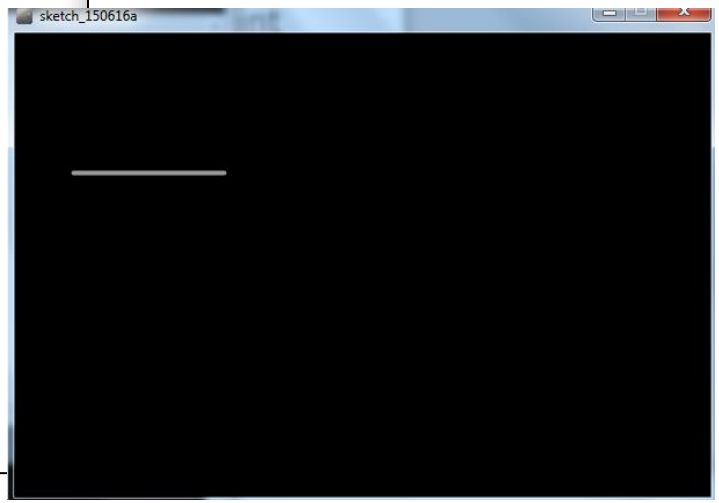
sketch_150616a | Processing 2.2.1

File Edit Sketch Tools Help

sketch_150616a

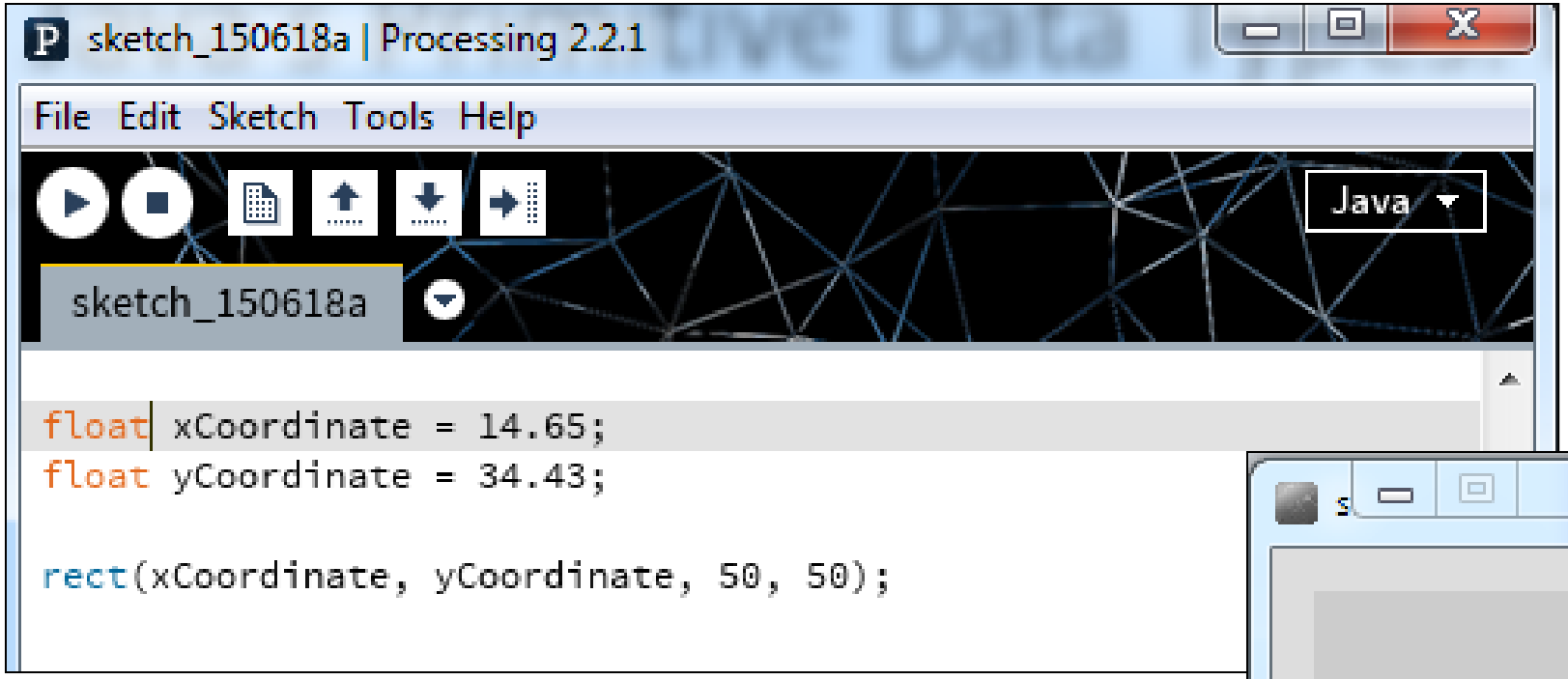
```
size(600, 400);
background(0);      //black
stroke(153);        // medium grey
strokeWeight(4);

int a = 50;
int b = 120;
int c = 180;

line(a, b, c, b);
```

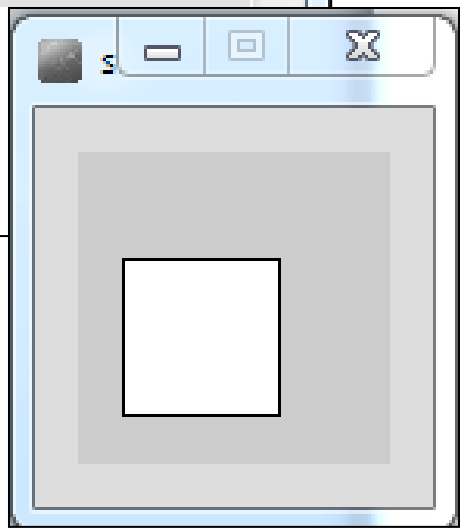
We can pass the defined variables as values to functions.



Based on the Processing Example: Basics → Data → Variables

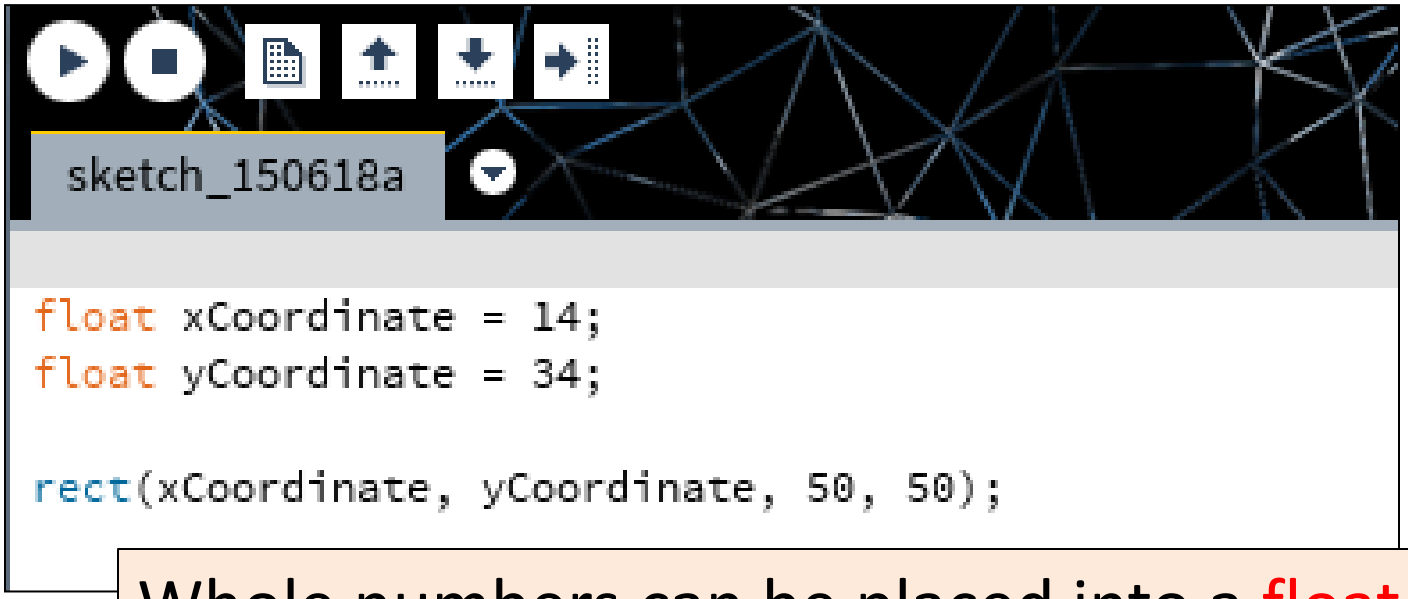
float data type: Example 4.3





We can pass the defined variables as values to functions.

float data type: Example 4.4



Whole numbers can be placed into a float variable.

Q: Why?

A: There is no loss of precision. We are not loosing any data.

Performing calculations on our variables

and the Order of Evaluation

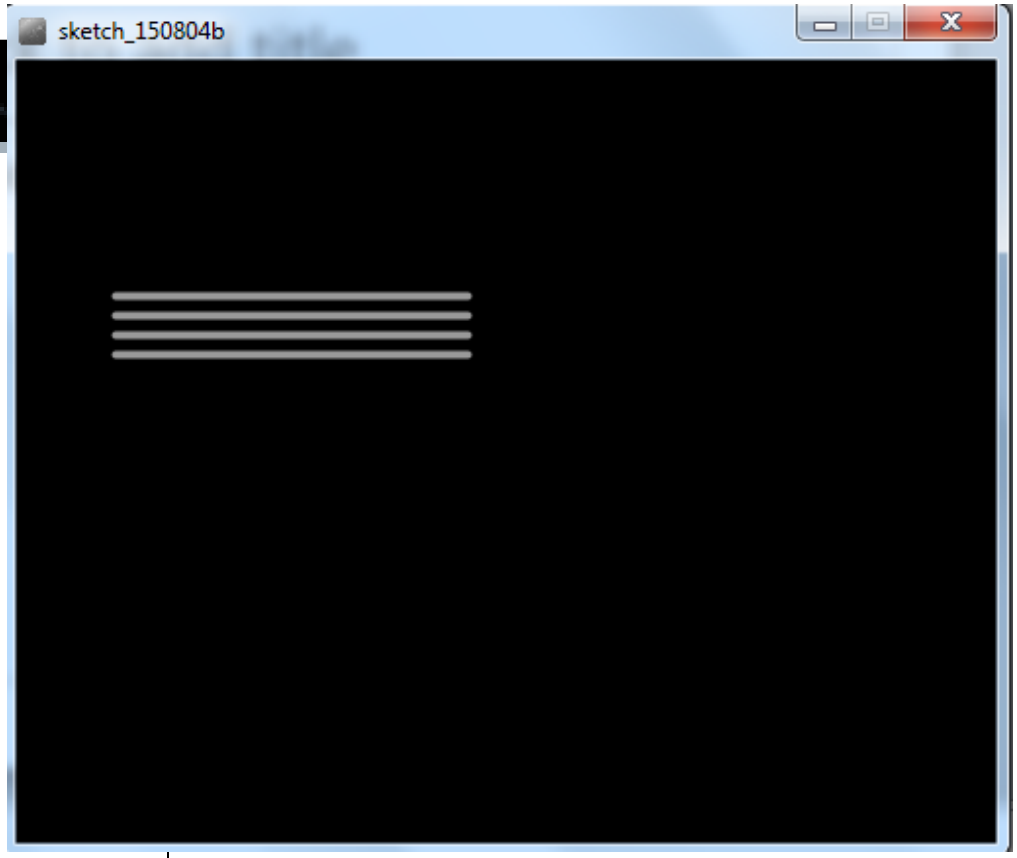
Arithmetic Operators

Arithmetic Operator	Explanation	Examples
+	Addition	6 + 2
		amountOwed + 10
-	Subtraction	6 – 2
		amountOwed – 10
*	Multiplication	6 * 2
		amountOwed * 10
/	Division	6 / 2
		amountOwed / 10

Arithmetic operators: Example 4.5

sketch_150804b

```
size(500, 400);
background(0);
stroke(153);
strokeWeight(4);

int a = 50;
int b = 120;
int c = 180;

line(a, b, a+c, b);
line(a, b+10, a+c, b+10);
line(a, b+20, a+c, b+20);
line(a, b+30, a+c, b+30);
```

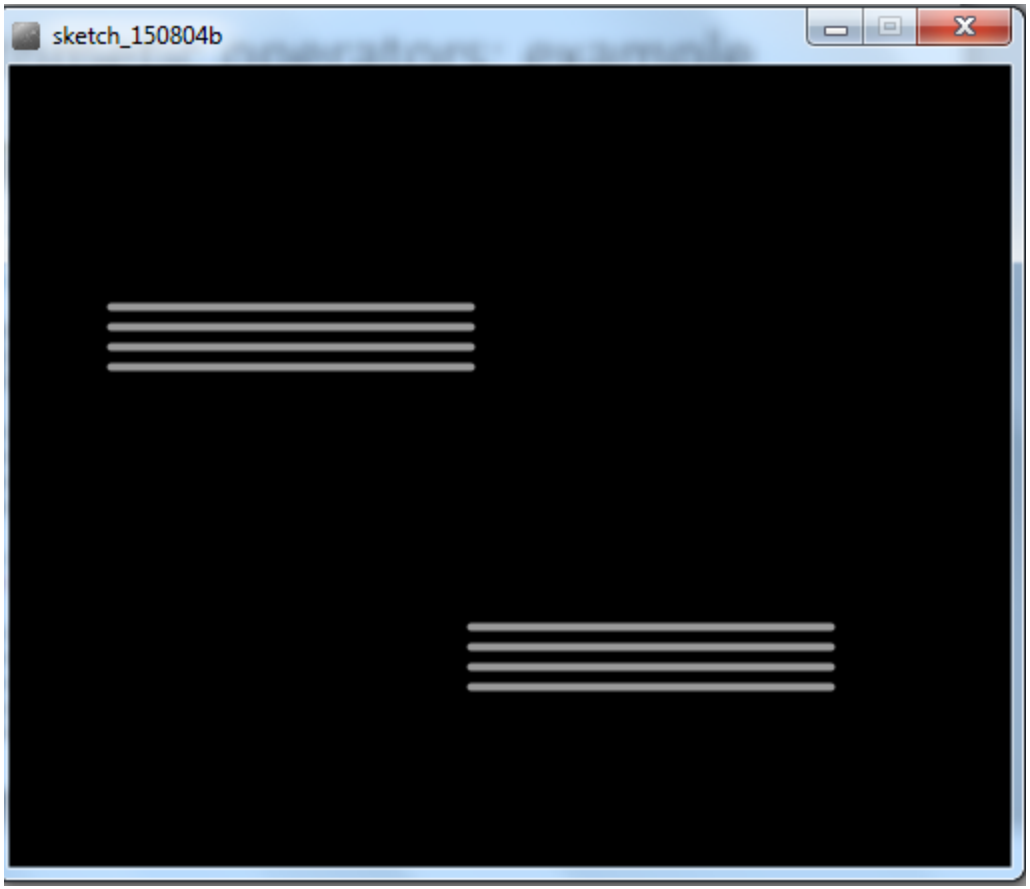


Based on the Processing Example: Basics → Data → Variables

Arithmetic operators: Example 4.6

sketch_150804b

```
size(500, 400);
background(0);
stroke(153);
strokeWeight(4);

int a = 50;
int b = 120;
int c = 180;

line(a, b, a+c, b);
line(a, b+10, a+c, b+10);
line(a, b+20, a+c, b+20);
line(a, b+30, a+c, b+30);

a = a + c;
b = height-b;

line(a, b, a+c, b);
line(a, b+10, a+c, b+10);
line(a, b+20, a+c, b+20);
line(a, b+30, a+c, b+30);
```

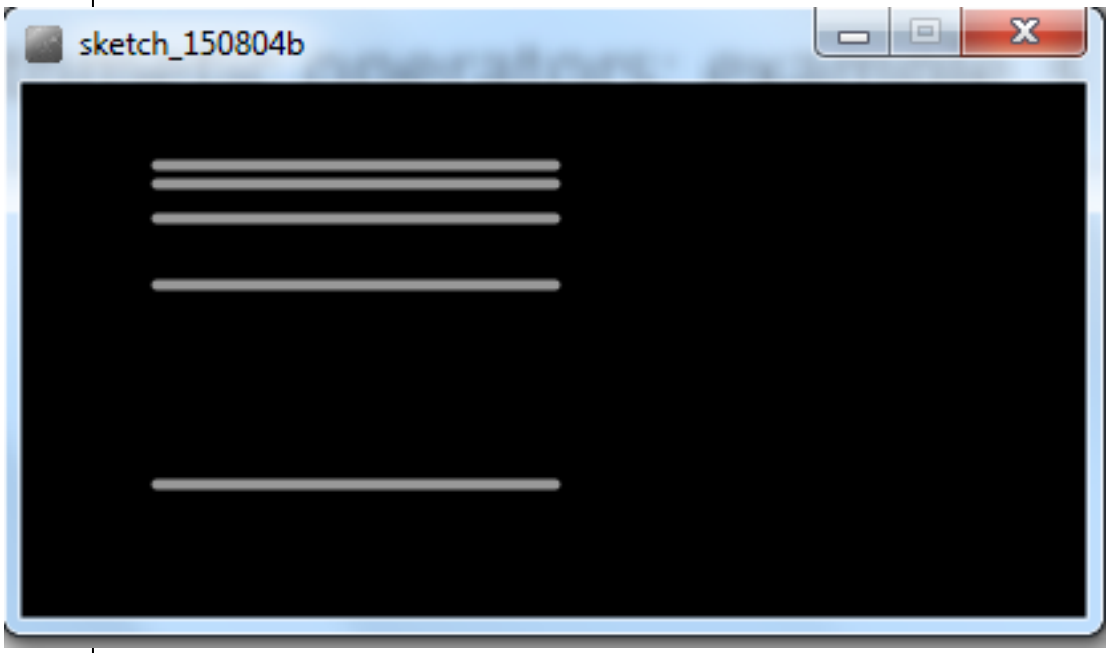


Based on the Processing Example: Basics → Data → Variables

Arithmetic operators: Example 4.7

sketch_150804b

```
size(400, 200);
background(0);
stroke(153);
strokeWeight(4);

int a = 50;
int b = 1500;
int c = 4;

line(a, b/10, a*c, b/10);
line(a, b/20, a*c, b/20);
line(a, b/30, a*c, b/30);
line(a, b/40, a*c, b/40);
line(a, b/50, a*c, b/50);
```



Based on the Processing Example: Basics → Data → Variables

Arithmetic Operators

- These examples are straightforward uses of the arithmetic operators.
- However, we typically want to do more complex calculations involving many arithmetic operators.
- To do this, we need to understand the **Order of Evaluation.**

Order of Evaluation

- Brackets ()
- Multiplication (*)
- Division (/)
- Addition (+)
- Subtraction (-)

BoMDAS

Beware My Dear Aunt Sally

Order of Evaluation - Quiz

What are the results of these calculations?

Q1: 3+6*5-2

Q2: 3+6*(5-2)

Q3: (3+6)*5-2

Questions?

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