

COMP 1010- Summer 2015 (A01)

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Remember the cat?

```
/******  
* Cat Face! Draw a cat face on the screen  
* author: Teo the dog  
* version: try #awesome  
* purpose: to show how a cat can be drawn  
*****/  
  
size(500,500); // make a 500x500 canvas  
  
//draw the head  
ellipse(250,250,300,300);  
  
//draw the ears  
triangle(375,80,300,150,400,200);  
triangle(125,80,200,150,100,200);  
  
//draw the eyes  
ellipse(175,225,60,30); // left eye  
ellipse(175,225,15,30);  
ellipse(325,225,60,30); // right eye  
ellipse(325,225,15,30);  
  
//whiskers!  
line(250,300,200,275);  
line(250,300,300,275);  
line(250,300,190,300);  
line(250,300,310,300);  
line(250,300,200,325);  
line(250,300,300,325);  
  
// draw the nose. draw after whiskers for nice overlap effect  
ellipse(250,300,30,30);
```

What if we want to make
the nose and whiskers
little higher? Say, 100
pixels higher?

Let's do it

That was a pain!!

There must be a better way..

variables

variables

sometimes we need to store data to use it in various places in the program:

e.g., log into a website: it should remember who you are!

in this case, it would store your name in a **variable!**

e.g.,: Hi [name], welcome to our site! We see that you come from [city]. People in [city] have previously bought the following items from us

note: this company writes the above line ONCE. **[name]** and **[city]** are variables. When you login, your name and city are stored in those variables.

math example:

$x = 1$ ← store the #1 in the **variable** x

$y = 15$ ← store the #15 in the **variable** y

$z = (x+1)*y$ ← **read** the values from **variables** x and y , do a calculation, and store the result in **z**

what does $z = ?$

x , y , and z are variables because they can store a range of numbers depending on the circumstances

box analogy

variables can be seen as boxes that you put data into

42



sorting a mess into designated boxes....



books

papers

toys

processing is just as strict

When you create a variable (a box), you need to tell processing what kind of information you are going to store in it

A number

Some text

Some music!!

So how do you specify this in processing?



books

papers

toys

Your first data type: the integer (int)

What is an integer? (highschool math?)

a whole number with no fractional part

42, -5002, 0, 24

what is the biggest integer?

theoretically there is none

Processing limits the amount of computer memory used by your integer so there is a maximum and a minimum

maximum: **2,147,483,647!**

((huh!? $2^{32}/2-1$))

minimum: **-2,147,483,648!**

there are **data types** available with more memory but we will talk about them later

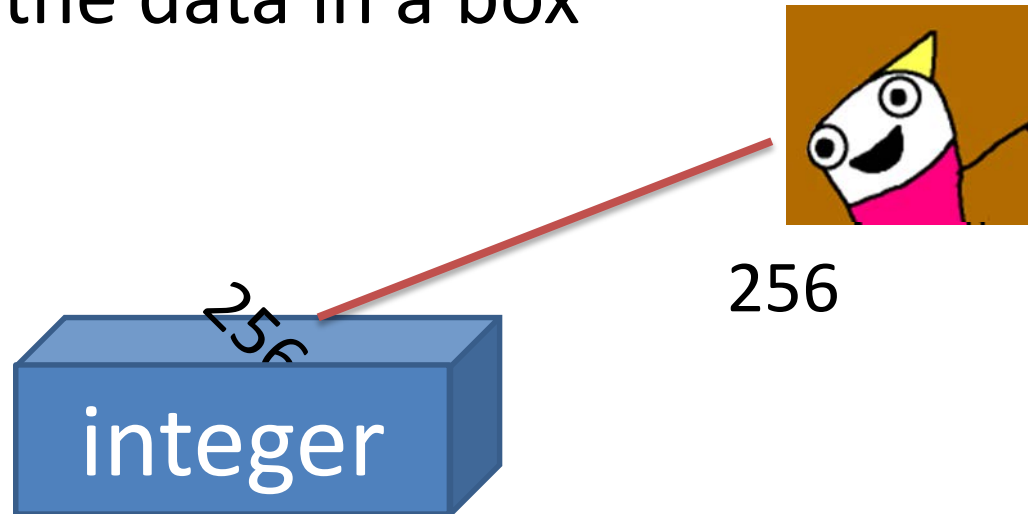
back up a second.. No fractions???
why such a ridiculous limitation?

its easier and faster for computers to store and work with whole numbers, so we usually stick to them if its all that we need

we'll learn a new data type for decimals later

three operations on **variables** (boxes)

- a) make a new box to store some data in
- b) put data into a box
- c) look at the data in a box



variables in processing

a) make a new **variable** to store some data in

b) put data into a **variable**

c) look at the data in a **variable**

variableType variableName;

int noseCenterX;

int noseCenterY;

variables in processing

a) make a new **variable** to store some data in

b) put data into a **variable**

c) look at the data in a **variable**

variableName = data;

noseCenterX = 250;

noseCenterY = 200;

literals



literals

Any data that is typed in, hard-coded into a program, and is not calculated, retrieved from the internet, the user, etc.

variables in processing

- a) make a new **variable** to store some data in
- b) put data into a **variable**
- c) look at the data in a **variable**

use the **variableName** anywhere you would use raw data

```
ellipse(noseCenterX,noseCenterY,30,30);
```

```
noseCenterX = noseCenterY;
```


Data is always copied, not linked
read top to bottom

```
int a;
```

```
int b;
```

```
a = 20;
```

```
b = a;
```

```
a = 10;
```

What does b equal?

Let's update our program with nose
center variables

Defining variables

You can define multiple variables at a time

```
type var1, var2, var3...;
```

Eg.,

```
int pointX, pointY;
```

Is the same as

```
int pointX;
```

```
int pointY;
```

combined declaration and assignment

You can create a variable and assign it a value in one statement!

Instead of....

```
int noseCenterX;
```

```
noseCenterX = 250;
```

variableType variableName = data;

```
int noseCenterX = 250;
```

variables are.. well.. **variable**..

```
int circleSize = 50;
```

```
ellipse(100,100,circleSize,circleSize);
```

```
circleSize = 10;
```

```
ellipse(100,100,circleSize,circleSize);
```

Same command but different result!

Re-defining variables

```
int circleSize = 50;  
ellipse(100,100,circleSize,circleSize);  
int circleSize = 10;  
ellipse(100,100,circleSize,circleSize);
```

Variables can only be defined once, otherwise it's like you're trying to create two different ones with the same name. Like building a new house on top of an existing one!!

empty variables

```
int circleSize;  
ellipse(100,100,circleSize,circleSize);
```

Well – what would you expect to reasonably happen?

Variables must be *initialized* – given a value – before they are used.

rules for variable names

no spaces!

no special characters !"#\$%&'()-=^[]{}
no special characters !"#%&'()-=^[]{ }

exception: underscore _

cannot start with a number but can
contain one

no reserved words

reserved words...

are special words that already have a special meaning, so you cannot use them as your program or variable names.

e.g.,

`int int`

Reserved Words:

Strategy: be aware of the problem,
but don't memorize

Integer Operations

integer operations!

you can do a bunch of standard math operations on integers:

addition

subtraction

multiplication

division

...?

integer “operators” (operations?)

addition!

the “+” symbol:

<integer> + <integer>

5+4, 6+10, 657+552, 5554543+2223232

Let’s look at one of the cat whiskers.

integer “operators” - subtraction

the “-” symbol:

<integer> - <integer>

10-2, 5-10, 40-30, 34243401-1312322

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//whiskers!  
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line(250,300,200,325);  
line(250,300,300,325);  
  
// draw the nose. draw after whiskers for nice overlap effect  
ellipse(250,300,30,30);
```

Cat whisker:

```
line(250,300,300,325);
```

```
→line(noseCenterX,noseCenterY,300,325);
```

Notice: the line end point is..

50 pixels to the right (250→300)

25 pixels below (300→325)

```
line(noseCenterX, noseCenterY,  
     noseCenterX+50, noseCenterY+25);
```


Cat whisker:

```
line(250,300,200,275);
```

```
→line(noseCenterX,noseCenterY,200,275);
```

Notice: the line end point is..

50 pixels to the left(250→200)

25 pixels above (300→275)

```
line(noseCenterX, noseCenterY,  
noseCenterX-50, noseCenterY-25);
```