

# COMP 1010- Summer 2015 (A01)

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# Hello!

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# Trucking along...

Understanding programs:

computers have tunnel vision

explicit, one by one instructions

simplest approach to getting it:

you need to know what happens, in  
what order

re-visit the “hold up the roof” example

# Hold up the roof!

```
int lineTop = 0;
```

```
void setup()  
{  
  size(500,500);  
}
```

```
void draw()  
{  
  background(255);  
  lineTop = lineTop + 1;  
  
  lineTop = min(mouseY, lineTop);  
  
  line(0,lineTop,499,lineTop);  
}
```

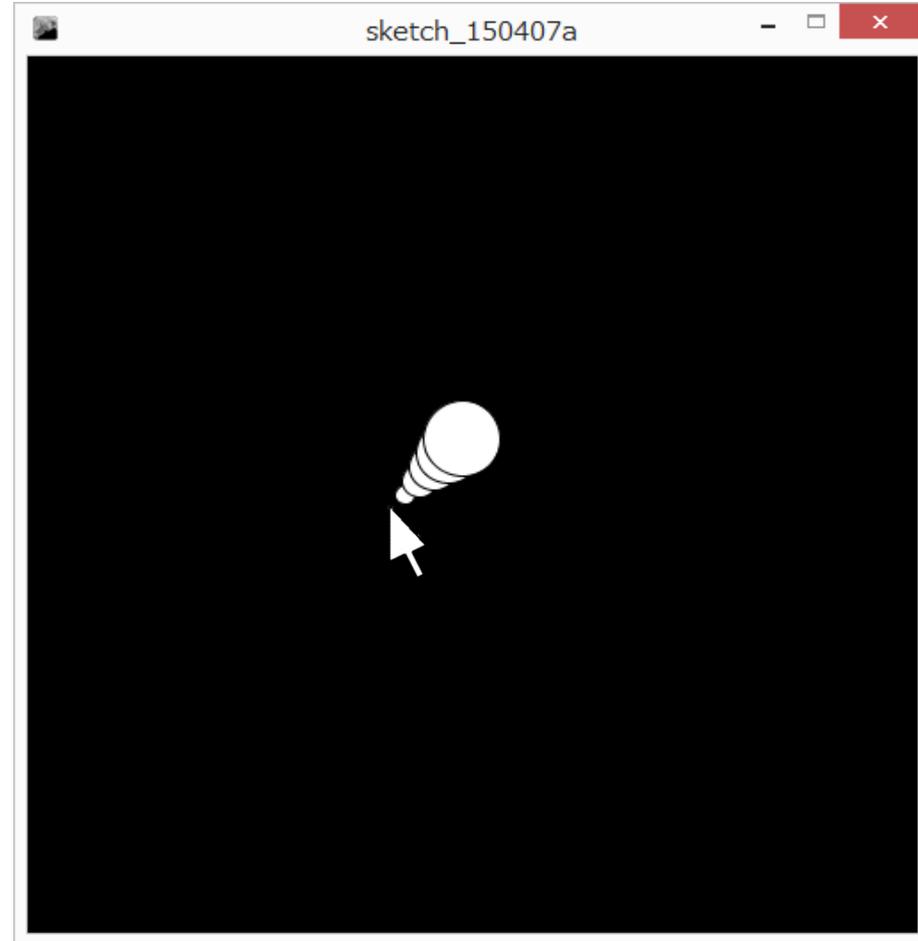
# Mouse cursor bubbles!

Bubble starts size 0

Goes right (+x)

Goes up (-y)

Bursts at size 50



# How to attack this???

When you're stuck, start by doing what you know

- Draw a circle size 0 at the mouse!
- Next step – size 1, 1 above and 1 right
- Next.. Size 2
- Last? Size 50
- See a pattern?

At each step the command is the same  
except for that step number

Make a variable

Make the variable get bigger by one each time

What next???

How do we stop it from getting bigger?

We already learned the tool...

# Non obvious – use modulo (remainder)

If you take any number  $n$  and divide it by 5, what is the possible range of remainders?

<u>n</u>	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>
n/5	0	0	0	0	0	1	1	1	1	1	2	2	2
n%5	0	1	2	3	4	0	1	2	3	4	0	1	2

/5 -> remainders 0..4

If you do  $n/m$ , you get numbers in the range  
0..m-1

How can we use modulo to help us  
with our step variable?

Modulo 50

# Joystick for a ball!

Ball moves based on mouse position

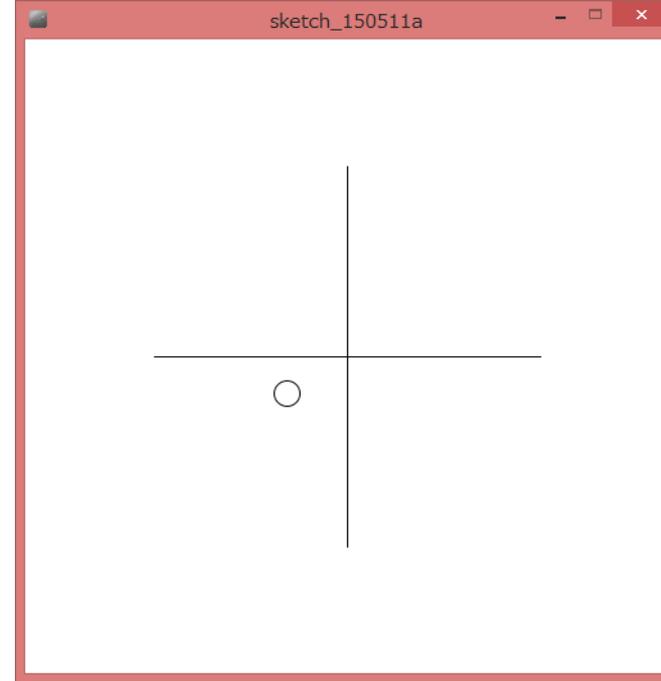
mouse in center – don't move

mouse to right/left – move to right/left

mouse to top/bottom – move up or down

First, draw the crosshairs

Make globals to remember the position of the ball



# How to calculate how much the ball moves?

X

$\text{mouseX} - 250$

if mouse is at 250, we get 0

if mouse is left of 250, we get neg.

if mouse is right of 250, we get pos.

Make new variables:  $\text{moveX}$  and  $\text{moveY}$

# Woah! Flies off the screen!

How to make sure it doesn't go off the edge?

min and max!!!!

What is the smaller of 499, and mouseX going to be?

if mouseX is right of the screen, then 499

if mouseX is in the screen, then the mouse

$\text{mouseX} = \min(\text{mouseX}, 499);$

What is the larger of 0 and mouseX going to be?

if mouseX is left of the screen (negative), then 0

if mouseX is on the screen, then mouseX

$\text{mouseX} = \max(0, \text{mouseX});$

Too fast...

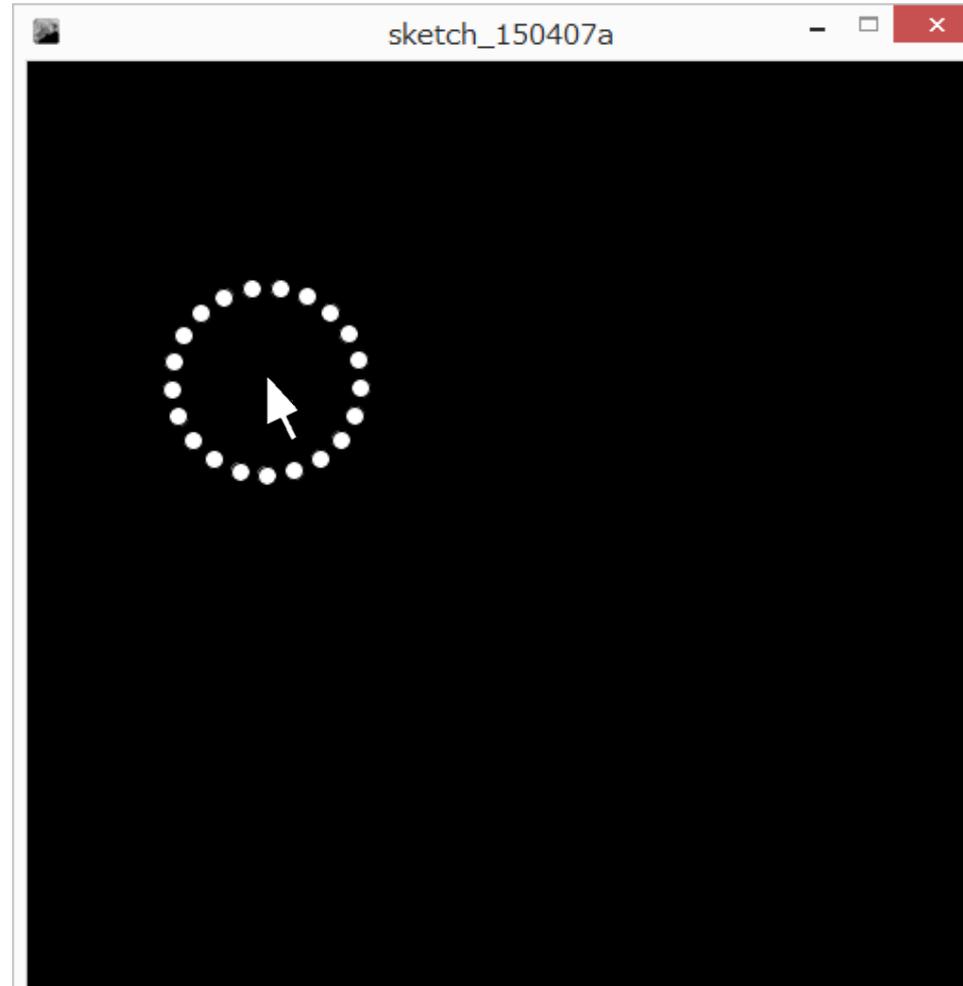
Scale down the movement

# new example:

Make a ball circle around  
the mouse

We need trigonometry

We need decimals



integer is fine.. but I *want* fractions!

I WANT  $5/2$  to give me 2.5

I don't want to be restricted to integers...

what do I do???

you need a new data type that allows decimal portions...

Floating point!

# why is it called floating point? (advanced)

its scientific notation:

first, we give a bunch of numbers:

e.g., 1234567

then, we tell it where to put the point:

e.g., after 4<sup>th</sup> digit: 1234.567

$$1.234567 \times 10^3$$

5 before first digit: 0.000001234567

$$1.234567 \times 10^{-6}$$

5 after last digit: 123456700000.0

$$1.234567 \times 10^{11}$$

we can store VERY small and VERY large numbers

# How to make a floating point variable

Instead of:

```
int variableName;
```

```
float variableName;
```

Use floats to draw 30% way across the screen

```
float percent = 0.3;
```

# Change the example

```
float percent = 30/100;
```

What happens?

Use println to investigate

# Doesn't work!!

Processing still does integer division!!! why??

**note:** the right side of the assignment does not change based on the variable on the left!!

so.. why is  $30/100$  giving an integer result?

**note:** if the numbers in an operation are integers, the computer does integer arithmetic:

**in programming speak:** if the operands are integers, processing uses an integer operator

# how to do floating point math?

**note:** if the numbers in an operation are integers, Java does integer arithmetic:

**note:** if either number in an operation is floating point, Java does floating point arithmetic

how do we force  $30/100$  to be floating point?

make either the 30 or the 100 a floating point:

$30.0/100$  or

$30/100.0$  or

$30.0/100.0$

# Processing works one step at a time... (confusing but important)

what about  $1.0 + 1/2 * 3.0$ ?

lets try it

why? – processing does it one step at a time.

Order of operations!

$1.0 + 1/2 * 3.0$

$1/2 \rightarrow \text{int} / \text{int} \rightarrow \text{integer division} \rightarrow 0$

$1 + 0 * 3.0$

(this is floating point, since  $\text{int} * \text{double}$ )

$1 + 0.0$