

# Come Back, Sphero

Professor Bob Brown

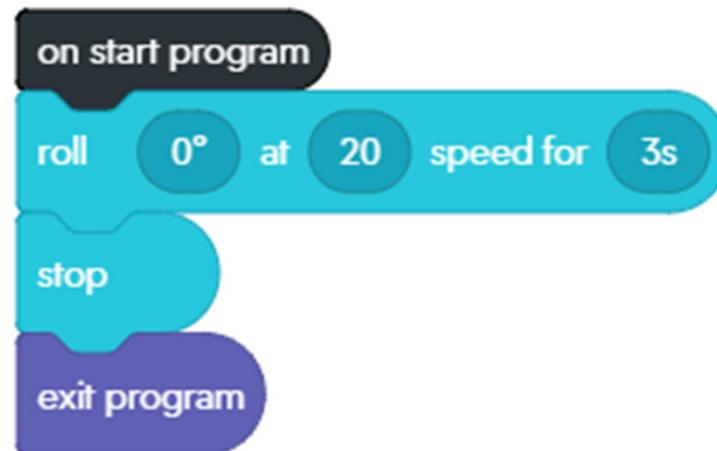
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# Last Time

We had a program that looked like this:



# Can We Make Sphero Come Back?

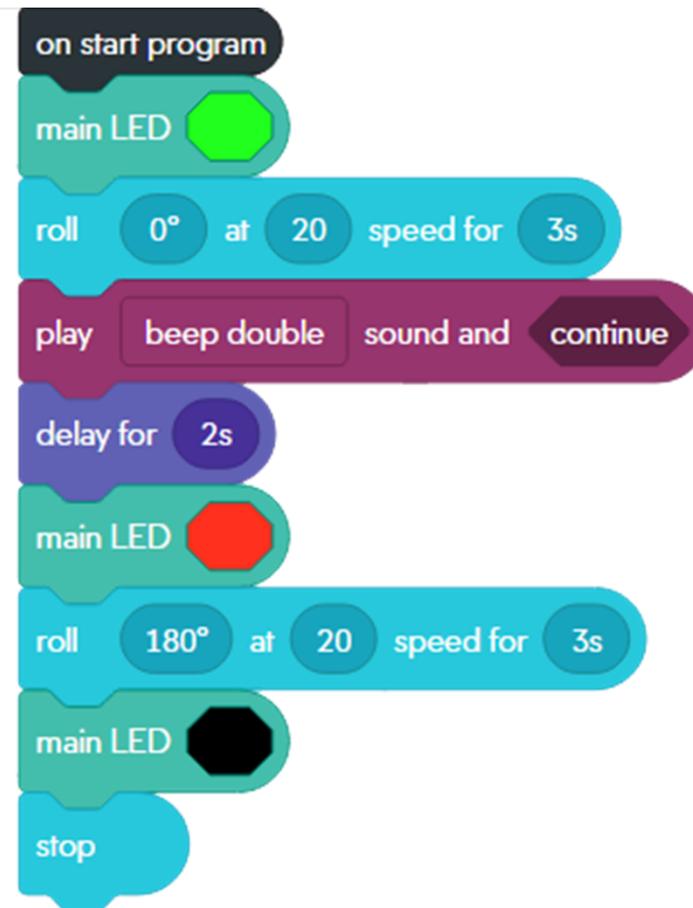
Start a new program. Call it “return”



Why do we need a delay?

The opposite of  $0^\circ$  is  $180^\circ$

# Let's Add Some LEDs

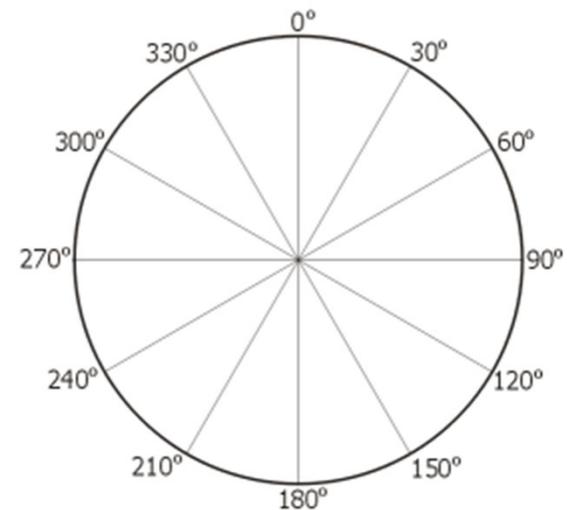


# Test your Program

- Remember to aim your Sphero.
- Run the program.
- Did the Sphero go out, then return?

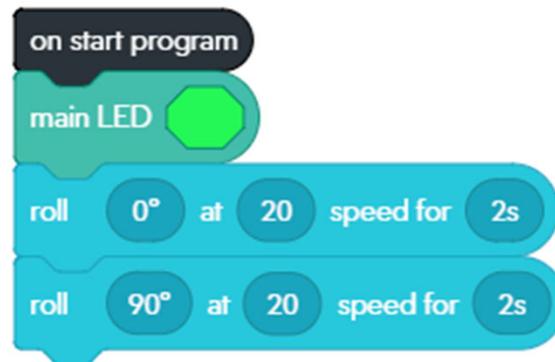
# Let's Draw a Square

- We've made Sphero go out and back.
- Can we make it draw a square? Sure!
- We need to think of Sphero's *heading* in terms of degrees.
- To turn right, we would change Sphero's direction to  $90^\circ$ .
- Then what?



# Let's Draw a Square

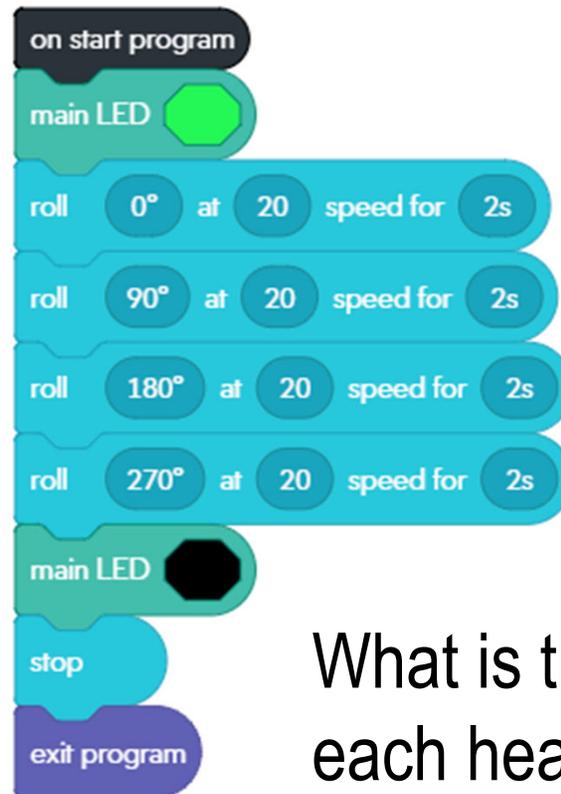
Start another new program; call it "square"



What goes in here?



# Let's Draw a Square

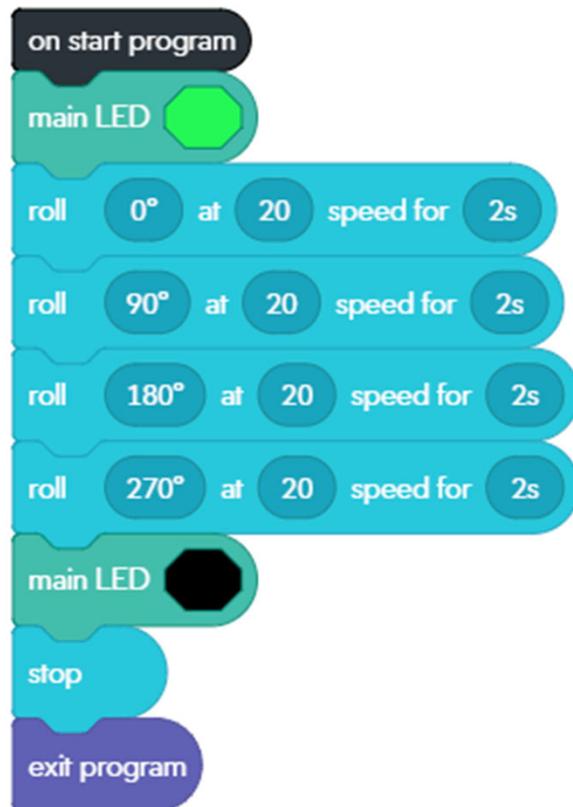


What is the relationship between each heading and the next?

# Test Your Program

- Start Sphero on a piece of tape.
- Did it return *exactly* to the tape marker?
- If not, what are some possible reasons?

# Look Again at the Square Program



This is the *same thing*, repeated four times with different headings.

# “Variables” Change in Value

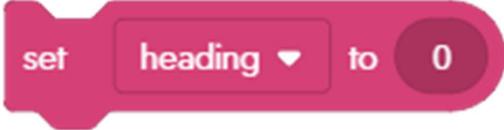


# What is a Variable ?

- In math, a variable is a letter that stands in for some value.
- In computing, a variable is a *named area of memory that holds a value*.
- So, variables have a *name* and a *value*.

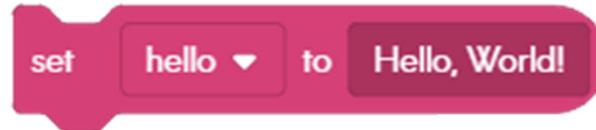


# Numbers as Variables

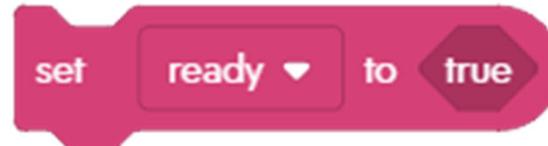
- “Set” defines a variable, sets value
- Numbers: A Scratch 'set heading to 0' block, which is a pink block with a notch on the left. It contains the text 'set', a dropdown menu with 'heading' and a downward arrow, the word 'to', and a circular input field containing the number '0'.
  - Whole numbers (integers): 123
  - Numbers with fractions (floats): 3.14

# Other Kinds of Data

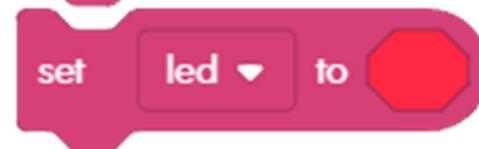
- **Strings:**



- **Booleans:**



- **Colors:**



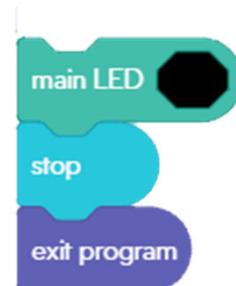
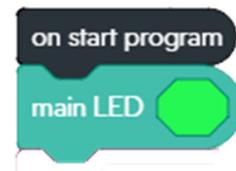
- **We will use these data types later.**

# Introducing the Loop

- In computer programming, a *loop* repeats the same action, possibly with different data.
- In our program, it is Sphero's *heading* that changes each time.
- Changing a program to make it faster, more efficient, or easier to understand is called *refactoring*.
- Let's refactor the square program.

# Start a New Program

- Call your program “square\_loop”
- It will start and end the same as before.

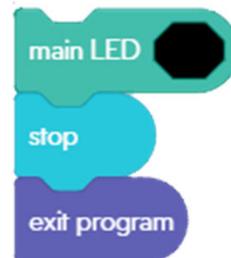
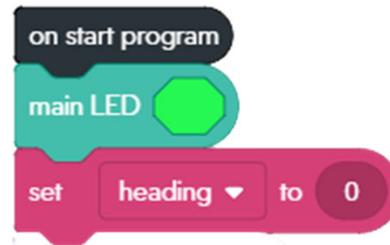


# A Variable for *heading*

- Create a new variable.
- Name your variable heading.
- Click “Number”
- Click the check mark.

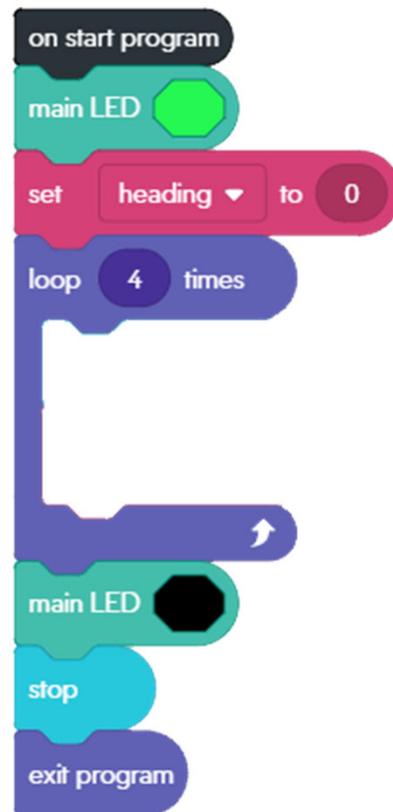
A screenshot of a "Create a Variable" dialog box. The dialog has a title bar with a close button (X) on the left and a checkmark on the right. The main content area shows "Variable Name" followed by the text "heading" in a text input field. Below this, it says "Choose a variable type and set the default value." There are four options listed: "String" with an "AI" icon, "Number" with a grid icon and a default value of "0" in a dark red circle, "Boolean" with a "T/F" icon, and "Color" with a paintbrush icon. The "Number" option is highlighted with a pink background.

# Start with *heading 0*

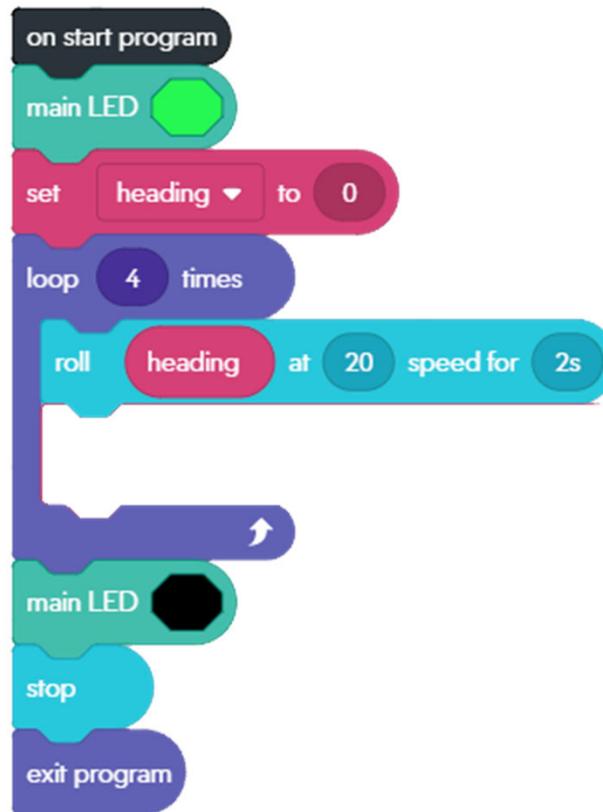


# Add a Loop

We will go through the loop 4 times.

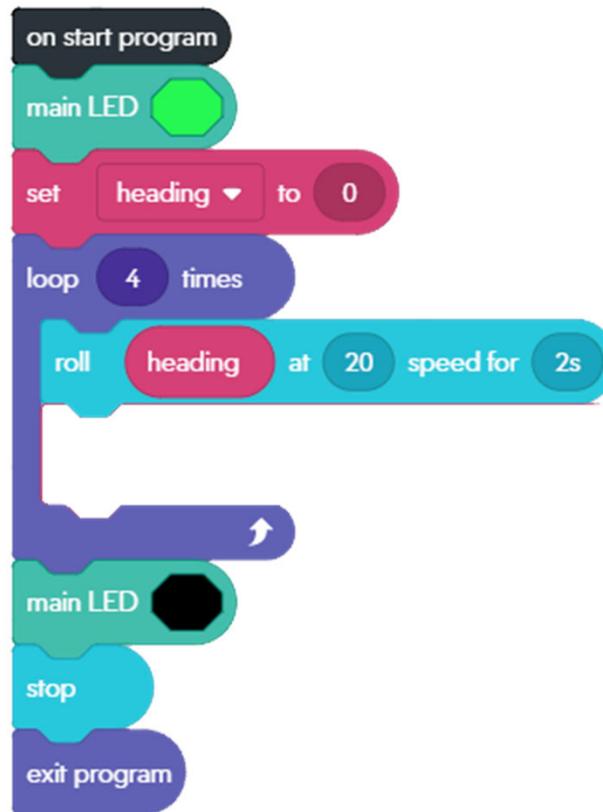


# Add the “Roll” Block



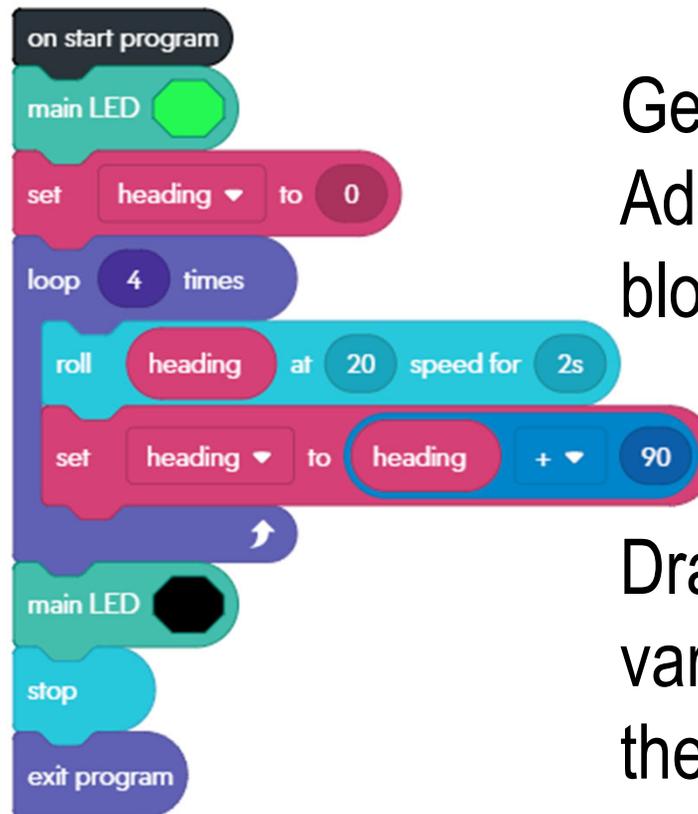
Drag the heading variable into the heading area. Set speed and time as before.

# Now Update the *heading*



What is the relationship between each heading and the next?

# Now Update the *heading*



```
on start program
  main LED (green)
  set heading to 0
  loop 4 times
    roll heading at 20 speed for 2s
    set heading to heading + 90
  main LED (black)
  stop
  exit program
```

Get a new set block.  
Add an addition  
block.

Drag the heading  
variable to the left of  
the plus.  
Set the right to 90.

# Test Your Program

- Does it draw a square?
- If not, what are some possible reasons?

# Thought Challenge

- Could you make the same program draw a triangle?
- What would you have to change?