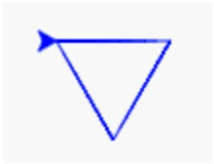

# Variables & Libraries

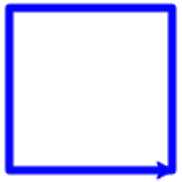
storing data & quickly adding functionality

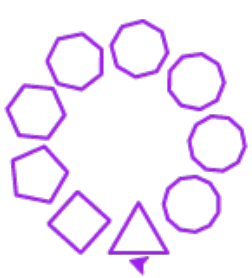
# Challenge Overview

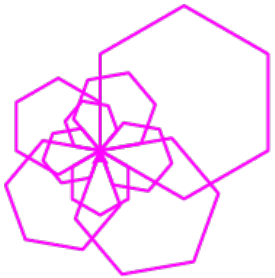
- **Day 1:** Getting started
- **Day 2:** Variables & Turtle
- **Day 3:** Loops
- **Day 4:** Writing Functions
- **Day 5:** Putting it all together!

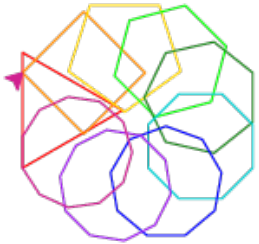
```
Hello, World!
```

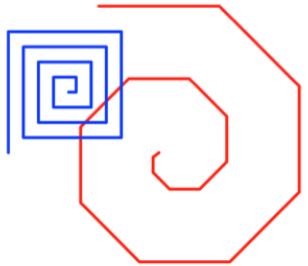












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# Why Variables?

- **Variables** allow us to **store data** in memory (or RAM) so that we can work with this information in our programs
- For example:
  - calculate the average run time or speed of 5 runners
  - calculate the amount of sales tax on a purchase
  - display text to the screen (like in “Hello, World!”)
- Help us make our code easier to change & modify
  - Make changes to one location & use in many
  - Saves time & frustration!

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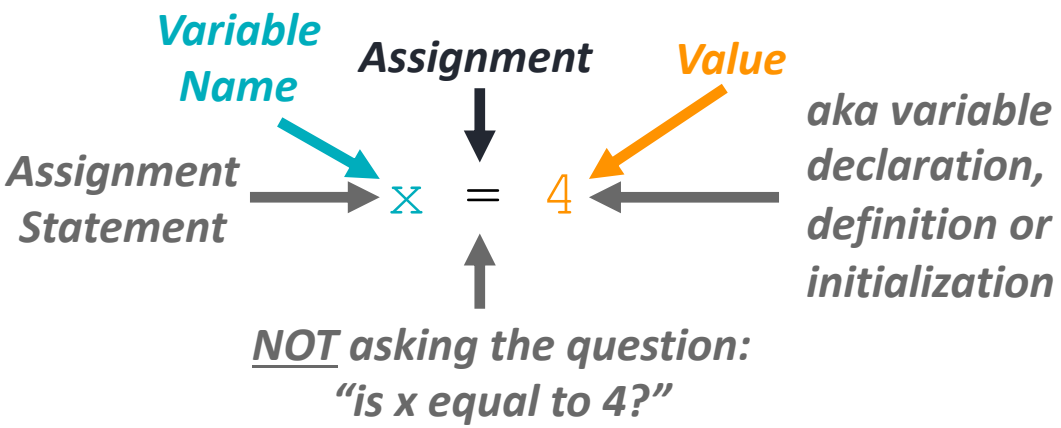
# Defining Variables




**Memory (aka RAM)**

| Variable Name | Value |
|---|---|
| x | 4 |
| | |
| | |
| | |
| | |
| | |

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# Defining Variables

```
x = 4
y = 2 + 3
z = x + y
z += 1
```

*Equivalent to:*

```
z = z + 1
```

***Memory (aka RAM)***

*Variable*

| *Name* | *Value* |
|---|---|
| x | 4 |
| z | 10 + 1 |
| | |
| y | 5 |
| | |
| | |

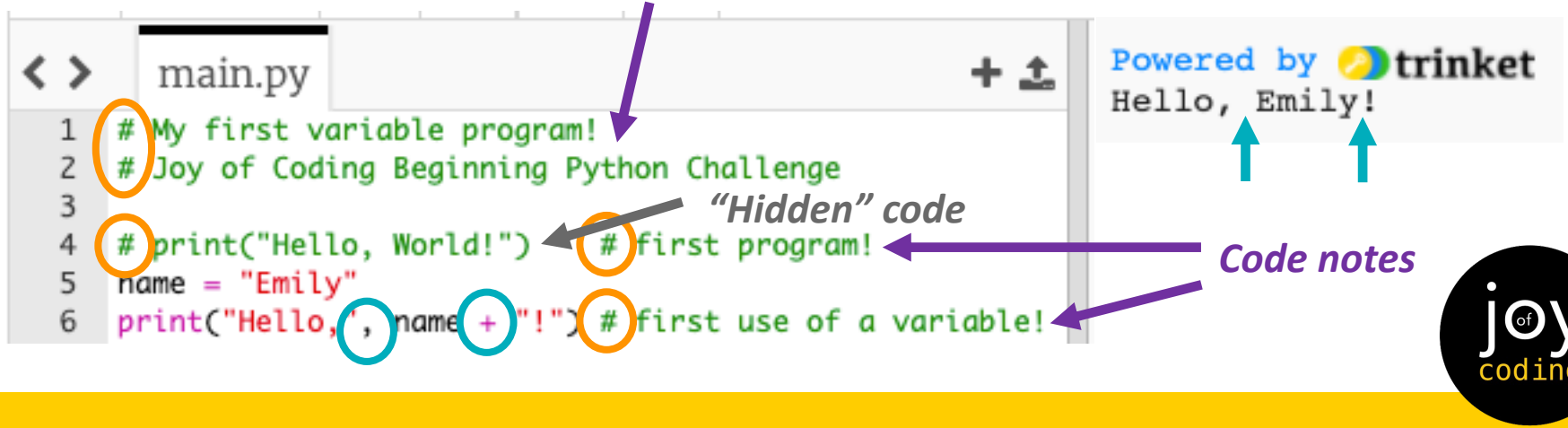
# Variables: Names & Types

- Variables have **names** (aka identifiers)
  - Have **meaningful** names (i.e., not x or y unless storing coordinates)
  - **Use** letters, numbers, or _
  - **Cannot** be a keyword like **for**, **def**, etc. or begin with a number
  - **Typically** begin with a lower case letter
- Variable values have **types**:
  - **string** `'hello'` `"c"` `"That's me!"`
  - **int** (integer) 4 237 -58 0 923,872,355
  - **float** (floating point) -2.5 55.67 346.978001 0.00000017
  - **complex** 4+6j 2+5j
  - **boolean** True False
  - **objects** or **collections** lists arrays files dictionaries turtles

# Comments

**Comments** allow us to write notes to ourselves and others about our code & save “hidden” code for later

*Best practice to begin with a description of your code & author info*

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# Why Libraries?

- The **fastest way to build programs** is by taking advantage of code that others have already written, tested, & debugged in **libraries**
  - Saves time & frustration!
  - Different time investment (learning & writing less vs writing more & testing)
- In python, libraries are organized into **modules**, like:
  - math `sqrt, floor, ceil, log, sin, cos, tan, pi, e`
  - statistics `mean, median, mode, stdev`
  - random *generate random numbers within a given range*
  - webbrowser *display web documents to user*
  - re *regular expression matching for processing text*
  - turtle *simple commands to draw shapes on screen*

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# Using Libraries: Import

In python, there are **two ways to import** library functions:

`import module` *VS* `from module import function`

```
import math

print(math.sqrt(25))
```

```
from math import sqrt

print(sqrt(25))
```

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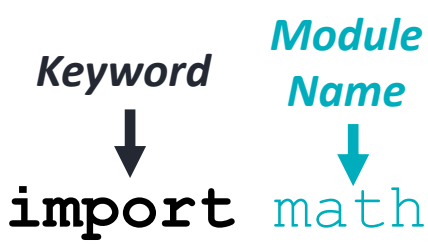
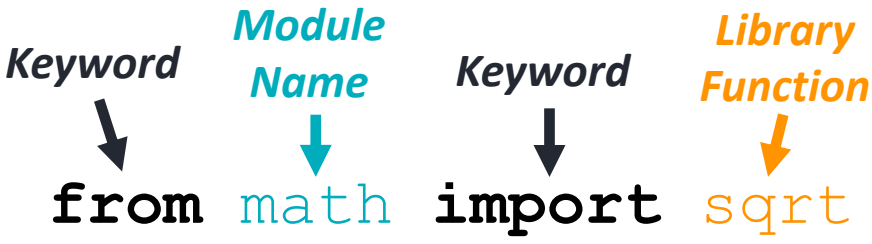
# Using Libraries: Import

In python, there are **two ways to import** library functions:

```
import module   VS   from module import function
```




```
print(math.sqrt(25))
```

Module Name — Library Function Call — Library Function

```
print(sqrt(25))
```

Library Function Call

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# Let's try it!

- Go to **trinket.io/turtle**
  - Not working? Try repl.it/languages/python_turtle or skulpt.org
  - Remove any code that you didn't write

- Draw a triangle using python turtle!
- See worksheet for details & video solution: bit.ly/beginning-python-challenge-day2
- See you in Day 3: Loops!

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