Learn to code with Python!

MITRE STEM Outreach

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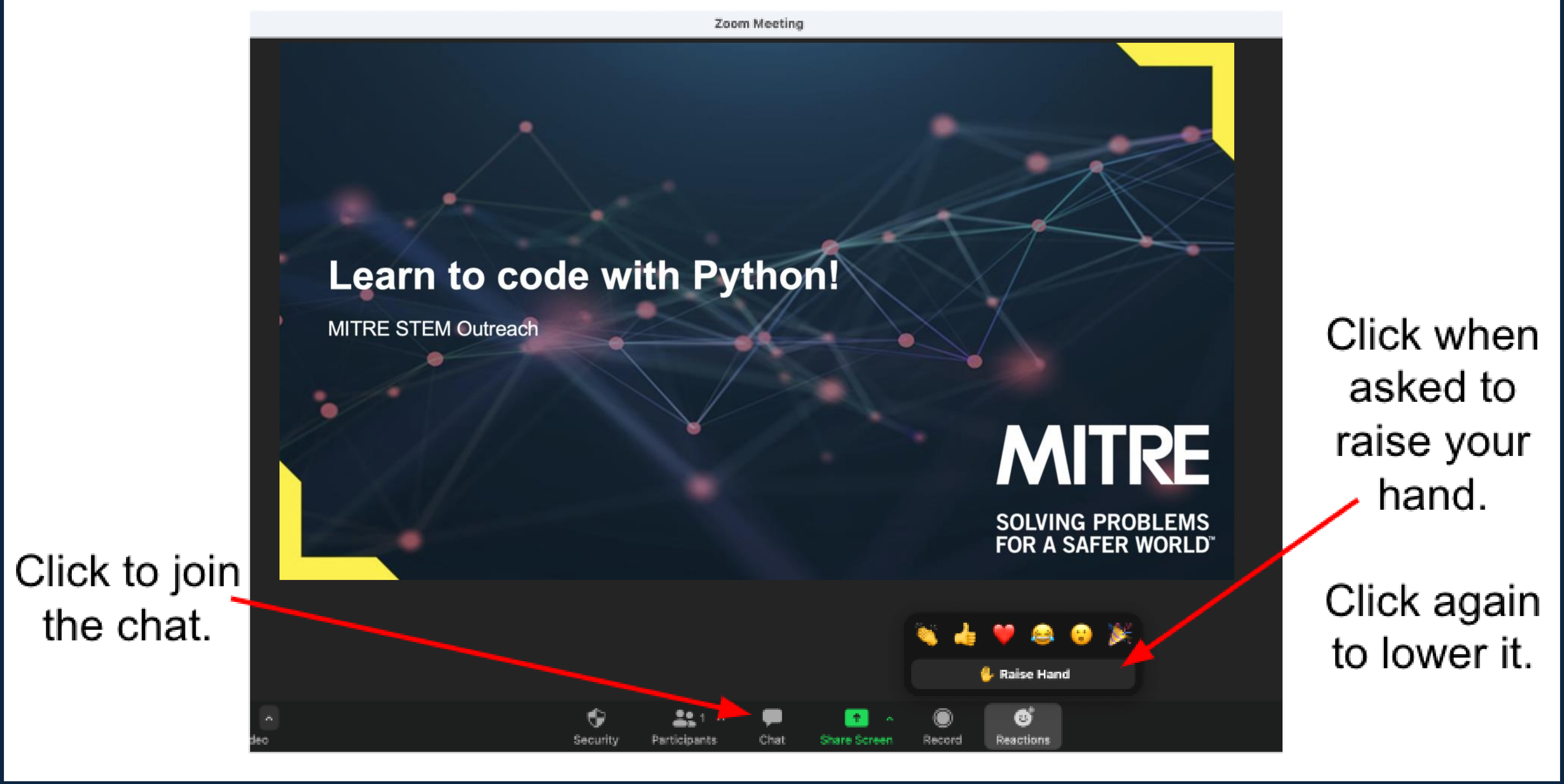
Agenda

- Introduction
- What is a programming language?
- What is Python?
- Python basics
- Coding Activity

Introduction

- Goals of workshop:
  - Introduction to programming languages
  - Basics of Python
  - Coding activity in Python
- Level of workshop: Beginner

Zoom Basics



Click to join the chat.

Click when asked to raise your hand.

Click again to lower it.

Zoom Etiquette

- Please use the chat for questions or the “raise your hand” feature

✋

- Mute your microphone unless you are speaking or asking a question
- Respect each other and the workshop instructor
- Have fun!

A little bit about you!

- Introduce yourself in the chat:
  - Name
  - Pronouns
  - Favorite outdoor activity OR favorite sweet treat

A little bit about you!

- What is your comfort level with coding? Choose an emoji:

🎉 I have never coded before and am excited to learn how!

👍 I have done a little bit of coding, but it is still very new to me!

❤️ I love coding and am very comfortable doing it!

What is a programming language?

The tool humans use to write instructions that a computer can follow

How many programming languages are there?

- Anywhere between 700 and 9,000
- Only a small percentage are widely used
- Some of the most popular:
  - JavaScript
  - Python
  - Java
  - Typescript

Most Demanded Programming Languages in 2022

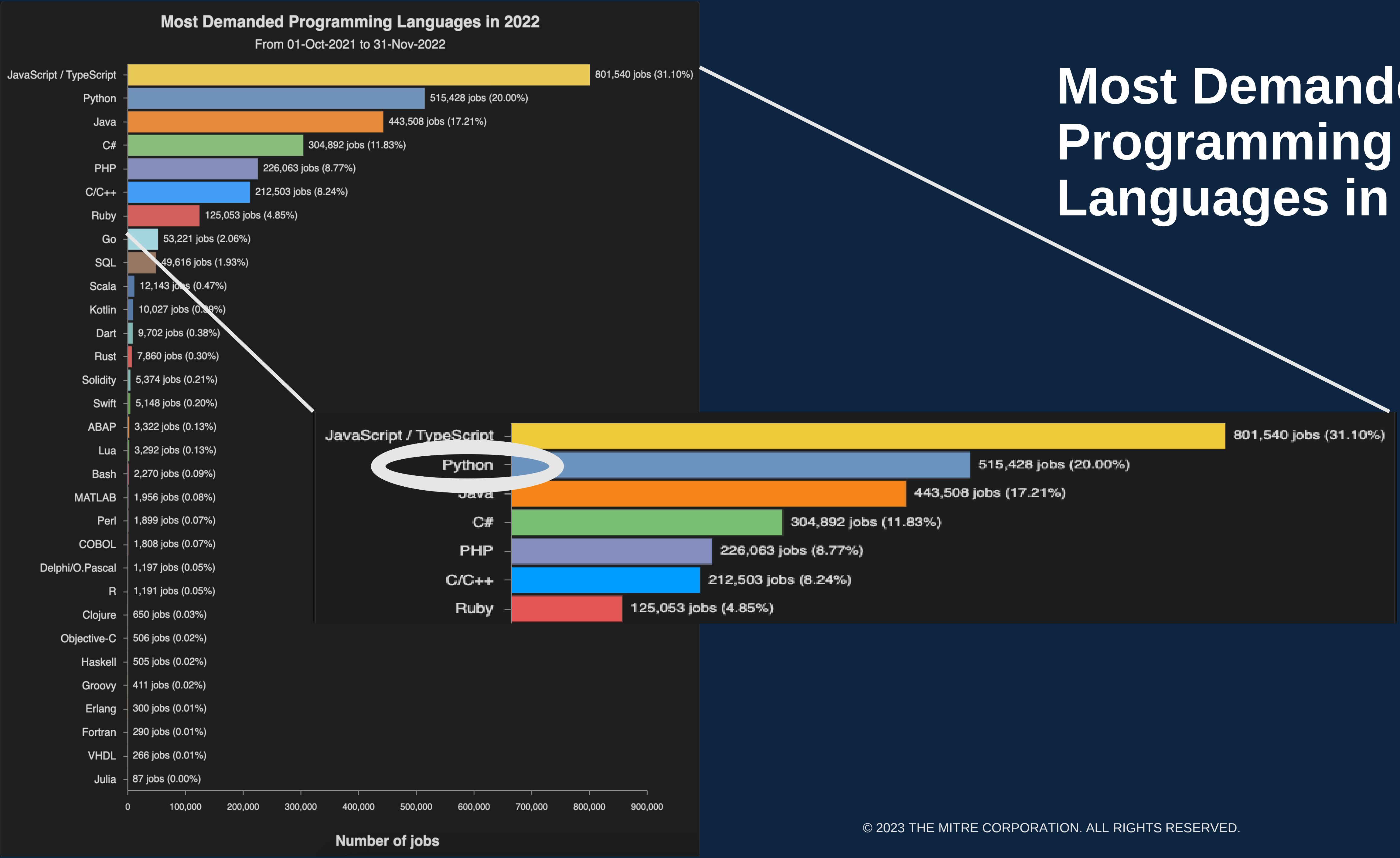


Image from: https://www.devjobsscanner.com/blog/top-8-most-demanded-languages-in-2022/

Important Words to Know

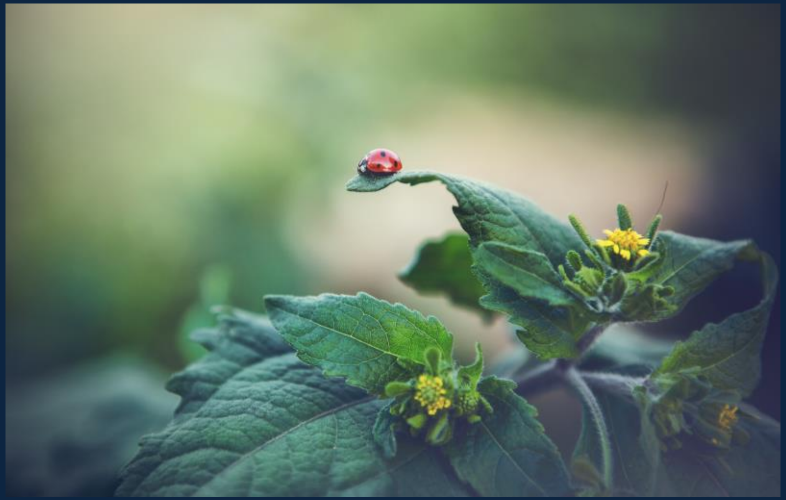
Program: a set of instructions that has been translated into commands a computer can understand

Orange Prune Rice
Orange juice with cinnamon is a wonderful combination, especially with the prunes. It sounds sweet but it's more savoury than you might expect. You can serve it with a salad or other veggies. I used broccoli.
Rice
Carrots
Cashews
Prunes (dried plums)
Broccoli
Orange juice
Cinnamon
Vegetable stock
Onion
Sauté onions and carrots
Add cinnamon, prunes and cashews
Add rice
Add orange juice with stock
Cook Broccoli

Image from: unsplash.com

What is a “bug” in computer programming?

- A “bug” is an error within a program
- Bugs are very common and happen all the time!
- Software engineers spend a lot of their time “debugging” – finding and correcting bugs (aka troubleshooting)
- Sometimes bugs are something very simple like a typo, other times it can be a bigger issue that takes days or weeks to fix



Python

A few things about Python

- One of the most widely used and easy-to-learn programming languages
- Popular for beginners
- Can be used for websites and complex data analysis

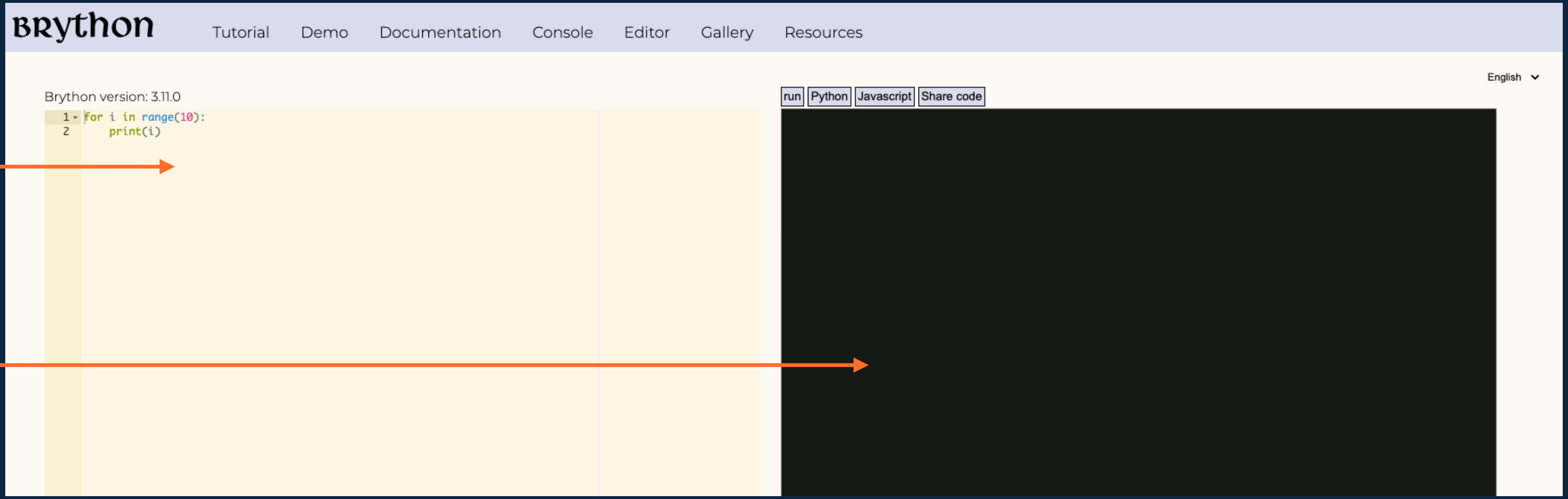
python™

Where do we write the code?

- Integrated Development Environment (IDE)
- Today we will use an online IDE so we can start coding without having to download anything to our computer
- Go to https://brython.info/tests/editor.html?lang=en

Editor window: where you write your code

Shell window: where the code is executed

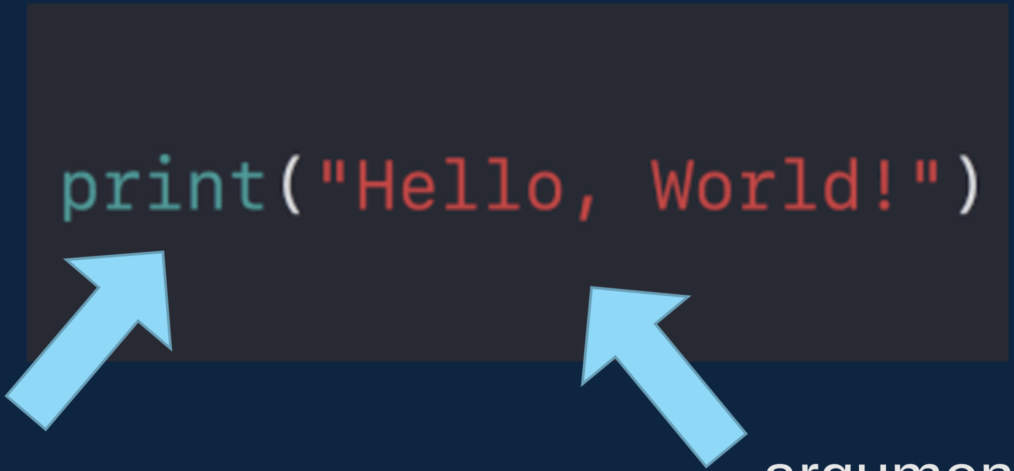


Brython version: 3.11.0

```
for i in range(10):
    print(i)
```

Let’s code!

- Task: print “Hello, World!”
- Python has a function called *print* that prints to the shell terminal



```
print("Hello, World!")
```

function

argument (what you want to print)

- Click on “Run” and see the output!

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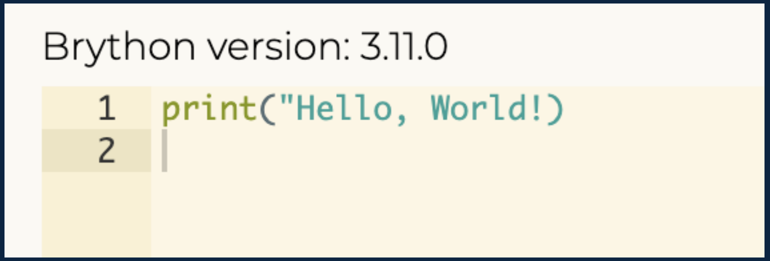
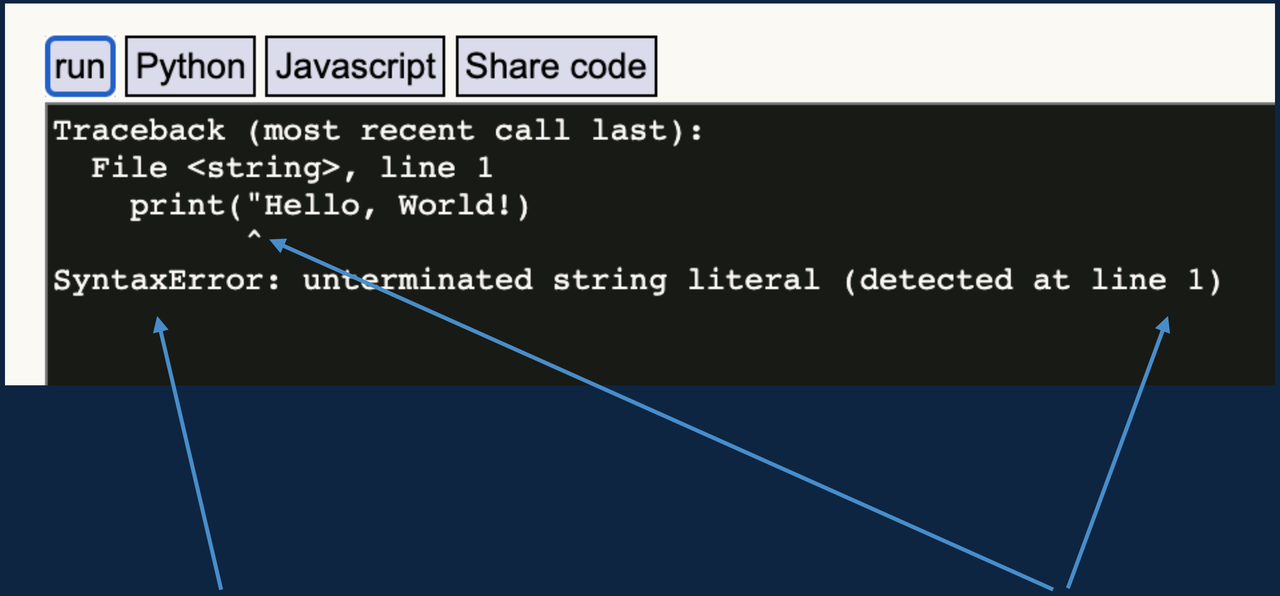
Error Messages

- Error messages are your friend!



Brython version: 3.11.0

```
print("Hello, World!)
```



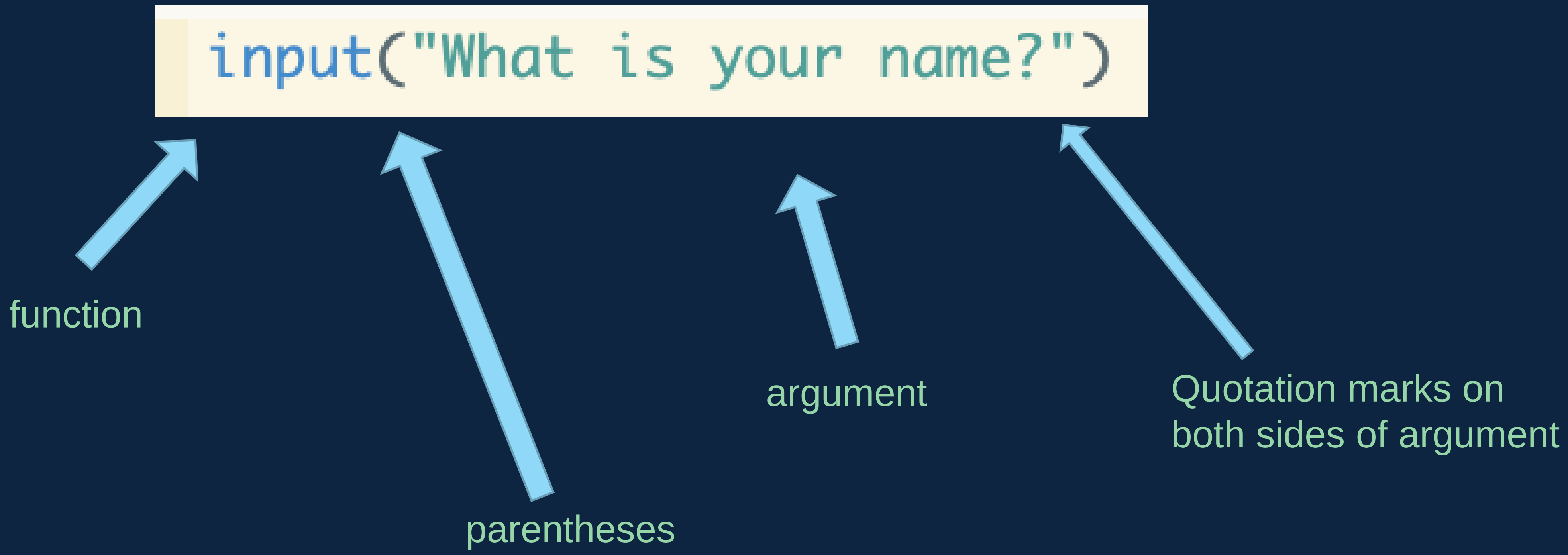
```
Traceback (most recent call last):
  File <string>, line 1
    print("Hello, World!)
          ^
SyntaxError: unterminated string literal (detected at line 1)
```

tells you what kind of error it is

tells you where the ”bug” is

How to get user input

- Now we want to say hello to the user (similar to many applications when you log in)
- How do we get user input?



```
input("What is your name?")
```

function

parentheses

argument

Quotation marks on both sides of argument

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How do we use the input?

- We need to store the input in a variable!

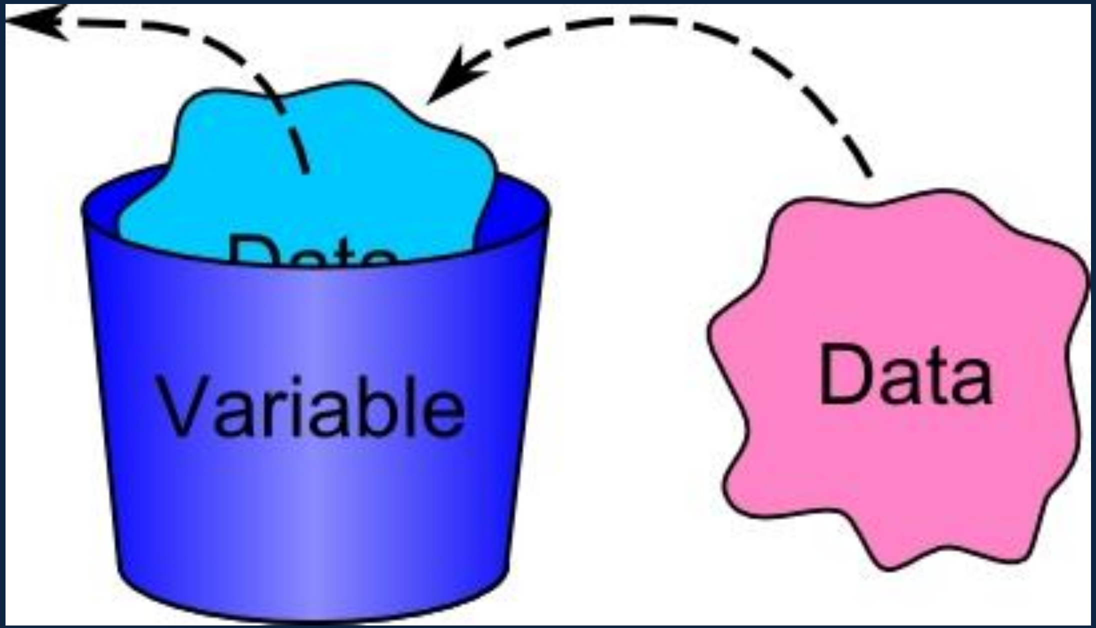


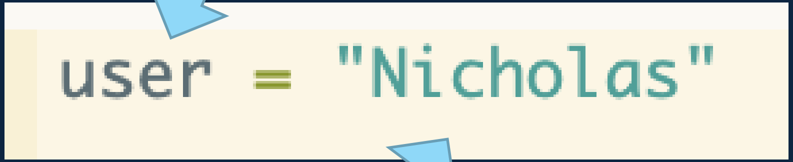
Image from: https://sites.google.com/a/iharrow.org.uk/compsci/2-2-programming/2-2-1-programming-concepts

What is a variable?

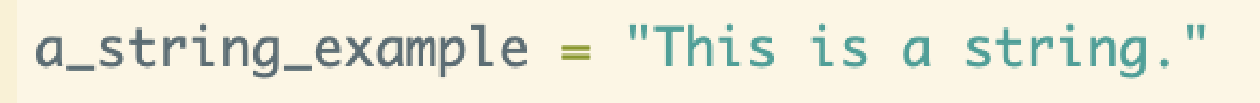
- Variable: container for storing a value
- Variables can be text, numbers, or other types of data

What is a variable?

- Variable: container for storing a value
- Variables can be text, numbers, or other types of data
- 1. Declare a variable



```
user = "Nicholas"
```



```
a_string_example = "This is a string."
```

- 2. Assign a value to that variable, using the assignment operator (=)
  - Variable names have to be one continuous word (underscores allowed, but no spaces)

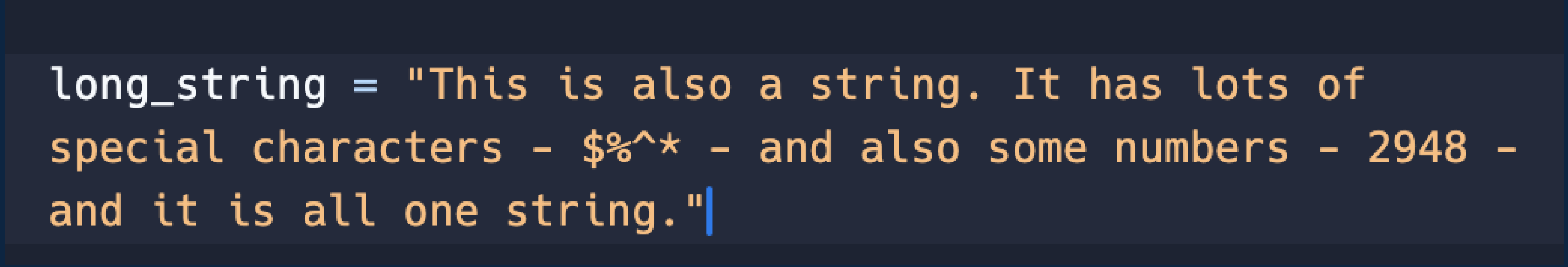
What is a string?

What is a string?

- A string is a data type
- A string is generally text, but can be any kind of character combination including letters, numbers, symbols, and special characters

Image from: unsplash.com

A string has to be placed inside quotation marks



```
favorite_food = "lasagna"

long_string = "This is also a string. It has lots of
special characters - $%^* - and also some numbers - 2948 -
and it is all one string."
```

“Hello, World!” version 2.0

- Instead of printing “Hello, World!”, write a program that prints ”Hello, [insert user name here]!” – for example, “Hello, Sandy!”

1. Get user input for user’s name (this should be a string)
2. Store user’s name in a variable
3. When printing “Hello, World!”, remove “World” and instead write your variable name for user’s name

“Hello, World!” version 2.0

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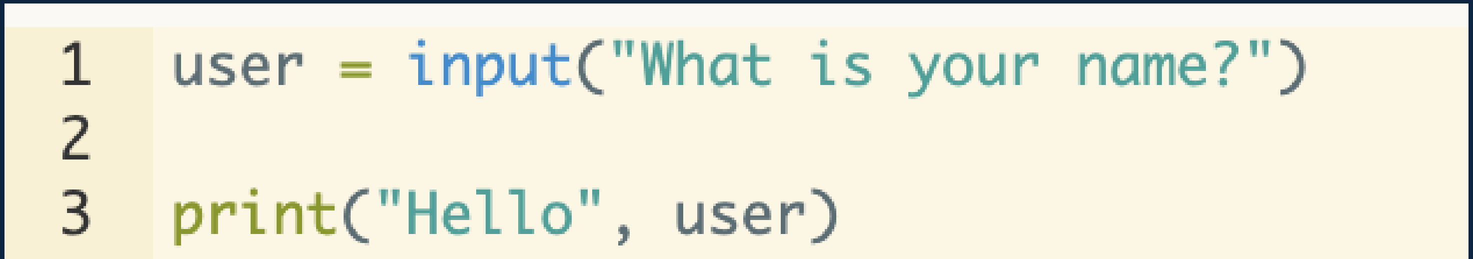


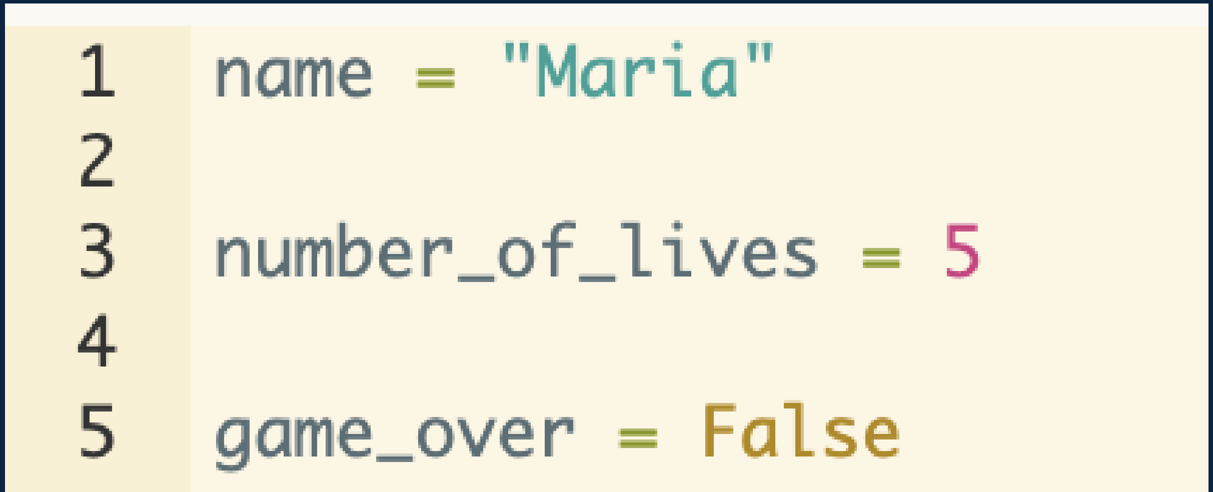
```
user = input("What is your name?")

print("Hello", user)
```

What other data types should I know?

Data Types in Python

- String
- Integer
- Boolean



```
name = "Maria"

number_of_lives = 5

game_over = False
```

Image from: unsplash.com

Boolean

- Only two options: True or False
- Are often used in if…else… statements
  - If [something is True], then…
  - If [something is False], then…

Image from: https://www.merriam-webster.com/games/true-or-false

Let’s code an activity together!

Why did the [insert animal] cross the road?

- Goal: Create a **program** that:
  - Asks the user for an animal.
  - Depending on which animal the user chooses, provide a joke involving that animal.
  - If the animal chosen does not have a joke associated with it, ask the user to try again with a different animal.

Image from: unsplash.com

Step 1: Get user input for animal

- Write a line of code that asks the user for an animal
- Make sure to store their answer in a variable!
- Print your variable on the next line to check your work!

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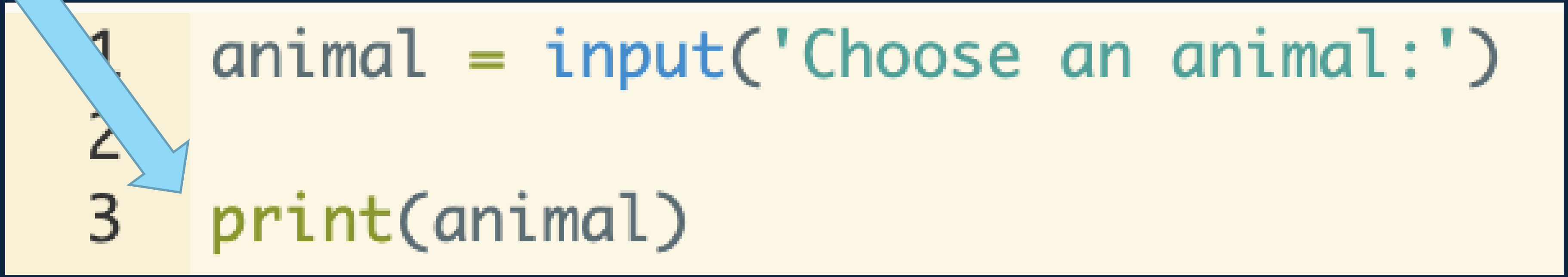


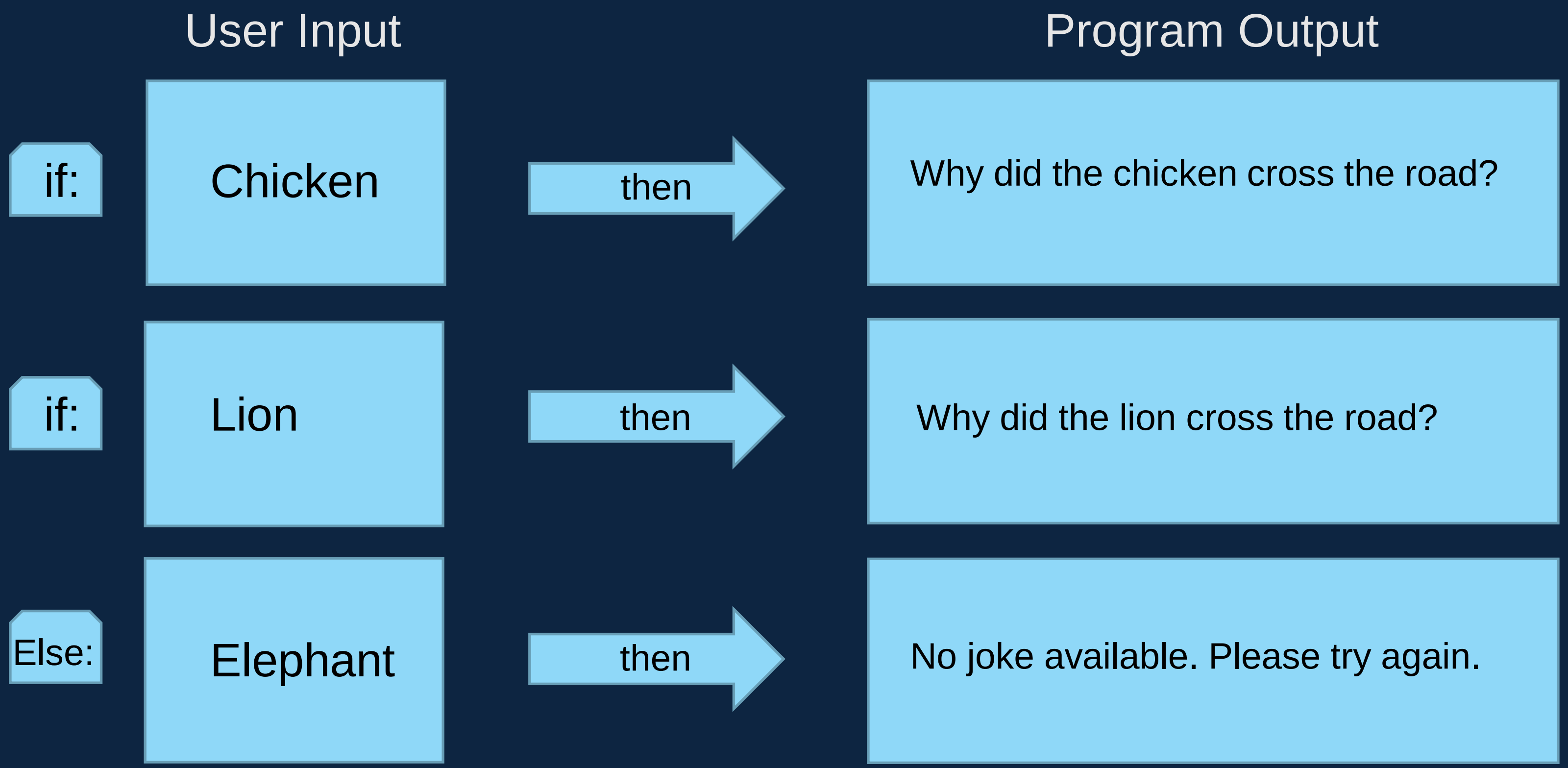
```python
animal = input('Choose an animal:')

print(animal)
```

Step 2: Add conditional logic to print correct joke

Conditional Statements

- If user chooses chicken, then tell chicken joke. If user chooses lion, then tell lion joke. If user chooses an animal that we don’t have a joke for, then tell the user to try again.



	User Input		Program Output
if:	Chicken	then	Why did the chicken cross the road?
if:	Lion	then	Why did the lion cross the road?
Else:	Elephant	then	No joke available. Please try again.

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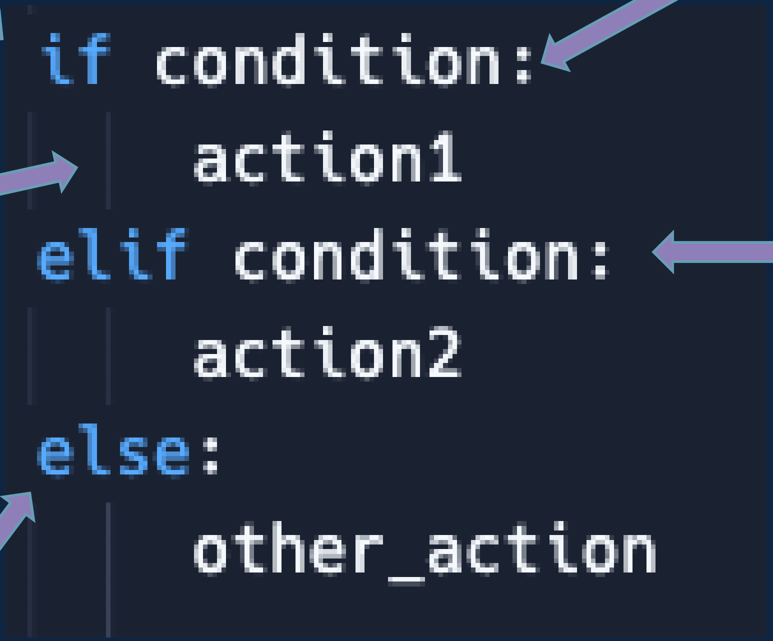
How to write if…else… statements in Python

first condition with “if”

colon



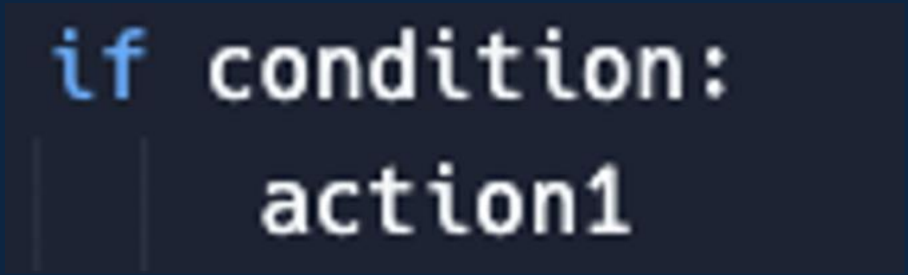
```
if condition:
    action1
elif condition:
    action2
else:
    other_action
```

indent

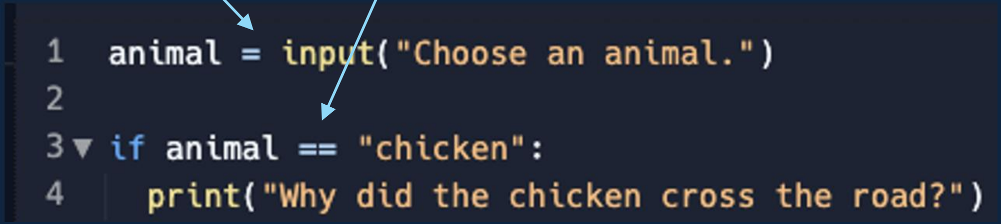
second condition with “elif”

all other conditions with “else”

Step 2: Add conditional logic to print correct joke



```
if condition:
    action1
```



assignment operator

equality operator

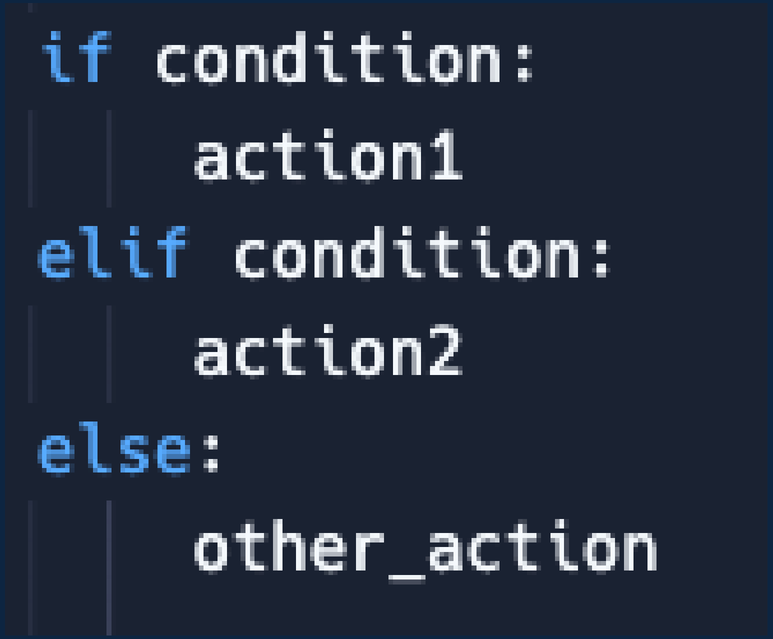
```
animal = input("Choose an animal.")

if animal == "chicken":
    print("Why did the chicken cross the road?")
```

Assignment operator: assigning value on the right to variable on the left

Equality operator: checking if both sides of the == are equal

- will return True if they are equal and False if they are not equal

Step 2: Add conditional logic to print correct joke



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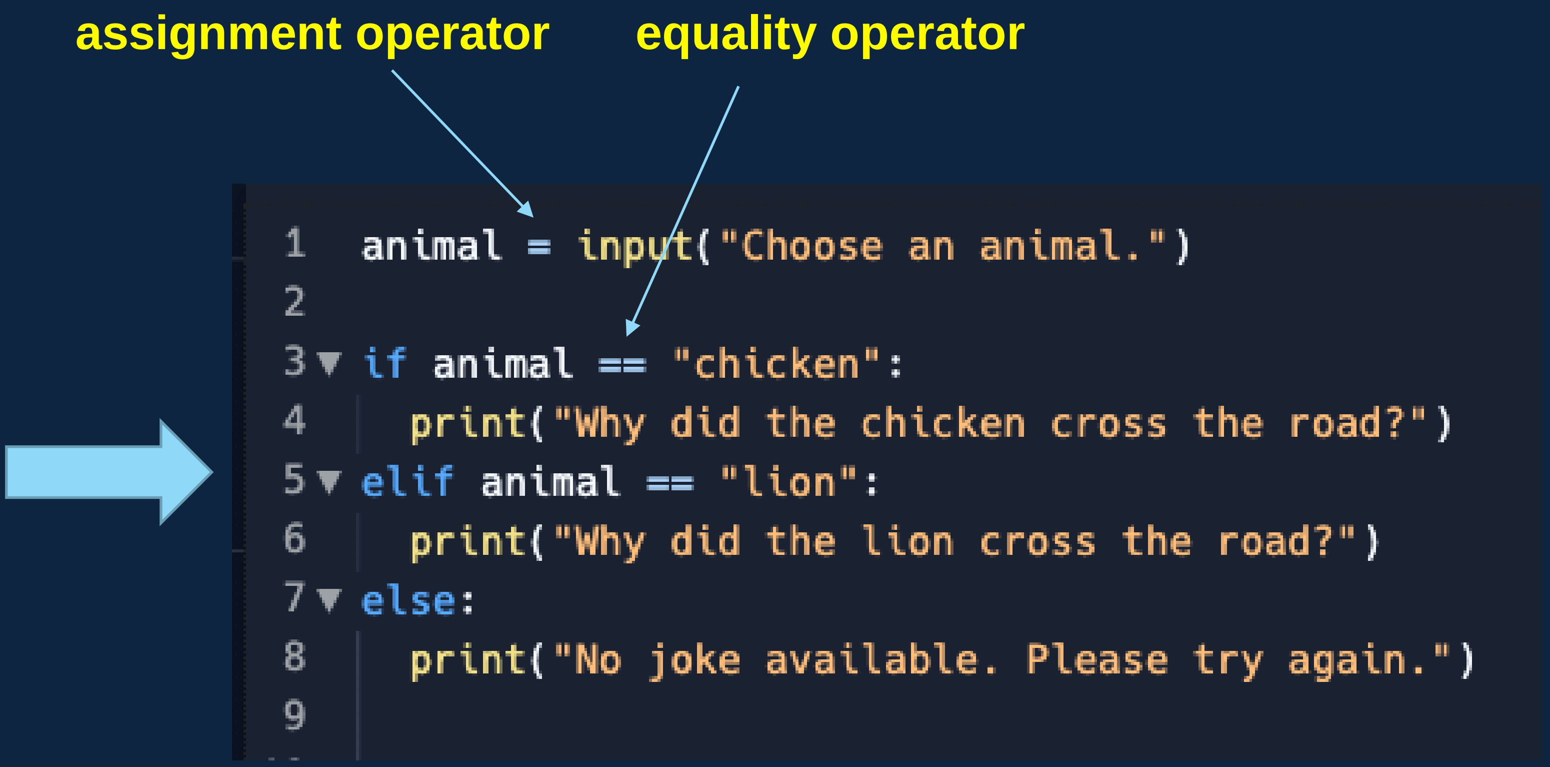


assignment operator

equality operator

```python
animal = input("Choose an animal.")

if animal == "chicken":
    print("Why did the chicken cross the road?")
elif animal == "lion":
    print("Why did the lion cross the road?")
else:
    print("No joke available. Please try again.")

```

Assignment operator: assigning value on the right to variable on the left

Equality operator: checking if both sides of the == are equal

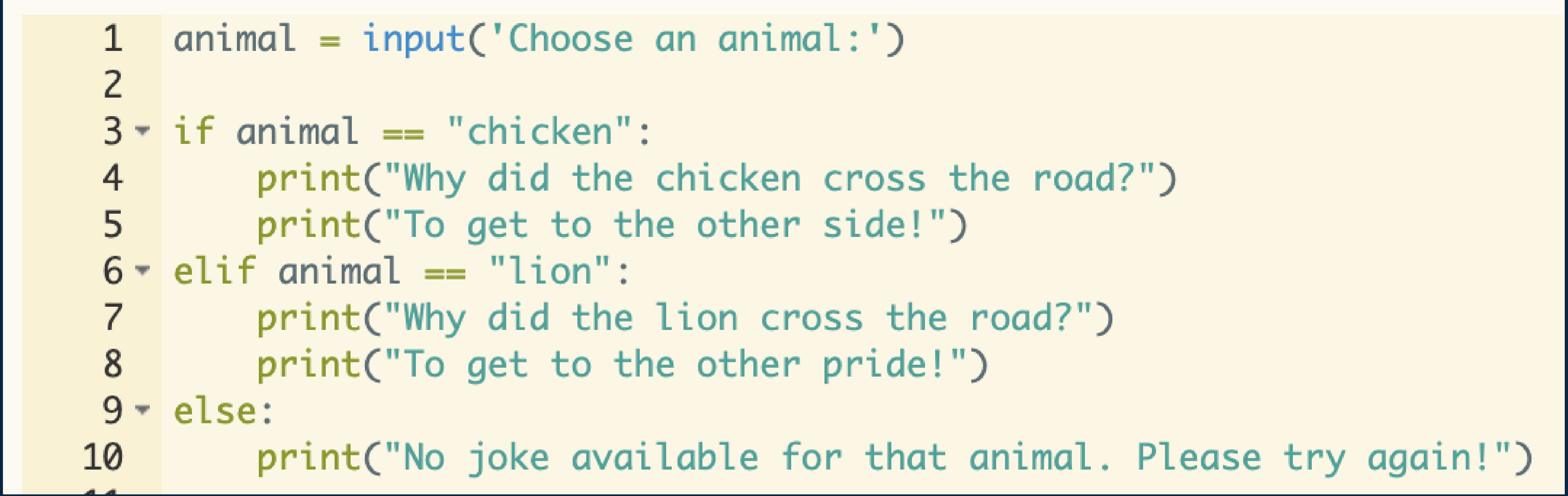
- will return True if they are equal and False if they are not equal

Step 3: Adding the punch line

- Go to this website: https://www.rd.com/article/why-did-the-chicken-cross-the-road-jokes/
- Decide which jokes you want to include (or you can make up your own!)
- Run your code!

Image from: unsplash.com

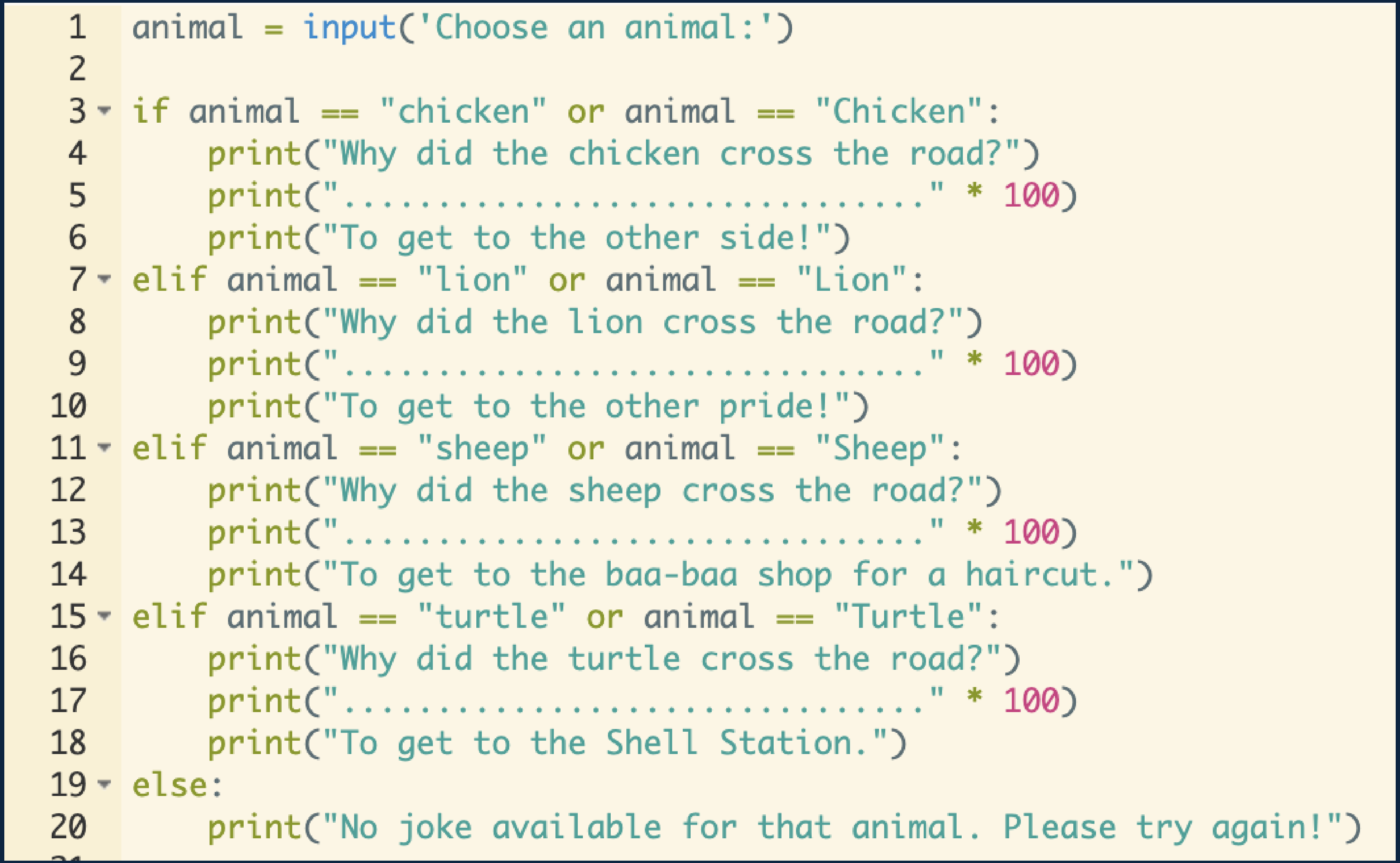
Step 3: Adding the punch line



```python
animal = input('Choose an animal:')

if animal == "chicken":
    print("Why did the chicken cross the road?")
    print("To get to the other side!")
elif animal == "lion":
    print("Why did the lion cross the road?")
    print("To get to the other pride!")
else:
    print("No joke available for that animal. Please try again!")
```

Step 3: A little fancier…



```python
animal = input('Choose an animal:')

if animal == "chicken" or animal == "Chicken":
    print("Why did the chicken cross the road?")
    print("..............................." * 100)
    print("To get to the other side!")
elif animal == "lion" or animal == "Lion":
    print("Why did the lion cross the road?")
    print("..............................." * 100)
    print("To get to the other pride!")
elif animal == "sheep" or animal == "Sheep":
    print("Why did the sheep cross the road?")
    print("..............................." * 100)
    print("To get to the baa-baa shop for a haircut.")
elif animal == "turtle" or animal == "Turtle":
    print("Why did the turtle cross the road?")
    print("..............................." * 100)
    print("To get to the Shell Station.")
else:
    print("No joke available for that animal. Please try again!")
```

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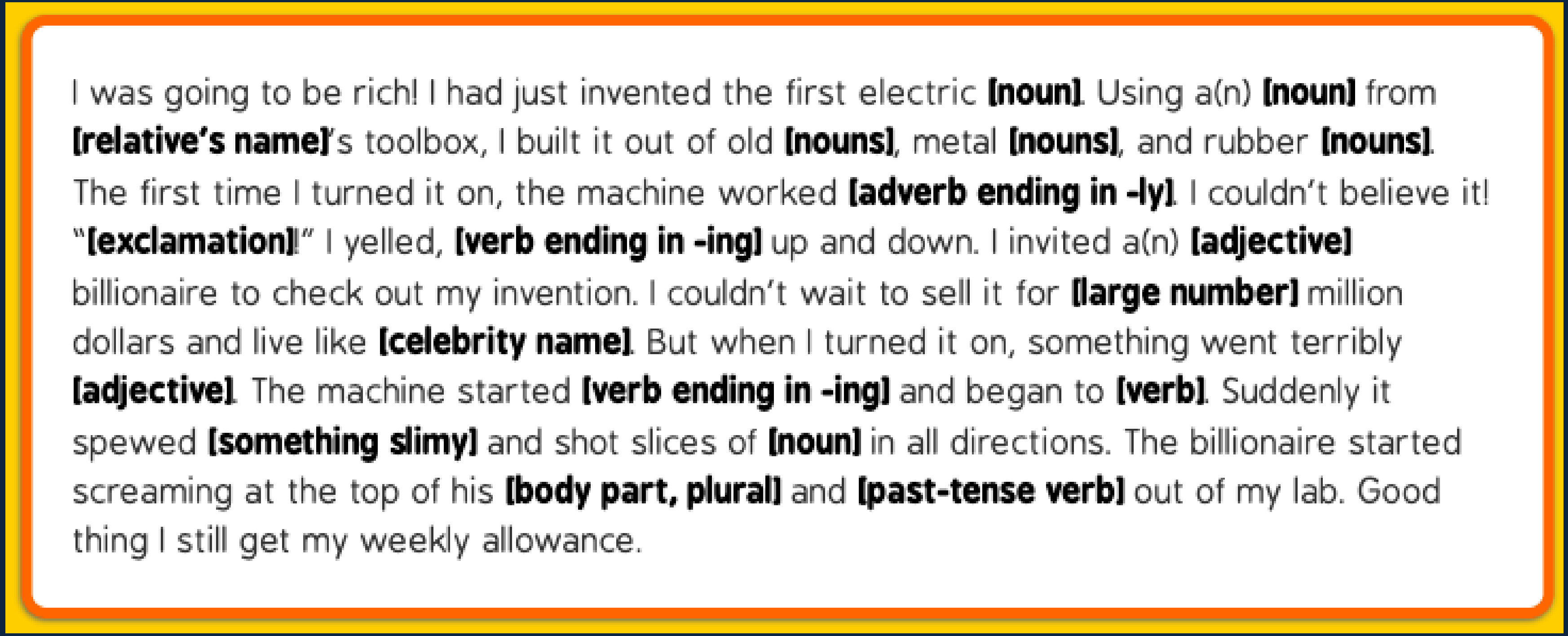
Congratulations! You have coded your first activity in Python!

If you have extra time:

- Try coding out a Mad Libs game
  - Ask for user input for verbs, nouns, adjectives, etc.
  - Print out the mad libs text with the user’s input inserted where those words belong



I was going to be rich! I had just invented the first electric **[noun]**. Using a(n) **[noun]** from **[relative’s name]**’s toolbox, I built it out of old **[nouns]**, metal **[nouns]**, and rubber **[nouns]**. The first time I turned it on, the machine worked **[adverb ending in -ly]**. I couldn’t believe it! “**[exclamation]**!” I yelled, **[verb ending in -ing]** up and down. I invited a(n) **[adjective]** billionaire to check out my invention. I couldn’t wait to sell it for **[large number]** million dollars and live like **[celebrity name]**. But when I turned it on, something went terribly **[adjective]**. The machine started **[verb ending in -ing]** and began to **[verb]**. Suddenly it spewed **[something slimy]** and shot slices of **[noun]** in all directions. The billionaire started screaming at the top of his **[body part, plural]** and **[past-tense verb]** out of my lab. Good thing I still get my weekly allowance.

https://kids.nationalgeographic.com/games/funny-fill-in/article/funny-fill-in-the-mad-inventor

Any volunteers to share their code and their activity?

Any questions?

To learn about more MITRE STEM events, visit **STEM.MITRE.org**

Slides by Alessandra Hagarty

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