

Intro to Programming

What is programming?



Programming is not a bunch of crazy numbers!

It's giving computers a set of instructions!



A Special Language

A language to talk
to dogs!



Programming is a
language to talk to
computers

People are smart! Computers are dumb!

SALAD INSTRUCTIONS

Programming is like a recipe!

Computers do EXACTLY what you say, every time.

Which is great if you give them a good recipe!

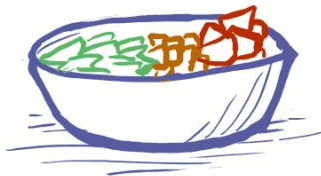
1) GET A LETTUCE HEAD, A CARROT, A TOMATO, A KNIFE, AND A BOWL



2) USE THE KNIFE TO CUT UP THE LETTUCE HEAD, CARROT, AND TOMATO



3) PUT THE LETTUCE, CARROT AND TOMATO IN THE BOWL



4) MIX THE CONTENTS OF THE BOWL



People are smart! Computers are dumb!

But if you get it
out of order....

A computer
wouldn't know
this recipe was
wrong!

SALAD INSTRUCTIONS

1) GET A LETTUCE HEAD,
A CARROT, A TOMATO, A
KNIFE, AND A BOWL



3) PUT THE LETTUCE,
CARROT AND TOMATO
IN THE BOWL



2) USE THE KNIFE TO CUT
UP THE LETTUCE HEAD,
CARROT, AND TOMATO



4) MIX THE CONTENTS
OF THE BOWL



People are smart! Computers are dumb!

Computers are bad at filling in the gaps!

A computer wouldn't know something was missing, it would just freak out!

SALAD INSTRUCTIONS



Everyone/thing has strengths!



- Understand instructions despite:
 - Spelling mistakes
 - Typos
 - Confusing parts
- Solve problems
- Tell computers what to do
- Get smarter every day



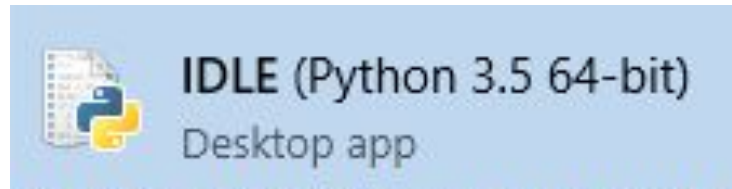
- Does exactly what you tell it
- Does it the same every time
- Doesn't need to sleep
- Will work for hours on end
- Doesn't get bored
- Really really fast
- Get smarter when you tell it how

Intro to Python

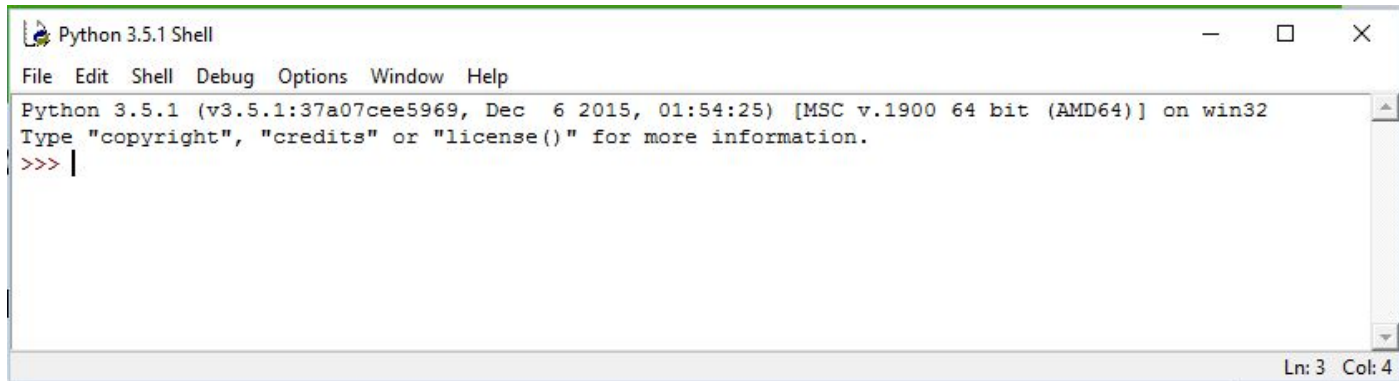
Let's get coding!

Where do we program? In IDLE

Click the start button and type IDLE!



Make sure the first number after "Python" is 3!

A screenshot of a Windows application window titled "Python 3.5.1 Shell". The window has a menu bar with "File", "Edit", "Shell", "Debug", "Options", "Window", and "Help". The main text area displays the following text: "Python 3.5.1 (v3.5.1:37a07cee5969, Dec 6 2015, 01:54:25) [MSC v.1900 64 bit (AMD64)] on win32", "Type \"copyright\", \"credits\" or \"license()\" for more information.", and a prompt ">>> |". The status bar at the bottom right shows "Ln: 3 Col: 4".

Make a mistake!

Type by **button mashing** the keyboard!

Then press enter!

asdf asdjlkj;pa j;k4uroei

Did you get a big red error message?

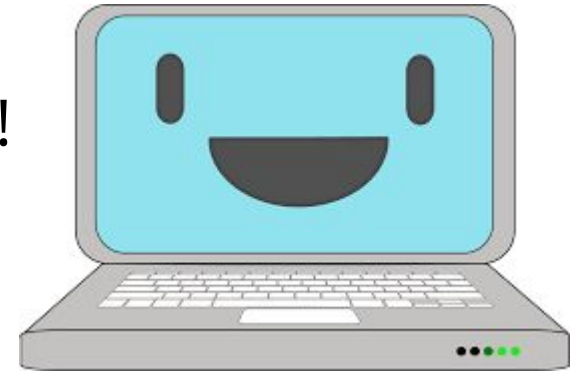
Mistakes are great!

*SyntaxError:
Invalid Syntax*

Good work you made an error!

*ImportError:
No module
named humour*

- Programmers make A LOT of errors!
- Errors give us hints to find mistakes
- Run your code often to get the hints!!
- Mistakes won't break computers!



*KeyError:
'Hairy Potter'*

*AttributeError:
'NoneType' object
has no attribute
'foo'*

*TypeError: Can't
convert 'int' object
to str implicitly*

We can learn from our mistakes!

Error messages help us fix our mistakes!
We read error messages from bottom to top

Traceback (most recent call last):

File "C:/Users/Madeleine/Desktop/tmp.py", line 9, in <module>
 print("I have " + 5 + " apples")

TypeError: can only concatenate str (not "int") to str

1. What went wrong

2. What code didn't work

3. Where that code is

Write some code!!

Type this into the window
Then press enter!

```
print('hello world')
```

Did it print:

hello world

???

Tell me more!

We can `print` things in lots of different ways in python!

```
>>> print("Hello world!")
```

```
>>> print("Hello", "world!")
```

```
>>> print("Hello", "world", end="!")
```

Tell me more!

We can `print` things in lots of different ways in python!

```
>>> print("Hello world!")
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```
Hello world!
```

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```

```
>>> print("Hello", "world!")
```

```
Hello world!
```

```
>>> print("Hello", "world", end="!")
```

```
Hello world!
```

Note that this last one will not have a new line after it!

Tell me more!

We can `print` on many lines at once!

```
>>> print("""Hello world.
```

```
This is me!
```

```
Life should be fun for everyone""")
```

Tell me more!

We can `print` on many lines at once!

```
>>> print("""Hello world.
```

```
This is me!
```

```
Life should be fun for everyone""")
```

```
Hello world.
```

```
This is me!
```

```
Life should be fun for everyone
```

Python the calculator!

Try writing some maths into python!

```
>>> 1 + 5
```

```
>>> 2 - 7
```

```
>>> 2 * 8
```

```
>>> 12/3
```

Python the calculator!

Try writing some maths into python!

```
>>> 1 + 5
```

```
6
```

```
>>> 2 - 7
```

```
>>> 2 * 8
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```
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```
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```
>>> 2 - 7
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-5
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```
>>> 2 * 8
```

```
16
```

```
>>> 12/3
```

Python the calculator!

Try writing some maths into python!

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>>> 1 + 5
```

```
6
```

```
>>> 2 - 7
```

```
-5
```

```
>>> 2 * 8
```

```
16
```

```
>>> 12/3
```

```
4
```


A calculator for words!

What do you think these bits of code do?

Try them and see!

```
>>> "cat" + "dog"
```

```
>>> "tortoise" * 3
```

A calculator for words!

What do you think these bits of code do?

Try them and see!

```
>>> "cat" + "dog"
```

```
catdog
```

```
>>> "tortoise" * 3
```

A calculator for words!

What do you think these bits of code do?

Try them and see!

```
>>> "cat" + "dog"
```

```
catdog
```

```
>>> "tortoise" * 3
```

```
tortoisetortoisetortoise
```

Strings!

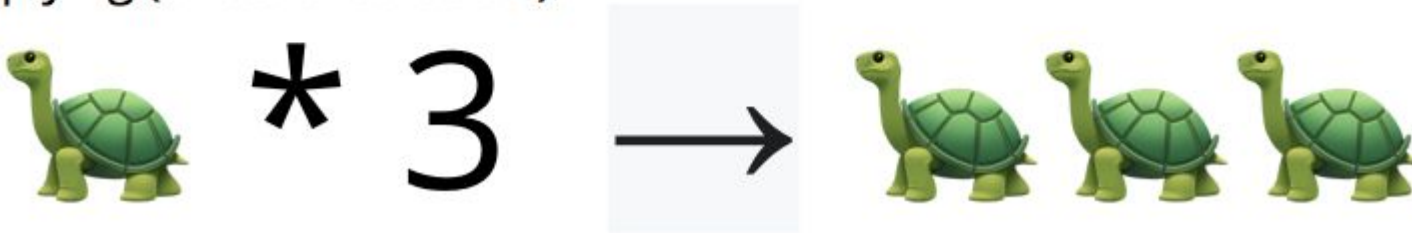
Strings are things with "quotes"

To python they are essentially just a bunch of pictures!

Adding :



Multiplying (3 lots of tortoise!):



Strings!

Strings can have any letters in them, even just spaces!

```
"Hello, world!"
```

```
"bla bla bla"
```

```
":)"
```

```
" "
```

```
'I can use single quotes too!'
```

```
"~\_(\ツ)\_/~"
```

```
"asdfghjklqwertyuiopzxcvbnm"
```

```
"DOGS ARE AWESOME!"
```

```
"!@#$%^&*()_+--[|\\:;'<>,./?"
```

Strings and Ints!

Integers are numbers in python.

We can do maths with integers but not strings

```
>>> 5 + "5"
```

We can turn a string into an integer using `int()`

```
>>> 5 + int("5")
```

Similarly, we turn an integer into a string using `str()`

```
>>> str(5) + "5"
```

Strings and Ints!

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TypeError: unsupported operand type(s) for +: 'int' and 'str'
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```
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```

```
10
```

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Strings and Ints!

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We can turn a string into an integer using `int()`

```
>>> 5 + int("5")
```

```
10
```

Similarly, we turn an integer into a string using `str()`

```
>>> str(5) + "5"
```

```
'55'
```

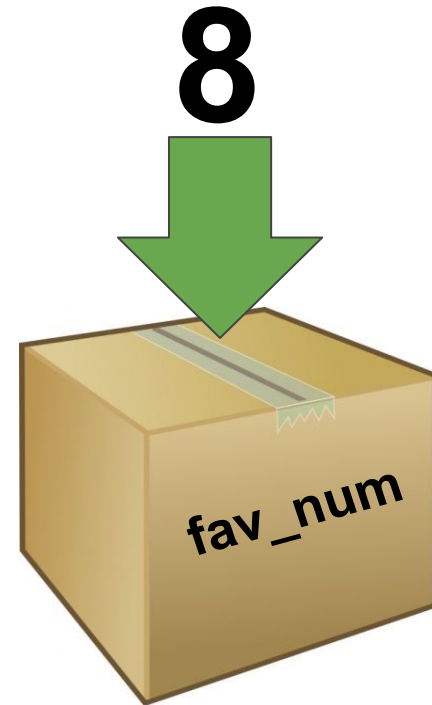
No Storing is Boring!

It's useful to be able to remember things for later!

Computers remember things in "**variables**"

Variables are like putting things into a **labeled cardboard box**.

Let's make our favourite number 8 today!



Variables

Instead of writing the number 8, we can write fav_num.



$$\text{fav_num} - 6 \\ \Rightarrow \mathbf{2}$$

$$\text{fav_num} + 21 \\ \Rightarrow \mathbf{29}$$

$$\text{fav_num} * 2 \\ \Rightarrow \mathbf{16}$$

$$\text{fav_num} / 2 \\ \Rightarrow \mathbf{4}$$

Variables

Instead of writing the number 8, we can write fav_num.



fav_num - 6
=> 2

fav_num + 21
=> 29

fav_num * 2
=> 16

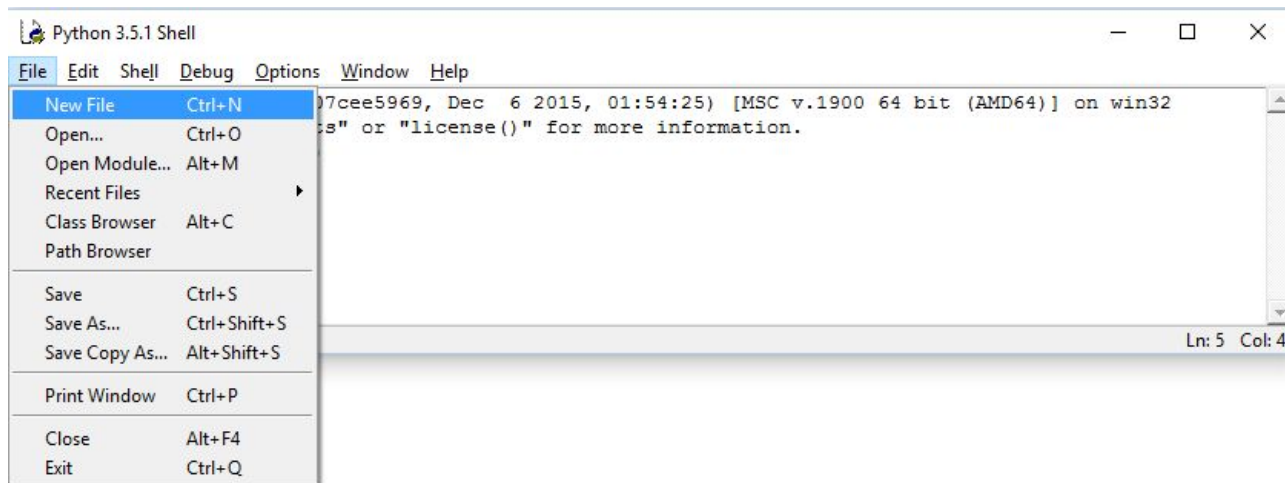
We'll come back to this later!

But writing 8 is
much shorter than
writing fav_num???



Coding in a file!

Code in a file is code we can run multiple times! Make a reusable “hello world”!



1. Make a new file called hello.py, like the picture
2. Put your `print('hello world')` code in it
3. Run your file using the F5 key

Adding a comment!

Sometimes we want to write things in our file that the computer doesn't look at. We can use **comments** for that!

Sometimes we want to write a note for a people to read

```
# This code was written by Vivian
```

And sometimes we want to not run some code (but don't want to delete it!)

```
# print("Goodbye world!")
```

Try it!

1. Add a comment to your hello.py file
2. Run your code to make sure it doesn't do anything extra!

Project time!

You now know all about printing and variables!

Let's put what we learnt into our project
Try to do the next Part!

The tutors will be around to help!

If Statements

Conditions!

Conditions let us make decision.

First we test if the condition is met!

Then maybe we'll do the thing



If it's raining take an umbrella

Yep it's raining

..... take an umbrella

Booleans (True and False)

computers store whether a condition is met in the form of

True and **False**

To figure out if something is **True** or **False** we do a comparison

`5 < 10`

`3 + 2 == 5`

`5 != 5`

`"Dog" == "dog"`

`"D" in "Dog"`

`"Q" not in "Cat"`

Booleans (True and False)

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To figure out if something is **True** or **False** we do a comparison

<code>5 < 10</code>	True	<code>"Dog" == "dog"</code>
<code>3 + 2 == 5</code>		<code>"D" in "Dog"</code>
<code>5 != 5</code>		<code>"Q" not in "Cat"</code>

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`5 < 10` **True**

`3 + 2 == 5` **True**

`5 != 5`

`"Dog" == "dog"`

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5 < 10	True	"Dog" == "dog"	False
3 + 2 == 5	True	"D" in "Dog"	True
5 != 5	False	"Q" not in "Cat"	

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True and **False**

To figure out if something is **True** or **False** we do a comparison

5 < 10	True	"Dog" == "dog"	False
3 + 2 == 5	True	"D" in "Dog"	True
5 != 5	False	"Q" not in "Cat"	True

Booleans (True and False)

Python has some special comparisons for checking if something is **in** something else. **Try these!**

```
>>> "A" in "AEIOU"  
>>> "Z" in "AEIOU"  
>>> "a" in "AEIOU"
```

```
>>> animals = ["cat", "dog", "goat"]  
>>> "banana" in animals  
>>> "cat" in animals
```

```
>>> phone_book = {"Maddie": 111, "Lucy": 222, "Julia": 333}  
>>> "Maddie" in phone_book  
>>> "Gabe" in phone_book  
>>> 333 in phone_book
```

Booleans (True and False)

Python has some special comparisons for checking if something is **in** something else. **Try these!**

True

"A" in "AEIOU"

False

"Z" in "AEIOU"

False

"a" in "AEIOU"

False

"banana" in animals

True

"cat" in animals

```
>>> animals = ["cat", "dog", "goat"]
```

```
>>> phone_book = {"Maddie": 111, "Lucy": 222, "Julia": 333}
```

True

"Maddie" in phone_book

False

"Gabe" in phone_book

False

333 in phone_book

It only checks in the keys!

Conditions

So to know whether to do something, they find out if it's **True**!

```
fave_num = 5
if fave_num < 10:
    print("that's a small number")
```

Conditions

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```
fave_num = 5  
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That's the
condition!

Conditions

So to know whether to do something, they find out if it's **True**!

```
fave_num = 5
if fave_num < 10:
    print("that's a small number")
```

That's the
condition!

Is it **True** that fave_num is less than 10?

- Well, fave_num is 5
- And it's **True** that 5 is less than 10
- So it is **True**!

Conditions

So to know whether to do something, they find out if it's **True**!

```
fave_num = 5
if True:
    print("that's a small number")
```

Put in the
answer to
the question

Is it **True** that fave_num is less than 10?

- Well, fave_num is 5
- And it's **True** that 5 is less than 10
- So it is **True**!

Conditions

So to know whether to do something, they find out if it's **True**!

```
fave_num = 5
if True:
    print("that's a small number")
```

What do you think happens?

```
>>>
```

Conditions

So to know whether to do something, they find out if it's **True**!

```
fave_num = 5
if True:
    print("that's a small number")
```

What do you think happens?

```
>>> that's a small number
```


Conditions

How about a different number???



```
fave_num = 9000  
if fave_num < 10:  
    print("that's a small number")
```

Conditions

Find out if it's **True**!

```
fave_num = 9000
if False:
    print("that's a small number")
```

Put in the
answer to
the question

Is it **True** that fave_num is less than 10?

- Well, fave_num is 9000
- And it's not **True** that 9000 is less than 10
- So it is **False**!

Conditions

How about a different number???

```
fave_num = 9000  
if fave_num < 10:  
    print("that's a small number")
```



What do you think happens?

```
>>>
```

Conditions

How about a different number???

```
fave_num = 9000  
if fave_num < 10:  
    print("that's a small number")
```



What do you think happens?

```
>>>
```



Nothing!

If statements

```
fave_num = 5  
if fave_num < 10:  
    print("that's a small number")
```

This line ...

... controls this line

If statements

Actually

```
fave_num = 5
if fave_num < 10:
    print("that's a small number")
    print("and I like that")
    print("A LOT!!")
```

This line ...

... controls anything below it
that is indented like this!

If statements

```
fave_num = 5
if fave_num < 10:
    print("that's a small number")
    print("and I like that")
    print("A LOT!!")
```

What do you think happens?

```
>>>
```

If statements

```
fave_num = 5
if fave_num < 10:
    print("that's a small number")
    print("and I like that")
    print("A LOT!!")
```

```
>>> that's a small number
>>> and I like that
>>> A LOT!!
```


If statements

```
word = "GPN"  
if word == "GPN":  
    print("GPN is awesome!")
```

What happens?

If statements

```
word = "GPN"  
if word == "GPN":  
    print("GPN is awesome!")
```

What happens?

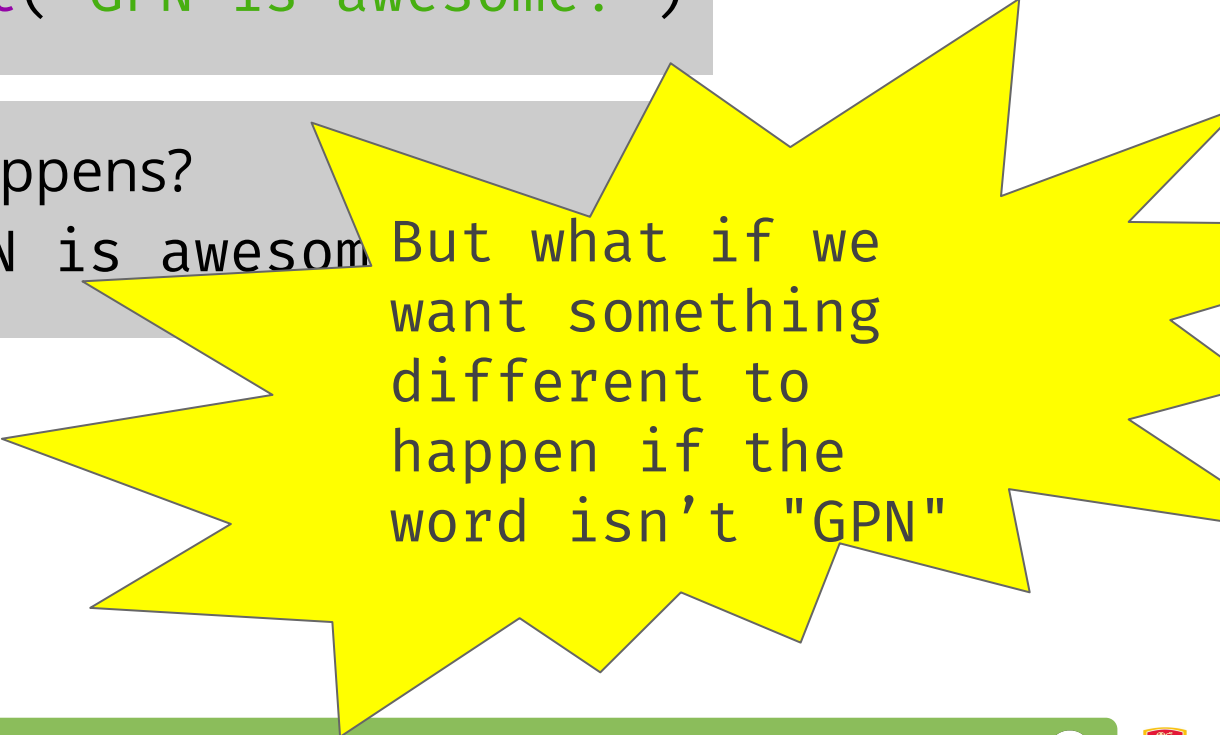
```
>>> GPN is awesome!
```

If statements

```
word = "GPN"  
if word == "GPN":  
    print("GPN is awesome!")
```

What happens?

```
>>> GPN is awesome
```



But what if we
want something
different to
happen if the
word isn't "GPN"

Else statements

else
statements
means something
still happens if
the **if** statement
was **False**

```
word = "Chocolate"  
if word == "GPN":  
    print("GPN is awesome!")  
else:  
    print("The word isn't GPN :(")
```

What happens?

Else statements

else
statements
means something
still happens if
the **if** statement
was **False**

```
word = "Chocolate"  
if word == "GPN":  
    print("GPN is awesome!")  
else:  
    print("The word isn't GPN :(")
```

What happens?

```
>>> The word isn't GPN :(
```

Elif statements

elif

Means we can
give specific
instructions for
other words

```
word = "Chocolate"
if word == "GPN":
    print("GPN is awesome!")
elif word == "Chocolate":
    print("YUMMM Chocolate!")
else:
    print("The word isn't GPN :(")
```

What happens?

Elif statements

elif

Means we can
give specific
instructions for
other words

```
word = "Chocolate"
if word == "GPN":
    print("GPN is awesome!")
elif word == "Chocolate":
    print("YUMMM Chocolate!")
else:
    print("The word isn't GPN :(")
```

What happens?

```
>>> YUMMM Chocolate!
```

Project Time!

You now know all about **if** and **else**!

See if you can do Part 6

The tutors will be around to help!