

Welcome to GPN

Who are the tutors?

Who are you?

Log on

Log on and jump on the GPN website

girlsprogramming.network/workshop

You can see:

- These **slides** (to take a look back or go on ahead).
- A digital copy of your **workbook**.
- Help bits of text you can **copy and paste**!

There's also links to places where you can do more programming!

Tell us you're here!

Click on the
Start of Day Survey
and fill it in now!

Today's project!

Markov Chains!

What is a Markov Chain?

A Markov chain is a simple Artificial Intelligence!

Let's play a game with some cups to help explain it

Let's play the cups game!

Let's generate some text in the style of
Green Eggs & Ham by Dr Seuss

Do you like green eggs and ham?

I do not like them, Sam-I-am.

I do not like green eggs and ham.

Would you like them here or there?

I would not like them here or there.

I would not like them anywhere.

Let's play the cups game!

- Each cup is labelled with a word from Green Eggs and Ham
- Each cup contains the words that follow the label in Green Eggs and Ham

Let's play the cups game!

Read the outside of your cup!

If you hear someone shout the word on the outside of your cup:

1. Pick a piece of paper from inside your cup
2. Shout out the word on the piece of paper
3. Put the piece of paper back in your cup



Today we'll be making Markov Chains!

Markov chains are exactly what we just did with the cups!

Today we'll make the computer do it too to make some crazy stories!!

Here's one we made from some Shakespeare!

doth stay! All days when I compare thee to unseeing
eyes be blessed made By chance, or eyes can see, For
all the top of happy show thee in dark directed. Then
thou, whose shadow shadows doth stay! All days when I
compare thee in your self in inward worth nor outward
fair, Can make bright, How would thy shade Through
heavy sleep on the eye of life repair, Which this,
Time's pencil, or my pupil pen, Neither in the living
day, When in eternal lines of that fair from fair
thou grow'st, So should the lines to a summer's day?



Imagine if you used one of these to do your homework!!

Using the workbook!

The workbooks will help you put your project together!

Each **Part** of the workbook is made of tasks!

Tasks - The parts of your project

Follow the tasks **in order** to make the project!

Hints - Helpers for your tasks!

Stuck on a task, we might have given you a hint to help you **figure it out**!

The hints have **unrelated** examples, or tips. **Don't copy and paste** in the code, you'll end up with something **CRAZY**!

Task 6.2: Add a blah to your code!

This has instructions on how to do a part of the project

1. **Start by doing this part**
2. **Then you can do this part**

Task 6.1: Make the thing do blah!

Make your project do blah

Hint

A clue, an example or some extra information to help you **figure out** the answer.

```
print('This example is not part of the project' )
```

Using the workbook!

The workbooks will help you put your project together!

Check off before you move on from a **Part!** Do some bonuses while you wait!

Checklist - Am I done yet?

Make sure you can tick off every box in this section before you go to the next Part.

Lecture Markers

This tells you you'll find out how to do things for this section during the names lecture.

Bonus Activities

Stuck waiting at a lecture marker? Try a purple bonus. They add extra functionality to your project along the way.



CHECKPOINT



If you can tick all of these off you're ready to move the next part!

- ☐ Your program does blah
- ☐ Your program does blob



★ BONUS 4.3: Do some extra!

Something to try if you have spare time before the next lecture!



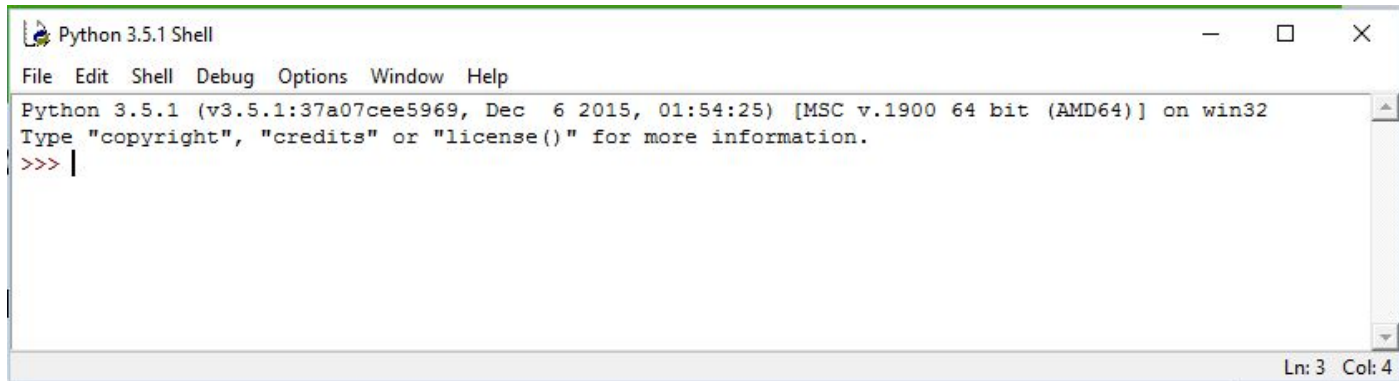
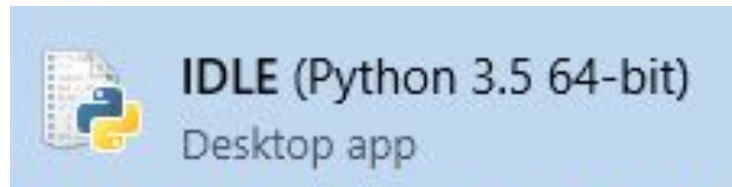
Intro to Python

Let's get coding!

Where do we program? In IDLE

Click the start button and type IDLE!

Make sure you click one that says **Python 3.x**



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?

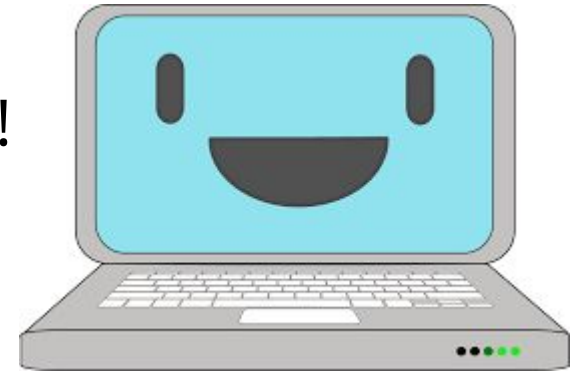
Mistakes are great!

*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!



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

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

*KeyError:
'Hairy Potter'*

Write some code!!

This is the first bit of code we will do. What do you think it does?

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

It prints the words “hello world” onto the screen!

Reusing variables

We can replace values in variables:

```
animal = "dog"
print("My favourite animal is a " + animal)
animal = "cat"
print("My favourite animal is a " + animal)
animal = animal + "dog"
print("My favourite animal is a " + animal)
```

What will this output? `My favourite animal is a dog`
`My favourite animal is a cat`
`My favourite animal is a catdog`

Asking a question!

It's more fun when we get to interact with the computer!

Let's get the computer to ask us a question!

```
my_name = input('What is your name? ')\nprint('Hello ' + my_name)
```

What do you think happens?

Asking a question!

Store the answer
in the variable
my_name

Writing input tells
the computer to
wait for a response

This is the question
you want printed to
the screen

```
my_name = input('What is your name? ')\nprint('Hello ' + my_name)
```

What do you think happens?

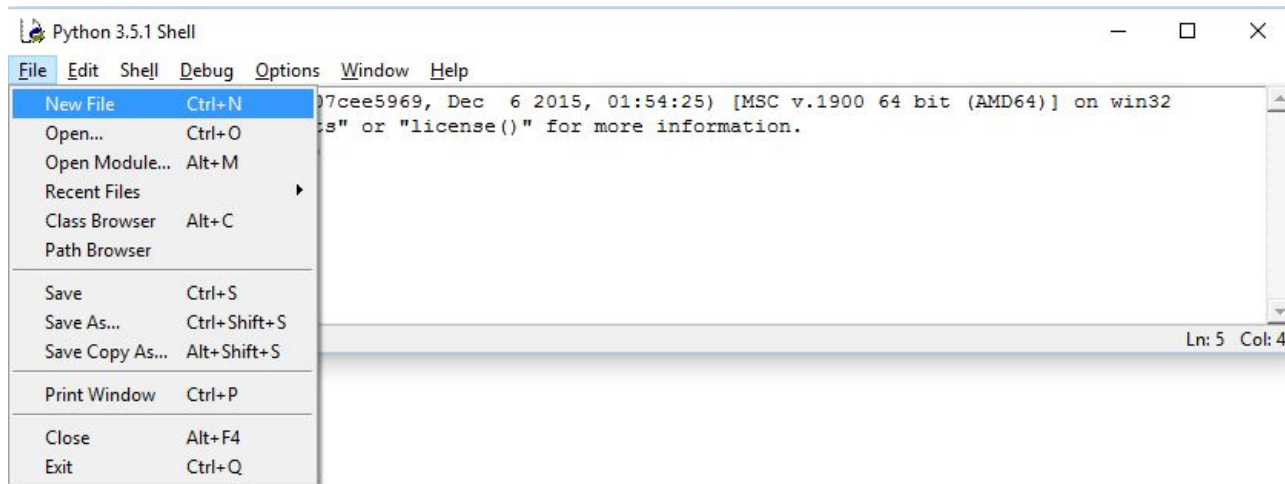
What is your name? Maddie

Hello Maddie

We can use the answer
the user wrote that we
then stored later!

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 code that the computer doesn't look at! We use **comments** for that!

Use comments to write a note or explanation of our code
Comments make code easier for humans to understand

```
# This code was written by Sheree
```

We can make code into a comment if we don't want it to run (but don't want to delete it!)

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

Project time!

You now know all about printing and variables and input!

Let's put what we learnt into our project
Try to do Part 0 - Part 2

The tutors will be around to help!

If Statements and Lists

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

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

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")
```

What do you think happens?

```
>>>
```

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")
```

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")
```

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

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

What happens?

If statements

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

What happens?

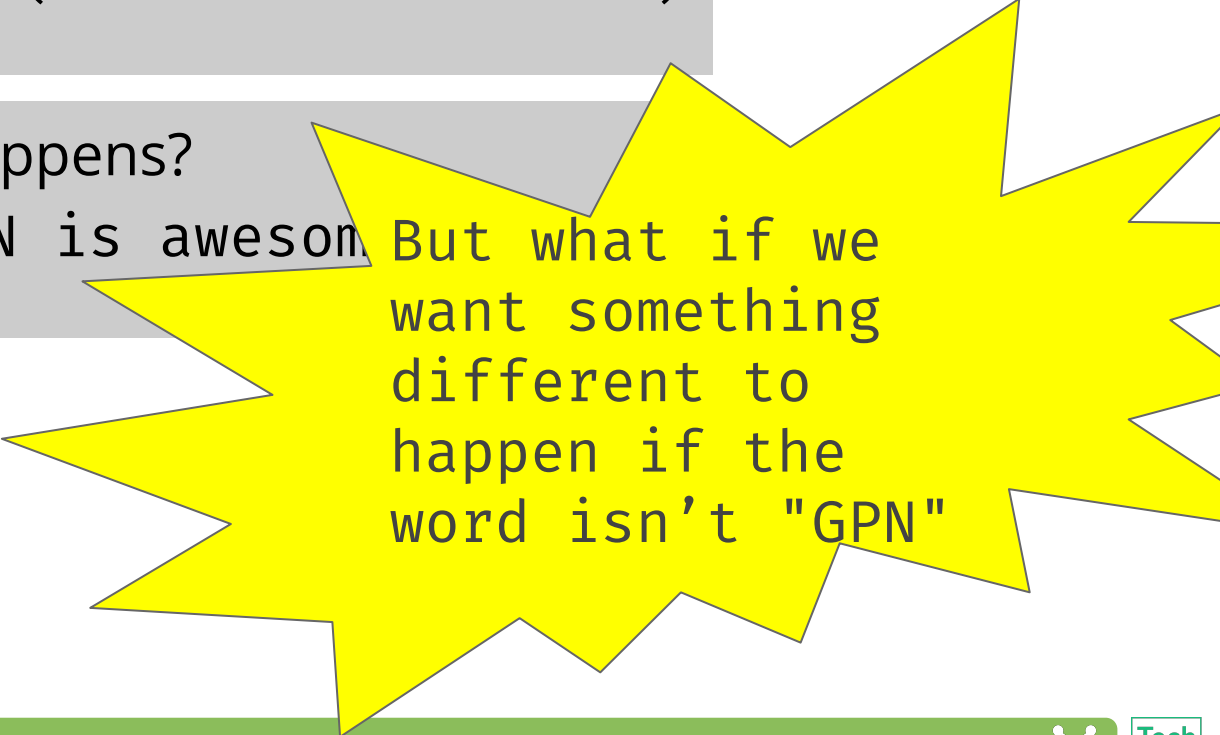
```
>>> GPN is awesome!
```

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 :(")
```

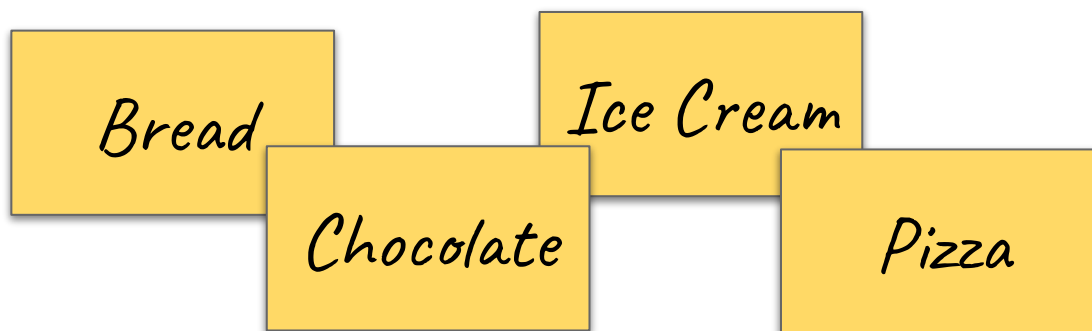
What happens?

```
>>> YUMM Chocolate!
```

Lists

When we go shopping, we write down what we want to buy!

But we don't store it on lots of little pieces of paper!



We put it in one big shopping list!

- Bread
- Chocolate
- Ice Cream
- Pizza

Lists

It would be annoying to store it separately when we code too

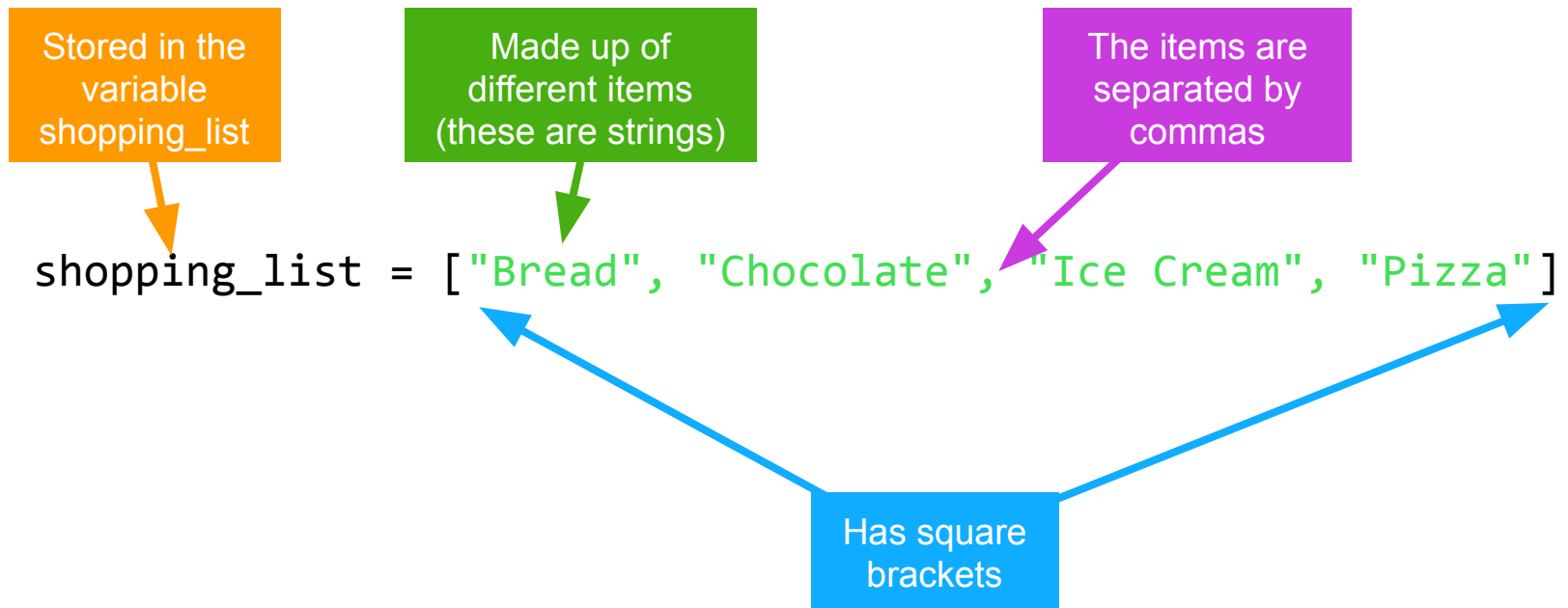
```
>>> shopping_item1 = "Bread"  
>>> shopping_item2 = "Chocolate"  
>>> shopping_item3 = "Ice Cream"  
>>> shopping_item4 = "Pizza"
```

So much repetition!

Instead we use a python list!

```
>>> shopping_list = ["Bread", "Chocolate", "Ice Cream",  
"Pizza"]
```


List anatomy



Project Time!

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

See if you can do Part 3

The tutors will be around to help!

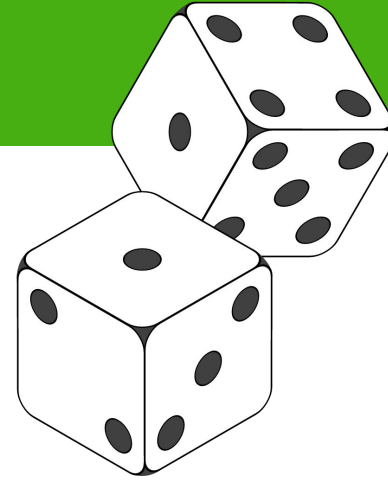
Random!

That's so random!

There's lots of things in life that are up to chance or random!



Python lets us **import** common bits of code people use! We're going to use the **random** module!



We want the computer to be random sometimes!



Using the random module

Let's choose something randomly from a list!

This is like drawing something out of a hat in a raffle!

Try this!

1. Import the random module!

```
>>> import random
```

2. Copy the shopping list into IDLE

```
>>> shopping_list = ["eggs", "bread", "apples", "milk"]
```

3. Choose randomly! Try it a few times!

```
>>> random.choice(shopping_list)
```



Using the random module

You can also assign your random choice to a variable

```
>>> import random
>>> shopping_list = ["eggs", "bread", "apples", "milk"]
>>> random_food = random.choice(shopping_list)
>>> print(random_food)
```



Project Time!

Raaaaaaaaaandom! Can you handle that?

Let's try use it in our project!

Try to do Part 4

The tutors will be around to

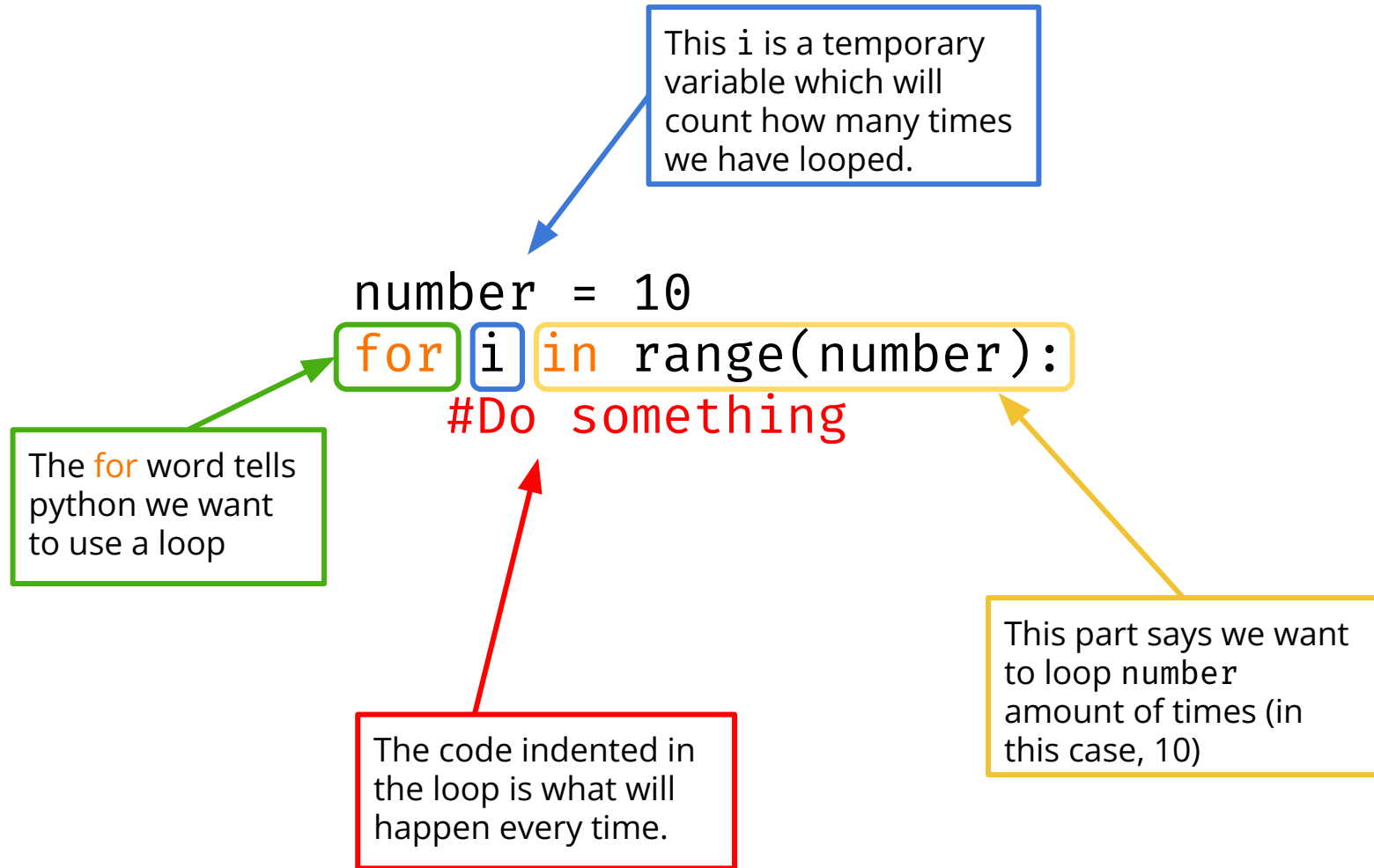
For Loops

For Loops

For loops allow you to do something a certain number of times.

We use them when we know exactly how many times we want to do something!

For Loops



Looping how many times?

We can loop through a list:

```
friends = 4  
for i in range(friends):  
    print("Hello friend!")
```

What's going to happen?

Looping how many times?

We can loop through a list:

```
friends = 4
for i in range(friends):
    print("Hello friend!")
```

What's going to happen?

```
>>> Hello friend!
>>> Hello friend!
>>> Hello friend!
>>> Hello friend!
```

We do what's in the for loop as many times as what is in the "range"

Project Time!

Now you know how to use a for loop!

Try to do Part 5
...if you are up **for it!**

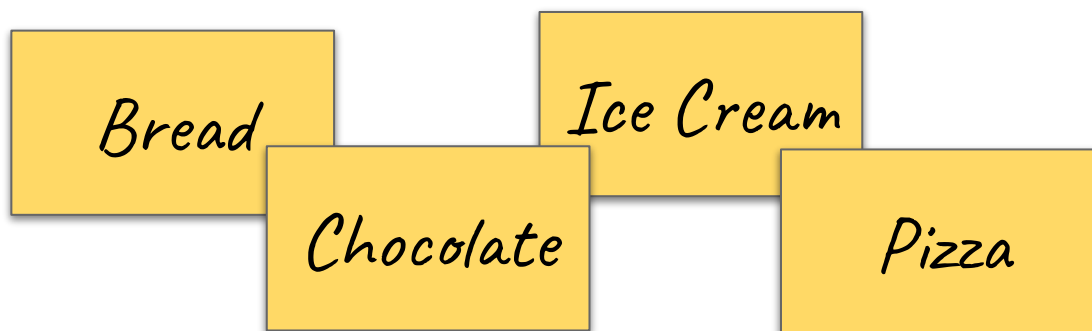
The tutors will be around to help!

Lists and Dictionaries

Lists

When we go shopping, we write down what we want to buy!

But we don't store it on lots of little pieces of paper!



We put it in one big shopping list!

- Bread
- Chocolate
- Ice Cream
- Pizza

Lists

It would be annoying to store it separately when we code too!

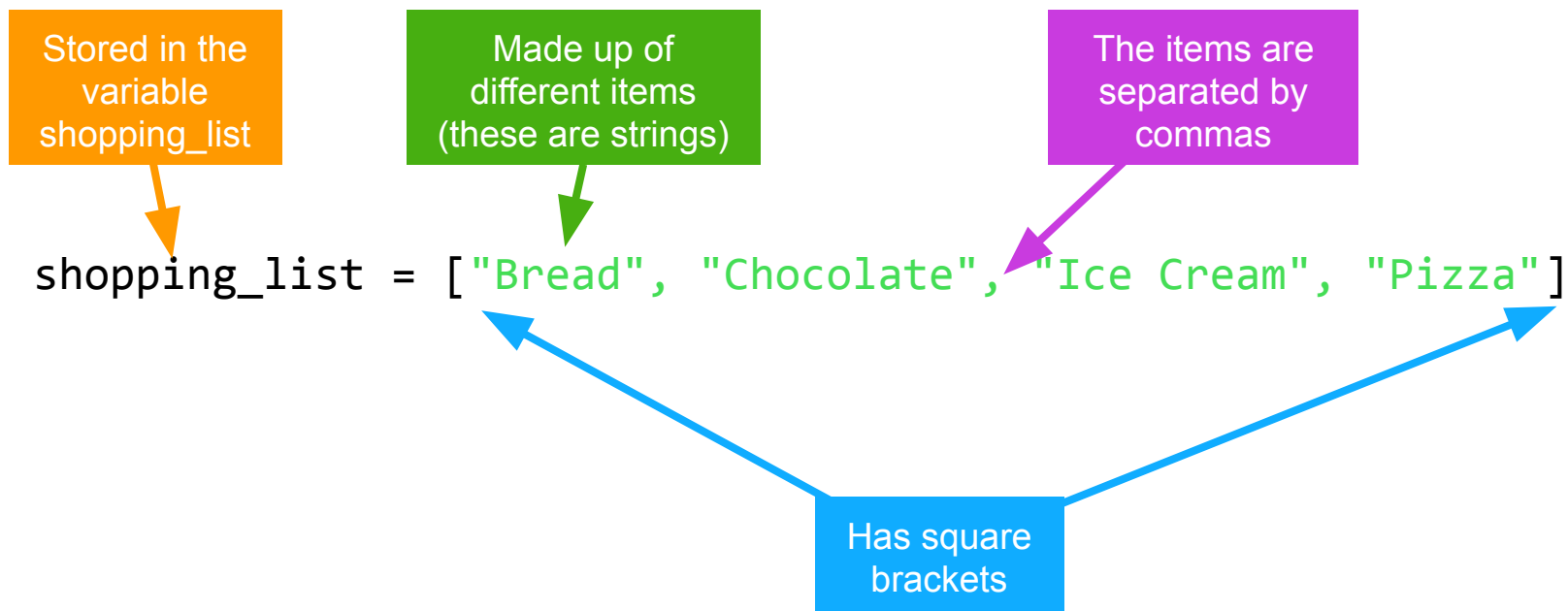
```
shopping_item1 = "Bread"  
shopping_item2 = "Chocolate"  
shopping_item3 = "Ice Cream"  
shopping_item4 = "Pizza"
```

So much repetition!!

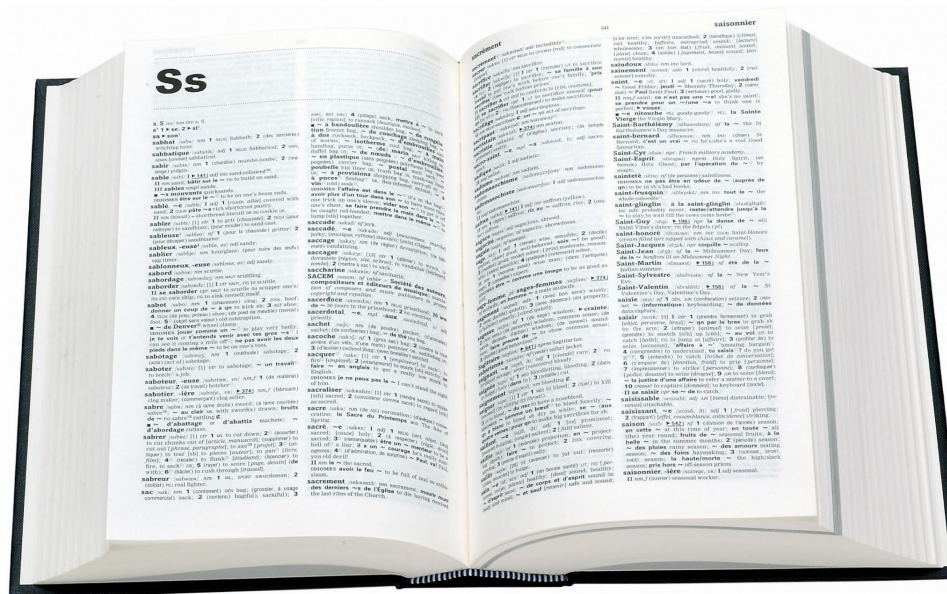
Instead we use a python list!

```
shopping_list = ["Bread", "Chocolate", "Ice Cream", "Pizza"]
```

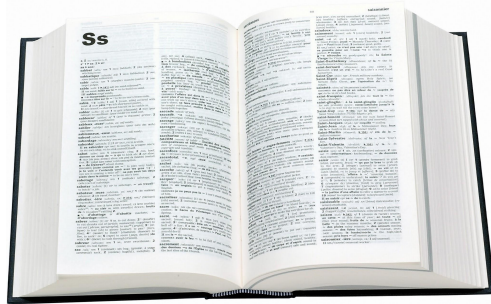

List anatomy



Dictionaries!



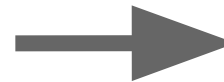
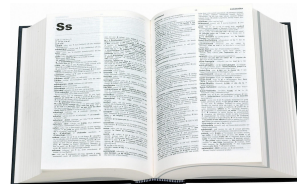
Dictionaries!



You know dictionaries!

**They're great at looking up thing
by a word, not a position in a list!**

Look up
Hello



Get back

***A greeting (salutation) said
when meeting someone or
acknowledging someone's
arrival or presence.***

Looking it up!

There are lots of times we want to look something up!



Competition registration

Team Name → List of team members



Phone Book

Name → Phone number



Vending Machine

Treat Name → Price

Looking it up!



Phone Book

Name → Phone number

↑
Key

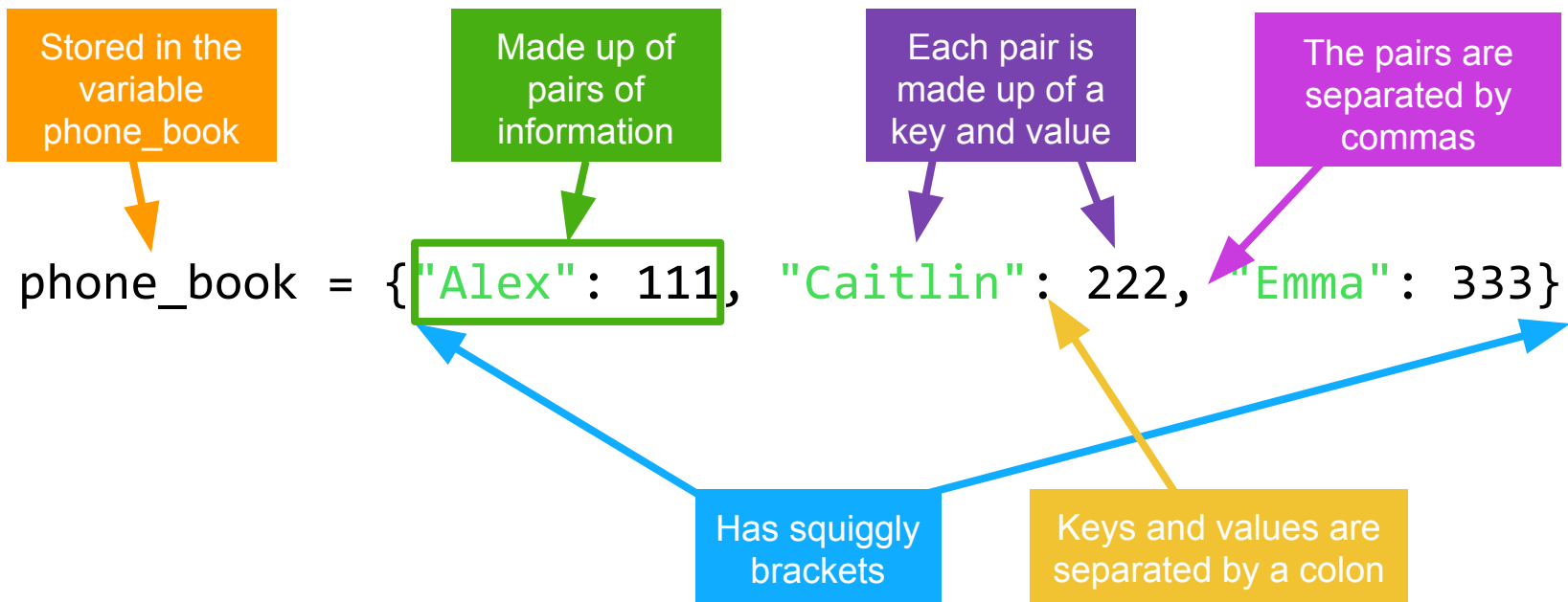
↑
Value

**We can use a dictionary for anything with a
key → value pattern!**



Dictionaries anatomy!

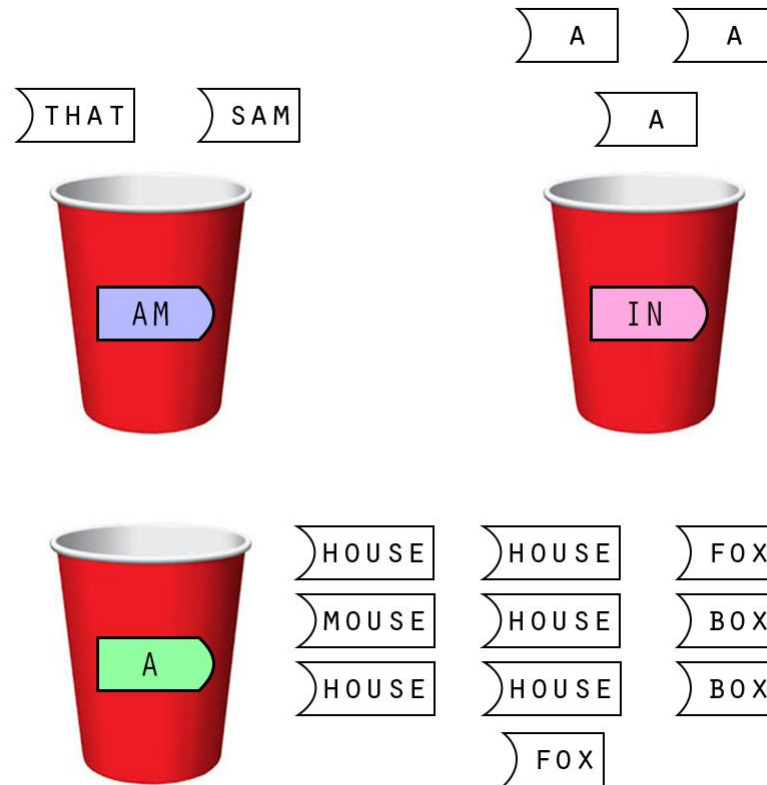
This is a python dictionary!



This dictionary has Alex, Caitlin and Emma's phone numbers

Cups!!

Remember the cups activity from the start of the day?

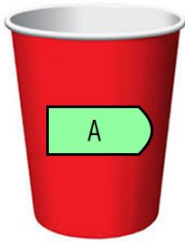


A Single Cup!

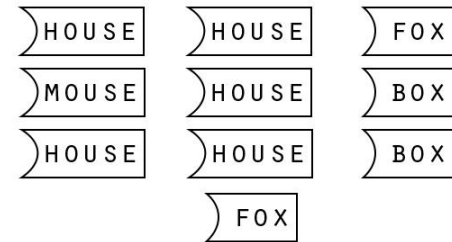
The word “A”

can be followed by

Any of these words



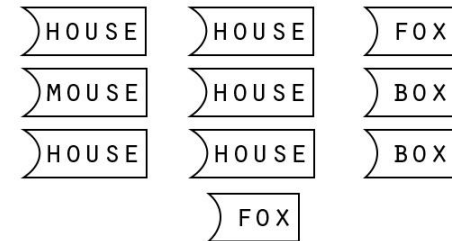
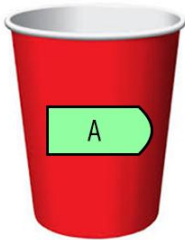
Key



Value

A Single Cup!

The word “A” can be followed by Any of these words



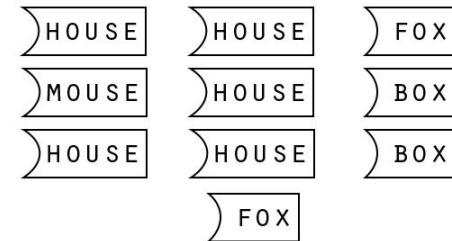
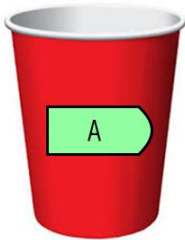
We can store the slips of paper as a python list!



```
['house', 'mouse', 'house',  
'mouse', 'box', 'fox', 'box',  
'fox', 'house', 'mouse']
```

A Single Cup!

The word “A” can be followed by Any of these words



We want to look up
the word “a” and get
back the list!

```
{ 'a' :  
  ['house', 'mouse', 'house',  
   'mouse', 'box', 'fox', 'box',  
   'fox', 'house', 'mouse']  
}
```

A Single Cup!

So we get a Dictionary with a List value!

```
{ 'a' : ['house', 'mouse', 'house',  
         'mouse', 'box', 'fox', 'box',  
         'fox', 'house', 'mouse'] }
```

↑
Key

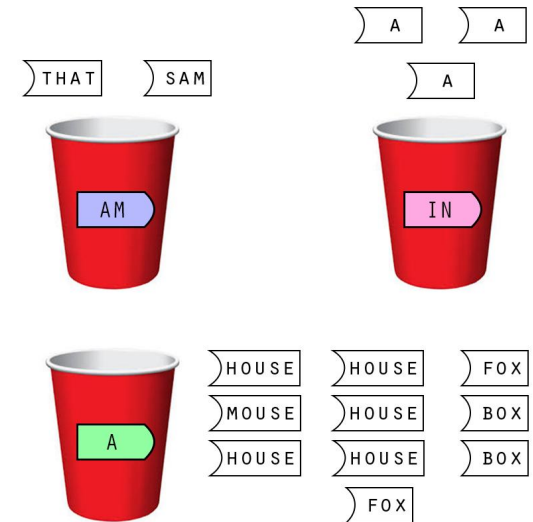
↑
Value

If you look up “A” you get back a list of all the words that can follow “a”

Cups → Dictionary with lists!

Here's what it looks like for a few more cups!

```
cups = { 'am': [ 'Sam', 'That' ],  
        'In': [ 'a', 'a', 'a' ],  
        'a' : [ 'house', 'mouse',  
                'house', 'mouse',  
                'box', 'fox', 'box',  
                'fox', 'house',  
                'Mouse' ]  
        .... }
```



You can get the whole cup dictionary from today's website!

Project time!

You now know all about lists and dictionaries!

Let's put what we learnt into our project
Try to do Part 6

The tutors will be around to help!

More Dictionaries and Lists!

Before we start this lecture
Trying doing Part 0 in your second workbook!

Getting words from sample text

In order to be able to read in lots of text we need to be able to turn sentences into a list of words.

We can do this by using `.split()` on our text!

Using split

```
text = "a really cool sentence"  
words = text.split()  
print(words)
```

What do you think words will be?

```
["a", "really", "cool", "sentence"]
```


More things you can do with lists!

There's lots of cool things we can do with lists! Like:

Getting the length of a list

```
words = ["a", "really", "cool", "sentence"]
```

```
print(len(words))
```

4

Adding new items to a list

```
words.append("yay")
```

```
print(words)
```

```
["a", "really", "cool", "sentence", "yay"]
```

Accessing Lists!

This favourites **list** holds four strings in order:

```
faves = ['books', 'butterfly', 'chocolate', 'skateboard']
```

We can count out the items using index numbers!

0



1



2



3



Remember: Indices start from zero!

Accessing Lists

We access the items in a **list** with an index such as [0]:

```
>>> faves[0]  
'books'
```

What code do you need to access the second item in the list?



Going Negative

Negative indices count backwards from the end of the **list**:

```
>>> faves[-1]  
'skateboard'
```

What would faves[-2] return?



Falling off the edge

Python complains if you try to go past the end of a **list**

```
>>> faves = ['books', 'butterfly', 'chocolate',  
             'skateboard']  
>>> faves[4]
```

```
Traceback (most recent call last):  
  File "<stdin>", line 1, in <module>  
IndexError: list index out of range
```

Updating our dictionaries!

We've seen how to use dictionaries - but how do we update existing ones? Let's have a look at a phone book example!

```
>>> phone_book = {  
    "Alex": 111, "Caitlin": 222, "Emma": 333  
}
```

- We met Rowena! Let's add her to our phone book

```
>>> phone_book["Rowena"] = 444
```

```
>>> phone_book
```

```
{ "Alex": 123, "Caitlin": 222, "Emma": 333,  
  "Rowena": 444 }
```

Lists in dictionaries!

We've been using lists as the values of our dictionary like this:

- Let's make some sports teams:

```
>>> team_members = {  
    "Sydney": ["Pauline", "Srishti", "Amara"],  
    "Perth": ["Criscell", "Ash", "Taylah"]  
}
```

- What happens if you do:

```
>>> team_members["Sydney"]  
["Pauline", "Srishti", "Amara"]
```

- What if we did this?

```
>>> team_members["Perth"].append("Priya")  
["Pauline", "Srishti", "Amara", "Priya"]
```

Project Time!

**Now you know even more about
Dictionaries and Lists!**

In your second workbook,
Try Parts 1 - 4

The tutors will be around to help!

Files

Filing it away!

What happens if we want to use different data in our program? What if that data is too big to write in with the keyboard?

We'd have to change our code!!

It would be better if we could keep all our data in a file and just be able to pick and choose what file we wanted to use today!

potter.txt

```
harry did not want to tell the  
others that he and luna were  
having the same hallucination if  
that was what it was so he said  
nothing more about the horses as  
he sat down inside the carriage  
and slammed the door behind him  
nevertheless he could not help  
watching the silhouettes of the  
horses moving beyond the window
```

Opening files!

To get access to the stuff inside a file in python we need to **open** it!
That doesn't mean clicking on the little icon!

```
f = open("test.txt", "r")
```

You'll now be able to read the things in `f`

If your file is in the same location as your code you can just use the name!

A missing file causes an error

Here we try to open a file that doesn't exist:

```
f = open("missing.txt", "r")
```

```
Traceback (most recent call last):
```

```
  File "<stdin>", line 1, in <module>
```

```
IOError: [Errno 2] No such file or  
directory: 'missing.txt'
```

You can read a whole file into a string

```
>>> f = open("haiku.txt", "r")
>>> my_string = f.read()
>>> my_string
'Wanna go outside.\nOh NO!
Help! I got outside!\nLet me
back inside!
```

```
>>> print(my_string)
Wanna go outside.
Oh NO! Help! I got outside!
Let me back inside!
```

haiku.txt

```
Wanna go outside.
Oh NO! Help! I got outside!
Let me back inside!
```

Write to files!

You can also write to files!

```
f = open("newfile.txt", "a")  
f.write("This is my new line!")
```

Notice we used `"a"` instead of `"r"`? We opened it in write mode!

This will create a new file if it doesn't exist, and add the new line to the bottom of the file. This is called `"a`ppending"!

Closing Time

Always remember to close your file when you're finished with it:

```
f.close()
```

This will close your file and save it.

Using **with**!

This is a special trick for opening files!

```
with open("words.txt", "r") as f:  
    print(f.read())
```

It automatically closes your file for you!

It's good when you are using files in python!

Project Time!

You learned how to handle files!

Have a go at the extensions in the
third workbook!

Well Done! :)