Programming technique workbook.
Python 1 section

Name:

Class:

- **Title:** Programming technique – Python 1

- **Big Question:** Solve complex problem using computational thinking techniques and programming constructs.

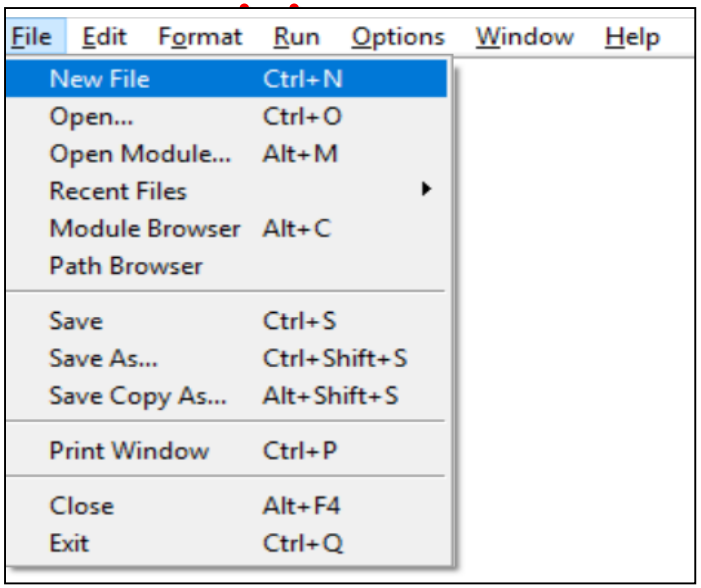
- **Small Questions**: What do we mean by selection, iteration, sequencing, variable, constants. Use selection to solve a problem. Comment on code. Identify errors. Use data types appropriately.

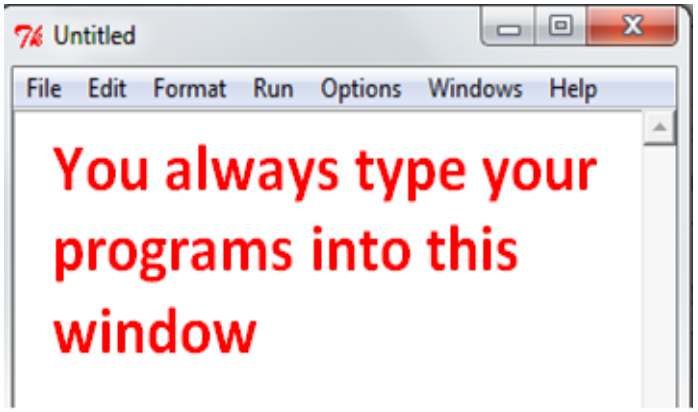
- **Key Words**: logic errors, syntax errors, run time errors, constants, variables, data types, iteration, selection, sequencing.

Python Introduction

Starter

- **Create a folder in your area named: Python.**
- **Create another folder inside the Python folder and name it: Lesson 1.**
- **Open IDLE Python. Click on FILE → New FILE.**





VARIABLES, INPUT AND OUTPUT

Thursday, August 29, 2019

Python Introduction

Lesson objectives…

- ❑ Understand the purpose of programming.
- ❑ Use the print and input functions successfully.
- ❑ Explain the purpose of a variable.

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Knowledge phase

1. Type `print("Hello world")`
2. Press F5
3. Save your program in the python folder as print.
4. **Task 2:** Change the code to display your name.
5. **Task 3:** Change your code to display your favourite film **and** age.

KEYWORDS: ***programming language, Python, IDLE, syntax***

Python Introduction

KEYWORDS:
Syntax error – where you've broken the rules of the language.

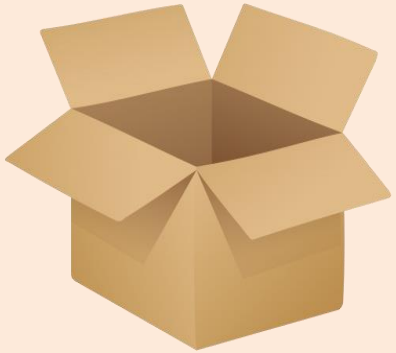
```
print("Hello year 7)

primt("How are you?")

print("Good bye"
```

KEYWORDS: *syntax, logic, repeat,*

Python Introduction

GLOSSARY KEYWORDS:

Variable: A location in a memory where data is **stored**. It **can** be changed while the program is running.



Constant: **A location in a memory where data is stored. It cannot be changed while the program is running.**

KEYWORDS: ***Variables, Constant, Python, Execute, inputs, print***

Python Introduction

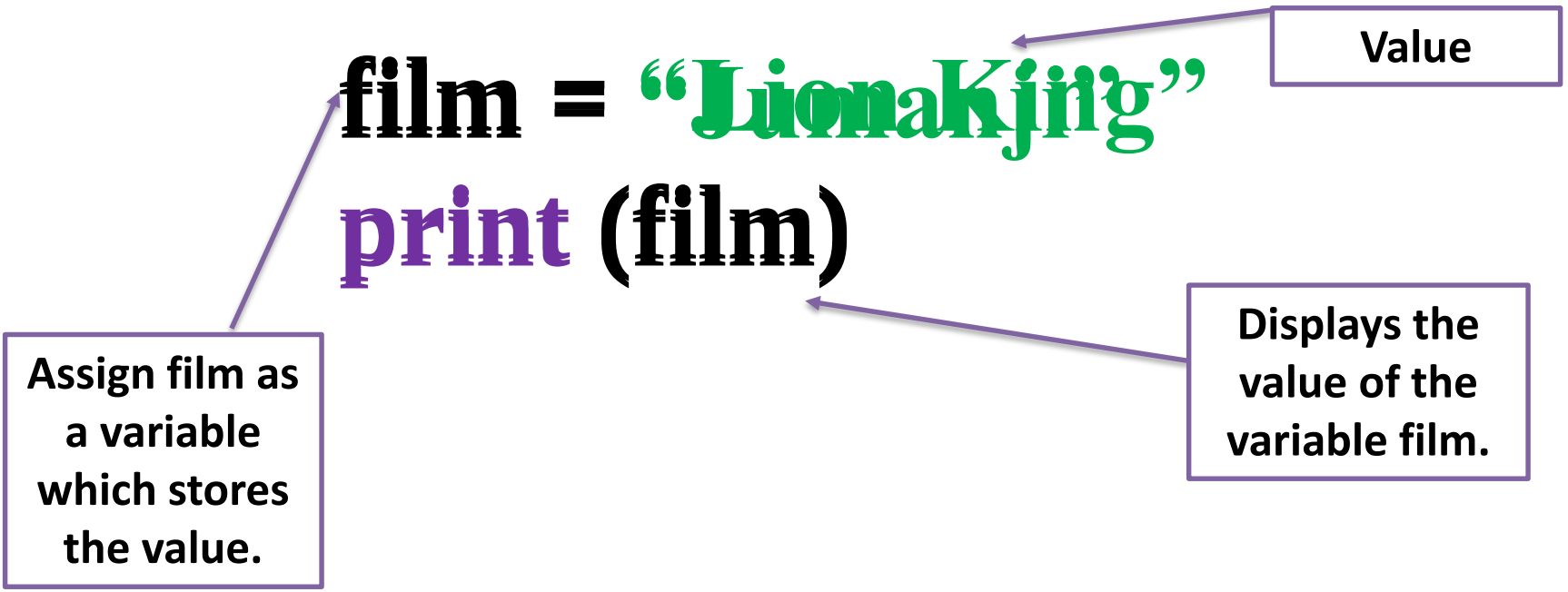
Definitions:

Syntax: the order of instructions
or commands.

Assignment: Giving a variable or constant a value.

KEYWORDS: *programming language, Python, IDLE, syntax*

Python Introduction



KEYWORDS: *Python, IDLE, window, shell, editor, variables, value, print.*

Python Introduction

What will this program display?

```
film = "Lion King"
print ("My favourite film is" , film)
```

Python Introduction

Demonstration

```
hobby = input("Enter a Hobby")
print (hobby)


name = input("what is your name")
print ("Oh you are", name)
```

KEYWORDS: *Syntax, Python, print, input, variables, constant*

Consolidation phase

Copy the code below, then change the variable name to car, change the question to "favourite car?", then display: car, "is a nice car"

```
name = input("what is your name")
print ("Oh you are", name)
```

KEYWORDS: *Syntax, Python, print, input, variables, constant*

Adding comments:

- Comments are useful to help understand your code.
- They will not affect the way a program runs.
- You use # to comment on code.
- **Add comment to your program from previous slide.**

Adding comments:

```
#number is a variable.
number = 7
#Displays the value of the variable.
print(number)
```

Application phase

Complete task 1-6

KEYWORDS: ***Variables, Constant, Python, Execute, inputs, print***

Q1 helpsheet

```
print("Hello World")
print(“I like cheese")
```

1. Display the following on 3 separate lines:

This is my first program.

It shows messages
Sometimes on different lines

Paste your code below:

2. Create a variable called food and store your favourite food inside the variable. Print out the value of the variable onto the screen.

Paste your code below:

Q2 helpsheet

```
food = "_____"
print(_____)
```

3) Ask the user for their favourite film. Display “I also like watching”, film. **E.G:**

```
Enter your favourite filmFast & Furious
I also like watching Fast & Furious
```

Paste your code below:

Q3 helpsheet

```
film = _____("Enter your favourite film")
print("_____", _____)
```

4. Create a program that ask the user for their firstname, surname, favourite subject and age then display the above on 4 separate lines. “Remember you can’t have space in a variable name.

Paste your code below:

Q4 helpsheet

```
firstname = input("Enter your firstname")
surname= _____(_______)
age = _______("_____")
subject = _____(_______)
print(_______)
print(_____)
_____(age)
_____(subject)
```

5. Create a program that ask the user for their name. Display the name 5 times on 1 line.

Paste your code below:

Q5 helpsheet

```
name = _____("Enter your name")
print(_____*5)
```

6. Create a program that ask the user for their favourite food. Display “I also like”, food. Food should be replaced with the user’s answer.

Paste your code below:

Q6 helpsheet

```
food = _____("_____")
print("I also like", _____)
```

Test phase

Complete the task on the next slide.

KEYWORDS: ***Variables, Constant, Python, Execute, inputs, print***

7. Ask for a user's name and age. Display "your name is", name, "and you are", age, "year old".E.G:

```
Enter your nameSuffar
Enter your age5
Your name is Suffar and your are 5 year old
```

Paste your code below:

Q7 helpsheet

```
name = _____("Enter your name")
age = _____("_______")
print("Your name is", _____, "and your age
is", _____)
```

Homework

https://www.youtube.com/watch?v=jhVuyveJMgA&list=PLCiOXwirraUBO3Z2dxnIfuNDspmJmorJB

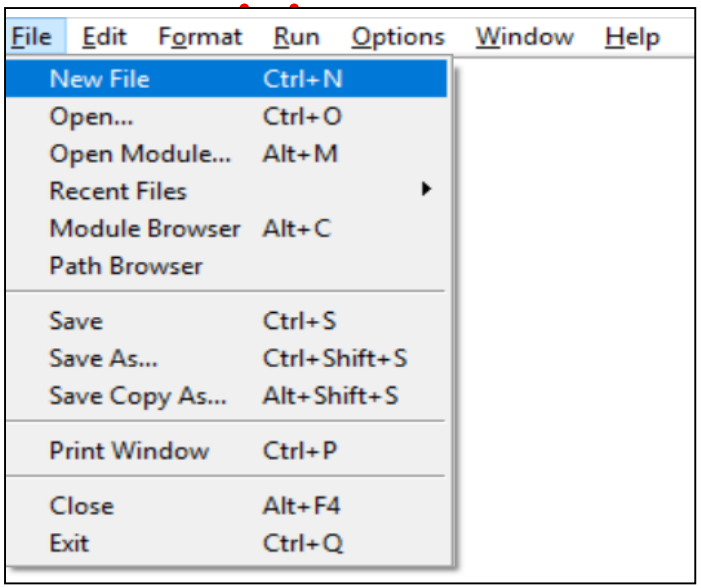
KEYWORDS: *Variables, Constant, Python, Execute, inputs, print*

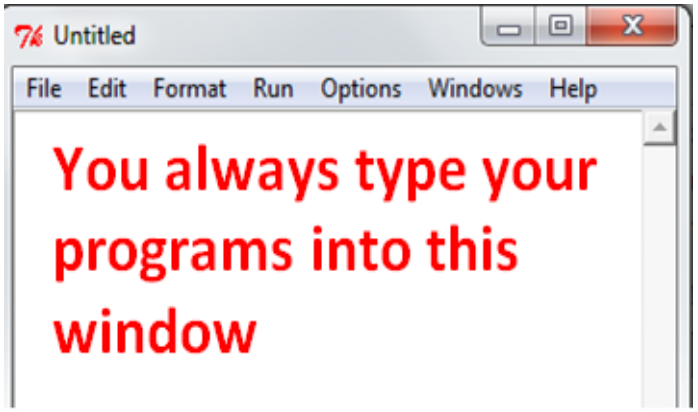
Revisit phase

Starter

Open IDLE Python.
Click on FILE → New FILE.

Create a program that asks the user if they like school or not, then display the answer.





Thursday, August 29, 2019

Data types

Lesson objectives…

- ❑ **Compare different data types.**
- ❑ **Create a program using variables and input command.**
- ❑ **Consolidate understanding of inputs, data types and variables.**

What are the advantages and disadvantages of storing data on a computers?

IAG LINK **Software engineer** (designs programs) **£20,698 - £50,908**

Knowledge phase

Data type: A description about the type of data a variable holds.

Why do we use data types?

The system will need to know the data type of the variable so that it can allocate the correct size of memory for the variable's data.

The computer will be unable to carry out the correct calculations on the variables unless it knows what type of data they contain.

KEYWORDS: ***Data types, Boolean, Real, Character, Integer.***

Data Types

- **String** holds alphanumeric data as text.
- **Integer** holds whole numbers.
- **Float/Real** holds numbers with a decimal point.
- **Character** holds a single, alphanumeric character.
- **Boolean** holds either '*True*' or '*False*'.

KEYWORDS: ***Data types, Boolean, Real, Character, Integer.***

Consolidation

- Go on
- www.kahoot.it

Game pin will be on the board.

KEYWORDS: *Data types, Boolean, Real, Character, Integer.*

Casting

- Python assumes any input is a string.
- If you try and perform a calculation with strings it won't work.
- You need to change the data type to either an integer or a float.
- **Casting: Changing a variable from one data type to another.**

Example:

```
age=int(input("How old are you?"))

age = str(age)
```

Above line will CAST age from integer to string.

Python task

1. Create a variable called ***number*** and allow the user to assign a value to it.
2. Now add this line:

```
print (number + number)
```

3. Run the program. Did it work?
4. Try converting/casting the data type:

```
number = int(number)
```

KEYWORDS: ***casting, data type, variable, program, algorithm***

Data Types

Demonstration:

```
number = int(input("Enter a number"))
print (number)


name = str(input("what is your name"))
print (name)
```

KEYWORDS: *Syntax, Python, print, input, variables, constant*

Application phase

Complete task 8-11

KEYWORDS: *Data types, Boolean, Real, Character, Integer.*

8. Complete the following table:

Data	Data Type
Age	Integer
House address	
Name	
Test tomorrow? Y/N	
Weight	
Price	
Is 5 == 5	

9. Ask the user for 2 numbers then divide the first number by the second number. Display the answer. To divide numbers use /

Paste your code below:

Q9 helpsheet

```
number1 = int(input("Enter a number"))
number2 = _______________
answer = ____/_____
print(_____)
```

10. Asks for the width of a rectangle. Asks for the length of a rectangle. Calculates the area of a rectangle. Print the area of a rectangle. To multiply numbers use *

Paste your code below:

Q10 helpsheet

```
width = int(input("_________"))
_______ = int(input("Enter a height"))
area = _____*_____
print("The area of the rectangle is", _____)
```

11. Asks 2 users for their weight, calculate the average weight of the 2 users.

Paste your code below:

Q11 helpsheet

weight1 = float(_____("User 1, enter your weight"))
weight2 = _____(input_____
average = (_____+_____) / 2
print(_____)

Test phase

Write a program which calculates how much money a student will need to buy a meal and two drinks. The user should be prompted to enter how much a meal costs, how much a drink costs, and then calculate and display the total required. Add comments to your code.

Paste your code below:

KEYWORDS: ***Data types, Boolean, Real, Character, Integer.***

Revisit phase:

Complete MS Form assessment on variables, constant, casting & data types.

Link:

https://forms.office.com/Pages/ResponsePage.aspx?id=NRrmRxWbmk-P3e1XFrwgvUKZUnHi_FpMtvQIsO11-sxUNEc4TjVTR09ORExaMEFWSDk5SkswNFUzUC4u

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Operators

Lesson objectives…

- ❑ Understand arithmetic operators.
- ❑ Demonstrate using operators to solve problems.
- ❑ Use operators to solve a real-world situation.

IAG LINK **Programmer analyst Salary: £25,000- £55,000**

Knowledge phase

Demonstration:

```
number1 = 10
number2 = int(input("Enter a
number"))
answer= number1 * number2
print(answer)
```

KEYWORDS: *Syntax, Python, print, input, variables, constant*

Command	Name	Example	Output
+	Addition	4+5	9
-	Subtraction	8-5	3
*	Multiplication	4*5	20
/	Division	19/3	6.33
%	**modulus**	19%3	1
**	Exponent	2**4	16
//	Whole-number Division **(Floor division)**	7//2 (rounded down)	3

Consolidation

- **Go on**
- **www.kahoot.it**

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KEYWORDS: *Arithmetic operators*

Application phase

- **Complete task 12-16**

KEYWORDS: ***Arithmetic operators***

12. Complete the following table:

Arithmetic operator name	Arithmetic operator symbol IN PYTHON
Addition	+
Subtraction	-
Multiplication	
Division	
Exponent “^”	
Modulus “MOD”	
Floor Division “DIV”	

Q13 helpsheet

```
number1 = 8  # store the value 8 in a variable called number1
number2 = 6  #store the value 6 in a variable called number2.
answer= number1 + number2    #add 2 numbers together and store them in a variable called answer.
print(answer)  #displays the answer.
```

13. **Create a variable x with a value of 5. Create a variable y with a value of 3. Create a variable z with a value 10.** ***Multiply three numbers together and store them in a variable called answer. Comment on the code.***

Paste your code below:

Q14 helpsheet

```
number1 = 8
number2 = 6
answer= number1 + number2
print(answer)
```

14. Alex has £20. Spending:£5 on pens. £3 on pencils. Total amount left?

Demonstrate this example using 4 variables and arithmetic operators. Comment on your code.

Paste your code below:

15. **Ask how many apples the user wants. Ask how many people the user will share the apples with. Find out how many apples will remain if you share the apples equally. Hint: use modulus %.**

Paste your code below:

Q15 helpsheet

apples = int(_____("How many apples do you want"))
people= _____
remain = _____ % _____
print(_____)

16. Asks for the home team name. Asks for the opponent team name. Asks for the number of goals scored by the home team. Asks for the number of goals scored by the opposition team. Calculates the goal difference for the home team.

Paste your code below:

Q16 helpsheet

homeTeam= ____(input("How many goals did the home team score??"))
opponent = _____
difference= _____-_____
print(_____)

Test phase

- **Ask the user how many sweets do they want, ask the shop owner how much each sweet cost "hint: Use float instead of int". Calculate the total cost, display the total cost + 20% interest rate on top of the total. Comment on the code #.**

Paste your code below:

KEYWORDS: *Data types, Boolean, Real, Character, Integer.*

Homework

https://www.youtube.com/watch?v=4u2ClNCtcgY

KEYWORDS: ***Data types, Boolean, Real, Character, Integer.***

Revisit phase

- 1. State the values of a, b, c, d and e after the following operations are carried out:

(a) a = 26 mod 5 =

b) b = 142 div 7 =

(c) c = (7 + 3) * 4 – 1 =

(d) d = 15.6 / 3 + 4.8 / 2 =

(e) e = “4” + “56” =

KEYWORDS: ***Arithmetic operators***

Thursday, August 29, 2019

If statement

Lesson objectives…

- Identify the meaning of basic relational/comparison operators.
- Identify the purpose of selection
- Prepare a python program using If statements.

IAG LINK

Software Quality Assurance Engineer Salary: £25,000- £50,000

Knowledge phase

Demonstration:

```
number1 = 5
number2 = 7
answer = number1 > number2
print(answer)
```

KEYWORDS: *Equal to, not equal to, greater than, less than*

Knowledge phase

Group demonstration:

Chelsea has scored 70 goals.

Arsenal has scored 64 goals.

In total, Chelsea has scored more goals than Arsenal.

Create the above example in python to display True.

KEYWORDS: ***Relational operators, greater than, less than, not equal to***

RELATIONAL OPERATORS

Operator	Meaning	Example	Evaluates to
==	equal to	7==7	True
!=	not equal to	6!=7	True
>	Greater than	7>6	True
<	Less than	5<8	True
>=	Greater than or equal to	6>=8	False
<=	Less than or equal to	7<=7	True

Consolidation

- Go on
- www.kahoot.it

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KEYWORDS: *Relational/comparison operators*

Programming constructs

There are 3 programming constructs:

- **Sequencing**
- **Selection**
- **Iteration**

KEYWORDS: ***Selection, if, else, then, variables, choice, decision, condition.***

Sequencing:

A set of instructions given in a particular order.

Example:

```
Name= input("Enter name")
print(Name)
```

If statement

Selection: Depending on the **condition** the algorithm follows a **choice** between different **alternatives**.

KEYWORDS: ***Selection, if, else, then, variables, choice, decision, condition.***

If statement

If

Then

Else

KEYWORDS: *Selection, if, then, else*

If statement

If it's cold outside then

Wear a jacket.

Else

Don't wear a jacket.

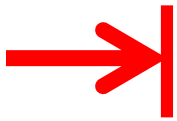
Demonstration:

How can we code this example in python? Watch the demonstration.

KEYWORDS: ***Selection, if, else, then, variables, choice, decision, condition.***

If statement

Indentation!



```
password = input("enter pass")
if password == "abc1":
    print("Access Granted")
elif password == "abc":
    print("Very close")
else:
    print("Access Denied")
```

- **Python requires indentation as part of the syntax.**
- **Indentation signifies the start and end of a block of code.**

KEYWORDS: *Selection, if, else, then, variables, choice, decision, condition.*

Application phase

- **Complete task 17-31**

KEYWORDS: *If statement*

17- Relational operators

Question	True/False
5 == 3	
2 != 5	
5 > 6	
8<2	
2!=2	
7==7	
1>=1	
7>=2	
9<=2	
9<=9	

Q18- Move to next slide

```
answer=input("What is your answer? ")
if answer == "chocolate":
        print("yum")
elif answer == "biscuits":
        print("crunchy")
elif answer == "sweets":
        print("chewy")
else:
        print("I don't know what that means.")
```

18. Use the code on the previous slide to complete the following table:

Answer (answer=_____)	Result
chocolate	
biscuits	
other	
Sweets	
crunchy	
error	

19. **Mancity has scored 60 goals.**

- **Manutd has scored 51 goals.**
- **In total, Manutd has scored less goals than Mancity.**
- **Create the above example in python to display True.**

Paste your code below:

Q19 helpsheet

mancity = ____
manutd = ___
_____= _____ < _____
_____(score)

20. **Create a program that asks for a person's age. If the age is greater than or equal to 18, display "You are old enough to vote", else display "You are not old enough to vote".**

Paste your code below:

Q20 helpsheet

```
age = ____________
if _____>=18:
    ______("You are old enough to vote")
_____:
    print(___________)
```

21. **Create a program that asks for a person's name. If the name is equal to Tom, display "Welcome Tom", else display "Hello stranger".**

Paste your code below:

Q21 helpsheet

```
name = _____________
if _____ == "Tom":
    print_______
____:
    _____("Hello stranger")
```

Q22 helpsheet

```
print("Hello user")
singer = input("Enter your favourite singer")
if singer == "Beyonce":
    print("Good singer")
elif singer =="Ed":
    print("Pretty decent")
else:
    print("Not too bad")
```

22. Create a program that Greets the user.

- Asks the user how they are feeling
- If the user enters “happy”, print “glad to hear it”
- If the user enters “sad” will tell the user a joke
- Has an error message for any other entry

Paste your code below:

Q23 helpsheet

```
number = int(input("Enter a number"))
if number > 70:
    print("above 70")
elif number > 40:
    print("Above 40 but less than 71")
else:
    print("Less than 41")
```

23. Ask user to enter a grade. If grade is >= 90, display A*, else if grade >= 80, display A, else if grade >= 70, display B, else if grade >= 60, display C, else display fail.

Paste your code below:

Q24 helpsheet

```
hobby = input("Enter a hobby")
team = input("Enter your favourite team")
print("Your favourite hobby is", hobby, "and your favourite team is", team)
```

24. **Ask the user for their favourite music band. Ask the user for their favourite song. Display the answers in a full sentence.**

Paste your code below:

Q25 helpsheet

```
number1 = int(input("Enter a number"))
number2 = int(input("Enter another number"))
answer = number1+number2
print(answer)
```

25. **Ask the user to input 2 numbers. Multiple these 2 numbers together. Display the answer.**

Paste your code below:

Q26 helpsheet

```
age = int(input("Enter your age"))
if age >= 18:
    print("You are old enough to vote")
else:
    print("You are not old enough to vote")
```

26) Create a program to allow the user to input a number. If the number is more than 100, print out a “too large” message, else display “too small”.

Paste your code below:

Q27 Helpsheet

```
name = input("Enter a name")
if name == "Steve":
      print ("Hi Steve, how are you?")
elif name == "John" :
      print ("Good to see you John")
else :
      print ("I don't know you")
```

You can only have one `else` and it has to be at the end.

27) Ask a user to enter a football team. If the user enters Chelsea, display blue, else if user enters Liverpool, display red, else display team not registered.

Paste your code below:

Q28 Helpsheet

```
number1 = int(input("Enter a number"))
number2 = int(input("Enter another
number"))
if number1 == 5:
    print(number1**number2)
elif number1 > 7:
    print(number1/number2)
else:
    print(number1*number2)
```

28) Create a program to allow the user to input 2 numbers. If the first number is bigger than 10, add the two numbers, otherwise multiply the two numbers. Print out the result.

Paste your code below:

29) Allow the user to enter two numbers, then ask them if they want the numbers added or multiplied. Depending on their answer, print the right answer.

Paste your code below:

Q29 Helpsheet

```
num1 = ____(input("Enter a number"))
num2 = _____________
operator = _________
if ______ == "add":
    ______(_____)
____ operator == "_____":
    print(____*_____)
____:
    _____("Wrong answer")
```

Q30 Helpsheet

```
name = input("Enter a name")
if name == "Steve":
      print ("Hi Steve, how are you?")
elif name == "John" :
      print ("Good to see you John")
else :
      print ("I don't know you")
```

You can only have one `else` and it has to be at the end.

30) Ask a user whether they want to take the red pill or the blue pill. If they write “red” then print “red is the colour of blood”. Elif they write “blue” then print “Are you sick?”. Else print “I don’t like that colour”

Paste your code below:

31) Ask the user to enter traffic light colour, if colour is = red, display STOP, else if colour = yellow, display get ready, else if colour is = green, display GO, else display an error.

Paste your code below:

Test phase:

Write a program to decide whether a year is a Leap year. The rules are:

A year is generally a Leap Year if it is divisible by 4, except that if the year is divisible by 100, it is not a Leap year, unless it is also divisible by 400. Thus 1900 was not a Leap Year, but 2000 was a Leap year.

Paste your code below:

KEYWORDS: ***If statement***

Revisit phase: identify the error

```
score = input("Please enter your test score: ")

if score == 75:
    print("Excellent, full marks!")
elif score <75 and score >=65:
    print("Very good, keep revising!")
elif score <65 and score > 55:
    print("Reasonable results, you need more revision")
else:
    print("Please attend at lunchtime to resit this test")
```

Solution:

score = int

Score must be casted into an integer.

Thursday, August 29, 2019

If statement

Lesson objectives…

- ❑ Use IF statement to solve real life problems.
- ❑ Understand the purpose of Boolean operators.
- ❑ Consolidate understanding of selection.

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Junior System Tester: **£24,000 initial salary**

Knowledge phase Demonstration

```
age = int(input("Enter your age"))
if age>=18:
    print("You are old enough to vote")
elif age==17:
    print("Try again in 1 year")
elif age<17:
    print("You are not old enough to vote")
else:
    print("Error. Input not understood")
```

Discuss the purpose of each line of code:

KEYWORDS: ***Selection, if, else, then, variables, choice, decision, condition.***

Knowledge phase

Boolean operators can be used to make selection statements more efficient and versatile. We use AND, OR & NOT.

It's important to use brackets in long Boolean expressions.

Order: Brackets, NOT, AND then OR.

KEYWORDS: ***Boolean operators, OR, AND , NOT***

If statement

Boolean expression	True/False
11 > 5 AND 7 == 3	False
NOT(13 == 2)	True
11 <= 2 OR 8 != 5	True
NOT(12 > 2 AND 5 < 1)	True

```
n = 0
if n == 2 or n == 3:
    print("Correct")
else:
    print("Incorrect")
```

KEYWORDS: *Boolean operators, OR, AND , NOT*

Consolidation

- Go on
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Game pin will be on the board.

KEYWORDS: *Data types, Boolean, Real, Character, Integer.*

Teacher Demonstration

```
name = input(“What is your name?”)
if name == "James" or name == "Don":
    print("I know you!")
else:
    print("Who are you?")
```

KEYWORDS: *Selection, if, else, then, variables, choice, decision, condition.*

Copy the code below and add comments to it in python.

```
name = input(“What is your name?”)
if name == "James" or name == "Don":
    print("I know you!")
else:
    print("Who are you?")
```

KEYWORDS: *Selection, if, else, then, variables, choice, decision, condition.*

Application phase

- **Complete task 32-35**

KEYWORDS: *Data types, Boolean, Real, Character, Integer.*

Q32 HELPSHEET.

```
name = input("Enter a name")
surname = input("Enter a surname")
if name == "James" and surname == "Don":
    print("I know you!")
else:
    print("Who are you?")
```

32) Create a program to ask the user to enter a username and password. If they get the username AND password right, display a “logged in” message. Otherwise, tell them they are wrong.

Paste your code below:

33) Ask the user if they play games on pc then ask them if they play on console, if pc = yes and console = yes, display Game master, else if pc = yes and console = no, display pc master, else if pc = no and console = yes, display console master, else display an error.

Paste your code below:

Q33 HELPSHEET.

```
pc = _____("Do you play games on a PC")
console = __________
if pc == "yes" and ______ == "yes":
    _____("Game master")
____ pc == "yes" and ______ == "no":
    print____
elif ___ == "no" and console == "yes":
    print("Console master")
_____:
    _____("Wrong option")
```

Q34 HELPSHEET.

```
age = int(input("Enter your age"))
if age >= 18 and age <= 20:
    print("You are between 18 and 20 years old")
elif age < 18:
    print("You are still a child")
else:
    print("you are an adult")
```

34) Ask for the user's age. If age > 12 AND age < 20 then print "You are a teenager". Else if the user is 11 or 12 year old, print "You are a tween." Else print "Invalid age".

Paste your code below:

Q35 HELPSHEET.

```
name = input("Enter a name")
surname = input("Enter a surname")
if name == "James" and surname == "Don":
    print("I know you!")
else:
    print("Who are you?")
```

35) Ask the user for current temperature. Ask the user if it's raining outside. If temp is less than 12 degrees and it's raining, display "Wear a coat and bring an umbrella". Else if temperature is less than 12 degrees and it's not raining, display "Wear a coat". Else if temp is greater or equal to 12, and it's raining, display bring an umbrella. Else display "you don't need a coat or an umbrella".

Paste your code below:

Test phase:

Write a program to do the following:

If the temperature is greater than 30, output “Too hot”.

If the temperature is between 21 and 30, output “Just right”

If the temperature is less than 21, output “A bit chilly”

Paste your code below:

KEYWORDS: ***If statement***

Homework:

Use the workbook to revise for end of unit assessment.

KEYWORDS: *If statement*

End of unit test

MS Form assessment:

Test link:
https://forms.office.com/Pages/ResponsePage.aspx?id=NRrmRxWbmk-P3e1XFrwgvUKZUnHi_FpMtvQIsO11-sxUNDAzTTRMQkdMUjFPSkJWOU82MzRGVDc5Sy4u

KEYWORDS: *If statement*