

Programming Assignment final

by Sophie Meyrick-Vernon

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Sophie Meyrick-Vernon

Computer Networks and Cyber Security: Foundation Year

Introduction to Computer Programming (ACCA4020)

Table of contents

1. Part A
 - a. Variables
 - b. If/else statement
 - c. Loops
2. Part B
 - a. Exercise 1
 - Logic stages
 - Code
 - Testing
 - b. Exercise 2
 - Logic stages
 - Code
 - Testing
 - c. Exercise 3
 - Logic stages
 - Code
 - Testing
 - d. Exercise 4
 - Logic stages
 - Code
 - Testing

Part A

a.

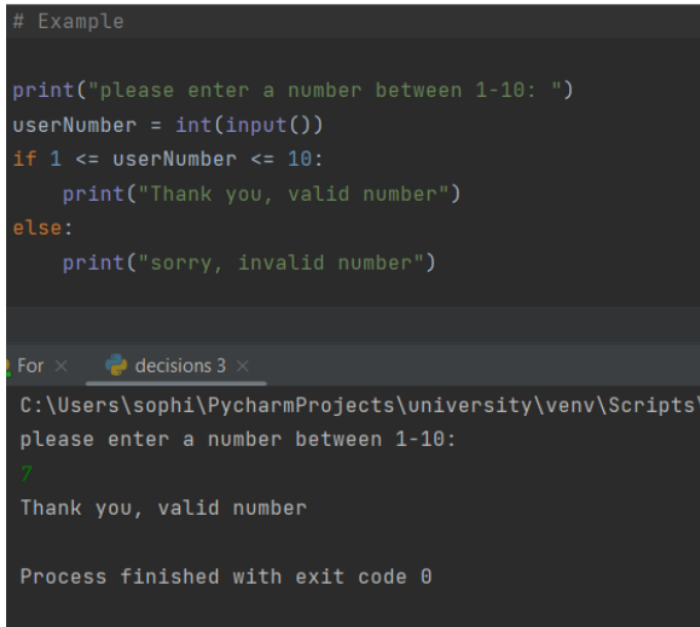
A variable is what you assign a value to that can then be used in a program. When declaring a variable, the purpose of the variable depends on what is assigned to it. If the variable is to hold a whole number, Python may infer that it is an 'integer'. If the variable is set to hold a decimal number, it may infer that it is a 'float'. If the variable is to hold letters, it may infer that it is a 'string'. Python isn't always accurate, so it is important to declare which variable type is needed when necessary [1].

b.

In python the code is executed one line at a time, when we use an if/else statement we are using it as conditional logic. What this means is we test a condition, if the condition in the code is true a block of code runs, if it is false a different block of code runs [2].

If more conditions are needed, an elif statement can be added. This appears between the if and the else in the block of code and multiple elifs can be used.

Example of an if statement:



```
# Example

print("please enter a number between 1-10: ")
userNumber = int(input())
if 1 <= userNumber <= 10:
    print("Thank you, valid number")
else:
    print("sorry, invalid number")
```

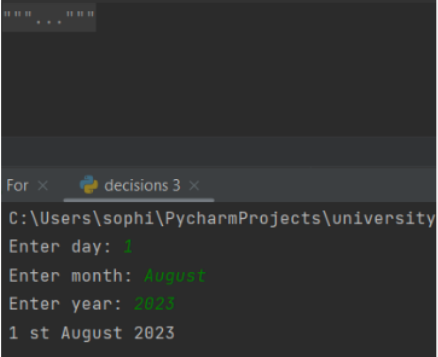
For × decisions 3 ×

C:\Users\sophi\PycharmProjects\university\venv\Scripts\python.exe
please enter a number between 1-10:
7
Thank you, valid number

Process finished with exit code 0

Example of an elif statement:

```
day = int(input("Enter day: "))
month = input("Enter month: ")
year = input("Enter year: ")
if day == 1 or day == 21 or day == 31:
    print(day,"st", month, year)
elif day == 2 or day == 22:
    print(day,"nd", month, year)
elif day == 3 or day == 23:
    print(day,"rd", month, year)
else:
    print(day,"th", month, year)
```



```
Enter day: 1
Enter month: August
Enter year: 2023
1 st August 2023
```

C.

When programming in python, it is inefficient to re-type blocks of code multiple times to repeat an action. This is where loops are important. For example, a while loop can be used to repeatedly execute a block of code until the condition is met, this means each time the codes condition isn't met it re-starts the code again until the condition is met [3]. Another type of loop is a for loop, this is where code is executed a specific amount of times

Example of a while loop:

```
1
2 # example
3 myNumber = int(input("Please enter a number, must be 10 or below: "))
4 while myNumber > 10:
5     print("That was out of range!")
6     myNumber = int(input("Have another go. "))
7 print("End of program.")
```

Run: For × While loops ×

C:\Users\sophi\PycharmProjects\university\venv\Scripts\python.exe "C:\Users\sophi\PycharmProjects\university\venv\Scripts\python.exe" "C:\Users\sophi\PycharmProjects\university\venv\Scripts\python.exe"

Please enter a number, must be 10 or below: 33

That was out of range!

Have another go. 22

That was out of range!

Have another go. 22

That was out of range!

Have another go. 7

End of program.

Example of a for loop:

```
1
2 # 1
3 for counter in range(0, 5, 1):
4     print("counting...", counter)
```

Run: For ×

C:\Users\sophi\PycharmProjects\university\venv\Scripts\python.exe "C:\Users\sophi\PycharmProjects\university\venv\Scripts\python.exe" "C:\Users\sophi\PycharmProjects\university\venv\Scripts\python.exe"

counting... 0

counting... 1

counting... 2

counting... 3

counting... 4

what times table?

Part B

Exercise 1

Logic stages:

1. Prompt user for name
2. Prompt user for national insurance number
3. Prompt user for age
4. Check age is above 16, and below 110 (if out of range back to 3)

5. Prompt user for pay
6. Check pay is above 0, and below 3000 (if out of range back to 5)

Code

```
name = input("Please enter your name: ") # user enters their name
niNumber = input("Please enter NI number: ") # user enters their national
insurance number
age = int(input("Please enter your age: ")) # user enters their age

while age < 16 or age > 110: # Checking that the user is over 16 and for
unrealistic numbers.
    age = int(input("That's out of range, Please enter your age (16-100): ")) #
user re-enters age when appropriate

pay = float(input("Please enter your monthly income: "))
while pay > 3000 or pay < 0: # Checking for negative numbers or if the pay
is too high.
    pay = float(input("That's out of range, please enter your monthly income:
(above 0, below £3000)"))
```

Testing

- i) Within range values

```
C:\Users\sophi\PycharmProjects\Assignment\venv\  
Please enter your name: Sophie  
Please enter NI number: JE248943B  
Please enter your age: 27  
Please enter your monthly income: 1500  
  
Process finished with exit code 0
```

ii) Testing age for valid input

```
C:\Users\sophi\PycharmProjects\Assignment\venv\Scripts\pyt  
Please enter your name: Sophie  
Please enter NI number: JE248943B  
Please enter your age: 2  
That's out of range, Please enter your age (16-100): 2  
That's out of range, Please enter your age (16-100): 3  
That's out of range, Please enter your age (16-100): 4  
That's out of range, Please enter your age (16-100): 27  
Please enter your monthly income: 1500  
  
Process finished with exit code 0
```

iii) Testing pay for valid input

```
C:\Users\sophi\PycharmProjects\Assignment\venv\Scripts\python.exe C:\Users\sophi\Pych  
Please enter your name: Sophie  
Please enter NI number: JE248943B  
Please enter your age: 27  
Please enter your monthly income: -1  
That's out of range, please enter your monthly income: (above 0, below £3000) 20  
That's out of range, please enter your monthly income: (above 0, below £3000) 10000  
That's out of range, please enter your monthly income: (above 0, below £3000) 24500  
That's out of range, please enter your monthly income: (above 0, below £3000) 1500  
  
Process finished with exit code 0
```

iv) Testing pay & age for valid input

```

C:\Users\sophi\PycharmProjects\Assignment\venv\Scripts\python.exe C:\Users\sophi\Py
Please enter your name: Sophie
Please enter NI number: JE248938
Please enter your age: 12
That's out of range, Please enter your age (16-100): 2
That's out of range, Please enter your age (16-100): 27
Please enter your monthly income: -44
That's out of range, please enter your monthly income: (above 0, below £3000) 1100
That's out of range, please enter your monthly income: (above 0, below £3000) 1500

Process finished with exit code 0

```

Exercise 2

Logic stages

1. Prompt user for radius of a circle
2. Check the number entered is above 0 (if not back to 1)
3. Calculate pi of circle from user input ($\pi * (\text{radius} * \text{radius})$)
4. Print calculation to 2 decimal places
5. Prompt user for length of the square side
6. Check the number entered is above 0 (if not back to 5)
7. Calculate area of square from user input ($\text{length} * \text{length}$)
8. Check that the square is smaller than the circle (if not back to 5)
9. Calculate area of circle with the area of square removed ($\text{circleArea} - \text{areaOfSquare}$)
10. Print total to 2 decimal places

Code

```

pi = 3.142 # pi

radius = float(input("please enter the radius of your circle: ")) # user
enters radius of a circle
while radius <= 0: # checking user entry is above 0
    radius = float(input(print("Radius must be above 0: "))) # try again
circleArea = pi * (radius * radius) # calculate area of circle
print("The area of the circle is: ", '%2.f' % circleArea) # print out
area of a circle to 2 decimal places

length = float(input("Please enter the length of the square side: ")) #
user enters length
while length <= 0: # checking user entry is positive
    length = float(input(print("Length must be above 0: "))) # try again
areaOfSquare = float(length * length) # calculate area of square

```

```

while areaOfSquare > circleArea:    # checking the square is smaller
    length = float(input(print("Your square is larger than your circle,
please try again. "))) # try again
    areaOfSquare = float(length * length)
print("The area of the square is: ", '%2.f' % areaOfSquare)    # print out
area of square to 2 decimal places

total = float(circleArea - areaOfSquare)    # calculate area of circle
minus area of square
print("Now lets calculate the area of the circle, once the square is
removed:", '%2.f' % total)    # print final result

```

Testing

i) Testing within range

```

C:\Users\sophi\PycharmProjects\Assignment\venv\Scripts\python.exe C:\Users\sop
please enter the radius of your circle: 10
The area of the circle is: 314
Please enter the length of the square side: 5
The area of the square is: 25
Now lets calculate the area of the circle, once the square is removed: 289

Process finished with exit code 0

```

ii) Testing while radius is out of range

```

C:\Users\sophi\PycharmProjects\Assignment\venv\Scripts\python.exe C:\Users\sop
please enter the radius of your circle: -1
Radius must be above 0:
None 1
Radius must be above 0:
None 1
Radius must be above 0:
None 10
The area of the circle is: 314
Please enter the length of the square side: 10
The area of the square is: 100
Now lets calculate the area of the circle, once the square is removed: 214

Process finished with exit code 0

```

iii) Testing while length is out of range

```
C:\Users\sophi\PycharmProjects\Assignment\venv\Scripts\python.exe C:\Users\sophi\PycharmProjects\Assignment\venv\Scripts\python.exe C:\Users\sophi\PycharmProjects\Assignment\venv\Scripts\python.exe
please enter the radius of your circle: 10
The area of the circle is: 314
Please enter the length of the square side: -1
Length must be above 0:
None
Length must be above 0:
None
The area of the square is: 25
Now lets calculate the area of the circle, once the square is removed: 289

Process finished with exit code 0
```

iv) Testing while square is larger than circle

```
C:\Users\sophi\PycharmProjects\Assignment\venv\Scripts\python.exe C:\Users\sophi\PycharmProjects\Assignment\venv\Scripts\python.exe C:\Users\sophi\PycharmProjects\Assignment\venv\Scripts\python.exe
please enter the radius of your circle: 10
The area of the circle is: 314
Please enter the length of the square side: 5000
Your square is larger than your circle, please try again.
None
Your square is larger than your circle, please try again.
None
Your square is larger than your circle, please try again.
None
The area of the square is: 16
Now lets calculate the area of the circle, once the square is removed: 298

Process finished with exit code 0
```

Exercise 3

Logic stages

1. Import random
2. Create list for shopping
3. Create list for price
4. User input 4 items and their prices to their shopping list
5. Print shopping list
6. Calculate total cost of shopping
7. Print total cost

8. Draw a random raffle ticket
9. Print how much discount the user gets
10. Calculate discount
11. Calculate new total
12. Print final total with discount

Code

```
import random # import random
shoppingList = [] # making a list for shopping
listPrice = [] # making a list for price

for counter in range(4): # appending the shopping/price list 4 times
    shoppingList.append(input("Please enter name of next item: "))
    listPrice.append(float(input("Please enter price of item: £")))

print("Here is a list of your shopping: ") # printing both lists
for counter in range(4):
    print(shoppingList[counter], "£", listPrice[counter])

total = float("%.2f" % sum(listPrice)) # calculating total
print("Your shopping costs: £", total)

discount = random.randint(10, 40) # drawing a random discount between 10%
and 40%
print("Drawing a raffle ticket...", "Your discount is", discount, "%")

discountAmount = (float(total * discount)/100) # calculating discount
newTotal = (float("%.2f" % (total - discountAmount))) # applying discount
print("Your new total is £", newTotal) # printing final total
```

Testing

i) Testing with correct values

```
C:\Users\sophi\PycharmProjects\Assignment\venv\Scripts\
Please enter name of next item: bread
Please enter price of item: £1.30
Please enter name of next item: milk
Please enter price of item: £1.20
Please enter name of next item: eggs
Please enter price of item: £0.95
Please enter name of next item: butter
Please enter price of item: £2.60
Here is a list of your shopping:
bread £ 1.3
milk £ 1.2
eggs £ 0.95
butter £ 2.6
Your Shopping costs: £ 6.05
Drawing a raffle ticket... Your discount is 31 %
Your new total is £ 4.17

Process finished with exit code 0
```

ii) Testing the raffle is random

```
Your Shopping costs: £ 6.05
Drawing a raffle ticket... Your discount is 31 %
Your new total is £ 4.17
```

```
Your Shopping costs: £ 5.64
Drawing a raffle ticket... Your discount is 18 %
Your new total is £ 4.62
```

```
Your Shopping costs: £ 7.7
Drawing a raffle ticket... Your discount is 10 %
Your new total is £ 6.93
```

Exercise 4

Logic stages

1. Import turtle
2. Create a function for o
3. Def turtle as t
4. Creating a Z
5. For loop 2 o's
6. Turtle done

Code

```
import turtle # importing turtle function

def o(): # creating a function for o
    t.pd()
    t.circle(40)
    t.pu()
    t.left(90)
    t.forward(10)
    t.right(90)
    t.pd()
    t.circle(30)
    t.pu()

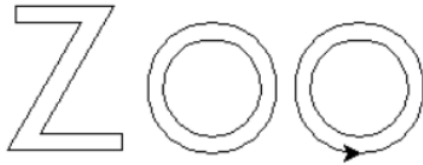
t = turtle.Turtle()

# z
t.forward(50)
t.right(120)
t.forward(90)
t.left(120)
t.forward(50)
t.right(90)
t.forward(10)
t.right(90)
t.forward(70)
t.right(120)
t.forward(90)
t.left(120)
t.forward(40)
t.right(90)
t.forward(10)
t.right(90)
t.forward(10)
t.pu()
t.goto(110, -90)

# 2 O's
for x in range(2):
```

```
o()  
t.goto(200, -90)  
turtle.done()
```

Testing



References

- [1] "W3 Schools," [Online]. Available: https://www.w3schools.com/python/python_variables.asp. [Accessed January 10 2023].
- [2] Q. Larson, "Free Code Champ," 10th April 2022. [Online]. Available: <https://www.freecodecamp.org/news/python-if-else-statement-example/>. [Accessed 10th January 2023].
- [3] "Geeks for Geeks," 9th January 2023. [Online]. Available: <https://www.geeksforgeeks.org/loops-in-python/>. [Accessed 11th January 2023].

Programming Assignment final

GRADEMARK REPORT

FINAL GRADE

87 / 100

GENERAL COMMENTS

Instructor

PART A

A1 Variables - You have talked about variables and types, and you talk a little about the dynamic typing via Python inferring based on the value entered. You need a bit more on this ie in Python types can change within the lifetime of the program

4 / 5

A2 If/Else - Good, with good examples, you could also have mentioned multiple conditions (although there is one in the code example) 4.5 / 5

A3 Loops - Good, with suitable examples. 5/5

PART B

B1 Variables

Logical Stages/Testing - Good logical stages. Testing is thorough. (See comment below about NI number)

4.5/5

Code - Good program with suitable validation on age and pay, you could also have validated for length of National Insurance number.

8.5/10

B2 Shape

Logical Stages/Testing - Good logical stages. Testing is good, see comment about areas below.

4/5

Code - Suitable validation used. The algorithm for the relative sizes of the square and circle is a bit lacking - the relative areas of the square won't allow it to always be less than the circle. It's a better approach to compare the relative sizes of radius and length. Good answer overall.

13/15

B3 Lists

Logical Stages/Testing - Good, although no need to mention "import random" as this is Python code specific and is therefore an implementation decision. Testing could be a bit wider (see comment about validating price below)

8/10

Code - You could have validated the price input (ie should not be negative) Other than that a good answer and all requirements met.

18/20

B4 Turtle

Code - Good use of Loop for the O. You could also have shortened your Z code by recognising the rotational symmetry of the Z character.

17/20

General comments:

Nice to see a suitable title page and contents page!
Good layout and writing style.

A very good assignment overall, well done.

OVERALL TOTAL FOR MODULE: 87%

PAGE 1
PAGE 2
PAGE 3
PAGE 4
PAGE 5
PAGE 6
PAGE 7
PAGE 8
PAGE 9
PAGE 10
PAGE 11
PAGE 12
PAGE 13
PAGE 14
PAGE 15