Ethiopian Institute of architecture, building construction and city development, AAU_ EiABC

Programming application short notes: Python Programming Language (part 3)

Students should revise their study of python part one and part two by starting from interface of PyCharm covered in these part and proceed to this (python part three) part of the course. Students should refer to the appendix section of all parts of the lecture notes.

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Python part 3

1. Working with PyCharm

Refer to your python part one chapter to revise about how to open PyCharm; on creating new project and on interface of PyCharm.

PyCharm unlike IDLE, provides an opportunity to write complex and multiple line programs. Unlike IDLE you can also go back and forth through past line of codes you can make edits. Since you have already studied visual studio code project development environment, it will be easier for you to understand how PyCharm works. Text editors for programing: Kite, Vim, Atom, VS Code, sublime text and ***PyCharm***.

After you open your PyCharm environment and created a project, you can go to the project browser area right click on the project folder and select new + file or python file. File option will not give you the option of .py extension and you will have to type it in while saving. However the python file option gives you the .py extension and you do not need to type it in.

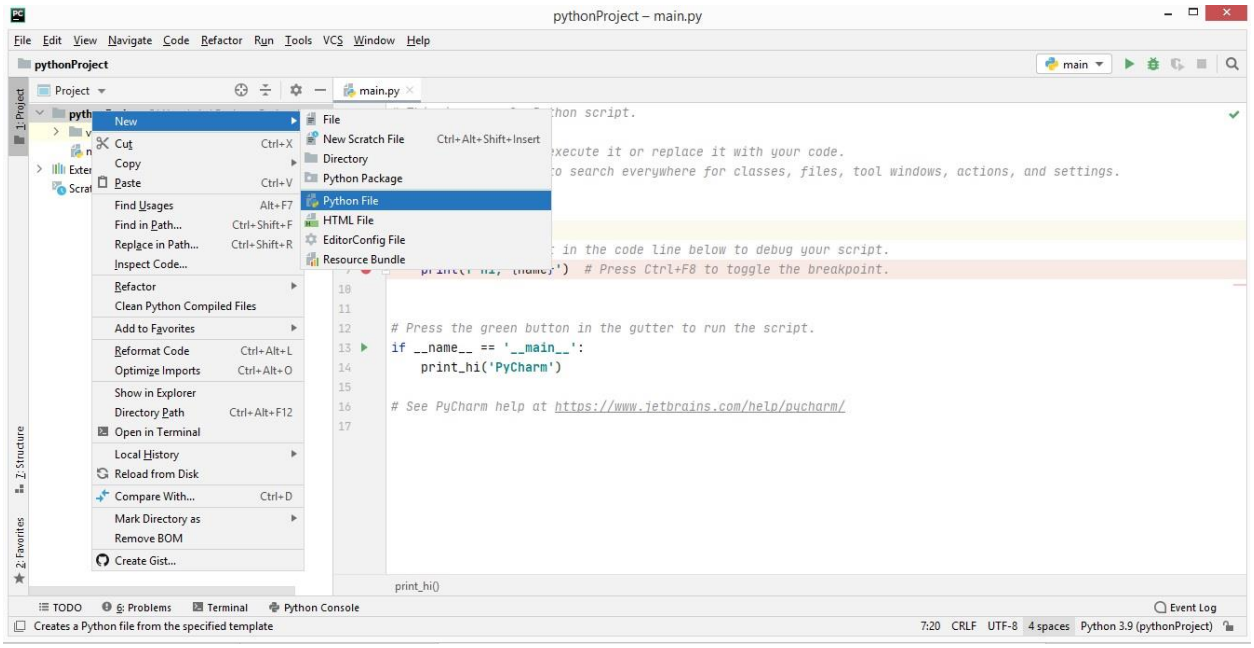


Figure 1: Create a new file or python file in PyCharm

On the resulting pop up window after selecting the python file option, type the name of the file as per your interest and enter. Here you do not need to type the .py in the file name as it will be provided by default.

Your project folder will be generated with different files. As you progress with your project, it will include more dependencies, modules imported, images etc.

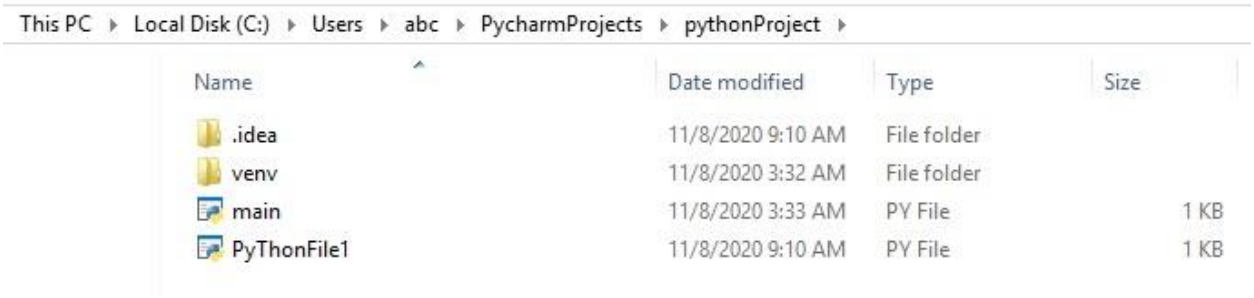


Figure 2: Project folder

1.1. Run

Type in your code in the code editing area and run your program via run (menu) + run. See the following figure and compare it with the figure above.

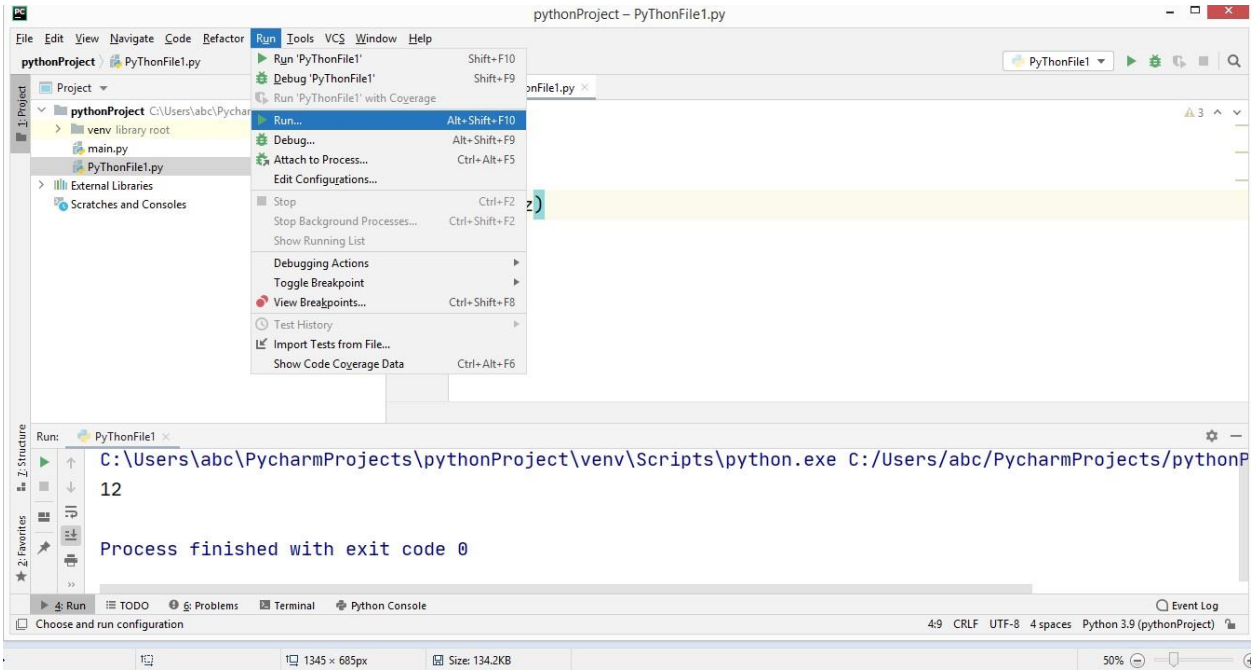


Figure 3: Running a project

You can also right click in your code editing area + right click + select run your python file. You can also do the same by pressing the paly button on the newly added window up on running the first time.

1.2. Trace and debug

One of the advantages of using IDE is that you can trace and debug your cod. Tracing and debugging becomes very important when you are working with a complex multi-line codes. To trace and debug, you can go to any line on your code and click on the corresponding number. The results in a red circle dot on the selected number as in the figure below. This red dot is your break point. It serves as a starting point from where you start tracing your code for debugging. After that go to your menu and select debug. On the resulting popup window select your file and PyCharm will start debugging. To go to next line, you can press F8 or go to run (Menu) + debugging action + step over. This will allow trace and debug the next line. Check the run window on the lower part of your PyCharm window for bug information.

Table 1: Trace and debug

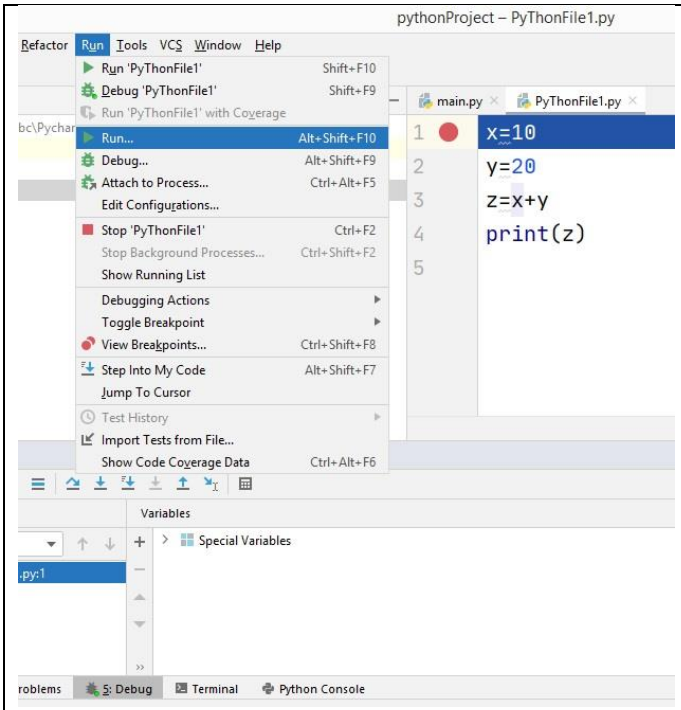


Figure 4: Break Point for debugging

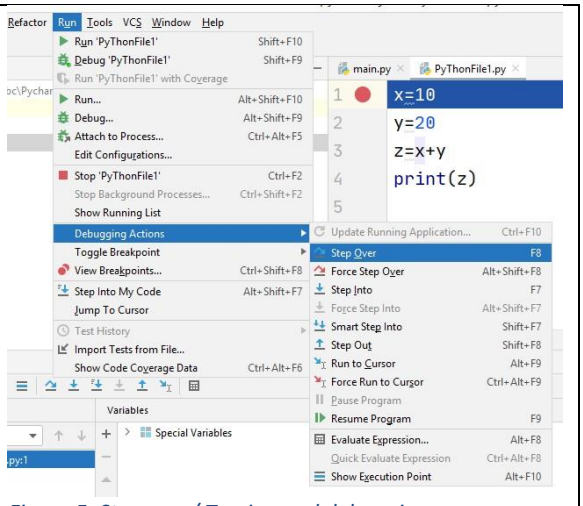


Figure 5: Step over/ Tracing and debugging

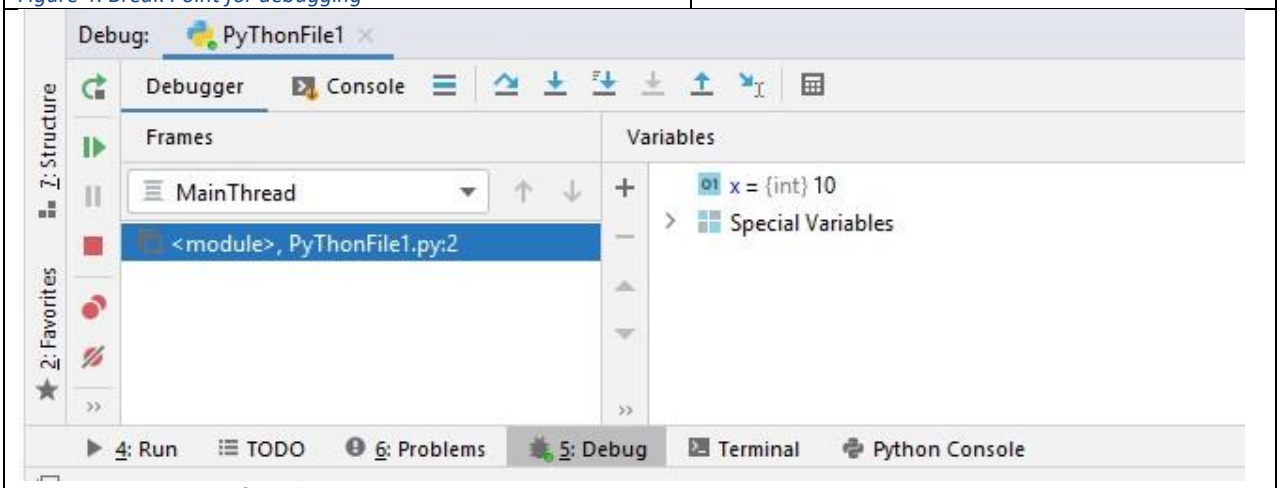


Figure 6: Run Window for Debugging

2. User input in python command line input

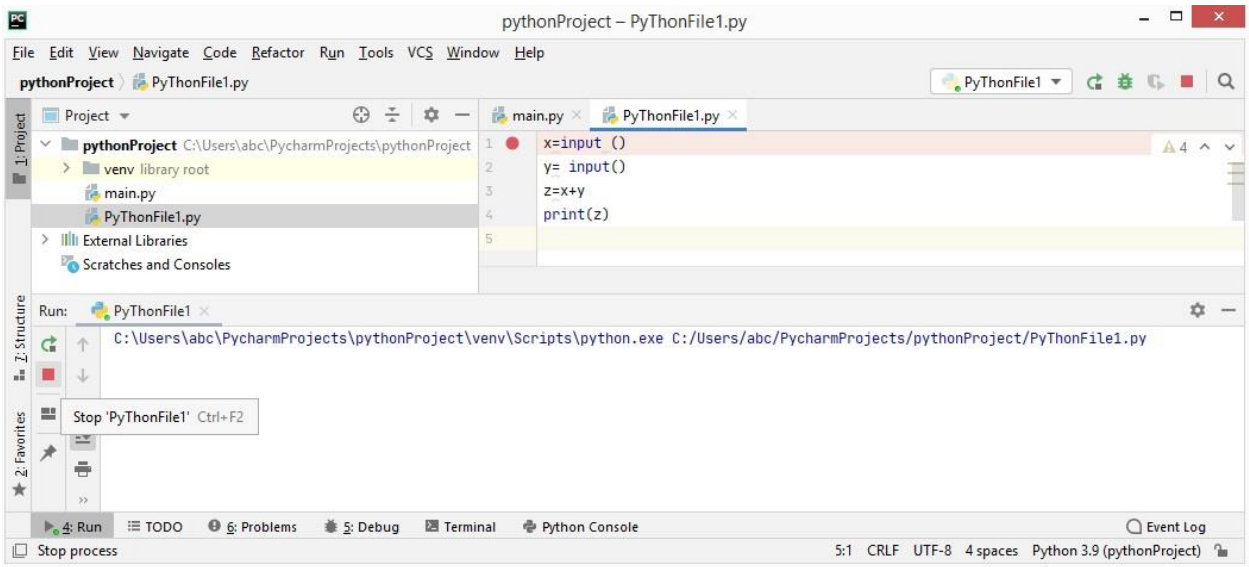


Figure 7: Input functions

Up until now we were running functions with variables. However we were not using an input. The input function allows you to collect client information and run it in your console window. See the following table and figures and their description.

Table 2: User Input

`x=input()`
`y= input()`
`z=x+y`
`print(z)`
	`x=input("Enter Value one")`
	`a=int(x)`
	`y= input("Enter Value two")`
	`b=int(y)`
	`z=a+b`
	`print(z)`
		`x=int(input("Enter Value one"))`
		`y= int(input("Enter Value two"))`
		`z=x+y`
		`print(z)`

This input code does not yield an output in the console as there are no inputs entered. Press the stop button (red square) on the left side of the console window and enter input values.	The value you will get up on running the above code will be as strings and you need to convert the inputs to integers or floats to make use of the additive arithmetic.	Here notice that x and y are converted to integers to avoid string out put up on running the program in the console. You can also save the line of codes you need by converting the inputs on the original variables.

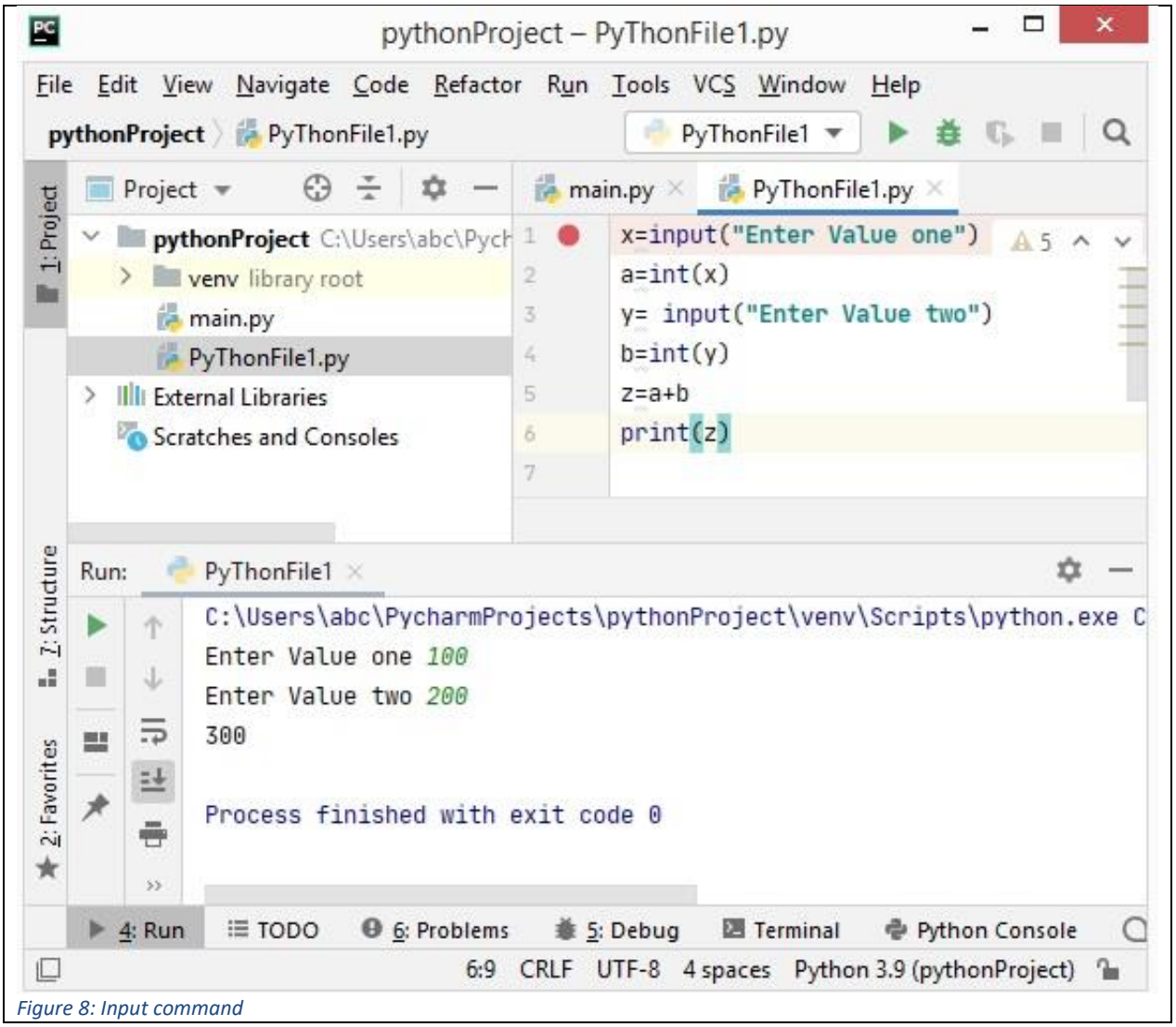


Figure 8: Input command

Figure 9: User input Project browser window, code editing window and the console window

Table 3: Character, input, log and perm functions practice

`ch=input('Enter a character')`
`print(ch[0])`
 	
Console:
Enter a character Abebe
A
	`ch=input('Enter a character')[0]`
	`print(ch)`
	
	Console:
	Enter a character Abebe
	A

When you run this input function, you will always get a character. Even if the client or a user entered an entire string. This is because we are fetching the 0 index.	The index inquiry can also be typed in the first line
`expression = eval (input('enter expression'))`	

```
print(expression)
```

Console:
eneter expression 1000/100-10
0.0

Class exercise on math module, input, log function.

On your earlier class exercise you have computed salary growth of a person in t years. By making use of the formula: $Y=a(r+1)^t$. For this exercise, make use of the same formula and setup an input structure (as shown in class) for Y (salary in t years) in PyCharm and show your work to your instructor.

Answer:

```
a=float(input("Enter Basic Salary"))
r=float(input("Enter Rate of salary increase"))
t=float(input("Enter Year of Experience"))
#y=a*(r+1)**t
y=a*pow((r+1),t)
print(y)
```

Restructure the above formula and setup an input structure to compute for t (number of years) in PyCharm and show it to your instructor. (5%) class exercise

Answer

```
import math
a=float(input("Enter initial Salary"))
r=float(input("Enter Rate of salary increase"))
#t=float(input("Enter Year of Experience"))
#y=a*(r+1)**t
#y=a*pow((r+1),t)
y=float(input("Enter Current salary amount"))
t=math.log(y/a,r+1) #total work experience in years
print(t)
```

Assignment on math module, input and perm function

Assignment:

This exercise also has two parts and you can work the first step on your IDLE environment and the second step n PyCharm and prepare two name.py files for the exercise.

The exercise is as follows: students that are not well versed with permutations and combinations may use the descriptions provided in the boxes under each question. The responsibility of the students is to make use of their python programing language and be able to access module and function like math, log, sqrt, perm, etc. to carry out the task. Please mind all components of the descriptions provided. (! In your standard algebra means factorial)

Step 1 = what are the chances that no two boys are sitting together for a photograph if there are five girls and two boys? (once they are done working with this step students should save name.py of the file and move on to the next step of the exercise on a new python file)

Description:

Here we can apply (a) permutation and combination and (b) probability.
Total number of children are 7. Yielding a total of 7! Total Ways of sitting combinations. Let us say: total number of ways children can sit together=CST, total number of ways that two boys can sit together=BST, total number of ways no two boys can sit together=NBST; therefore; CST=BST+NBST ; probability of no two boys sitting together =PNBST
CST=7! `#7 is the total number of children = tnc = b + g`
BST=2! X 6! `#2 is the number of boys that cannot sit together = nbnt and 6 is = tnc -1`
NBST=CST-BST `# 7!-2!x6!=7x6!-2!x6!=6!x5 … the workout is not a necessary information for your task. You only need the formula that can be computed in IDLE or PyCharm.`
PNBST=NBST/CST `# 6!x5/7!=6!x5/7x6!=5/7=0.7142 … the workout is not a necessary information for your task. You only need the formula that can be computed in IDLE or PyCharm.`
The comment lines are placed for you because you will need them to work on the second step of this exercise.

Answer for step 01,

IDLE	PyCharm

>>> import math
>>> CST=math.perm(7)
>>> BST=math.perm(2)*math.perm(6)
>>> NBST=CST-BST
>>> PNBST=NBST/CST
>>> PNBST
0.7142857142857143
	`import math`
	`CST=math.perm(7)`
	`BST=math.perm(2)*math.perm(6)`
	`NBST=CST-BST`
	`PNBST=NBST/CST`
	`print(PNBST)`

step2 = for the scenarios in step one create a variable for number of boys (for example: b) , for number of girls (for example: g), total number of children (for example: tnc) and another variable for number of boys that cannot sit together (for example: nbnt). Model a scenario by making use of the input function to compute probability of no boys sitting together (PNBST) for any appropriate value that is entered for tnc or nbnt. (once students are done working on this file students shouldsave name.py file of the exercise)

Answer for step 02,

PyCharm

```
import math
b=int(input('enter number of boys'))
g=int(input('enter number of girls'))
tnc=b+g
nbnt=int(input('enter the number of boys that cannot sit together'))
CST=math.perm(tnc) #tnc is the totalnumber of children
BST=math.perm(nbnt)*math.perm(tnc-1) #nbnt is the number of boys that can not sit
togehter
NBST=CST-BST
PNBST=NBST/CST
if PNBST>=0 and PNBST<=1:
    print(PNBST)
else:
    print('invalid or there is no solution')
```

Or

Step 01

```
import math
CST=math.factorial(7)
BST=math.factorial(2)*math.factorial(6)
NBST=CST-BST
PNBST=NBST/CST
print('Probability of No Two Boys Sit
Together is =',PNBST)
```

Step 02

```
import math
b=int(input('Please enter number of boys'))
g=int(input('Please enter number of girls'))
tnc=b+g
nbnt=int(input('Please enter number of boys
not to sit together'))
CST=math.factorial(tnc)
BST=math.factorial(nbnt)*math.factorial(tnc-
1)
NBST=CST-BST
PNBST=NBST/CST
print('Probability of no ',nbnt,'Boys sit
together is = ',PNBST)
```

3. If, elif , else , exit and try statements in python

The internal processing unit of our computer employs the principles of the ‘if’ key to process programs in its logical unit section. CPU (central processing unit) = CU (Control unit) + MU (memory Unit) + ALU (Arithmetic unit and logical unit). Knowing flowchart helps for programing (reading).

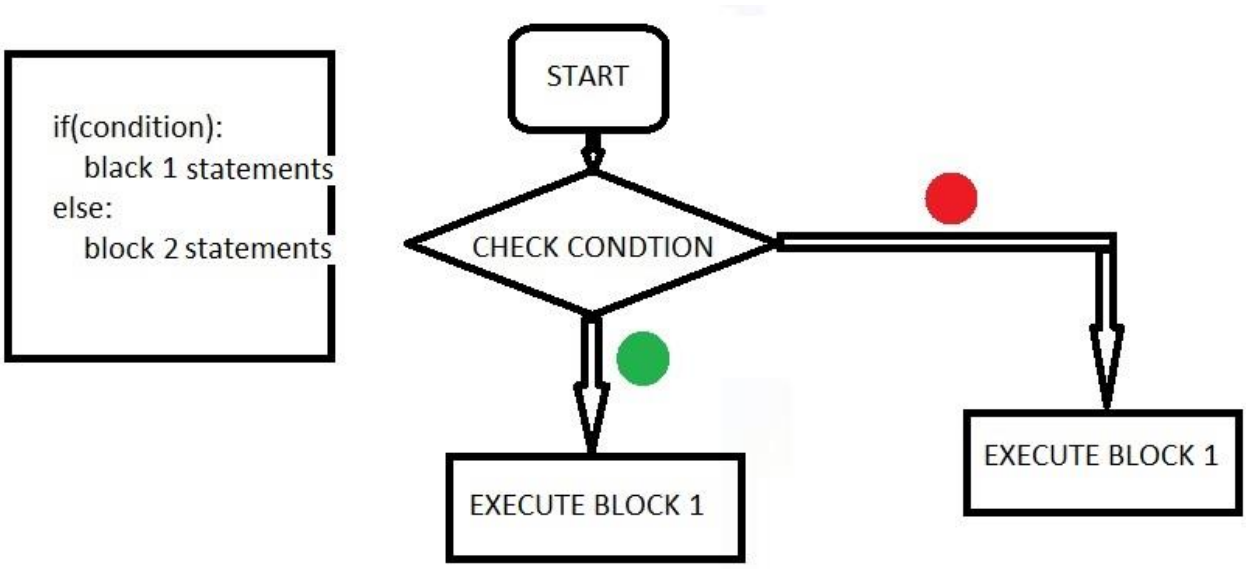


Figure 10: If statement flow chart

Mind the colon syntax in the following exercises.

Table 4: if , elif and else in python

if	If , else

# mind the indentation / commonly four. 	
 	
`if False:`
`  print("all is well")`
`if True:`
`  print("all is well!")`
`x=11`
`y= x % 2`
`if y==0:`
`  print('Even number')`
`if y==1:`
`  print('Odd number')`
	# mind the indentation / commonly four.
	# you can make your programming efficient by making use of the else key
	
	`if False:`
	`  print("all is well")`
	`else:`
	`  print("all is well!")`
	`x=11`
	`y= x % 2`
	`if y==0:`
	`  print('Even number')`
	`else:`
	`  print('Odd number')`

# mind the indentation / commonly four. 	
# you can make your programming efficient by making use of the else key 	
# when you have if within if, the second if is considered if the second if is satisfied. This case is called nested if. 	
	`x = 20`
	
	`if x==10:`
	`  print("ten")`
	
	`elif x==20:`
	`  print("twenty")`
	
	`elif x==30:`
	`  print("thirty")`
	
	`elif x==40:`

```
if False:
    print("all is well")
else:
    print("all is well!")
x=10
y= x % 2
if y==0:
    print('Even number')
    if x>4:
        print('x is greater than three')
    else:
        print('x is less than three')
else:
    print('Odd number')


in the console you will see:

all is well!
Even number
x is greater than three
```

```
    print("forty")

else:
    print("invalid input")
```

Assignment:

Table 5: Assignment on if, elif, else and exit statement

Students shall select only one of the two Scenarios indicated in the boxes provided below and model the selected scenario in PyCharm environment and email. Students may use the given example below (solved example scenario). The example name.py file can also be found at this link (Example_Scenario). (https://drive.google.com/file/d/1-6vpbBN7LtnIgrZN-ofDnodR-OGLskfo/view?usp=sharing) All scenarios indicated in this exercise file are extracted from an Indian GAT exams and modified for the exercise under consideration.
Example scenario: Students may use the following solved scenario as an example (take a look at the python code provided). a. The Scenario to be used as an example for the exercise under consideration : Eight people - A, B, C, D, E, F, G, and H – ride to work in three cars. The first two cars each take three people, and the third car takes only two people. B rides with H in the second car. G rides with only one other person. F rides with two other people. If C rides with B, the following pairs and triplets can ride together: (1) A and G; (2) G and E; (3) A, D and F and (4) B, C and H b. The solution Python code to be used as an example is as follows: Possible arrangement of people in the three cars can be: in car1=A, D, F; in car2=B, C, and H; in

car3=G, E. The above order of cars may not be the only possible order.

Answer example scenario :

```
#1 (Given)
# The Scenario to be used as an example for the exercise under consideration :
#Eight people - A, B, C, D, E, F, G, and H - ride to work in three cars.
# The first two cars each take three people, and third car takes only two people.
#B rides with H in the 2nd car.
#G rides with only one other person.
#F rides with two other people
#If C rides with B, the following pairs and triplets can ride together:
# (1) A and G; (2) G and E; (3) A, D and F (4) B, C and H

#2 (Possible arrangement of people in the three cars can be:)
#in car1 =  A, D, F;
#in car2 =  B, C, H;
#in car3 =  G, E;
#The above order is not the only possible order for the cars.

# The solution in Python code to be used as an example is as follows:

start=input("Read the following Scenario. If you understand the Scenario and want to
continue enter Y.\n"
            "If you do not understand the scenario and do not want to continue enter
N.\n"
            "Eight people - A, B, C, D, E, F, G, and H - ride to work in three
cars.\n"
            "The first two cars each take three people, and the third car takes only
two people. \n"
            "B rides with H in the 2nd car. G rides with only one other person. F
rides with two other people. \n"
            "If C rides with B, the following pairs and triplets can ride
together:\n"
            "(1) A and G; (2) G and E; (3) A, D and F and (4) B, C and H")
if start =='Y' or start=='y':
    car1 = input("Enter any person that can ride in car one: ")
    if car1 == 'A' or car1=='a':
        print('Correct ! , the other people that can ride in this car are D and F')
    elif car1=='D' or car1=='d':
        print('Correct ! , the other people that can ride in this car are A and F')
    elif car1=='F' or car1=='f':
        print('Correct ! , the other people that can ride in this car are A and D')
    elif car1=='B' or car1=='b' or car1=='C' or car1=='c' or car1=='E' or car1=='e'
or car1=='G' or car1=='g' \
            or car1=='H' or car1=='h':
        print('You are wrong !')
    else:
        print('Wrong input !')

    car2 = input("Enter any person that can ride in car two: ")
    if car2 == 'B' or car2=='b':
        print('Correct ! , the other people that can ride in this car are C and H')
    elif car2=='C' or car2=='c':
        print('Correct ! , the other people that can ride in this car are B and H')
    elif car2=='H' or car2=='h':
        print('Correct ! , the other people that can ride in this car are B and C')
    elif car2=='A' or car2=='a' or car2=='D' or car2=='d' or car2=='E' or car2=='e'
or car2=='F' or car2=='f' \
            or car2=='G' or car2=='g':
        print('You are wrong')
    else:
        print('Wrong input !')
```

```
    car3 = input("Enter any person that can ride in car three (Caps lock ): ")
    if car3 == 'G' or car3=='g':
        print('Correct ! , the other person that can ride in this car is E')
    elif car3=='E' or car3=='e':
        print('Correct ! , the other person that can ride in this car is G')
    elif car3=='A' or car3=='a' or car3=='B' or car3=='b' or car3=='C' or car3=='c'
or car3=='D' or car3=='d' \
           or car3=='F' or car3=='f' or car3=='H' or car3=='h':
        print('You are wrong')
    else:
        print('Wrong input !')

elif start == 'N' or start=='n':
    print("Thank you! Perhaps you can take a look at the Scenario next time and try
again.")
else:
    print("Wrong input, Good bye!")

finish=input("Please type E to exit or rerun the program to try again")
if finish=='E' or finish=='e':
    exit
else:
    print("Wrong input, Good bye!")

exit
```

Select one of the following scenarios for your exercise and follow instruction given in the respective boxes.

Scenario option 1:

As a follow up to your previous class exercise, based on the following description of a specific scenario create a model in your PyCharm environment and email the resulting 'name.py' file to your instructor. Students should apply relevant information (to carry out the task under consideration) from all components of their covered course materials (python part 1, 2 and 3).

Six people – Ramzan, Shahid, Tayyab, Usman, Vajiha, and Waseem are standing in line for tickets to an upcoming concert.
Ramzan is fifth in line and is not next to Shahid.
Usman is immediately behind Tayyab.
Waseem is not last.
Vajiha is last in line.

Answer by students:

```
start=input("Six people – Ramzan, Shahid, Tayyab, Usman, Vajiha, and Waseem are
standing in line for tickets to an upcoming concert.\n"
            "Ramzan is fifth in line and is not next to Shahid.\n"
            "Usman is immediately behind Tayyab. \n"
            "Waseem is not last.  \n"
            "Vajiha is last in line. \n"
            "The possible arrangement for the places are\n"
            "(1st) Shahid, Tayyab, Waseem; \n"
            "(2nd) Shahid, Waseem, Tayyab, (Usman if Tayyab is 1st) \n"
            "(3rd) Shahid, Waseem, Tayyab, (Usman if Tayyab is 2nd)  \n"
            "(4th) Waseem, (Usman if Tayyab is 3rd); "
```

```
            "(5th) Ramzan; "
            "(6th) Vajiha\n"
            "Enter Y to continue : ")
if start =='Y' or start=='y':
    #=======================first line=====================#
    first = input("Enter any person that can sit first : ")
    if first == 'Shahid' or first=='shahid':
        print('Correct ! , the other people that can work on monday are Tayyab and
Waseem ')
    elif first=='Tayyab' or first=='tayyab':
        print('Correct ! , the other people that can work on monday are Shahid and
Waseem')
    elif first=='Waseem' or first=='waseem':
        print('Correct ! , the other people that can work on monday are Shahid and
Tayyab')
    elif first=='Usman' or first=='usman' or first=='Vajiha' or first=='vajiha' or
first=='Ramzan' or first=='ramzan':
        print('You are wrong ! the persons that can work on Monday are Shahid,
Tayyab and Waseem')
    else:
        print('Wrong input !')
    #=======================second line=====================#
    second = input("Enter any person that can sit second: ")
    if first=='Shahid' or first == 'shahid':
        if second == 'Shahid' or second == 'shahid':
            print('Shahid sit on first place')
    if first != 'shahid'and second == 'Shahid' or first != 'shahid'and second ==
'shahid' or\
            first != 'shahid'and second == 'Shahid' or first != 'Shahid'and second
== 'Shahid':
            print('Correct ! , the other people that sit second are Tayyab, Usman
and Waseem')
    elif second=='Waseem' or second=='waseem':
        print('Correct ! , the other people that sit second are Shahid, Tayyab and
Usman')
    elif first!= 'Tayyab' and second=='Tayyab' or first!= 'tayyab'and
second=='tayyab' or first!= 'Tayyab'and second=='tayyab' or \
            first!= 'tayyab'and second=='Tayyab' or second=='Ramzan' or
second=='ramzan' or second=='Vajiha' or second=='vajiha':
        print('You are wrong')
    else:
        print('Wrong input !')

    # =======================third line=====================#

    third = input("Enter any person that can sit third: ")
    if second=='Shahid' or second == 'shahid':
        if third == 'Shahid' or third == 'shahid':
            print('Shahid sit on second place')
    if second != 'shahid'and third == 'Shahid' or second != 'shahid'and third ==
'shahid' or\
            second != 'shahid'and third == 'Shahid' or second != 'Shahid'and third
== 'Shahid':
            print('Correct ! , the other people that sit third are Tayyab and
Waseem')
    if first=='Shahid' or first == 'shahid':
        if third == 'Shahid' or third == 'shahid':
            print('Shahid sit on first place')
    if first != 'shahid'and third == 'Shahid' or first != 'shahid'and third ==
'shahid' or\
            first != 'shahid'and third == 'Shahid' or first != 'Shahid'and third ==
'Shahid':
            print('Correct ! , the other people that sit third are Tayyab and
```

```
Waseem')
    elif third=='Waseem' or third=='Waseem':
        print('Correct ! , the other people that sit third are Shahid, Tayyab and
Usman')
    elif second!= 'Tayyab' and third=='Tayyab' or second!= 'tayyab'and
third=='tayyab' or second!= 'Tayyab'and third=='tayyab' or \
            second!= 'tayyab'and third=='Tayyab':
        print('Correct ! , the other people that sit third are Shahid and Waseem')
    elif third=='Ramzan' or third=='ramzan' or third=='Vajiha' or third=='vajiha':
        print('You are wrong')
    else:
        print('Wrong input !')

    #=======================fourth line=======================#

    fourth = input("Enter any person that can sit fourth: ")
    if fourth=='Waseem' or fourth=='waseem':
        print('Correct ! , the other people that sit fourth is Usman')
    if third == 'Tayyab' or third == 'tayyab':
        if fourth == 'Usman' or fourth == 'usman':
            print('Correct ! , the other people that sit fourth is Waseem')
    elif third!= 'Tayyab' and fourth=='Usman' or third!= 'tayyab'and fourth=='Usman'
or third!= 'Tayyab'and fourth=='usman' or \
            third!= 'tayyab'and fourth=='tayyab' or fourth=='Ramzan' or
fourth=='ramzan' or fourth=='Vajiha' or fourth=='vajiha':
        print('You are wrong')
    else:
        print('Wrong input !')

    #=======================fifth line=======================#

    fifth = input("Enter any person that can sit fifth: ")
    if fifth == 'Ramzan' or fifth == 'ramzan':
        print('Correct ! ')
    elif fifth == 'Usman' or fifth == 'usman' or fifth == 'Vajiha' or fifth ==
'vajiha' or fifth == 'Waseem' or fifth == 'waseem'\
            or fifth == 'Shahid' or fifth == 'shahid'or fifth == 'Tayyab' or fifth
== 'tayyab':
        print('You are wrong')
    else:
        print('Wrong input !')
    #=======================sixth last line=======================#

    sixth = input("Enter any person that can sit sixth: ")
    if sixth == 'Varija' or sixth == 'varija':
        print('Correct ! ')
    elif sixth == 'Usman' or sixth == 'usman' or sixth == 'Ramzan' or sixth ==
'ramzan' or sixth == 'Waseem' or sixth == 'waseem'\
            or sixth == 'Shahid' or sixth == 'shahid'or sixth == 'Tayyab' or sixth
== 'tayyab':
        print('You are wrong')
    else:
        print('Wrong input !')



elif start == 'N' or start=='n':
    print("Thank you! Perhaps you can take a look at the Scenario next time and try
again.")
else:
    print("Wrong input, Good bye!")

finish=input("Please type E to exit or rerun the program to try again")
```

```
if finish=='E' or finish=='e':
    exit
else:
    print("Wrong input, Good bye!")

exit
```

Scenario option 2:

As a follow up to your previous class exercise, based on the following description of a specific scenario create a model in your PyCharm environment and email the resulting 'name.py' file to your instructor. Students should apply relevant information (to carry out the task under consideration) from all components of their covered course materials (python part 1, 2 and 3).

The baby toy store employs five cashiers – Alam, Babar, Chohan, Dilawer, and Esa – each of whom works alone on exactly one day, Monday through Friday.
Alam will work only on Tuesday or Thursday.
Babar will not work on Monday or Wednesday.
Chohan works on Friday.
Dilawer and Esa do not work on consecutive days.
The following is a possible work schedule:

Monday	Tuesday	Wednesday	Thursday	Friday
Esa	Alam	Dilawar	Babar	Chohan

Answer by students:

```
start = input("Please read the scenario below and write Y/y if you understand the
event or press N/n if you dont understand the event. \n"
"The baby toy store employees five cashiers – Alam, Babar, Chohan, Dilawer, and Esa
– each of whom \n"
"works alone on exactly one day, Monday through Friday. \n"
"Alam will work only on Tuesday or Thursday. \n"
"Babar will not work on Monday or Wednesday. \n"
"Chohan works on Friday. \n"
"Dilawer and Esa do not work on consecutive days. \n"
"You can not type one person twice since they all work only once a week! \n"
              "type:" "A or a for Alam \n"
                      "B or b for Babar \n"
                      "C or c for Chohan \n"
                      "D or d for Dilawer \n"
                      "E or e for Esa")


if start == "y" or start == "Y":
    Monday = input("Enter the people that work on Mondays: ")
    if Monday == "D" or Monday == "d" or Monday == "E" or Monday == "e":
        print("Correct answer! That is a possible scenario on Monday")
    elif Monday == "A" or Monday == "a" or Monday == "B" or Monday == "B" or Monday
== "C" or Monday == "c":
        print("Wrong answer, he/she cannot work on Mondays")
    else:
        print("Wrong input!")

    Tuesday= input("Enter the people that work on Tuesdays: ")
    if Tuesday == "A" or Tuesday == "a":
```

```
        print("Correct, A can work on Tuesdays")
    elif Tuesday == "B" or Tuesday == "b":
        print("Correct, B can work on Tuesdays")
    elif Tuesday == "C" or Tuesday == "c" or Tuesday == "E" or Tuesday == "e" or
Tuesday == "D" or Tuesday == "d":
        print("Wrong answer, try again!")
    else:
        print("Wrong input")

    Wednesday = input("Enter the people that work on Wednesday: ")
    if Wednesday == "D" or Wednesday == "d" or Wednesday == "E" or Wednesday == "e":
        print("Correct answer! That is a possible scenario")
    elif Monday == "d" or Monday == "D":
        print("D already worked on Monday, a person con only work once a week!")
    elif Wednesday == "A" or Wednesday == "a" or Wednesday == "B" or Wednesday ==
"b" or Wednesday == "C" or Wednesday == "c":
        print("Not correct! Please try another scenario!")
    else:
        print("Wrong input!")


    Thursday = input("Enter the people that work on Thursdays: ")
    if Thursday == "a" or Thursday == "A":
        print("Correct, A can work on Thursdays")
    elif Thursday == "b" or Thursday == "B":
        print("Correct, B can work on Thursdays")
    elif Thursday == "C" or Thursday == "c" or Thursday == "D" or Thursday == "d" or
Thursday == "E" or Thursday == "e":
        print("Your answer is not correct, try again")
    else:
        print("Wrong input")


    Friday = input("Enter the people that work on Fridays: ")
    if Friday == "C" or Friday == "c":
        print("Correct, only C can work on Friday")
    elif Friday == "a" or Friday == "A" or Friday == "D" or Friday == "d" or Friday
== "B" or Friday == "b" or Friday == "E" or Friday == "e":
        print("Your answer is not correct, please try again")
    else:
        print("Wrong input")

elif start == "N" or start == "N":
    print("Thank you perhaps you can take another look and try again later!")
else:
    print("Wrong input!")

finish = input("Please type 'E' to exit the program or rerun the program to try
again!")
if finish == "e" or Finish == "E":
    print("Good Bye!")
else:
    print("Wrong input, goodbye")
```

Additional Exercise 1:

Ethiopian tax Rate:

No.	Salary Range (ETB)	Tax Rate	Deduction (ETB)
1	0 – 600	Non-Taxable	–
2	601-1,650	10%	60
3	1,651 – 3,200	15%	142.50
4	3,201 – 5,250	20%	302.50
5	5,251 – 7,800	25%	565
6	7,801 – 10,900	30%	955
7	Over 10,900	35%	1,500

Based on the range aforementioned tax rate and range calculate tax of employee
calculate pension (7%) of each employee
calculate net pay of employee

Answer:

```
salary = int(input('please enter your salary: '))
if 0 < salary < 600:
    tax = 'Non Taxable salary'
    pension = salary*0.07
    deduction = 0
    net_payment = salary
    print ('You should pay a tax amount of which is: ', tax)
    print ('You have a pension value of: ', pension)
    print ('Your salary has a deduction of: ', deduction)
    print ('Your Net Payment is: ', net_payment)
elif 601 < salary < 1650:
    tax = salary*0.1
    pension = salary*0.07
    deduction = 60
    net_payment = salary - (tax - deduction) - pension
    print ('You should pay a tax amount of 10% which is: ', tax)
    print ('You have a pension value of: ', pension)
    print ('Your salary has a deduction of: ', deduction)
    print ('Your Net Payment is: ', net_payment)
elif 1651 < salary < 3200:
    tax = salary*0.15
    pension = salary*0.07
    deduction = 142.5
    net_payment = salary - (tax - deduction) - pension
    print ('You should pay a tax amount of 15% which is: ', tax)
    print ('You have a pension value of: ', pension)
    print ('Your salary has a deduction of: ', deduction)
    print ('Your Net Payment is: ', net_payment)
elif 3201 < salary < 5250:
    tax = salary*0.2
    pension = salary*0.07
    deduction = 302.5
    net_payment = salary - (tax - deduction) - pension
    print ('You should pay a tax amount of 20% which is: ', tax)
    print ('You have a pension value of: ', pension)
    print ('Your salary has a deduction of: ', deduction)
    print ('Your Net Payment is: ', net_payment)
elif 5251 < salary < 7800:
    tax = salary*0.25
    pension = salary*0.07
    deduction = 565
    net_payment = salary - (tax - deduction) - pension
    print ('You should pay a tax amount of 25% which is: ', tax)
```

```
    print ('You have a pension value of: ', pension)
    print ('Your salary has a deduction of: ', deduction)
    print ('Your Net Payment is: ', net_payment)
elif 7801 < salary < 10900:
    tax = salary*0.3
    pension = salary*0.07
    deduction = 955
    net_payment = salary - (tax - deduction) - pension
    print ('You should pay a tax amount of 30% which is: ', tax)
    print ('You have a pension value of: ', pension)
    print ('Your salary has a deduction of: ', deduction)
    print ('Your Net Payment is: ', net_payment)
elif salary > 10901:
    tax = salary*0.35
    pension = salary*0.07
    deduction = 1500
    net_payment = salary - (tax - deduction) - pension
    print ('You should pay a tax amount of 35% which is: ', tax)
    print ('You have a pension value of: ', pension)
    print ('Your salary has a deduction of: ', deduction)
    print ('Your Net Payment is: ', net_payment)
```

Additional Exercise 2:

Take a look at the examples and instructions given in class and carry out the following task. Source: GAT exam: https://sheir.org/edu/gat-sample-analytical-reasoning/

The resulting .py file should be emailed to eceg.eiabc@gmail.com with the file name: Assignment2_firstname_secondname.py

The assignment should be emailed before next class or August 2, 2021:

Scenario to be simulated with if, elif, else, etc. conditional statements on python: Persons live in a street, having houses in line. Consider the following:

1. A lives in the corner's house
2. C is between E and G
3. There is 1 house between D and F
4. F is neighbor of G
5. There are two houses between A and G

Your simulation should be interactive and should help answer the following questions:

Who lives in the second corner?
Who lives in the middle?
Who lives between B and G?
Who is neighbor of A?
How many houses are there between B and E?

Answers: (D)(G) (F)(E)(3)

Answer by students:

```
name = input("Hello!, \nPlease Enter Your Name: ").capitalize()

print("Hello again " + name + "."
"\nWelcome! This is a simple imagination quiz.\n")
response = input("Do you wanna play the quiz?\nEnter 'Y' for Yes  or enter 'N' for
No:\n").capitalize()

if response == "Y":
    print("Great! let's play then!")
    print("You have the following information. Please read them carefully.")

    print("**************************************************")
    print(" ************************************************")
#Given
    print("Persons live in a street, having houses in line. Consider the following:
")
    print("    A lives in the corner's house,              ")
    print("    C is between E and G,                       ")
    print("    There is 1 house between D and F,           ")
    print("    F is neighbor of G and,                     ")
    print("    There are two houses between A and G.       ")

    print(" ************************************************")
    print("**************************************************")


    print("Based on the information given above answer the following
questions.\nGood luck!!!\n")
    score = 0
    questions = 0

#Q1
    Q1 = input("1. Who lives in the second corner?\n   Your answer: ").capitalize()
    if Q1 == 'D':
        print("Correct! the answer is D")
        score += 1
        questions +=1
        print("your score is : " + str(score) + "/"+ str(questions) +"\n\n")
    elif Q1 == "A" or Q1 == "A" or Q1 == "B" or Q1 == "C" or Q1 == "E" or Q1 == "F"
or Q1 == "G":
        print("No! the correct answer is 'D'.")
        score += 0
        questions += 1
        print("your score is : " + str(score) + "/" + str(questions) +"\n\n")
    else:
        print("Invalid answer.\nThe correct answer is 'D'.")
        score += 0
        questions += 1
        print("your score is : " + str(score) + "/" + str(questions) +"\n\n")


#Q2
    Q2 = input("2. Who lives in the middle?\n   Your answer: ").capitalize()
    if Q2 == 'G':
        print("Correct! the answer is G")
        score += 1
        questions +=1
        print("your score is : " + str(score) + "/" + str(questions) +"\n\n")
    elif Q2 == "A" or Q2 == "A" or Q2 == "B" or Q2 == "C" or Q2 == "E" or Q2 == "F"
or Q2 == "D":
        print("No! the correct answer is 'G'.")
        score += 0
```

```
        questions += 1
        print("your score is : " + str(score) + "/" + str(questions) +"\n\n")
    else:
        print("Invalid answer.\nThe correct answer is 'G'.")
        score += 0
        questions += 1
        print("your score is : " + str(score) + "/" + str(questions) +"\n\n")

#Q3
    Q3 = input("3. Who lives between B and G?\n   Your answer: ").capitalize()
    if Q3 == 'F':
        print("Correct! the answer is F")
        score += 1
        questions +=1
        print("your score is : " + str(score) + "/" + str(questions) +"\n\n")
    elif Q3 == "A" or Q3 == "A" or Q3 == "B" or Q3 == "C" or Q3 == "E" or Q3 == "G"
or Q3 == "D":
        print("No! the correct answer is 'F'.")
        score += 0
        questions += 1
        print("your score is : " + str(score) + "/" + str(questions) +"\n\n")
    else:
        print("Invalid answer.\nThe correct answer is 'F'.")
        score += 0
        questions += 1
        print("your score is : " + str(score) + "/" + str(questions) +"\n\n")
#Q4
    Q4 = input("4. Who is the neighbor of A?\n   Your answer: ").capitalize()
    if Q4 == 'E':
        print("Correct! the answer is E")
        score += 1
        questions +=1
        print("your score is : " + str(score) + "/"+ str(questions) +"\n\n")
    elif Q4 == "E" or Q4 == "A" or Q4 == "B" or Q4 == "C" or Q4 == "F" or Q4 == "G"
or Q4 == "D":
        print("No! the correct answer is 'E'.")
        score += 0
        questions += 1
        print("your score is : " + str(score) + "/"+ str(questions) +"\n\n")
    else:
        print("Invalid answer.\nThe correct answer is 'E'.")
        score += 0
        questions += 1
        print("your score is : " + str(score) + "/" + str(questions) +"\n\n")

#Q5
    Q5 = str(input("5. How many houses are there between B and E?\n   Your answer:
"))
    if Q5 == '3':
        print("Correct! the answer is 3")
        score += 1
        questions +=1
        print("your score is : " + str(score) + "/" + str(questions) +"\n\n")
    elif Q5 != "3":
        print("No! the correct answer is '3'.")
        score += 0
        questions += 1
        print("your score is : " + str(score) + "/" + str(questions) +"\n\n")
    else:
        print("Invalid answer.\nThe correct answer is 'E'.")
        score += 0
        questions += 1
        print("your score is : " + str(score) + "/" + str(questions) +"\n\n")
```

```
    print("Dear " + name + ", your final score is: " + str(score) + "/" +
str(questions))
    if score == 5:
        print("you are so good at imagination. Keep it up!!\nGood by dear " + name +
".")
    elif score >= 3 and score < 5:
        print("you are good, but good can be better.\nHere is the correct order of
the houses: \nA>>E>>C>>G>>F>>B>>D.\n Good bye " + name +".")
    elif score >= 1 and score < 3:
        print("Exprience more dear " + name + ".\nHere is the correct order of the
houses: \nA>>E>>C>>G>>F>>B>>D.\nGood bye for now.")
    else:
        print("Hmm, it seems that you don't understand the quiz.\nHere is the
correct order of the houses: \nA>>E>>C>>G>>F>>B>>D. Good bye " + name +".")


elif response == "N":
    print("Okay, that is unfortunate! Good by!!")
    exit()
else:
    print("Ohh!!!, That is an invalid input.\nGood bye!!!")
    exit()
```

4. While loop and for loop in python

4.1. While loops

While loop provides the programmer to run a function several times between an initial and provided condition. This is very handy in contrary to doing the output manually. The program needs the following components: Initialization, condition and increment (decrement).

Table 6: While loop

`x = 10`
 	
`while x<20:`
`    print ("EiABC")`
`    #x=x+1`
`    x+=1`
 	
Run this code in PyCharm and see what prints out.
	`x = 10`
	`#while x<20 and x>0 :`
	`while x>1:`
	`    print ("EiABC", 2000+x)`
	`    #x=x+1`
	`    x-=1`
	
	Run this code in PyCharm and see what prints out.

`x = 1`
 	
`while x<10:`
`    print ("EiABC",end="")`
`    y=1`
`    while y<=10:`	

`        print("Graduate students",end="")`
`        y=y+1`
`    x=x+1`
`    print()`
 	
Run this code in PyCharm and see what prints out.	

4.2. For loops

While loop works with conditions while for loop works with sequences. As mentioned in your previous chapter (2.7.3. Sequence data types), sequences are concerned with: list, tuple, set, string, range.

Table 7: For loop

`x = ['AAU', 2020, 12097]`
`print(x[2])`
 	
list and index
	`x = ['AAU', 2020, 12097]`
	`#print(x[2])`
	`for y in x:`
	`    print(y)`
	
	for loop in list

`x = 'AAU'`
`#print(x[2])`
`for y in x:`
`    print(y)`
 	
for loop in a string
	`for y in ['AAU', 2020, 12097]:`
	`    print(y)`
	
	for loop in list

`for y in range(15):`
`    print(y)`
 	
for loop in a string
	`for y in range(15,31,2):`
	`    print(y)`
	
	For loop in range with starting point, ending point and iteration.

`for y in range(10,21):`
`    if y%2==0:`
`        print(y)`
 	
if inside a for loop with module moderator	

Exercise:

5. Break, continue, pass, exit, try, except

5.1. Break

The statement 'break' while working in loops allows to exit from the running function and jump to the next function in the program. Compare and contrast the different outputs in all three of the different cases in the following table:

Enter the value 3 in the console.	Enter the value 6 in the console.	Rearrange your code as follows and enter the value 3 and 6 in the console and see the result for each entry.

max = 5
x =int(input('How many people are there in town?'))
i= 1
while i<=x:
  i += 1
  if x>max:
  break
  else:
  print('People ', end='')
 	
print(' All is well')
	max = 5
	x =int(input('How many people are there in town?'))
	i= 1
	while i<=x:
	  i += 1
	  if x>max:
	  break
	  else:
	  print('People ', end='')
	
	print(' All is well')
		max = 5
		x =int(input('How many people are there in town?'))
		i= 1
		while i<=x:
		  i += 1
		  print('People ', end='')
		  if x > max:
		  break
		
		print(' All is well')

How many people are there in town?3 People People People All is well	How many people are there in town?6 All is well	How many people are there in town?3 People People People All is well How many people are there in town?6 People All is well

Edit the above code and see what prints in the console after entering different values as inputs:

Edit the above code as follows, run the program and enter the value 3 in the console	Edit the above code as follows, run the program and enter the value 6 in the console	

max = 5
x =int(input('How many people are there in town?'))
i= 1
while i<=x:
  if i > max:
  break
  i += 1
  print('People ', end='')
	max = 5
	x =int(input('How many people are there in town?'))
	i= 1
	while i<=x:
	  if i > max:
	  break
	  i += 1
	  print('People ', end='')	

How many people are there in town?3 People People People All is well	How many people are there in town?6 People People People People People All is well	

5.2. Continue

While the statement 'break' allows to jump out of a loop (while or for), the statement 'continue' allows to omit a condition stated and continues with the loop without jumping out.

	Compare the following codes with the exercises in the break statement

	examples above	
	Enter the value 10 in the console	Enter the value 3 in the console

for i in range(1,51):
    if i%2==0:
        continue
 	
    print(i,end='')
	max = 5
	x =int(input('How many people are there in town?'))
	i= 1
	while i<=x:
	    if i > max:
	        continue
	    i += 1
	    print('People ', end='')
	
	print(' All is well')
		max = 5
		x =int(input('How many people are there in town?'))
		i= 1
		while i<=x:
		    if i > max:
		        continue
		    i += 1
		    print('People ', end='')
		
		print(' All is well')

13579111315171921232527293133353739414345474749	How many people are there in town?3 People People People All is well	How many people are there in town?6 People People People People People

5.3. Pass

The statement 'pass' allows a function to pass from a running function (block) to another block in a loop.

for i in range (1,51):
    if (i%3==0):
        pass
 	
    else:
        print(i ,end ='')	

1245781011131416171920222325262829313234353738404143444647495	

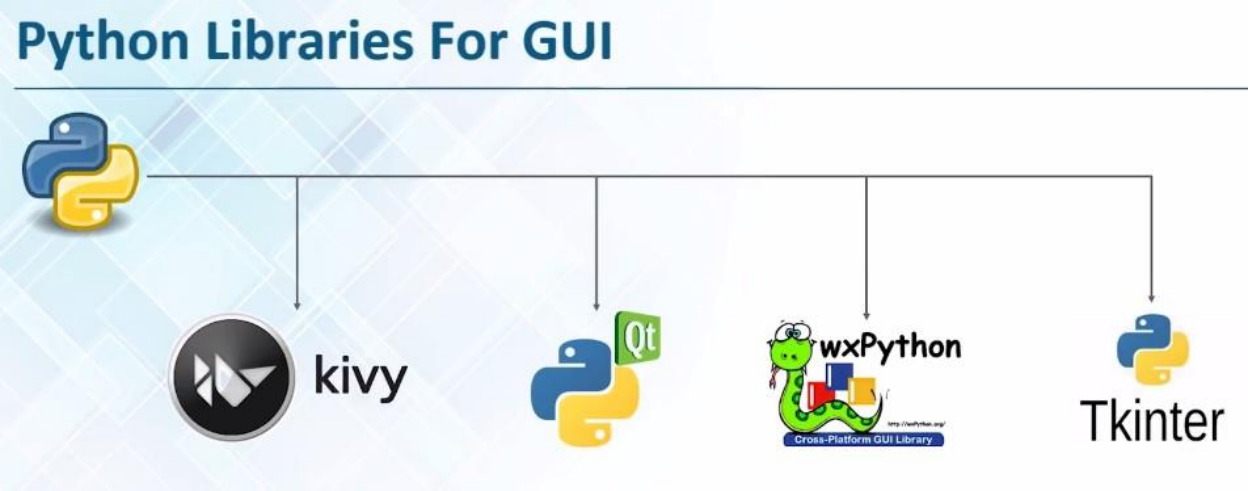
6. Graphics user interface (GUI)

GUI is a visual way for users to interact with their computers or programmes. This include windows OS, webpages, etc. through different widgets like buttons, scrolls, boxes,etc.

6.1. Different types of Graphic user interface (GUI) for python

There are different python GUI frameworks that we can use to create python GUI with. These frame works are all open source or have community or developers (commercial) packages. Among these the

popular ones are: PYQT5 (www.riverbankcomputing.co.uk/news), Tkinter (this framework is a built in to your python install and you do not need to install it separately), Wxpython (http://wxpython.org) , Kivy (the only solution to work with python code on mobile phones, it is mostly used for creating cross-platform multi-touch mobile applications) and PyForms.



6.2. Tkinter (GUI)

We are using tkinter to work on exercises related to GUI.

Tkinter provides classes which allow the display, positioning and control of widgets. Toplevel widgets are Tk and Toplevel. Other widgets are Frame, Label, Entry, Text, Canvas, Button, Radiobutton, Checkbutton, Scale, Listbox, Scrollbar, OptionMenu, Spinbox, LabelFrame and PanedWindow.

Table 8: GUI general

6.2.1. GUI Tkinter component's Exercises

6.2.1.1. GUI Starts a window:

```
#starts a window that is 500x100
from tkinter import* #imports modules related to GUI

root = Tk() #creates the window
root.geometry("500x100") #modifies root window
root.title("EIABC") #Name of project

root.mainloop() #puts the program into a long-running while loop called the event loop.puts the program into a long-running while loop called the event loop.
```

6.2.1.2. GUI Grids

```
#creates a 2 by 2 grid
from tkinter import *

root= Tk()
root.title("EIABC_Grid")

label1 = Label(text='Label1')
label1.grid(row=0, column=0)
label2 = Label(text='Label2')
label2.grid(row=0, column=1)
label3 = Label(text='Label3')
label3.grid(row=1, column=0)
label4 = Label(text='Label4')
label4.grid(row=1, column=1)

mainloop()
```

6.2.1.3. GUI *Label*

```
# Creates lebel
from tkinter import *

root= Tk()

hello_label =
Label(text='hello')
hello_label.grid(row=0,
column=1)

mainloop()
```

6.2.1.4. GUI Grids (*Grid arrangement of the GUI (both column and row start from 0*)

Table 9: GUI Grids

0,0	0,1	0,2	0,3	0,4	0,5	0,6	(N rows, N columns)
1,0	1,1	1,2	1,3	1,4	1,5	1,6	(N rows, N columns)
2,0	2,1	2,2	2,3	2,4	2,5	2,6	(N rows, N columns)
3,0	3,1	3,2	3,3	3,4	3,5	3,6	(N rows, N columns)
4,0	4,1	4,2	4,3	4,4	4,5	4,6	(N rows, N columns)
5,0	5,1	5,2	5,3	5,4	5,5	5,6	(N rows, N columns)

6.2.1.5. GUI Entry boxes

```
# Creates Entry boxes
from tkinter import *

root= Tk()
root.title("EIABC_Entr
y Boxes")

entry = Entry()
entry.grid(row=0,
column=0)
entry.insert(0,
'hello, enter value
here!')

mainloop()
```

6.2.1.6. GUI Buttons

```
# Creates Buttons
from tkinter import *

def callback():
label.configure(text='Button
clicked')

root = Tk()
root.title("EIABC_Buttons")

label = Label(text='Not
clicked')
button = Button(text='Click
me', command=callback)
label.grid(row=0, column=0)
button.grid(row=1, column=0)

mainloop()
```

6.2.1.7. GUI List

```
# Creates list
from tkinter import *

root = Tk()
root.title("EIABC_List")

listbox = Listbox(root)
listbox.pack()
listbox.insert(END, "a list
entry")
for item in ["one", "two",
"three", "four"]:
    listbox.insert(END, item)

mainloop()
```

6.2.1.8. GUI Scrollbars

```
# creates scrollbars
from tkinter import *

root = Tk()
root.title("EIABC_Scro
llbar")

root.title('scroll
bar')
root.geometry('150x150
')
w = Scale(root,
from_=0, to=42)
w.pack()
w = Scale(root,
from_=0, to=200,
orient=HORIZONTAL)
w.pack()

mainloop()
```

6.2.1.9. GUI Checkbox

```
# Creates checkbox
from tkinter import *

root = Tk()
root.title('EiABC checkbox')
root.geometry('200x200')

CheckVar1 = IntVar()
CheckVar2 = IntVar()
C1 = Checkbutton(root, text =
"Music", variable =
CheckVar1, \
onvalue = 1, offvalue = 0,
height=5, \
width = 20, )
C2 = Checkbutton(root, text =
"Video", variable =
CheckVar2, \
onvalue = 1, offvalue = 0,
height=5, \
width = 20)
C1.pack()
C2.pack()

root.mainloop()
```

6.2.1.10. GUI Option button

```
#Creates option button
from tkinter import *

def sel():
 selection = "You selected the
option " + str(var.get())
 label.config(text =
selection)

root = Tk()
root.title('EiABC option
button')

root.geometry('300x100')
var = IntVar()
R1 = Radiobutton(root,
text="Option 1", variable=var,
value=1, command=sel)
R1.pack( anchor = W )
R2 = Radiobutton(root,
text="Option 2", variable=var,
value=2, command=sel)
R2.pack( anchor = W )
R3 = Radiobutton(root,
text="Option 3", variable=var,
```

```
value=3, command=sel)
R3.pack( anchor = W)
label = Label(root)
label.pack()

root.mainloop()
```

6.2.1.11. GUI Canvas

Lines

```
from tkinter import Tk, Canvas, Frame, BOTH

class Example(Frame):
 def __init__(self):
     super().__init__()
     self.initUI()
 def initUI(self):

self.master.title("EIABC_Canvas1_Lines")
     self.pack(fill=BOTH, expand=1)
     canvas = Canvas(self)
     canvas.create_line(15, 25, 200, 25)
     canvas.create_line(300, 35, 300, 200,
dash=(4, 2))
     canvas.create_line(55, 85, 155, 85,
105, 180, 55, 85)
     canvas.pack(fill=BOTH, expand=1)
def main():

 root = Tk()
 ex = Example()
 root.geometry("400x250+300+300")

 root.mainloop()

if __name__ == '__main__':
 main()
```

Lines, fills and colors

```
from tkinter import Tk, Canvas, Frame,
BOTH
class Example(Frame):
   def __init__(self):
      super().__init__()
      self.initUI()
   def initUI(self):

self.master.title("EIABC_Canvas2_Lines_F
ill_Colours")
         self.pack(fill=BOTH, expand=1)
         canvas = Canvas(self)
         canvas.create_rectangle(30, 10,
120, 80,
outline="#fb0", fill="#fb0")
         canvas.create_rectangle(150,
10, 240, 80,
outline="#f50", fill="#f50")
         canvas.create_rectangle(270,
10, 370, 80,
outline="#05f", fill="#05f")
         canvas.pack(fill=BOTH,
expand=1)
def main():
   root = Tk()
   ex = Example()
   root.geometry("400x100+300+300")
   root.mainloop()

if __name__ == '__main__':
   main()
```

6.2.1.12. GUI Lambda

```
#Uses one function for multiple events.
from tkinter import *

alphabet = 'ABCDEFGHIJKLMNOPQRSTUVWXYZ'
def callback(x):
    label.configure(text='Button {} clicked'.format(alphabet[x]))

root = Tk()
root.title("EIABC_Lambda")

label = Label()
label.grid(row=1, column=0, columnspan=26)
buttons = [0]*26 # create a list to hold 26 buttons
for i in range(26):
    buttons[i] = Button(text=alphabet[i],
                        command = lambda x=i: callback(x))
    buttons[i].grid(row=0, column=i)
```

6.2.1.13. GUI Text and time

```
from tkinter import*

import time;  # imports module related to time
root = Tk()
root.geometry("500x100")
root.title("EIABC")

text_Input=StringVar() #declaration for text input variable
operator=("")

x = Frame(root, width=500 ,height=200,bg="gray")
x.pack(side=TOP)

localtime=time.asctime(time.localtime(time.time()))

label = Label(x, font=('areal', 35, 'bold'), text="EIABC", fg="red")
label.grid(row=0, column=0)
label= Label(x, font=('areal', 20, 'bold'), text=localtime, fg="black")
label.grid(row=5, column=0)


root.mainloop()
```

6.2.2. GUI Class exercises*: Grade*

6.2.2.1. GUI grade

Create a program for computing grade of students by making use of (a) if and else (b) if, elif and else. And create a GUI for any one of the two options, a or b. Use the following rules to simulate the task:: (1) students that score marks from 90 to 100 score are graded with 'A', from 75 to 90 with 'B', from 45 to 75 with 'C', from 30 to 44 with 'D', from 30 to 0 with 'F'. (2) if students score any mark different from the above ranges, they are scored with 'wrong score'

Answer:

Step one: solve the problem with (a) if and (b) elif and else

(a)If

```
#evaluates grade through defined bool
function
from tkinter import *

def bool():

    score = float(entry_score.get())
    #score= float(input ("Enter score:"))

    if score >= 90 and score <= 100:
        grade = 'A'
    elif score >= 70 and score < 90:
        grade = 'B'
    elif score >= 45 and score < 70:
        grade = 'C'
    elif score >= 30 and score < 45:
        grade = 'D'
    elif score >= 0 and score < 30:
        grade = 'F'
    else:
        grade = "wrong score"


output_label_grade.configure(text='Grade
```

(b) elif and else

```
#evaluates grade through defined bool
function
from tkinter import *

def bool():

    score = float(entry_score.get())
    #score= float(input ("Enter score:"))

    if score >= 90 and score <= 100:
        grade = 'A'
    if score >= 70 and score < 90:
        grade = 'B'
    if score >= 45 and score < 70:
        grade = 'C'
    if score >= 30 and score < 45:
        grade = 'D'
    if score >= 0 and score < 30:
        grade = 'F'
    else:
        grade = "wrong score"


output_label_grade.configure(text='Grade
```

```
of the Student is: {}'.format(grade))

root = Tk()
root.title("EIABC_Grade")

inquiry_label_score = Label(text='Enter
Score of the Student', font=('Broadway',
16), fg='black')
inquiry_label_score.grid(row=0, column=0)

entry_score = Entry(font=('Tekton Pro',
16), width=9)
entry_score.insert(0, '?!')
entry_score.grid(row=1, column=0)

output_label_grade = Label(font=('Bauhaus
93', 16), fg='red')
eval_button_grade =
Button(text='Evaluate', font=('Verdana',
16), command=bool )

eval_button_grade.grid(row=2, column=0)
output_label_grade.grid(row=3, column=0)

mainloop()
```

```
of the Student is: {}'.format(grade))

root = Tk()
root.title("EIABC_Grade")

inquiry_label_score = Label(text='Enter
Score of the Student', font=('Broadway',
16), fg='black')
inquiry_label_score.grid(row=0, column=0)

entry_score = Entry(font=('Tekton Pro',
16), width=9)
entry_score.insert(0, '?!')
entry_score.grid(row=1, column=0)

output_label_grade = Label(font=('Bauhaus
93', 16), fg='red')
eval_button_grade =
Button(text='Evaluate', font=('Verdana',
16), command=bool )

eval_button_grade.grid(row=2, column=0)
output_label_grade.grid(row=3, column=0)

mainloop()
```

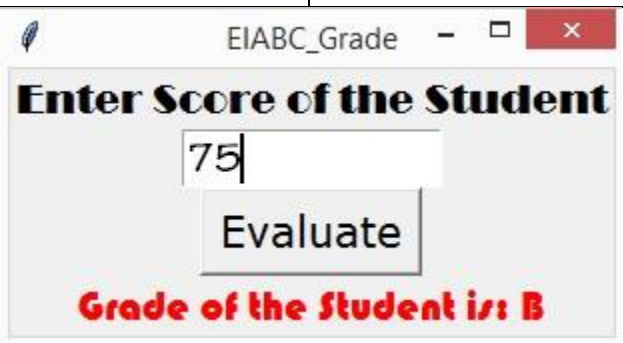


Figure 11: Grades

More exercises:

1. Based on the following grade range calculate grade using calculate button

Raw Mark Interval	Corresponding Grade
>100 and < 1	Wrong grade
90-100	A+
83-90	A
80-83	A–
75- 80	B+
68- 75	B
65- 68	B–
60-65	C+

50- 60	C
45- 50	C–
40-45	D
30-40	Fx
<30	F

2. Create first Name, Last Name, Gender, Mark and Grade
3. Create Check Box Male and Female
4. Window title must be Grade calculator

Answer by students:

```
from tkinter import*

def cal():
 grade=int(entry.get())
 firstname=str(finame.get())
 lastname=str(laname.get())
 #entry.delete(0,END)
 if grade > 100:
    text4.configure(text='Welcome '+ firstname + " "  ,bg="gray")
    text7.configure(text='Name: '+ firstname + " " + lastname ,bg="goldenrod")
    text6.configure(text="Gender: "+ var1.get(),bg="greenyellow")
    text5.configure(text=firstname+" " +'Wrong input, make sure you Entered the right
value' ,bg="red",fg="white")

 elif 90 <= grade < 100:
    text4.configure(text='Welcome '+ firstname + " " + lastname ,bg="gray")
    text7.configure(text='Name: '+ firstname + " " + lastname ,bg="goldenrod")
    text6.configure(text="Gender: "+ var1.get(),bg="greenyellow")
    text5.configure(text='Your Grade is: A+',bg="brown")


 elif 83 <= grade < 90:
    text4.configure(text='Welcome '+ firstname + " " + lastname ,bg="gray")
    text7.configure(text='Name '+ firstname + " " + lastname ,bg="goldenrod")
    text6.configure(text="Gender: "+ var1.get(),bg="greenyellow")
    text5.configure(text='Your Grade is: A',bg="brown")


 elif 80 <= grade < 83:
    text4.configure(text='Welcome '+ firstname + " " + lastname ,bg="gray")
    text7.configure(text='Name '+ firstname + " " + lastname ,bg="goldenrod")
    text6.configure(text="Gender: "+ var1.get(),bg="greenyellow")
    text5.configure(text='Your Grade is:  A- ',bg="brown")
    window.geometry("600x500")

 elif 75 <= grade < 80:
    text4.configure(text='Welcome '+ firstname + " " + lastname ,bg="gray")
    text7.configure(text='Name '+ firstname + " " + lastname ,bg="goldenrod")
    text5.configure(text='Your Grade is:  B+ ',bg="brown")
    text6.configure(text="Gender: "+ var1.get(),bg="greenyellow")

 elif 68 <= grade < 75:
    text4.configure(text='Welcome '+ firstname + " " + lastname ,bg="gray")
    text7.configure(text='Name '+ firstname + " " + lastname ,bg="goldenrod")
    text6.configure(text="Gender: "+ var1.get(),bg="greenyellow")
```

```
    text5.configure(text='Your Grade is  B ',bg="brown")


 elif 65 <= grade < 68:
    text4.configure(text='Welcome '+ firstname + " " + lastname ,bg="gray")
    text7.configure(text='Name '+ firstname + " " + lastname ,bg="goldenrod")
    text6.configure(text="Gender: "+ var1.get(),bg="greenyellow")
    text5.configure(text='Your Grade is B-',bg="brown")

 elif 60 <= grade < 65:
    text4.configure(text='Welcome '+ firstname + " " + lastname ,bg="gray")
    text7.configure(text='Name '+ firstname + " " + lastname ,bg="goldenrod")
    text5.configure(text='Your Grade is: C+ ',bg="brown")
    text6.configure(text="Gender: "+ var1.get(),bg="greenyellow")
    window.geometry("600x500")
 elif 50 <= grade < 60:
    text4.configure(text='Welcome '+ firstname + " " + lastname ,bg="gray")
    text7.configure(text='Name '+ firstname + " " + lastname ,bg="goldenrod")
    text6.configure(text="Gender "+ var1.get(),bg="greenyellow")
    text5.configure(text='Your Grade is: C ',bg="brown")


 elif 45 <= grade < 50:
    text4.configure(text='Welcome '+ firstname + " " + lastname ,bg="gray")
    text7.configure(text='Name '+ firstname + " " + lastname ,bg="blue")
    text6.configure(text="Gender "+ var1.get(),bg="greenyellow")
    text5.configure(text='Your Grade is: C- ',bg="brown")


 elif 40 <= grade < 45:
    text4.configure(text='Welcome '+ firstname + " " + lastname ,bg="gray")
    text7.configure(text='Name '+ firstname + " " + lastname ,bg="goldenrod")
    text6.configure(text="Gender: "+ var1.get(),bg="greenyellow")
    text5.configure(text='Your Grade is: D ',bg="brown")


 elif 30 <= grade < 40:
    text4.configure(text='Welcome '+ firstname + " " + lastname ,bg="gray")
    text7.configure(text='Name '+ firstname + " " + lastname ,bg="goldenrod")
    text6.configure(text="Gender: "+ var1.get(),bg="greenyellow")
    text5.configure(text='Your Grade is: Fx ',bg="brown")


 elif 0<= grade < 30:
    text4.configure(text='Welcome '+ firstname + " " + lastname ,bg="gray")
    text7.configure(text='Name '+ firstname + " " + lastname ,bg="goldenrod")
    text6.configure(text="Gender: "+ var1.get(),bg="greenyellow")
    text5.configure(text='Your Grade is: F ',bg="brown")
    window.geometry("600x500")

 elif grade < 0:
    text4.configure(text='Welcome '+ firstname + " " + lastname ,bg="gray")
    text7.configure(text='Name '+ firstname + " " + lastname ,bg="goldenrod")
    text6.configure(text="Gender: "+ var1.get(),bg="greenyellow")
    text5.configure(text=firstname+" " +'I Think You Enterd Wrong input, make sure you
Entered the right value',bg="red",fg="white")




window=Tk()
window.title("Grade Calculation")
window.configure(background="gray")
```

```
window.geometry("600x500")

text1=Label(window, text="Enter Your Result Here: ", width=25,font=("Calibri",11))
text1.grid(row=7, column=2,sticky=W,pady=10,padx=10)

entry=Entry(window, width=20, bg="white", fg="black", font=("Calibri",10))
entry.grid(row=7, column=3,sticky=W,pady=10,padx=10)

btn1=Button(window, text="Calculate", bg="darkblue", fg="white", command=cal,
font=("Calibri",13))
btn1.grid(row=15, column=3, sticky=W,pady=10)



fname=Label(window, text="Enter Your First Name ", width=25,font=("Calibri",10),
bg="white" ,fg="black" )
fname.grid(row=3, column=2,sticky=W,pady=10,padx=10)
finame=Entry(window,width=20, bg="white", fg="black", font=("Calibri",9))
finame.grid(row=3, column=3,sticky=W,pady=10,padx=10)

lname=Label(window, text="Enter Your Last Name " ,width=25,font=("Calibri",10),
bg="white" , fg="black")
lname.grid(row=5, column=2 ,sticky=W,pady=10,padx=10)
laname=Entry(window,width=20, bg="white", fg="black", font=("Calibri",9))
laname.grid(row=5, column=3,sticky=W,pady=10,padx=10)

gender=Label(window, text="Select Your Gender ",width=25,font=("Calibri",10),
bg="white" , fg="black" )
gender.grid(row=6, column=2,sticky=W, pady=10,padx=10)

var1 = StringVar()

c1 = Radiobutton(window, text = "Male", variable = var1,value = "Male", height=2,
width = 6, )
c1.deselect()
c1.grid(row=6, column=3,sticky=W,pady=10,padx=10)

c2 = Radiobutton(window, text = "Female", variable = var1,value = "Female",
height=2,width =6)
c2.grid(row=6, column=4,sticky=W,pady=10)

text4=Label(window, font=("Calibri",9), bg="greenyellow" , fg="black")
text4.grid(row=9, column=2,sticky=W, pady=10,padx=10)

text5=Label(window, font=("Calibri",9), bg="brown", fg="black")
text5.grid(row=12, column=2,sticky=W, pady=10,padx=10)

text6=Label(window, font=("Calibri", 9))
text6.grid(row=11, column=2,sticky=W ,pady=10,padx=10)

text7=Label(window, font=("Calibri", 9))
text7.grid(row=10, column=2,sticky=W ,pady=10,padx=10)

window.mainloop()
```

6.2.2.2. Exercise (GUI): Exponential growth

In your previous class you have simulated exponential salary increase of an employee with the equation $y=a(r+1)^t$ by making use of input function and the console of your python program.

t= number of years of experience before salary of employee gets to y amount.
r=rate of salary increment in a year.
y=salary of an employee in t years.

For this exercise construct a graphics user interface (GUI) for the same formula.

Hint:
Your GUI should have label and input for a, r, t.
Your GUI should have label and output for y.
Your GUI should have calculate or compute button.
Students can choose their own fg and bg colors of their own as long as all buttons, outputs and inputs are visible.

Answer:

```
import math

from tkinter import *

def calculate():
    t=float(entry_t.get())
    a=float(entry_a.get())
    r= float(entry_r.get())
    sy =a*pow((r+1),t)
    output_label_sy.configure(text='Salary After Y Years: {}'.format(sy))

   #entry.delete(0,END)

root = Tk()
root.title("EIABC_Salary")

inquiry_label_t = Label(text='Enter Number of Experience in Years', font=('Broadway',
16), fg='black')
inquiry_label_t.grid(row=0, column=0)
entry_t = Entry(font=('Tekton Pro', 16), width=4)
entry_t.insert(0, '?!')
entry_t.grid(row=0, column=1)

inquiry_label_a = Label(text='Enter Basic Salary', font=('Broadway', 16,), fg='black')
inquiry_label_a.grid(row=1, column=0)
entry_a = Entry(font=('Tekton Pro', 16), width=4)
entry_a.insert(0, '?!')
entry_a.grid(row=1, column=1)

inquiry_label_r = Label(text='Enter Rate of Salary Increment', font=('Broadway',
16,),fg='black')
inquiry_label_r.grid(row=2, column=0)
entry_r = Entry(font=('Tekton Pro', 16), width=4)
entry_r.insert(0, '?!')
entry_r.grid(row=2, column=1)

output_label_sy = Label(font=('Bauhaus 93', 16), fg='red')
calc_button_sy = Button(text='Calculate', font=('Verdana', 16), command=calculate)

calc_button_sy.grid(row=0, column=2)
```

```
output_label_sy.grid(row=3, column=0, columnspan=2)

mainloop()
```

Sample imputes and outputs: (1) input(Number of years=10, Basic salary=50, rate=0.3), (output=68929.245) (2) input(Number of years=10, Basic salary=1000, rate=0.35), (output=201065.558)

The GUI with three columns and four rows:

Figure 12: Exponential Growth 01

Change the above GUI As follows, with a single column, and 8 rows.

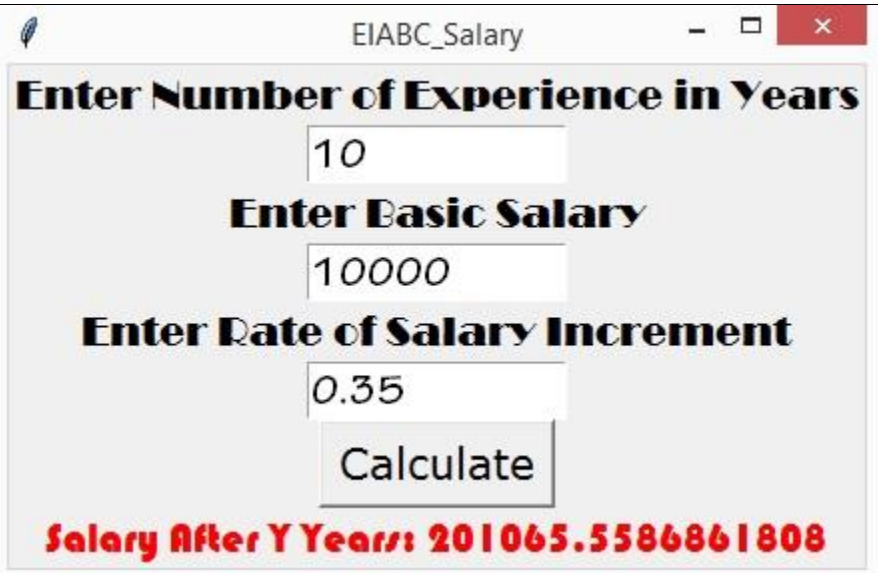


Figure 13: Exponential growth 02

6.2.2.3. GUI temperature convert

*Create a GUI to convert Fahrenheit Temperature to Celsius: Celsius = (9/5)*Fahrenheit+32*

Answer

```
# the following programme converts temperatures from Fahrenheit to Celsius.
#Celsius = (9/5)*Fahrenheit+32

from tkinter import *

def calculate():
   temp = int(entry.get())
```

```
    temp = 9/5*temp+32
    output_label.configure(text = 'Converted in Degree Celsius: {:.1f}'.format(temp))
    #entry.delete(0,END)

root = Tk()
root.title("EIABC_Temp_Convert:Fahrenheit to Celsius")

inquiry_label = Label(text='Enter a temperature in Fahrenheit', font=('Broadway',
16,),bg='black', fg='white')
output_label = Label(font=('Bauhaus 93', 16), bg='black', fg='white')

entry = Entry(font=('Tekton Pro', 16), width=4)
entry.insert(0, '?!')

calc_button = Button(text='Ok', font=('Verdana', 16), command=calculate)

inquiry_label.grid(row=0, column=0)
entry.grid(row=0, column=1)
calc_button.grid(row=0, column=2)
output_label.grid(row=1, column=0, columnspan=2)

mainloop()
```

Figure 14: Temp convert

6.2.2.4. Calculator:

```
from tkinter import* #imported modules related to GUI

#
root = Tk() #creates the window
root.geometry("500x600") #modifies root window
root.title("EIABC") #Name of project
#

text_Input=StringVar() #declaration for text input variable
operator=("")
#

f2 = Frame(root, width=500 ,height=500,bg="yellow") #modifies root Frame )
f2.pack(side=BOTTOM) #

#


def btnClick(numbers):
    global operator
    operator=operator + str(numbers)
    text_Input.set(operator)
def btnClearDisply():
    global operator
    operator=""
    text_Input.set("")
```

```
def btnEqualsInput():
    global operator
    sumup=str(eval(operator))
    text_Input.set(sumup)
    operator=""
#


textDisplay = Entry (f2,font=('arial', 20, 'bold'), textvariable=text_Input,bd=30,
insertwidth=4,
                     bg="white", justify='right')
textDisplay.grid(columnspan=5)
#

btn7=Button(f2,padx=16, pady=16, bd=8, fg="black", font=('arial',20,'bold'),
            text="7", bg="yellow", command=lambda: btnClick(7)).grid(row=2, column=0)
btn8=Button(f2,padx=16, pady=16, bd=8, fg="black", font=('arial',20,'bold'),
            text="8", bg="yellow", command=lambda: btnClick(8)).grid(row=2, column=1)
btn9=Button(f2,padx=16, pady=16, bd=8, fg="black", font=('arial',20,'bold'),
            text="9", bg="yellow", command=lambda: btnClick(9)).grid(row=2, column=2)
#

Addition=Button(f2,padx=16, pady=16, bd=8, fg="black", font=('arial',20,'bold'),
            text="+", bg="yellow", command=lambda: btnClick("+")).grid(row=2,
column=3)
#

btn4=Button(f2,padx=16, pady=16, bd=8, fg="black", font=('arial',20,'bold'),
            text="4", bg="yellow", command=lambda: btnClick(4)).grid(row=3, column=0)
btn5=Button(f2,padx=16, pady=16, bd=8, fg="black", font=('arial',20,'bold'),
            text="5", bg="yellow", command=lambda: btnClick(5)).grid(row=3, column=1)
btn6=Button(f2,padx=16, pady=16, bd=8, fg="black", font=('arial',20,'bold'),
            text="6", bg="yellow", command=lambda: btnClick(6)).grid(row=3, column=2)
#

Subtraction=Button(f2,padx=16, pady=16, bd=8, fg="black", font=('arial',20,'bold'),
            text="-", bg="yellow", command=lambda: btnClick("-")).grid(row=3,
column=3)
#

btn1=Button(f2,padx=16, pady=16, bd=8, fg="black", font=('arial',20,'bold'),
            text="1", bg="yellow", command=lambda: btnClick(4)).grid(row=4, column=0)
btn2=Button(f2,padx=16, pady=16, bd=8, fg="black", font=('arial',20,'bold'),
            text="2", bg="yellow", command=lambda: btnClick(5)).grid(row=4, column=1)
btn3=Button(f2,padx=16, pady=16, bd=8, fg="black", font=('arial',20,'bold'),
            text="3", bg="yellow", command=lambda: btnClick(6)).grid(row=4, column=2)
#

Multiply=Button(f2,padx=16, pady=16, bd=8, fg="black", font=('arial',20,'bold'),
            text="*", bg="yellow", command=lambda: btnClick("*")).grid(row=4,
column=3)
#

btn0=Button(f2,padx=16, pady=16, bd=8, fg="black", font=('arial',20,'bold'),
            text="0", bg="yellow", command=lambda: btnClick(0)).grid(row=5, column=0)
btnClear=Button(f2,padx=16, pady=16, bd=8, fg="black", font=('arial',20,'bold'),
            text="C", bg="yellow", command=btnClearDisply).grid(row=5, column=1) #no
need for lambda
btnEquals=Button(f2,padx=16, pady=16, bd=8, fg="black", font=('arial',20,'bold'),
            text="=", bg="yellow", command=btnEqualsInput).grid(row=5, column=2)
#

Division=Button(f2,padx=16, pady=16, bd=8, fg="black", font=('arial',20,'bold'),
```

```
            text="/", bg="yellow", command=lambda: btnClick("/")).grid(row=5,
column=3)
#

root.mainloop() #end
```

End of part one, two and three. Course will be continued next class. Until then work on exercises and read the reading materials provided.

References

(Under development)

Appendix

a. Printing patterns

Before thinking about patterns, let us recap about loop functions: The loop function in general helps to make your programming efficient. Instead of writing several lines for a repeating output, we can use the loop functions and have the same output with only fewer lines of codes. See the following examples:

Table 10, Pattern

The following two codes have the same outputs in the console.	Printed output in the console:

<table>
<tr>
<td>

```
print ('^^^^^^')
print ('^^^^^^')
print ('^^^^^^')
print ('^^^^^^')
print ('^^^^^^')
print ('^^^^^^')
print ('^^^^^^')
print ('^^^^^^')
print ('^^^^^^')
print ('^^^^^^')
```

</td>
<td>

```
for i in range (1,11):
      i += 1
      print ('^^^^')
```

Class exercise: can you think of any other short lines of codes to do the same task?

Answer(example):

[redacted]

</td>
<td>

```
^^^^
^^^^
^^^^
^^^^
^^^^
^^^^
^^^^
^^^^
^^^^
^^^^
```

</td>
</tr>
<tr>
<td>

```
print(1*'^')
print(2*'^')
print(3*'^')
print(4*'^')
print(5*'^')
print(6*'^')
print(7*'^')
print(8*'^')
print(9*'^')
print(10*'^')
```

</td>
<td>

```
x=0
i='^'
while x<11:
 x += 1
 print (x*i)
```

Class exercise: can you think of any other short lines of codes to do the same task?

Answer (example):

[redacted]

</td>
<td>

```
^
^^
^^^
^^^^
^^^^^
^^^^^^
^^^^^^^
^^^^^^^^
^^^^^^^^^
^^^^^^^^^^
```

</td>
</tr>
</table>

Printing patterns in python allows the programmer to practice visualization, logic, etc. in light of the fact, students should practice printing complex patterns in the console: