**Outline**

Access the Python Development environment and continue the tutorial to gain an additional exposure to the Python programming language. Begin to develop an familiarity with intermediate programming concepts.

**Objectives**

* Use correct terminology to describe programming concepts;
* Describe the types of data that computers can process and store (e.g., numbers, text);
* Explain the difference between constants and variables used in programming;
* Use variables, expressions, and assignment statements to store and manipulate numbers and text in a program

**Materials**

* Python3 Development Environment at: //repl.it/
* Python Tutorial at: <http://www.letslearnpython.com/learn/>

**Accessing the Tutorial**

Accessing the Tutorial

* Go to: <http://www.letslearnpython.com/learn/>
* Read up to “Lesson 12: Input”

**Level 1: Input & Output**

1. Read through “Lesson 12: Input – What Is Input?” and “Lesson 12: Input – Example” and “Lesson 12: Input – Shortcut”.
2. Type the following code into the white area of the IDE and run the program. Explain what you see in the black area of the IDE.

print("Type your name:")

name = input()

print("Hi", name, "how are you?")

the code asks for your name and then prints hell plus your name

1. Create a short program that reads numerical input from the console and does the following:
   1. Uses the input() function to read a numerical value from the console.
   2. Calculates the square root of the number
   3. Prints the result to the console output
   4. Provides appropriate prompt and message strings to go with the input and output.
   5. Provide your complete program below.

number=input("type in a number: ")  
int(number)  
sqrt(number)

**Level 2: Tic-Tac-Toe Game**

1. Write a Python program to play a game of Toc-Tac-Toe. (You may modify a program that you found on-line to meet the expectations of this module.)
   1. The program may be either player v. computer or player 1 v. player 2.
   2. The program does not need to determine a winner
   3. The program just needs to keep track of moves and spaces in the game board
2. Provide a complete listing of your program.
   1. Your listing **MUST** include line numbers .
3. import turtle
4. myPen=turtle.Turtle()
5. game=1
6. #this variable is to signify the while game==1 loop below
7. p1=True
8. p2=False
9. #these variables are to see who's turn it is, p1 or p2
10. nextPerson = True
11. #this is to see if the game should allow the next person to go since if u guess a spot that is taken or a number that is not between 1 and 9 it will go to the next person this is to stop that
12. turns=0
13. #turns is to check if all the spots are taken or not and if they are and noone has 3 in a row it will tell the game that it is a draw
14. spot1=0
15. spot2=0
16. spot3=0
17. spot4=0
18. spot5=0
19. spot6=0
20. spot7=0
21. spot8=0
22. spot9=0
23. #spot variables help the game to tell weather or not a certain spot is taken
24. myPen.width(5)
25. myPen.speed(0)
26. def drawX (x, y):
27. myPen.goto(x, y)
28. myPen.down()
29. myPen.right(45)
30. myPen.forward(70.7106781185)
31. myPen.right(180)
32. myPen.forward(141.421356237)
33. myPen.right(180)
34. myPen.forward(70.7106781185)
35. myPen.left(90)
36. myPen.forward(70.7106781185)
37. myPen.right(180)
38. myPen.forward(141.421356237)
39. myPen.right(180)
40. myPen.forward(70.7106781185)
41. myPen.right(45)
42. myPen.up()
43. def drawO (x, y):
44. myPen.goto(x, y)
45. myPen.right(90)
46. myPen.forward(50)
47. myPen.left(90)
48. myPen.down()
49. myPen.circle(50)
50. for board in "1":
51. myPen.left(90)
52. myPen.up()
53. myPen.forward(150)
54. myPen.left(90)
55. myPen.forward(150)
56. myPen.down()
57. myPen.right(180)
58. for gameboard in "123":
59. for row in "123":
60. for square in "1234":
61. myPen.forward(100)
62. myPen.right(90)
63. myPen.forward(100)
64. myPen.right(180)
65. myPen.forward(300)
66. myPen.left(90)
67. myPen.forward(100)
68. myPen.left(90)
69. #this is to make the 3x3 board
70. print("A number coresponds with a spot on the board.\nThe numbers go from 1 to 9 from left to right.\n2 players can play at once.\nPlayer 1 is X and Player 2 is O\n")
71. #prints instruction
72. while game==1:
73. #this is the game loop that i was talking about
74. if p1==True and p2==False:
75. #this makes sure that it is player 1's turn before doing the code bellow
76. nextPerson=True
77. #tells the game that right now the next person will go unless an invalid input is put in
78. turn=int(input("Player 1 turn: "))
79. #prints player 1 turn and asks for input
80. p1=True
81. #sets player 1 to true to make it so the game knows that it is player 1's turn
82. if turn==1:
83. #checks if the player has put in 1 or another number as their turn
84. if spot1==0:
85. #if this spot has noones symbol on it, it will have spot1 as 0 but if it doesn't...
86. myPen.up()
87. drawX(-100, 100)
88. myPen.up()
89. spot1=1
90. #this will make spot1 equal to 1 to signify that player 1 has taken this spot
91. turns+=1
92. #this will add to the turns to help the game know how many spots are taken
93. else:
94. #...this will happen
95. print("This spot is taken!")
96. nextPerson=False
97. #makes sure that the next person won't go until player 1 has selected a valid spot
98. elif turn==2:
99. #the rest is pretty much the same exept the fact that they have different spot names
100. if spot2==0:
101. myPen.up()
102. drawX(0, 100)
103. myPen.up()
104. spot2=1
105. turns+=1
106. else:
107. print("This spot is taken!")
108. nextPerson=False
109. elif turn==3:
110. if spot3==0:
111. myPen.up()
112. drawX(100, 100)
113. myPen.up()
114. spot3=1
115. turns+=1
116. else:
117. print("This spot is taken!")
118. nextPerson=False
119. elif turn==4:
120. if spot4==0:
121. myPen.up()
122. drawX(-100, 0)
123. myPen.up()
124. spot4=1
125. turns+=1
126. else:
127. print("This spot is taken!")
128. nextPerson=False
129. elif turn==5:
130. if spot5==0:
131. myPen.up()
132. drawX(0, 0)
133. myPen.up()
134. spot5=1
135. turns+=1
136. else:
137. print("This spot is taken!")
138. nextPerson = False
139. elif turn==6:
140. if spot6==0:
141. myPen.up()
142. drawX(100, 0)
143. myPen.up()
144. spot6=1
145. turns+=1
146. else:
147. print("This spot is taken!")
148. nextPerson=False
149. elif turn==7:
150. if spot7==0:
151. myPen.up()
152. drawX(-100, -100)
153. myPen.up()
154. spot7=1
155. turns+=1
156. else:
157. print("This spot is taken!")
158. nextPerson=False
159. elif turn==8:
160. if spot8==0:
161. myPen.up()
162. drawX(0, -100)
163. myPen.up()
164. spot8=1
165. turns+=1
166. else:
167. print("This spot is taken!")
168. nextPerson=False
169. elif turn==9:
170. if spot9==0:
171. myPen.up()
172. drawX(100, -100)
173. myPen.up()
174. spot9=1
175. turns+=1
176. else:
177. print("This spot is taken!")
178. nextPerson=False
179. else:
180. print("Type in a number that is between 1 and 9")
181. nextPerson = False
182. #this is to detect weather or not a number between 1 and 9 was put in if it wasn't then it will tell u to guess again but turn next preson off to make sure that player 2 doesn't go yet
183. if nextPerson==True:
184. p1=False
185. p2=True
186. #if next person is true then it will make p2 true to allow player 2 to go
187. elif nextPerson==False:
188. p1=True
189. p2=False
190. #if it isn't then it will do the opposite
191. #below it checks all possible combination of spots that can be taken by a player to win for both players
192. if spot1==1 and spot2==1 and spot3==1:
193. print("Player 1 wins!")
194. break
195. elif spot4==1 and spot5==1 and spot6==1:
196. print("Player 1 wins!")
197. break
198. elif spot7==1 and spot8==1 and spot9==1:
199. print("Player 1 wins!")
200. break
201. elif spot1==1 and spot4==1 and spot7==1:
202. print("Player 1 wins!")
203. break
204. elif spot2==1 and spot5==1 and spot8==1:
205. print("Player 1 wins!")
206. break
207. elif spot3==1 and spot6==1 and spot9==1:
208. print("Player 1 wins!")
209. break
210. elif spot1==1 and spot5==1 and spot9==1:
211. print("Player 1 wins!")
212. break
213. elif spot7==1 and spot5==1 and spot3==1:
214. print("Player 1 wins!")
215. break
216. elif spot1==2 and spot2==2 and spot3==2:
217. print("Player 2 wins!")
218. break
219. elif spot4==2 and spot5==2 and spot6==2:
220. print("Player 2 wins!")
221. break
222. elif spot7==2 and spot8==2 and spot9==2:
223. print("Player 2 wins!")
224. break
225. elif spot1==2 and spot4==2 and spot7==2:
226. print("Player 2 wins!")
227. break
228. elif spot2==2 and spot5==2 and spot8==2:
229. print("Player 2 wins!")
230. break
231. elif spot3==2 and spot6==2 and spot9==2:
232. print("Player 2 wins!")
233. break
234. elif spot1==2 and spot5==2 and spot9==2:
235. print("Player 1 wins!")
236. break
237. elif spot7==2 and spot5==2 and spot3==2:
238. print("Player 1 wins!")
239. break
240. elif turns==9:
241. print("Its a tie!")
242. break
243. #break will stop the loop imedietly if the statment above it is true
244. #also checks if the turns are equal to 9 if they are that means that all spots have been taken and it is a tie
245. if p2==True and p1==False:
246. nextPerson=True
247. #this is to check weather or not p2 is allowed to go (if player 1 guessed a invalid spot or a spot that was already taken)
248. #p2 code is also similar to p1 code but its just smaller since it takes less code to draw a o than to draw an x
249. #for player 2 instead of setting the spot to 1 it will set it to 2 to signify that player 2 has taken that spot
250. turn = int(input("Player 2 turn: "))
251. if turn == 1:
252. if spot1 == 0:
253. myPen.up()
254. drawO(-100, 100)
255. myPen.up()
256. spot1 = 2
257. turns+=1
258. else:
259. print("This spot is taken!")
260. nextPerson=False
261. elif turn == 2:
262. if spot2 == 0:
263. myPen.up()
264. drawO(0, 100)
265. myPen.up()
266. spot2 = 2
267. turns+=1
268. else:
269. print("This spot is taken!")
270. nextPerson=False
271. elif turn == 3:
272. if spot3 == 0:
273. myPen.up()
274. drawO(100, 100)
275. myPen.up()
276. spot3 = 2
277. turns+=1
278. else:
279. print("This spot is taken!")
280. nextPerson=False
281. elif turn == 4:
282. if spot4 == 0:
283. myPen.up()
284. drawO(-100, 0)
285. myPen.up()
286. spot4 = 2
287. turns+=1
288. else:
289. print("This spot is taken!")
290. nextPerson=False
291. elif turn == 5:
292. if spot5 == 0:
293. myPen.up()
294. drawO(0, 0)
295. myPen.up()
296. spot5 = 2
297. turns+=1
298. else:
299. print("This spot is taken!")
300. nextPerson=False
301. elif turn == 6:
302. if spot6 == 0:
303. myPen.up()
304. drawO(100, 0)
305. myPen.up()
306. spot6 = 2
307. turns+=1
308. else:
309. print("This spot is taken!")
310. nextPerson=False
311. elif turn == 7:
312. if spot7 == 0:
313. myPen.up()
314. drawO(-100, -100)
315. myPen.up()
316. spot7 = 2
317. turns+=1
318. else:
319. print("This spot is taken!")
320. nextPerson=False
321. elif turn == 8:
322. if spot8 == 0:
323. myPen.up()
324. drawO(0, -100)
325. myPen.up()
326. spot8 = 2
327. turns+=1
328. else:
329. print("This spot is taken!")
330. nextPerson=False
331. elif turn == 9:
332. if spot9 == 0:
333. myPen.up()
334. drawO(100, -100)
335. myPen.up()
336. spot9 = 2
337. turns+=1
338. else:
339. print("This spot is taken!")
340. nextPerson=False
341. else:
342. print("Type in a number that is between 1 and 9")
343. nextPerson = False
344. if nextPerson==True:
345. p1=True
346. p2=False
347. else:
348. p1=False
349. p2=True
350. #this is the same code from above and serves the same purpose, to check if someone won or if it is a tie
351. if spot1==1 and spot2==1 and spot3==1:
352. print("Player 1 wins!")
353. game=2
354. elif spot4==1 and spot5==1 and spot6==1:
355. print("Player 1 wins!")
356. game = 2
357. elif spot7==1 and spot8==1 and spot9==1:
358. print("Player 1 wins!")
359. game = 2
360. elif spot1==1 and spot4==1 and spot7==1:
361. print("Player 1 wins!")
362. game = 2
363. elif spot2==1 and spot5==1 and spot8==1:
364. print("Player 1 wins!")
365. game = 2
366. elif spot3==1 and spot6==1 and spot9==1:
367. print("Player 1 wins!")
368. game = 2
369. elif spot1==1 and spot5==1 and spot9==1:
370. print("Player 1 wins!")
371. game = 2
372. elif spot7==1 and spot5==1 and spot3==1:
373. print("Player 1 wins!")
374. game = 2
375. elif spot1==2 and spot2==2 and spot3==2:
376. print("Player 2 wins!")
377. game=2
378. elif spot4==2 and spot5==2 and spot6==2:
379. print("Player 2 wins!")
380. game = 2
381. elif spot7==2 and spot8==2 and spot9==2:
382. print("Player 2 wins!")
383. game = 2
384. elif spot1==2 and spot4==2 and spot7==2:
385. print("Player 2 wins!")
386. game = 2
387. elif spot2==2 and spot5==2 and spot8==2:
388. print("Player 2 wins!")
389. game = 2
390. elif spot3==2 and spot6==2 and spot9==2:
391. print("Player 2 wins!")
392. game = 2
393. elif spot1==2 and spot5==2 and spot9==2:
394. print("Player 1 wins!")
395. game = 2
396. elif spot7==2 and spot5==2 and spot3==2:
397. print("Player 1 wins!")
398. game = 2
399. elif turns==9:
400. print("Its a tie!")
401. game=2
402. #game = 2 will allow the loop to stop since it only does the loop if game is equal to 1
403. Explain how your program keeps track of the game board.   
     (Provide specific code references by line number.)

On line 12 to 21 there are variables that correspond with all spots on the game board and when a spot is taken the game changes that variable according to which user took that spot

* 1. What python types and data structures are used?

Variables and if then statements

* 1. How are moves by player X and player O recorded?

By the change in value of the variables

* 1. How are free spaces recorded?

The free spaces are known as 0 when they are variables only to change when a player takes them

1. Explain how moves and commands are input from the console.  
   (Provide specific code references by line number.)
   1. How does the player tell the program about the move location (row, column)?

The player lets the game know when the game asks for player 1 or player 2 turn and the player will give a number that goes with a spot on the game board (1 to 9)

* 1. How does the program verify that the move location is valid?

It cheeks if the input is equal to 1 or 2 or 3 etc.

* 1. How does the program verify that the space is free?

If the spot variable corresponding with the spot is equal to 0

* 1. What does the program do if there is something wrong with the move?

It tells the player that the spot is taken or that the spot is not between 1 and 9

1. Explain how the program keeps track of gameplay.  
   (Provide specific code references by line number.)
   1. How does the program switch between player X and player O moves?

The nextPerson variable lets the game know weather or not the next person will go or not and then continues the loop

* 1. How does the program keep asking for moves?

With the if game==1 loop

* 1. How does the program decide when to stop asking for moves?

If a player wins or if it is a tie

**Level 3: Basic Enhancements**

1. Explain, in plain words, a strategy for determining if player “x” or player “O” has won the game after a move is made.

The game cheeks all possible winning combinations and if one is true then that player wins

1. Provide a function called “checkWinForX” that returns the Boolean value of “True” if player “x” won the game.
2. Modify your program to check and print a message, and stop the game of player “x” or player “O” wins the game.
3. Demonstrate your enhanced game to Mr. Nestor for credit for this level.

**Level 4: AI Enhancements**

1. Explain, in plain words, a strategy for suggesting the best move for player “x” or player “O” to make when it is their turn to move.
2. Create a function to implement your strategy for suggesting the best move.
3. Modify your program to print a suggested move when it is each player’s turn to move.
4. Demonstrate your AI enhanced game to Mr. Nestor for credit for this level.