EECS 1210 Introduction to Programming in Python
Spring Semester 2024
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Self-Check 6

Answer the following questions to check your understanding of your material. Expect the same kind of questions to show up on your tests.

1. Definitions and Short Answers

1. Given the following if-statement

```
x = int(input('enter one number: '))
y = int(input('another number: '))
if y == 0:
    print('sorry, cannot divide by 0!')
else:
    print(f'{x} / {y} = {x/y}')
```

   - What is the purpose of checking `if y == 0`? 零不能當除數故先檢查
   - What is the purpose of calling the `int()` function on the first two lines? Will the code still work if you replace the first two lines with

     ```
     x = input('enter one number: ')
     y = input('another number: ')
     ```

     instead? Why or why not? 要先轉成整數 字串無法執行除法運算

2. The following if-statements are not correct in Python syntax. What is wrong with them and how can they be fixed? Do not change the functionality.

   - ```
     if y == 0:
         # do nothing
     else:
         print(f'{x} / {y} = {x/y}')
     ```

     if 不能不做事, 可以在 if 的敘述加個 pass
   - ```
     if y != 0:
         print(f'{x} / {y} = {x/y}')
     else:
         # do nothing
     ```

     else 不能不做事, 可以在 else 的敘述加個 Pass 或是直接把 else 拿掉
   - ```
     if x == 0:
         print('zero, without checking y')
     else if y == 0:
         print('sorry, cannot divide by 0!')
     ```
     ```

```
else:
    print(f'{x} / {y} = {x/y}')
```
else if 要改成 elif

- ```
  if y == 0: print('sorry, cannot divide by zero') else:
      print(f'{x}/{y}={x/y}')
  ```
  要將 else 多換行不然格式不符

3. Given the dictionary
   ```
   eng = {'one': 1, 'two': 2, 'three': 3, 'four': 4}
   ```
   what is the **value** of the following expressions, and which ones cause **errors**?
   - `4 in eng` false
   - `'three' in eng` true
   - `('two', 2) in eng` false
   - `{'one': 1} in eng` error
   - `eng['three']` 3
   - `eng[0]` error
   - `eng[1]` error
   - `eng['two':2]` error
4. Consider the code:
   ```
   1  english={'one':1,'pan':'鍋子','cabbage':'高麗菜','pie':'派餅'}
   2  spanish = {'uno':1, 'pan':'麵包','col':'高麗菜',  'pie':'腳'}
   3  french = {'une':1, 'toi':'你',  'col':'衣領',    'pie':'鵲'}
   4  word = input('enter word to look up: ')
   5  if word in english:
   6      print(f'in English: {english[word]}')
   7  elif word in spanish:
   8      print(f'in Spanish: {spanish[word]}')
   9  elif word in french:
   10     print(f'in French: {french[word]}')
   11 else:
   12     print(f'{word} not found in dictionary')
   ```
   When running the program, what happens when you type the following text when prompted?
   - uno in Spanish: 1
   - pan in English: 鍋子
   - toi in French: 你
   - pie in English: 派餅
   - col in Spanish: 高麗菜
   - cabbage in English: 高麗菜
   - 1 1 not found in dictionary
   - ten ten not found in dictionary
   ```

5. In Question #4, if you swap lines 7-8 with lines 9-10, will the code output exactly the same results for all inputs or different for some inputs? Which?
   col 會變成 in French: 衣領 其餘不變
6. If the code in Question#4 is modified so all `elif` clauses get replaced by `if`, as shown in the following code:

```
 5 if word in english:
 6     print(f'in English: {english[word]}')
 7 if word in spanish:
 8     print(f'in Spanish: {spanish[word]}')
 9 if word in french:
10     print(f'in French: {french[word]}')
11 else:
12     print(f'{word} not found in dictionary')
```

   Suppose the user enters a word that is in `english` but not in `french`, does the `print` statement on the last line still get executed? Why or why not?
   會,因為第 9 行的 if 和第 11 行的 else 視為一組,使用者只要輸入的 word 不是 french,就會執行 else 內容,故 print 會被執行
7. Given the following code

```
passing = False
if int(input('enter grade: ')) >= 60:
    passing = True
```

   - what is the equivalent statement that uses both `if` and `else`?

```
if int(input('enter grade: ')) >= 60:
    passing = True
else:
    passing = False
```

   - what is the equivalent (assignment) statement that does not use `if` at all?
     passing = int(input('enter grade: '))>=60
8. Consider the following version of the code(假設三個字典已經定義)

```
 1 word = input('enter word to look up: ')
 2 outList = []
 3 if word in english:
 4     outList.append(f'in English: {english[word]}')
 5 if word in spanish:
 6     outList.append(f'in Spanish: {spanish[word]}')
 7 if word in french:
 8     outList.append(f'in French: {french[word]}')
 9 if not outList:
10     print(f'{word} not found in dictionary')
11 else:
```

12 `    print('\n'.join(outList))`

- If line 9 is changed to `if outList:`, then how should the rest of the code be updated so it behaves exactly the same?
  將第 10 行與第 12 行互相對調
- What does line 12 do?
  印出 word 在三種語言字典的查詢情況
- Is line 2 really necessary?
  是,不然 outlist 無定義
- What if line 2 is removed and line 4 is replaced by
  ```
      outList = [f'in English: {english[word]}']
  ```
  will the code still work the same way as before? if not, how can it be fixed by adding more code?
  若輸入非英語字典內容,則 outlist 就無定義
  可以在第 4 行和第 5 行之間插入

```
    else:
        outlist = []
```

9. Convert the `if-else` statement in the previous question (lines 9-12) into a single `print()` with a **conditional expression** as its argument.
```
print(f'{word} not found in dictionary' if not outlist \
    else '\n'.join(outList))
```
10. Convert the `if-elif-elif-else` statement with four suites in Question#4 (lines 5-12) into a single `print()` statement whose argument is a **conditional expression**.
```
print (f'in English: {english[word]}' if word in english else \
    f'in Spanish: {spanish[word]}' if word in spanish else \
    f'in French: {french[word]}' if word in french else \
    f'{word} not found in dictionary' )
```
11. Is there a form of conditional expression that uses the `elif` keyword? If so, provide an example. 沒有! 詳見第六週影片"條件表達式 5 分 15 秒處
12. Given the following nested if-statement
```
if x < 0:
    if y > 3:
        print('correct')
```
rewrite it as a single if statement by combining the two conditions.
```
if x < 0 and y > 3:
        print('correct')
```
13. Given the following function that returns a boolean value:
```
def test(y):
    if y % 10:
        return False
    else:
        return True
```
rewrite it as a single return statement by eliminating the if-else construct completely.

```
def test(y):
    return not bool(y % 10)
```

14. Given the following function:

```
def fn(z):
    if z % 10:
        return True
    if z > 400:
        return False
    return True
```

rewrite it as a single return statement by eliminating all if-constructs completely.

```
def fn(z):
    return z <= 400 or bool(z % 10)
```

15. Write a Python function to concatenate a list of strings **using a while loop**.

```
def concat_str(L): # L is a list of strings
    # - an index into L to select one item at a time
    # - a result variable initialized to empty string
    while ____:  # fill in your condition
        # concatenate result with the next string in L
        # increment the index variable
    # return the result string
def concat_str(L):
    count = 0
    result = ""
    while count < len(L):
        result += L[count]
        count += 1
    return result
```

16. Write a Python function to concatenate a list of strings **using a for loop**.

```
def concat_str(L):  # L is a list of strings
    # - the result variable initialized to empty string
    for ______ :   # get one string at a time from L
        # concatenate result with string from for loop
    # return the result string
def concat_str(L):
    result = ""
    for s in L:
        result += s
    return result
```

17. Given the source code

```
1  def index(L, val):
2      i = 0
3      while i < len(L):
```

```
4           if L[i] == val:
5               break
6           i += 1
7       return i if i < len(L) else -1
```

```
def index(L, val):
    flag = True
    i = 0
    while flag:
        if L[i] == val:
            flag = False
            continue
        i += 1
        if(i >= len(L)):
            flag = False
    return i if i < len(L) else -1
```

Rewrite the code so that it does not use a `break` to exit the loop but still uses the same code as line 7 to return the i value. Hint: you need a separate "flag" variable that can take a `True` or `False` value; it should be initialized before the loop and is tested as part of the `while`-condition. The flag should be set to cause a break out of the loop. Be sure the i value is correct after exiting the loop.

18. Convert the code from Problem #17 into a `while-else` construct (where the `else` clause is associated with the `while` construct rather than with an `if` clause)

```
1 def index(L, val):
2     i = 0
3     while i < len(L):
4         if L[i] == val:
5             break
6         i = i + 1
7     return i if i < len(L) else -1
```

can be rewritten as

```
1 def index(L, val):
2     i = 0
3     while i < len(L):
4         if L[i] == val:
5             break
6         i = i + 1
7     else: # while loop tests False
8         return -1
9     return i
```

19. Convert the code from Problem #17 into a `while True:` on line 3 and convert the `while` condition into an `if` condition inside the loop.

def index(L, val):
i = 0
while True:
  if i >= len(L):
    break:
(後略)

20. Referring to the same code as in Problem #17, what happens if you replace `break` on line 5 with `continue`? For example,
    - `>>> L = "abaca"`
      `>>> index(L, 'a')`
      Does the function return a value or go into an infinite loop? Why?
      會進入無限迴圈,因為 i 會一直停在 0 無法增長
    - `>>> L = "abcde"`
      `>>> index(L, 'z')`
      Does the function return a value or go into an infinite loop and why?
      不會進入無限迴圈,i 值將持續增加直至超過 len(L)終止迴圈且回傳值為-1
      Try to predict the behavior of the code before you try running it to verify your answer.
21. In the code

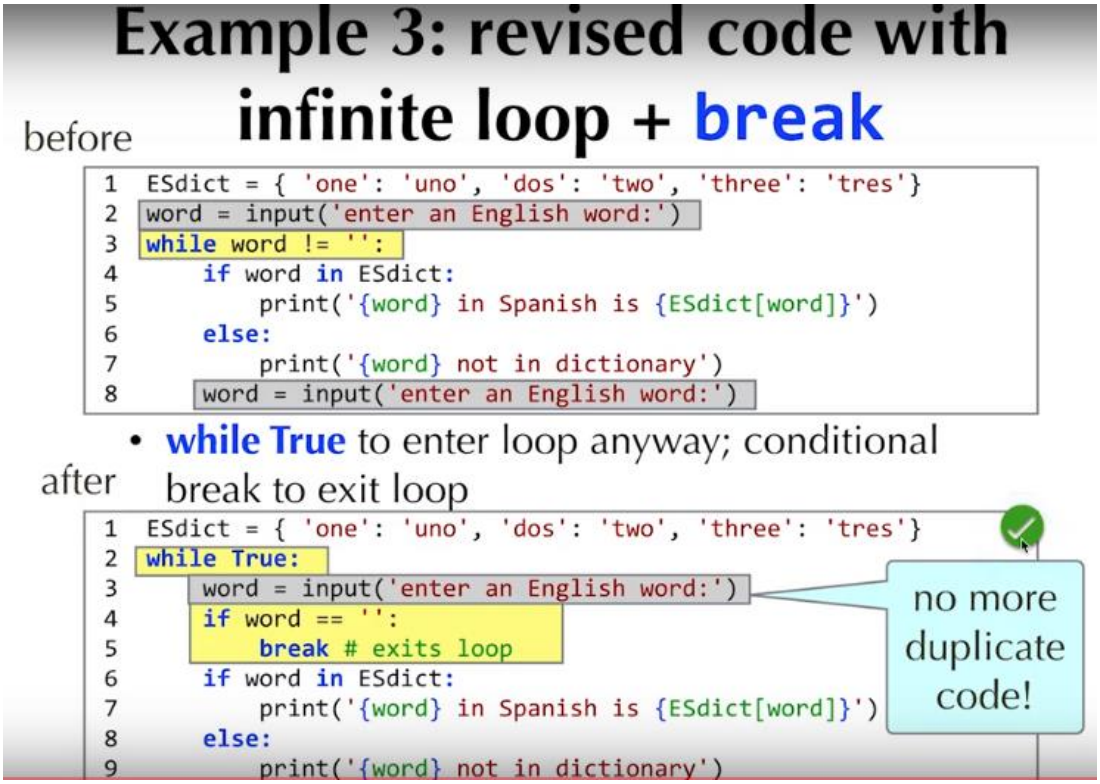
```
1  def index(L, val):
2      i = 0
3      while i < len(L):
4          if L[i] == val:
5              break
6          i = i + 1
7      else:
8          return -1
9      return i
```

What causes the else suite (lines 7-8) to be executed? If line 5 is executed, will line 8 be executed?
當 i >= len(L)時會執行 else suite,若 line5 的 break 執行則不執行 else suite 故 line8 不執行

22. Given the code

```
1  ESdict = { 'one': 'uno', 'dos': 'two', 'three': 'tres'}
2  word = input('enter an English word:')
3  while word != '':
4      if word in ESdict:
5          print(f'{word} in Spanish is {ESdict[word]}')
6      else:
7          print(f'{word} not in dictionary')
8      word = input('enter an English word:')
```

However, there is redundancy because line 2 and line 8 are exactly the same (except for indentation). How can this code be rewritten to eliminate this redundancy?



23. Given the following code

```
1  def StackInterpreter():
2      L = []
3      while True:
4          line = input('command? ')
5          words = line.split()
6          if len(words) == 0:
7              pass
8          elif words[0] == 'show':
9              print(L)
10         elif words[0] == 'push':
11             L.extend(words[1:])
12         elif words[0] == 'pop':
13             print(L.pop())
14         elif words[0] == 'quit':
15             break
16         else:
17             print('unknown command')
```

If the `elif` keywords on lines 8, 10, 12, 14 are replaced by `if`, will the code still behave the same way as far as the user is concerned? Why?

一樣,因為 word[0]之值只有一種可能也就是說不用考慮判斷順序

24. Using the same code from the previous problem, line 7 can be replaced by a single-keyword statement and the code still behaves the same way to the user. What is the keyword? Explain.

continue 因為一但滿足 if 敘述,此迴圈之後的判斷都無需執行

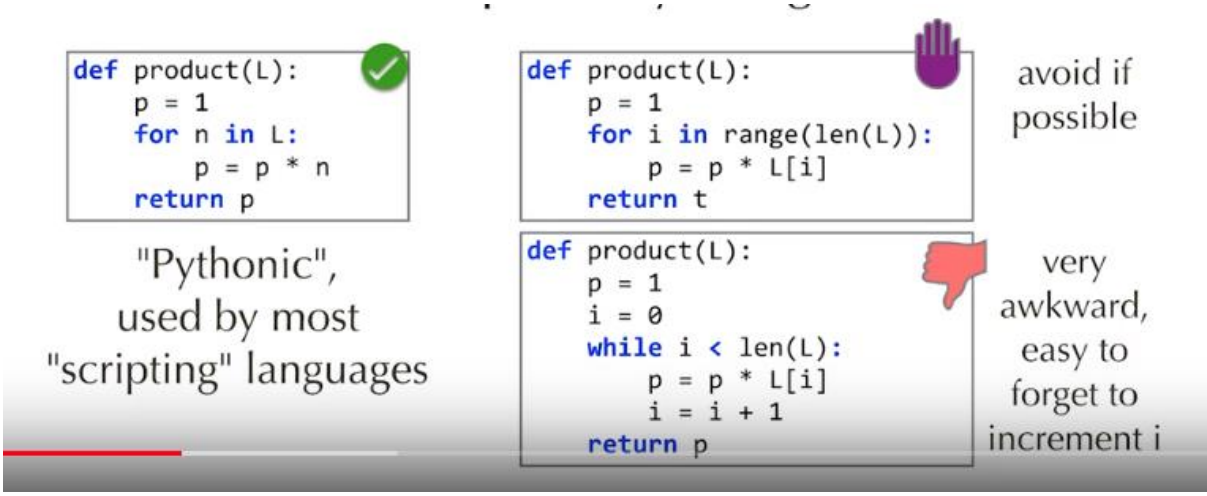
25. Using the same code from the previous problem, line 15 can be replaced by a single-keyword statement and the code still behave the same way. What is it?
return 即結束 function
26. Given the code

```
1  def StackInterpreter():
2      L = []
3      while True:
4          line = input('command? ')
5          words = line.split()
6          if len(words) == 0:
7              continue
8          if words[0] == 'show':
9              print(L)
10             continue
11         if words[0] == 'push':
12             L.extend(words[1:])
13             continue
14         if words[0] == 'pop':
15             print(L.pop())
16             continue
17         if words[0] == 'quit':
18             break
19         print('unknown command')
```

Why doesn't line 19 need to be inside an `else`-clause but can be an unconditional statement at the same level as all preceding `if`-statements?
因為前面的 if 敘述執行的都是 continue 或是 break,若 if 成立就會跳走,不會執行到 line19
有沒有擺在 else 裡面無太大區別
27. Given the Python code

```
1  def product(L):
2      p = 1
3      for i in range(len(L)):
4          p = p * L[i]
5      return t
```

- Rewrite it as a `while`-loop
- Rewrite it as a Pythonic `for`-loop



28. What is the value of the expression
    - `list(enumerate("abcde"))`
      `[(0, 'a'), (1, 'b'), (2, 'c'), (3, 'd'), (4, 'e')]`
    - `list(enumerate(range(5, 10)))`
      `[(0, 5), (1, 6), (2, 7), (3, 8), (4, 9)]`
    - `list(enumerate(['Sun', 'Mon', 'Tue', 'Wed']))`
      `[(0, 'Sun'), (1, 'Mon'), (2, 'Tue'), (3, 'Wed')]`
    - `list(enumerate(['Jan', 'Feb', 'Mar'], start=1))`
      `[(1, 'Jan'), (2, 'Feb'), (3, 'Mar')]`
29. Rewrite the following code using a Pythonic for-loop:

```
1  def find(L, val):
2      i = 0
3      while i < len(L):
4          if L[i] == val:
5              return i
6          i = i + 1
7      return -1
```

```
1  def find(L, val):
2      for i, v in enumerate(L):
3          if v == val:
4              return i
5      return -1
```

2. Programming Exercises

1. Write a Python program named **`dateconv.py`** to prompt the user for date in US format of mm/dd/yyyy (e.g., `'02/15/2019'` and outputs it in the full format of `'February 15, 2019'`. You may assume the dates are given as decimal literals separated by `'/'`, but you should also check if the dates are in range. If the dates

are out of range, then you should inform the user what is wrong. For instance

```
$ python3 dateconv.py
enter date in mm/dd/yyyy: 02/15/2019
February 15, 2019
enter date in mm/dd/yyyy: 02/29/2019
Invalidate day 29 for February: not a leap year
enter date in mm/dd/yyyy: 01/01/2001
January 1, 2001
enter date in mm/dd/yyyy: 13/10/2038
Invalid month 13: should be between 01 and 12
enter date in mm/dd/yyyy: 10/32/2019
Invalid day for October: should be between 01..31
enter date in mm/dd/yyyy: 04/31/2019
Invalid day for April: should be between 01..30
enter date in mm/dd/yyyy: quit
bye
$ _
```

Hin: Build up your program one piece at a time. First, simply use a loop to prompt for input and check for 'quit'. If not quit then first use a print statement to check if the input is as you expect. Once confirmed, you can use `str`'s `split()` method to split a string by its separator (`'/'` in this case). Then, you can check the array of strings, assuming you can convert them to `int`, and check if each one is within range.
Month can be checked easily. Day depends on the month, and for the month of February, day also depends on whether the year is a leap year (28 or 29 days). If any field is invalid, then report the error and loop again. If all fields are correct then display the full month string.
You may store the names of the months all in a list indexed by the month number or in a dictionary keyed by the month. You may use the leap year function from a previous lecture.

answer :
https://drive.google.com/a/gapp.nthu.edu.tw/file/d/1Z46Jyxocnft417owoKT-9UR6R-tZar0V/view?usp=sharing

3. Small Programming Project

1. [somewhat challenging] Write a Python program named `long_multiply(a, b)` to return a string that shows the steps in a long multiplication. (note: `a` is called the *multiplier*, and `b` is the *multiplicand*) For example

```
>>> print(long_multiply(12, 34))
  12
x)34
----
```

```
  48
 36
----
 408
```

Hint: You should construct the return value of the function by concatenating different strings together. It is probably easier if you just append the strings into a list and join them by `'\n'.join(`*listOfStrings*`)`.

a) Before you join the strings, you need to determine the **width** to format each line. This is the maximum number of characters needed to represent the multiplier, multiplicand + 2 (because `'x)'` takes two positions), and the product.

b) Create the following strings and append each one into a list:
   i) string for the multiplier with the width (right aligned),
   ii) `'x)'` concatenated the multiplicand formatted with width-2 (also right-aligned),
   iii) string of `'-'` repeated for width times
   iv) loop over the partial products of multiplier * each digit of the multiplicand, but each time shifted one position to the left.
   v) another string of `'-'` repeated for width times
   vi) finally, the product as a string, formatted to the same width, right aligned.

c) finally, `return '\n'.join(` *list of strings created in above steps*)
   Note: you may assume a and b are both nonnegative integers. Your code should work with integers of any number of digits.

answer:
https://drive.google.com/open?id=1R2OWTOJNlco3-dxlvklvl7lohsX6-H-D