

## Tutorial Exercises Week 2 - Solutions

### Question 1

Assign the strings 'I', 'love' and 'Tilburg' to the variables `a`, `b` and `c`, respectively. Use these 3 variables to print the output 'I love Tilburg' on one line.

```
a = 'I'
b = 'love'
c = 'Tilburg'
a + ' ' + b + ' ' + c
```

'I love Tilburg'

### Question 2

The days of the week in Dutch are maandag, dinsdag, woensdag, donderdag, vrijdag, zaterdag, zondag. Create a dictionary in Python where the *keys* are the days of the week in English and the *values* are the days of the week in Dutch. Use your dictionary to translate a day of the week from English to Dutch.

```
dow = {
    'Monday' : 'maandag',
    'Tuesday' : 'dinsdag',
    'Wednesday' : 'woensdag',
    'Thursday' : 'donderdag',
    'Friday' : 'vrijdag',
    'Saturday' : 'zaterdag',
    'Sunday' : 'zondag'
}
dow['Thursday']
```

'donderdag'

### Question 3

Today is Thursday. What day of the week will it be in 200 days' time? *Hint:* make use of the modulus operator.

```
dow = {
    0 : 'Monday',
    1 : 'Tuesday',
    2 : 'Wednesday',
    3 : 'Thursday',
    4 : 'Friday',
    5 : 'Saturday',
    6 : 'Sunday'
}
dow[(3 + 200) % 7]
```

'Monday'

#### Question 4

If **a** and **b** are logical constants (one of **True** or **False**), **not (a or b)** is always the same as which of the following?

- **a or b**
- **a and b**
- **not a or not b**
- **not a and not b**

This is one of De Morgan's laws. **NOT (A OR B)** is the same as **NOT A AND NOT B**:

$$\neg(A \vee B) \Leftrightarrow (\neg A) \wedge (\neg B)$$

where  $\neg$  means NOT,  $\vee$  means OR and  $\wedge$  means AND. So the answer is **not a and not b**.

To see this in Python we can create two lists containing every possible combination of **True** and **False**:

```
a = [True, True, False, False]
b = [True, False, True, False]
```

**NOT (A OR B)** gives for each pair:

```
[not (a[i] or b[i]) for i in range(len(a))]
```

```
[False, False, False, True]
```

**NOT A AND B** gives for each pair:

```
[not a[i] and not b[i] for i in range(len(a))]
```

```
[False, False, False, True]
```

We can see that these are the same.

The other De Morgan's Law is that NOT (A AND B) is the same as NOT A OR NOT B:

$$\neg(A \wedge B) \Leftrightarrow (\neg A) \vee (\neg B)$$

Try write a set of Python commands to check this law as well!

### Question 5

Consider the following two lists:

```
a = [2, 4, 6, 8]
b = [1, 4, 6]
```

Write a single line of Python code that uses a list comprehension that checks for every element in **a** whether it is contained *somewhere* in **b**. The output should be [False, True, True, False] because 4 and 6 are in **b** while 2 and 8 are not.

```
[i in b for i in a]
```

```
[False, True, True, False]
```

### Question 6

From the following list:

```
a = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
```

Write a single line of Python code using slices that creates a new list **b** with elements [1, 2, 3, 8, 9, 10].

```
a[:3] + a[7:]
```

```
[1, 2, 3, 8, 9, 10]
```

### Question 7

- Anne is taking the following courses: 'Math', 'English', 'German', 'Physics', 'History', 'Economics'.
- Ben is taking the following courses: 'Math', 'English', 'French', 'Chemistry', 'History', 'Business'.

Create two Python variables containing the courses Anne and Ben are taking. Write a line of Python code to find the courses they are taking together.

```
anne = set(['Math', 'English', 'German', 'Physics', 'History', 'Economics'])
ben = set(['Math', 'English', 'French', 'Chemistry', 'History', 'Business'])
anne.intersection(ben)
```

```
{'English', 'History', 'Math'}
```

### Question 8

This is continued from Question 7. Write a line of Python code to find what courses Ben is taking that Anne isn't taking.

```
ben.difference(anne)
```

```
{'Business', 'Chemistry', 'French'}
```

### Question 9

Use Python code to find the average of the following list of numbers:

```
a = [2, 4, 3, 8, 5, 3, 5, 9, 1, 7]
```

Write your code in such a way that if you change the list `a` to another one (potentially with a different number of elements) that the code will still work.

```
sum(a) / len(a)
```

4.7

### Question 10

Write a `for` loop over the following list of numbers that prints `True` if the number is even and `False` if the number is odd:

```
a = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
```

```
for i in a:  
    print(i % 2 == 0)
```

False  
True  
False  
True  
False  
True  
False  
True  
False  
True

### Question 11

Count how many times the number 10 appears in the following list using 3 different methods:

- Using a `for` loop.
- Using a list comprehension
- Using one of the list's methods.

You may find it useful to use the fact that `True` equals one and `False` equals zero when converted to an integer.

```
a = [20, 10, 10, 20, 10, 20, 10, 10, 20, 10]
```

The `for` loop approach:

```
counter = 0
for i in a:
    counter += i == 10
counter
```

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The list comprehension approach:

```
sum([i == 10 for i in a])
```

6

The list method approach:

```
a.count(10)
```

6

### Bonus Question

In case you manage to complete exercises 1-11 quickly, you can try this question.

Use Python to convert 13,446,566 seconds into days, hours, minutes and seconds. Then get Python to print the message:

13446566 seconds is A days, B hours, C minutes and D seconds.

replacing A, B, C and D with what you find.

```
secs = 13446566
remaining = secs
days = remaining // (24 * 60 * 60)
remaining %= (24 * 60 * 60)
hours = remaining // (60 * 60)
remaining %= (60 * 60)
minutes = remaining // 60
remaining %= 60
seconds = remaining

str(secs) + " seconds is " + str(days) + " days, " + str(hours) + \
    " hours, " + str(minutes) + " minutes and " + str(seconds) + " seconds."
```

'13446566 seconds is 155 days, 15 hours, 9 minutes and 26 seconds.'