Introduction to Python
Day Two Exercises

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1 Working with dictionaries

1. Define this dictionary in Python: `molecules = {"DNA":"nucleotides", "protein":"amino acids", "hair":"keratin"}`, and perform the following tasks:

   (a) Create two lists called `molecules_keys` and `molecules_values`, comprised of the keys and values in `molecules`, respectively. Use dictionary methods for this task.

   (b) Add the key:value pair `"ribosomes":"RNA"` to the `molecules` dictionary. Print the dictionary to confirm.

   (c) Add yet another key:value pair, `"ribosomes":"rRNA"`, to the `molecules` dictionary, and print out the new dictionary. Understand why the result contains the key:value pairs shown.

2. Congratulations, you've been hired as a zoo-keeper! Now you have to feed the animals. You received these handy Python dictionaries which tells you (a) to which category each animal belongs, and (b) what to feed each category animal category:

```
category = {"lion": "carnivore", "gazelle": "herbivore", "anteater":
"insectivore", "alligator": "homovore", "hedgehog": "insectivore", "cow":
"herbivore", "tiger": "carnivore", "orangutan": "frugivore"}

feed = {"carnivore": "meat", "herbivore": "grass", "frugivore": "mangos",
"homovore": "visitors", "insectivore": "termites"}
```

   Copy and paste these dictionaries into a Python script. Use indexing to determine what you should feed the orangutan and print the result.

2 If/elif/else Exercises

1. In Texas, you can be a member of the elite "top 1%" if you make at least $423,000 per year. Alternatively, in Hawaii, you can be a member once you start making at least $279,000 per year! Finally, if you live in New York, you need to earn at least $506,000 a year to make the cut.

Andrew is CEO of Big Money Company, and he earns $425,000 per year, and Stacey is CEO of Gigantic Money Company with an annual salary of $700,000. Use if-statements to determine, and print, whether Andrew and Stacey would be considered top 1%-ers in Texas, Hawaii, and New York.

2. Copy and paste the list below into a Python script and perform the following tasks.
`b = [19, 3, 2, 88, 82, 31, -9, 8, 33, -6, -111]`

   (a) Write an if/else statement to determine whether the length of list `b` is above or below 10. If this condition is true, create a new list called `newb` that contains the first 5 numbers in b. If this condition is false, create a new list called `newb` that contains the *last 5 numbers* from list `b`.

   (b) Determine the sum of the list `newb` (Hint: use the `sum()` function).

   (c) Use an if/else statement to determine if this sum is even or odd (Hint: use the modulus operator, `%`), and print a sentence summarizing the result.

3 For-loop Exercises

1. Write a for-loop to print the powers of 2, ranging from 2^0 to 2^{15}. (Note that in Python, the expontent symbol is **, as in 3**2 = 9).

2. Modify your code from (1) such that all each power-of-2 value is saved to a list called `powers2`. Print the resulting list.

3. This is the longest German word[1]: "rindfleischetikettierungsuberwachungsaufgabenubertragungsgesetz" (accents removed), meaning "widow of a Danube steamboat company captain". Save this word to a string variable in Python, and count the number of times each letter in the alphabet (a-z) appears in this word. For each letter, print the number of occurrences, e.g. "a: 4".
Hints:

   - Use a *nested for-loop* structure. The outer loop should loop over the word, and the inner loop over the alphabet.
   - You can loop over strings just like lists.

   Now, modify this code in several ways:

   (a) Modify your code such that letters with a count of 0 do not get printed.

   (b) Modify your code from the previous point such that it uses the `in` operator. This operator returns True or False, as in: `"a" in "apple"` returns True, and `3 in [4,5,6,7,8]` returns False.

   (c) Modify your code to save the letter counts as you loop. For this, you will need to define a variable to store the sum, and you can increment this variable with counts as you go. Once this is complete, use an if-else statement to check that the total sum is equal to length of the full word. Print a statement indicating whether your sum is correct or not.

[1] Sadly, this AP article reported in 2013 that this word has been stricken from the dictionary.

4. A silly professor has decided to curve grades in a very special way: grades above 95 are reduced by 10%, grades between 75-95 (inclusive) remain the same, and grades below 80 are raised by 10%. You have been tasked with crunching the numbers.

   (a) Create a list of new grades that reflects these rules from the following grade list:
   `grades = [45, 94, 25, 68, 88, 95, 72, 79, 91, 82, 53, 66, 58]`

   (b) The *nested* list below contains three sets of grades for silly professor's three classes:
   `all_grades = [[45, 94, 25, 68, 88, 95, 72, 79, 91, 82, 53, 66, 58], [23, 46, 17, 67, 55, 42, 31, 73], [91, 83, 79, 76, 82, 91, 95, 77, 82, 77]]`
   Create a new nested list with the curved grades for each of these classes.

5. When you loop over a dictionary, the loop-variable will be the dictionary *keys*. Using the zoo-keeper dictionaries from today's second dictionary exercise, perform the following tasks:

   (a) Practice looping over dictionaries by writing a for-loop that iterates over the entries in `feed`. At each iteration, print the dictionary key and value (Hint: this will involve indexing).

   (b) Loop over the animals in `category` and print what food each animal should eat, e.g. "The gazelle should eat grass."