

PYTHON EXERCISE AND PROBLEMS

1. Write a function that, when called, returns the next digit of π (approx 3.14159...). You may assume that the function will not be called more than 10 times. The function would be used like this: `print(next_digit_pi())` # 3 `print(next_digit_pi())` # 1 `print(next_digit_pi())` # 4 `print(next_digit_pi())` # 1 You may import `math` and use `math.pi`
2. Write code that repeatedly prompts the user for input, and then outputs the number of items that the user entered the input before the user entered "pumpkin spice latte" (with any capitalization) For example, an interaction with the user might look like What is your order? (User input:) Pumpkin pie What is your order? (User input:) Candy What is your order? (User input:) pumPkin Spice latte 2 The number 2 is printed because the user ordered two items before ordering a pumpkin spice latte.
3. Write a function that takes the number `n` and returns a list of all the perfect squares between 0 and `n`. A perfect square is a number `s` such that $k^2 = s$ for some integer `k`. For example, `get perfect` should return the list `[0, 1, 4, 9, 16, 25, 36]` `def get_perfect_squares(n):`
4. Write a function with the signature `duplicates(list0)`, which returns `True` iff `list0` contains at least two adjacent elements with the same value.
5. Write a function with the signature `match_pattern(list1, list2)` which returns `True` iff the pattern `list2` appears in `list1`. In other words, we return `True` iff there is an `i` such that $0 \leq i \leq \text{len}(\text{list1}) - \text{len}(\text{list2})$ and `list1[i] = list2[0]` `list1[i + 1] = list2[1]` . . . `list1[i + len(list2) - 1] = list2[-1]` For example, if `list1` is `[4, 10, 2, 3, 50, 100]` and `list2` is `[2, 3, 50]`, `match_pattern(list1, list2)` returns `True` since the pattern `[2, 3, 50]` appears in `list1`
6. Write a function with the signature `list1_start_with_list2(list1, list2)`, which returns `True` iff `list1` is at least as long as `list2`, and the first `len(list2)` elements of `list1` are the same as `list2`. Note: `len(lis)` is the length of the list `lis`, i.e., the number of elements in `lis`. First write the function without using slicing ("slicing" means saying things like `list1[2:5]`), and using a loop.
7. Clean the following text. After cleaning, count three most frequent words in the string.
`sentence = "%! $am@% a %tea@cher%, &and& l lo%#ve %tea@ching%;. There $is nothing; &as& mo@re rewarding as educa@ting &and& @emp%o@wering peo@ple. ;I found tea@ching m%o@re interesting tha@n any other %jo@bs. %Do@es thi%s mo@tivate yo@u to be a tea@cher!?"`

```
print(clean_text(sentence));
```

I am a teacher and I love teaching There is nothing as more rewarding as educating and empowering people I found teaching more interesting than any other jobs Does this motivate you to be a teacher

```
print(most_frequent_words(cleaned_text)) # [(3, 'I'), (2, 'teaching'), (2, 'teacher')]
```

8. What is the most frequent word in the following paragraph?

paragraph = 'I love teaching. If you do not love teaching what else can you love. I love Python if you do not love something which can give you all the capabilities to develop an application what else can you love.'

The position of some particles on the horizontal x-axis are -12, -4, -3 and -1 in the negative direction, 0 at origin, 4 and 8 in the positive direction. Extract these numbers from this whole text and find the distance between the two furthest particles.

```
points = ['-1', '2', '-4', '-3', '-1', '0', '4', '8']
```

```
sorted_points = [-4, -3, -1, -1, 0, 2, 4, 8]
```

```
distance = 8 - (-4) # 12
```

9. Exercises: Level 1
10. Declare a function `add_two_numbers`. It takes two parameters and it returns a sum.
11. Area of a circle is calculated as follows: $\text{area} = \pi \times r \times r$. Write a function that calculates `area_of_circle`.
12. Write a function called `add_all_nums` which takes arbitrary number of arguments and sums all the arguments. Check if all the list items are number types. If not do give a reasonable feedback.
13. Temperature in $^{\circ}\text{C}$ can be converted to $^{\circ}\text{F}$ using this formula: $^{\circ}\text{F} = (^{\circ}\text{C} \times 9/5) + 32$. Write a function which converts $^{\circ}\text{C}$ to $^{\circ}\text{F}$, `convert_celsius_to_fahrenheit`.
14. Write a function called `check_season`, it takes a month parameter and returns the season: Autumn, Winter, Spring or Summer.
15. Write a function called `calculate_slope` which return the slope of a linear equation
16. Quadratic equation is calculated as follows: $ax^2 + bx + c = 0$. Write a function which calculates solution set of a quadratic equation, `solve_quadratic_eqn`.
17. Declare a function named `print_list`. It takes a list as a parameter and it prints out each element of the list.
18. Declare a function named `reverse_list`. It takes an array as a parameter and it returns the reverse of the array (use loops).

19. `print(reverse_list([1, 2, 3, 4, 5])) # [5, 4, 3, 2, 1] print(reverse_list1(["A", "B", "C"])) # ["C", "B", "A"]`
20. Declare a function named `capitalize_list_items`. It takes a list as a parameter and it returns a capitalized list of items
21. Declare a function named `add_item`. It takes a list and an item parameters. It returns a list with the item added at the end.
22. `food_staff = ['Potato', 'Tomato', 'Mango', 'Milk']; print(add_item(food_staff, 'Meat')) # ['Potato', 'Tomato', 'Mango', 'Milk','Meat']; numbers = [2, 3, 7, 9]; print(add_item(numbers, 5)) [2, 3, 7, 9, 5]`
23. Declare a function named `remove_item`. It takes a list and an item parameters. It returns a list with the item removed from it.
24. `food_staff = ['Potato', 'Tomato', 'Mango', 'Milk']; print(remove_item(food_staff, 'Mango')) # ['Potato', 'Tomato', 'Milk']; numbers = [2, 3, 7, 9]; print(remove_item(numbers, 3)) # [2, 7, 9]`
25. Declare a function named `sum_of_numbers`. It takes a number parameter and it adds all the numbers in that range.
26. `print(sum_of_numbers(5)) # 15 print(sum_all_numbers(10)) # 55 print(sum_all_numbers(100)) # 5050`
27. Declare a function named `sum_of_odds`. It takes a number parameter and it adds all the odd numbers in that range.
28. Declare a function named `sum_of_even`. It takes a number parameter and it adds all the even numbers in that - range.

Exercises: Level 2

29. Declare a function named `evens_and_odds` . It takes a positive integer as parameter and it counts number of evens and odds in the number.
30. `print(evens_and_odds(100)) # The number of odds are 50. # The number of evens are 51.`
31. Call your function `factorial`, it takes a whole number as a parameter and it return a factorial of the number
32. Call your function `is_empty`, it takes a parameter and it checks if it is empty or not
33. Write different functions which take lists. They should calculate `_mean`, `calculate_median`, `calculate_mode`, `calculate_range`, `calculate_variance`, `calculate_std` (standard deviation).

34. Exercises: Level 3

35. Write a function called `is_prime`, which checks if a number is prime.
36. Write a function which checks if all items are unique in the list.
37. Write a function which checks if all the items of the list are of the same data type.
38. Write a function which check if provided variable is a valid python variable
39. Go to the data folder and access the `countries-data.py` file.
40. Create a function called `most_spoken_languages` in the world. It should return 10 or 20 most spoken languages in the world in descending order
- 41.

Create a function called `most_populated_countries`. It should return 10 or 20 most populated countries in descending order.

```
sets it_companies = {'Facebook', 'Google', 'Microsoft', 'Apple', 'IBM', 'Oracle', 'Amazon'}  
A = {19, 22, 24, 20, 25, 26} B = {19, 22, 20, 25, 26, 24, 28, 27}  
age = [22, 19, 24, 25, 26, 24, 25, 24]
```

Find the length of the set `it_companies`

Add 'Twitter' to `it_companies`

Insert multiple IT companies at once to the set `it_companies`

Remove one of the companies from the set `it_companies`

42. What is the difference between `remove` and `discard`
43. Join A and B

Find A intersection B

Is A subset of B

Are A and B disjoint sets

Join A with B and B with A

What is the symmetric difference between A and B

Delete the sets completely

44. Convert the ages to a set and compare the length of the list and the set, which one is bigger?
45. Explain the difference between the following data types: string, list, tuple and set
Create an empty dictionary called dog
46. Add name, color, breed, legs, age to the dog dictionary
47. Create a student dictionary and add first_name, last_name, gender, age, marital status, skills, country, city and address as keys for the dictionary
48. Get the length of the student dictionary
49. Get the value of skills and check the data type, it should be a list
50. Modify the skills values by adding one or two skills
51. Get the dictionary keys as a list
52. Get the dictionary values as a list
53. Change the dictionary to a list of tuples using items() method
54. Delete one of the items in the dictionary
55. Delete one of the dictionaries

The following list contains some fruits:

```
fruits = ['banana', 'orange', 'mango', 'lemon']
```

If a fruit doesn't exist in the list add the fruit to the list and print the modified list. If the fruit exists print('That fruit already exist in the list')

56. Check if the season is Autumn, Winter, Spring or Summer. If the user input is: September, October or November, the season is Autumn. December, January or February, the season is Winter. March, April or May, the season is Spring June, July or August, the season is Summer
57. Get two numbers from the user using input prompt. If a is greater than b return a is
Declare an empty list

Declare a list with more than 5 items

Find the length of your list

Get the first item, the middle item and the last item of the list

Declare a list called `mixed_data_types`, put your (name, age, height, marital status, address)

58. Declare a list variable named `it_companies` and assign initial values Facebook, Google, Microsoft, Apple, IBM, Oracle and Amazon.

Print the list using `print()`

Print the number of companies in the list

Print the first, middle and last company

Print the list after modifying one of the companies

Add an IT company to `it_companies`

Insert an IT company in the middle of the companies list

Change one of the `it_companies` names to uppercase (IBM excluded!)

Join the `it_companies` with a string `'#; '`

Check if a certain company exists in the `it_companies` list.

Sort the list using `sort()` method

Reverse the list in descending order using `reverse()` method

Slice out the first 3 companies from the list

Slice out the last 3 companies from the list

Slice out the middle IT company or companies from the list

Remove the first IT company from the list

Remove the middle IT company or companies from the list

Remove the last IT company from the list

Remove all IT companies from the list

Destroy the IT companies list

Join the following lists:

```
front_end = ['HTML', 'CSS', 'JS', 'React', 'Redux']
```

```
back_end = ['Node', 'Express',
```

59. Write a code which gives grade to students according to theirs scores:

80-100, A

70-89, B

60-69, C

50-59, D

0-49, F