### ****Set 1****

### ****1. Data Types****

**Problem 1**: Identify the data types of the following variables:

x = 10

y = 3.14

z = "Hello, Python!"

a = True

b = [1, 2, 3]

c = (4, 5, 6)

d = {7, 8, 9}

e = {"name": "Alice", "age": 25}

Write a Python script to print the data types of each variable using the type() function.

**Problem 2**: Perform operations with mixed data types and explain the result:

a = 5

b = "10"

c = 2.5

* Add a and c.
* Concatenate b with " is a number".
* Try adding a and b (What happens? Why?).

### ****2. Type Conversion****

**Problem 3**: Convert the following data types:

* Convert an integer x = 15 to a string, float, and boolean.
* Convert a float y = 3.99 to an integer and a string.
* Convert a string z = "123" into an integer and a float.

**Problem 4**: Write a program that accepts a user’s input as a string and converts it to:

* Integer
* Float
* Boolean  
  Print the converted values.

### ****3. Loops****

**Problem 5**: Use a for loop to print all the even numbers between 1 and 50.

**Problem 6**: Write a program to calculate the factorial of a number using a while loop.  
Example: Input = 5, Output = 120 (because 5!=5×4×3×2×1=1205! = 5 \times 4 \times 3 \times 2 \times 1 = 1205!=5×4×3×2×1=120)

**Problem 7**: Write a Python program to create the following pattern using nested loops:

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**Problem 8**: Iterate through the following dictionary using a loop and print its keys and values:

student = {"name": "John", "age": 20, "grade": "A"}

**Problem 9**: Create a list of numbers from 1 to 10. Use a loop to create a new list containing the squares of these numbers.  
Example: Input = [1, 2, 3], Output = [1, 4, 9]

**Problem 10**: Write a program that uses a loop to reverse a string.  
Example: Input = "Python", Output = "nohtyP"

### Bonus Challenges

**Challenge 1**: Write a program that counts the number of vowels in a given string.  
Example: Input = "Hello, Python!", Output = 4

**Challenge 2**: Use a loop to check if a given number is a prime number.  
Example: Input = 7, Output = "Prime"

### ****Set 2****

**1. String Methods**

**Problem 1**: Write a program that takes a string input and performs the following:

* Convert the string to uppercase.
* Replace all spaces with underscores (\_).
* Check if the string ends with a specific substring (e.g., "ing").

**Problem 2**: Given the string:

text = " Python is Amazing! "

* Remove the leading and trailing whitespaces.
* Count the occurrences of the letter "i".
* Split the string into words.

**Problem 3**: Write a program that reverses a string using slicing and the join() method.  
*Example*: Input = "Hello", Output = "olleH"

**2. Number Methods**

**Problem 4**: Use the following number:

num = -25.678

* Find its absolute value.
* Round it to 1 decimal place.
* Convert it into an integer.

**Problem 5**: Write a program to check if a given number is even or odd using the modulo operator and print the result.

**3. Boolean Methods**

**Problem 6**: Write a program that uses the any() and all() functions on the following list:

bool\_list = [True, False, True, False]

* Use any() to check if at least one element is True.
* Use all() to check if all elements are True.

**4. List Methods**

**Problem 7**: Given the list:

numbers = [5, 3, 8, 6, 2]

* Append the number 10.
* Sort the list in ascending order.
* Remove the smallest number.

**Problem 8**: Write a program to:

* Create a list of 5 names.
* Use index() to find the position of a specific name.
* Use slicing to print the first three names.

**5. Tuple Methods**

**Problem 9**: Given the tuple:

items = (10, 20, 30, 40, 50)

* Find the index of 30.
* Count how many times 20 appears in the tuple.
* Convert the tuple into a list and add a new item.

**6. Set Methods**

**Problem 10**: Write a program to:

* Create two sets: A = {1, 2, 3} and B = {3, 4, 5}.
* Find the union of the sets.
* Find the intersection of the sets.
* Find the difference (A - B).

**Problem 11**: Remove all duplicates from the following list using a set:

nums = [1, 2, 2, 3, 4, 4, 5]

### ****7. Dictionary Methods****

**Problem 12**: Given the dictionary:

student = {"name": "Alice", "age": 20, "grade": "A"}

* Add a new key-value pair for "subject": "Math".
* Update the "grade" to "A+".
* Use a loop to print all keys and values.

**Problem 13**: Write a program that:

* Creates a dictionary with 5 items.
* Deletes an item using the pop() method.
* Clears all items using the clear() method.

**8. Conditional Statements (if-elif-else)**

**Problem 14**: Write a program to check if a number is:

* Positive
* Negative
* Zero

**Problem 15**: Write a program to calculate the grade of a student based on marks:

* Marks >= 90: Grade A
* Marks >= 75: Grade B
* Marks >= 50: Grade C
* Else: Grade F

**9. While Loop**

**Problem 16**: Write a program to calculate the sum of numbers from 1 to 100 using a while loop.

**Problem 17**: Write a program that takes user input repeatedly until the user enters "quit". Print all the inputs received.

**Problem 18**: Use a while loop to generate the following pattern:

1

12

123

1234

12345

### Bonus Challenges

**Challenge 1**: Write a program to check if a string is a palindrome (reads the same forwards and backwards).  
Example: Input = "radar", Output = "Palindrome"

**Challenge 2**: Write a program to count the frequency of each character in a string using a dictionary.  
Example: Input = "hello", Output = {'h': 1, 'e': 1, 'l': 2, 'o': 1}

### ****Set 3****

**1. Print Numbers**

Write a program to print all numbers from 1 to 10 using a for loop and the range() function.

**2. Print Even Numbers**

Write a program to print all even numbers between 1 and 20.

**3. Reverse Range**

Use a for loop to print numbers from 10 down to 1 in reverse order.

**4. Sum of Numbers**

Write a program to calculate the sum of all numbers from 1 to 50 using a for loop.

**5. Multiplication Table**

Write a program that generates the multiplication table of a given number (e.g., 5) using a for loop and range().

**6. Skip Counting**

Use a for loop to print numbers from 1 to 50, skipping every third number (e.g., 1, 4, 7, ...).

**7. Square of Numbers**

Write a program that prints the squares of all numbers from 1 to 10.

**8. Sum of Odd Numbers**

Write a program to calculate the sum of all odd numbers between 1 and 50 using a for loop and range().

**9. Nested Range**

Use nested for loops to generate the following pattern:

1

12

123

1234

12345

**10. Prime Numbers**

Write a program to print all prime numbers between 1 and 50 using a for loop and range().  
(Hint: Use an inner for loop to check divisibility of each number.)