1. Write a Python program to convert temperatures to and from Celsius and Fahrenheit.

```
# Prompt the user to input a temperature in the format (e.g., 45F, 102C, etc.)
temp = input("Input the temperature you like to convert? (e.g., 45F, 102C etc.

# Extract the numerical part of the temperature and convert it to an integer
degree = int(temp[:-1])

# Extract the convention part of the temperature input (either 'C' or 'F')
i_convention = temp[-1]

# Check if the input convention is in uppercase 'C' (Celsius)
if i_convention.upper() == "C":
    # Convert the Celsius temperature to Fahrenheit
    result = int(round((9 * degree) / 5 + 32))
    o_convention = "Fahrenheit"  # Set the output convention as Fahrenheit
# Check if the input convention is in uppercase 'F' (Fahrenheit)
elif i_convention.upper() == "F":
    # Convert the Fahrenheit temperature to Celsius
    result = int(round((degree - 32) * 5 / 9))
    o_convention = "Celsius"  # Set the output convention as Celsius
else:
    # If the input convention is neither 'C' nor 'F', print an error message a
    print("Input proper convention.")
    quit()

# Display the converted temperature in the specified output convention
print("The temperature in", o_convention, "is", result, "degrees.")
```

2. Write a Python program to construct the following pattern, using a nested for loop.

```
n = int(input("Enter n value"))
for i in range(n):
    for j in range(i):
        print('* ', end="")
    print('')
for i in range(n, 0, -1):
    for j in range(i):
        print('* ', end="")
    print('')
```

3. Write a Python program to count the number of even and odd numbers in a series of numbers

Sample numbers : numbers = (1, 2, 3, 4, 5, 6, 7, 8, 9)

```
numbers = (1, 2, 3, 4, 5, 6, 7, 8, 9)
count_odd = 0
count_even = 0
for x in numbers:
    if not x % 2:  # If 'x' modulo 2 equals 0, it's e
        count_even += 1
    else:
        count_odd += 1
# Print the total count of even and odd numbers
print("Number of even numbers:", count_even)
print("Number of odd numbers:", count_odd)
```

Data Types and Operators

1. Experiment with Numeric Data Types

Q1: Write a Python program to demonstrate numeric data types (int, float, complex).

x = 10 # Integer

y = 10.5 # Float

z = 2 + 3j # Complex

print("Integer:", x)

print("Float:", y)

print("Complex:", z)

2. String Data Type

Q2: Write a Python program to manipulate strings (concatenation, slicing, length).
Code:

```
python
CopyEdit
string = "Hello, Python!"
```

```
print("String:", string)
print("Sliced String:", string[7:13])
print("Length of String:", len(string))
```

3. List Data Type

Q3: Create a list of numbers and find their sum using a loop.
Code:

```
python
CopyEdit
numbers = [10, 20, 30, 40, 50]
total = sum(numbers)
print("Sum of list:", total)
```

4. Arithmetic Operators

Q4: Write a program to perform addition, subtraction, multiplication, and division.
Code:

```
python
CopyEdit
a = 15
b = 5
print("Addition:", a + b)
print("Subtraction:", a - b)
print("Multiplication:", a * b)
print("Division:", a / b)
```

---

5. Relational Operators

Q5: Check if a number is greater than another using relational operators.
Code:

```
python
CopyEdit
x = 10
y = 20
print("x > y:", x > y)
print("x < y:", x < y)
```

---

6. Logical Operators

Q6: Write a Python program using logical operators (`and`, `or`, `not`).
Code:

```
python
CopyEdit
```

```
a, b = True, False
print("a and b:", a and b)
print("a or b:", a or b)
print("not a:", not a)
```

7. Membership Operators

Q7: Check if an element exists in a list using membership operators.
Code:

```
python
CopyEdit
my_list = [1, 2, 3, 4, 5]
print("4 in list:", 4 in my_list)
print("6 in list:", 6 in my_list)
```

8. Identity Operators

Q8: Demonstrate the use of `is` and `is not`.
Code:

```
python
CopyEdit
a = 10
b = 10
print("a is b:", a is b)
print("a is not b:", a is not b)
```

9. Bitwise Operators

Q9: Perform bitwise AND, OR, XOR operations on two integers.
Code:

```
python
CopyEdit
x, y = 5, 3
print("x & y:", x & y)
print("x | y:", x | y)
print("x ^ y:", x ^ y)
```

10. Type Conversion

Q10: Convert a float to an integer and a string to a float.
Code:

```
python
CopyEdit
num = 10.7
str_num = "45.6"
print("Integer:", int(num))
print("Float from string:", float(str_num))
```

Conditional Statements (10 Experiments)

1. Simple If Statement

Q1: Write a program to check if a number is positive.
Code:

```
python
CopyEdit
num = 10
if num > 0:
    print("The number is positive.")
```

2. If-Else Statement

Q2: Check if a number is odd or even.
Code:

```
python
CopyEdit
num = 7
if num % 2 == 0:
    print("Even")
else:
    print("Odd")
```

3. Nested If-Else

Q3: Find the largest of three numbers.
Code:

```
python
CopyEdit
a, b, c = 10, 20, 15
if a > b:
    if a > c:
        print("Largest:", a)
    else:
        print("Largest:", c)
else:
    if b > c:
```

```
        print("Largest:", b)
    else:
        print("Largest:", c)
```

4. Grading System

Q4: Write a program to assign grades based on marks.
Code:

```
python
CopyEdit
marks = 85
if marks >= 90:
    print("Grade: A")
elif marks >= 75:
    print("Grade: B")
elif marks >= 50:
    print("Grade: C")
else:
    print("Grade: F")
```

5. Leap Year Check

Q5: Check if a year is a leap year.
Code:

```
python
CopyEdit
year = 2024
if (year % 4 == 0 and year % 100 != 0) or (year % 400 == 0):
    print("Leap Year")
else:
    print("Not a Leap Year")
```

6. Age Group

Q6: Write a program to classify a person's age group (child, teenager, adult).
Code:

```
python
CopyEdit
age = 25
if age <= 12:
    print("Child")
elif age <= 19:
    print("Teenager")
else:
    print("Adult")
```

7. Divisibility Check

Q7: Check if a number is divisible by both 3 and 5.
Code:

```
python
CopyEdit
num = 15
if num % 3 == 0 and num % 5 == 0:
    print("Divisible by 3 and 5")
else:
    print("Not divisible")
```

8. Voting Eligibility

Q8: Check if a person is eligible to vote based on age.
Code:

```
python
CopyEdit
age = 17
if age >= 18:
    print("Eligible to vote")
else:
    print("Not eligible")
```

9. Check Alphabet Case

Q9: Determine if a character is uppercase or lowercase.
Code:

```
python
CopyEdit
char = 'A'
if char.isupper():
    print("Uppercase")
else:
    print("Lowercase")
```

10. Check Character Type

Q10: Check if a character is a vowel or consonant.
Code:

```
python
CopyEdit
char = 'e'
if char in 'aeiouAEIOU':
    print("Vowel")
else:
    print("Consonant")
```

1. Print Numbers from 1 to 10

Code:

```
python
CopyEdit
for i in range(1, 11):
    print(i, end=" ")
```

---

2. Sum of Numbers in a List

Code:

```
python
CopyEdit
numbers = [1, 2, 3, 4, 5]
total = 0
for num in numbers:
    total += num
print("Sum of numbers:", total)
```

---

3. Multiplication Table of a Given Number

Code:

```
python
CopyEdit
num = 5
for i in range(1, 11):
    print(f"{num} x {i} = {num * i}")
```

---

4. Count Vowels in a String

Code:

```
python
CopyEdit
string = "Hello, Python!"
vowels = "aeiouAEIOU"
count = 0
for char in string:
```

```
    if char in vowels:
        count += 1
print("Number of vowels:", count)
```

5. Print Star Pattern

Code:

```
python
CopyEdit
rows = 5
for i in range(1, rows + 1):
    print("*" * i)
```

While Loops (5 Experiments)

1. Print Numbers from 1 to N

Code:

```
python
CopyEdit
n = 10
i = 1
while i <= n:
    print(i, end=" ")
    i += 1
```

2. Factorial of a Number

Code:

```
python
CopyEdit
num = 5
factorial = 1
i = 1
while i <= num:
    factorial *= i
    i += 1
print("Factorial of", num, "is", factorial)
```

3. Reverse a Number

Code:

```
python
```

```
CopyEdit
num = 12345
reverse = 0
while num > 0:
    digit = num % 10
    reverse = reverse * 10 + digit
    num //= 10
print("Reversed Number:", reverse)
```

4. Check if a Number is Prime

Code:

```
python
CopyEdit
num = 29
is_prime = True
i = 2
while i <= num // 2:
    if num % i == 0:
        is_prime = False
        break
    i += 1
if is_prime:
    print(num, "is a prime number")
else:
    print(num, "is not a prime number")
```

5. Sum of Digits of a Number

Code:

```
python
CopyEdit
num = 12345
total = 0
while num > 0:
    total += num % 10
    num //= 10
print("Sum of digits:", total)
```

Nested Loops (5 Experiments)

1. Print Multiplication Table (1 to 5)

Code:

```
python
CopyEdit
```

```
for i in range(1, 6):
    for j in range(1, 11):
        print(f"{i} x {j} = {i * j}")
    print()
```

---

2. Number Pyramid Pattern

Code:

```
python
CopyEdit
rows = 5
for i in range(1, rows + 1):
    for j in range(1, i + 1):
        print(j, end=" ")
    print()
```

---

3. Prime Numbers in a Range

Code:

```
python
CopyEdit
start, end = 10, 50
for num in range(start, end + 1):
    is_prime = True
    for i in range(2, num):
        if num % i == 0:
            is_prime = False
            break
    if is_prime and num > 1:
        print(num, end=" ")
```

---

4. Check Armstrong Numbers in a Range

Code:

```
python
CopyEdit
start, end = 100, 500
for num in range(start, end + 1):
    sum_of_cubes = 0
    temp = num
    while temp > 0:
        digit = temp % 10
        sum_of_cubes += digit ** 3
        temp //= 10
    if num == sum_of_cubes:
        print(num, "is an Armstrong number")
```

---

5. Diamond Pattern with Stars

Code:

```
python
CopyEdit
rows = 5
# Upper part
for i in range(1, rows + 1):
    print(" " * (rows - i) + "*" * (2 * i - 1))
# Lower part
for i in range(rows - 1, 0, -1):
    print(" " * (rows - i) + "*" * (2 * i - 1))
```

Control Statements (Break, Continue, Pass) (5 Experiments)

1. Break Statement in a Loop

Code:

```
python
CopyEdit
for i in range(1, 11):
    if i == 5:
        break
    print(i, end=" ")
```

---

2. Continue Statement in a Loop

Code:

```
python
CopyEdit
for i in range(1, 11):
    if i % 2 == 0:
        continue
    print(i, end=" ")
```

---

3. Pass Statement in a Loop

Code:

```
python
CopyEdit
for i in range(1, 6):
    if i == 3:
        pass  # Do nothing for i == 3
    else:
```

```
        print(i)
```

4. Use of Break in a While Loop

Code:

```
python
CopyEdit
i = 1
while i <= 10:
    if i == 7:
        break
    print(i, end=" ")
    i += 1
```

5. Skipping Negative Numbers (Continue)

Code:

```
python
CopyEdit
numbers = [-10, -5, 0, 5, 10]
for num in numbers:
    if num < 0:
        continue
    print("Positive Number:", num)
```

1. Calculate the Sum of Even Numbers in a Range

Code:

```
python
CopyEdit
start = 1
end = 20
total = 0
for num in range(start, end + 1):
    if num % 2 == 0:
        total += num
print("Sum of even numbers:", total)
```

2. Reverse a String

Code:

```
python
CopyEdit
string = "Python"
```

```
reversed_string = ""
for char in string:
    reversed_string = char + reversed_string
print("Reversed String:", reversed_string)
```

3. Print Fibonacci Series

Code:

```
python
CopyEdit
n = 10  # Number of terms
a, b = 0, 1
print("Fibonacci Series:", end=" ")
for _ in range(n):
    print(a, end=" ")
    a, b = b, a + b
```

4. Find the Largest Number in a List

Code:

```
python
CopyEdit
numbers = [3, 5, 7, 2, 8, 10]
largest = numbers[0]
for num in numbers:
    if num > largest:
        largest = num
print("Largest number:", largest)
```

5. Count Words in a Sentence

Code:

```
python
CopyEdit
sentence = "Python is a powerful programming language"
word_count = 0
for word in sentence.split():
    word_count += 1
print("Total words:", word_count)
```

6. Print Only Prime Numbers in a List

Code:

```
python
CopyEdit
numbers = [2, 3, 4, 5, 6, 7, 8, 9, 10, 11]
for num in numbers:
    is_prime = True
    for i in range(2, num):
        if num % i == 0:
            is_prime = False
            break
    if is_prime and num > 1:
        print(num, end=" ")
```

---

7. Find the Factorial of a Number (Using For Loop)

Code:

```
python
CopyEdit
num = 5
factorial = 1
for i in range(1, num + 1):
    factorial *= i
print("Factorial of", num, "is", factorial)
```

---

8. Print Square and Cube of Numbers in a Range

Code:

```
python
CopyEdit
start = 1
end = 5
print("Number\tSquare\tCube")
for num in range(start, end + 1):
    print(f"{num}\t{num**2}\t{num**3}")
```

---

9. Count Occurrences of a Character in a String

Code:

```
python
CopyEdit
string = "banana"
char_to_count = 'a'
count = 0
for char in string:
    if char == char_to_count:
        count += 1
print(f"'{char_to_count}' occurs {count} times in the string.")
```

10. Find the Sum of Elements in a Matrix

Code:

```
python
CopyEdit
matrix = [
    [1, 2, 3],
    [4, 5, 6],
    [7, 8, 9]
]
total = 0
for row in matrix:
    for element in row:
        total += element
print("Sum of all elements in the matrix:", total)
```