Week 2: Control Flow and Conditional Statements

1. If-else statements

The if statement is used to create a decision structure, which allows a program to have more than one path of execution. The if statement causes one or more statements to execute only when a Boolean expression is true. A control structure is a logical design that controls the order in which a set of statements execute. So far, we have used only the simplest type of control structure: the sequence structure. A sequence structure is a set of statements that execute in the order that they appear. For example, the following code is a sequence structure because the statements execute from top to bottom.

```python
name = input('What is your name? ')
age = int(input('What is your age? '))
print('Here is the data you entered:')
print('Name:', name)
print('Age:', age)
```

What is your name? Ali
What is your age? 20
Here is the data you entered:
Name: Ali
Age: 20

When the **if statement executes, the condition is tested. If the condition is true**, the statements that appear in the block following the if clause are executed. **If the condition is false, the statements in the block are skipped.**

The == Operator

The == operator determines whether the operand on its left is equal to the operand on its right. If the values referenced by both operands are the same, the expression is true. Assuming that a is 4, the expression a == 4 is true and the expression a == 2 is false.

Let's look at the following example of the if statement:

however, the assignment statement is skipped. Figure shows a flowchart for this section of code.

```python
# Example: Check if a number is even or odd
# Input: A number
number = int(input("Enter a number: "))
# If-else condition
if number % 2 == 0:
    print(f"The number {number} is even.")
else:
    print(f"The number {number} is odd.")
```

Enter a number: 5
The number 5 is odd.
Enter a number: 6
The number 6 is even.

```
x = int(input("What's x? "))
y = int(input("What's y? "))
if x < y:
    print("x is less than y")
if x > y:
    print("x is greater than y")
if x == y:
    print("x is equal to y")
```

What's x? 7
What's y? 5
x is greater than y

What's x? 4
What's y? 2
x is less than y

What's x? 5
What's y? 5
x is equal to y

```
x = int(input("What's x? "))
y = int(input("What's y? "))
if x < y:
    print("x is less than y")
elif x > y:
    print("x is greater than y")
elif x == y:
    print("x is equal to y")
```

What's x? 7
What's y? 5
x is greater than y

What's x? 4
What's y? 2
x is less than y

What's x? 5
What's y? 5
x is equal to y

```python
x = int(input("What's x? "))
y = int(input("What's y? "))
if x < y:
    print("x is less than y")
elif x > y:
    print("x is greater than y")
else:
    print("x is equal to y")
```

```python
x = int(input("What's x? "))
y = int(input("What's y? "))
if x < y or x > y:
    print("x is not equal to y")
else:
    print("x is equal to y")
```

```python
x = int(input("What's x? "))
y = int(input("What's y? "))
if x == y:
    print("x is equal to y")
else:
    print("x is not equal to y")
```

```python
x = int(input("What's x? "))
y = int(input("What's y? "))
if x != y:
    print("x is not equal to y")
else:
    print("x is equal to y")
```

1. Check if a number is positive or negative

```python
number = float(input("Enter a number: "))
if number >= 0:
    print("The number is positive.")
else:
    print("The number is negative.")
```

```
Enter a number: 3
The number is positive.
Enter a number: -7
The number is negative.
```

2. Find the largest of two numbers

```python
a = int(input("Enter the first number: "))
b = int(input("Enter the second number: "))
if a > b:
    print(f"{a} is larger than {b}.")
else:
    print(f"{b} is larger than or equal to {a}.")
```

Enter the first number: 5
Enter the second number: 7
7 is larger than or equal to 5.

3. Check if a number is divisible by 5

```python
number = int(input("Enter a number: "))
if number % 5 == 0:
    print(f"{number} is divisible by 5.")
else:
    print(f"{number} is not divisible by 5.")
```

Enter a number: 15
15 is divisible by 5.
Enter a number: 17
17 is not divisible by 5.

4. Check if a year is a leap year

```python
year = int(input("Enter a year: "))
if (year % 4 == 0 and year % 100 != 0) or (year % 400 == 0):
    print(f"{year} is a leap year.")
else:
    print(f"{year} is not a leap year.")
```

Enter a year: 2025
2025 is not a leap year.
Enter a year: 2028
2028 is a leap year.

5. Check if a number is within a range from 1 to 100

```python
number = int(input("Enter a number: "))
if 1 <= number <= 100:
    print(f"{number} is within the range 1-100.")
else:
    print(f"{number} is outside the range 1-100.")
```

Enter a number: 75
75 is within the range 1-100.

6. Multiple conditions using logical operators

```python
# Check if a number is within a range and even
num = int(input("Enter a number: "))
```

```python
if 10 <= num <= 20 and num % 2 == 0:
    print(f"{num} is within the range 10-20 and is
even.")
else:
    print(f"{num} does not satisfy the conditions.")
```

Enter a number: 12
12 is within the range 10-20 and is even.
Enter a number: 6
6 does not satisfy the conditions.

2. Using if, elif, and else

```python
# Determine the grade based on marks
marks = int(input("Enter your marks: "))

if marks >= 90:
    print("Grade: A")
elif marks >= 80:
    print("Grade: B")
elif marks >= 70:
    print("Grade: C")
elif marks >= 60:
    print("Grade: D")
else:
    print("Grade: F")
```

Enter your marks: 85
Grade: B