

# Unit 2

## Lessons 1,2 and 3

**Python** provides special constructs to control the execution of one or more statements depending on a condition. Such constructs are called as **control statements or control-flow statements**.

**The control-flow statements are of three types:**

**Selection Statement** - is a statement whose execution results in a choice being made as to which of two or more paths should be followed.

- if construct
- if-else construct
- if-elif-else construct
- Nested if-elif-else construct

**Iterative Statement** - is a statement which executes a set of statements repeatedly depending on a condition.

- while loop
- for loop
- else clause on loop statements

**Control flow Statement** - is a statement which transfers control-flow to some other section of the program based on a condition.

- break statement
- continue statement
- pass statement

The general **syntax** of **if statement** in Python is,

```
    If test expression:  
        statement(s)
```

**Example:**

```
    If x > 0:  
        print ("x is positive")
```

**Note:**

The if-construct is a selection statement, the statements within the block are executed only once when the condition evaluates to True, Otherwise the control goes to the first statement after the if-construct.

- In Python, the body (block of statements) of the If statement is indicated by indentation.
- Python interprets non-zero values as True. None and 0 are interpreted as False.

Take an integer as input from the console using input() function. Write a program to check the given integer is divisible by 7 or not, print the result to the console as shown in the examples.

### **Case 1**

Sample Input and Output 1:

Enter a number: 77

Given number 77 is divisible by 7

End of program

### **Case 2**

Sample Input and Output 2:

Enter a number: 40

End of program

Solution:

```
#Program to illustrate simple if statement
```

```
num = int(input("Enter a number: "))
```

```
if(num%7==0):
```

```
    print("Given number {} is divisible by {}".format(num,7))
```

```
print("End of program")
```

**Select the correct output for the below Python code?**

```
a = 27
b = 27.0
if(a == b):
    print("a and b are equal")
if(a != b):
    print("a and b are not equal")
```

- A. Interpreter Error
- B. a and b are equal.
- C. a and b are equal a and b are not equal
- D. a and b are not equal.

**Select the correct output for the below Python code?**

```
a = 27
b = 27.0
if(a == b):
    print("a and b are equal")
if(a != b):
    print("a and b are not equal")
```

- A. Interpreter Error
- B. a and b are equal.**
- C. a and b are equal a and b are not equal
- D. a and b are not equal.

## if-else statement

The if-else statement provides two different paths of execution depending on the result of the condition. The body of if is executed when the condition associated with the expression is true.

### syntax for the if-else statement :

if(expression):

body of If

else:

body of else

**if x%2 == 0:**

**print (x, “is even”)**

**else:**

**print (x, “is odd”)**

**The alternatives are called branches.**

Since the condition must be true or false, exactly one of the alternatives will be executed. The alternatives are called branches, because they are branches in the flow of execution.



Write a program to check whether the marks obtained by the student got distinction or not. Take marks as input from the user which of type int.

Follow the below conditions while writing the program.

- If marks > distinction \_marks print the message as **User secured distinction**
- Otherwise print the message **User did not secure distinction**

Print the result to the console as shown in the examples.

**Sample Input and Output 1:**

```
Enter marks obtained: 78
User secured distinction
```

**Sample Input and Output 2:**

```
Enter marks obtained: 55
User did not secure distinction
```

**NOTE:** The distinction\_marks = **75** is already defined in the program.

Solution:

```
distinction_marks = 75
```

```
# write your code here
```

```
marks=int(input("Enter marks obtained: "))
```

```
if(marks>distinction_marks):
```

```
    print("User secured distinction")
```

```
else:
```

```
    print("User did not secure distinction")
```

Take an integer as input from the console using `input()` function. Write a program to check the given input amount is greater or less than the minimum balance.

Follow the given instructions while writing the program and print the output as shown in the example.

Assume minimum balance is **1000**

- If input  $\geq 1000$  print Sufficient balance
- Otherwise the message should print on the console is Balance is Low

**Sample Input and Output 1:**

```
Enter balance in your account: 500  
Balance is low
```

**Sample Input and Output 2:**

```
Enter balance in your account: 2000  
Sufficient balance
```

Solution:

```
balance=int(input("Enter balance in your account: "))
```

```
if(balance>=1000):
```

```
    print("Sufficient balance")
```

```
else:
```

```
    print("Balance is low")
```

 Are the following statements correct? Which one is better?

```
if age < 16:  
    print("Cannot get a driver's license")  
if age >= 16:  
    print("Can get a driver's license")
```

(a)

```
if age < 16:  
    print("Cannot get a driver's license")  
else:  
    print("Can get a driver's license")
```

(b)



Both are correct, but b is better as condition is tested only once

Practice Programs:

1. Write a program to check number is even or not.
2. Write a program to check whether a person is eligible to vote or not?

Write a program to calculate the income tax as follows

Step 1: get all deductions (80c, 80cc, HRA, Medical)

Step 2: Add all the deductions to standard deduction 150000

Step 3: Get Gross Income

Step 4: Get taxable income (as Gross Income - Deductions)

Step 5: Calculate Income Tax based on taxable income as follows

```
if (Tax_Income > 0):
    if (Gross_Income <= 500000):
        Income_Tax = (Tax_Income * .1)
    if (Gross_Income <= 1000000) and (Gross_Income > 500000):
        Income_Tax = 25000 + ((Gross_Income - 500000)*.2)
    if (Gross_Income > 1000000):
        Income_Tax = 75000 + ((Gross_Income - 1000000) *.3)
    print("Gross Income is " , Gross_Income)
    print("Total Deductions = " , Ded_tot)
    print("Income Tax = " , Income_Tax)
else :
    print("Hurray..No Income Tax")
```

#### Sample Input and Output 1:

```
Enter Amount to be deducted under 80c: 50000
Enter Amount to be deducted under 80cc: 5000
Enter Amount to be deducted under HRA: 15000
Enter Amount to be deducted under Medical: 10000
Enter Gross Income: 250000
Gross Income is 250000
Total Deductions = 230000
Income Tax = 2000.0
```

#### Sample Input and Output 2:

```
Enter Amount to be deducted under 80c: 5000
Enter Amount to be deducted under 80cc: 2000
Enter Amount to be deducted under HRA: 1500
Enter Amount to be deducted under Medical: 500
Enter Gross Income: 20000
Hurray..No Income Tax
```

## Solution:

# Deductions

Ded\_std = 150000

# Request Inputs

Ded\_80c = int(input("Enter Amount to be deducted under 80c: "))

Ded\_80cc = int(input("Enter Amount to be deducted under 80cc: "))

Ded\_hra = int(input("Enter Amount to be deducted under HRA: "))

Ded\_med = int(input("Enter Amount to be deducted under Medical: "))

Gross\_Income = int(input("Enter Gross Income: "))

Ded\_tot = (Ded\_std + Ded\_80c + Ded\_80cc + Ded\_hra + Ded\_med)

Tax\_Income = Gross\_Income - Ded\_tot

# complete the missing code

if (Tax\_Income > 0):

    if (Gross\_Income <= 500000):

        Income\_Tax = (Tax\_Income \* 0.1)

    if (Gross\_Income <= 1000000) and (Gross\_Income > 500000):

        Income\_Tax = 25000 + ((Gross\_Income - 500000)\*0.2)

    if (Gross\_Income > 1000000):

        Income\_Tax = 75000 + ((Gross\_Income - 1000000) \*0.3)

    print ("Gross Income is" ,Gross\_Income)

    print ("Total Deductions =",Ded\_tot)

    print ("Income Tax =",Income\_Tax)

else:

    print ("Hurray..No Income Tax")

## if-elif-else

The if-elif-else construct extends the if-else construct by allowing to chain multiple if constructs as shown below:

if test expression:

body of if

elif test expression:

body of elif

elif test expression:

body of elif

...

elif test expression:

body of elif

else:

body of else

**if x < y:**

**print (x, "is less than", y)**

**elif x > y:**

**print (x, "is greater than", y)**

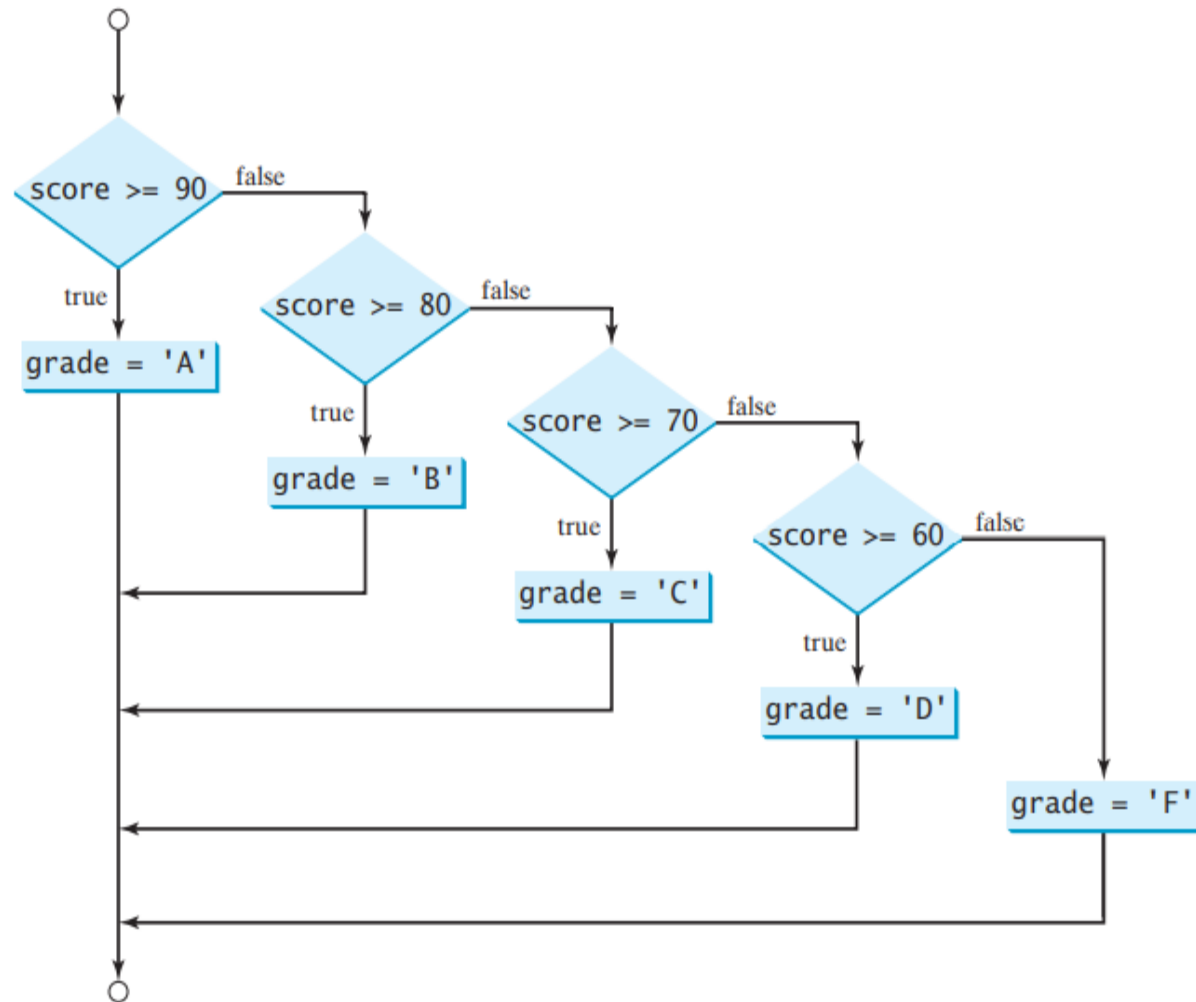
**else:**

**print (x, "and", y, "are equal")**



## Example to understand if-elif-else

```
if score >= 90.0:  
    grade = 'A'  
elif score >= 80.0:  
    grade = 'B'  
elif score >= 70.0:  
    grade = 'C'  
elif score >= 60.0:  
    grade = 'D'  
else:  
    grade = 'F'
```



Multi-way if-elif-else statement to assign a grade.

What is the output of the following?

```
if (10 < 0) and (0 < -10):
```

```
    print("A")
```

```
elif (10 > 0) or False:
```

```
    print("B")
```

```
else:
```

```
    print("C")
```

A: A

B: B

C: C

D: Error

Predict output of the following python program.

a, b, c = 5, 1, 15

```
if (a < b) and (a < c):  
    print("A is minimum")  
elif (b < a) and (b < c):  
    print("B is minimum")  
else:  
    print("C is minimum")
```

A: A is minimum

B: B is minimum

C: C is minimum

D: Error

## Important Points:

- The if elif else construct is used when we have multiple mutually exclusive expressions.
- If the condition for if is false, then the condition for the next elif is evaluated and so on upto the next elif.
- If all the conditions are false, then the body of else is executed.
- Only one block among if elif else blocks is executed based on the condition.
- The if block can have only one else block, but it can have multiple elif blocks.
- Indentation is used for each of the if-elif-else blocks

Take character as input from the console using input() function. Write a program to check whether the given input is a character or a digit, if the input is 0 exit the program, otherwise print the result to the console as shown in the examples

**Sample Input and Output 1:**

```
Enter '0' for exit.  
Enter any character: 7  
Given character 7 is a digit
```

**Sample Input and Output 2:**

```
Enter '0' for exit.  
Enter any character: D  
Given character D is an alphabet
```

**Sample Input and Output 3:**

```
Enter '0' for exit.  
Enter any character: @  
@ is not an alphabet nor a digit
```

## **Solution:**

```
print("Enter '0' for exit.")
ch=input("Enter any character: ")
if ch == '0':
    exit()
elif(ch>='A' and ch<='Z'):
    print("Given character {} is an alphabet".format(ch))
elif(ch>='a' and ch<='z'):
    print("Given character {} is an alphabet".format(ch))
elif(ch>='1' and ch<='9'):
    print("Given character {} is a digit".format(ch))
else:
    print("{} is not an alphabet nor a digit".format(ch))
```

Take an integer num as input from the console using input() function. Write a program to check the given num is a positive or a negative one, print the result to the console as shown in the examples.

**Sample Input and Output 1:**

```
Enter a number: 02  
Positive number
```

**Sample Input and Output 2:**

```
Enter a number: -52142  
Negative number
```

**Sample Input and Output 3:**

```
Enter a number: 0  
Zero
```

Solution:

```
number=int(input("Enter a number: "))
```

```
if(number==0):
```

```
    print("Zero")
```

```
elif(number>0):
```

```
    print("Positive number")
```

```
else:
```

```
    print("Negative number")
```



Take an integer year as input from the console using input() function. Write a program to check the given year is a leap year or not, print the result to the console as shown in the examples.

### **Sample Input and Output 1:**

```
Enter a year: 2004  
2004 is a leap year
```

### **Sample Input and Output 2:**

```
Enter a year: 1700  
1700 is not a leap year
```

# Solution:

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

## Practice Programs:

1. Write a program to calculate the electricity bill, we must understand electricity charges and rates.

1 - 100 unit - 1.5/-  
101-200 unit - 2.5/-  
201-300 unit - 4/-  
300 - 350 unit - 5/-  
above 350 - 15 /-

2. Write a program that prompts the user to enter a weight in pounds and height in inches and then displays the BMI. Note that one pound is 0.45359237 kilograms and one inch is 0.0254 meters. Use ladder if concept.

```
if bmi < 18.5
    print("Underweight")
if bmi < 25
    print("Normal")
if bmi < 30
    print("Overweight")
else
    print("Obese")
```

$$\text{bmi} = \text{weightInKilograms} / (\text{heightInMeters} * \text{heightInMeters})$$

3. Suppose you shop for rice and find it in two different sized packages. You would like to write a program to compare the costs of the packages. The program prompts the user to enter the weight and price of each package and then displays the one with the better price. Here is a sample run:

```
Enter weight and price for package 1: 50, 24.59 ↵ Enter
Enter weight and price for package 2: 25, 11.99 ↵ Enter
Package 1 has the better price.
```

4. Write a Python program to check a triangle is equilateral, isosceles or scalene.

Note :An equilateral triangle is a triangle in which all three sides are equal.

A scalene triangle is a triangle that has three unequal sides.

An isosceles triangle is a triangle with (at least) two equal sides.

## Solution 1

```
units=int(input("Enter number of units:"))
```

```
if (units <= 100):
```

```
    bill= units * 1.5
```

```
elif (units <= 200):
```

```
    bill=((100 * 1.5) +(units - 100) * 2.5)
```

```
elif (units <= 300):
```

```
    bill=((100 * 1.5) +(100 * 2.5) +(units - 200) * 4)
```

```
elif (units <= 350):
```

```
    bill=((100 * 1.5) +(100 * 2.5) +(100 * 4) +(units - 300) * 5)
```

```
elif (units>350):
```

```
    bill = ((100 * 1.5) + (100 * 2.5) + (100 * 4) + (50 * 5)+((units - 350) * 15))
```

```
print("Electricity bill is:",bill)
```

## Solution 2

# Prompt the user to enter weight in pounds

```
weight = eval(input("Enter weight in pounds: "))
```

# Prompt the user to enter height in inches

```
height = eval(input("Enter height in inches: "))
```

```
KILOGRAMS_PER_POUND = 0.45359237 # Constant
```

```
METERS_PER_INCH = 0.0254 # Constant
```

# Compute BMI

```
weightInKilograms = weight * KILOGRAMS_PER_POUND
```

```
heightInMeters = height * METERS_PER_INCH
```

```
bmi = weightInKilograms / (heightInMeters * heightInMeters)
```

# Display result

```
print("BMI is", format(bmi, ".2f"))
```

```
if bmi < 18.5:
```

```
    print("Underweight")
```

```
elif bmi < 25:
```

```
    print("Normal")
```

```
elif bmi < 30:
```

```
    print("Overweight")
```

## Solution 3

```
w1, p1 = eval(input("Enter weight and price for package 1: "))
```

```
w2, p2 = eval(input("Enter weight and price for package 2: "))
```

```
pricePerKilo1 = p1 / w1
```

```
pricePerKilo2 = p2 / w2
```

```
if pricePerKilo1 > pricePerKilo2:
```

```
    print("Package 1 has the better price.")
```

```
elif pricePerKilo2 > pricePerKilo1:
```

```
    print("Package 2 has the better price.")
```

```
else:
```

```
    print("Both have a good price")
```

## Solution 4

```
x,y,z=eval(input("Enter three sides:"))
# _Check for equilateral triangle
if x == y == z:
    print("Equilateral Triangle")

# Check for isosceles triangle
elif x == y or y == z or z == x:
    print("Isosceles Triangle")

# Otherwise scalene triangle
else:
    print("Scalene Triangle")
```



# Conditional expressions

A conditional expression evaluates an expression based on a condition (Also known as ternary operator)

Conditional expressions are in a completely different style. The syntax is:

**expression1 if boolean-expression else expression2**

The result of this conditional expression is expression1 if boolean-expression is true; otherwise, the result is expression2.

1) Suppose you want to assign the larger number of variables number1 and number2 to max.

You can simply write a statement using the conditional expression:

**max = number1 if number1 > number2 else number2**

2) The following statement displays the message number is even if number is even, and otherwise displays number is odd.

```
print("number is even" if number % 2 == 0 else "number is odd")
```