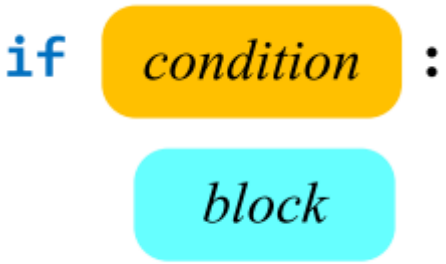
Decision Structure

Contents

1. Control Structures

A **control structure** is a block of programming that analyses variables and chooses a direction in which to go based on given parameters.

1.1 Simple If statement




```
if x < 10:
    y = x
```

could be written

```
if  x < 10: y = x
```

but may *not* be written as

```
if x < 10:
y = x
```

Exercise:

1. Kathryn teaches a science class and her students are required to take three tests. She wants to write a program that her students can use to calculate their average test score. She also wants the program to congratulate the student enthusiastically if the average is greater than 95. Here is the algorithm in pseudocode:

   Get the first test score
   Get the second test score
   Get the third test score
   Calculate the average
   Display the average
   If the average is greater than 95:

Congratulate the user

2. Write a code that will take two numbers **a** and **b** as input from user. The program will only divide **a** from by **b** only if b is not equal to zero.

Listing 4.3: alternatedivision.py

```
#  Get two integers from the user
dividend = int(input('Please enter the number to divide: '))
divisor = int(input('Please enter dividend: '))
#  If possible, divide them and report the result
if divisor != 0:
    quotient = dividend/divisor
    print(dividend, '/', divisor, "=", quotient)
print('Program finished')
```

1.2 If else statement

```
if condition :
    if-block
else:
    else-block
```

Exercise:

1. Write a Program for checking whether the given number is an even number or not.
2. Write a code that will take two numbers **a** and **b** as input from user. The program will only divide **a** from by **b** only if b is not equal to zero otherwise it will print that "**Divisor cannot be 0**"
3. Write a Python program that requests an integer value from the user. If the value is between 1 and 100 inclusive, print "OK;" otherwise, print "Out of range."

Problem 17: What happens when the following code is executed? Will it give any error? Explain the reasons.

```
x = 2
if x == 2:
    print x
else:
    print y
```

Problem 18: What happens the following code is executed? Will it give any error? Explain the reasons.

```
x = 2
if x == 2:
    print x
else:
    x +
```

1.3 Compound Boolean Expression

We can combine simple Boolean expressions, each involving one relational operator, into more complex Boolean expressions using the logical operators and, or, and not. A combination of two or more Boolean expressions using logical operators is called a **compound Boolean expression.**

Table 4.4 Precedence of Some Python Operators. Higher precedence operators appear above lower precedence operators.

Arity	Operators	Associativity
binary	**	
unary	+, -	
binary	*, /, //, %	left
binary	+, -	left
binary	>, <, >=, <=, ==, !=	left
unary	not	
binary	and	left
binary	or	left

```
x = 10
y = 20
b = (x == 10)              # assigns True to b
b = (x != 10)              # assigns False to b
b = (x == 10 and y == 20)  # assigns True to b
b = (x != 10 and y == 20)  # assigns False to b
b = (x == 10 and y != 20)  # assigns False to b
b = (x != 10 and y != 20)  # assigns False to b
b = (x == 10 or y == 20)   # assigns True to b
b = (x != 10 or y == 20)   # assigns True to b
b = (x == 10 or y != 20)   # assigns True to b
b = (x != 10 or y != 20)   # assigns False to b
```

```
if x < 10 and input("Print value (y/n)?") == 'y':
    print(x)
```

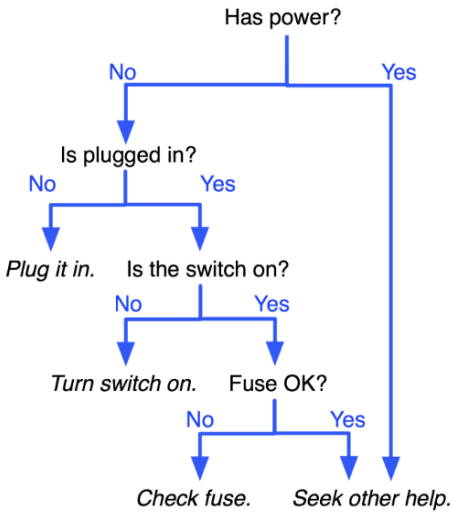
If x is a numeric value less than 10, this statement will query the user to print or not print the value of x. If $x \geq 10$, the program need not stop and wait for the user's input. If $x \geq 10$, the user's input is superfluous anyway. Now consider the statement with the Boolean expressions ordered the other way:

```
if input("Print value (y/n)?") == 'y' and x < 10:
    print(x)
```

1.4 If elif else statement

The if statement can have optional elif clauses when there are more conditions to be checked. The elif keyword is short for else if, and is useful to avoid excessive indentation.

```
If condition:
  code
elif condition:
  code
else:
  code
```



1.5 Nested if else

```
If condition:
   If condition:
      code
   else:
      code
else:
      code
```

Assignment 2:

Part 1 :

1. Write a Python program that requests five integer values from the user. It then prints the maximum and minimum values entered. If the user enters the values 3, 2, 5, 0, and 1, the program would indicate that 5 is the maximum and 0 is the minimum. Your program should handle ties properly; for example, if the user enters 2, 4 2, 3 and 3, the program should report 2 as the minimum and 4 as maximum.
2. Write a Python program that requests five integer values from the user. It then prints one of two things: if any of the values entered are duplicates, it prints "DUPLICATES"; otherwise, it prints "ALL
3. Write a program that takes numbers of seconds as input from user and calculate total number of hours, minutes and seconds from it. Lets say if user enters 12345 it should display output as:
   Hours: 3
   Minutes: 25
   Seconds: 45
4. Write a Python program that allows a user to type in an English day of the week (Sunday, Monday, etc.). The program should print the Spanish equivalent, if possible.
5. **Age Classifier**
   Write a program that asks the user to enter a person's age. The program should display a message indicating whether the person is an infant, a child, a teenager, or an adult. Following are the guidelines:
   A. If the person is 1 year old or less, he or she is an infant.
   B. If the person is older than 1 year, but younger than 13 years, he or she is a child.
   C. If the person is at least 13 years old, but less than 20 years old, he or she is a teenager.
   D. If the person is at least 20 years old, he or she is an adult.

6. Body Mass index

Write a program that calculates and displays a person's body mass index (BMI). The BMI is often used to determine whether a person is overweight or underweight for his or her height. A person's BMI is calculated with the following formula:

$$BMI = \frac{weight}{height^2} \times 703$$

where weight is measured in pounds and height is measured in inches. The program should ask the user to enter his or her weight and height and then display the user's BMI.

The program should also display a message indicating whether the person has optimal weight, is underweight, or is overweight.

- A person's weight is considered to be optimal if his or her BMI is between 18.5 and 25.
- If the BMI is less than 18.5, the person is considered to be underweight.
- If the BMI value is greater than 25, the person is considered to be overweight.

7.**Shipping Charges**

The Fast Freight Shipping Company charges the following rates:

Weight of Package	**Rate per Pound**
2 pounds or less	$1.50
Over 2 pounds but not more than 6 pounds	$3.00
Over 6 pounds but not more than 10 pounds	$4.00
Over 10 pounds	$4.75

Write a program that asks the user to enter the weight of a package and then displays the shipping charges.

Part 2:

Question 1:

Given the following definitions:

```
x, y, z = 3, 5, 7
```

evaluate the following Boolean expressions:

(a) `x == 3`

(b) `x < y`

(c) `x >= y`

(d) `x <= y`

(e) `x != y - 2`

(f) `x < 10`

(g) `x >= 0 and x < 10`

(h) `x < 0 and x < 10`

(i) `x >= 0 and x < 2`

(j) `x < 0 or x < 10`

(k) `x > 0 or x < 10`

(l) `x < 0 or x > 10`

Question 2:

Given the following definitions:

```
x, y = 3, 5
b1, b2, b3, b4 = True, False, x == 3, y < 3
```

evaluate the following Boolean expressions:

(a) b3

(b) b4

(c) not b1

(d) not b2

(e) not b3

(f) not b4

(g) b1 and b2

(h) b1 or b2

(i) b1 and b3

(j) b1 or b3

(k) b1 and b4

(l) b1 or b4

(m) b2 and b3

(n) b2 or b3

(o) b1 and b2 or b3

(p) b1 or b2 and b3

(q) b1 and b2 and b3

(r) b1 or b2 or b3

(s) not b1 and b2 and b3

(t) not b1 or b2 or b3

(u) not (b1 and b2 and b3)

(v) not (b1 or b2 or b3)

Question 3:

```
# i, j, and k are numbers
if  i < j:
    if j < k:
        i = j
    else:
        j = k
else:
    if j > k:
        j = i
    else:
        i = k
print("i =", i, " j =", j, " k =", k)
```

What will the code print if the variables i, j, and k have the following values?

(a) i is 3, j is 5, and k is 7

(b) i is 3, j is 7, and k is 5

(c) i is 5, j is 3, and k is 7

(d) i is 5, j is 7, and k is 3

(e) i is 7, j is 3, and k is 5

(f) i is 7, j is 5, and k is 3

Question 4:

Consider the following Python program that prints one line of text:

```
val = int(input())
if val < 10:
    if val != 5:
        print("wow ", end='')
    else:
        val += 1
else:
    if val == 17:
        val += 10
    else:
        print("whoa ", end='')
print(val)
```

What will the program print if the user provides the following input?

(a) 3

(b) 21

(c) 5

(d) 17

(e) -5

Question 5:

```
n = int(input())
if n < 1000:
    print('*', end='')
if n < 100:
    print('*', end='')
if n < 10:
    print('*', end='')
if n < 1:
    print('*', end='')
print()
```

```
n = int(input())
if n < 1000:
    print('*', end='')
elif n < 100:
    print('*', end='')
elif n < 10:
    print('*', end='')
elif n < 1:
    print('*', end='')
print()
```

How do the two programs react when the user provides the following inputs?

(a) 0

(b) 1

(c) 5

(d) 50

(e) 500

(f) 5000

Why do the two programs behave as they do?

Upload: Google Classroom

Deadline: 3rd Nov 2021 11:55 PM