CSIT881
Programming and Data Structures

Decision Making Statements

UNIVERSITY
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Decision Making Statements

Objectives:

- Understanding the usage of Decision Making Statements

- Solving problems using:
  - Single-selection statement **`if`**
  - Double-selection statement **`if-else`**
  - Multiple-selection statement **`if-elif-...-else`**

Hello World example

```
# ask user to choose a language
print("Choose a language:  (I)talian  (W)elsh   (Z)ulu")
language_option = input("Enter language selection: ")

# display Hello World, How are you, in different languages
if (language_option == "I"):
  print("Ciao mondo.")
  print("Come stai?")
elif (language_option == "W"):
  print("Helo Byd.")
  print("Sut wyt ti?")
elif (language_option == "Z"):
  print("Sawubona Mhlaba.")
  print("Unjani?")
else:
  print("Hello World.")
  print("How are you?")
```

```
Choose a language:  (I)talian  (W)elsh   (Z)ulu
Enter language selection: W
Helo Byd.
Sut wyt ti?
```

Hello World example

```
if (language_option == "I"):
#{
  print("Ciao mondo.")
  print("Come stai?")
#}
elif (language_option == "W"):
#{
  print("Helo Byd.")
  print("Sut wyt ti?")
#}
elif (language_option == "Z"):
#{
  print("Sawubona Mhlaba.")
  print("Unjani?")
#}
else:
#{
  print("Hello World.")
  print("How are you?")
#}
```

If you are coming from C and Java background, perhaps using the **comments with curly brackets** like this may help you to see the beginning and the end of your code block better!

if - else

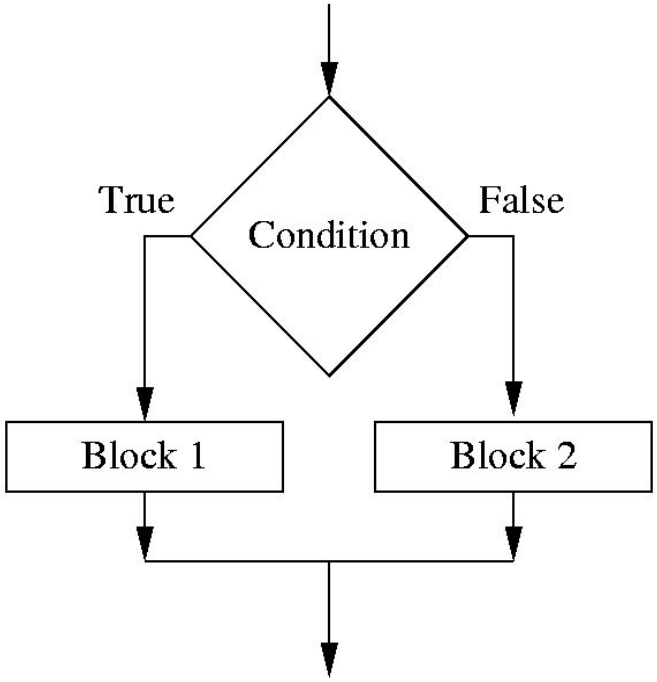
Double-selection statement **`if-else`**

is the most common decision making statement.

We use this control structure to specify two different actions in our program.

We will need to provide a condition. If this condition is *true* then our program will perform a certain action. And if this condition is *false* then another action will be taken.

if - else




```
if (some condition):
    block 1 statements
    …
else:
    block 2 statements
    ...
```

Example 1

Number of items	**Cost**
1-50	$3 per item Postage: $10
More than 50	$2 per item Postage: free

Example 1

Number of items	Cost
1-50	$3 per item Postage: $10
More than 50	$2 per item Postage: free

If the user buys 10 item:

```
Item cost = $3 x 10 = $30
Postage: $10

Total cost: $40
```

Example 1

Number of items	Cost
1-50	$3 per item Postage: $10
More than 50	$2 per item Postage: free

If the user buys 100 item:

```
Item cost = $2 x 100 = $200
Postage: free

Total cost: $200
```

Example 1

```
# get the number of items from the user

item_input = input("Enter the quantity: ")
item_count = int(item_input)

# calculate the cost

if (item_count <= 50):

else:
```

Example 1

```
# get the number of items from the user

item_input = input("Enter the quantity: ")
item_count = int(item_input)

# calculate the cost

if (item_count <= 50):
    unit_price = 3
    postage = 10
    total_cost = unit_price * item_count + postage

    print("Total cost: ${0}".format(total_cost))
else:
```

Example 1

```
# get the number of items from the user

item_input = input("Enter the quantity: ")
item_count = int(item_input)

# calculate the cost

if (item_count <= 50):
    unit_price = 3
    postage = 10
    total_cost = unit_price * item_count + postage

    print("Total cost: ${0}".format(total_cost))
else:
    unit_price = 2
    total_cost = unit_price * item_count

    print("Total cost: ${0}".format(total_cost))
```

Example 1

```
# get the number of items from the user

item_input = input("Enter the quantity: ")
item_count = int(item_input)

# calculate the cost

if (item_count <= 50):
#{
  unit_price = 3
  postage = 10
  total_cost = unit_price * item_count + postage

  print("Total cost: ${0}".format(total_cost))
#}
else:
#{
  unit_price = 2
  total_cost = unit_price * item_count

  print("Total cost: ${0}".format(total_cost))
#}
```

if - elif - elif - … - else

Multiple-selection statement **`if-elif-...-else`**

is to be used when we have different actions in our code to handle different conditions.

In each of the **`if`** and **`elif`** control structures, we will need to provide a condition.

The last control structure **`else`** is optional.

If **`else`** is used then the block of codes that belong to **`else`** will be executed if all the previous conditions (of **`if`** and **`elif`**) are false.

if - elif - elif - … - else

```
if (condition1):
    # condition1 is true
    statement
    statement
    ...
elif (condition2):
    # condition1 is false and condition2 is true
    statement
    statement
    ...
elif (condition3):
    # condition1 is false, condition2 is false, and condition3 is true
    statement
    statement
    ...
else:
    # all the conditions are false
    statement
    statement
    ...
```

Example 2

Number of items	Cost
1-50	$3 per item Postage: Standard post: $10 Registered post: $15 Express post: $20
More than 50	$2 per item Postage: Standard post: free Registered post: $15 Express post: $20

10 items + Registered Post

```
Item cost = $3 x 10 = $30
Postage: $15
Total cost: $45
```

Example 2

Number of items	Cost
1-50	$3 per item Postage: Standard post: $10 Registered post: $15 Express post: $20
More than 50	$2 per item Postage: Standard post: free Registered post: $15 Express post: $20

100 items + Registered Post

```
Item cost = $2 x 100 = $200
Postage: $15
Total cost: $215
```

Example 2

Number of items	Cost
1-50	$3 per item Postage: Standard post: $10 Registered post: $15 Express post: $20
More than 50	$2 per item Postage: Standard post: free Registered post: $15 Express post: $20

100 items + Standard Post

```
Item cost = $2 x 100 = $200
Postage: free
Total cost: $200
```

Example 2

```
# get the number of items from the user
item_input = input("Enter the quantity: ")
item_count = int(item_input)

# get the shipping method Standard/Registered/Express?
shipping = input("Shipping method (s/r/e): ")

# calculate the cost
```

Example 2

```
# calculate the cost

# determine the unit price




# determine the postage




# determine the total cost
```

Example 2

```
# determine the unit price

if (item_count <= 50):
    unit_price = 3

else:
    unit_price = 2
```

Example 2

```
# determine the postage

if (shipping == "s"):
    # standard post



elif (shipping == "r"):
    # registered post



else:
    # express post


```

Example 2

```
# determine the postage

if (shipping == "s"):
  # standard post $10 for 1-50 items, free for > 50 items

  if (item_count <= 50):
    postage = 10
  else:
    postage = 0

elif (shipping == "r"):
  # registered post




else:
  # express post
```

Example 2

```
# determine the postage

if (shipping == "s"):
  # standard post $10 for 1-50 items, free for > 50 items

  if (item_count <= 50):
    postage = 10
  else:
    postage = 0

elif (shipping == "r"):
  # registered post $15
  postage = 15



else:
  # express post



```

Example 2

```
# determine the postage

if (shipping == "s"):
  # standard post $10 for 1-50 items, free for > 50 items

  if (item_count <= 50):
    postage = 10
  else:
    postage = 0

elif (shipping == "r"):
  # registered post $15
  postage = 15



else:
  # express post $20
  postage = 20
```

Example 2

```
# determine the total cost

total_cost = unit_price * item_count + postage

print("Total cost: ${0}".format(total_cost))
```

Example 3

```
# grade A: 100-80, B: 79-60, C: 59-40, D: 39-0

# ask user to enter the mark



# determine the grade based on mark



# display the mark and grade
```

Example 3

```
# grade A: 100-80, B: 79-60, C: 59-40, D: 39-0

# ask user to enter the mark

mark_input = input("Please enter mark: ")
mark = int(mark_input)


# determine the grade based on mark



# display the mark and grade
```

Example 3

```
# grade A: 100-80, B: 79-60, C: 59-40, D: 39-0

# determine the grade based on mark

if (mark >= 80):
  grade = "A"

elif (mark >= 60):
  grade = "B"

elif (mark >= 40):
  grade = "C"

else:
  grade = "D"
```

Example 3

```
# display the mark and grade

print("Mark {0}, Grade {1}".format(mark, grade))
```

```
#grade A: 100-80, B: 79-60, C: 59-40, D: 39-0
mark_input = input("Please enter mark: ")
mark = int(mark_input)

if (mark >= 80):
  grade = "A"
elif (mark >= 60):
  grade = "B"
elif (mark >= 40):
  grade = "C"
else:
  grade = "D"

print("Mark {0}, Grade {1}".format(mark, grade))
```

mark is greater than or equal to 80

```
Please enter mark: 90
Mark 90, Grade A
```

```
#grade A: 100-80, B: 79-60, C: 59-40, D: 39-0
mark_input = input("Please enter mark: ")
mark = int(mark_input)

if (mark >= 80):
  grade = "A"
elif (mark >= 60):
  grade = "B"
elif (mark >= 40):
  grade = "C"
else:
  grade = "D"

print("Mark {0}, Grade {1}".format(mark, grade))
```

```
Please enter mark: 62
Mark 62, Grade B
```

```
#grade A: 100-80, B: 79-60, C: 59-40, D: 39-0
mark_input = input("Please enter mark: ")
mark = int(mark_input)

if (mark >= 80):
  grade = "A"
elif (mark >= 60):
  grade = "B"
elif (mark >= 40):
  grade = "C"
else:
  grade = "D"

print("Mark {0}, Grade {1}".format(mark, grade))
```



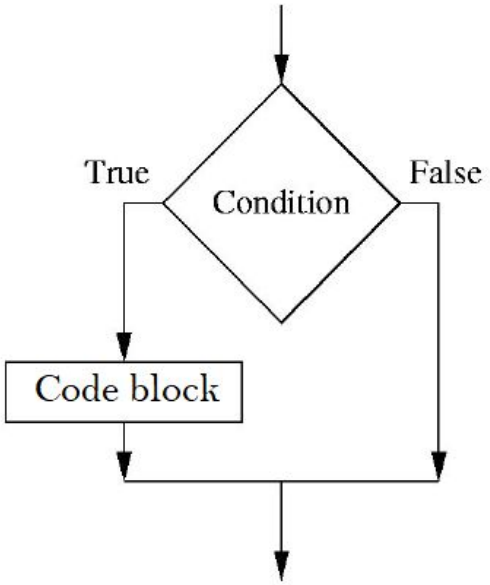
```
Please enter mark: 45
Mark 45, Grade C
```

```
#grade A: 100-80, B: 79-60, C: 59-40, D: 39-0
mark_input = input("Please enter mark: ")
mark = int(mark_input)

if (mark >= 80):
  grade = "A"
elif (mark >= 60):
  grade = "B"
elif (mark >= 40):
  grade = "C"
else:
  grade = "D"

print("Mark {0}, Grade {1}".format(mark, grade))
```

```
Please enter mark: 15
Mark 15, Grade D
```

if (alone)

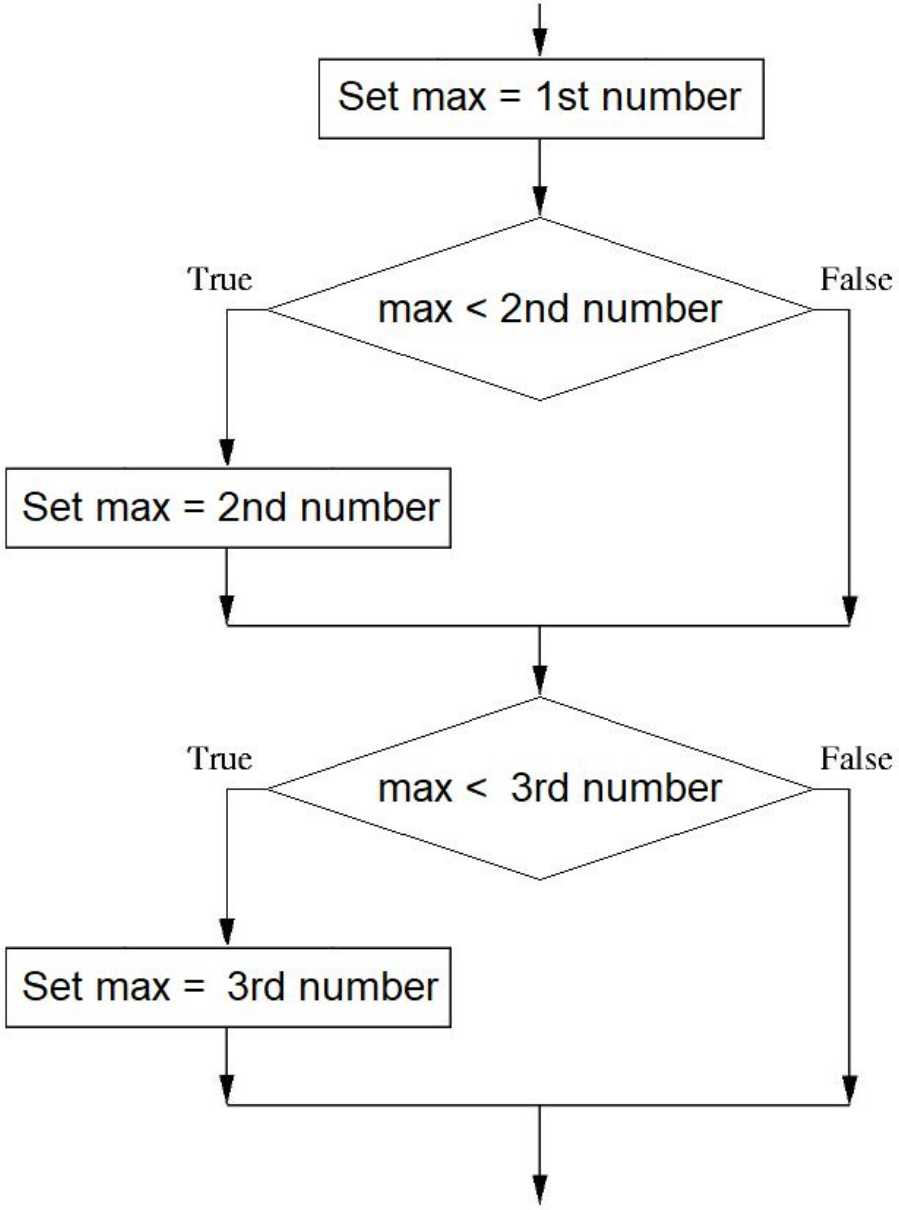
```
if (some condition):
    statements
    ...
```



The single-selection statement **`if`** is to be used when we want to perform an action if a condition is *true* or skip the action when the condition is *false*.

Example 4

Finding the maximum number among 3 given numbers



```
user_input = input("Enter the 1st integer: ")
number1 = int(user_input)
user_input = input("Enter the 2nd integer: ")
number2 = int(user_input)
user_input = input("Enter the 3rd integer: ")
number3 = int(user_input)

number_max = number1

if (number2 > number_max):
  number_max = number2

if (number3 > number_max):
  number_max = number3

print("Max of {0}, {1}, {2} is {3}"
         .format(number1, number2, number3, number_max))
```

```
user_input = input("Enter the 1st integer: ")
number1 = int(user_input)
user_input = input("Enter the 2nd integer: ")
number2 = int(user_input)
user_input = input("Enter the 3rd integer: ")
number3 = int(user_input)

number_max = number1

if (number2 > number_max):
  number_max = number2

if (number3 > number_max):
  number_max = number3

print("Max of {0}, {1}, {2} is {3}"
        .format(number1, number2, number3, number_max))
```

number1 12

number2 3

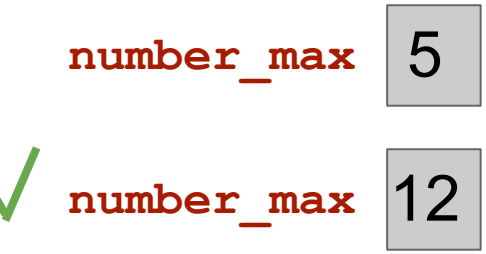
number_max 12

number3 5

senario 1

```
Enter the 1st integer: 12
Enter the 2nd integer: 3
Enter the 3rd integer: 5
Max of 12, 3, 5 is 12
```

```
user_input = input("Enter the 1st integer: ")
number1 = int(user_input)
user_input = input("Enter the 2nd integer: ")
number2 = int(user_input)
user_input = input("Enter the 3rd integer: ")
number3 = int(user_input)

number_max = number1

if (number2 > number_max):
  number_max = number2

if (number3 > number_max):
  number_max = number3

print("Max of {0}, {1}, {2} is {3}"
        .format(number1, number2, number3, number_max))
```



senario 2

```
Enter the 1st integer: 5
Enter the 2nd integer: 12
Enter the 3rd integer: 3
Max of 5, 12, 3 is 12
```

```
user_input = input("Enter the 1st integer: ")
number1 = int(user_input)
user_input = input("Enter the 2nd integer: ")
number2 = int(user_input)
user_input = input("Enter the 3rd integer: ")
number3 = int(user_input)

number_max = number1

if (number2 > number_max):
  number_max = number2

if (number3 > number_max):
  number_max = number3

print("Max of {0}, {1}, {2} is {3}"
        .format(number1, number2, number3, number_max))
```

number1 5

number2 3

number3 12

number_max 5

✗

✓ **number_max** 12

senario 3

```
Enter the 1st integer: 5
Enter the 2nd integer: 3
Enter the 3rd integer: 12
Max of 5, 3, 12 is 12
```

```
user_input = input("Enter the 1st integer: ")
number1 = int(user_input)
user_input = input("Enter the 2nd integer: ")
number2 = int(user_input)
user_input = input("Enter the 3rd integer: ")
number3 = int(user_input)

number_max = number1

if (number2 > number_max):
  number_max = number2

if (number3 > number_max):
  number_max = number3

print("Max of {0}, {1}, {2} is {3}"
        .format(number1, number2, number3, number_max))
```

number1 3

number2 5

number3 12

number_max 3

✓ **number_max** 5

✓ **number_max** 12

senario 4

```
Enter the 1st integer: 3
Enter the 2nd integer: 5
Enter the 3rd integer: 12
Max of 3, 5, 12 is 12
```

Equality

```
if (number1 == 5):
  # number1 is equal to 5

if (number1 == number2):
  # number1 is equal to number2

if (your_answer == “Y”):
  # your_answer is equal to “Y”

if (student_name == “John”):
  # student_name is equal to “John”
```

Remember the double equal sign ==

Inequality

```
if (number1 != 5):
  # number1 is not equal to 5

if (number1 != number2):
  # number1 is not equal to number2

if (your_answer != “Y”):
  # your_answer is not equal to “Y”

if (student_name != “John”):
  # student_name is not equal to “John”
```

Comparison

```
if (number1 < 5):
  # number1 is less than 5


if (number1 <= 5):
  # number1 is less than or equal to 5


if (number1 > 5):
  # number1 is greater than 5


if (number1 >= 5):
  # number1 is greater than or equal to 5
```

Logical And

```
if ((number1 > 5) and (number1 < 10)):
  # number1 is greater than 5 AND less than 10


if ((age > 40) and (student_type == “Domestic”)):
  # age is greater than 40
  # AND student_type is equal to “Domestic”
```

Logical Or

```
if ((number1 < 1000) or (number1 > 5000)):
  # number1 is less than 1000
  # OR greater than 5000
```

```
if ((student_type == “Exchange”) or (student_type
== “Domestic”)):
  # student_type is equal to “Exchange”
  # OR is equal to “Domestic”
```

Logical Negation

```
if (not (number1 == 1000)):
  # number1 is not equal to 1000
```

Block and indentation

```
if (condition):
  this is
  a block
  of codes
  that is indented
  by the same amount
  of spaces
else:
  usually
  we use 2, 3 or 4 spaces for
  indentation
```

In Python, all the continuous lines indented with same number of spaces form a **block**.

All statements within the block must be indented the same amount.

We usually use 2, 3 or 4 spaces for indentation.

Block and indentation

```
if (item_count <= 50):
#{
  unit_price = 3
  postage = 10
  total_cost = unit_price * item_count + postage

  print("Total cost: ${0}".format(total_cost))
#}
else:
#{
  unit_price = 2
  total_cost = unit_price * item_count

  print("Total cost: ${0}".format(total_cost))
#}
```

If you are coming from C, C++, Java, etc... background, perhaps using the above coding style will help you!

Common mistakes

```
if (condition):
  this is
  a block
  of codes
  that is indented
  by the same amount
  of spaces
else:
  usually
  we use 2, 3 or 4 spaces for
  indentation
```

Forget the colon **:**

Wrong indentation,
mix-up between spaces and tabs

Make your choice of indentation and use it consistently!