Algorithm and Data Structures
Week 2

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If Statement

- Python uses decision-making statements using the **if** keyword.
- If the condition evaluates to True, the block of statements inside the if statement will be executed.
- If the condition evaluates to False, the next block (after the IF statement) is executed.

```
if <condition>:
    instructions
```

Else Statement

- The **else** statement can be combined with the if statement, as a branch that is executed when the condition / result evaluates to False.
- Else is optional.
- However, there can be no more than one else statement in a block of code.

```
if <condition>:
    instructions1
else:
    instructions2
```

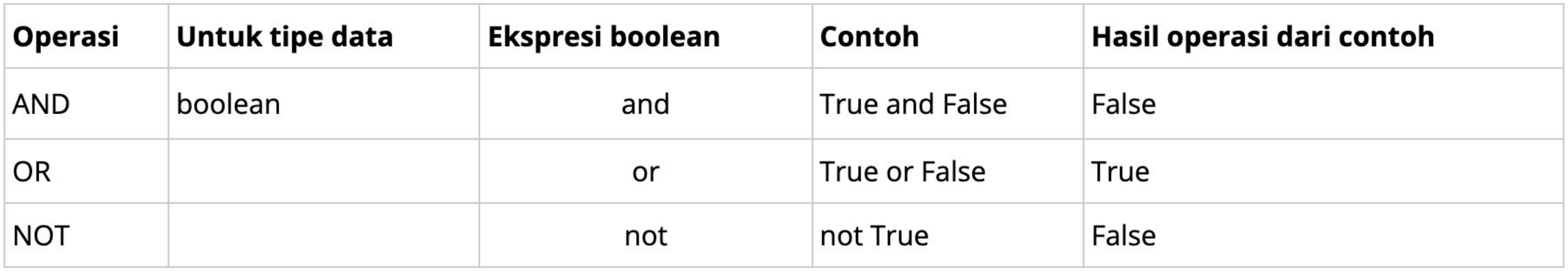
Elif Statement

- Elif is short for else if, and is a branch of the "if" logic. With elif we can create program code that will select several possibilities that can occur.
- An IF statement can be followed by one or more elif statements (optional and not restricted).

```
if <condition>:
      instructions1
elif <condition>:
      instructions2
else:
      instructions3
```

Boolean

- The boolean data type is a data type that has only two values, namely True and False. Values with a boolean data type can be applied to a condition when making decisions. Values True and False can also be converted into the context of numbers, namely 1 for True and 0 for False.



Operasi	**Untuk tipe data**	**Ekspresi boolean**	**Contoh**	**Hasil operasi dari contoh**
AND	boolean	and	True and False	False
OR		or	True or False	True
NOT		not	not True	False

Looping

- There are two kinds of looping in Python. Looping in collection and looping in a condition.
- A collection loop is a loop that uses a collection as the basis for the loop. The number of iterations will be equal to the number of items in the collection.
- Conditional looping is a method used by computers to run commands repeatedly as long as the conditions are still met.

Looping

```
for letter in 'Informatics':
   print (letter)


number = 0
while (number < 5):
    print(number)
    number += 1
print("Program completed")
```

Function

- A function is a group of instructions made into a union. The minimum function is created with the keyword def followed by the function name and parentheses ().

```
def function_name():
      instructions
```

- If we define a set of functions in a program and run it. Nothing happens. A function should be called to make it executed.

```
def greet_bryan():
   print("Hi Bryan")
   print("Nice to see you!")
greet_bryan()
```

Return Statement

- Functions can return values. In order for the function to return a value, a return command is added in an instruction line followed by the value or variable to be returned.

```
def first():
   """Returns the first item"""
   product = ["shirt", "shoes", "pants",
   "shirt", "hat"]
   return product[0]

result = first()
print(result)

print(first())
```

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Argument of Function

- Arguments are variables that hold input values to be processed inside the function. The value of the argument is entered when the function is called. Writing a function with arguments has the following syntax.

```
def area_triangle(base, height):
      """ Returns the area of a triangle with
      with input base and height """
      area = 0.5 * base * height
return area

print(area_triangle(5, 10))
```

Recursion

- Recursion is a problem-solving method in which a solution to a problem depends on the solution of smaller problems that are part of the problem.
- An example of a well-known recursion problem is factorial computation. Factorial is a value obtained by multiplying a number by positive numbers that are smaller than that number. For example, the factorial of 4 is 4 x 3 x 2 x 1 = 24.

Recursion Function

- A recursive function is a function that calls itself. Calls inside functions are needed to solve smaller problems before they can solve the whole problem.
- When creating a recursive function, there are two important things to consider: the base case and the recursive case.
  - Base Case
    Base case is a condition in which the function will stop (no longer repeat)
  - Recursive case
    The recursive case is the condition in which the function will call itself.

Recursion Function

```
def function_recursive(arguments):
    """ recursive function """
    if (condition): # base case
       <instructions>
    else: # recursive case
       <step reduction>

def factorial(number):
     if number == 1 or number == 0: # base case
        returns 1
     else: # recursive case
        return number * factorial(number-1) #step
reduction

num = int(input("Enter Number : "))
print("The factorial of", num, "is", factorial(num))
```

Exercise

- Write a program that checks whether a number is prime or not prime!
- Example :

  Input : 5
  Output : Prime

  Input : 4
  Output : Not Prime

Rubic for Prime or Not

- Correctness
  - Program correctly identifies prime and non-prime numbers. (30 points)
  - Handles edge cases (e.g., 0, 1, negative numbers) appropriately. (20 points)
- Code Quality
  - Code can run without error. (30 points)
  - Proper use of comments for clarity and explanation. (20 points)

Exercise

- Write a program in Python to remove repetitive items from a list.

  Given : [2,2,3,4,4,4,5,5,6,7]
  Expected output : [2,3,4,5,6,7]

Rubic for Remove Repetitive Items

- Correctness
    - Program correctly remove repetitive items. (30 points)
    - Handles edge cases (e.g., empty list, list with no repetitive items) (20 points)
- Code Quality
    - Code can run without error. (30 points)
    - Proper use of comments for clarity and explanation. (20 points)

Exercise

- Write a program to calculate the sum of all number between 1 and a given number (input).

  input = 5
  output = 15

- For example, if the input is 5 so the program need to calculate 1 + 2 + 3 + 4 + 5. which is 15.

Rubic for Sum All Number

- Correctness
  - Program correctly sum all number. (30 points)
  - Handles edge cases (e.g., input of 0, negative numbers) (20 points)
- Code Quality
  - Code can run without error. (30 points)
  - Proper use of comments for clarity and explanation. (20 points)