python™

Python Track

Basics, Conditionals, Loops & Functions

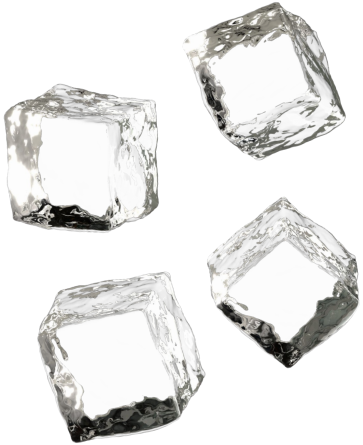
A2SV

Lecture Flow

- Python Basics
- Conditionals
- Loops
- Functions

Python Basics

- Why Python?
- Python Syntax and Structure
- Variables
- Data Types
- Operators



Why Python?

Python - Why?

- **Simpler Syntax** – Focus on DSA, not complex code.
- **Built-in Tools** – Use libraries for easy implementation.
- **Interview-Friendly** – Popular for coding interviews.

Syntax

- No semicolons, yay?
- Indentation matters.
- Almost similar to the English language.

```
// Java
public class HelloWorldApp {
    public static void main(String[] args) {
        System.out.println("Hello World!");
    }
 }

# Python
print('Hello, world!')
```

Syntax - Indentation

- In Python, unlike other programming languages, indentation serves a crucial purpose beyond just readability.
- Python uses indentation as a way to indicate and define blocks of code.

```
a = 200
b = 33
c = 500
if a > b:
   if a > c:
       print("a is greater than both b and c")
```

Variables

- Variables are used to store and manipulate data.
- Python has no command for declaring a variable.
- They are created by assigning a value to a name.
- Python has dynamic typing.

```
x = 4         # x is of type int
x = "A2SV"    # x is now of type str
```

Variables- Names

- Can only contain alphanumeric characters and underscores (A-z, 0-9, and _)
- Must start with a letter or the underscore character
- Can not start with a number
- Case-sensitive (age, Age and AGE are three different variables)
- Can not be a keyword (if, while, and, for, ...)
- snake_case

Data Types in Python

- Data types define the kind of data that can be stored and manipulated in a program.
- Common Built-in Data Types:
    - Boolean (bool)
    - Integer (int)
    - Float (float)
    - String (str)

Boolean

- In programming you often need to know if an expression is **True** or **False**.
- You can evaluate any expression in Python, and get one of two answers, **True** or **False**.
- When you compare two values, the expression is evaluated and Python returns the Boolean answer:

```
10 > 9   # True
10 == 9 # False
10 < 9   # False
```

Boolean- Evaluation

- The **bool()** function allows you to evaluate any value, and give you **True** or **False** in return,
- In Python values with content are True:
  - Any string is **True** , except empty strings.
  - Any number is **True** , except **0**.
  - Any list, tuple, set, and dictionary are **True** , except empty ones.

Numeric data types

- Integer:
  - Represent integer numbers without any decimal points
  - Can be positive or negative numbers, or zero.
  - Examples of integers are: x = -5, x = 0, x = 10, x = 100

Numeric data types

- Float:
  - Represent decimal numbers or numbers with a fractional part
  - They are written with a decimal point, even if the fractional part is zero
  - Examples of floating-point numbers are: **x =-2.5**, **x = 3.14**, **x = 1.0**

Operators

- Operators are used to perform operations on variables and values.
- In the example below, we use the + operator to add together two values:

```
print(10 + 5)
```

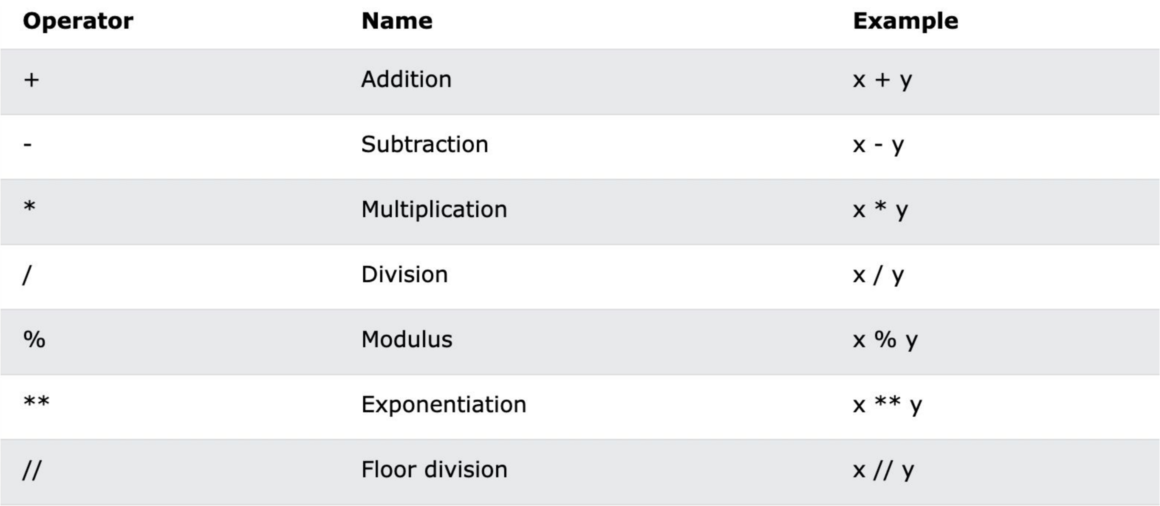
Operators

- Python divides the operators in the following groups:
  - Arithmetic operators
  - Assignment operators
  - Comparison operators
  - Logical operators
  - Identity operators
  - Membership operators

Operators- Arithmetic

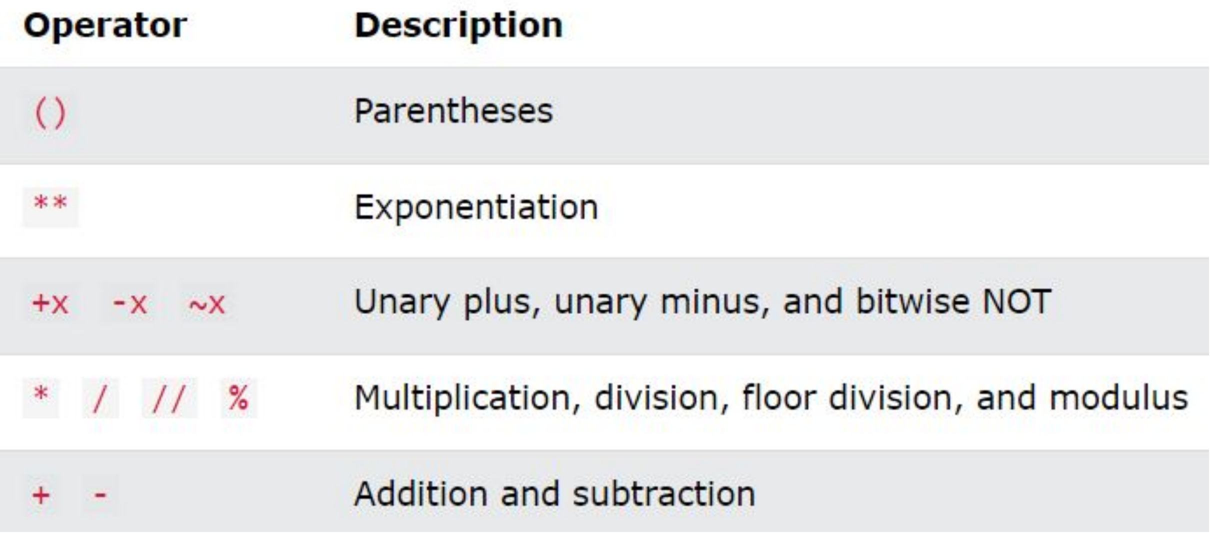
- Arithmetic operators are used with numeric values to perform common mathematical operations.

Operators- Arithmetic



Operator	Name	Example
+	Addition	x + y
-	Subtraction	x - y
*	Multiplication	x * y
/	Division	x / y
%	Modulus	x % y
**	Exponentiation	x ** y
//	Floor division	x // y

Operators- Precedence

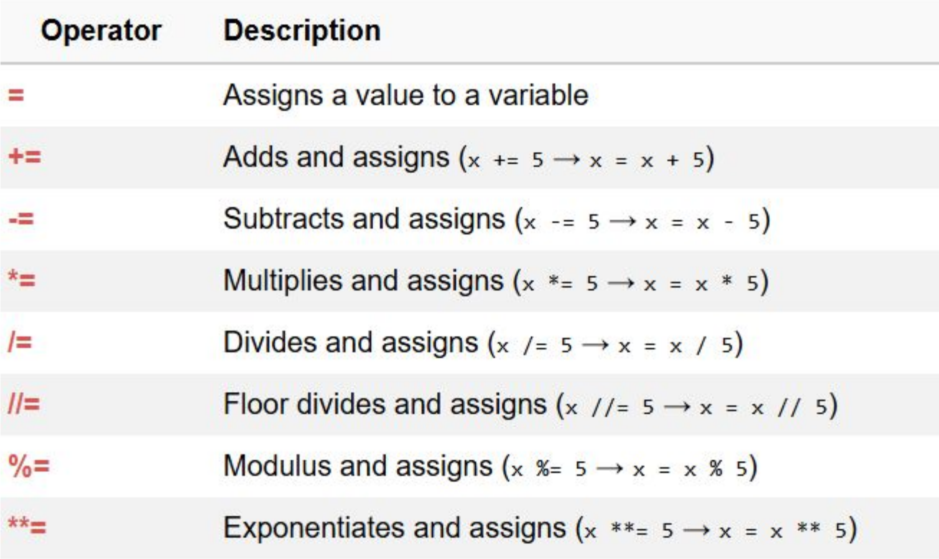


Operator	Description
()	Parentheses
**	Exponentiation
+x -x ~x	Unary plus, unary minus, and bitwise NOT
* / // %	Multiplication, division, floor division, and modulus
+ -	Addition and subtraction

Operators- Assignment

- Assignment operators are used to assign values to variables. The most basic assignment operator is “=”.

Operators- Assignment

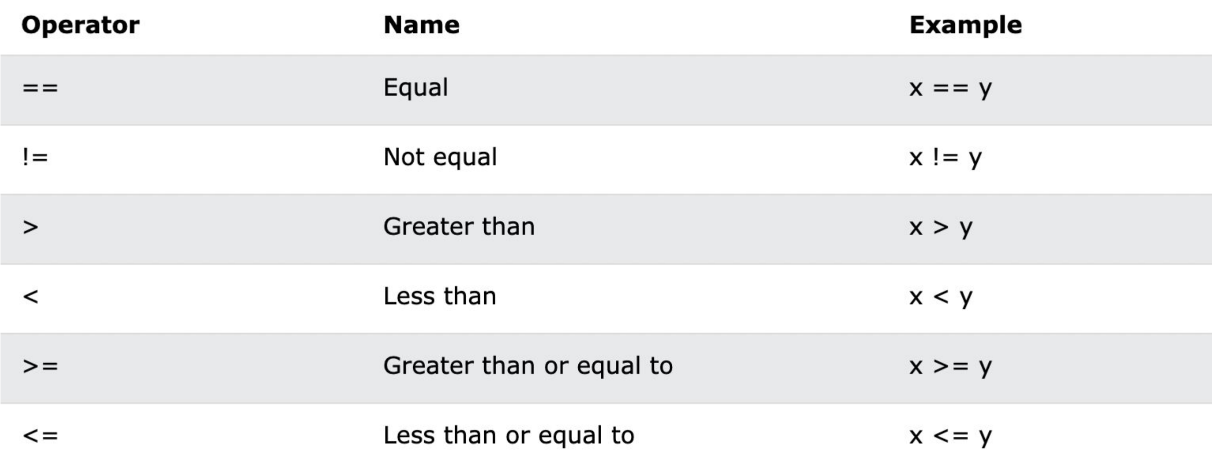


Operator	Description
=	Assigns a value to a variable
+=	Adds and assigns (`x += 5` → `x = x + 5`)
-=	Subtracts and assigns (`x -= 5` → `x = x - 5`)
*=	Multiplies and assigns (`x *= 5` → `x = x * 5`)
/=	Divides and assigns (`x /= 5` → `x = x / 5`)
//=	Floor divides and assigns (`x //= 5` → `x = x // 5`)
%=	Modulus and assigns (`x %= 5` → `x = x % 5`)
**=	Exponentiates and assigns (`x **= 5` → `x = x ** 5`)

Operators- Comparison

- Comparison Operators are used to compare two values.

Operators- Comparison



Operator	Name	Example
==	Equal	x == y
!=	Not equal	x != y
>	Greater than	x > y
<	Less than	x < y
>=	Greater than or equal to	x >= y
<=	Less than or equal to	x <= y

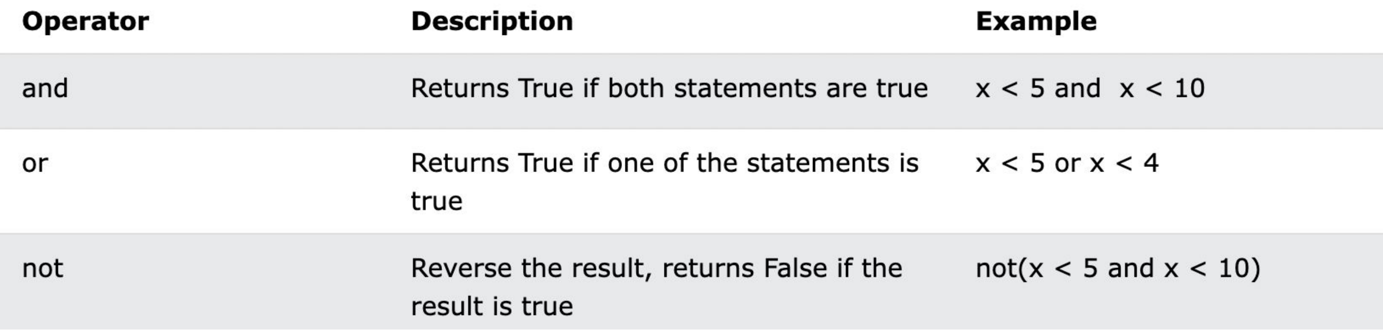
Practice Problems

- Arithmetic Operators
- Division
- Convert the Temperature
- Palindrome Number

Operators- Logical

- Logical operators are used to combine conditional statements.

Operators- Logical

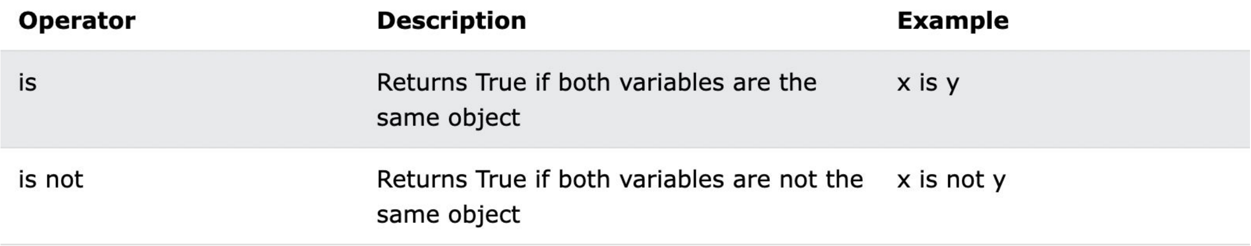


Operator	Description	Example
and	Returns True if both statements are true	x < 5 and x < 10
or	Returns True if one of the statements is true	x < 5 or x < 4
not	Reverse the result, returns False if the result is true	not(x < 5 and x < 10)

Operators- Identity

- Identity Operators are used to compare the objects, not if they are equal, but if they are actually the same object, with the same memory location.

Operators- Identity

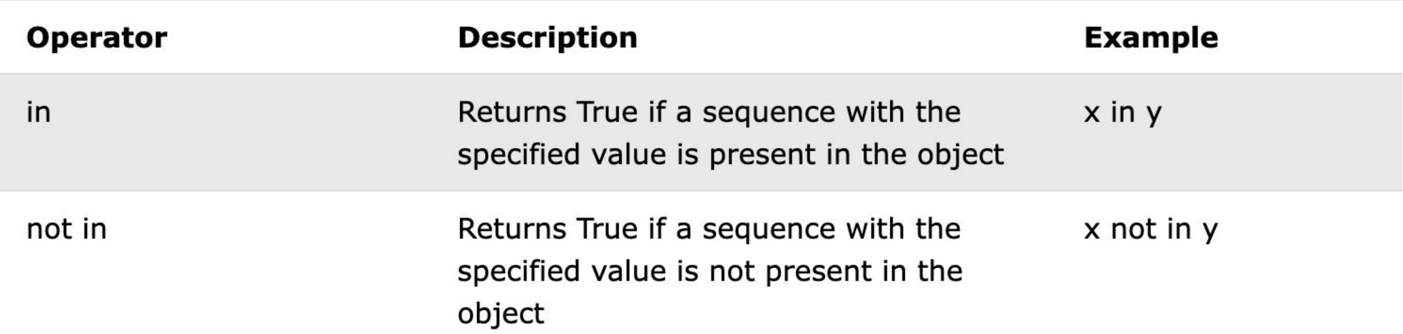


Operator	Description	Example
is	Returns True if both variables are the same object	x is y
is not	Returns True if both variables are not the same object	x is not y

Operators- Membership

- Membership Operators are used to test if a value exists in a sequence or object that supports membership tests.

Operators- Membership



Operator	Description	Example
in	Returns True if a sequence with the specified value is present in the object	x in y
not in	Returns True if a sequence with the specified value is not present in the object	x not in y

Check Point

Strings

- Strings in python are surrounded by either single quotation marks, or double quotation marks.
- **'hello'** is the same as **"hello"**.
- You can display a string literal with the **print()** function:
- String in python are immutable.
- You can assign a multiline string to a variable by using three quotes:

```
a = """Lorem ipsum dolor sit amet,
consectetur adipiscing elit,
sed do eiusmod tempor incididunt
ut labore et dolore magna aliqua."""
```

Strings - Slicing Strings

- You can return a range of characters by using the slice syntax.
- Specify the start index and the end index, separated by a colon, to return a part of the string. We can also specify step as a third parameter (optional).

```
b = "Hello, World"
print(b[2])       # l
print(b[-3])      # r
print(b[2:5])     # llo
print(b[:5])      # Hello
print(b[2:])      # llo, World
print(b[5:2:-1])  # ,ol
print(b[::-1])    # dlroW ,olleH
print(b[::2])     # Hlo ol
```

Strings - String Concatenation

- To concatenate, or combine, two strings you can use the + operator.

```
a = "Hello"
b = "World"
c = a + b
print(c)  # HelloWorld
```

Strings - Formatting

- To format strings in python we can use f-strings.

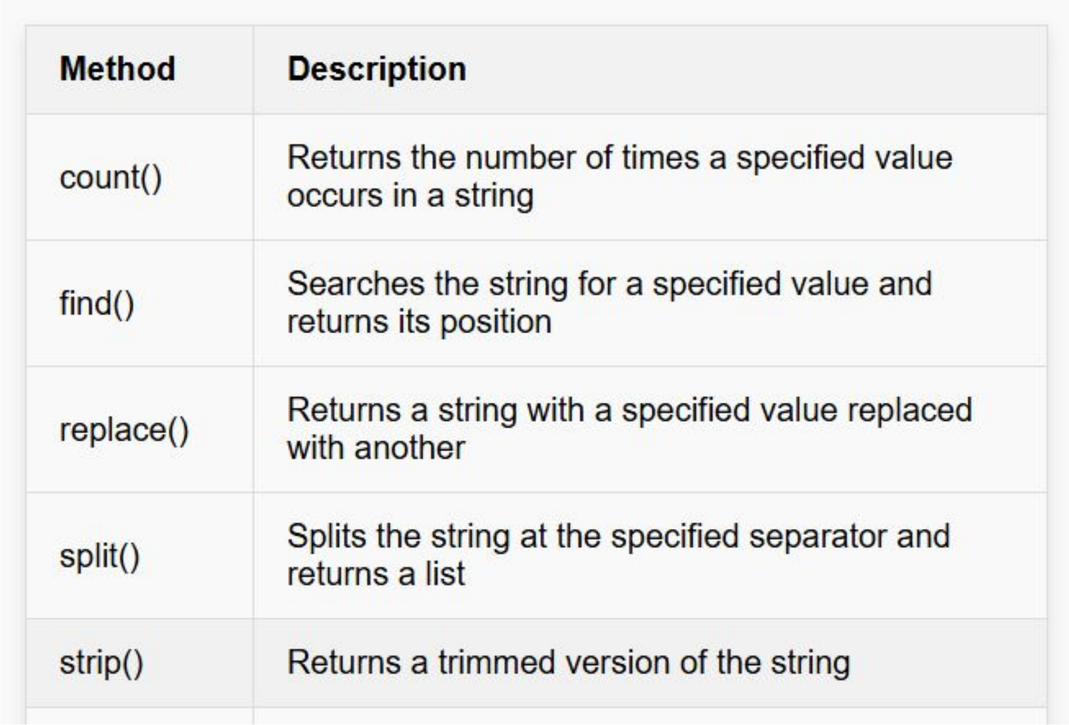
```
a = 1
b = "hello"
print(f"{b} {a} {a + 2}") # hello 1 3
```

Strings - Substring search

- In python we can use the **”in”** operator to check if a string occurs as a substring of another string

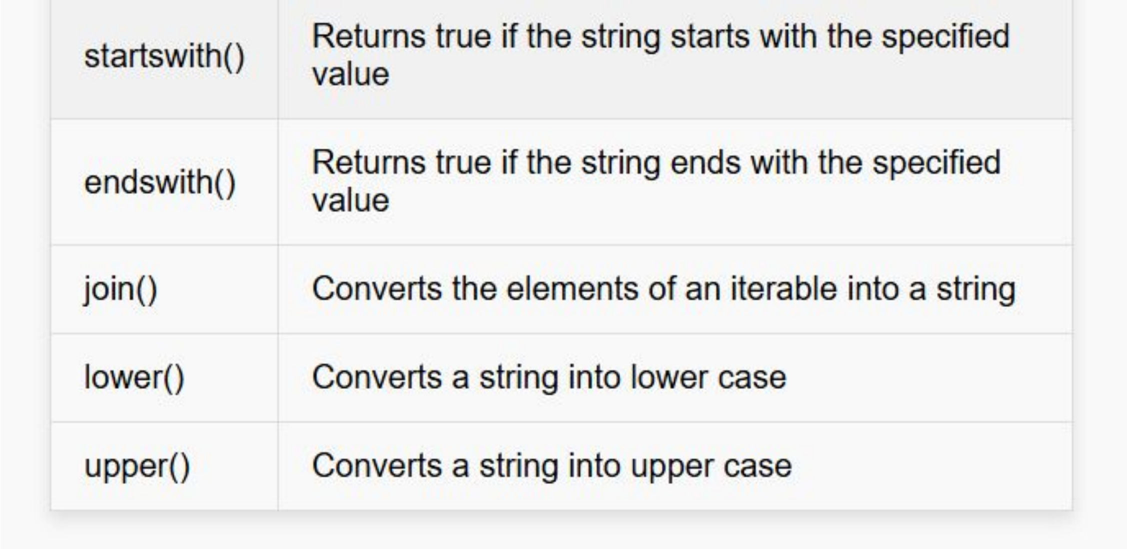
```
print("Hello" in "Hello world")  # True
```

Strings - Common Methods



Method	Description
count()	Returns the number of times a specified value occurs in a string
find()	Searches the string for a specified value and returns its position
replace()	Returns a string with a specified value replaced with another
split()	Splits the string at the specified separator and returns a list
strip()	Returns a trimmed version of the string

Strings - Common Methods



startswith()	Returns true if the string starts with the specified value
endswith()	Returns true if the string ends with the specified value
join()	Converts the elements of an iterable into a string
lower()	Converts a string into lower case
upper()	Converts a string into upper case

Variables - Casting

- Variable casting allows converting a value from one data type to another.
- Python provides built-in functions for explicit casting, such as **’str()’**, **’int()’**, and **’float()’**.

```
y = int(3.0)   # y will be 3
z = float(3)   # z will be 3.0
```

Check point

- What will be the output of the following statements?

```
s = "Hello, World!"

print(s[5]) # ?
print(s[-2]) # ?
print(s[1:]) # ?
print(s[-2:]) # ?
```

Practice Problems

- sWAP cASE
- String Split and Join
- What's Your Name?

Conditionals

If statement

- We use **if** statement to write a single alternative decision structure.
- Here is the general format of the if statement:

```
if condition:
    statement
    statement
```

```
a = 33
b = 200
if b > a:
  print("b is greater than a")
```

Elif

- The **elif** keyword is pythons way of saying "if the previous conditions were not true, then try this condition".

```
a = 33
b = 33
if b > 33:
  print("b is greater than a")
elif a == b:
  print("a and b are equal")
```

Else

- The **else** keyword catches anything which isn't caught by the preceding conditions.

```
a = 200
b = 33
if b > a:
  print("b is greater than a")
elif a == b:
  print("a and b are equal")
else:
  print("a is greater than b")
```

Nested Conditionals

- You can have **if** statements inside **if** statements, this is called nested **if** statements.
- We can use logical operators to combine conditional statements.

```
a = 200
b = 33
c = 500
if a > 0:
    if a > b and c > a:
        print("Both conditions are True")
```

Loops

For Loop

- A **for** loop is used for iterating over a sequence (that is either a list, a tuple, a dictionary, a set, or a string).

```
for item in iterable:
    statement
    statement
```

For Loop

```
fruits = ["apple", "banana", "cherry"]
for fruit in fruits:
  print(fruit)
```

```
# Output
"apple"
"Banana"
"cherry"
```

While Loop

- With the **while** loop we can execute a set of statements as long as a condition is true.

```
while  condition:
    // Code to execute while the condition is true
    // Update condition to avoid infinite loop
```

```python
i = 1
while i < 6:
  print(i) # 1, 2, 3, 4, 5
  i += 1
```

Nested Loops

- A nested loop is a loop inside a loop.
- The "inner loop" will be executed one time for each iteration of the "outer loop":

```python
adjectives = ["red", "big", "tasty"]
fruits = ["apple", "banana", "cherry"]
for adjective in adjectives:
 for fruit in fruits:
  print(adjective, fruit)
   # red apple
   # red banana
   # red cherry
   # ...
```

The range() Function

- The **range()** function returns a sequence of numbers, starting from 0 by default, and increments by 1 (by default), and ends at a specified number.

```python
# Loop through numbers from 0 to 5 (inclusive) with a step of 1
for x in range(6): # start = 0, final= 5, step = 1
  print(x)

# Loop through numbers from 2 to 5 (inclusive) with a step of 1
for x in range(2, 6): # start = 2, final = 5, step = 1
  print(x)

# Loop through numbers from 2 to 8 (inclusive) with a step of 2
for x in range(2, 10, 2): # start = 2, final = 9, step = 2
  print(x)
```

Continue Statement

- With the **continue** statement we can stop the current iteration, and continue with the next.

```python
i = 0
while i < 9:
  i += 1
  if i == 3:
    continue
  print(i)
```

```
# output
0
1
2
4
5
6
7
8
```

```python
for i in range(9):
  if i == 3:
    continue
  print(i)
```

```
# output
0
1
2
4
5
6
7
8
```

Break Statement

- With the **break** statement we can stop the loop even if the while condition is true:

```
for i in range(9):
  if i > 3:
# Exit the loop if the current value of i
# is greater than 3
    break
  print(i)       # output
                 0
                 1
                 2
                 3
```

```
i = 1
while i < 9:
  print(i)
  if i == 3:
# Exit the loop if the current value of i
# is equal to 3
    break
  i += 1             # output
                     1
                     2
```

Check point

- What is the output of the following nested Loop?

```python
for num in range(10,14):
    for i in range(2, num):
        if num % i == 1:
            print(num)
            break
```

A) 10
11
12
13

B) 11
13

Functions

Functions

- A function is a reusable block of code which only runs when it is called.
- You can pass data, known as parameters, into a function.
- A function can return data as a result.

```
def my_function():
  print("Hello from a function")
my_function()
```

Arguments

- Information can be passed into functions as arguments.
- Arguments are specified after the function name, inside the parentheses.
- You can add as many arguments as you want, just separate them with a comma.

```
def my_function(full_name):
    full_name[0] = “Anna”
    print(full_name[0] + " Refsnes")
data = ["Emil"]
my_function(data)
print(data[0])
```

Return Values

- To let a function **return** a value, use the return statement:

```
def my_function(x):
  return 5 * x
print(my_function(3)) # 15
print(my_function(5)) # 25
print(my_function(9)) # ?
```

Lambda

- A lambda function is a small anonymous function.
- A lambda function can take any number of arguments, but can only have one expression.
- Syntax:

    lambda *arguments* : *expression*

```
x = lambda a : a + 10
print(x(5))

x = lambda a, b : a * b
print(x(5, 6))
```

Practice Problems

- Smallest even multiple
- Weird
- Powers
- Mod Power
- Longest Common Prefix
- More exercise

Quote of the day

“A year from now you may wish you had started today”

– Karen Lamb

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