UNIVERSITY OF AGDER

Statements and functions

Lecture 2

Agenda

- Recap from last time
- Statements (and, or, nesting)
- Functions (built in and self defined)

Recap

- Variables
  - `x = 4`
  - `mystring = "hello"`
- Operators
  - +, - , *, **, /, %, =, <, >, ==, !=
- Loops (Statements)
  - ```
    for element in range(0, 10):
        print(element)
    ```
    ```

Recap

- If we list all the natural numbers below 10 that are multiples of 3 or 5, we get 3, 5, 6 and 9. The sum of these multiples is 23.

  Find the sum of all the multiples of 3 or 5 below 1000.

Statements - if/elif/else

- The probability of rain today is ~4%
- We want to create a program which tells me if I should use an umbrella or not based on the probability of rain
- If the probability of rain is larger than 64%, the program should advise me to use the umbrella
- If the probability is smaller, the program should advise me to leave it at home

Statements - if/else with intervals

- We want to see if a value lies **between** 0.5 and 0.9. Is the example below correct?

```
rain  = 0.61
if rain > 0.5:
    print("Above 0.5")
elif rain < 0.9:
    print("Below 0.9")
```

Statements - if/else with intervals

- Correct way to do it:

```
rain = 0.91
if rain > 0.5 and rain < 0.9:
    print(“Correct”)
```

Recap 2

- If we list all the natural numbers below 10 that are multiples of 3 or 5, we get 3, 5, 6 and 9. The sum of these multiples is 23.
  Find the sum of all the multiples of 3 or 5 below 1000.

Nested statements

- What if we want more complicated programs, based on previous information. E.g. if it is sunny outside we want to check if it is hot enough to use shorts.

  Ex: Is it sunny outside?

  Is the temperature above 20 degrees?

  Yes: Use shorts

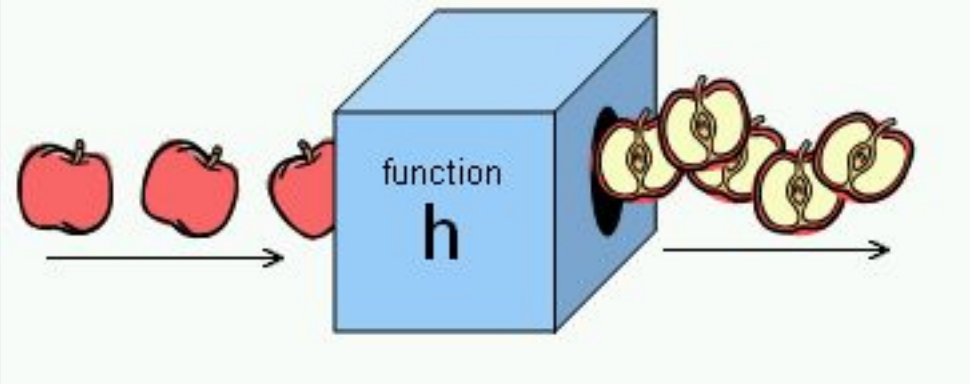
  No: Do not use shorts

  Is it raining?

  Use an umbrella

Functions

- What is a function?



Src: https://en.wikibooks.org/wiki/Algebra/Functions

Functions

- We have already used some built in functions, such as `print()`, `range()`, `type()`. Many more exists.
- https://docs.python.org/3/library/functions.html

- A function takes something in and returns something
  - Example: Multiplication by 4

Input	Multiply by 4	Output
4	Input * 4	16
0	Input * 4	0

Functions

- Why do we need function?
    - Reuse - in multiple scripts
    - Saves us time, no copy/paste of code
    - Errors can be fixed once and for all
    - Readability, easier to see what a block of code do

- We can define our own functions in Python

Functions

- What it looks like in Python

```
def multiply_by_4(input):
    result = input*4
    return result
```

Functions

- Def - is the keyword used to define a function
- The function needs a name e.g. multiply_by_4
- The function can have one or more inputs
- The function may return something, but it does not have to. The `return` keyword may be dropped if the function is not supposed to return anything.

- Create a function that multiply two arbitrary numbers and returns the result

Functions

- Let’s say we want to create a program which decides what I should wear depending on the whether it is sun, rain, snow or fog
- If it is sun, I should wear sunglasses
- If it is rain, I should wear a raincoat
- If it is snow, I should wear a coat
- If it is fog, I should wear a hat
- The input to the function is `“rain”, “snow”, “fog” or “sun”`
- The output should tell me what to wear

Functions

- The sum of the squares of the first ten natural numbers is,
  - $1^2 + 2^2 + ... + 10^2 = 385$
- The square of the sum of the first ten natural numbers is,
  - $(1 + 2 + ... + 10)^2 = 55^2 = 3025$

Hence the difference between the sum of the squares of the first ten natural numbers and the square of the sum is $3025 - 385 = 2640$.

Find the difference between the sum of the squares of the first one hundred natural numbers and the square of the sum.