Functions

Defining and Using Functions

f(x)

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Functions Overview

Declaring and Invoking Functions

Functions

- Function == named piece of code
  - Can take parameters and return result

Use snake_case

Function parameter

```
def function_name(parameter: type):
    statement(s)
```

Type of the parameter

Why Use Functions?

- More **manageable programming**
  - Splits large problems into small pieces
  - Better organization of the program
  - Improves code readability
  - Improves code understandability
- Avoiding **repeating code**
  - Improves code maintainability
- Code **reusability**
  - Using existing functions several times

Built-In Functions

- Python has a set of **built-in functions** that we can call at **any time**
- List of some built-in functions

```
abs()
min()
max()
round()
```

```
sum()
filter()
map()
sorted()
```

Problem: Absolute Values

- Write a program that
  - Receives a sequence of numbers, separated by a **single space**
  - **Prints** their **absolute value** as a list

```
1 2.5 -3 -4.5
```

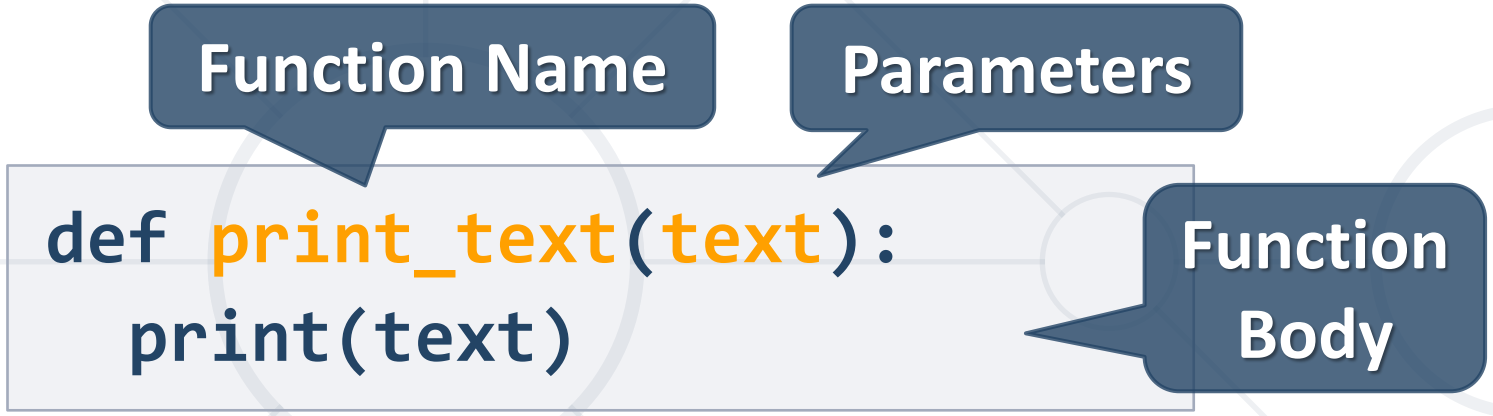
```
[1.0, 2.5, 3.0, 4.5]
```

Problem: Absolute Values

```python
list_of_strings = input().split()

list_of_numbers = []
for n in list_of_strings:
    number = float(n)
    list_of_numbers.append(number)

list_of_absolute_numbers = []
for n in list_of_numbers:
    absolute_number = abs(n)
    list_of_absolute_numbers.append(absolute_number)

print(list_of_absolute_numbers)
```

Declaring and Invoking Functions

Declaring Function



```python
def print_text(text):
  print(text)
```

- Using the **def** statement is the most common way to define a function in python
- Functions can have **several parameters**
- It is possible for function to **not** return a value

Invoking a Function (1)

- Functions are **first** declared, then **invoked** (many times)

```
def print_header():
  print("This is header")
```

Function Declaration

- Functions can be **invoked** (called) by their name

```
print_header()
```

Function Invocation

Invoking a Function (2)

- A function can be invoked from:
  - Other functions

```
def print_header():
    print_header_top()
    print_header_bottom()
```

Function invoking functions

  - Itself (recursion)

```
def crash():
    crash()
```

Function invoking itself

Function Without Parameters

- Executes the code after
- Does not return result

```
def multiply_numbers():
    result = 5 * 5
    print(result)
multiply_numbers()  #25
```

Prints result on the console

return

Return Values

The Return Keyword

Return Keyword (1)

- Functions can return a value that you can use directly:

```
def give_me_five():
    return 5
print(give_me_five())  # Print the returned value
#Out: 5
```

- or save the value for later use:

```
num = give_me_five()
print(num) #Print the saved returned value
#Out: 5
```

Return Keyword (2)

- If **return** is encountered in the function the function will be exited immediately

```
def give_me_another_five():
    return 5
    print('This statement will not be printed.')
print(give_me_another_five()) #Out: 5
```

Problem: Grades

- Write a program that **receives a grade** a grade between 2.00 and 6.00 and **prints** the **corresponding grade** in **words**
  - Between **2.00** and **2.99** - '`Fail`'
  - Between **3.00** and **3.49** - '`Poor`'
  - Between **3.50** and **4.49** - '`Good`'
  - Between **4.50** and **5.49** - '`Very Good`'
  - Between **5.50** and **6.00** - '`Excellent`'

Solution: Grades

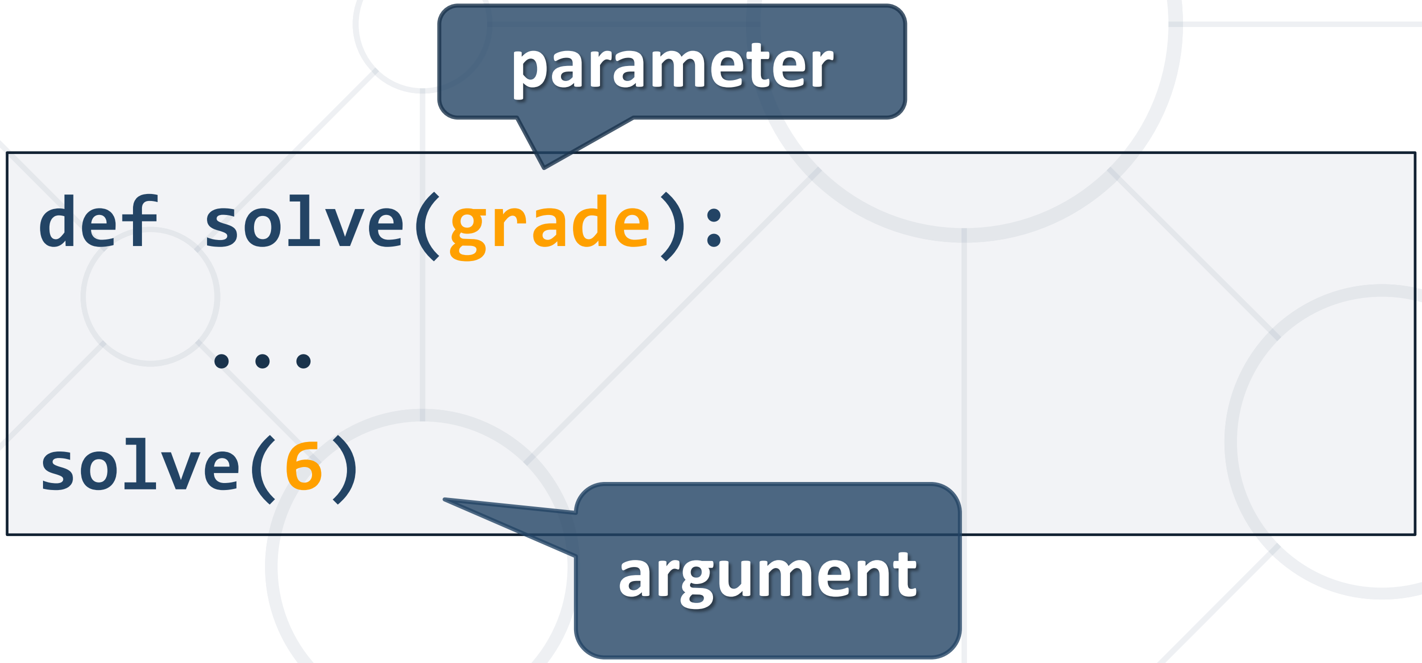
```python
def grades(grade):
    if grade >= 2.00 and grade <= 2.99 :
      return 'Fail'
    elif grade >= 3.00 and grade <= 3.49:
       return 'Poor'
    # TODO: Add other conditions
```

params
vs
args

Parameters vs Arguments

Parameters vs Arguments

- **Parameter** is variable defined in function definition, while **argument** is actual value passed to the function



```
def solve(grade):
    ...
solve(6)
```

Default Arguments

- Function arguments can have **default** values
- If the function is called **without the argument**, the argument gets its default value

```
def person(first_name = 'George', last_name ='Brown'):
    print(first_name, last_name)
person('Peter') #'Peter Brown'
```

Keyword (Named) Arguments

- Functions can be called using **keyword arguments**
- When we use keyword/named arguments, it's the **name** that matters, not the **position**

```
def area(width, height):
    return width * height
print(area(height = 2, width = 1))
```

Problem: Calculations

- Write a function that **receives three parameters** and calculates a result depending on operator
- The operator can be '**`multiply`**', '**`divide`**', '**`add`**', '**`subtract`**'
- The input comes as three parameters - two **integers** and an operator as a **string**

```
5, 10, 'multiply'
```

```
25
```

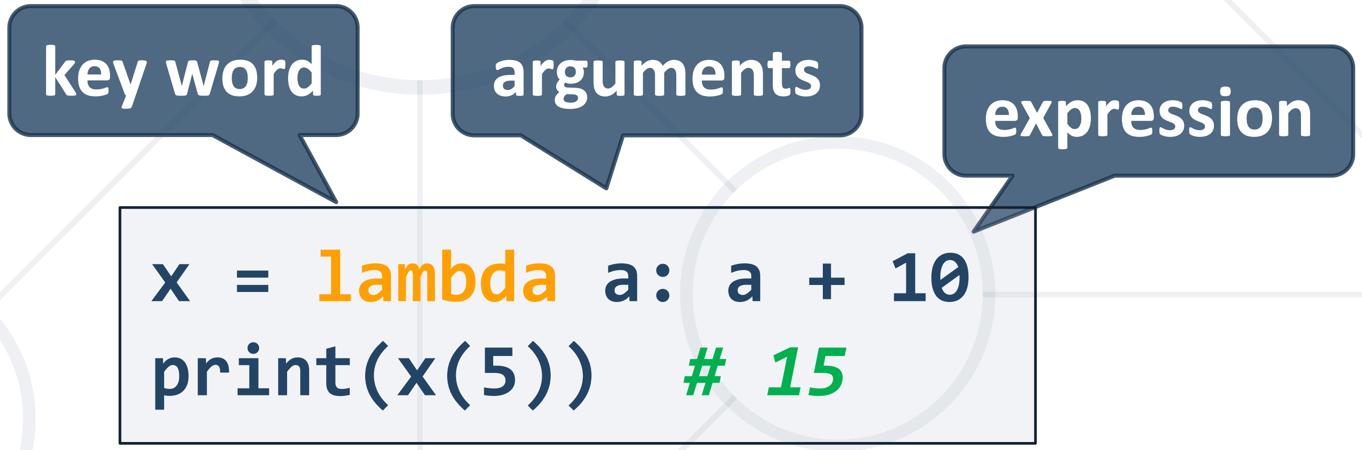
Solution: Calculations

```python
def solve(a,b,operator):
    result = None
    if operator == 'multiply:
        result = a * b
    elif operator == 'divide':
        result = a / b
    # TODO : other cases
    return result
print(solve(5,10,'multiply')) # 50
```

Lambda Functions

Lambda Definition

- Lambda is an **anonymous one-time** function
  - Like a function, it can take a parameter and return a result



```
x = lambda a: a + 10
print(x(5))  # 15
```

Lambda Example

- It can take multiple parameters

```
x = lambda a, b: a * b
print(x(3, 4))  # 12
```

```
full_name = lambda first, last: f'I am {first} {last}'
result = full_name('Guido', 'van Rossum')
print(result)  # I am Guido van Rossum
```

Problem: Repeat String

- Write a function which **receives** a **string** and a **counter n**
- The function should return a **new string** – the **result** of repeating the old string **n** times
- Print the result on the console

```
abc
3
```

$\Rightarrow$

```
abcabcabc
```

Summary

- Break large programs into simple **functions** that solve small sub-problems
- Consist of **declaration** and **body**
- Are invoked by their **name**
- Can accept **parameters**

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