



The Matter of Arguments

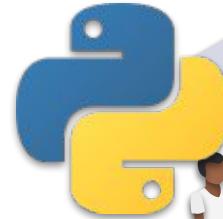




Table of Contents

- ▶ Arguments vs Parameters
- ▶ Correct Use of Arguments
- ▶ Arbitrary Number of Arguments



1

Arguments vs Parameters

“

What is the parameters?”



“

What is the arguments?”



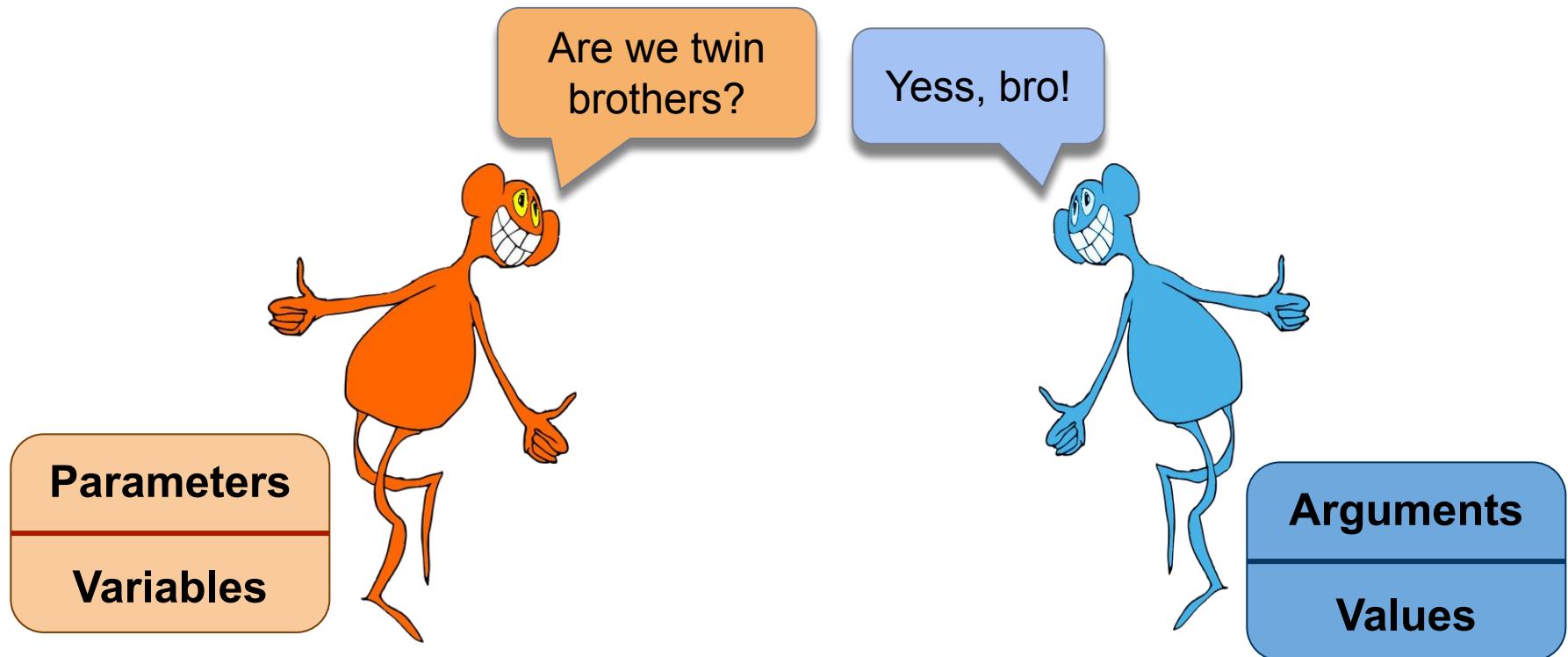
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Arguments vs Parameters



Arguments vs Parameters (review)

- Let's take a look at this pre-class example :

```
1 def who(first, last) : # 'first' and 'last' are the parameters(or variables)
  )
2   print('Your first name is :', first)
3   print('Your last name is :', last)
4
5 who('Guido', 'van Rossum') # 'Guido' and 'van Rossum' are the arguments
6 print()
7 who('Marry', 'Bold') # 'Marry' and 'Bold' are also the arguments
```

Arguments vs Parameters (review)

- You will better understand this topic through an example

```
1 def who(first, last) : # 'first' and 'last' are the parameters(or variables)
  2     print('Your first name is :', first)
  3     print('Your last name is :', last)
  4
  5 who('Guido', 'van Rossum') # 'Guido' and 'van Rossum' are the arguments
  6 print()
  7 who('Marry', 'Bold') # 'Marry' and 'Bold' are also the arguments
```

first and last are the parameters

```
1 Your first name is : Guido
2 Your last name is : van Rossum
3
4 Your first name is : Marry
5 Your last name is : Bold
```

the names passed into the function are the arguments

Arguments vs Parameters (review)

- ▶ Is this correct use ?

```
1 who('Joseph') # we passed only one argument into the function
```

Arguments vs Parameters (review)

- ▶ It raises an error.

```
1 who('Joseph') # we passed only one argument into the function
```

```
1 Traceback (most recent call last):
2   File "code.py", line 5, in <module>
3     who('Joseph')
4 TypeError: who() missing 1 required positional argument: 'last'
```



Correct Use of Arguments

2

- ▶ Positional Arguments
- ▶ Keyword Arguments

**Summarize what
you've just learned
about the usage and
the differences of
these parameters.**

-Write in two sentences.

Students, write your response!



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Positional Arguments (review)



- ▶ Respect to their positions!...

```
1 def pos_args(a, b):  
2     print(a, 'is the first argument')  
3     print(b, 'is the second argument')  
4  
5 pos_args(3,4)  
6 print()  
7 pos_args(4,3)
```

What is the output? Try to figure out in your mind...



Students, write your response!

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Positional Arguments (review)

- ▶ The output :

```
1 def pos_args(a, b):  
2     print(a, 'is the first argument')  
3     print(b, 'is the second argument')  
4  
5 pos_args(3,4)  
6 print()  
7 pos_args(4,3)
```

```
1 3 is the first argument  
2 4 is the second argument  
3  
4 4 is the first argument  
5 3 is the second argument  
6
```

Positional Arguments (review)

- ▶ String type arguments :

```
1 pos_args('first','second')
2 print()
3 pos_args('second', 'first')
```

Positional Arguments (review)

- The output :

```
1 pos_args('first','second')
2 print()
3 pos_args('second', 'first')
```

```
1 def pos_args(a, b):
2     print(a, 'is the first argument')
3     print(b, 'is the second argument')
4
5 pos_args(3,4)
6 print()
7 pos_args(4,3)
```

```
1 first is the first argument
2 second is the second argument
3
4 second is the first argument
5 first is the second argument
6
```

Positional Arguments



▶ Task :

- ▶ Define a function named **texter** to print the following output in accordance with input .

```
a = "i"  
b = "love"  
c = "you"
```

```
texter(c, a, b)
```

Output

```
i love you
```

Positional Arguments

- ▶ The function definition can be like :

```
1 def texter(text1, text2, text3):  
2     print(f"{text2} {text3} {text1}")  
3  
4  
5
```

Keyword Arguments (review)

- ▶ The other usage of arguments :

The formula syntax is : **kwargs=values**.

Keyword Arguments (review)



- ▶ Consider the following example :

```
1 def who(first, last) : # same structure as the previous one
2     print('Your first name is :', first)
3     print('Your last name is :', last)
4
5 who(first='Guido', last='van Rossum') # calling the function is different
6 # we used kwargs to pass the values into the function
```

Keyword Arguments (review)

- ▶ Consider the following example :

```
1 def who(first, last) : # same structure as the previous one
2     print('Your first name is :', first)
3     print('Your last name is :', last)
4
5 who(first='Guido', last='van Rossum') # calling the function is different
6 # we used kwargs to pass the values into the function
```

```
1 Your first name is : Guido
2 Your last name is : van Rossum
3
```

Keyword Arguments

▶ Task :

- ▷ Call the `texter` function using keyword arguments in order to get the same output as the previous one.

```
1 def texter(text1, text2, text3):  
2     print(f"{text2} {text3} {text1}")  
3  
4  
5
```



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Keyword Arguments

- ▶ The calling syntax can be like :

```
1 def texter(text1, text2, text3):  
2     print(f"{text2} {text3} {text1}")  
3  
4 texter(text1="you", text2="i", text3="love")  
5 texter(text2="i", text3="love", text1="you")  
6 |
```

kwargs saves us from positional restrictions.

Output

```
i love you  
i love you
```

Keyword Arguments (review)

- We can assign **default values** to the **parameters** when *defining a function* :

```
def func(x = "ali", y = 11):  
    body
```



Keyword Arguments (review)

- ▶ A phenomenon example in the official Python docs :

```
1 def parrot(voltage, state='a stiff', action='voom', type='Norwegian Blue'):  
2     print("-- This parrot wouldn't", action, end=' ')  
3     print("if you put", voltage, "volts through it.")  
4     print("-- Lovely plumage, the", type)  
5     print("-- It's", state, "!")  
6
```

```
1 parrot(1000)                                     # 1 positional  
    argument  
2 parrot(voltage=1000)                            # 1 keyword argument  
3 parrot(voltage=1000000, action='vooooooooom')    # 2 keyword arguments  
4 parrot(action='vooooooooom', voltage=1000000)    # 2 keyword arguments  
5 parrot('a million', 'bereft of life', 'jump')    # 3 positional  
    arguments  
6 parrot('a thousand', state='pushing up the daisies') # 1 positional, 1  
    keyword  
7
```

Keyword Arguments (review)



- Let's call the `parrot` function in several ways below one by one:

```
1 def parrot(voltage, state='a stiff', action='voom', type='Norwegian Blue'):  
2     print("-- This parrot wouldn't", action, end=' ')\n3     print("if you put", voltage, "volts through it.")\n4     print("-- Lovely plumage, the", type)\n5     print("-- It's", state, "!\")\n6\n7 parrot(1000)                                     # 1 positional argument\n8
```

What is the output? Try to figure out in your mind...



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Keyword Arguments (review)

- Let's call the `parrot` function in several ways below one by one:

```
1 def parrot(voltage, state='a stiff', action='voom', type='Norwegian Blue'):  
2     print("-- This parrot wouldn't", action, end=' ')  
3     print("if you put", voltage, "volts through it.")  
4     print("-- Lovely plumage, the", type)  
5     print("-- It's", state, "!")  
6  
7 parrot(1000)                                     # 1 positional argument  
8
```

Output

```
-- This parrot wouldn't voom if you put 1000 volts through it.  
-- Lovely plumage, the Norwegian Blue  
-- It's a stiff !
```

Keyword Arguments (review)



- Let's call the **parrot** function in several ways below one by one:

```
1 def parrot(voltage, state='a stiff', action='voom', type='Norwegian Blue'):  
2     print("-- This parrot wouldn't", action, end=' ')  
3     print("if you put", voltage, "volts through it.")  
4     print("-- Lovely plumage, the", type)  
5     print("-- It's", state, "!")  
6  
7 parrot(voltage=1000)                                     # 1 keyword argument  
8
```

Discuss in class! Try to figure out the output in your mind...



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Keyword Arguments (review)

- Let's call the `parrot` function in several ways below one by one:

```
1 def parrot(voltage, state='a stiff', action='voom', type='Norwegian Blue'):  
2     print("-- This parrot wouldn't", action, end=' ')  
3     print("if you put", voltage, "volts through it.")  
4     print("-- Lovely plumage, the", type)  
5     print("-- It's", state, "!")  
6  
7 parrot(voltage=1000)                                     # 1 keyword argument  
8
```

Output

```
-- This parrot wouldn't voom if you put 1000 volts through it.  
-- Lovely plumage, the Norwegian Blue  
-- It's a stiff !
```

Keyword Arguments (review)

- Let's call the `parrot` function in several ways below one by one:

```
1 def parrot(voltage, state='a stiff', action='voom', type='Norwegian Blue'):  
2     print("-- This parrot wouldn't", action, end=' ' )  
3     print("if you put", voltage, "volts through it.")  
4     print("-- Lovely plumage, the", type)  
5     print("-- It's", state, "!")  
6  
7 parrot(voltage=1000000, action='VOOOOOM') # 2 keyword arguments  
8
```

Discuss in class! Try to figure out the output in your mind...

Keyword Arguments (review)

- Let's call the `parrot` function in several ways below one by one:

```
1 def parrot(voltage, state='a stiff', action='voom', type='Norwegian Blue'):  
2     print("-- This parrot wouldn't", action, end=' ')  
3     print("if you put", voltage, "volts through it.")  
4     print("-- Lovely plumage, the", type)  
5     print("-- It's", state, "!")  
6  
7 parrot(voltage=1000000, action='V00000M') # 2 keyword arguments  
8
```

Output

```
-- This parrot wouldn't V00000M if you put 1000000 volts through it.  
-- Lovely plumage, the Norwegian Blue  
-- It's a stiff !
```

Keyword Arguments (review)

- Let's call the `parrot` function in several ways below one by one:

```
1 def parrot(voltage, state='a stiff', action='voom', type='Norwegian Blue'):  
2     print("-- This parrot wouldn't", action, end=' ')\n3     print("if you put", voltage, "volts through it.")\n4     print("-- Lovely plumage, the", type)\n5     print("-- It's", state, "!\")\n6\n7 parrot(action='VOOOOOM', voltage=1000000) # 2 keyword arguments\n8
```

Discuss in class! Try to figure out the output in your mind...

Keyword Arguments (review)

- Let's call the `parrot` function in several ways below one by one:

```
1 def parrot(voltage, state='a stiff', action='voom', type='Norwegian Blue'):  
2     print("-- This parrot wouldn't", action, end=' ')  
3     print("if you put", voltage, "volts through it.")  
4     print("-- Lovely plumage, the", type)  
5     print("-- It's", state, "!")  
6  
7 parrot(action='VOOOOOM', voltage=1000000)          # 2 keyword arguments  
8
```

Output

```
-- This parrot wouldn't VOOOOOM if you put 1000000 volts through it.  
-- Lovely plumage, the Norwegian Blue  
-- It's a stiff !
```

Keyword Arguments (review)



- Let's call the `parrot` function in several ways below one by one:

```
1 def parrot(voltage, state='a stiff', action='voom', type='Norwegian Blue'):  
2     print("-- This parrot wouldn't", action, end=' ')\n3     print("if you put", voltage, "volts through it.")\n4     print("-- Lovely plumage, the", type)\n5     print("-- It's", state, "!\")\n6\n7 parrot('a million', 'bereft of life', 'jump')      # 3 positional arguments\n8
```

Discuss in class! Try to figure out the output in your mind...

Keyword Arguments (review)

- Let's call the `parrot` function in several ways below one by one:

```
1 def parrot(voltage, state='a stiff', action='voom', type='Norwegian Blue'):  
2     print("-- This parrot wouldn't", action, end=' ')  
3     print("if you put", voltage, "volts through it.")  
4     print("-- Lovely plumage, the", type)  
5     print("-- It's", state, "!")  
6  
7 parrot('a million', 'bereft of life', 'jump')      # 3 positional arguments  
8
```

Output

```
-- This parrot wouldn't jump if you put a million volts through it.  
-- Lovely plumage, the Norwegian Blue  
-- It's bereft of life !
```

Keyword Arguments (review)

- Let's call the `parrot` function in several ways below one by one:

```
1 def parrot(voltage, state='a stiff', action='voom', type='Norwegian Blue'):  
2     print("-- This parrot wouldn't", action, end=' ')\n3     print("if you put", voltage, "volts through it.")\n4     print("-- Lovely plumage, the", type)\n5     print("-- It's", state, "!\")\n6\n7 parrot('a thousand', state='pushing up the daisies') # 1 positional, 1 keyword  
8
```

Discuss in class! Try to figure out the output in your mind...

Keyword Arguments (review)

- Let's call the `parrot` function in several ways below one by one:

```
1 def parrot(voltage, state='a stiff', action='voom', type='Norwegian Blue'):  
2     print("-- This parrot wouldn't", action, end=' ')  
3     print("if you put", voltage, "volts through it.")  
4     print("-- Lovely plumage, the", type)  
5     print("-- It's", state, "!")  
6  
7 parrot('a thousand', state='pushing up the daisies') # 1 positional, 1 keyword
```

Output

```
-- This parrot wouldn't voom if you put a thousand volts through it.  
-- Lovely plumage, the Norwegian Blue  
-- It's pushing up the daisies !
```

Keyword Arguments (review)

```
1 def parrot(voltage, state='a stiff', action='voom', type='Norwegian Blue'):
2     print("-- This parrot wouldn't", action, end=' ')
3     print("if you put", voltage, "volts through it.")
4     print("-- Lovely plumage, the", type)
5     print("-- It's", state, "!")
6
```

- ▶ Invalid usage :

```
1 parrot()                      # required argument missing
2 parrot(voltage=5.0, 'dead')    # non-keyword argument after a keyword argument
3 parrot(110, voltage=220)       # duplicate value for the same argument
4 parrot(actor='John Cleese')    # unknown keyword argument
5
```

Keyword Arguments

- ▶ No argument may receive a value more than once.
- ▶ Here's an example that fails due to this restriction:

```
1 def function(a):  
2     pass # actually, 'pass' does nothing. it just moves to the next line of  
      code  
3  
4 function(0, a=0)  
5
```

Keyword Arguments

- ▶ No argument may receive a value more than once.
- ▶ Here's an example that fails due to this restriction:

```
1 def function(a):  
2     pass # actually, 'pass' does nothing. it just moves to the next line of  
      code  
3  
4 function(0, a=0)  
5
```

```
1 Traceback (most recent call last):  
2   File "code.py", line 4, in  
3     function(0, a=0)  
4   TypeError: function() got multiple values for argument 'a'
```



3

Arbitrary Number of Arguments

Default Arguments

- ▶ Basic usage of the arguments :
 - Positional
 - Keyword

```
1 def city(capital, continent='Europe'):  
2     print(capital, 'in', continent)  
3  
4 city('Athens') # we don't have to pass any arguments into 'continent'  
5 city('Ulaanbaatar', continent='Asia') # we can change the default value by kwargs  
6 city('Cape Town', 'Africa') # we can change the default value by positional args.
```



Default Arguments

- ▶ The output :

```
1 def city(capital, continent='Europe'):
2     print(capital, 'in', continent)
3
4 city('Athens') # we don't have to pass any arguments into 'continent'
5 city('Ulaanbaatar', continent='Asia') # we can change the default value by kwargs
6 city('Cape Town', 'Africa') # we can change the default value by positional args.
```

```
1 Athens in Europe
2 Ulaanbaatar in Asia
3 Cape Town in Africa
4
```



*args and **kwargs

- ▶ The logic of *args and **kwargs

```
def name(*parameter)
```

```
    name(multiple args)
```

```
def name(**parameter)
```

```
    name(multiple kwargs)
```



*args and **kwargs (review)

- ▶ Example :

```
1 def fruiterer(fruit1, fruit2) :  
2     print('I want to get', fruit1, 'and', fruit2)  
3  
4 fruiterer('orange', 'banana')  
5
```



*args and **kwargs (review)

- ▶ The output :

```
1 def fruiterer(fruit1, fruit2) :  
2     print('I want to get', fruit1, 'and', fruit2)  
3  
4 fruiterer('orange', 'banana')  
5
```

```
1 I want to get orange and banana
```



*args and **kwargs (review)

- Let's do it with *args :

*args

```
1 def fruiterer(*fruit) :  
2     print('I want to get :')  
3     for i in fruit :  
4         print('-', i)  
5  
6 fruiterer('orange', 'banana', 'melon', 'ananas')  
7
```

What is the output? Try to figure out in your mind...



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*args and **kwargs (review)

- ▶ The output :

```
1 def fruiterer(*fruit) :  
2     print('I want to get :')  
3     for i in fruit :  
4         print('-', i)  
5  
6 fruiterer('orange', 'banana', 'melon', 'ananas')  
7
```

```
1 I want to get :  
2 - orange  
3 - banana  
4 - melon  
5 - ananas
```



*args and **kwargs

▶ Task :

- ▷ Define a function named `slicer` to collect even numbers into the list `evens`, odd numbers into the list `odds` from the given numbers by using `*args`.
- ▷ ..prints the result.

```
1 | 
2 | slicer(1, 2, 3, 4, 5, 6, 7, 8, 9)
3 | 
```

Output

```
even list : [2, 4, 6, 8]
odd list : [1, 3, 5, 7, 9]
```

*args and **kwargs

- ▶ The defining of that function can be like :

```
1 def slicer(*num) :  
2     evens = []  
3     odds = []  
4     for i in num :  
5         if i%2 == 0 :  
6             evens.append(i)  
7         else :  
8             odds.append(i)  
9     print("even list : ", evens)  
10    print("odd list : ", odds)
```

*args and **kwargs (review)

**kwargs

the **kwargs works in accordance with the format of the dicts





*args and **kwargs (review)

- You can examine the following example :

```
1 def animals(**kwargs):  
2     for key, value in kwargs.items():  
3         print(value, "are", key)  
4  
5 animals(Carnivores="Lions", Omnivores="Bears", Herbivores  
       ="Deers", Nomnivores="Human")  
6
```

-Pay attention to
the **key-value** pairs

What is the output? Try to
figure out in your mind...



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*args and **kwargs (review)

- ▶ You can examine the following example :

```
1 def animals(**kwargs):  
2     for key, value in kwargs.items():  
3         print(value, "are", key)  
4  
5 animals(Carnivores="Lions", Omnivores="Bears", Herbivores  
       ="Deers", Nomnivores="Human")  
6
```

```
1 Lions are Carnivores  
2 Bears are Omnivores  
3 Deers are Herbivores  
4 Human are Nomnivores  
5
```

*args and **kwargs

▶ Task :

- ▷ Define a function named `organizer` to collect the given names into the `list names`, ages into the `list ages` by using `**kwargs`.

```
1
2 organizer(Beth=26, Oscar=42, Justin=18, Frank=33)
3
```

Output

```
['Beth', 'Oscar', 'Justin', 'Frank']
[26, 42, 18, 33]
```



*args and **kwargs

- ▶ The defining of that function can be like :

```
1 def organizer(**people):  
2     names = []  
3     ages = []  
4     for key, value in people.items():  
5         names.append(key)  
6         ages.append(value)  
7     print(names, ages, sep="\n")  
8
```

*args and **kwargs

- ▶ This time it is used `reverse` but it **works** as the **same** logic.

```
def name(multiple parameters)
```

```
    name(*variable)
```

```
def name(multiple parameters)
```

```
    name(**variable)
```



*args and **kwargs (review)

- Carefully examine the following examples :

```
1 def brothers(bro1, bro2, bro3):  
2     print('Here are the names of brothers :')  
3     print(bro1, bro2, bro3, sep='\n')  
4  
5 family = ['tom', 'sue', 'tim']  
6 brothers(*family)  
7
```

Calling a function
using *args

What is the output? Try to
figure out in your mind...





*args and **kwargs (review)

- Carefully examine the following examples :

```
1 def brothers(bro1, bro2, bro3):  
2     print('Here are the names of brothers :')  
3     print(bro1, bro2, bro3, sep='\n')  
4  
5 family = ['tom', 'sue', 'tim']  
6 brothers(*family)  
7
```

```
1 Here are the names of brothers :  
2 tom  
3 sue  
4 tim  
5
```



*args and **kwargs

► Task :

- ▶ Define a function named `merger` to prints the following output from the given tuple `genius`.
- ▶ Call the function using variable `genius` as `*args`.

```
genius = ('Bill', 'Rossum', 'Guido van', "Gates")
```

Output

merger()

For me, Bill Gates and Guido van Rossum are geniuses



*args and **kwargs

- ▶ The defined function and calling it can look like :

```
1 def merger(arg1, arg2, arg3, arg4):  
2     print(f"For me, {arg1} {arg4} and {arg3} {arg2} are geniuses.")  
3  
4 genius = ('Bill', 'Rossum', 'Guido van', "Gates")  
5  
6 merger(*genius)  
7
```



*args and **kwargs (review)

- Carefully examine the following examples :

```
1 def gene(x, y): # defined by positional args  
2     print(x, "belongs to Generation X")  
3     print(y, "belongs to Generation Y")  
4  
5 dict_gene = {'y' : "Marry", 'x' : "Fred"}  
6 gene(**dict_gene) # we call the function by a single  
7 argument(variable)
```

-Calling a function using
** kwargs

-Pay attention to the
type of **kwarg**. Since it
works with **keys**, the
type is a **dict**.

What is the output? Try to
figure out in your mind...

*args and **kwargs (review)

- Carefully examine the following examples :

```
1 def gene(x, y): # defined by positional args
2     print(x, "belongs to Generation X")
3     print(y, "belongs to Generation Y")
4
5 dict_gene = {'y' : "Marry", 'x' : "Fred"}
6 gene(**dict_gene) # we call the function by a single
7 argument(variable)
```

```
1 Fred belongs to Generation X
2 Marry belongs to Generation Y
3
```

*args and **kwargs



▶ Task :

- ▷ Create a dictionary named `friends` with the names (as keys) and ages (as values) of your three friends.
- ▷ Define a function named `meaner` to prints the average of your friends ages.
- ▷ Call the function using variable `friends` as `**kwargs`.



*args and **kwargs

- ▶ The defined function and calling it can look like :

```
1 def meaner(Alfred, Joseph, Eric):  
2     avg = (Alfred + Joseph + Eric) / 3  
3     print("The average of their ages is :", avg)  
4  
5 friends = {'Alfred': 44, 'Joseph': 39, 'Eric': 55}  
6  
7 meaner(**friends)  
8
```

Output

```
The average of their ages is : 46.0
```



*args and **kwargs (review)

- Carefully examine the following examples :

```
1 def gene(x='Solomon', y='David'): # defined by kwargs  
2     (default values assigned to x and y)  
3     print(x, "belongs to Generation X")  
4     print(y, "belongs to Generation Y")  
5  
5 dict_gene = {'y' : "Marry", 'x' : "Fred"}  
6 gene(**dict_gene)  
7
```

What is the output? Try to figure out in your mind...





*args and **kwargs (review)

- Carefully examine the following examples :

```
1 def gene(x='Solomon', y='David'): # defined by kwargs  
2     (default values assigned to x and y)  
3     print(x, "belongs to Generation X")  
4     print(y, "belongs to Generation Y")  
5  
5 dict_gene = {'y' : "Marry", 'x' : "Fred"}  
6 gene(**dict_gene)  
7
```

```
1 Fred belongs to Generation X  
2 Marry belongs to Generation Y  
3
```