

[220] Using Functions

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Learning Objectives Today

How to call functions

- input/output

Please read Ch 3
of Think Python

Modules:

- import styles
- attribute operator (the ".")
- math module

Inspection:

- discover functions in a module
- learn what function does

make a battleship game!

Main Code:

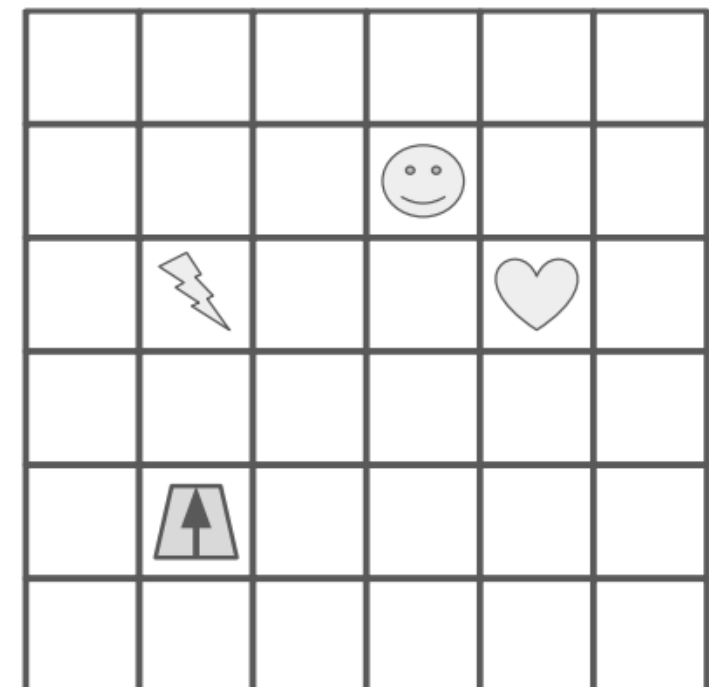
1. Put 2 in the “moves” box
2. Perform the steps under “Move Code”, then continue to step 3
3. Rotate the robot 90 degrees to the right (so arrow points to right)
4. Put 3 in the “moves” box
5. Perform the steps under “Move Code”, then continue to step 6
6. Whatever symbol the robot is sitting on, write that symbol in the “resut” box

Move Code:

- A. If “moves” is 0, stop performing these steps in “Move Code”, and go back to where you last were in “Main Code” to complete more steps
- B. Move the robot forward one square, in the direction the arrow is pointing
- C. Decrease the value in “moves” by one
- D. Go back to step A

“Move Code” is a function

**Functions are like “mini programs”,
as in our robot worksheet problem**



we'll learn about how to give functions input by passing arguments (e.g., 2) to parameters (e.g., moves)

Main Code:

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3. Rotate the robot 90 degrees to the right (so arrow points to right)
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today we'll learn how to use functions in Python

we'll also learn how to ask functions

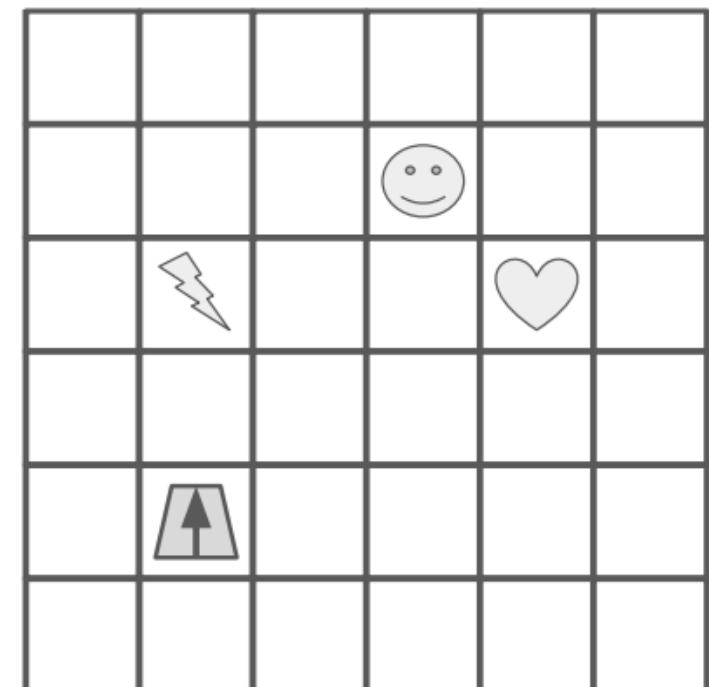
questions and get answers called return values

Move Code:

- A. If "moves" is 0, stop performing these steps in "Move Code", and go back to where you last were in "Main Code" to complete more steps
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- C. Decrease the value in "moves" by one
- D. Go back to step A

next lecture, we'll learn how to write our own new functions

**Functions are like "mini programs",
as in our robot worksheet problem**



General Function Concepts

Some Code

...

code

...

code

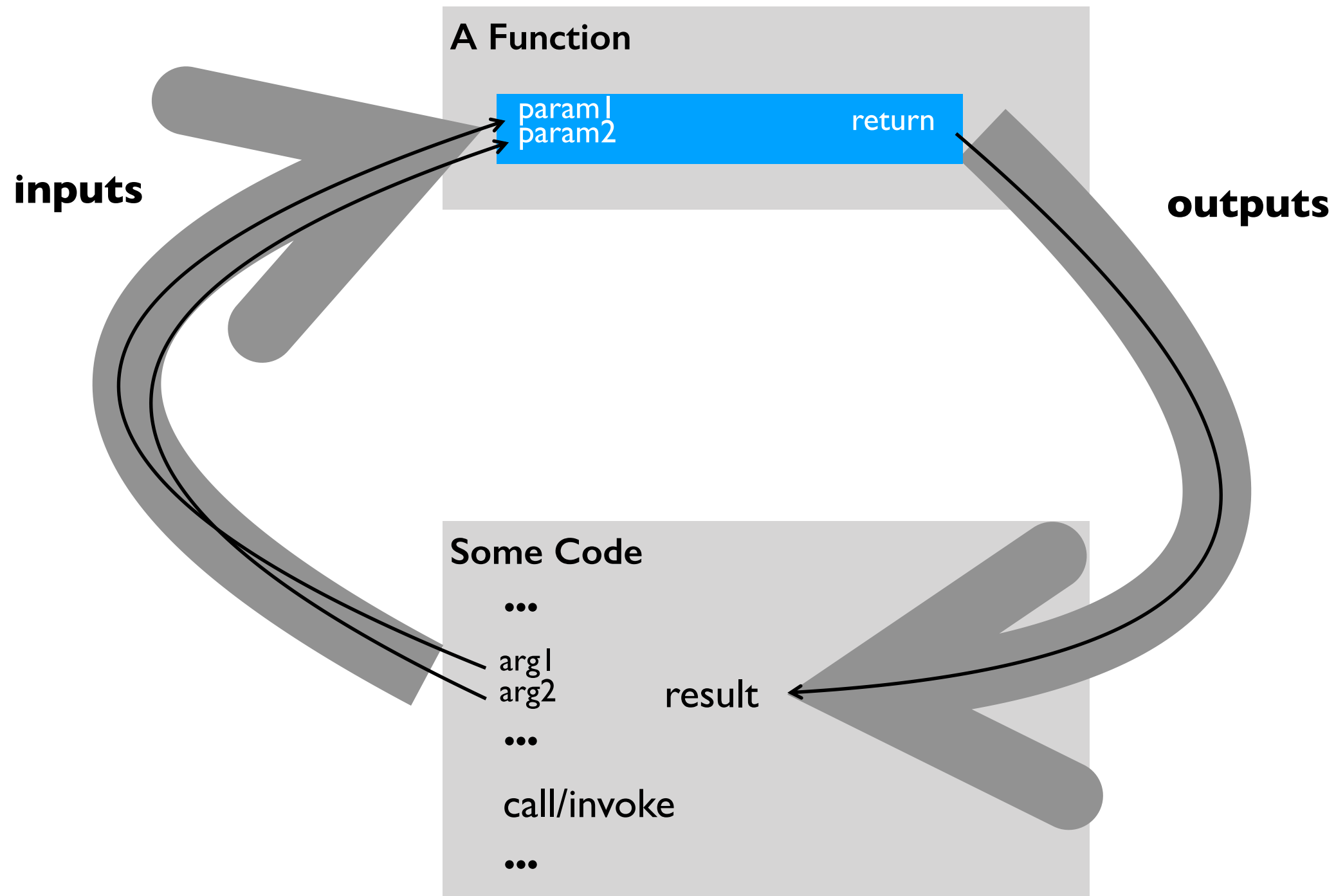
...



Yikes, copied code!

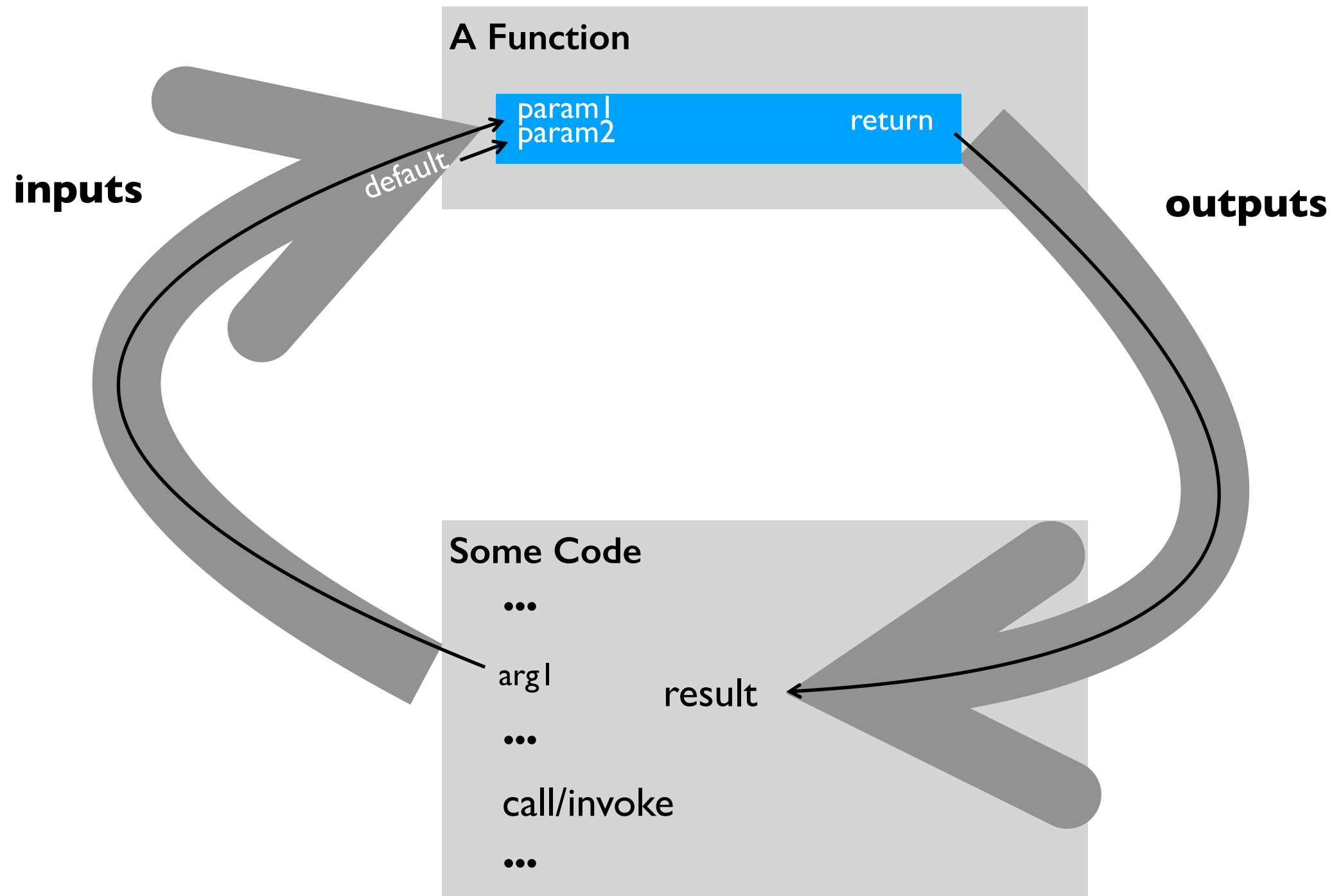
Vocabulary

- **refactor**: change organization of code (e.g., to avoid repetition)
- **parameter**: variable that receives input to function
- **argument**: value sent to a function (lines up with parameter)
- **return value (or result)**: function output sent back to calling code



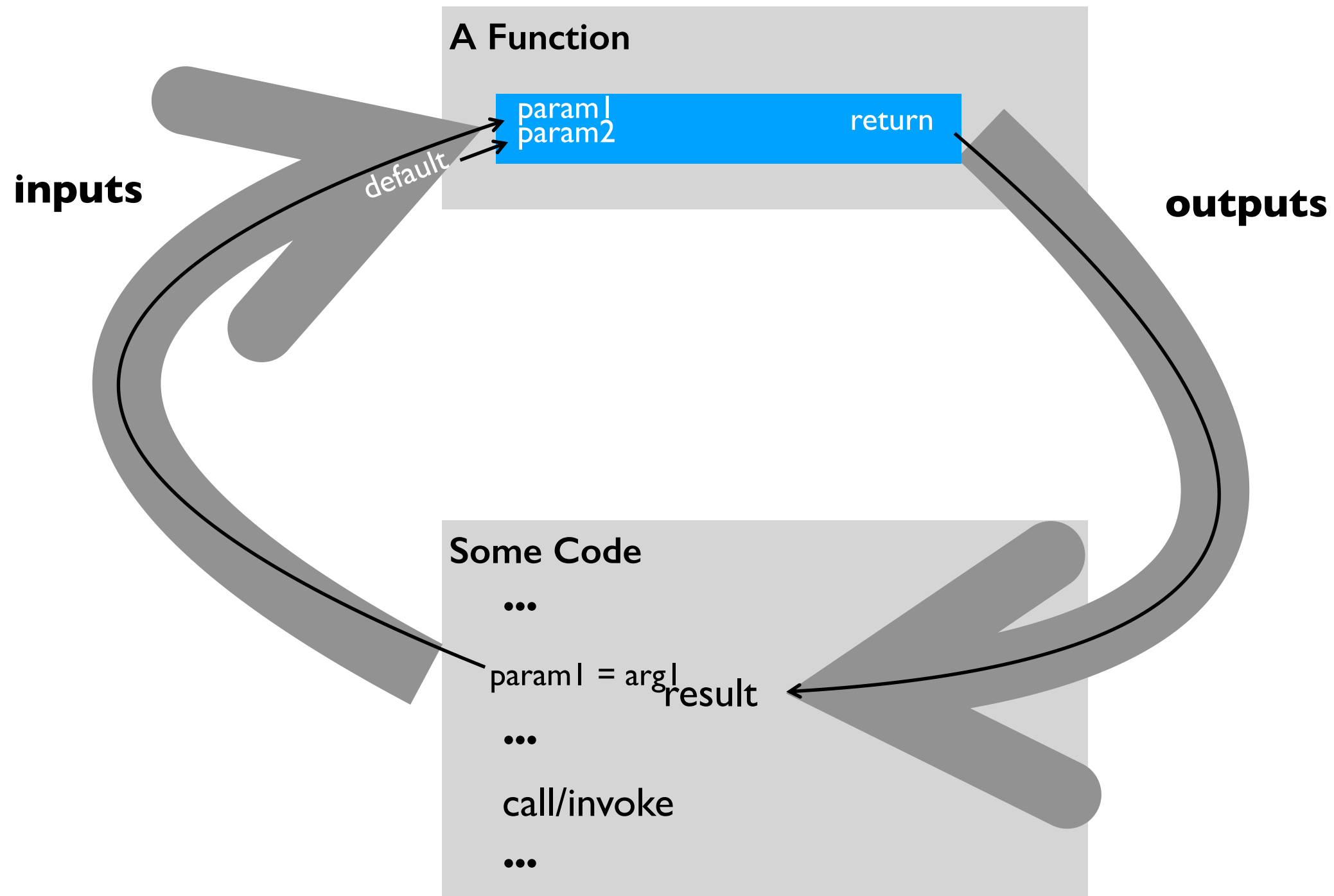
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- **return value (or result)**: function output sent back to calling code
- **default argument**: value put in parameter if argument not passed
- **named/keyword argument**: argument explicitly tied to a parameter



Calling/Invoking a Function in Python

```
print("hello")  
result = f(x)
```

ALWAYS: function's name


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arguments

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print("hello")  
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ALWAYS: function's name

ALWAYS: followed by parentheses

SOMETIMES: with one or more arguments

Calling/Invoking a Function in Python

```
print("hello")
```

```
result = f(x)
```



return value

ALWAYS: function's name

ALWAYS: followed by parentheses

SOMETIMES: with one or more arguments

SOMETIMES: producing a result

Calling/Invoking a Function in Python

```
print("hello", "world")  
x = input()
```

ALWAYS: function's name

ALWAYS: followed by parentheses

SOMETIMES: with one or more arguments

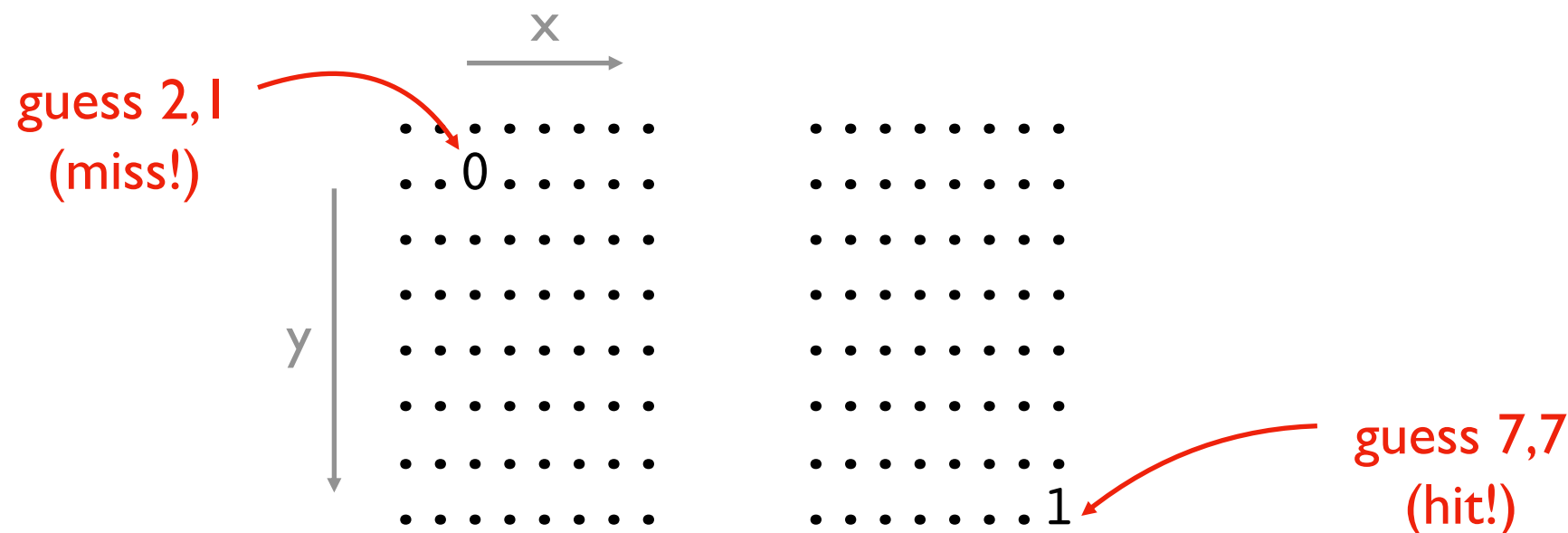
SOMETIMES: producing a result

demos

Battleship Demo (Version I)



<https://boardgamegeek.com/image/288374/battleship>



Version I (MVP)

- 1 ship, 1 guess
- ship is 1 space
- fixed position
- top/left is 0,0
- horrible graphics

Types of modules (collections of functions)

1

built into Python (`__builtins__` module). `print()`, `type()`, ...

2

pre-installed with Python (e.g., `math`). `sin`, `log`, `max`, ...

3

installed with pip (e.g. jupyter)

4

written yourself (a `.py` file)

Types of modules (collections of functions)

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installed with pip (e.g. jupyter)

4

written yourself (a `.py` file)

`from math import *`

OR

`from math import log`

OR

`import math`

demos

Battleship Demo (Version 2)



<https://boardgamegeek.com/image/288374/battleship>

guess 2,1
(miss!)

0

1

guess 7,7
(hit!)

Version 1 (MVP)

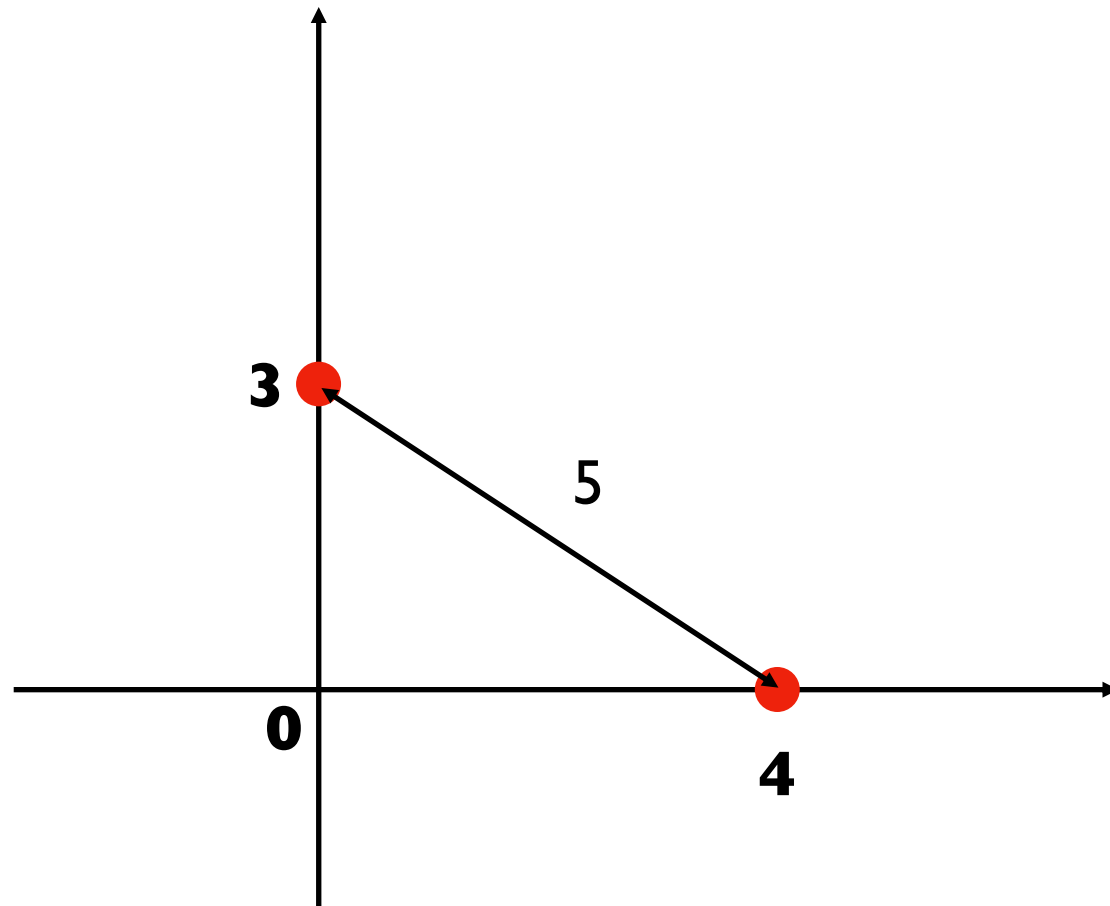
- 1 ship, 1 guess
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Version 2

- larger ship
- multiple ships
- random locations

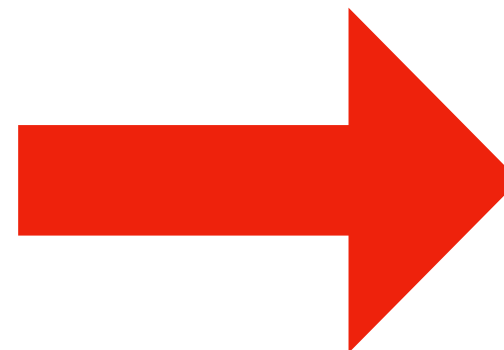
time permitting

Demo: Polar Coords Distance



point 1: distance 3 at angle 90°

point 2: distance 4 at angle 0°



distance: 5

time permitting