

Building Brains 2

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Review

- Functions
 - Used to sequence commands
 - Used to do a well-defined computation
 - Function composition
- Building Brains
 - Use functions to sequence robot movements
 - Use “for VARIABLE in SEQUENCE:”
 - Do something N times
 - Do something to each item in a sequence

Function to Sequence Commands

```
def refrain(timing):  
    """ Function that plays the refrain """  
    beep(timing, c2)  
    beep(timing, a)  
    beep(timing, fSharp)  
    beep(timing, aSharp)
```

```
refrain(.5)
```

Function to Sequence Commands

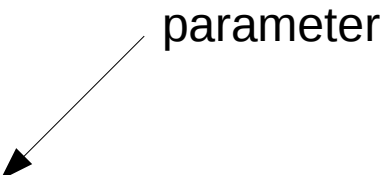
```
def refrain(timing):  
    """ Function that plays the refrain """  
    beep(timing, c2)  
    beep(timing, a)  
    beep(timing, fSharp)  
    beep(timing, aSharp)
```

```
refrain(.5)
```

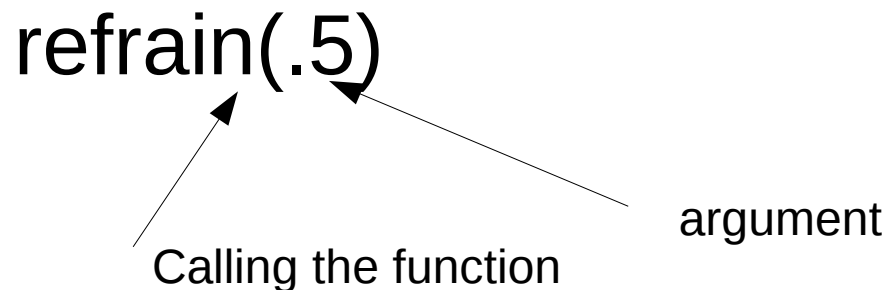
1. Indent commands
2. add a def name():
3. abstract common parts
4. add variables
5. add a return
6. add useful comments
7. “call” the function
8. test and debug!

Function to Sequence Commands

```
def refrain(timing):  
    beep(timing, c2)  
    beep(timing, a)  
    beep(timing, fSharp)  
    beep(timing, aSharp)
```



```
refrain(.5)
```



Function to Compute

```
def celsius(F):  
    """ Converts Fahrenheit to Celsius """  
    return ((F - 32) / 9.0) * 5
```

```
celsius(72)
```

Function to Compute

```
def celsius(F):  
    """ Converts Fahrenheit to Celsius """  
    return ((F - 32) / 9.0) * 5
```

celsius(72)

Calling the function

argument

Return value

parameter

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Building Brains

```
def yoyo():  
    forward(1, 2)  
    turnLeft(1, .7)
```

Building Brains

```
def yoyo():  
    forward(1, 2)  
    turnLeft(1, .7)
```

```
yoyo()  
yoyo()  
yoyo()  
yoyo()
```

Building Brains

```
def yoyo():  
    forward(1, 2)  
    turnLeft(1, .7)  
  
for i in range(4):  
    yoyo()
```

Python's **for** command

```
for VARIABLE in SEQUENCE:  
    COMMAND  
    COMMAND  
    ...
```

Python's **for** command

```
for letter in "Hello":  
    print letter
```

```
h  
e  
l  
l  
o
```

Python's **for** command

```
for letter in "Hello":  
    print letter
```

```
for i in range(4):  
    print i
```

Python's **for** command

```
for i in range(4):  
    print i
```

0

1

2

3

What is `range(4)`?

What is range(4)?

```
>>> range(4)
```

What is range(4)?

```
>>> range(4)  
[0, 1, 2, 3]
```

What is range(4)?

```
>>> range(4)  
[0, 1, 2, 3]
```

New type: List

For Command

- Used for doing things N times (where N is the argument to range)
- Used for doing something to each item in the sequence

```
for i in range(23):  
    dance()
```

```
for i in [2, 3, 6, 8]:  
    beep(.5, 440 * i)
```

```
for i in range(8):  
    beep(.5, 440 * i)
```

Review

- New type: “list”
- Lists and strings are both “sequences”
- New command: “for”
 - Used for doing things N times (where N is the argument to range)
 - Used for doing something to each item in the sequence

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Building Brains 2

- What's missing from our robot control programs so far?

Building Brains 2

- What's missing from our robot control programs so far?

Senses!

Know your Robot: Senses



Reading Sensors

- Light sensors
 - getLight(POSITION)
 - getBright(POSITION)
 - POSITION is either “left”, “center”, “right”, 0, 1, 2
- Infrared (IR) sensors
 - getIR(POSITION) - “left”, “right”, 0, 1
 - getObstacle(POSITION) - “left”, “center”, “right”, 0, 1, 2
- POSITION can also be “all”

Building Brains 2

- Follow a maze
- Avoid obstacles
- Go to the light
- Run away from the light

Structure of a Robot Brain

- Read sensors
- Decide what to do
- Make Movement
- Repeat