# CS50's Introduction to Programming with Python

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### **Cookie Jar**



Source: Sesame Street

Suppose that you'd like to implement a <u>cookie jar (https://en.wikipedia.org/wiki/Cookie\_jar)</u> in which to store cookies. In a file called <u>jar.py</u>, implement a <u>class</u> called <u>Jar</u> with these methods:

- \_\_init\_\_ should initialize a cookie jar with the given capacity, which represents the maximum number of cookies that can fit in the cookie jar. If capacity is not a non-negative int, though, \_\_init\_\_ should instead raise a ValueError.
- \_\_str\_\_ should return a str with n \$, where n is the number of cookies in the cookie jar. For instance, if there are 3 cookies in the cookie jar, then str should return " \$ \$ \$"

- deposit should add n cookies to the cookie jar. If adding that many would exceed the cookie jar's capacity, though, deposit should instead raise a ValueError.
- withdraw should remove n cookies from the cookie jar. Nom nom nom. If there aren't that many cookies in the cookie jar, though, withdraw should instead raise a ValueError.
- capacity should return the cookie jar's capacity.
- size should return the number of cookies actually in the cookie jar, initially 0.

Structure your class per the below. You may not alter these methods' parameters, but you may add your own methods.

Either before or after you implement <code>jar.py</code>, additionally implement, in a file called <code>test\_jar.py</code>, **four or more** functions that collectively test your implementation of <code>Jar</code> thoroughly, each of whose names should begin with <code>test\_</code> so that you can execute your tests with:

```
pytest test_jar.py
```

Note that it's not as easy to test instance methods as it is to test functions alone, since instance methods sometimes manipulate the same "state" (i.e., instance variables). To test one method (e.g., withdraw), then, you might need to call another method first (e.g., deposit). But the method you call first might itself not be correct!

And so programmers sometimes <u>mock (https://en.wikipedia.org/wiki/Mock\_object)</u> (i.e., simulate) state when testing methods, as with Python's own <u>mock object library</u> (https://docs.python.org/3/library/unittest.mock.html), so that you can call just the one method but modify the underlying state first, without calling the other method to do so.

For simplicity, though, no need to mock any state. Implement your tests as you normally would!

#### **▼** Hints

```
from jar import Jar

def test_init():
    ...

def test_str():
    jar = Jar()
    assert str(jar) == ""
    jar.deposit(1)
    assert str(jar) == "**"
    jar.deposit(11)
    assert str(jar) == "***

def test_deposit():
    ...

def test_withdraw():
    ...
```

#### Demo

You're welcome, but not required, to implement a main function, so this is all we can demo!



Source: Sesame Street

## **Before You Begin**

Log into <u>cs50.dev (https://cs50.dev/)</u>, click on your terminal window, and execute cd by itself. You should find that your terminal window's prompt resembles the below:

```
$
```

Next execute

```
mkdir jar
```

to make a folder called jar in your codespace.

Then execute

```
cd jar
```

to change directories into that folder. You should now see your terminal prompt as jar/ \$. You can now execute

```
code jar.py
```

to make a file called jar.py where you'll write your program. You can also execute

```
code test_jar.py
```

to create a file called | test\_jar.py| where you can write tests for your program.

#### **How to Test**

Here's how to test your code manually:

- Open your test\_jar.py file and import your Jar class with from jar import Jar.
  Create a function called test\_init, wherein you create a new instance of Jar with jar = Jar(). assert that this jar has the capacity it should, then run your tests with pytest test\_jar.py.
- Add another function to your test\_jar.py file called test\_str. In test\_str, create a new instance of your Jar class and deposit a few cookies. assert that str(jar) prints out as many cookies as have been deposit ed, then run your tests with pytest test\_jar.py.
- Add another function to your test\_jar.py file called test\_deposit. In test\_deposit, create a new instance of your Jar class and deposit a few cookies. assert that the jar's size attribute is as large as the number of cookies that have been deposit ed. Also assert that, if you deposit more than the jar's capacity, deposit should raise a ValueError. Run your tests with pytest test\_jar.py.
- Add another function to your test\_jar.py file called test\_withdraw. In test\_withdraw, create a new instance of your Jar class and first deposit a few cookies. assert that withdraw ing from the jar leaves the appropriate number of cookies in the jar's size attribute. Also assert that, if you withdraw more than the jar's size, withdraw should raise a ValueError. Run your tests with pytest test\_jar.py.

You can execute the below to check your code using check50, a program that CS50 will use to test your code when you submit. But be sure to test it yourself as well!

check50 cs50/problems/2022/python/jar

Green smilies mean your program has passed a test! Red frownies will indicate your program output something unexpected. Visit the URL that check50 outputs to see the input check50 handed to your program, what output it expected, and what output your program actually gave.

#### **How to Submit**

In your terminal, execute the below to submit your work.

submit50 cs50/problems/2022/python/jar