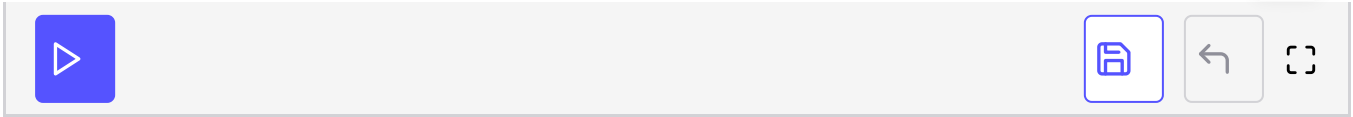
The for Loop

We'll learn about for loops in Python.

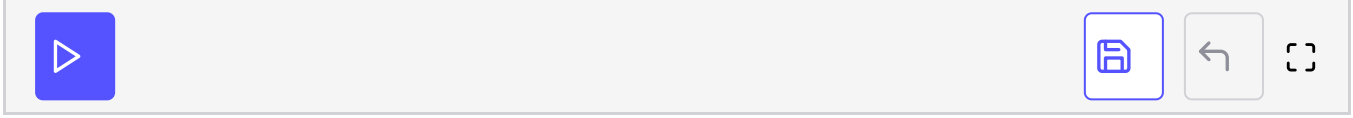
As mentioned above, you use a loop when you want to iterate over something n number of times. It's a little easier to understand if we see an example. Let's use Python's builtin **range** function. The range function will create a list that is n in length. In Python 2.x, there is actually another function called **xrange** that is a number generator and isn't as resource intensive as range. They basically changed **xrange** into **range** in Python 3. Here is an example:

```
print(range(5))  # range(0, 5)
```



As you can see, the range function above took an integer and returned a **range** object. The range function also accepts a beginning value, an end value and a step value. Here are two more examples:

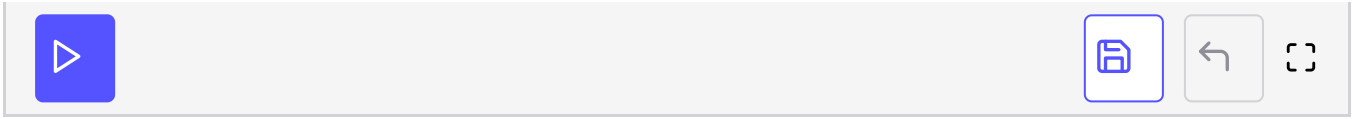
```
print(range(5,10))  # range(5, 10)
print(list(range(1, 10, 2)))  # [1, 3, 5, 7, 9]
```



The first example demonstrates that you can pass a beginning and end value and the range function will return the numbers from the beginning value up to but not including the end value. So in the case of 5-10, we get 5-9. The second example shows how to use the **list** function to cause the range function to return every second element between 1 and 10. So it starts with one, skips two, etc. Now you're probably wondering what this has to do with loops. Well one easy way to show how a loop works is if we use the range function! Take a look:

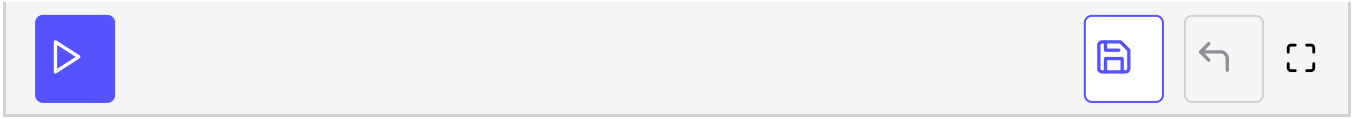
```
for number in range(5):
    print(number)

# 0
# 1
# 2
# 3
# 4
```



What happened here? Let's read it from left to right to figure it out. For each number in a range of 5, print the number. We know that if we call range with a value of 5, it will return a list of 5 elements. So each time through the loop, it prints out each of the elements. The for loop above would be the equivalent of the following:

```
for number in [0, 1, 2, 3, 4]:
    print(number)
```



The range function just makes it a little bit smaller. The for loop can loop over any kind of Python iterator. We've already seen how it can iterate over a list. Let's see if it can also iterate over a dictionary.

```
>>> a_dict = {"one":1, "two":2, "three":3}
>>> for key in a_dict:
        print(key)

three
two
one
```

When you use a **for** loop with a dictionary, you'll see that it automatically loops over the keys. We didn't have to say **for key in a_dict.keys()** (although that would have worked too). Python just did the right thing for us. You may be wondering why the keys printed in a different order than they were defined in the dictionary. As you may recall from chapter 3, dictionaries are unordered, so when we iterate over it, the keys could be in any order.

Now if you know that the keys can be sorted, then you can do that before you

iterate over them. Let's change the dictionary slightly to see how that works.

```
a_dict = {1:"one", 2:"two", 3:"three"}
keys = a_dict.keys()
keys = sorted(keys)
for key in keys:
    print(key)

# 1
# 2
# 3
```

Let's take a moment to figure out what this code does. First off, we create a dictionary that has integers for keys instead of strings. Then we extract the keys from the dictionary. Whenever you call the keys() method, it will return an unordered list of the keys. If you print them out and find them to be in ascending order, then that's just happenstance. Now we have a view of the dictionary's keys that are stored in a variable called **keys**. We sort it and then we use the **for** loop to loop over it.

Now we're ready to make things a little bit more interesting. We are going to loop over a range, but we want to print out only the even numbers. To do this, we want to use a conditional statement instead of using the range's step parameter. Here's one way you could do this:

```
for number in range(10):
    if number % 2 == 0:
        print(number)
# 0
# 2
# 4
# 6
# 8
```

You're probably wondering what's going on here. What's up with the percent sign? In Python, the % is called a modulus operator. When you use the modulus operator, it will return the remainder. There is no remainder when you divide an even number by two, so we print those numbers out. You probably won't use the modulus operator a lot in the wild, but I have found it

useful from time to time.

Now we're ready to learn about the **while** loop.