

# Reading from Files (it's magic!)







# Three Steps to File Reading

- Any program that needs to read from a file will follow the same basic 3-step process.
- Example: Suppose we have a file with integers in it, and we'd like to have a program compute the sum of all the integers in the file.

# Step 1: Open the file



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- Uses the `open()` function.
- Always done the same way no matter how the file is organized.

```
file = open("filename.txt", "r")
```

`open()` returns a "file object," which is a data type like `int`, `float`, or `string`.

Replace this string with the real name of your file (don't forget the quotes!)

The "r" means open the file for reading.

## Step 2: Loop over the file



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```
file = open("filename.txt", "r")  
for line in file:
```

**line** can be any string variable you want. This variable will store each line of the file as it is read.





## Step 2: Loop over the file

```
file = open("filename.txt", "r")  
while [there are more lines in the  
file that we haven't read]:  
    line = [read the next line  
from the file]
```

- The "magic" for loop operates similarly to the pseudocode above.
- You only have access to one line of the file at a time.

## Step 2: Loop over the file

- Inside the loop, do whatever you need to do with the string variable --- this will depend on the program you're trying to write.

```
file = open("filename.txt", "r")
for line in file:
    print(line) # Print the line
```

## Step 2: Loop over the file

- Usually a good idea to "strip" the newline character from the line before processing:

```
file = open("filename.txt", "r")
for line in file:
    line = line.rstrip()
    print(line)
```

# Step 3: Close the file



## Step 3: Close the file

- After you are done reading from the file, you should close the file:

```
file = open("filename.txt", "r")
for line in file:
    line = line.rstrip()
    print(line)
file.close()
```

# Complete file-reading loop

- Use this as a template for file reading:

```
file = open("filename.txt", "r")
for line in file:
    line = line.rstrip()
    print(line) # Use for debugging
    [process the line]
file.close()
```

# Reminders



- Each line of the file is always read as a **string**.
- If you want to process each line as an int or a float, you must do the conversion manually.

```
file = open("filename.txt", "r")
for line in file:
    line = line.rstrip()
    num = int(line)
    print("this is a number:", num)
```

**line** is a string variable  
(read by the magic for  
loop)

**num** is an int variable  
(converted through the  
**int** function)



- When initially writing code to read from a file, always print the lines from the file as you read them.
  - Incredibly helpful for debugging.
  - Remove the print part when you're convinced the program works otherwise.

```
file = open("filename.txt", "r")
for line in file:
    line = line.rstrip()
    # Keep this print stmt for debugging.
    print(line)
```

- The "magic" for loop stops automatically at the end of the file. It will never read past the end of the file.
- However, blank lines at the end of the file (often put there by accident) can cause weird errors.

You try



- In Python, create a new file with some integers, one per line. (at least 6 integers)
- Save this file as `numbers.txt`.
- Write the basic file-reading loop to read in all the numbers and print them out as they're being read.
- Add code to add up all the numbers and print their total at the end.
- Add code to print their average at the end.
- Add code to print the differences between consecutive numbers as they're being read.
- Add code to print a "moving average" of the most recent three numbers in the file. (This means print the average of numbers 1, 2, and 3; then 2, 3, and 4; then 3, 4, and 5, etc)

