Programming Foundations with Python:
Learn Object Oriented Programming

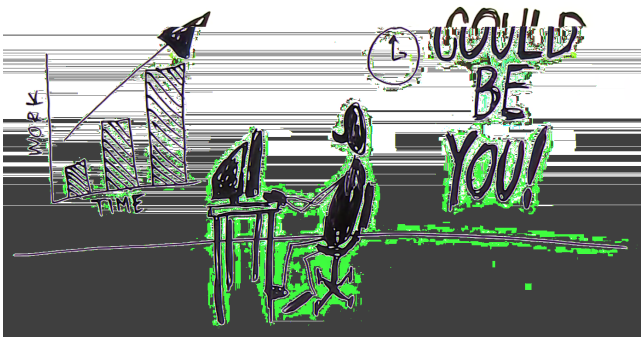
Lesson 1 Notes

Course Map

So we just finished lesson zero, which was an introduction. In this lesson, lesson one, we will build two main projects while using functions. Now, towards the end of this lesson we will present a scenario where functions won't quite present a very elegant solution. That will pave the way for us to learn new stuff in lesson two and

three.
Now if you feel extremely comfortable with functions and understand their limitations completely you should consider moving on to the next lesson, however if you feel like you want to learn more about functions in the Python programming language, continue to take this lesson, watch the next video, we will use it to write our first program.

Take a Break (Story)

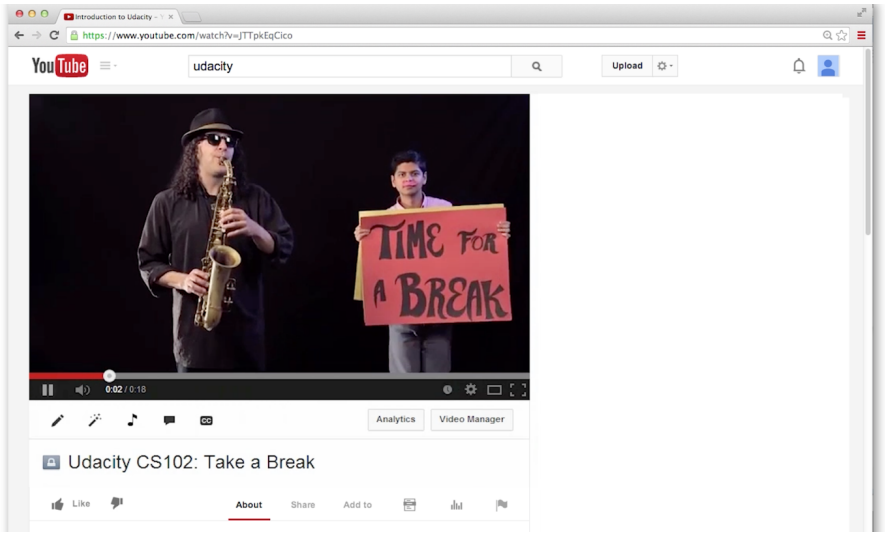


Can you think of a friend who works really long hours on a computer? Programming, writing, researching for hours. By the way, that person could be you. This seems to be a problem, especially as the number of hours we spend on a computer keeps going up. If you could only remember to walk away from the computer for a little bit.

Let's write a program that schedules breaks throughout the day reminding that friend who works really long hours on the computer, to listen to music, get up and dance to their favorite song, or just walk away from the computer every once in a while.

Take a Break (Output)

Okay. So, I wrote a program called Take A Break that for now is hidden behind this graphic. But, let me just focus on running it. When I do that, the program starts to keep track of time and after every two hours of work on the computer it opens a browser to play your friend's favorite song.



After another two hours of work, it prompts you to take another break and so on. Let's build this.

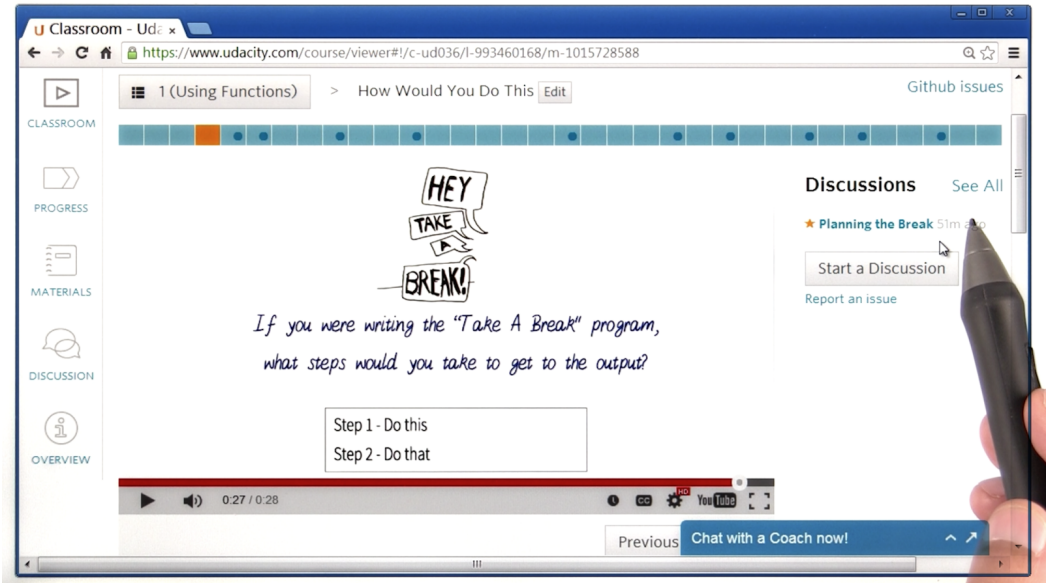
How Would You Do This

Now before we write that program, let me ask you. If you are writing the Take A Break program, what steps would you take to get to the output. Don't worry about writing code right now, in plain English, simply identify the steps you would need to take to make this program work. Step one do this, step two do that.

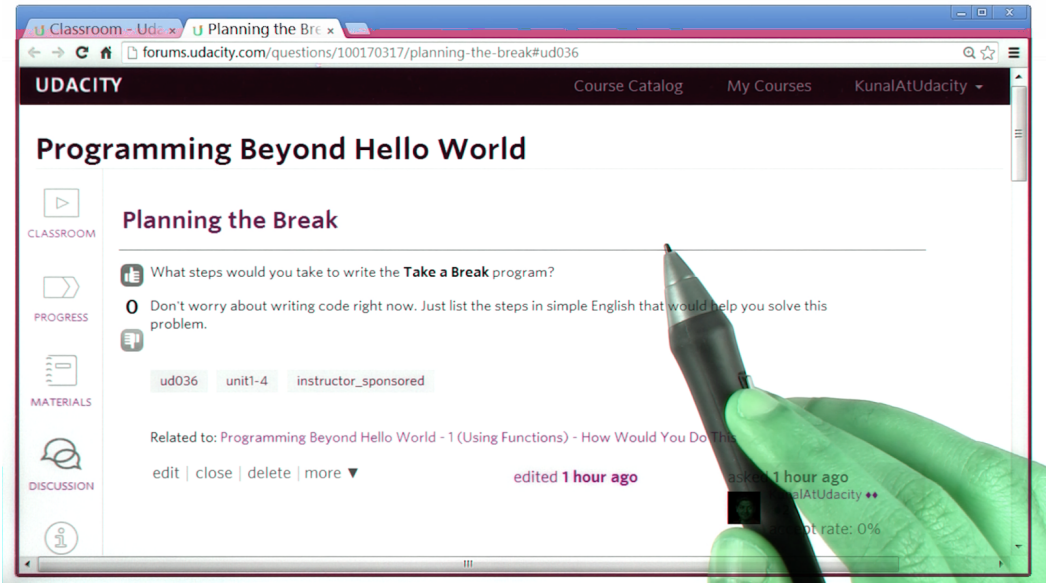
You can submit your answers on the discussion forum. And while you are there you can read the ideas others submitted on the forum as well. The next video will give you a quick tour of how to use the forum.

Planning the Break

So the way to submit this answer on the forum, is to look under the Discussions



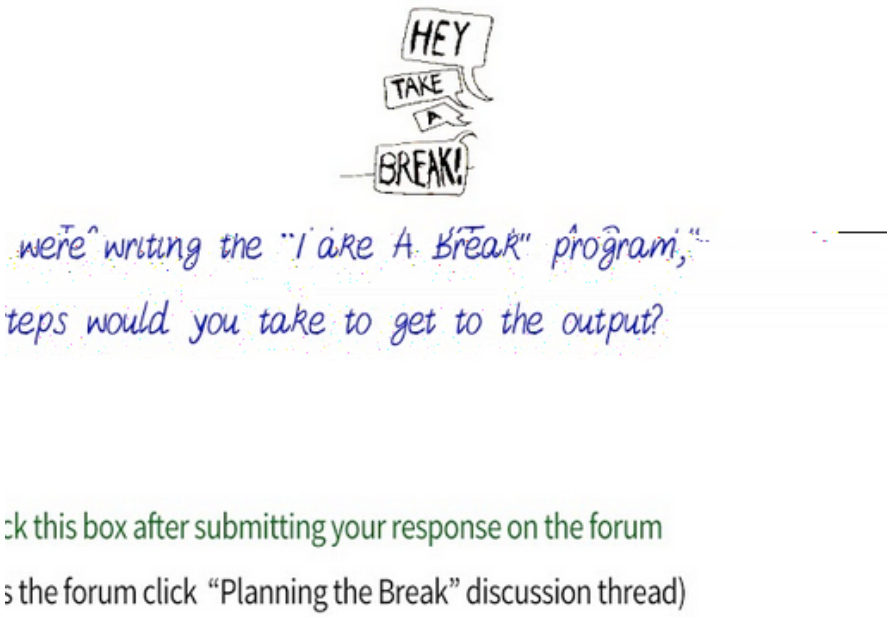
section of the web page. For now, there is just the one link here. Although, you may see multiple links under Discussions. Click on the link that is in bold, and has a star in front of it. Now, the star means that I created this thread for you to submit your responses. After I click on it, a new tab opens with a Discussion forum.



Here, you can simply scroll down, to submit your responses.

So here I am, back to the original question, which is, if you were writing the Take a Break program, what steps would you take to get to the output? Make sure you submit your responses on the Discussion forum, and, check this box after you've submitted your answer.

Question:

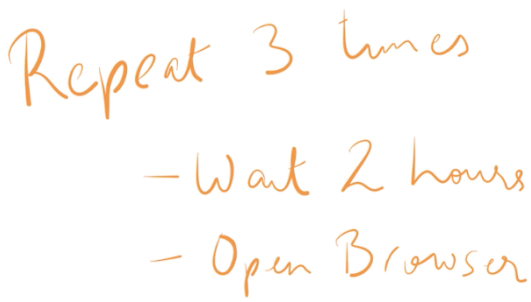


One Way Of Doing This

Thank you for sharing your responses. I will be providing feedback on the forums periodically. Now there are several ways in which to solve this problem. One way is for us to write a program that somehow keeps track of time, say two hours, and it

essentially does nothing during that time. So the first thing we want the program to do is Wait for two hours.

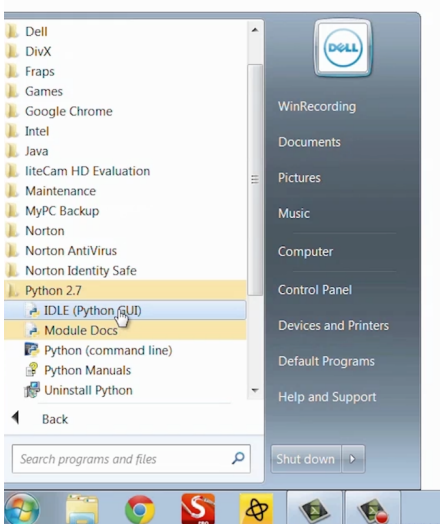
And after we've waited for that amount of time, we want the program to open up a web browser, which plays let's say a YouTube video which is your friends favorite song. So the second thing is to open a browser.



Now because we want these two steps to happen multiple times during the day. Because we want to take multiple breaks during the day. We want to put these two steps inside some sort of loop. So let's say we want to repeat these steps three times. Let's build this. I encourage you to follow along.

Launching Python

So, the first thing I will do on my Windows machine, is open Python and IDLE. Here's how to do it. I can go to the Start Menu, hit All Programs, find Python 2.7, which is what we just installed and launch IDLE.

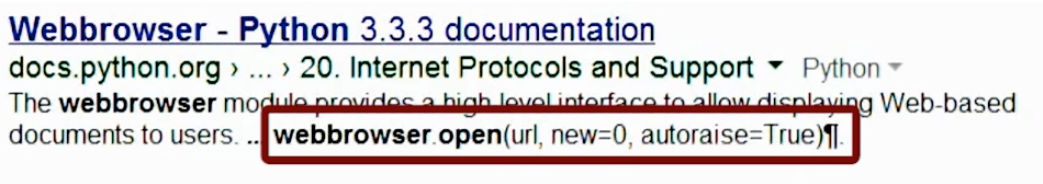


On a Mac, this is what you'll need to do. I will go to Spotlight and then type IDLE. You can think of IDLE as a notepad or a place where we write Python programs.

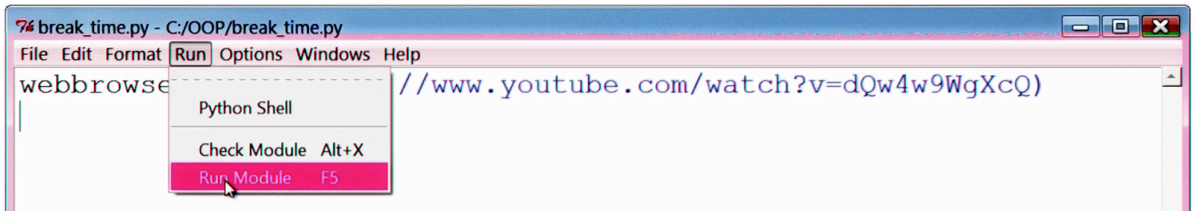
I can click on File and then New File and boom, I will get a fresh new place where I can write my code. By the way, the other window is where we'll see the output of our program. Okay, let me rearrange both of these windows so we can see them at the same time.

What is the Error

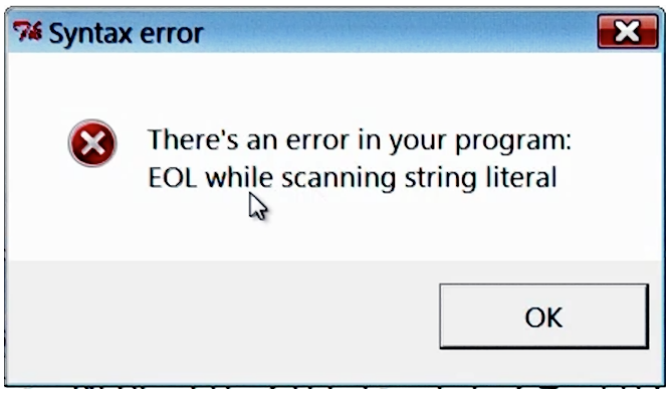
So previously, I Googled to find out how one would open a web browser in python. And I discovered that there is this function called webbrowser.open.



This function takes in the link I want to open. I just placed a Youtube address in there. In fact, this could have been any link you want. Alright. Let's save the program and run it. I'm going to call it break_time.py. Py stands for Python. To run it, I will click on Run, and then click on Run Module.



Now my hypothesis is that when we run this program it will open the Youtube link. Let's see. Oh. It seems like we have an error.



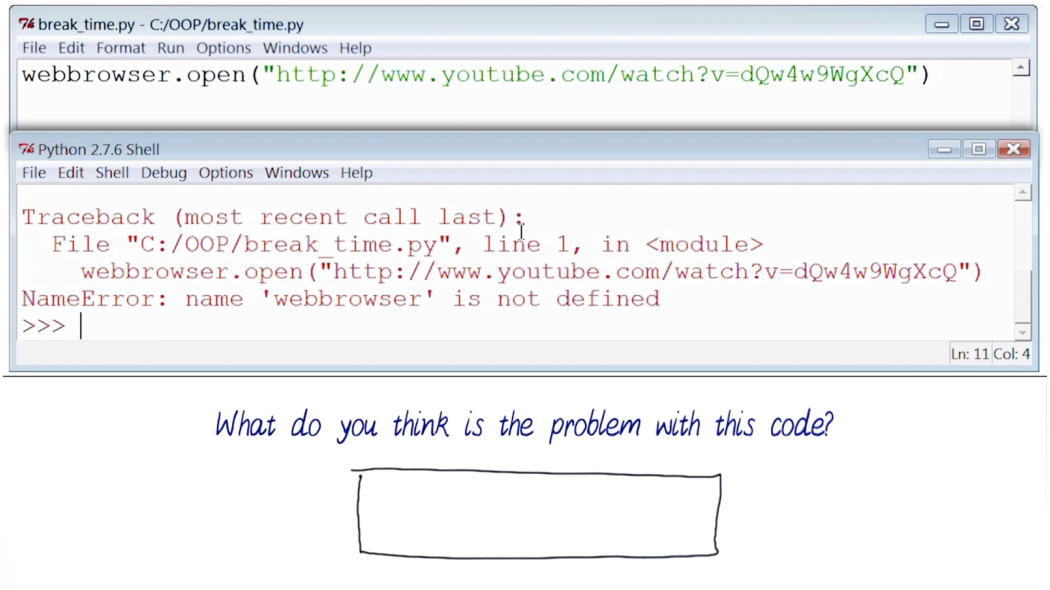
Okay, it says there's an error in your program, EOL, whatever that means, while scanning the string literal. Okay? Oh, look Python is pointing out the error. It seems

like I missed the closing quote, so I'm going to add that. Let me save the program one more time and run it. Now I believe it will work. Hmmm, another error.

You know, when I first learned how to program, I felt so intimidated by these errors. Look at them. They are red and in your face, but to make the program work, we have to somehow get past them.

Question:

So, would you mind reading the error and telling us what you think is the problem with this code? Enter your responses in this box.

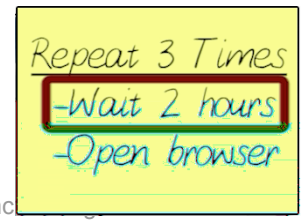


Squashing The Bug

So Python is having difficulty, understanding what webbrowser is. We can fix this, by saying import webbrowser at the top. This is our way of telling Python, hey, we want to use webbrowser and all of its functionality in our program. Let's Save and Run.

Alright. This time the program worked, and we can check off one of the things we have to do.

Making the Program Wait

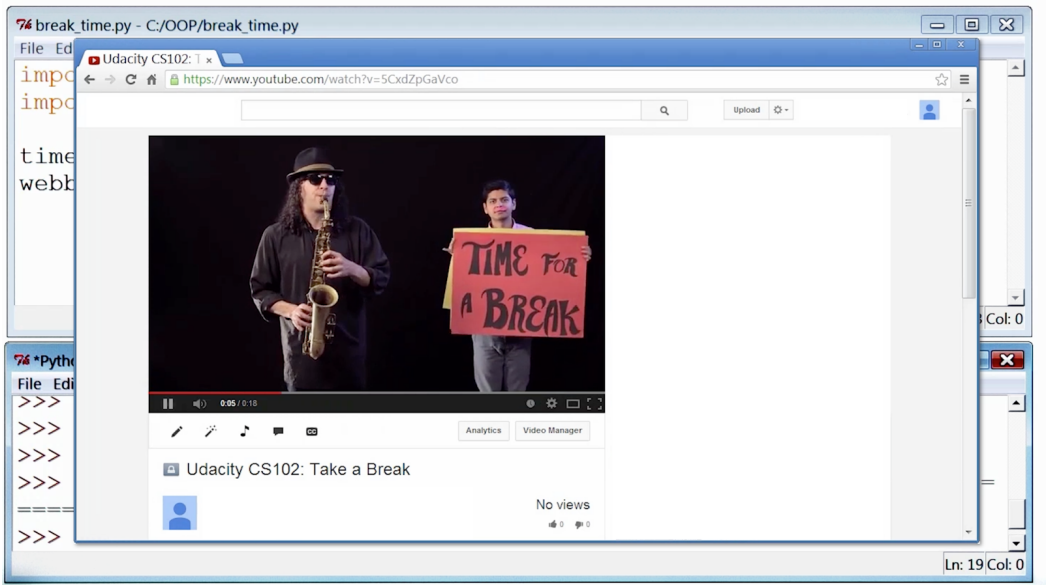


So next, I will attempt to make my program wait for a certain period of time.
To find out about this, I went back to Google, and then typed python make my program wait. One of the first links there was

this website called stackoverflow.com. Now this will soon become one of your favorite website as a programmer. it suggested to use something called time.sleep which suspends the program for a given number of seconds.

Okay, back to the program. Now since I'm still in testing phase I will try to suspend the program only for about ten seconds; we can change this number later. I also know that I have to import the time module.

Okay, let's save this and run. Alright. It seems like the program is waiting for a few seconds before it opens the web browser.



Another item bites the dust.

Adding a Loop

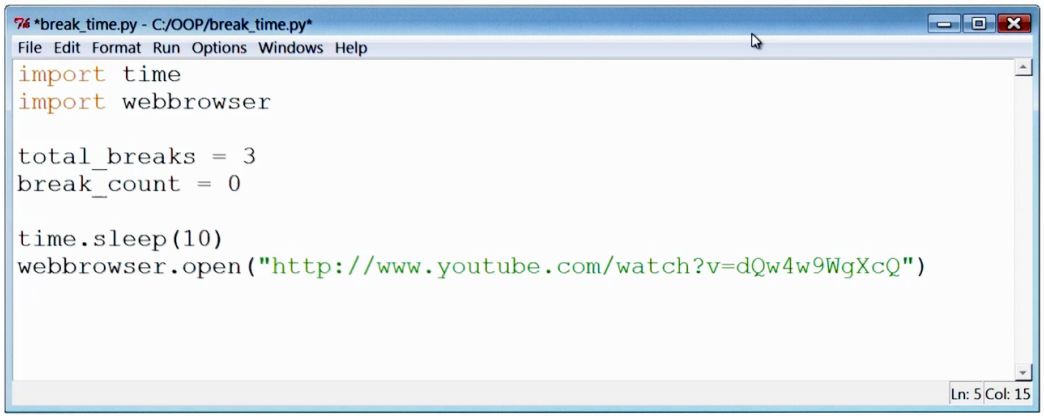
Now the next thing we have to do, is to put these two steps within a loop, so our program can prompt the user to take a break multiple times during the day. So your challenge is to add a loop to this code, so it prompts the user to take 3 breaks.

Now if you are confused about this task, there are some helpful links on loops in the instructor notes.

Question:

Adding a Loop (Solution)

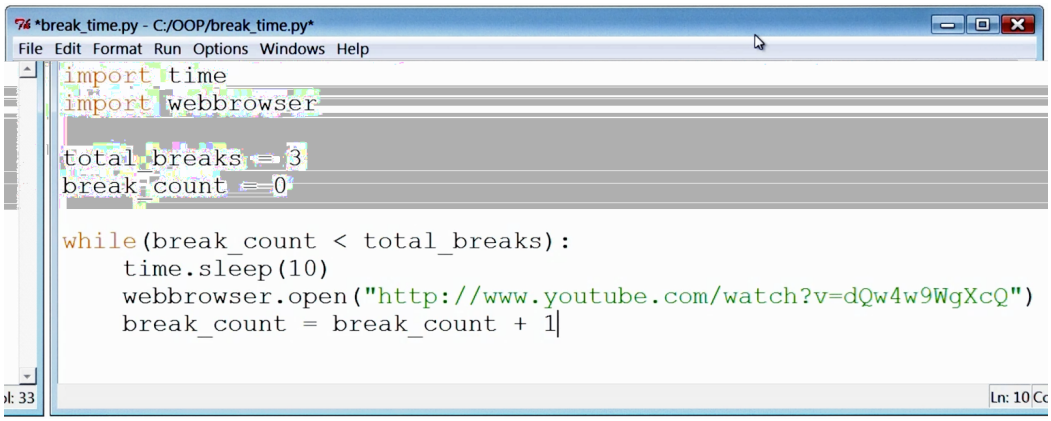
Here's one way of doing that. Say, I want to take three breaks throughout the day. I will use the break count variable to keep count of the number of breaks I've taken.



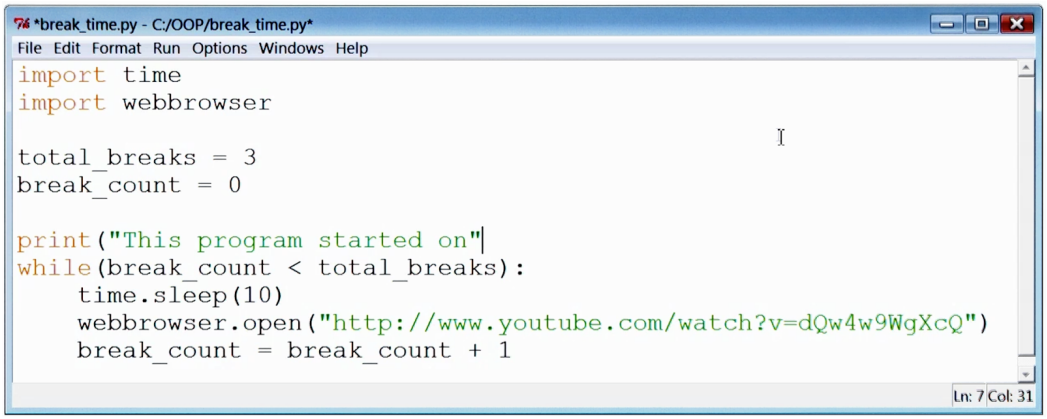
And then add a while loop, to make sure that this code runs three times.

By the way, if you want to see some information on how while loops work, there is a helpful link in the instructor notes.

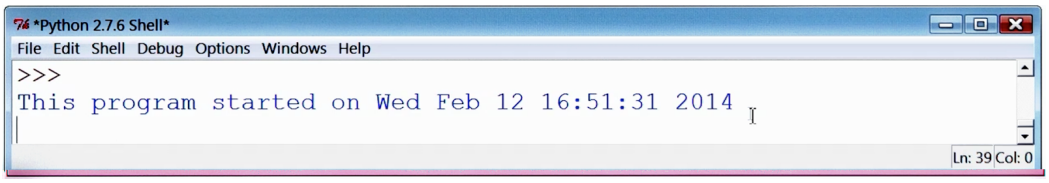
Now, if I run this program. The program will wait for ten seconds and play the song



and do that three times. Another handy addition to our program can be a print statement that tells us when our program began.



Now, how do I find the current time? When I have to do some testing like this, I start to use this output window, so I can import time here. Which, as you may guess, is a way to access time. And I know there is a function called ctime, or current time. That seems like the current time on my computer. Great. Back to the



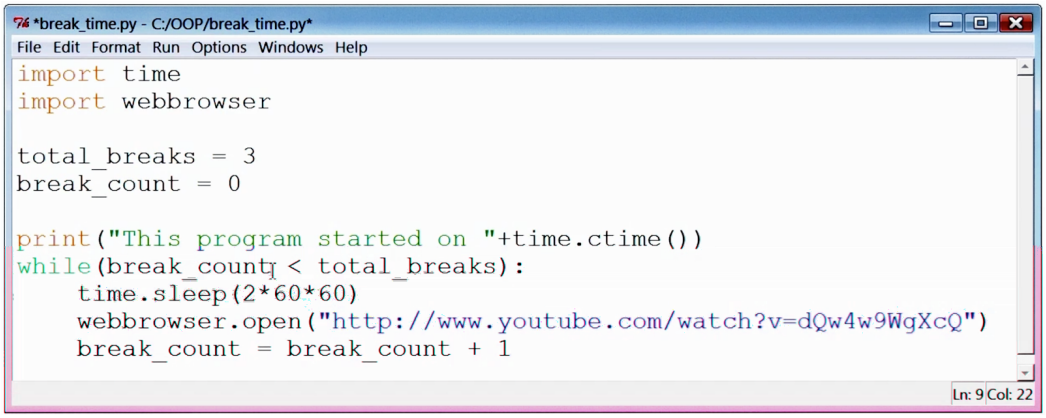
main program where I'll add this. Let me save and run this program.

Now, as soon as I run the program, I get a prompt, suggesting when I started the program. Ten seconds after that, a video is played which asks me to take a break.

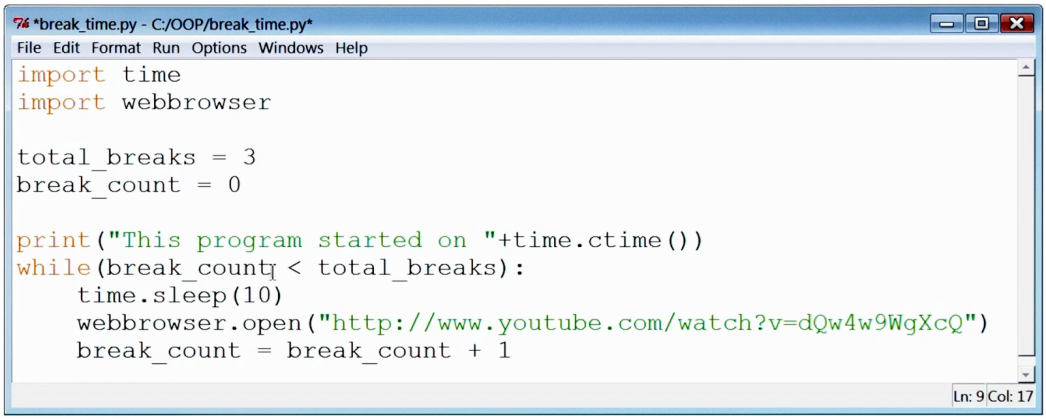
So far so good. Another ten seconds pass by and another suggestion to take a break. Now, if I want to stop this program midway, I can either restart IDLE or use Ctrl+C in the shell window, which will stop the execution of the program when it comes back from sleep.

Making the Program Wait Longer

Okay, so our program is lacking just one more thing. Let's say that we want to take a break after every two hours of work on the computer. I can increase the duration of delay from ten seconds to two hours. Now remember, the sleep function takes in seconds, so this number to the computer is two seconds and not two hours. To fix this, I can find out the number of seconds in two hours.



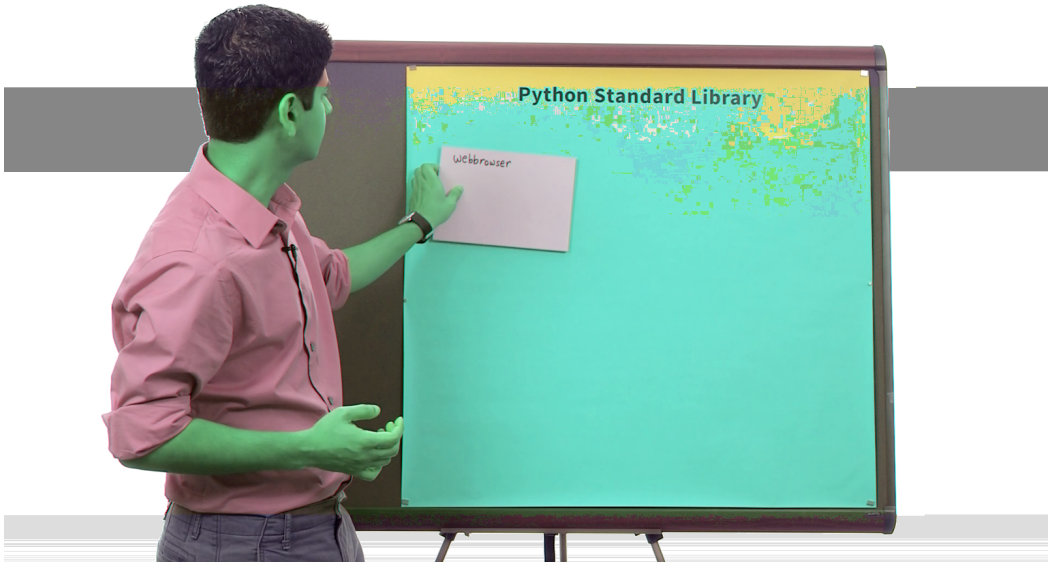
And use that instead. Since I'm still testing my program, I will keep the wait time to a manageable ten seconds.



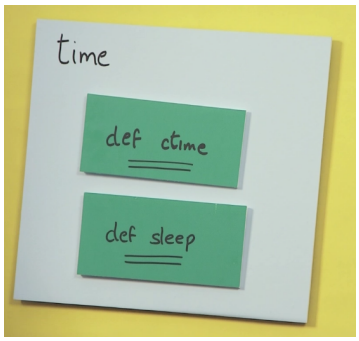
Okay, so now that we have written our first program, let's understand where functions like webbrowser.open and time.sleep are coming from.

Where Does webbrowser Come From

Now imagine that this yellow sheet of paper is the Python Standard Library. Imagine that this is what we got when we downloaded Python.



Inside Python is a file named webbrowser. And inside webbrowser is a function called open. Now this is the function that allowed us to play the YouTube video.



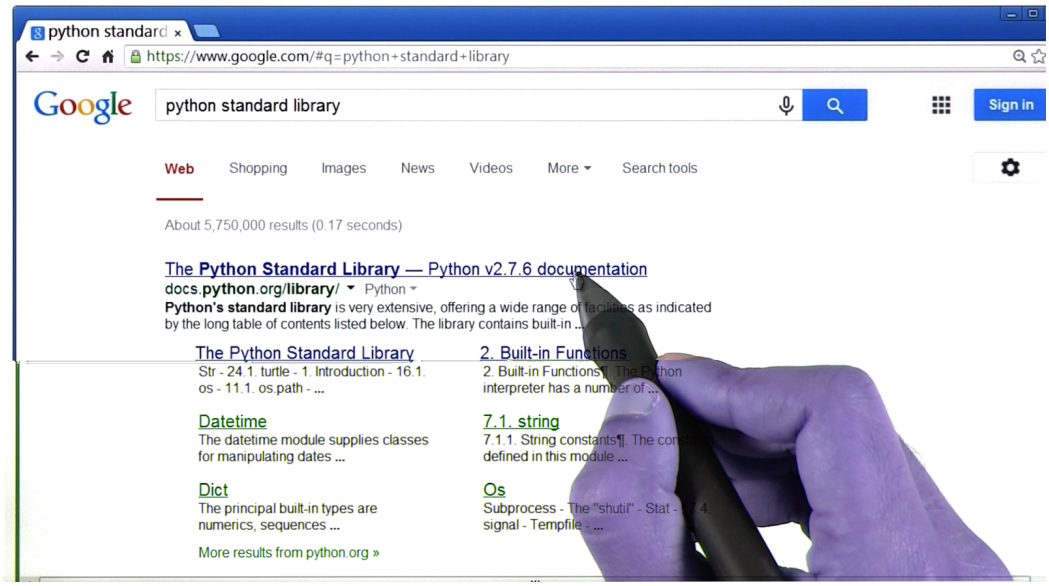
Much like webbrowser, there is another file or module inside the Python Standard Library. It's called time, and time has several functions defined inside of it. Two of them are, ctime which gives you the current time, and sleep, which suspends program animation for a little bit.

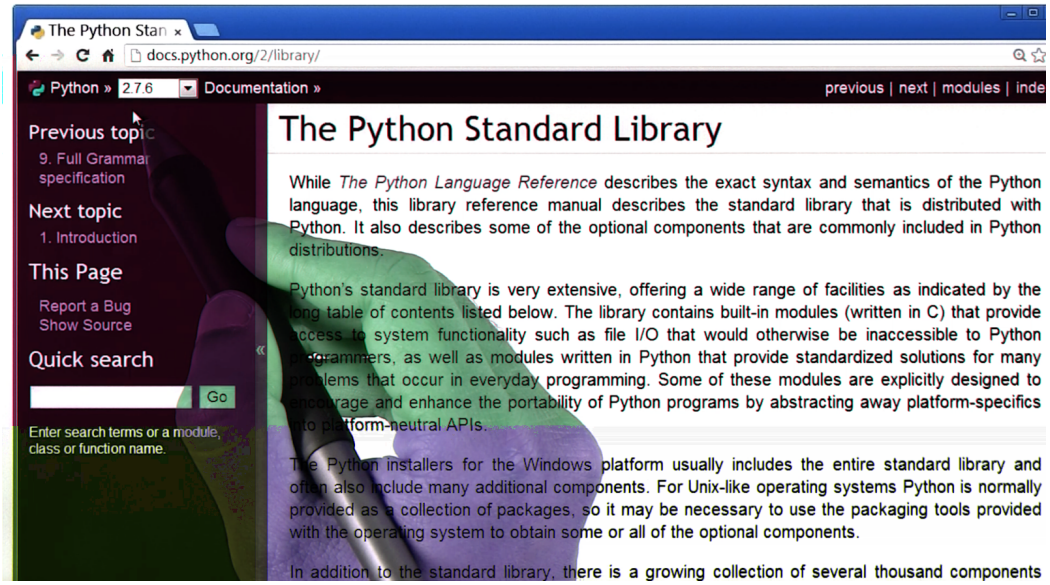
Now here's a thought, how does function sleep actually suspend or pause program flow for a given number of seconds? We don't really know how it does that behind the scenes. In much the same way, how does function open, opens up a webbrowser to play a YouTube video for us? We don't quite know how it does that behind the scenes also.

That detail is hidden from us, and this hiding of detail in programming is called abstraction. Now this idea of abstraction is a really powerful one in programming, because it allows us to focus on the program that we actually want to write which is the take a break program, and it empowers us to use these functions simply by reading their documentation. So lets read some documentation now and see if these functions actually exist in the Python Standard Library.

Reading webbrowser Documentation

Okay, so I will search for Python Standard Library, and I got to this documentation page. By the way, the link to this page is also available in the instructor notes.
I will check to make sure that I am reading documentation for the version of Python I downloaded, which is version 2.7.





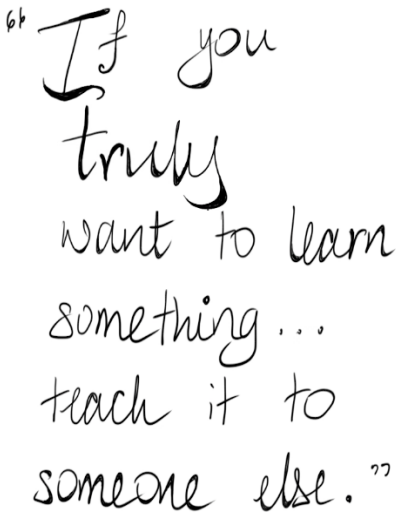
In here, I can scroll down to web browser. You will notice that it says here, that the web browser module provides a high level interface to allow displaying web based documents to users, which is really a fancy way of saying, it will show you websites.

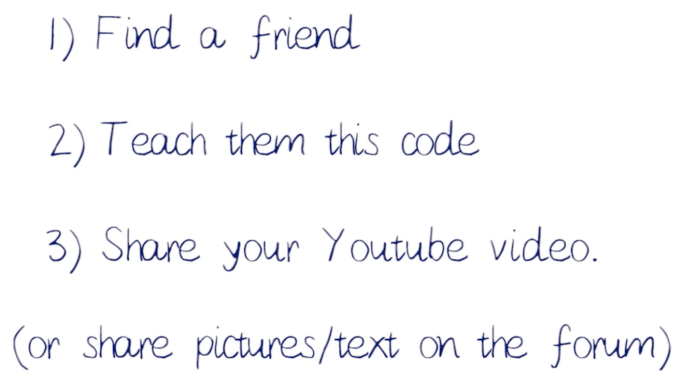
And if I scroll down, I can find the function, webbrowser.open, which takes in a URL and displays that URL using the default browser.

If I go back, I can also find the module named time. Here it is, and if I click on it, I can read its documentation. It says, this module provides various time related functions, and we use two of those functions. If you scroll down, you'll find time.ctime, which gives the current time of the computer, and time.sleep, which suspends execution for a given number of seconds.

Enhancing the Take a Break Project

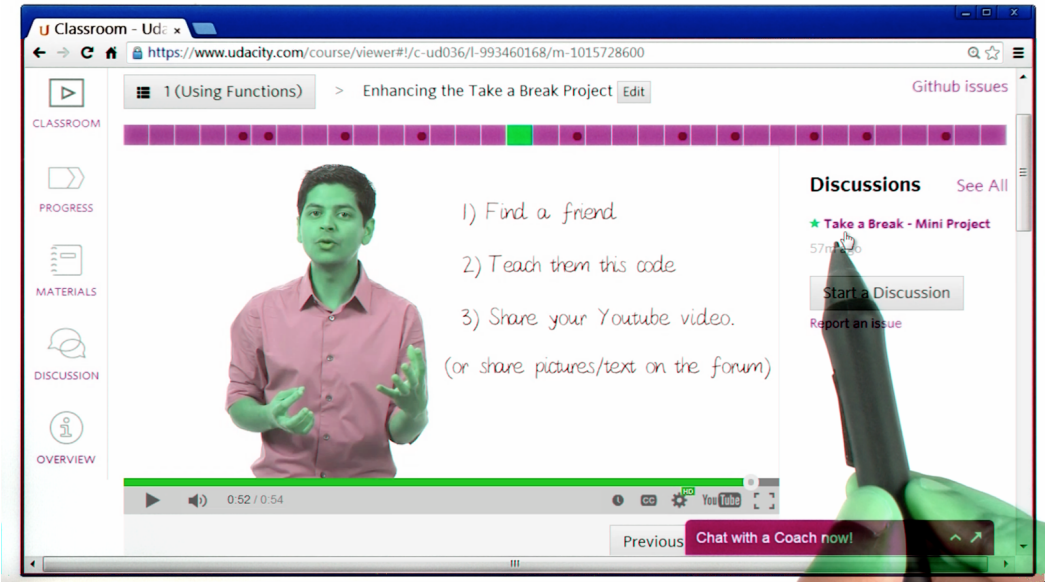
Okay, so here's your chance to demonstrate what you've learned thus far. You know, my computer science professor in college used to say, if you truly want to learn something, teach it to someone else. And that's what we are doing to do in this exercise. We want you to find a friend or a colleague that does not know much about computer programming at all. And then we want you to teach this program that we've written together to that individual. Now, while you're doing that, we want you to use your phone or a video camera to record a video of your conversation with that friend. Capture their reactions and then you can share that video with us on our discussion forum. Now, if you don't have access to a video camera, you can also share with us photos or some text describing your friend's reaction while you were teaching them this piece of code.
The next video we'll showcase how to share videos and photos on our discussion forum.



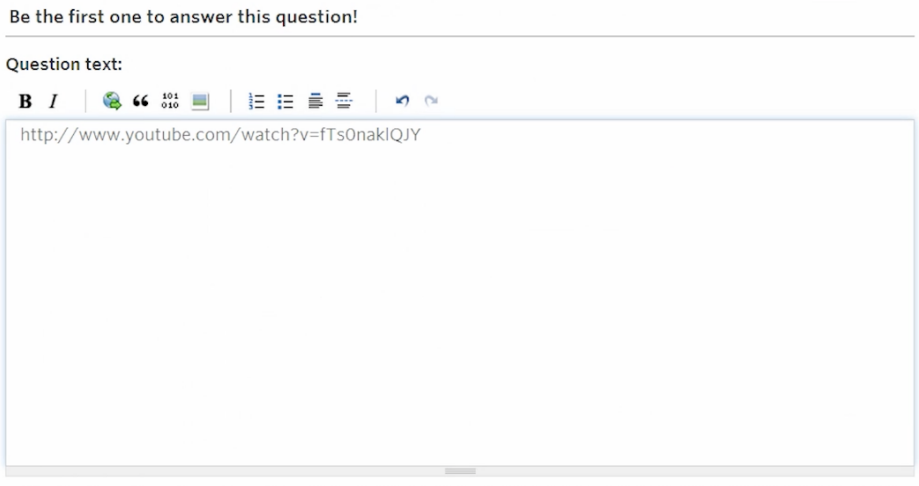


Take a Break - Mini Project

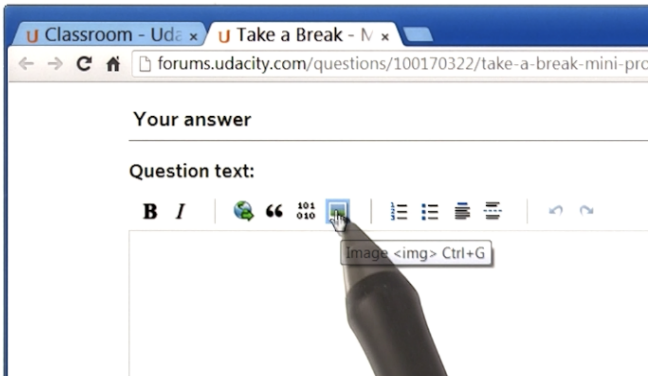
Okay, so to share videos and photos, I will click on the Discussion thread with a star. Now, the star means that I created this thread for you to submit your responses.



Once the discussion forum has opened, you can simply scroll down and add a YouTube link right here to the discussions.



You will notice that there is a YouTube video that is embedded right within the discussion forum. There. Now let's talk about how to upload a photo. To do that, I will click on this tiny photo icon, and then simply upload a photo from my computer.



That's the one I want to upload. And you will notice that much like the YouTube video, the photo is also uploaded right here within the discussion forums. Let me hit Submit, and done.

So here I am, back to the mini project, which is for you to teach the program that

we have written together, to a friend or a colleague. We also want you to use your smartphone to record a video of your conversation. And then share that YouTube video with us on the discussion forum. Oh, by the way, if you are an unable to record a video, we would love to see some photos or some text describing your conversation with your friend. After you've submitted your responses on the forum, make sure you check this box.

Question:

Take a Break - Mini Project

1. Teach the program we wrote to a friend or a colleague
2. Use your smart phone to record a video of that conversation
3. Share your YouTube video on the forum
   (if you can't record a video, upload photos or text describing the conversation with your friend)

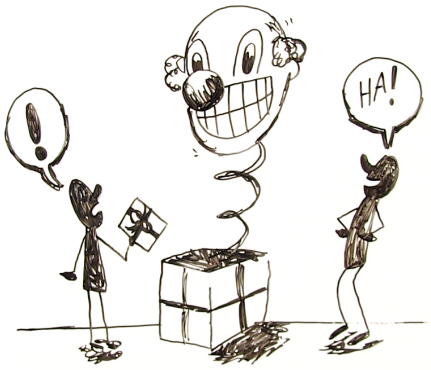
☐ Check this box after submitting your response on the forum

(To access the forum click "Take a Break - Mini Project" discussion thread)

Course Map

So, we've just seen one example of how functions can help us design the Take a Break program. Let's see another example of how functions can help make things easier.

Secret Message (Story)

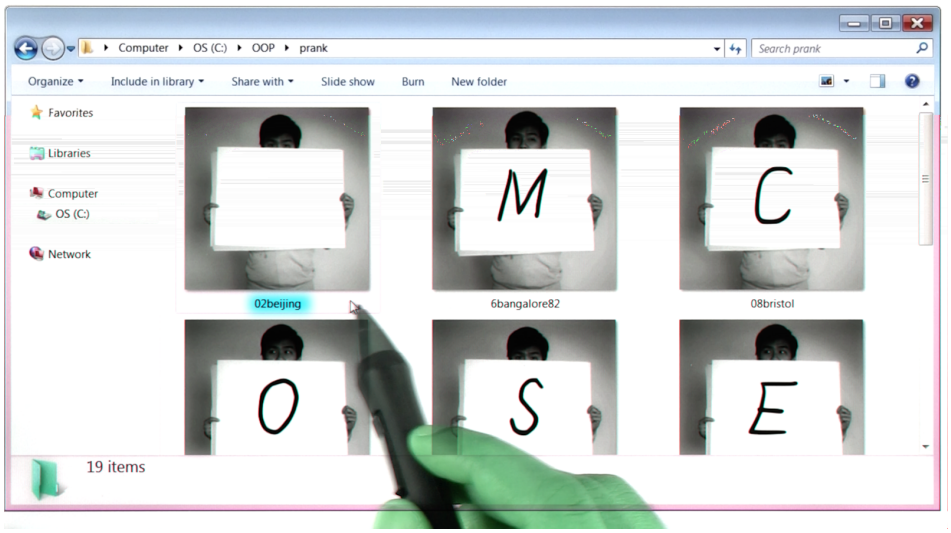


My friends and I, we play a lot of pranks on each other. Today, however, I was on the receiving end of one. This morning, I could not find my house keys. Just then, I got a text message from a friend. We have hidden your house keys, said the text message. To find them, you have to solve a puzzle. On your computer there is a folder with several photos. If you rename all the files by removing the numbers from the photo name, the photos will reveal a secret message and lead you to the house key.

This renaming of 50 files will take a long time. I can't wait to solve this puzzle so I can get my friends back.

Secret Message (Output)

So, here I have a folder on my computer with a bunch of photos. Now, you'll notice that the message in these photos is all jumbled up, we can't quite read it just yet. Now, if I zoom into these photos, you'll notice that the names of the photos, they have numbers in them.



And it's our task to remove those numbers. And I wrote a program that does just that. Let me run it. The output window shows all of the files that were renamed and if I look at the folders again, you'll notice that the photos have been renamed. Their names don't have any numbers in them anymore.

Also, if I zoom out just a little bit. You'll notice that the photos are now revealing a message. Which in this case is just, SOME SECRET MESSAGE. Let's build this program.

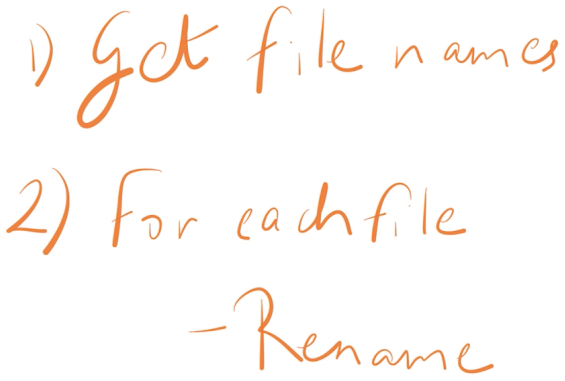
Question:

Planning a Secret Message

Now before I start coding, I want to ask you, what steps would you take to rename a bunch of files on your computer? Don't worry about writing any code right now. In simple English, just identify the steps you would need to make to create this program. Step one, do this. Step two, do that. You can submit your answer on the discussion forum, and while still there, you can read the ideas others have submitted.

One Way of Doing This

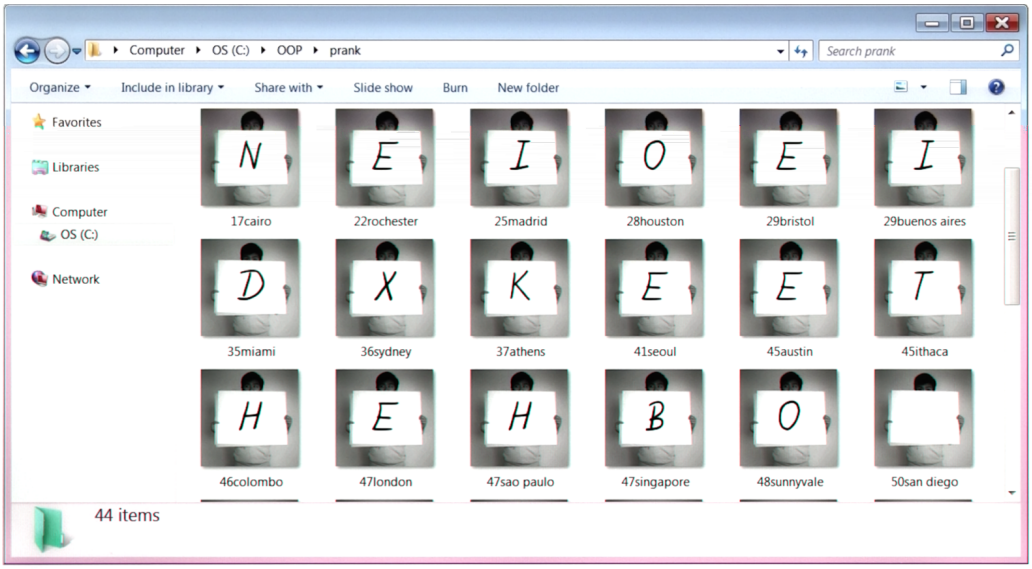
Thank you for sharing your responses. I will be providing feedback on the discussion forums periodically. Now, here's one way in which we can solve this problem. We have to write a program that somehow looks at the right folder and gets for us all of the filenames from that folder. So let me write this down. As the first step we have to get all the file names.



Once we have all of the file names, for each of the filename, what we want the program to do is rename those files. So as a second step, for each file, we want to rename it. And by rename I mean remove all of the numbers from the file name. Let's build this. I encourage you to follow along.

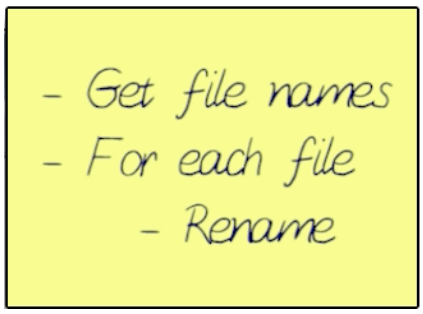
Opening a File

Now you can do this with existing files on your computer, but if you want to follow along this example, feel free to download the zip file in the instructor notes. When you unzip that file, you'll have a folder much like this one, with about 50 photos.



Okay, so what I've done thus far is just created a new file in IDLE, and I called it rename_files.py. And inside that, I've created an empty function by the same name. Then I added comments of the two main things I have to do in my program. By the way, notice that the function right now is empty, and if I saved and ran the program, it would essentially do nothing.

The first thing I have to do, is get the file names from a given folder. So Google can help with that. Let me just type in Find file names in a folder in Python.



Now I read through the results, and I got to this stack overflow.com page. And here I read that there is this thing called os.listdir, which will get you everything that's in a given directory. Now it turns out that there is a module in Python called os, short for operating system. And that has a function inside it called listdir, which as its name suggests, lists everything that's in a given directory.

So let's add this to the code and see what it does. Now this function listdir takes in a path of the folder that contains our photos. So I'll go back to my folder. Copy its address, and paste it. Now for those of you who are on a Mac, you can use a document in the instructor notes, that will help you get the path of your folder. On

a Windows machine however, right before where the path begins, I will add this letter r, and r stands for raw path, and it tells Python hey, take this string as it is, and don't interpret it any other way.

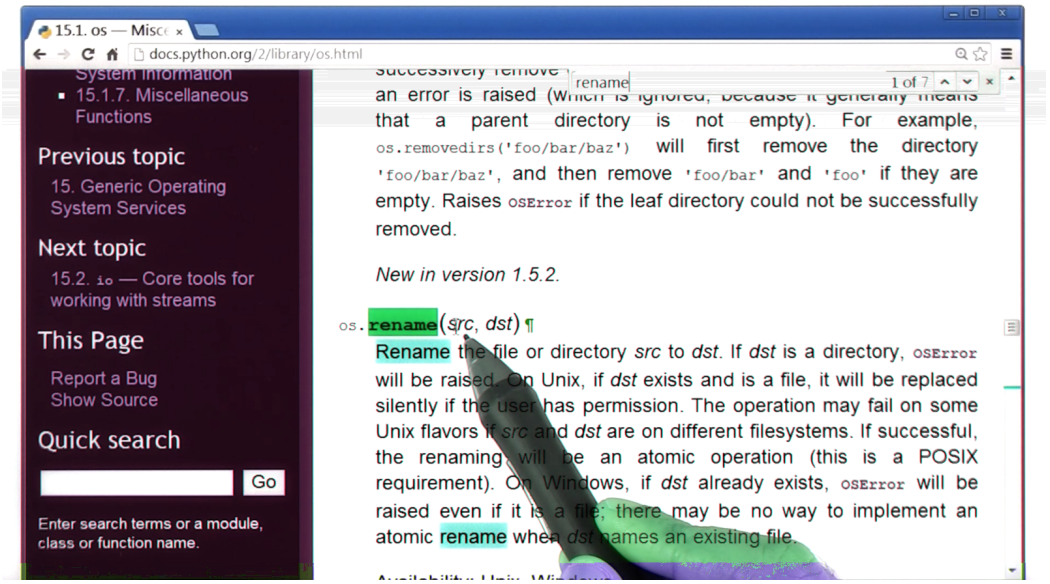
So here let me just save this in a variable, and print that out. Let me save, and then run, and oh wow, we get a list of all of the file names inside that folder. It's an ugly looking list, but a list nonetheless. Alright, step one of the program is done.

Changing File Names

Okay, let's do step two now, which is to rename files. Now, I provided the link to the documentation for the module OS in the instructor notes. I want you to scan that documentation and find out which function we can use to rename files. By the way, this sort of a search is done quite commonly by Software Engineers. Once you've found that function Enter the name of that function in the box provided.

Checking os Documentation

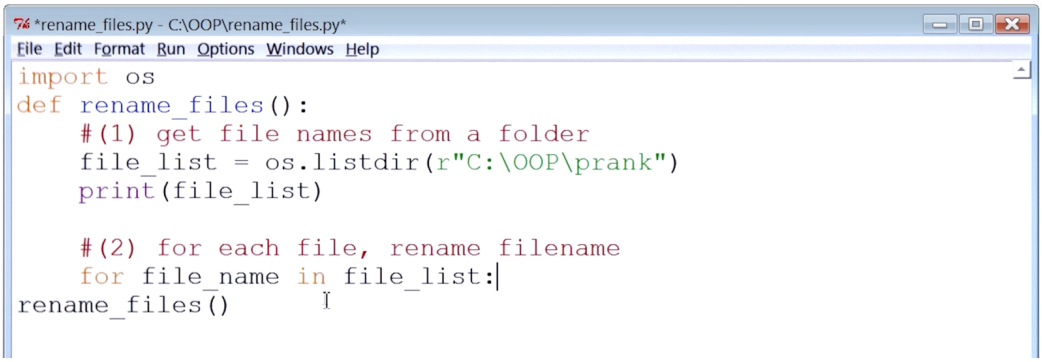
So, here I am in the Python documentation for OS and let me just search for something that can help us rename a file. Lo and behold, there is a rename function we could use.



It takes the source or the current name of the file and changes it to the destination or the new name of the file. Let's use this function.

Renaming Files

So, I know I want to rename all of my files. And I remember to rename 50 photos, I think I'll have to use some sort of a loop. So, I'll just write one down now by saying, for file_name, in file_list. Now, bear in mind, file_list is something we've seen before. In fact, we printed it out. This was a list of all of the photos inside the folder. And what this for loop is going to allow us to do is work with each photo file one at a time.

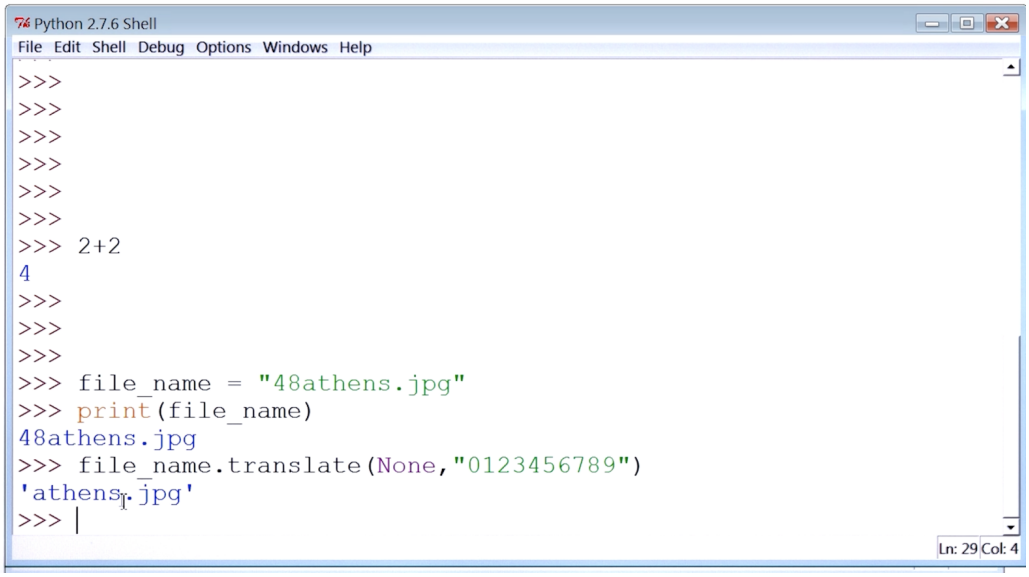


So, for each photo, I want to change its name. And the old name is in file_name. And the new name, well, I know the new name is devoid of any numbers. But how to do that, I still don't know. And this means I'll have to do some experimentation. And to run those experiments I generally use the Python Shell window, where I can just start typing and seeing the result really quickly. Let me make more room for this window so you can see it properly.

So, say, my file name was the following string; 48athens.jpg. Let me print that out, okay, good. Now, previously I Googled to find out that there is a string function called translate that takes up to two arguments.

```
string.translate(table, list of characters to remove)
```

The first argument is a table. Which translates one set of characters to another set of characters and since we don't have that, I can use the keyword None. And the second is a list of all characters that we want to remove from the string. And those I know are numbers, so that will be zero, one, two, three, four, five, six, seven, eight, nine. All of those numbers. Let me try that. Oh hey, look, the file name now has no numbers in it.



So, because that experiment worked, I will go back to the code and add this file_ name.translate function into my code.

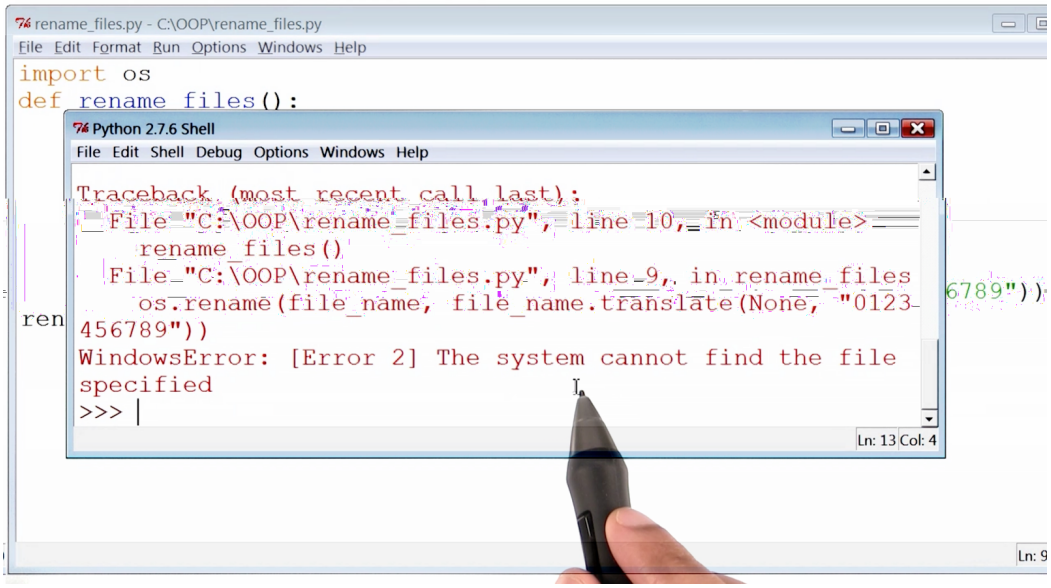
Question: What is the Error

Okay. So we are back to the code and all I have done is added the translate function to our program. So what this code is doing now, is saying, for each file or for each photo, inside our folder, rename it. Here is the old file name and here is the new file name devoid of any numbers.

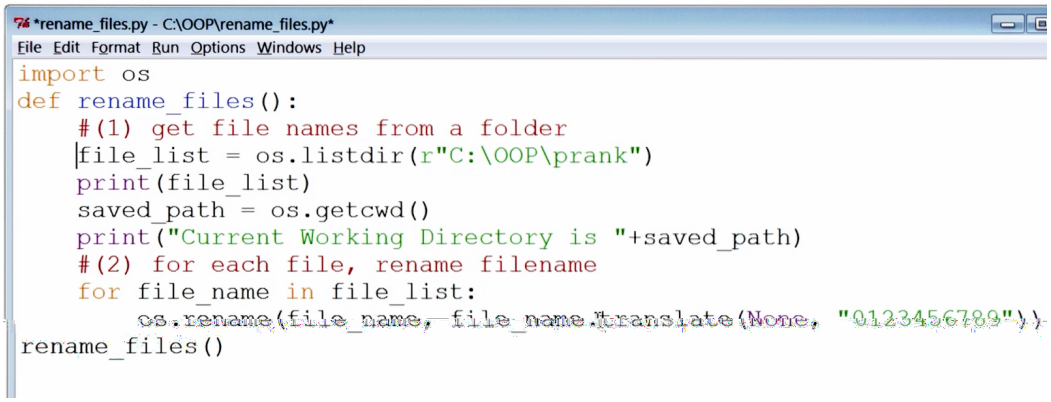
Now my hypothesis is that if I save and run this program, all of the photo files will be renamed and we'll see the secret message. So let me go ahead and save it and run the program. Oh wow. That clearly did not work. Would you mind reading through this editor and telling us what you think is the problem? Once you have a hypothesis, feel free to enter it into the box provided.

Squashing the Bug

So the error suggests that the system or the program, it can not find the file specified. You know, that's really interesting because at one point we were able to find all of the files. In fact we printed out all of the file names.

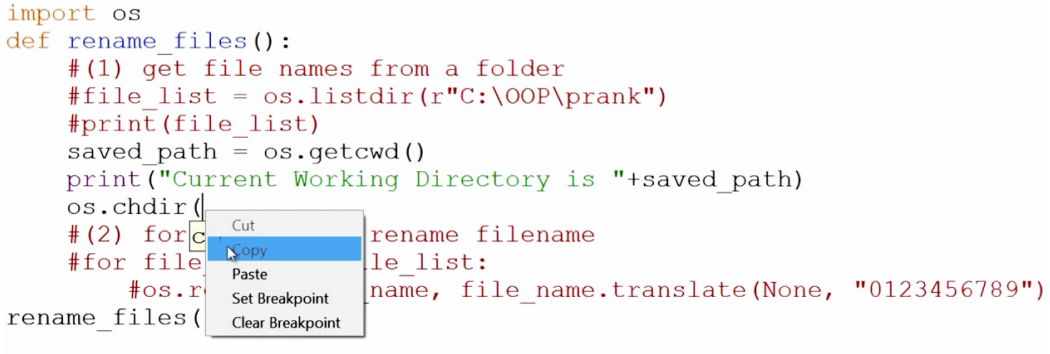


Okay, let's continue to read the error. It says that the error is in line 9, and it's happening around os.rename. This makes me wonder if the program is actually looking at the right folder when it's trying to rename the files. So going back to our program, I know there is this function called os.getcwd. CWD stands for Current Working Directory. Let me see if that in a variable and print it.



And I will comment everything else out for the time being. Let me Save, and Run. It seems that the program's Current Working Directory is this folder called OOP, which resides in the C drive. And if I go back to my program, I know that my files or my photos are inside this folder called prank, which is inside OOP which resides in the C drive.

No wonder the program can't find any of the files. It's looking inside OOP. Meanwhile, all of the files are inside the folder prank. To fix this, I can use the change directory function. And with this function I can ask the program to look at the folder where my files actually reside, which is this folder right here. So I'm going to copy that, and I'm going to paste it here.



And then let me uncomment some of the lines I'd commented out before. Towards the end of the function, I will change the path back to how I found it. Let me Save, and Run the program one more time. Hmmm, the program didn't quite throw an adder this time. But now I want to check to see if the files have actually been renamed.

So here we are back at our folder, and you'll notice that the names of the files don't have any numbers any more. They've been renamed. And if I zoom out a little bit, you'll notice that the photos will reveal a secret message, which is that the keys are in the closet behind the shoebox.

All right, it seemed like our program worked. Now, before we finish this project, my final recommendation in terms of improving it, is to add a print statement each time we change the name of a file. So here I am printing the old name of the file, and here is its new name.

Rename Troubles

Now that our code has worked, I want you to think about the following two scenarios. What would happen if we try to rename a file that does not exist in our folder? Or, if we try to rename a file to a name that already exists in our folder? You can submit your answers on the discussion forum. After you've done that, make sure to check this box before you continue.

What would happen if:

a) we try to rename a file that does not exist

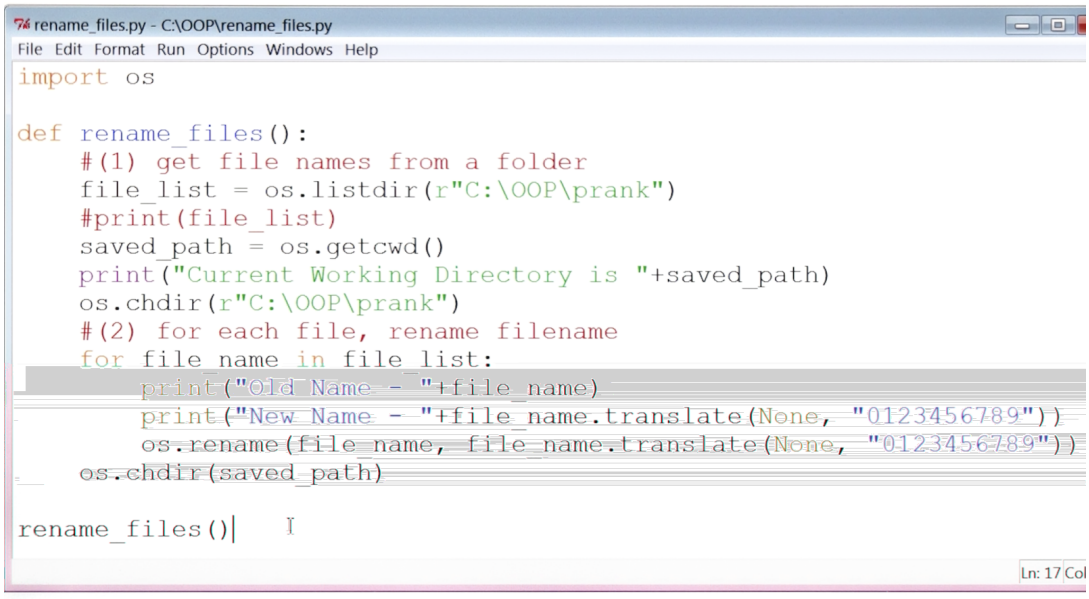
b) we try to rename a file to a name that already exists in the folder

Submit your answers on the discussion forum

☐ Check this box after submitting your response on the forum
(To access the forum click "Rename Troubles" discussion thread)

Exceptions

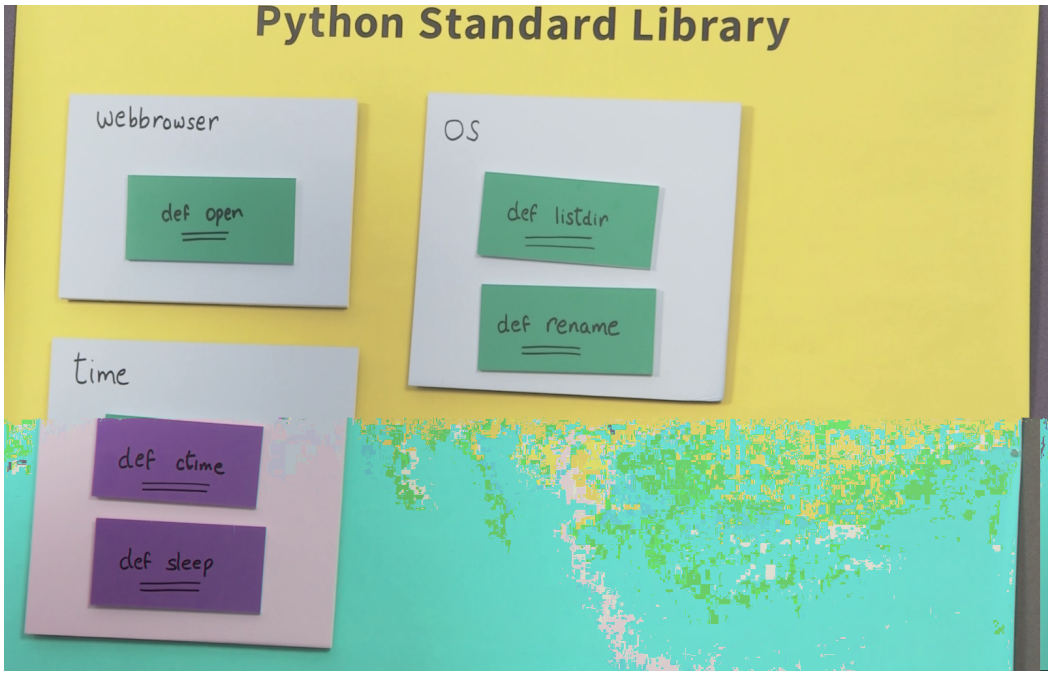
Thank you for sharing your thoughts. Now, if any one of these two scenarios occurs, the program that we wrote will throw an error. We call this error an exception. I want you to put a pin in this thought as we will return to this idea in the later lessons of this course.



Okay, so we are back at our code again. And now I'm curious to see where the different functions of OS like listdir and rename are coming from. Let's find out.

Where Does os Come From

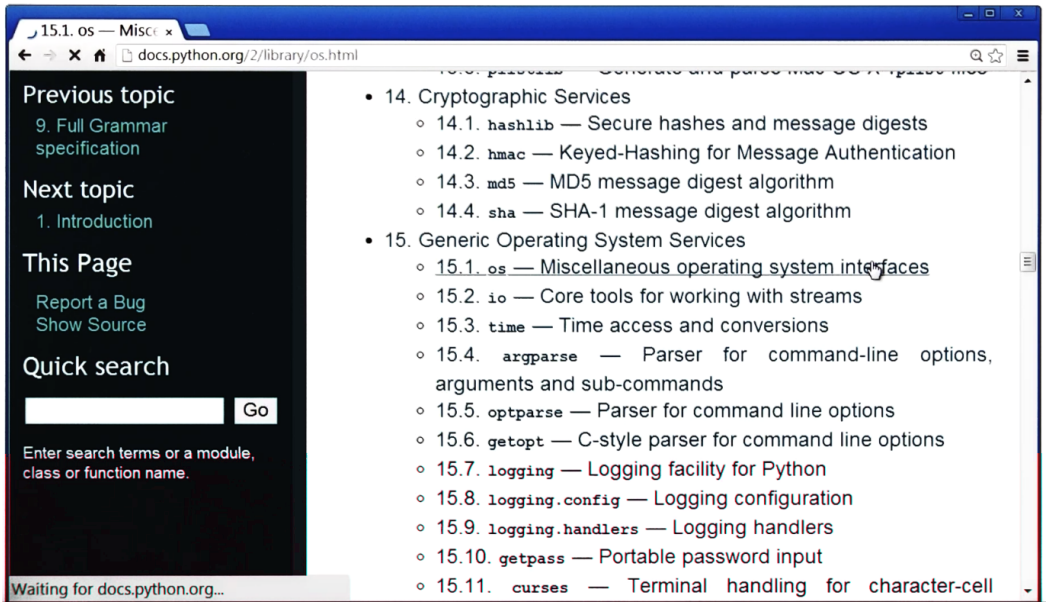
So, much like web browser and time, Python has another module inside it called OS, which is short for operating system.



Inside OS are several functions, two of them are listdir, this lists out all the files in a given directory and rename, which renames a given file. Don't take my word for it, let's look for them in the documentation.

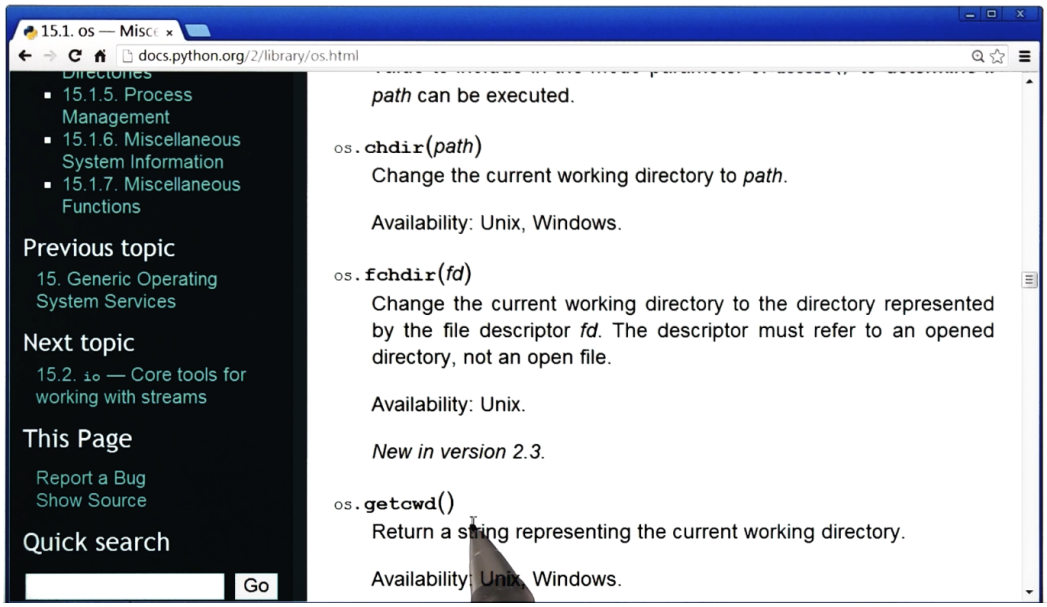
Reading os Documentation

Okay, so here is the Python documentation, and if I scroll down, I can find the os module.



Let me click on it. And in here, we can find all of the OS related functions that we

used. So here is os.chdir or change directory, and here is os.getcwd, or get current working directory.



Let me scroll down some more. And if I do that I find os.listdir, which lists all of the files within a given directory and on scrolling down even further, I find os.rename.

By the way, I want to make a quick note here that even though we don't know how functions like rename really work behind the scenes. We can read their documentation and use them just fine. This hiding of detail behind documentation, in computer science, is called abstraction.

Secret Message

So here is your mini project. We want you to create your very own secret message, for a friend, or a loved one. Now, the secret message could be anything from you wishing them a great day to you telling them how happy you are to have them in your life. You can start by showing them the jumbled up version of your message. Now, we have provided some images of the alphabet in the instructor notes. You can use them if you'd like. Then run the program and reveal your secret message to your friend. Your assignment is to share videos or photos of your friend's reaction with us on the discussion forum. Once you're done, check this box before you continue.

Secret Message - Mini Project

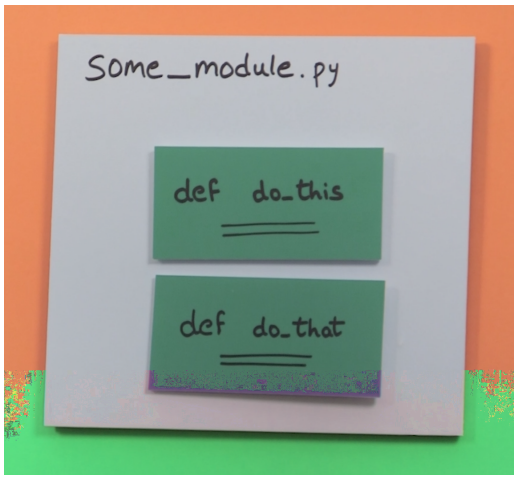
1. Create your own secret message for a friend (or a loved one)
2. Show them the jumbled up message; then run your program

3. Reveal the secret message to your friend
4. Share videos / photos of your friend's reaction on the forum

☐ Check this box after submitting your response on the forum
(To access the forum click "Secret Message - Mini Project" discussion thread)

Edge Case

So thus far, what we've been doing is writing a lot of functions. We generally start by creating an empty Python file. Let's call it some_module.py, in this case. And then we add functions to it. Functions like do_this(). And another function, let's call it do_that(), for instance. And, essentially what we're doing is writing code, one line at a time. Almost like a recipe and frankly that technique has been working for us thus far. So, let's continue to use this technique while solving the next programming challenge which is building a movie website.



When Functions Do Not Suffice

Favorite Movies

So let's assume we want to make a movies website. Much like this one. Now, if you were to make this based on what we have been doing this far, what we would do is start with an empty programming file, and we would like it something like movies.py. Now, since a movie has a lot of data associated with it, like the movie's title, its storyline, we would add that to our program. Also, we would want to do things with our movies, like show the movies trailer or show or print all of the movies information. So we would add those function to our code as well.

movies.py

movies.py - /Users/Kunal/Desktop/Kunal/Udacity/CS 102/Slides/Lesson1/movies.py

```
title
storyline

def show_trailer():
    # Open browser and play trailer


def show_info():
    # Print movie information


```

Ln: 9 Col: 29

So far, so good. So, further imagine that we want to run this program. And we want to play a movie's trailer. Well, which movie's trailer? To make that work, we would have to provide the show_trailer function some information or arguments, like this. In this case we are saying hey, play Toy Story's, youtube_url. That seems manageable enough. Now let's try to print out a movie's information. Well, which movie's information? Again we would have to supply some sort of information or arguments, to the show_info function.

movies.py

```
movies.py – /Users/Kunal/Desktop/Kunal/Udacity/CS 102/Slides/Lesson1/movies.py
title
storyline

def show_trailer(title, youtube_url):
    # Open browser and play trailer


def show_info(title, storyline, release_date
              rating, youtube_url
              director, box_office):
    # Print movie information
```

```
>>> movies.show_trailer("Toy Story", "http://www.youtube.com/watch?v=dQw4w9WgXcQ")

>>> movies.show_info("Toy Story", "Andy's Toys Come to Life", "Nov 22, 1995",
                     8, "http://www.youtube.com/watch?v=dQw4w9WgXcQ",
                     "John Lasseter" $30,000,000)
```

Arguments like the movie's title, its storyline, the release_date, rating, youtube_url, director, box_office, et cetera.

Now, I don't know about you, but this function show_info is already getting too convoluted for me. Imagine what happens if we have to supply more information to it. Like the movie's cast or the movie's reviews.

What we really want to do is define a template for our movie and record all of the data that needs to go into that template. Data like the move's title, it's storyline and functions like show_trailer and show information and then simply say, hey, Toy Story is a movie and so is Avatar. And then have the ability to say, show me Toy Story's trailer or show me Avatar's information. No arguments necessary. Now, one way of doing this, just by using functions, is to take the template we have defined and make multiple copies of it.

Template

```
movies.py – /Users/Kunal/Desktop/Kunal/Udacity/CS 102/Slides/
title
storyline

def show_trailer():
    # Open browser and play trailer


def show_info():
    # Print movie information
```

toy_story.py

```
movies.py – /Users/Kunal/Desktop/Kunal/Udacity/CS 102/Slides/
title
storyline

def show_trailer():
    # Open browser and play trailer


def show_info():
    # Print movie information
```

```
>>> toy_story.show_trailer()
```

avatar.py

```
movies.py – /Users/Kunal/Desktop/Kunal/Udacity/CS 102/Slides/
title
storyline

def show_trailer():
    # Open browser and play trailer


def show_info():
    # Print movie information
```

```
>>> avatar.show_info()
```

So, we could make a copy of this template and call it toy_story.py, and make

another copy of this template, and call it avatar.py. Now we will be able to say things like toy_story.show_trailer and avatar.show_info.

Now, this doesn't seem like a very smart solution to me. Imagine what happens, if we have to add more pieces of data to our template. Or if you have to rename one of our functions. Say, from, show_trailer to play_trailer. If that happens, we will have to make those changes in each and every copy that we make. This doesn't seem like a very smart thing to do.

So what we really need is a way of making copies of a template, without having multiple files. We need the ability to define a template for something, like we did for movies, and then be able to say, hey, Toy Story is a type of that template, and so is Avatar. Avatar is also a type of that template. We need something new, and that new thing in programming is called a class. So what are classes and how do you use them? Let's find out in the next few lessons.