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<b>Started on</b>	Saturday, September 10, 2022, 12:40 PM
<b>State</b>	Finished
<b>Completed on</b>	Sunday, September 11, 2022, 7:35 AM
<b>Time taken</b>	18 hours 54 mins
<b>Marks</b>	24.80/30.00
<b>Grade</b>	<b>82.67</b> out of 100.00

Question 1

Correct

1.00 points out of 1.00

Flag question

In this tutorial, we will explore how to obtain Jupyter notebooks from GitHub and specifically look at how to use a notebook to remove the instrument response from seismograms using ObsPy to calculate a local earthquake magnitude. As discussed in the webinar for this tutorial, you can also use SAC to remove the instrument response with the `transfer` command.

To begin the tutorial, click on [Read the Guide](#) to start learning about GitHub. I like how the Guide is active, asking you to create an account with GitHub ([github.com](#)) and provides instructions for getting started. Although I can't require you to create an account, I strongly encourage you to do so. It is my sincere hope that with the coding skills you have developed during this course, you will get a chance to develop some code for your future classes, work, research, or even just for fun. And when you do, I hope you will share the code with others via GitHub.

What is the order of tasks when developing code based on what the guide explains?

Create a branch	2	✓
Clone a repository	not required	✓
Change the code	3	✓
Open a pull request	5	✓
Merge a branch	6	✓
Create a repository	1	✓
Commit changes to the code	4	✓

Check

Correct

Marks for this submission: 1.00/1.00.

Question 2

Correct

1.00 points out of 1.00

Flag question

Perhaps the most important aspect of using GitHub is the ability to download code from it. However, I find that information about how to do this takes a few more clicks to find on the GitHub website. You can read about how to do this here:

<https://docs.github.com/en/github/creating-cloning-and-archiving-repositories/cloning-a-repository>

This guide explains how to create a local copy of software that is stored on the GitHub website. Which of the following would be the command to download a repository of software on your OSL desktop?

Select one:

☐ a. git download "https://github.com/username/repository"

☐ b. github create "https://github.com/username/repository"

☒ c. git clone "https://github.com/username/repository" ✓

☐ d. github clone "https://github.com/username/repository"

☐ e. git create "https://github.com/username/repository"

☐ f. github download "https://github.com/username/repository"

Check

Correct

Marks for this submission: 1.00/1.00.

Question 3

Correct

1.00 points out of 1.00

Flag question

This was a very brief introduction to GitHub, but hopefully it is enough to give you a flavor of how easy and useful it is. Let's go back to the main [GitHub.com](#) page and you should see a Search box in the upper left that says "Search or jump to:". You can search for any variety of code on GitHub using this, but today I would like you to search for "local earthquake magnitude" as that is what we are interested in calculating today. What repository do you find?

*Note: If you did not create an account, you can still search for "local earthquake magnitude" on GitHub.com, but the search box will be in the upper right and say "Search GitHub"*

Select one:

☐ a. iris-edu/localmag

☐ b. obspy/localmag

☐ c. seismohio/localeqmag

☒ d. seismohio/localmag ✓ Correct. This is my GitHub account and the respository I made for this assignment.

☐ e. obspy/localeqmag

☐ f. iris-edu/localeqmag

Check

Correct

Marks for this submission: 1.00/1.00.

Question 4

Correct

1.00 points out of 1.00

Flag question

Click on the repository that is the answer to the previous question. Which files are included in this repository?

Select one or more:

☒ a. A Jupyter notebook ✓ 1 of 2 correct answers

☐ b. A Python script

☐ c. No files are present in this repository yet

☐ d. Compiled code

☒ e. A README file ✓ 1 of 2 correct answers

Check

Correct

Marks for this submission: 1.00/1.00.

Question 5

Correct

1.00 points out of 1.00

Flag question

What is the URL of this repository such that you can download it to your OSL desktop? Recall that it should have this format: "https://github.com/username/respository"

Select one:

☐ a. https://git.com/seismohio/localmag/localmag.ipynb

☐ b. https://git.com/localmag

☒ c. https://github.com/seismohio/localmag ✓ Correct. This is what you will want to use in the next question.

☐ d. https://github.com/localmag/localmag.ipynb

☐ e. https://github.com/seismohio/localmag/localmag.ipynb

☐ f. https://git.com/localmag/localmag.ipynb

☐ g. https://git.com/seismohio/localmag

☐ h. https://github.com/localmag

Check

Correct

Marks for this submission: 1.00/1.00.

Question 6

Correct

Now log into OSL and move into the **jupyter** directory you created in a previous assignment. Once you are inside the **jupyter** directory, which command do you type to download my GitHub repository to this directory? Type in the full command.

1.00 points out of 1.00

Flag question

Answer:  ✓

Check

Correct. Go ahead and run this now: `git clone "https://github.com/seismohio/localmag"`

Correct

Marks for this submission: 1.00/1.00.

Question 7

Correct

1.00 points out of 1.00

Flag question

What does running the command from the previous question create in the jupyter directory?

Select one:

- ☐ a. a file called localmag
- ☐ b. a file called README.md
- ☐ c. a directory called git
- ☐ d. a directory called clone
- ☐ e. a directory called seismohio
- ☒ f. a directory called localmag ✓
- ☐ g. a file called localmag.ipynb
- ☐ h. nothing

Check

Correct

Marks for this submission: 1.00/1.00.

Question 8

Correct

1.00 points out of 1.00

Flag question

What files are inside the directory that is created?

Select one or more:

- ☐ a. jupyter
- ☐ b. seismohio
- ☐ c. Nothing
- ☒ d. README.md ✓ 1 of 2 correct answers.
- ☒ e. localmag.ipynb ✓ 1 of 2 correct answers.
- ☐ f. localmag

Check

Correct

Marks for this submission: 1.00/1.00.

Question 9

Correct

1.00 points out of 1.00

Flag question

Go ahead and run

`jupyter notebook`

and then choose to open the Jupyter notebook file with python. Which file is it?

Select one:

- ☐ a. seismohio
- ☐ b. localmag
- ☐ c. README.md
- ☒ d. localmag.ipynb ✓
- ☐ e. jupyter

Check

Correct

Marks for this submission: 1.00/1.00.

Question 10

Correct

1.00 points out of 1.00

Flag question

When the Jupyter Notebook loads, you should see a brief introduction in a Markdown cell, and then a code cell with some imports. Many of these will look familiar from our previous tutorials, but there are a couple new ones as well. Which of the imports will be used for determining the distance between an earthquake and a station? You might want to use some web searching to help if you are not sure.

Select one:

- ☐ a. import os
- ☐ b. from obspy import UTCDateTime, read, read\_inventory
- ☐ c. from obspy.clients.fdsn import Client
- ☐ d. from math import log10
- ☒ e. from obspy.geodetics import gps2dist\_azimuth ✓
- ☐ f. from obspy.clients.fdsn.mass\_downloader import CircularDomain, Restrictions, MassDownloader

Check

Correct

Marks for this submission: 1.00/1.00.

Question 11

Correct

1.00 points out of 1.00

Flag question

Which of the imports will be used for downloading a large number of waveforms with a single command?

Select one:

- ☐ a. import os
- ☒ b. from obspy.clients.fdsn.mass\_downloader import CircularDomain, Restrictions, MassDownloader ✓
- ☐ c. from obspy.geodetics import gps2dist\_azimuth
- ☐ d. from math import log10
- ☐ e. from obspy import UTCDateTime, read, read\_inventory
- ☐ f. from obspy.clients.fdsn import Client

Check

Correct

Marks for this submission: 1.00/1.00.

Question 12

Correct

0.67 points out of 1.00

Flag question

If you have not already done so, go ahead and Run the code in the imports Code cell. The next Markdown box describes that this notebook downloads a particular earthquake from the Eastern Tennessee Seismic Zone by default. If you go to the USGS website for this earthquake, what is the primary type of focal mechanism for this earthquake?

Select one:

- ☐ a. thrust faulting
- ☐ b. reverse faulting
- ☒ c. left-lateral strike slip faulting ✓
- ☐ d. normal faulting
- ☐ e. right-lateral strike slip faulting

Check

Correct

Marks for this submission: 1.00/1.00. Accounting for previous tries, this gives **0.67/1.00**.

Question 13

Correct

0.80 points out of 1.00

Flag question

Returning to the Jupyter notebook, you can Run the next Code cell that sets the variables for the earthquake catalog search that by default would return the Eastern Tennessee Seismic Zone earthquake. However, you should note that the Markdown cell above it describes that you could use this same code to calculate the local magnitude for an earthquake not in the catalog. Which information would you need to input for a non-catalog event to accomplish this?

Select one or more:

☒ a. event origin time ✓ 1 of 3 correct answers.

☐ b. event moment magnitude

☒ c. event longitude ✓ 1 of 3 correct answers.

☒ d. event latitude ✓ 1 of 3 correct answers.

☐ e. event focal mechanism

Check

Correct

Marks for this submission: 1.00/1.00. Accounting for previous tries, this gives 0.80/1.00.

Question 14

Correct

0.67 points out of 1.00

Flag question

Now you can run the next Code cell that prints what is returned from the earthquake catalog search. I know it may be confusing that we will be determining the local magnitude of an earthquake that already has a magnitude calculated in the catalog, but this is just meant to be an educational example. It turns out though, that the type of magnitude reported in the catalog for this earthquake is different than a local magnitude (typically written as  $M_L$ ), so we can compare the answer we get with that in the catalog to see if the different techniques result in a different answer. What is the magnitude information that is reported in the catalog?

Select one:

☐ a. 3.8 local magnitude

☐ b. 3.72 body-wave magnitude

☐ c. 3.8 body-wave magnitude

☐ d. 3.72 moment magnitude

☐ e. 3.72 local magnitude

☒ f. 3.8 moment magnitude ✓

Check

Correct

Marks for this submission: 1.00/1.00. Accounting for previous tries, this gives 0.67/1.00.

Question 15

Correct

1.00 points out of 1.00

Flag question

The next Code cell prepares the variables for the waveform search. What is the length of time in seconds that will be retrieved for each of the waveforms found in the search?

Answer:  ✓

Check

Correct

Marks for this submission: 1.00/1.00.

Question 16

Correct

1.00 points out of 1.00

Flag question

When looking for waveforms that meet the criteria of the search, what is the radius away from the pre-defined latitude and longitude that will be searched. I am looking for an answer that is in kilometers.

Answer:  ✓

Check

Correct

Marks for this submission: 1.00/1.00.

Question 17

Correct

0.00 points out of 1.00

Flag question

This Jupyter notebook uses the Mass\_Downloader library of ObsPy, which you can read more about here:

[https://docs.obspy.org/packages/autogen/obspy.clients.fdsn.mass\\_downloader.html](https://docs.obspy.org/packages/autogen/obspy.clients.fdsn.mass_downloader.html)

The code includes the domain and restrictions settings to help identify which stations meet the criteria for downloading a large set of waveforms. In this case, we will only be downloading a small set, but I wanted to introduce you to this library as many seismology research tasks these days involve processing large numbers of seismograms. You may recall that some stations have multiple types of channels and in some cases even multiple location codes at a single site. The Restrictions() function has priority options to help limit the waveforms you have to analyze from each station. Based on the priority settings in the Code cell, which of these network.station.location.channel codes would have the highest priority (the network.station.location.channel waveform that would be downloaded above all others)?

Select one:

☐ a. IU.ANMO.10.HH2

☐ b. IU.ANMO..BH2

☐ c. IU.ANMO.10.BH1

☒ d. IU.ANMO..HH2 ✓

☐ e. IU.ANMO.10.HHZ

☐ f. IU.ANMO..BH1

☐ g. IU.ANMO.20.BHZ

☐ h. IU.ANMO.10.BHZ

☐ i. IU.ANMO.20.HH2

☐ j. IU.ANMO.20.HH1

☐ k. IU.ANMO..HHZ

☐ l. IU.ANMO.20.BH1

Check

Correct

Marks for this submission: 1.00/1.00. Accounting for previous tries, this gives 0.00/1.00.

Question 18

Correct

1.00 points out of 1.00

Flag question

The next Code cell is where the MassDownloader() function is actually called. It sends the domain and restrictions settings, but it also sets where the miniseed data and station metadata will be stored. Which of the following is true about the storage?

Select one or more:

☐ a. the miniseed data is stored in a directory called mseed

☐ b. the metadata is stored in a directory called metadata

☐ c. the metadata is stored in the current directory

☐ d. the miniseed data is stored in a directory called miniseed

☒ e. the metadata is stored in a directory called stations ✓ 1 of 2 correct answers.

☐ f. the metadata is stored in a directory called stationxml

☒ g. the miniseed data is stored in a directory called waveforms ✓ 1 of 2 correct answers.

☐ h. the miniseed data is stored in the current directory

Check

Correct

Marks for this submission: 1.00/1.00.

Question 19

Correct

0.67 points out of 1.00

Flag question

The output of the mdl.download() command will be shown in pink. Which of the following are FDSN clients that are searched by this command?

Select one or more:

☒ a. GFZ ✓ 1 of 5 correct answers

☒ b. NCEDC ✓ 1 of 5 correct answers

☒ c. ISC ✓ 1 of 5 correct answers

☒ d. IRIS ✓ 1 of 5 correct answers

- ☐ e. CENC
- ☒ f. USGS ✓ 1 of 5 correct answers

Check

**Correct**  
Marks for this submission: 1.00/1.00. Accounting for previous tries, this gives **0.67/1.00**.

**Question 20**  
Correct  
1.00 points out of 1.00  
Flag question

Which of the following are FDSN clients that do NOT have datasetselect webservices running that would allow this function to download data?

Select one or more:

- ☐ a. NCEDC
- ☒ b. EMSC ✓ 1 of 3 correct answers.
- ☒ c. USGS ✓ 1 of 3 correct answers.
- ☐ d. GFZ
- ☒ e. ISC ✓ 1 of 3 correct answers.
- ☐ f. IRIS

Check

**Correct**  
Marks for this submission: 1.00/1.00.

**Question 21**  
Correct  
0.67 points out of 1.00  
Flag question

The next Code cell is the most complicated code we have dealt with in our tutorials thus far, so it will help to spend a few questions on this. The Markdown text before describes this code as a loop. How is the loop accomplished?

Select one:

- ☐ a. The for command loops over each metadata file in the waveforms directory.
- ☒ b. The for command loops over each miniseed file in the waveforms directory. ✓
- ☐ c. The for command loops over each miniseed file in the stations directory.
- ☐ d. The for command loops over each metadata file in the stations directory.
- ☐ e. The while command loops over each miniseed file in the stations directory.
- ☐ f. The while command loops over each miniseed file in the waveforms directory.
- ☐ g. The while command loops over each metadata file in the stations directory.
- ☐ h. The while command loops over each metadata file in the waveforms directory.

Check

**Correct**  
Marks for this submission: 1.00/1.00. Accounting for previous tries, this gives **0.67/1.00**.

**Question 22**  
Correct  
0.33 points out of 1.00  
Flag question

The first part of the loop is where the filenames are set and read into trace and inventory structures. After that, a key part of the loop occurs when it removes the instrument response. This is accomplished with the remove\_response() function that you can read about here:

[https://docs.obspy.org/packages/autogen/obspy.core.trace.Trace.remove\\_response.html](https://docs.obspy.org/packages/autogen/obspy.core.trace.Trace.remove_response.html)

This command is called with a variable called filt. What does this variable indicate?

Select one:

- ☐ a. After removing the response, the seismogram is primarily filtered between 1 and 40 Hz, but allows some energy out to 0.5 and 50 Hz.
- ☐ b. After removing the response, the seismogram is primarily filtered for energy from 0.5 to 1 Hz and from 40 to 50 Hz.
- ☒ c. Before removing the response, the seismogram is primarily filtered between 1 and 40 Hz, but allows some energy out to 0.5 and 50 Hz. ✓
- ☐ d. Before removing the response, the seismogram is primarily filtered for energy from 0.5 to 1 Hz and from 40 to 50 Hz.
- ☐ e. After removing the response, the seismogram is primarily filtered below 0.5 Hz and above 50 Hz, but allows some energy out to 1 and 40 Hz.
- ☐ f. Before removing the response, the seismogram is primarily filtered below 0.5 Hz and above 50 Hz, but allows some energy out to 1 and 40 Hz.

Check

**Correct**  
Marks for this submission: 1.00/1.00. Accounting for previous tries, this gives **0.33/1.00**.

**Question 23**  
Correct  
0.00 points out of 1.00  
Flag question

Based on the command description and the following disp variable, in what unit does the remove\_response() function output the seismogram in this code?

Select one:

- ☐ a. millimeters
- ☐ b. meters per second
- ☐ c. millimeters per second squared
- ☒ d. meters ✓
- ☐ e. microns per second
- ☐ f. millimeters per second
- ☐ g. meters per second squared
- ☐ h. microns
- ☐ i. microns per second squared

Check

**Correct**  
Marks for this submission: 1.00/1.00. Accounting for previous tries, this gives **0.00/1.00**.

**Question 24**  
Correct  
0.67 points out of 1.00  
Flag question

The next part of the loop calculates the distance between the event and the station. In what unit does the gps2dist\_azimuth() function output in this code?

Select one:

- ☐ a. kilometers
- ☐ b. centimeters
- ☐ c. millimeters
- ☐ d. microns
- ☒ e. meters ✓

Check

**Correct**  
Marks for this submission: 1.00/1.00. Accounting for previous tries, this gives **0.67/1.00**.

**Question 25**  
Correct  
1.00 points out of 1.00  
Flag question

This code prints the displacement, distance, and local magnitude calculated for each station and channel retrieved. What is the largest displacement recorded by this code (in microns)? Round your answer to the nearest 0.01.

Answer: 18.427 ✓

Check

**Correct**  
Marks for this submission: 1.00/1.00.

**Question 26**

What is the local magnitude calculated for this particular station and channel? Again, round to the nearest 0.01.



Correct  
1.00 points out of 1.00  
Flag question

Answer:  ✓

Correct  
Marks for this submission: 1.00/1.00.

Question 27  
Correct  
0.67 points out of 1.00  
Flag question

What is the purpose of the ms variable in this code?

- Select one:
- ☐ a. it calculates the local magnitude
  - ☒ b. it sums the local magnitude value for each waveform ✓
  - ☐ c. it counts the number of waveforms
  - ☐ d. it stores the local magnitude value for each waveform
  - ☐ e. it stores the average local magnitude value for all of the waveforms

Correct  
Marks for this submission: 1.00/1.00. Accounting for previous tries, this gives 0.67/1.00.

Question 28  
Correct  
0.67 points out of 1.00  
Flag question

What is the purpose of the n variable in this code?

- Select one:
- ☒ a. it counts the number of waveforms ✓
  - ☐ b. it sums the local magnitude value for each waveform
  - ☐ c. it calculates the local magnitude
  - ☐ d. it stores the average local magnitude value for all of the waveforms
  - ☐ e. it stores the local magnitude value for each waveform

Correct  
Marks for this submission: 1.00/1.00. Accounting for previous tries, this gives 0.67/1.00.

Question 29  
Correct  
1.00 points out of 1.00  
Flag question

What is the average local magnitude calculated by this code? Round to the nearest 0.01.

Answer:  ✓

Correct  
Marks for this submission: 1.00/1.00.

Question 30  
Correct  
1.00 points out of 1.00  
Flag question

How does the local magnitude compare to the magnitude found in the original catalog?

- Select one:
- ☐ a. The local magnitude calculated in this manner is slightly smaller than the local magnitude in the catalog.
  - ☒ b. The local magnitude calculated in this manner is slightly larger than the moment magnitude in the catalog. ✓ Correct. For earthquakes of this size, in this part of the country, it is relatively common for the moment magnitude to be slightly smaller than the local magnitude.
  - ☐ c. The local magnitude calculated in this manner is the same as the moment magnitude in the catalog.
  - ☐ d. The local magnitude calculated in this manner is slightly smaller than the moment magnitude in the catalog.
  - ☐ e. The local magnitude calculated in this manner is slightly larger than the local magnitude in the catalog.
  - ☐ f. The local magnitude calculated in this manner is the same as the local magnitude in the catalog.

Correct  
Marks for this submission: 1.00/1.00.

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