Programming Project 07

This assignment is worth 45 points (4.5% of the course grade) and must be **completed and turned in before 11:59 on Monday, November 2, 2020.**

Assignment Overview

- List and Tuples
- File manipulation

Assignment Background

Earthquakes are the shaking of the ground caused by the release of energy stored in the Earth's crust. These natural disasters happen without warning and can be destructive. While we can't predict when they'll happen (yet), we can analyze earthquakes that have occurred in the past. Documenting their magnitude and damage is important to understand these phenomena by learning patterns useful to pinpoint possible locations of future earthquakes.

Your task is to build a program that visualizes the location, magnitude, and damage from past earthquakes. This program will show the damage caused by all earthquakes in a single year. Also, it will show the magnitude and location of each earthquake in a single year. Finally, it will compare the total damage caused by these natural disasters within a range of years.

Project Specifications

You must implement the following functions:

1. The first functions open the file and then read the file to put the specified data into a list of tuples that we use in the program.

a) **open_file()** This function repeatedly prompts the user for a filename until the file is opened successfully. An error message should be shown if the file cannot be opened. It returns a file pointer. Use try-except to determine if the file can be opened.

b) **read_file(fp)** This function read a file pointer and returns a sorted list of tuples. The master list will have the following structure:

```
[(year, month, magnitude, location, latitude, longitude,
deaths, missing, injuries, damage),…]
```

Each row of the file contains the date, magnitude, location, and the damages (i.e. deaths, missing, injured, and property damage) caused by each earthquake. For this project, we are only interested in the following columns:

```
year = int(line[2])
month = int(line[3])
magnitude = float(line[9])
```

```
location = line[19]
latitude = float(line[20])
longitude = float(line[21])
deaths = int(line[23])
missing = int(line[25])
injuries = int(line[27])
damages = float(line[29])
```

If the number of deaths, missing, injured, and damages columns are empty, replace it with a zero. If any other numerical data cannot be made into an `int` or `float`, skip that entire line of data (hint: `try-except`).

Create a tuple with items in this order:

```
tup = (year,month,magnitude,location,latitude,longitude,\
                  deaths,missing,injuries,damages)
```

Sort the list of tuples returned using the default settings.

2. The next set of functions use the list of tuples that was gathered from the file and processes them to create new arrangements of data (which also happen to be lists, sometimes a list of lists, other times a list of lists of tuples).

a) **get_damage_data(data,year):** This function iterates through the list of earthquake tuples and returns a list of the earthquakes that occurred in the given year. This function extracts the month, location (*truncated to the first 40 characters*), the number of deaths, missing, injuries, and damages from earthquakes in a single year into a tuple in that order:

```
tup = (month,location,deaths,missing,injuries,damages)
```

If no earthquake had occurred in the selected year, return an empty list.
Keep the items in the same order that they are in the data parameter, i.e. simply append as you read through data.

b) **get_quake_data(data, year):** This function iterates through the list of earthquake tuples and returns a list of the month, magnitude, location and coordinates from each earthquake that occurred in the given year. The tuple is

```
tup = (month, magnitude, location, latitude, longitude)
```

If no earthquake had occurred in the selected year, return an empty list. Note that unlike the `get_damage_data` function, we will **not** truncate the location data. Keep the items in the same order that they are in the data parameter, i.e. simply append as you read through data.

c) summary_statistics(data, year_start, year_end): This function returns a list of three lists: total number of earthquakes, the damage costs caused by an earthquake, and the

total casualties (deaths, missing, and injured) for each earthquake within a range of years—each item in `earthquake_count_by_year` and `total_damages_by_year` lists will be a tuple:
`(year, value)`
For the `casualties_by_year` list the tuple will be:
`(year, (total_deaths, total_missing, total_injured))`
The range of years is inclusive of the specified start and end years. Each list will have an entry for each of the specified years in year-order, and the first item in each tuple will be the year. This function returns a list

```
L = [[list_of_earthquake_count_by_year],
     [list_of_total_damage_by_year],
     [list_of_casualties_by_year]]
```

The `year_end` must be greater than or equal to the `year_start`. If not, a list of empty lists is returned. You may assume that years will be integers (no error checking for ints is necessary). Also, if there are no earthquakes in the specified years, a list of empty lists is returned. (We are using a list of empty lists as an indicator that we found something wrong in this function.) Keep the items in the same order that they are in the data parameter, i.e. simply append as you read through data.
Hint: you get the needed information using your `get_damage_data` function.

Note: I found list comprehension to be handy for collecting damage and casualty data—not necessary, but it resulted in terse code.

3. The last set of functions that you write display the data gathered by the previous functions.

a) **display_damage_data(L, year)** The first parameter is a list of damage for a particular year; the second parameter is that year as an int. The L list is a list of tuples that originated in the `get_damage_data` function:
`(month, location, deaths, missing, injuries, damages)`
This function displays the damage costs of each earthquake in L. There is a centered title line of width 98 (use the "^" in the string formatting) followed by two header lines (one only has the word "millions" on it) followed by the data, and finally with the totals of the numerical data columns.
The two header rows contains the following strings:

```
"Month","Location","Deaths","Missing","Injuries","Damage"

"","","","","","(Millions)"
```

and rows use the following format:

```
 "{:8s}{:40s}{:>12s}{:>12s}{:>12s}{:>14s}".
```

The subsequent rows of data use the following formatting:
`"{:<8s}{:40s}{:12,d}{:12,d}{:12,d}{:14,.2f}".`
Note that the data passed to this function as a parameter came from a call in main to the `get_damage_data` function.
You need to display the corresponding month name from the MONTHS list provided in the starter code.

b) **display_quake_data(L, year):** This function prints the magnitude of each earthquake and is quite similar to the `display_damage_data` function except that here the L list of tuples originated in the `get_quake_data` function so each tuple is:
`(month, magnitude, location, latitude, longitude)`
There is one centered title line of width 58, followed by the header row which uses the following string format:
`"{:8s}{:10s}{:40s}".`
The header line contains the following strings:
`"Month","Magnitude","Location"`

The subsequent data rows use this string
Unlike the previous function there is no final row of column totals.
`"{:<8s}{:<10.2f}{:40s}".`

c) **display_summary_statistics(L,start_year,end_year):** This function first prints a table of damage by year for each year in the year range with a row of totals for the two data columns. Then casualty data is displayed with a line for deaths, a line for missing, and a line for injuries. Each casualty data line will have the total for the range of years and the percent that total is over the total casualties (deaths + missing + injured). Note that data used in this function originated in the `summary_statistics` function). The header row of the total number of earthquakes and damage costs uses the following string format:
`"{:5s}{:>10s}{:>12s}".`
The subsequent data rows use this string format:
`"{:<5d}{:10,d}{:12,.2f}".`
Followed by totals of the two data columns using that same data format.

The header row of the total casualties per type uses the following string format noting the 11 to account for the percent character in the data rows.:
`"{:10s}{:>10s}{:>11s}"`
The subsequent data rows use this string format:
`"{:10s}{:10d}{:10,.2f}%".`

4. **Then there are three plotting functions that we provide that will plot the data gathered above.**

5. **Finally, comes the "main" which prompts for user input and based on that input calls the appropriate functions. Then it prompts again.**

d) **main()** This function is the starting point of the program. The program starts by opening the file with the earthquake data. Then the program will display the menu, prompt for user input, and then repeatedly prompt the user to select an option from the following menu:

i. **Option 1:** Display the damage costs caused by each earthquake in a single year. Call your `get_damage_data` function. Prompt for a year (validation is required!) and display the selected earthquake damage cost data. Prompt the user whether they want to plot the data. If `"y"`, call `plot_bar`.
ii. **Option 2:** Display the magnitude of each earthquake in a single year. Call your `get_quake_data` function. Prompt for a year (validation is required!) and display the selected earthquake magnitude data. Prompt the user whether they want to plot the data. If `"y"`, call `plot_intensity_map`.
iii. **Option 3:** Display the total number of earthquakes, damage costs, and damages caused by earthquakes within a range of years. Call `summary_statistics` to get the data. Prompt for the start year and end year. **Hint: Prompt for both values before converting to int.** Prompt the user whether they want to plot the data. If `"y"`, draw three plots, one for each list returned by your call to the `summary_statistics` function: `plot_line` for the first list, `plot_line` for the second list, and `plot_pie` for the third list.
iv. **Option 4:** Stop the program.

If the user does not enter any of these options, the program needs to display an error message and prompt again until a valid option is selected.

2. Hints and Notes

a) Need to print a header line? Using multiple string inside a format method, use the "`*`" operator to unpack the list. Unpacking is used with iterable items (e.g. lists, strings, and tuples) to take each individual value of the iterable and assign it to various argument positions. In other words, each element from the iterable becomes an individual value. For example:

```
lst = ["I", "Love", "Python!"]
print("{} {} {}".format(*lst)) # It prints: I love Python!
```

b) We provide a constant MONTHS to assist with printing month names in the display functions.
c) Provided functions:
   a. **`plot_intensity_map(year, quake_data):`** This function creates a map showing the magnitude of each earthquake in the selected year. Note: this function requires the world background which is in the file `"world-map.jpg"` so make sure that file (which we provide) is in the same directory as your program.

   b. **`plot_bar(L, title, x_label, y_label):`** This function creates a plot of the total number of earthquakes per month in a single year. It receives the list of

earthquakes in a year, a title string, the x-axis label string, and the y-axis label string. Hint: build the title string with the appropriate year before calling the function.

c. **plot_line(L,title,x_label,y_label):** This function creates a plot a line of the total values across a range of years. This function is used to show the total number of earthquakes and the total damage costs for each year. It receives a list of total values within a range of years, a title string, the x-axis label string, and the y-axis label string.

d. **plot_pie(L,title):** This function creates a plot of the total percentages of damage per type (i.e. deaths, missing, injured). It receives a list of lists, where each list contains the string with the damage type and the total count. It also receives a title string.

Deliverables

The deliverable for this assignment is the following file:

proj07.py – the source code for your Python program

Be sure to use the specified file name and to submit it for grading via Mimir before the project deadline.

(See Mimir for function tests details)

Test Case 1:

```
Enter filename: earth_data.csv

File is not found! Please Try Again!
Enter filename: earthquake_data_tiny.csv

Earthquake data software

        1) Visualize damage data for a single year
        2) Visualize earthquakes magnitudes for a single year
        3) Visualize number of earthquake and their damages within a range of years
        4) Exit the program

        Enter a command: abc


Option 'abc' is invalid! Please Try Again!

Earthquake data software

        1) Visualize damage data for a single year
        2) Visualize earthquakes magnitudes for a single year
        3) Visualize number of earthquake and their damages within a range of years
        4) Exit the program

        Enter a command: 8


Option '8' is invalid! Please Try Again!
```

```
Earthquake data software

        1) Visualize damage data for a single year
        2) Visualize earthquakes magnitudes for a single year
        3) Visualize number of earthquake and their damages within a range of years
        4) Exit the program

        Enter a command: 1

Enter a year: xxxx

Year input 'xxxx' is incorrect!

Earthquake data software

        1) Visualize damage data for a single year
        2) Visualize earthquakes magnitudes for a single year
        3) Visualize number of earthquake and their damages within a range of years
        4) Exit the program

        Enter a command: 1

Enter a year: 2000

Year input '2000' is incorrect!

Earthquake data software

        1) Visualize damage data for a single year
        2) Visualize earthquakes magnitudes for a single year
        3) Visualize number of earthquake and their damages within a range of years
        4) Exit the program

        Enter a command: 2

Enter year: year

Year input 'year' is incorrect!

Earthquake data software

        1) Visualize damage data for a single year
        2) Visualize earthquakes magnitudes for a single year
        3) Visualize number of earthquake and their damages within a range of years
        4) Exit the program

        Enter a command: 2

Enter year: 1650

Year input '1650' is incorrect!

Earthquake data software

        1) Visualize damage data for a single year
        2) Visualize earthquakes magnitudes for a single year
        3) Visualize number of earthquake and their damages within a range of years
        4) Exit the program

        Enter a command: 3

Enter start year: abc
Enter end year: 2019

Year range [abc,2019] is invalid!

Earthquake data software

        1) Visualize damage data for a single year
```

```
        2) Visualize earthquakes magnitudes for a single year
        3) Visualize number of earthquake and their damages within a range of years
        4) Exit the program

        Enter a command: 3

Enter start year: 2019
Enter end year: 2019

Year range [2019,2019] is invalid!

Earthquake data software

        1) Visualize damage data for a single year
        2) Visualize earthquakes magnitudes for a single year
        3) Visualize number of earthquake and their damages within a range of years
        4) Exit the program

        Enter a command: n


Option 'n' is invalid! Please Try Again!

Earthquake data software

        1) Visualize damage data for a single year
        2) Visualize earthquakes magnitudes for a single year
        3) Visualize number of earthquake and their damages within a range of years
        4) Exit the program

        Enter a command: 4


Thank you for using this program!
```

Test Case 2:

```
Enter filename: earthquake_data_small.csv

Earthquake data software

        1) Visualize damage data for a single year
        2) Visualize earthquakes magnitudes for a single year
        3) Visualize number of earthquake and their damages within a range of years
        4) Exit the program

        Enter a command: 1

Enter a year: 2016

                                Earthquake damage costs in 2016
Month   Location                                        Deaths     Missing    Injuries        Damage
                                                                                            (Millions)
JAN     MOROCCO:  MELILLA                                    1           0          26           0.00
JAN     INDIA:  IMPAHL                                      13           0         100          75.00
JAN     USA: ALASKA:  KENAI                                  0           0           0           0.00
FEB     TAIWAN:  TAINAN                                    117           0         525         700.00
MAR     INDONESIA: SUMATRA:                                  0           0           0           0.00
APR     AFGHANISTAN:  KHYBER PAKHTUNKHWA                     6           0           5           0.00
APR     INDIA: ASSAM; BANGLADESH                             2           0         170           0.00
APR     VANUATU ISLANDS                                      0           0           0           0.00
MAY     CHINA:  TIBET (XIZANG PROVINCE)                      0           0          60           0.00
MAY     ALGERIA:  MEDEA:  MIHOUB                             0           0          28           0.00
MAY     ECUADOR:  MANABI PROVINCE                            1           0         162           0.00
JUN     INDONESIA:  MALUKU:  TERNATE ISLAND                  0           0           0           0.00
JUN     INDONESIA:  SUMATRA:  PESISIR SELATAN                1           0          30           0.00
JUL     CHINA:  GUANGXI PROVINCE                             0           0           0           0.00
JUL     TAJIKISTAN:  RASHT                                   0           0           0           0.00
```

```
JUL     INDONESIA:  SUMBAWA ISLAND:  WEST NUSA T          0          0          4          0.00
JUL     NORTHERN MARIANA ISLANDS                          0          0          0          0.00
AUG     PERU:  AREQUIPA                                   9          0         68          0.00
AUG     JAPAN:  OFF EAST COAST HONSHU                     0          0          0          0.00
AUG     MYANMAR (BURMA): CHAUK                            4          0         20         10.00
AUG     NEW CALEDONIA:  LOYALTY ISLANDS                   0          0          0          0.00
AUG     SOUTH SANDWICH ISLANDS                            0          0          0          0.00
SEP     RWANDA:  RISUZI; CONGO:  UKAVU                    8          0          0          0.00
SEP     BALKANS NW:  MACEDONIA                            0          0         30         10.00
SEP     SOUTH KOREA:  GYEONGJU                            1          0         14         21.00
SEP     NICARAGUA:  LEON                                  1          0          5          0.00
SEP     TANZANIA:  LAKE VICTORIA;  UGANDA: RAKAI         23          0        252        458.00
SEP     NEW ZEALAND:  GISBORNE                            0          0          0          0.00
OCT     JAPAN:  KURAYOSHI                                 0          0          7        100.00
OCT     ITALY: NORCIA                                     2          0         20        200.00
NOV     POLAND:  RUDNA                                    8          0          9          0.00
NOV     USA: OKLAHOMA:  CUSHING                           0          0          0         20.00
NOV     CHINA:  XINJIANG PROVINCE:  KASHGAR               1          0          0          5.50
NOV     JAPAN: NEAR E COAST HONSHU                        0          0         15          0.00
NOV     NICARAGUA                                         0          0          0          0.00
NOV     NEW ZEALAND:  AMBERLEY                            2          0          0          0.00
DEC     ECUADOR:  ESMERALDAS                              3          0         47          0.00
DEC     CHINA:  N. XINJIANG:  URUMQI                      1          0          0        135.00
DEC     INDONESIA:  SUMATRA:  ACEH:  PIDIE JAYA         104          0        857        100.00
DEC     SOLOMON ISLANDS                                   0          0          0          0.00
DEC     CHILE                                             0          0          0          0.00
DEC     SOLOMON ISLANDS                                   1          0          0          0.00
DEC     PAPUA NEW GUINEA:  NEW BRITAIN NEW IRELA          0          0          0          0.00

Total                                                   309          0      2,454      1,834.50

Do you want to plot (y/n)? n

Earthquake data software

        1) Visualize damage data for a single year
        2) Visualize earthquakes magnitudes for a single year
        3) Visualize number of earthquake and their damages within a range of years
        4) Exit the program

        Enter a command: 1

Enter a year: 2020

                                  Earthquake damage costs in 2020
Month   Location                                        Deaths     Missing    Injuries        Damage
                                                                                            (Millions)
JAN     CHINA:  XINJIANG PROVINCE                          1          0          2          0.00
JAN     TURKEY:  ELAZIG AND MALATYA PROVINCES             41          0      1,600          0.00
JAN     CUBA: GRANMA;  CAYMAN IS;  JAMAICA                 0          0          0          0.00
FEB     TURKEY: VAN;  IRAN                                10          0         60          0.00
MAR     BALKANS NW:  CROATIA:  ZAGREB                      1          0         27      6,000.00
MAR     USA: UTAH                                          0          0          0         48.50
MAR     RUSSIA:  KURIL ISLANDS                             0          0          0          0.00
APR     CHINA:  QINGHAI PROVINCE                           0          0          0         11.28
MAY     CHINA:   YUNNAN PROVINCE:  QIAOJIA                 4          0         24          0.00
MAY     GREECE:  CRETE                                     0          0          0          0.00
JUN     PERU:  COAST:  CHIMBOTE                            1          0          0          0.00
JUN     TURKEY:  VAN                                       0          0          5          0.00
JUN     TURKEY:  BINGOL                                    1          0         17          0.00
JUN     INDONESIA: NORTH MALUKU: MOROTAI                   0          0          0          0.00
JUN     MEXICO: OAXACA                                    10          0          0          0.00
JUL     VIETNAM: SON LA PROVINCE                           0          0          0          0.00
JUL     USA: ALASKA                                        0          0          0          0.00
AUG     USA: NORTH CAROLINA:  SPARTA                       0          0          0          0.00
AUG     PHILIPPINES:  MASBATE                              1          0         48          0.00

Total                                                     70          0      1,783      6,059.78
```

```
Do you want to plot (y/n)? n

Earthquake data software

        1) Visualize damage data for a single year
        2) Visualize earthquakes magnitudes for a single year
        3) Visualize number of earthquake and their damages within a range of years
        4) Exit the program

        Enter a command: 4


Thank you for using this program!
```

Test Case 3:

```
Enter filename: earthquake_data_small.csv

Earthquake data software

        1) Visualize damage data for a single year
        2) Visualize earthquakes magnitudes for a single year
        3) Visualize number of earthquake and their damages within a range of years
        4) Exit the program

        Enter a command: 2

Enter year: 2018

       Earthquake magnitudes and locations in 2018
Month   Magnitude Location
JAN     3.40      THE NETHERLANDS: GRONINGEN
JAN     4.90      BALKANS NW:  MONTENEGRO: BERANE
JAN     5.00      IRAN:  KERMANSHAH
JAN     5.20      ECUADOR:  PASTAZA
JAN     5.50      IRAN: KERMANSHAH
JAN     6.00      INDONESIA:  JAVA:  BANTEN
JAN     6.10      AFGHANISTAN; PAKISTAN:  BALUCHISTAN
JAN     7.10      PERU: YAUCA
JAN     7.50      HONDURAS
JAN     7.90      USA: ALASKA:  KODIAK ISLAND
FEB     6.10      PAPUA NEW GUINEA:  S HIGHLANDS
FEB     6.40      TAIWAN:  HUALIEN
FEB     7.20      MEXICO:  OAXACA
MAR     6.00      PAPUA NEW GUINEA:  S HIGHLANDS
APR     4.40      INDONESIA:  JAVA:  BANJARNEGARA
APR     4.70      ITALY:  MUCCIA
APR     4.90      VENEZUELA:  MERIDA
APR     5.20      TURKEY:  ADIYAMAN
APR     5.30      IRAN:  KERMANSHAH
APR     5.60      JAPAN:  SHIMANE PREFECTURE
APR     6.30      PAPUA NEW GUINEA:  HELA
MAY     2.10      SOUTH AFRICA:  WEST RAND
MAY     4.10      POLAND:  SILESIAN:  JASTRZEBIE-ZDROJ
MAY     5.10      CHINA:  JILIN PROVINCE:  NINGJIANG
MAY     5.30      IRAN:  KOHGILUYEH AND BOYER-AHMAD: SISAKHT
MAY     5.80      COMOROS:  MAYOTTE
MAY     6.20      AFGHANISTAN: TAKHAR;  PAKISTAN
MAY     6.90      USA: HAWAIIAN ISLANDS: PUNA DISTRICT
JUN     4.90      COLOMBIA:  PASTO
JUN     5.30      AZERBAIJAN: SHAKI-ZAQATALA
JUN     5.50      JAPAN:  OSAKA
JUL     5.20      INDONESIA: SUMATRA: SOLOK
JUL     5.90      IRAN:  KERMANSHAH
JUL     6.40      INDONESIA:  LOMBOK ISLAND
AUG     5.00      CHINA:   YUNNAN PROVINCE:  YUXI
AUG     5.90      INDONESIA:  LOMBOK ISLAND
AUG     6.00      IRAN:  KERMANSHAH
```

```
AUG     6.30      INDONESIA:  LOMBOK ISLAND
AUG     6.90      INDONESIA:  LOMBOK ISLAND
AUG     6.90      INDONESIA:  LOMBOK ISLAND
AUG     7.10      NEW CALEDONIA:  LOYALTY ISLANDS
AUG     7.30      VENEZUELA:  SUCRE; TRINIDAD
AUG     8.20      FIJI ISLANDS
SEP     5.30      INDIA:  WEST BENGAL
SEP     5.50      IRAN:  KERMAN
SEP     5.60      CHINA: YUNNAN PROVINCE:  MOJIANG HANI
SEP     6.60      JAPAN:  HOKKAIDO
SEP     7.50      INDONESIA:  SULAWESI
SEP     7.80      FIJI ISLANDS
OCT     5.90      HAITI: PORT-DEX-PAIX
OCT     6.50      NEW CALEDONIA:  LOYALTY ISLANDS
NOV     4.90      AFGHANISTAN:  HINDU KUSH:  BAGHLAN
NOV     5.60      INDONESIA:  SULAWESI:  MAMASA
NOV     6.30      IRAN: KERMANSHAH; IRAQ: KURDISTAN
NOV     7.00      USA: ALASKA:  ANCHORAGE
DEC     5.10      ITALY:  SICILY:  CATANIA
DEC     5.40      CHINA:  SICHUAN:  YIBIN
DEC     5.50      MOZAMBIQUE
DEC     5.60      VANUATU ISLANDS: AMBRYM ISLAND
DEC     7.50      NEW CALEDONIA:  LOYALTY ISLANDS

Do you want to plot (y/n)? n

Earthquake data software

        1) Visualize damage data for a single year
        2) Visualize earthquakes magnitudes for a single year
        3) Visualize number of earthquake and their damages within a range of years
        4) Exit the program

        Enter a command: 2

Enter year: 2015

       Earthquake magnitudes and locations in 2015
Month   Magnitude Location
JAN     5.30      CHINA:  SICHUAN PROVINCE:  LESHAN
FEB     3.60      BALKANS NW:  BOSNIA-HERZEGOVINA:
FEB     4.50      CHINA:  YUNNAN PROVINCE
FEB     4.50      PERU:  AREQUIPA:  CAYLLOMA:  CABANACONDE
FEB     5.10      CHINA:  XINJIANG PROVINCE:  SHAWAN
FEB     5.40      PAKISTAN:  BATTAGRAM
FEB     6.40      VANUATU ISLANDS
FEB     6.70      JAPAN:  HONSHU
MAR     4.40      BALKANS NW: SERBIA:  KOSJERIC
MAR     4.60      CHINA:  ANHUI PROVINCE:  FUYANG
MAR     7.50      PAPUA NEW GUINEA
APR     6.40      TAIWAN:  TAIPEI
APR     7.80      NEPAL:   KATHMANDU; INDIA; CHINA; BANGLADESH
MAY     5.70      JAPAN:  HONSHU:  S. OF
MAY     7.30      NEPAL:   DOLAKHA
MAY     7.50      PAPUA NEW GUINEA
MAY     7.80      JAPAN:  BONIN ISLANDS [CHICHIJIMA ISLAND]
JUN     5.30      INDIA:  KOKRAJHAR
JUL     5.10      PAKISTAN:  ABBOTTABAD
JUL     5.90      COLOMBIA-PANAMA:  COLOMBIA:  UNGUIA
JUL     6.10      PHILIPPINES:  MINDANAO
JUL     6.40      CHINA:  S. XINJIANG:  HOTAN
JUL     6.70      SOLOMON ISLANDS
JUL     6.90      USA: ALASKA
JUL     7.00      INDONESIA:  PAPUA
JUL     7.00      SOLOMON ISLANDS
AUG     4.50      EL SALVADOR:  ALEGRIA
AUG     5.80      RWANDA:  BUKAVU
SEP     6.60      INDONESIA:  SORONG
SEP     8.30      CHILE:  CENTRAL
```

```
OCT     5.80      ARGENTINA:  GALPON
OCT     7.50      AFGHANISTAN: HINDU KUSH
NOV     5.10      VENEZUELA:  MERIDA
NOV     5.30      VENEZUELA:  MERIDA
NOV     5.60      KYRGYZSTAN: OSH
NOV     6.50      INDONESIA:  EAST NUSA TENGGARA:  ALOR
NOV     6.70      JAPAN:  KYUSYU ISLAND
NOV     6.80      SOLOMON ISLANDS
NOV     6.90      CHILE:  LA SERENA
NOV     7.60      PERU-BRAZIL
NOV     7.60      PERU-BRAZIL
DEC     6.30      AFGHANISTAN; PAKISTAN
DEC     6.60      MEXICO:  COCOTITLAN
DEC     7.20      TAJIKISTAN

Do you want to plot (y/n)? n

Earthquake data software

        1) Visualize damage data for a single year
        2) Visualize earthquakes magnitudes for a single year
        3) Visualize number of earthquake and their damages within a range of years
        4) Exit the program

        Enter a command: 4


Thank you for using this program!
```

Test Case 4:

```
Enter filename: earthquake_data.csv

Earthquake data software

        1) Visualize damage data for a single year
        2) Visualize earthquakes magnitudes for a single year
        3) Visualize number of earthquake and their damages within a range of years
        4) Exit the program

        Enter a command: 3

Enter start year: 1940
Enter end year: 1950

Number of earthquakes and costs per year
Year     Quakes        Cost
1940         13       43.00
1941         17        0.00
1942         12        2.50
1943         21        0.00
1944         14      102.00
1945          6       25.00
1946         17        0.00
1947         15        0.00
1948         18    1,028.50
1949         19       32.50
1950         22       20.00

Total       174    1,253.50

Total Casualties
Casualties     Total    Percent
Deaths        162483     85.63%
Missing            0      0.00%
Injured        27259     14.37%

Do you want to plot (y/n)? n
```

```
Earthquake data software

        1) Visualize damage data for a single year
        2) Visualize earthquakes magnitudes for a single year
        3) Visualize number of earthquake and their damages within a range of years
        4) Exit the program

        Enter a command: 3

Enter start year: 2010
Enter end year: 2020

Number of earthquakes and costs per year
Year     Quakes        Cost
2010         62   47,173.30
2011         60   23,938.11
2012         49   16,883.30
2013         53    2,140.43
2014         55    1,505.16
2015         48   10,737.65
2016         52   30,134.50
2017         64   13,524.50
2018         65   11,571.25
2019         60    7,796.64
2020         24    6,059.78

Total       592  171,464.62

Total Casualties
Casualties     Total    Percent
Deaths        341073     64.73%
Missing         1343      0.25%
Injured       184491     35.01%

Do you want to plot (y/n)? n

Earthquake data software

        1) Visualize damage data for a single year
        2) Visualize earthquakes magnitudes for a single year
        3) Visualize number of earthquake and their damages within a range of years
        4) Exit the program

        Enter a command: 4


Thank you for using this program!
```

Test Case 5:

```
Enter filename: earthquake_data.csv

Earthquake data software

        1) Visualize damage data for a single year
        2) Visualize earthquakes magnitudes for a single year
        3) Visualize number of earthquake and their damages within a range of years
        4) Exit the program

        Enter a command: 1

Enter a year: 1918

                                Earthquake damage costs in 1918
Month   Location                                        Deaths     Missing    Injuries        Damage
                                                                                            (Millions)
JAN     RUSSIA:  E COAST OF                                  0           0           0          0.00
```

```
FEB     CHINA:  GUANGDONG PROVINCE                    2,000          0          0          0.00
FEB     PHILIPPINES:  MINDANAO                            0          0          0          0.00
APR     USA: CALIFORNIA                                   0          0          0          0.20
MAY     CHILE:  NORTHERN                                  0          0          0          0.00
JUL     PAPUA NEW GUINEA:  N COAST                        0          0          0          0.00
JUL     BANGLADESH:  SRIMANGAL                            0          0          0          0.00
AUG     CHINA:  YUNNAN PROVINCE                           0          0          0          0.00
AUG     PHILIPPINES:  MINDANAO:  COTABATO                46          0          0          0.00
SEP     RUSSIA:  KURIL ISLANDS                            0          0          0          0.00
OCT     PUERTO RICO:  MONA PASSAGE                        0          0          0          4.00
NOV     RUSSIA:  KURIL ISLANDS                            0          0          0          0.00
NOV     INDONESIA:  BANDA SEA                             0          0          0          0.00
DEC     CHILE:  COPIAPO                                   0          0          0          0.00

Total                                                 2,046          0          0          4.20

Do you want to plot (y/n)? n

Earthquake data software

        1) Visualize damage data for a single year
        2) Visualize earthquakes magnitudes for a single year
        3) Visualize number of earthquake and their damages within a range of years
        4) Exit the program

        Enter a command: 2

Enter year: 1944

       Earthquake magnitudes and locations in 1944
Month   Magnitude Location
JAN     7.80      ARGENTINA:  SAN JUAN PROVINCE
FEB     7.40      TURKEY
MAR     7.20      CHINA:  XINJIANG PROVINCE
MAR     7.50      INDONESIA:  FLORES
APR     4.80      IRAN:  GORGAN
MAY     7.50      PAPUA NEW GUINEA:  NEW IRELAND
JUN     6.00      TURKEY:  USAK
JUL     5.70      GREECE:  KAMPOS (LACONIA)
SEP     5.60      USA: NEW YORK:  MASSENA
SEP     7.00      CHINA:  XINJIANG
OCT     6.80      TURKEY:  AYVALIK
OCT     7.50      NEW CALEDONIA:  LOYALTY ISLANDS
NOV     7.50      VANUATU ISLANDS
DEC     8.10      JAPAN:  OFF SOUTHEAST COAST KII PENINSULA

Do you want to plot (y/n)? n

Earthquake data software

        1) Visualize damage data for a single year
        2) Visualize earthquakes magnitudes for a single year
        3) Visualize number of earthquake and their damages within a range of years
        4) Exit the program

        Enter a command: 1

Enter a year: 2000

                                  Earthquake damage costs in 2000
Month   Location                                        Deaths     Missing    Injuries        Damage
                                                                                           (Millions)
JAN     INDIA-BANGLADESH BORDER:  MAHESHKHALI               0          0           0          0.00
JAN     CHINA:  LIAONING PROVINCE                           0          0          30          0.00
JAN     CHINA:  YUNNAN PROVINCE:  YAOAN COUNTY              5          0       2,528         73.50
FEB     SOUTH AFRICA; SWAZILAND:  MBABANE-MANZIN            0          0           1          0.00
FEB     IRAN:  BARDASKAN                                    1          0          15          0.00
MAR     JAPAN:  VOLCANO ISLANDS                             0          0           0          0.00
APR     GREECE:  CRETE                                      0          0           0          0.00
```

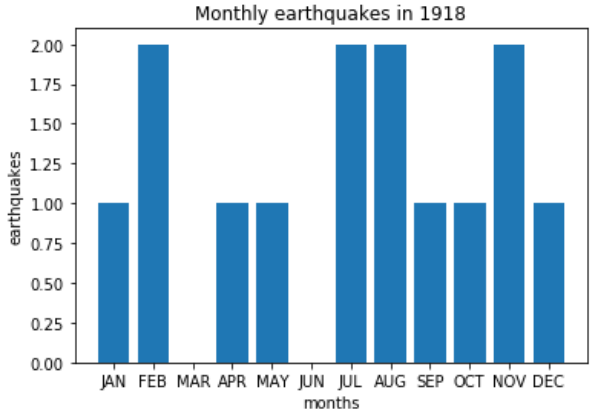
```
MAY     TURKEY:  DOGANYOL                                0          0          0          0.00
MAY     TAIWAN:  TAI-CHUNG COUNTY                        3          0         13          0.00
JUN     TURKEY:  CERKES                                  2          0         80          0.00
JUN     CHINA:  YUNNAN PROVINCE:  LIUKU; MYANMAR         0          0          0          0.00
JUN     TAIWAN:  NAN-TOU                                 2          0         36          0.00
JUN     ICELAND:  GRIMSNES                               0          0          0         12.00
JUN     ICELAND:  VESTMANNAEYJAR                         0          0          1         20.00
JUN     INDONESIA:  SOUTHERN SUMATERA:  LAHAT            1          0          0          0.00
JUN     AUSTRALIA:  S                                    0          0          0          0.00
JUN     INDONESIA:  SUMATRA:  BENGKULU                 103          0      2,174          6.00
JUL     INDONESIA: JAWA:BANDUNG                          0          0          6          0.00
JUL     NICARAGUA:  MASAYA                               7          0         42          0.00
JUL     JAPAN:  NEAR S COAST HONSHU:  KOZU-SHIMA         1          0          0          0.00
JUL     JAPAN:  NEAR S COAST HONSHU:  NII-JIMA           0          0         10          0.00
JUL     PHILIPPINES:  BASCO                              0          0          6          0.00
JUL     JAPAN:  HONSHU:  S                               0          0          1          0.00
AUG     CHINA:  YUNNAN PROVINCE:  WUDING                 1          0        406         43.00
AUG     RUSSIA:  SAKHALIN ISLAND                         0          0          8          0.92
SEP     USA: CALIFORNIA:  NAPA                           0          0         41         50.00
OCT     AFGHANISTAN-TAJIKISTAN:  RAKHOR                  0          0          0          0.00
OCT     TANZANIA:  NKANSI                                0          0          6          0.00
OCT     JAPAN:  HONSHU:  W:  OKAYAMA                     0          0        130        150.00
NOV     PANAMA-COLOMBIA:  JURADO                         0          0          2          0.00
NOV     AZERBAIJAN:  BAKU                               31          0        430          0.00
NOV     PAPUA NEW GUINEA:  NEW BRITAIN                   0          0          0          0.00
NOV     PAPUA NEW GUINEA:  NEW IRELAND                   0          0          0          0.00
NOV     PAPUA NEW GUINEA:  NEW IRELAND                   2          0          0          0.00
DEC     TURKEY:  AFYON-BOLVADIN                          6          0         41          0.00
DEC     TURKMENISTAN:  NEBITDAG-TURKMENBASHI            11          0          0          0.00

Total                                                  176          0      6,007        355.42

Do you want to plot (y/n)? n

Earthquake data software

        1) Visualize damage data for a single year
        2) Visualize earthquakes magnitudes for a single year
        3) Visualize number of earthquake and their damages within a range of years
        4) Exit the program

        Enter a command: 2

Enter year: 2020

       Earthquake magnitudes and locations in 2020
Month   Magnitude Location
JAN     6.00      CHINA:  XINJIANG PROVINCE
JAN     6.40      PUERTO RICO:  PONCE
JAN     6.70      TURKEY:  ELAZIG AND MALATYA PROVINCES
JAN     7.70      CUBA: GRANMA;  CAYMAN IS;  JAMAICA
FEB     6.00      TURKEY: VAN;  IRAN
MAR     5.00      INDONESIA:  JAVA:  SUKABUMI
MAR     5.40      BALKANS NW:  CROATIA:  ZAGREB
MAR     5.70      USA: UTAH
MAR     7.50      RUSSIA:  KURIL ISLANDS
APR     5.30      CHINA:  QINGHAI PROVINCE
MAY     4.60      IRAN:  TEHRAN
MAY     5.20      CHINA:   YUNNAN PROVINCE:  QIAOJIA
MAY     6.60      GREECE:  CRETE
JUN     4.50      PERU:  COAST:  CHIMBOTE
JUN     5.40      TURKEY:  VAN
JUN     5.90      TURKEY:  BINGOL
JUN     6.40      INDONESIA: NORTH MALUKU: MOROTAI
JUN     7.40      KERMADEC ISLANDS:  S OF
JUN     7.40      MEXICO: OAXACA
JUL     4.80      VIETNAM: SON LA PROVINCE
JUL     7.00      PAPUA NEW GUINEA:  MOROBE
JUL     7.80      USA: ALASKA
```

```
AUG     5.10      USA: NORTH CAROLINA:  SPARTA
AUG     6.60      PHILIPPINES:  MASBATE

Do you want to plot (y/n)? n

Earthquake data software

        1) Visualize damage data for a single year
        2) Visualize earthquakes magnitudes for a single year
        3) Visualize number of earthquake and their damages within a range of years
        4) Exit the program

        Enter a command: 3

Enter start year: 2019
Enter end year: 2020

Number of earthquakes and costs per year
Year     Quakes        Cost
2019         60    7,796.64
2020         24    6,059.78

Total        84   13,856.42

Total Casualties
Casualties     Total    Percent
Deaths           331      4.14%
Missing            4      0.05%
Injured         7655     95.81%

Do you want to plot (y/n)? n

Earthquake data software

        1) Visualize damage data for a single year
        2) Visualize earthquakes magnitudes for a single year
        3) Visualize number of earthquake and their damages within a range of years
        4) Exit the program

        Enter a command: 4


Thank you for using this program!
```

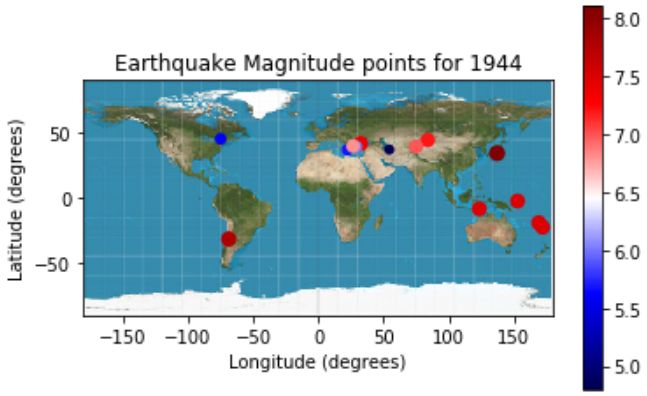
Test 6: Plotting

```
Enter filename: earthquake_data.csv

Earthquake data software

        1) Visualize damage data for a single year
        2) Visualize earthquakes magnitudes for a single year
        3) Visualize number of earthquake and their damages within a range of years
        4) Exit the program

        Enter a command: 1

Enter a year: 1918

                                Earthquake damage costs in 1918
Month   Location                                  Deaths     Missing    Injuries        Damage
                                                                                     (Millions)
JAN     RUSSIA:  E COAST OF                            0           0           0          0.00
FEB     CHINA:  GUANGDONG PROVINCE                 2,000           0           0          0.00
FEB     PHILIPPINES:  MINDANAO                         0           0           0          0.00
APR     USA: CALIFORNIA                                0           0           0          0.20
MAY     CHILE:  NORTHERN                               0           0           0          0.00
```

```
JUL     PAPUA NEW GUINEA:  N COAST                      0          0          0          0.00
JUL     BANGLADESH:  SRIMANGAL                          0          0          0          0.00
AUG     CHINA:  YUNNAN PROVINCE                         0          0          0          0.00
AUG     PHILIPPINES:  MINDANAO:  COTABATO              46          0          0          0.00
SEP     RUSSIA:  KURIL ISLANDS                          0          0          0          0.00
OCT     PUERTO RICO:  MONA PASSAGE                      0          0          0          4.00
NOV     RUSSIA:  KURIL ISLANDS                          0          0          0          0.00
NOV     INDONESIA:  BANDA SEA                           0          0          0          0.00
DEC     CHILE:  COPIAPO                                 0          0          0          0.00

Total                                               2,046          0          0          4.20

Do you want to plot (y/n)? y
```

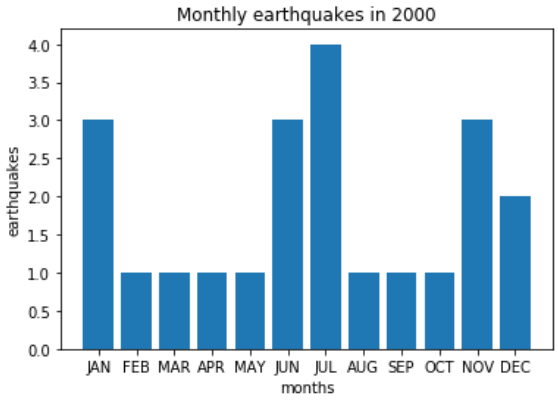



```
Earthquake data software

        1) Visualize damage data for a single year
        2) Visualize earthquakes magnitudes for a single year
        3) Visualize number of earthquake and their damages within a range of years
        4) Exit the program

        Enter a command: 2

Enter year: 1944

       Earthquake magnitudes and locations in 1944
Month   Magnitude Location
JAN     7.80      ARGENTINA:  SAN JUAN PROVINCE
FEB     7.40      TURKEY
MAR     7.20      CHINA:  XINJIANG PROVINCE
MAR     7.50      INDONESIA:  FLORES
APR     4.80      IRAN:  GORGAN
MAY     7.50      PAPUA NEW GUINEA:  NEW IRELAND
JUN     6.00      TURKEY:  USAK
JUL     5.70      GREECE:  KAMPOS (LACONIA)
SEP     5.60      USA: NEW YORK:  MASSENA
SEP     7.00      CHINA:  XINJIANG
OCT     6.80      TURKEY:  AYVALIK
OCT     7.50      NEW CALEDONIA:  LOYALTY ISLANDS
NOV     7.50      VANUATU ISLANDS
DEC     8.10      JAPAN:  OFF SOUTHEAST COAST KII PENINSULA

Do you want to plot (y/n)? y
```

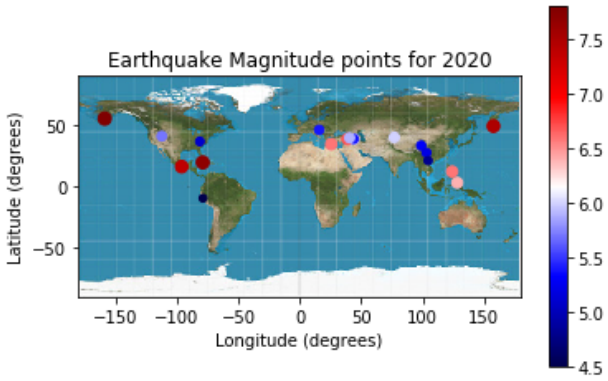



```
Earthquake data software

        1) Visualize damage data for a single year
        2) Visualize earthquakes magnitudes for a single year
        3) Visualize number of earthquake and their damages within a range of years
        4) Exit the program

        Enter a command: 1

Enter a year: 2000

                                    Earthquake damage costs in 2000
Month   Location                                          Deaths     Missing    Injuries        Damage
                                                                                              (Millions)
JAN     INDIA-BANGLADESH BORDER:  MAHESHKHALI                  0           0           0          0.00
JAN     CHINA:  LIAONING PROVINCE                              0           0          30          0.00
JAN     CHINA:  YUNNAN PROVINCE:  YAOAN COUNTY                 5           0       2,528         73.50
FEB     SOUTH AFRICA; SWAZILAND:  MBABANE-MANZIN               0           0           1          0.00
FEB     IRAN:  BARDASKAN                                       1           0          15          0.00
MAR     JAPAN:  VOLCANO ISLANDS                                0           0           0          0.00
APR     GREECE:  CRETE                                         0           0           0          0.00
MAY     TURKEY:  DOGANYOL                                      0           0           0          0.00
MAY     TAIWAN:  TAI-CHUNG COUNTY                              3           0          13          0.00
JUN     TURKEY:  CERKES                                        2           0          80          0.00
JUN     CHINA:  YUNNAN PROVINCE:  LIUKU; MYANMAR               0           0           0          0.00
JUN     TAIWAN:  NAN-TOU                                       2           0          36          0.00
JUN     ICELAND:  GRIMSNES                                     0           0           0         12.00
JUN     ICELAND:  VESTMANNAEYJAR                               0           0           1         20.00
JUN     INDONESIA:  SOUTHERN SUMATERA:  LAHAT                  1           0           0          0.00
JUN     AUSTRALIA:  S                                          0           0           0          0.00
JUN     INDONESIA:  SUMATRA:  BENGKULU                       103           0       2,174          6.00
JUL     INDONESIA: JAWA:BANDUNG                                0           0           6          0.00
JUL     NICARAGUA:  MASAYA                                     7           0          42          0.00
JUL     JAPAN:  NEAR S COAST HONSHU:  KOZU-SHIMA               1           0           0          0.00
JUL     JAPAN:  NEAR S COAST HONSHU:  NII-JIMA                 0           0          10          0.00
JUL     PHILIPPINES:  BASCO                                    0           0           6          0.00
JUL     JAPAN:  HONSHU:  S                                     0           0           1          0.00
AUG     CHINA:  YUNNAN PROVINCE:  WUDING                       1           0         406         43.00
AUG     RUSSIA:  SAKHALIN ISLAND                               0           0           8          0.92
SEP     USA: CALIFORNIA:  NAPA                                 0           0          41         50.00
OCT     AFGHANISTAN-TAJIKISTAN:  RAKHOR                        0           0           0          0.00
OCT     TANZANIA:  NKANSI                                      0           0           6          0.00
OCT     JAPAN:  HONSHU:  W:  OKAYAMA                           0           0         130        150.00
NOV     PANAMA-COLOMBIA:  JURADO                               0           0           2          0.00
NOV     AZERBAIJAN:  BAKU                                     31           0         430          0.00
NOV     PAPUA NEW GUINEA:  NEW BRITAIN                         0           0           0          0.00
NOV     PAPUA NEW GUINEA:  NEW IRELAND                         0           0           0          0.00
NOV     PAPUA NEW GUINEA:  NEW IRELAND                         2           0           0          0.00
DEC     TURKEY:  AFYON-BOLVADIN                                6           0          41          0.00
DEC     TURKMENISTAN:  NEBITDAG-TURKMENBASHI                  11           0           0          0.00

Total                                                        176           0       6,007        355.42
```

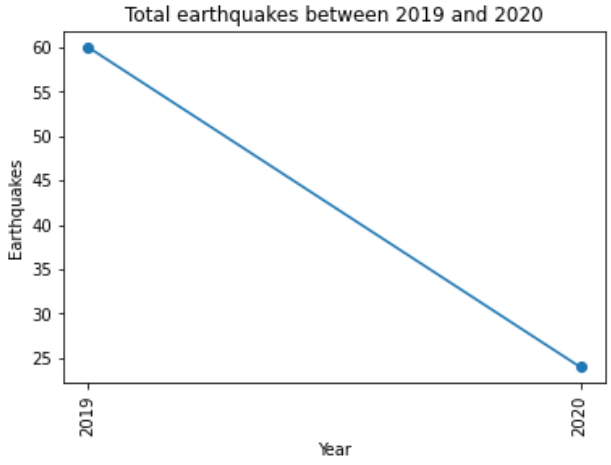
```
Do you want to plot (y/n)? y
```

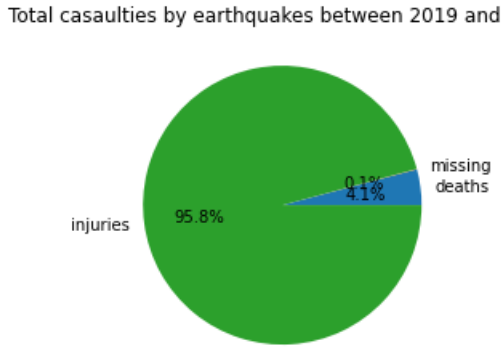


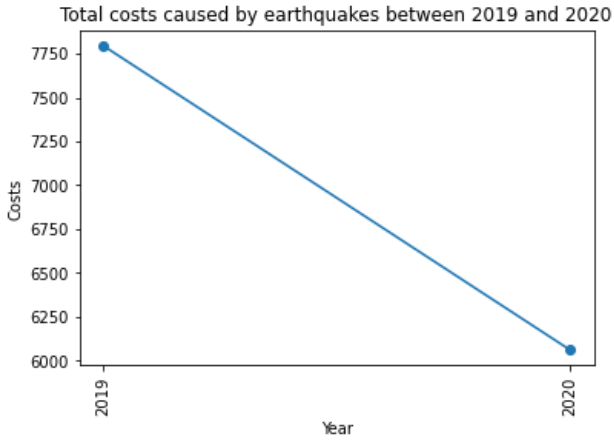

```
Enter year: 2020

       Earthquake magnitudes and locations in 2020
Month   Magnitude Location
JAN     6.00      CHINA:  XINJIANG PROVINCE
JAN     6.40      PUERTO RICO:  PONCE
JAN     6.70      TURKEY:  ELAZIG AND MALATYA PROVINCES
JAN     7.70      CUBA: GRANMA;  CAYMAN IS;  JAMAICA
FEB     6.00      TURKEY: VAN;  IRAN
MAR     5.00      INDONESIA:  JAVA:  SUKABUMI
MAR     5.40      BALKANS NW:  CROATIA:  ZAGREB
MAR     5.70      USA: UTAH
MAR     7.50      RUSSIA:  KURIL ISLANDS
APR     5.30      CHINA:  QINGHAI PROVINCE
MAY     4.60      IRAN:  TEHRAN
MAY     5.20      CHINA:   YUNNAN PROVINCE:  QIAOJIA
MAY     6.60      GREECE:  CRETE
JUN     4.50      PERU:  COAST:  CHIMBOTE
JUN     5.40      TURKEY:  VAN
JUN     5.90      TURKEY:  BINGOL
JUN     6.40      INDONESIA: NORTH MALUKU: MOROTAI
JUN     7.40      KERMADEC ISLANDS:  S OF
JUN     7.40      MEXICO: OAXACA
JUL     4.80      VIETNAM: SON LA PROVINCE
JUL     7.00      PAPUA NEW GUINEA:  MOROBE
JUL     7.80      USA: ALASKA
AUG     5.10      USA: NORTH CAROLINA:  SPARTA
AUG     6.60      PHILIPPINES:  MASBATE

Do you want to plot (y/n)? y
```



```
Earthquake data software

        1) Visualize damage data for a single year
        2) Visualize earthquakes magnitudes for a single year
        3) Visualize number of earthquake and their damages within a range of years
        4) Exit the program

        Enter a command: 3

Enter start year: 2019
Enter end year: 2020

Number of earthquakes and costs per year
Year     Quakes        Cost
2019         60    7,796.64
2020         24    6,059.78

Total        84   13,856.42

Total Casualties
Casualties     Total    Percent
Deaths           331      4.14%
Missing            4      0.05%
Injured         7655     95.81%

Do you want to plot (y/n)? y
```








```
Earthquake data software

        1) Visualize damage data for a single year
        2) Visualize earthquakes magnitudes for a single year
        3) Visualize number of earthquake and their damages within a range of years
        4) Exit the program

        Enter a command: 4

Thank you for using this program!
```

Grading Rubrics

Computer Project #07 Scoring Summary

General Requirements:
(5 pts) Coding Standard 1-9 (descriptive comments, function headers, etc...)

Implementation:
(2 pts) open_file (No Mimir Test)
-1 point No try/except
-1 point No while loop

(4 pts) read_file function test

(3 pts) get_damage_data function test

(3 pts) get_quake_data function test

(5 pts) summary_statistics function test

(5 pts) Pass Test1

(4 pts) Pass Test2

(4 pts) Pass Test3

(4 pts) Pass Test4

(4 pts) Pass Test5

(2 pts) Pass Plotting Test

Note: hard coding an answer earns zero points for the whole project
-10 points for not using main()