Worksheet 02

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Topics

- Effective Programming

Effective Programming

a) What is a drawback of the top down approach?

Becuase we implement the functions last and test last in the top down approach, there might be issues combining individual components late in the development process.

b) What is a drawback of the bottom up approach?

Because we implement the functions first in bottom up approach, we could lose sight of the bigger picture and focus too much on the smaller issues within these functions.

c) What are 3 things you can do to have a better debugging experience?

1- Read the error message.

2- Re-read the code and take time it before debugging.

3- Write clean code.

d) (Optional) Follow along with the live coding. You can write your code here:

In [3]:
```
class Board:

    def __init__(self):
        self.board = [["-" for _ in range(8)] for _ in range(8)]

    def __repr__(self):
        res = ""
        for row in range(8):
            for col in range(8):
                res+= self.board[row][col]
                res += " "
            res += "\n"
        return res

    def set_queen_at(self, row, col):
        self.board[row][col] = "Q"

    def unset_queen_on_row(self, row):
        self.board[row] = ["-" for _ in range(8)]

    def find_solution(self):

        row = 0
        col = 0
        while(row < 8):
            # we are searching for a solution
            if (self.is_valid_move(row, col)):
                self.set_queen_at(row, col)
                row += 1
                col += 0

            else:
                col += 1
                if (col >= 8):
                    # we weren't able to place a queen on this row
                    # we need to backtrack and adjust the postion
                    # of the queen on the previous row
                    col = self.get_queen_on_row(row - 1)
                    col += 1
                    row -= 1

        # we have found the solution
        print("Found a solution: ")
        print(self)


test = Board()
print(test)
test.set_queen_at(1, 1)
print(test)
test.unset_queen_on_row(1)
print(test)
```

```
  Cell In [3], line 27
    for row in range(8):
    ^
IndentationError: expected an indented block
```

Exercise

This exercise will use the Titanic dataset (https://www.kaggle.com/c/titanic/data) (https://www.kaggle.com/c/titanic/data (https://www.kaggle.com/c/titanic/data)). Download the file named `train.csv` and place it in the same folder as this notebook.

The goal of this exercise is to practice using pandas (https://pypi.org/project/pandas/) methods. If your:

1. code is taking a long time to run
2. code involves for loops or while loops
3. code spans multiple lines

look through the pandas documentation for alternatives. This cheat sheet (https://pandas.pydata.org/Pandas_Cheat_Sheet.pdf) may come in handy.

a) Complete the code below to read in a filepath to the `train.csv` and returns the DataFrame.

In [45]:
```
import pandas as pd

df = pd.read_csv("train.csv")
df.describe()
```

Out[45]:

	PassengerId	Survived	Pclass	Age	SibSp	Parch	Fare
count	891.000000	891.000000	891.000000	714.000000	891.000000	891.000000	891.000000
mean	446.000000	0.383838	2.308642	29.699118	0.523008	0.381594	32.204208
std	257.353842	0.486592	0.836071	14.526497	1.102743	0.806057	49.693429
min	1.000000	0.000000	1.000000	0.420000	0.000000	0.000000	0.000000
25%	223.500000	0.000000	2.000000	20.125000	0.000000	0.000000	7.910400
50%	446.000000	0.000000	3.000000	28.000000	0.000000	0.000000	14.454200
75%	668.500000	1.000000	3.000000	38.000000	1.000000	0.000000	31.000000
max	891.000000	1.000000	3.000000	80.000000	8.000000	6.000000	512.329200

b) Complete the code so it returns the number of rows that have at least one empty column value

In [46]:
```
print("there are " + str((df.isna().any(axis=1).sum())) + " rows with at
```

```
there are 708 rows with at least one empty value
```

c) Complete the code below to remove all columns with more than 200 NaN values

In [47]:
```
df.columns
drop_cols = df.isna().sum() > 200
df = df.drop(df.columns[drop_cols].tolist(), axis=1)
df.columns
```

Out[47]:
```
Index(['PassengerId', 'Survived', 'Pclass', 'Name', 'Sex', 'Age', 'SibS
p',
       'Parch', 'Ticket', 'Fare', 'Embarked'],
      dtype='object')
```

d) Complete the code below to replaces `male` with 0 and `female` with 1

In [54]:
```
df['Sex'] = df['Sex'].replace({'male': '0', 'female': '1'})
df.head()
```

Out[54]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Embarl
0	1	0	3	Braund, Mr. Owen Harris	0	22.0	1	0	A/5 21171	7.2500	
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	1	38.0	1	0	PC 17599	71.2833	
2	3	1	3	Heikkinen, Miss. Laina	1	26.0	0	0	STON/O2. 3101282	7.9250	
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	1	35.0	1	0	113803	53.1000	
4	5	0	3	Allen, Mr. William Henry	0	35.0	0	0	373450	8.0500	

e) Complete the code below to add four columns `First Name` , `Middle Name` , `Last Name` , and `Title` corresponding to the value in the `name` column.

For example: `Braund, Mr. Owen Harris` would be:

First Name	Middle Name	Last Name	Title
Owen	Harris	Braund	Mr

Anything not clearly one of the above 4 categories can be ignored.

In [49]:
```
df[['Last Name', 'Title', 'First Name', 'Middle Name']] = df['Name'].str
df['Middle Name'] = df['Middle Name'].fillna('')
df.head()
```

Out[49]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Embarl
0	1	0	3	Braund, Mr. Owen Harris	0	22.0	1	0	A/5 21171	7.2500	
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	1	38.0	1	0	PC 17599	71.2833	
2	3	1	3	Heikkinen, Miss. Laina	1	26.0	0	0	STON/O2. 3101282	7.9250	
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	1	35.0	1	0	113803	53.1000	
4	5	0	3	Allen, Mr. William Henry	0	35.0	0	0	373450	8.0500	

f) Complete the code below to replace all missing ages with the average age

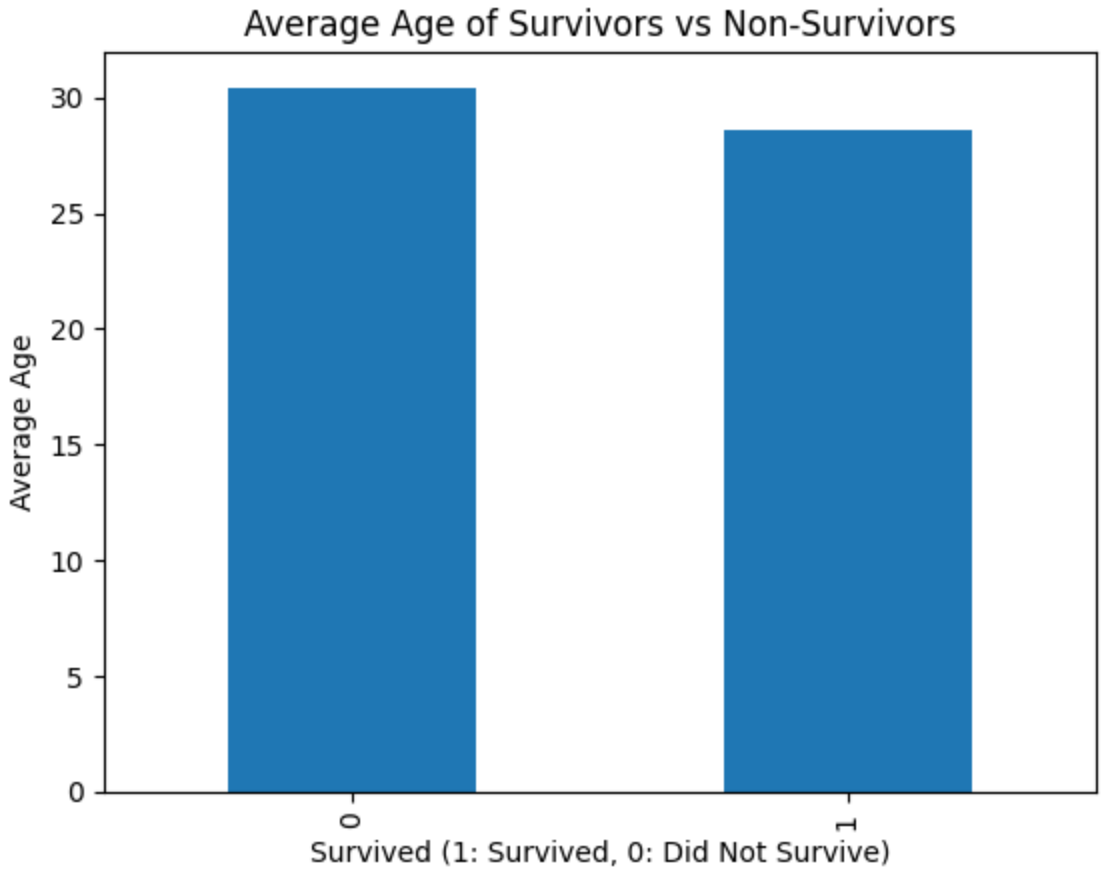
In [51]:
```
df['Age'] = df['Age'].fillna(df['Age'].mean())
df.head()
```

Out[51]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Embarl
0	1	0	3	Braund, Mr. Owen Harris	0	22.0	1	0	A/5 21171	7.2500	
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	1	38.0	1	0	PC 17599	71.2833	
2	3	1	3	Heikkinen, Miss. Laina	1	26.0	0	0	STON/O2. 3101282	7.9250	
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	1	35.0	1	0	113803	53.1000	
4	5	0	3	Allen, Mr. William Henry	0	35.0	0	0	373450	8.0500	

g) Plot a bar chart of the average age of those that survived and did not survive. Briefly comment on what you observe.

In [59]:
```
import matplotlib.pyplot as plt

# Calculate the average ages
average_ages = df.groupby('Survived')['Age'].mean()

# Plot the bar chart
average_ages.plot(kind='bar')
plt.title('Average Age of Survivors vs Non-Survivors')
plt.xlabel('Survived (1: Survived, 0: Did Not Survive)')
plt.ylabel('Average Age')

plt.show()



# There is no big difference between the average age of the survivors an
```



In [ ]: