Hands-on-data #2

The goal of this assignment is for you to practice simple visualizations applied to educational data. You can create those visualizations with Excel or any other software of your choice.

When submitting the assignment, submit a text document that includes your visualizations as well as explanations for your answers.

```
import pandas as pd
import ho2
```

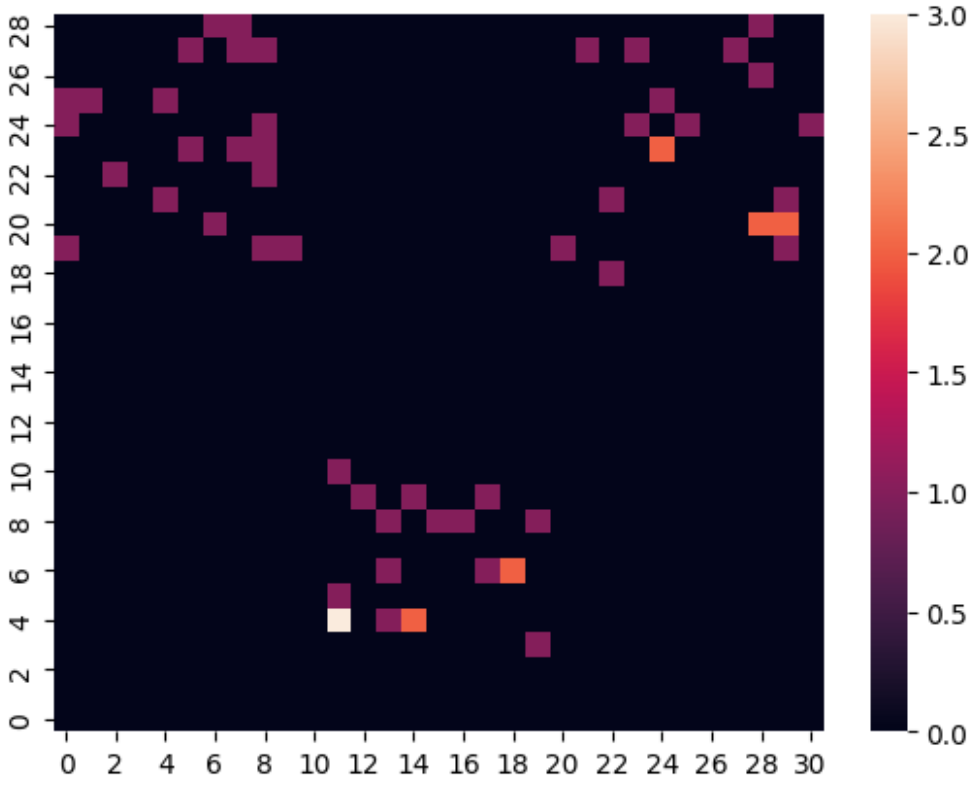
Question 1 (1.5 point)

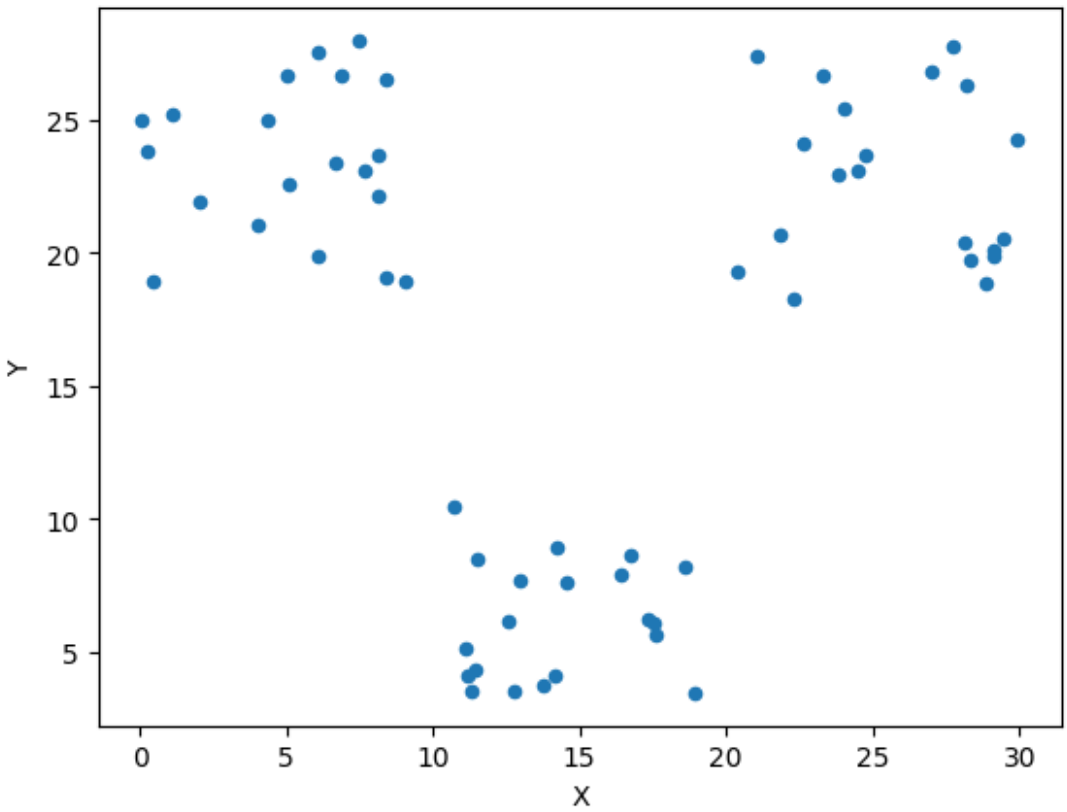
Draw scatterplots and heatmap for the datasets named Assignment-2-Scatterplot1.csv and Assignment-2-Scatterplot-2.csv. In both cases, give a quick description of the distribution of the data points and explain which visualization (scatterplot or heat map) is most appropriate.

```
scatter1 = pd.read_csv('./data/Assignment-2-Scatterplot-1.csv')
scatter2 = pd.read_csv('./data/Assignment-2-Scatterplot-2.csv')

ho2.plot_heatmap(scatter1), ho2.plot_scatter(scatter1)
```

```
(None, None)
```

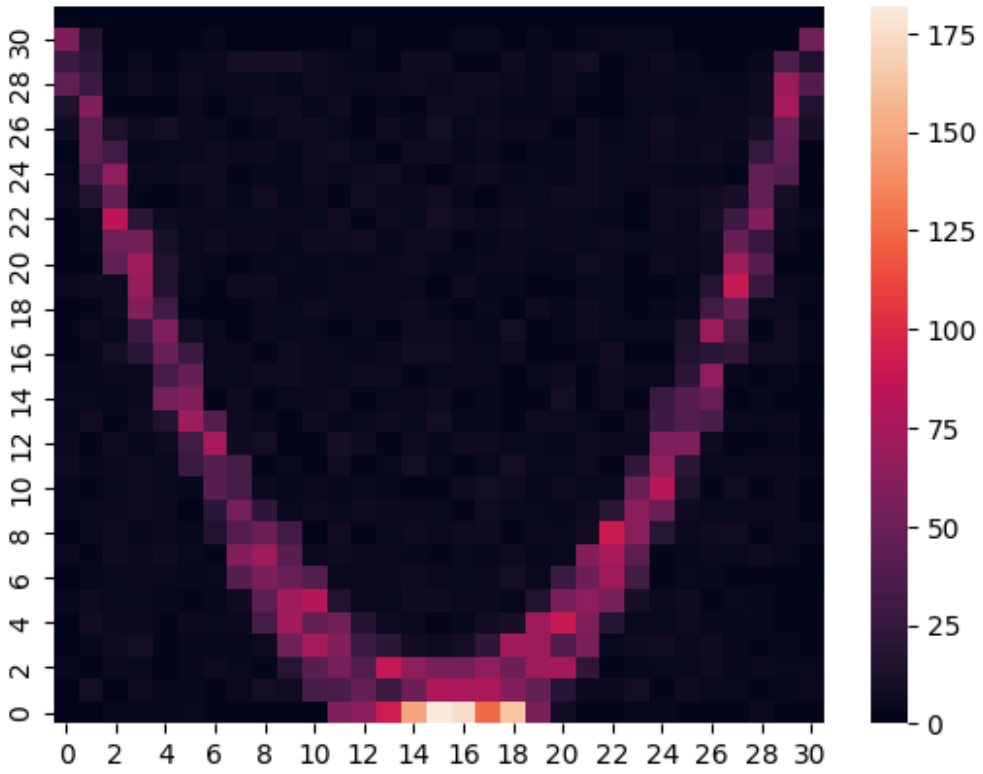

0 2 4 6 8 10 12 14 16 18 20 22 24 26 28
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
3.0
2.5
2.0
1.5
1.0
0.5
0.0

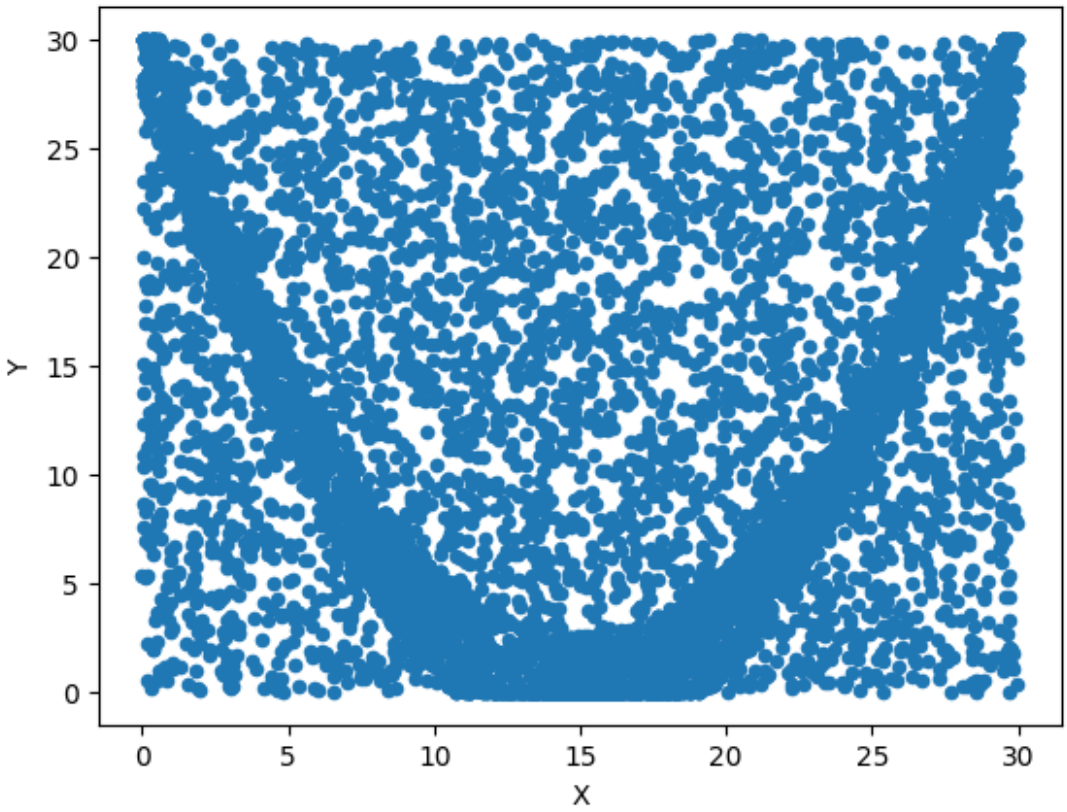

Y
25
20
15
10
5
0 5 10 15 20 25 30
X

For `scatterplot-1`, we can see that points are clustered in 3 regions. There isn't a lot of overlap for each data point, so a scatterplot is appropriate

```
ho2.plot_heatmap(scatter2), ho2.plot_scatter(scatter2)
```

```
(None, None)
```





For `scatterplot-2`, many of the datapoints overlap. The heatmap is the more appropriate visualization method, as in it we can better observe that the points are concentrated around the contour of a parabola.

Question 2 (1.5 point)

Using the dataset named ASSISTments-sample.csv, draw the learning curves for the skills named “Box and Whisker” and “Inverse Relation”. Provide a short description/analysis of each curve.

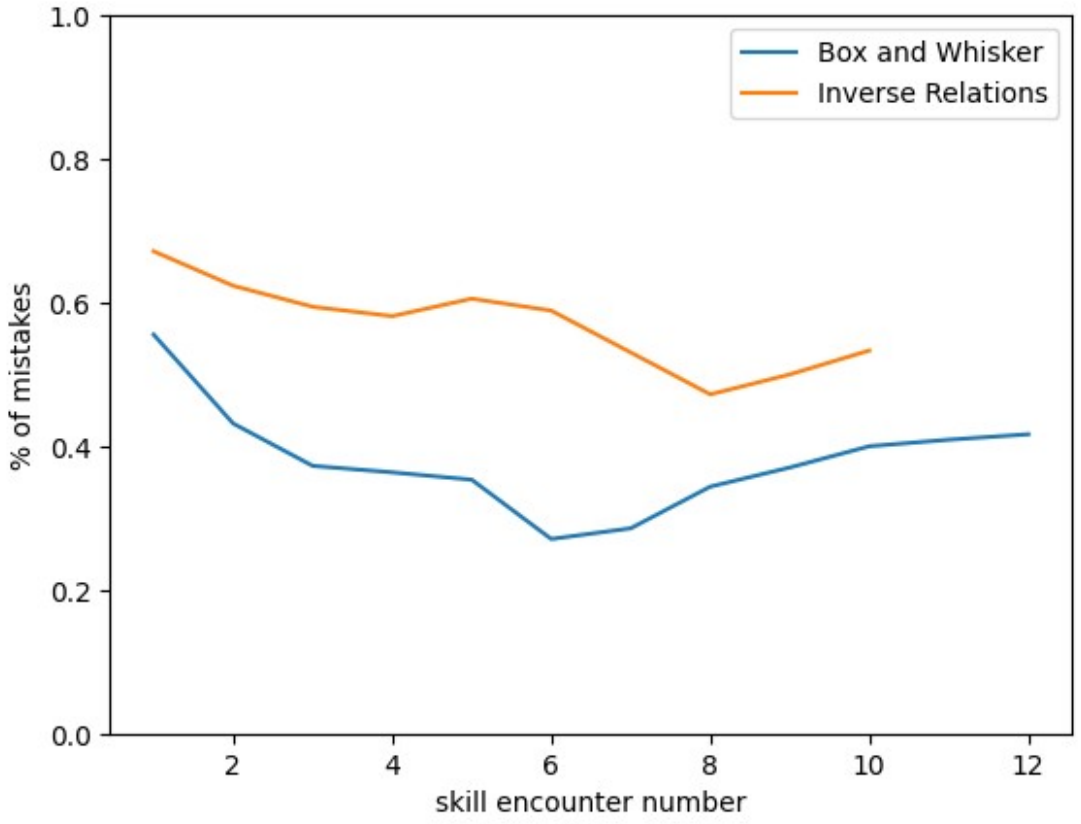
```
assistment = pd.read_csv('./data/ASSISTments-sample.csv')

ho2.learning_curve_for(assistment, 'Box and Whisker')
ho2.learning_curve_for(assistment, 'Inverse Relations')
```

```
Skill: Box and Whisker
Beginning %: 0.5555555555555556
End %: 0.41666666666666663
   Change in %:0.13888888888888895

Skill: Inverse Relations
Beginning %: 0.6715116279069767
End %: 0.5333333333333333
```

```
   Change in %:0.1381782945736434
```



Students make more mistakes in problems involving the skill `Inverse Relations`. The learning curve also indicates that student's progress is slower when compared to the skill `Box and Whisker`. When solving problems that involve the `Box and Whisker` skill, students are able to quickly improve. By the second time they encounter a `Box and Whisker` problem, students go from a $55\,\%$ mistake rate to under $45\,\%$ cummulative mistake rate ($45\,\%$ of all answered questions are incorrect).

Nevertheless, despite `Box and Whisker` having a faster improvement at the start, the two skills observe a very similar improvement of $13.8\,\%$.

Question 3 (2 point)

Create a visualization using either the ASSISTments (this can include the features created during Weeks 2-3) or the Cognitive Tutor (this can include the features created in Assignment 1) datasets. You are not limited to visualization types seen in class. Feel free to use other types of visualization (for example histograms or pie charts). Explain the goal behind the visualization (what information are you trying to convey) as well as a quick analysis of the result of applying this visualization to the dataset.

Percent Incorrect for a Given Student

The function `plot_percent_incorrect` plots the percent of actions that resulted in either a `WRONG` or a `BUG` assessment for a given student.

As an example, any time student `z9svx3mA4s` tried to use the `squareroot` action, it resulted in an incorrect assessment.

A teacher could use this plot to see where their students are making the most mistakes. For student `z9svx3mA4s`, it could be that they need a refresher on squareroots.

```
cog_data = pd.read_csv('./data/CognitiveTutorAlgebra-gaming-
clips.csv')

ho2.plot_percent_incorrect(cog_data, 'z9svx3mA4s')
```

```
        student      action         Row ID       time    Gaming
clip  \
0    AQfVkV1aEx       BLANK  197555.995407  18.476815  196508.756563

1    AQfVkV1aEx         add  197507.451613  31.354839  196149.000000

2    AQfVkV1aEx      aproot  197896.500000  36.500000            NaN

3    AQfVkV1aEx         clt  198072.714286  29.071429            NaN

4    AQfVkV1aEx  distribute  198707.428571  15.660714            NaN

..          ...         ...            ...        ...            ...

867  z9svx3mA4s        simp  282338.250000  16.875000            NaN

868  z9svx3mA4s       split  281807.181818   9.000000            NaN

869  z9svx3mA4s  squareroot  280489.000000   3.000000            NaN

870  z9svx3mA4s    subtract  278728.905000   9.305000  278126.375000

871  z9svx3mA4s      typein  278392.302632   6.718045  275737.000000


      Correct  Incorrect
0    0.621610   0.378390
1    0.774194   0.225806
2    0.333333   0.666667
3    0.285714   0.714286
4    0.892857   0.107143
..        ...        ...
867  0.875000   0.125000
868  0.363636   0.636364
869  0.000000   1.000000
```

```
870  0.905000   0.095000
871  0.906015   0.093985

[872 rows x 7 columns]
```