Project 1:
SAT and ACT Analysis

Python Libraries used:

- import numpy as np

- import scipy.stats as stats

- import seaborn as sns

- import matplotlib.pyplot as plt

- import pandas as pd

Data dictionary of FINAL dataframe

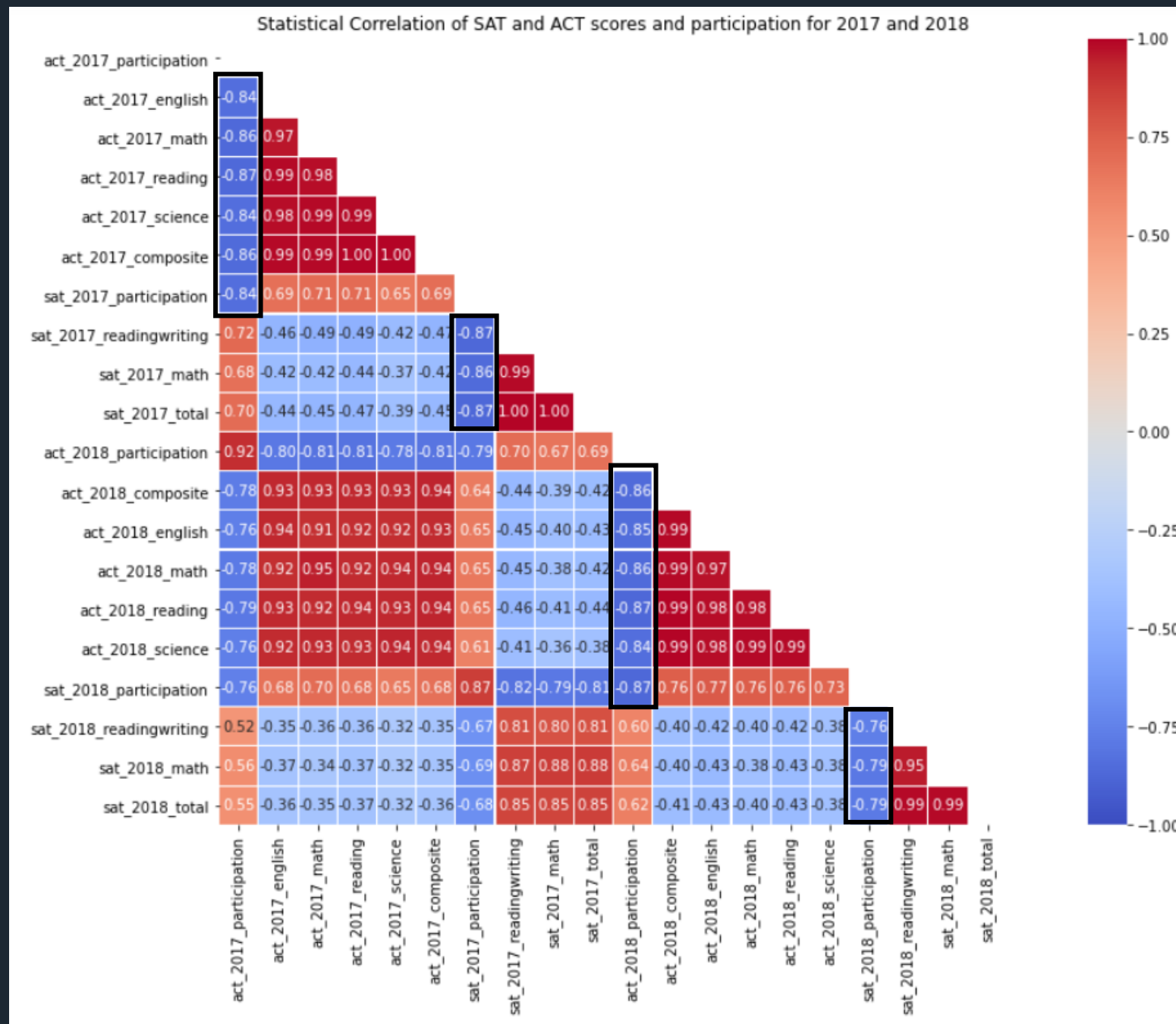| Feature	Type	Dataset	Description
state	object	ACT/SAT	Name of State
act_201X_participation	float	ACT	Participation within the State in year 201X
act_201X_english	float	ACT	English Score for the State in year 201X
act_201X_math	float	ACT	Math Score for the State in year 201X
act_201X_reading	float	ACT	Reading Score for the State in year 201X
act_201X_science	float	ACT	Science Score for the State in year 201X
act_201X_composite	float	ACT	Composite Score for the State in year 201X
sat_201X_participation	float	SAT	Participation within the State in year 201X
sat_201X_readingwriting	int	SAT	Evidence-based Reading and Writing Score for the State in year 201X
sat_201X_math	int	SAT	Math Score for the State in year 201X
sat_201X_total	int	SAT	Total Score for the State in year 201X

Trend Investigation

- Colorado SAT & ACT participation
  - SAT: 11% to 100% from 2017 to 2018
  - ACT: 100% to 30% from 2017 to 2018

- Illinois SAT & ACT participation
  - SAT: 9% to 99% from 2017 to 2018
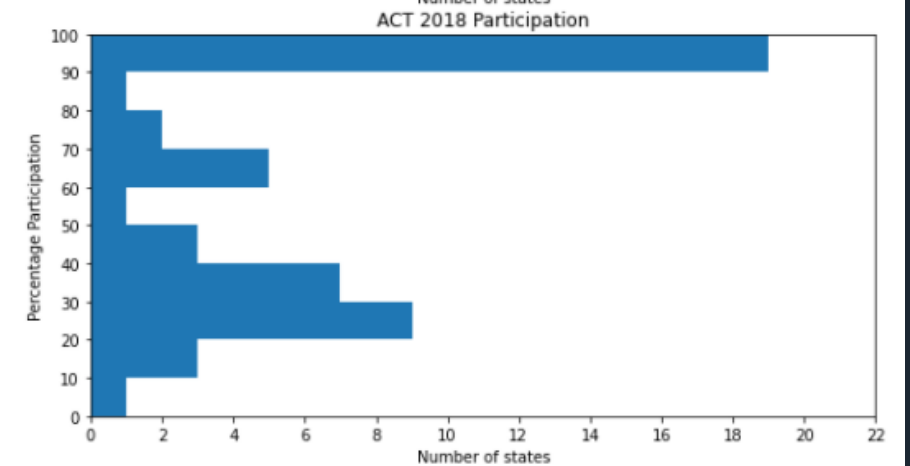 - ACT: 93% to 43% from 2017 to 2018
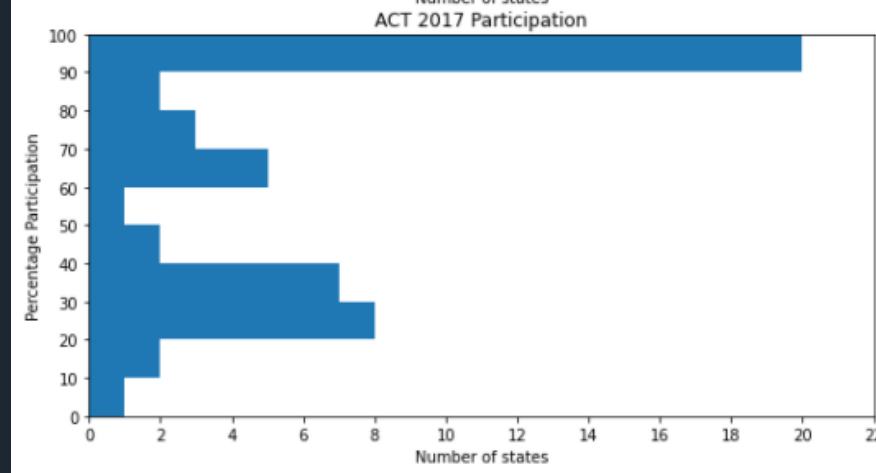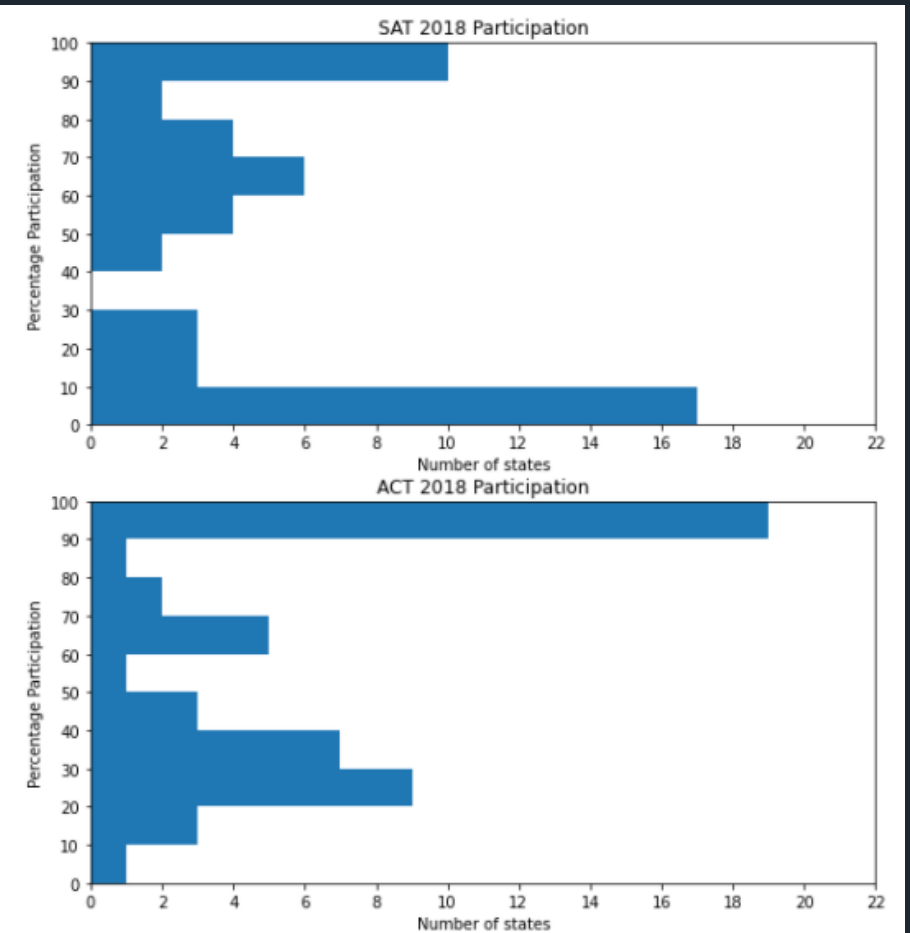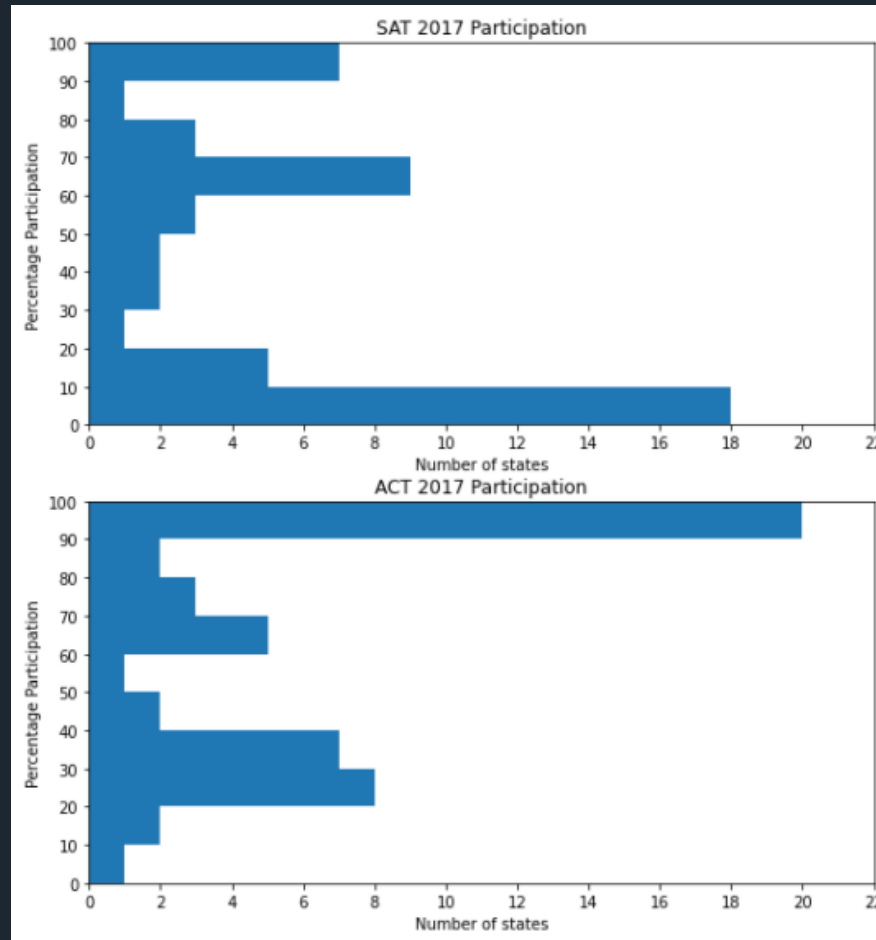
Data Visualization

Scoring well is inversely related with participation as shown in heatmap.

Inverse relationship between participation between the tests indicate that states generally choose between one test or the other

Statistical Correlation of SAT and ACT scores and participation for 2017 and 2018
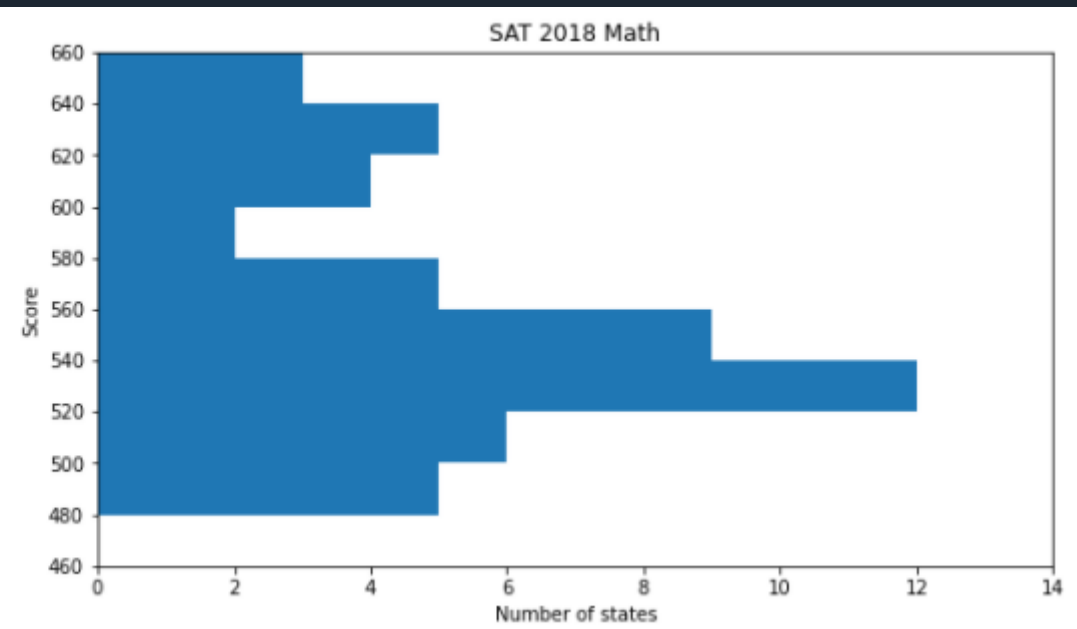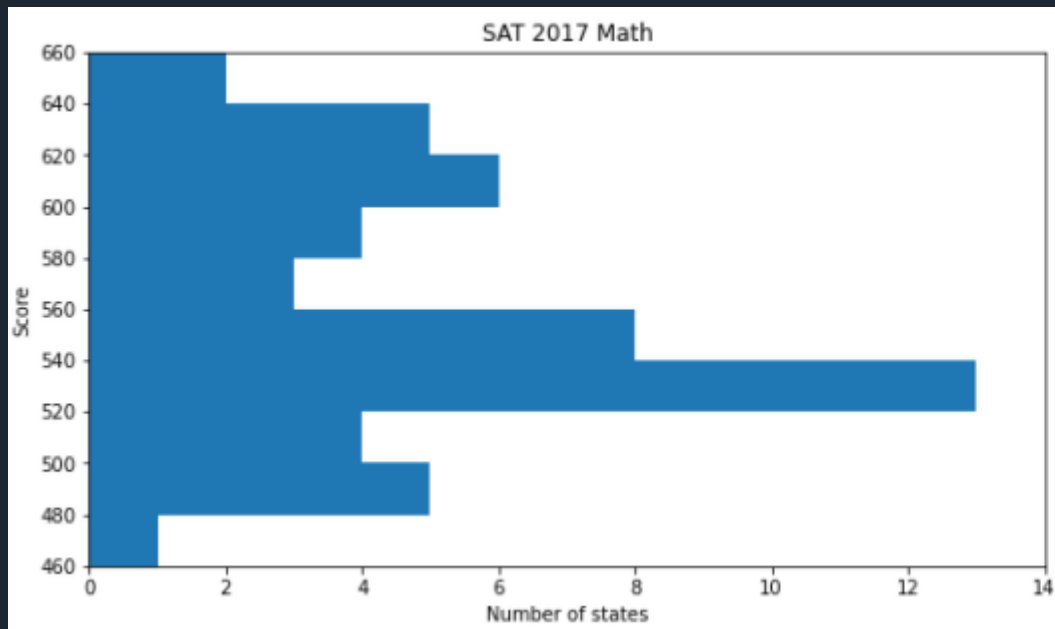
Data Visualization

- Studying participations reveal 3 groups:

  - Full or almost full participation

  - Moderately high participation
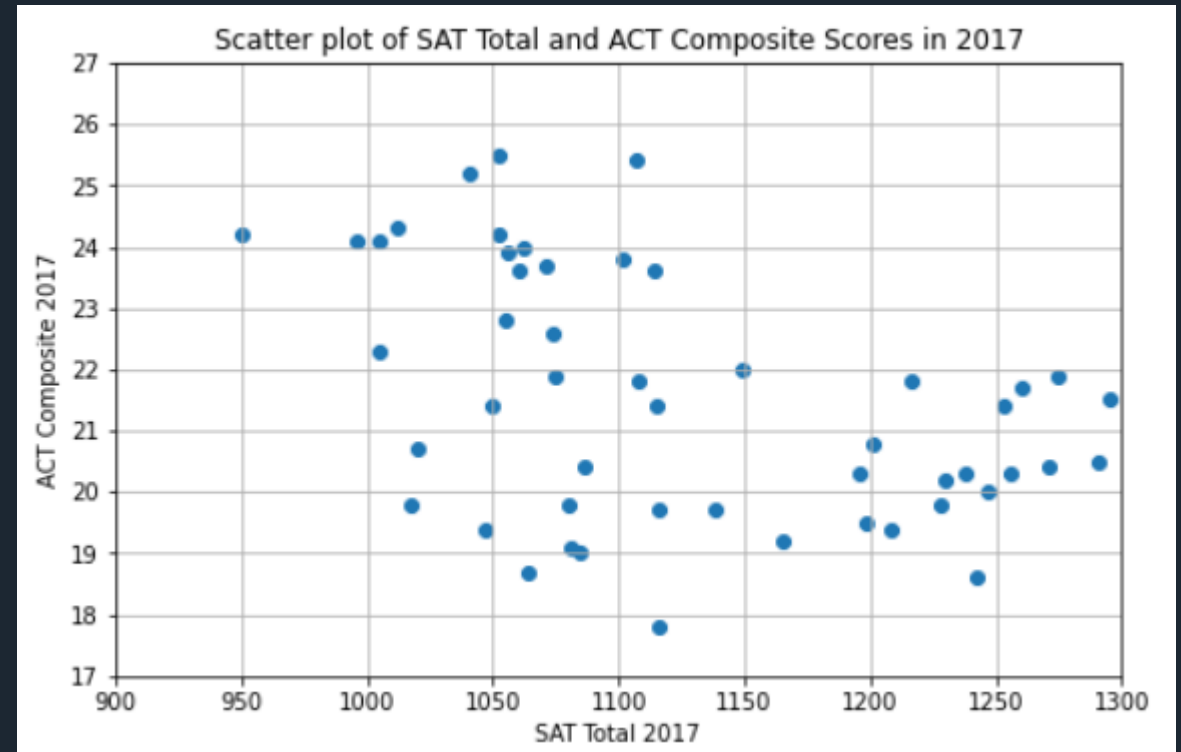
  - Low participation

Data Visualization & Hypothesis Testing

- Studying scores generally reveal 2 groups:

    - Lower scoring states.

    - Higher scoring states.

- As shown in the heatmap, scoring well is inversely related with participation.

- A two-sample t-test yields a p-value of $6.54*10^{-14}$ further confirming this.

Data Visualization

- Little correlation for scoring between the ACT and SAT, even for similar subjects.
  - i.e. states that do well in the SAT may or may not do well in the ACT.

Scatter plot of SAT Total and ACT Composite Scores in 2017

Additional research, conclusions & recommendations

- Minnesota is the "smartest" state:

  - Highest ACT score among all states with 100% participation

  - Highest SAT scores among all states

  - https://bgr.com/2020/09/19/dumbest-states-united-states-ranking/ 😆

- The swings in Colorado and Illinois from ACT to SAT were down to state initiatives.

  - https://www.denverpost.com/2017/03/06/colorado-juniors-sat-college-exam/

  - https://www.chicagotribune.com/news/ct-illinois-chooses-sat-met-20160211-story.html

- To lobby authorities in Kentucky to take up the SAT

  - Kentucky has good SAT scores with very low participation

  - To "sell" the SAT to the authorities based on the good scores for 2017 and 2018

  - Represents the largest potential increase in participation

  - Win-win for state and College Board

- To study the colleges, universities and scholarships that require the SAT for admission or consideration.