SOLAR SYSTEM EXPLORATION

GUANYU SONG, JASON LI

DOMAIN

- We used a public database containing physical data of celestial bodies in the solar system
- Our schema

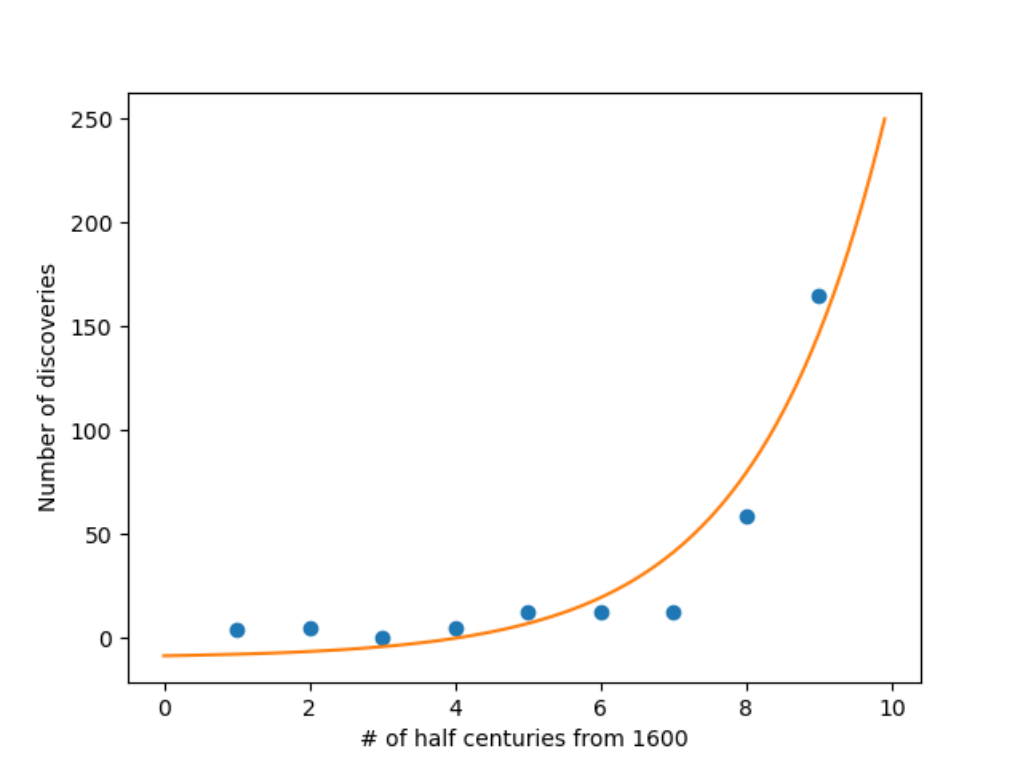
QUESTIONS

1. Which nation has contributed most to the discovery of celestial bodies among different historical periods? Are there spikes in discoveries with the advent of new technologies?
2. Is there a relationship between volume, mass, gravity, and escape velocity? Can we derive the physics formulas ourselves using the data?
3. What is the relationship between number of moons and planet volume, mass, and gravity?

RESULTS – QUESTION 1

- The rate of discovery is trending upwards with a rapid increase in the late 20th and early 21st century
- Possible reasons for this trend upwards is increase in interest in astronomy and advancement in observation technology
- The trend suggests that we are not running out of easily discoverable bodies

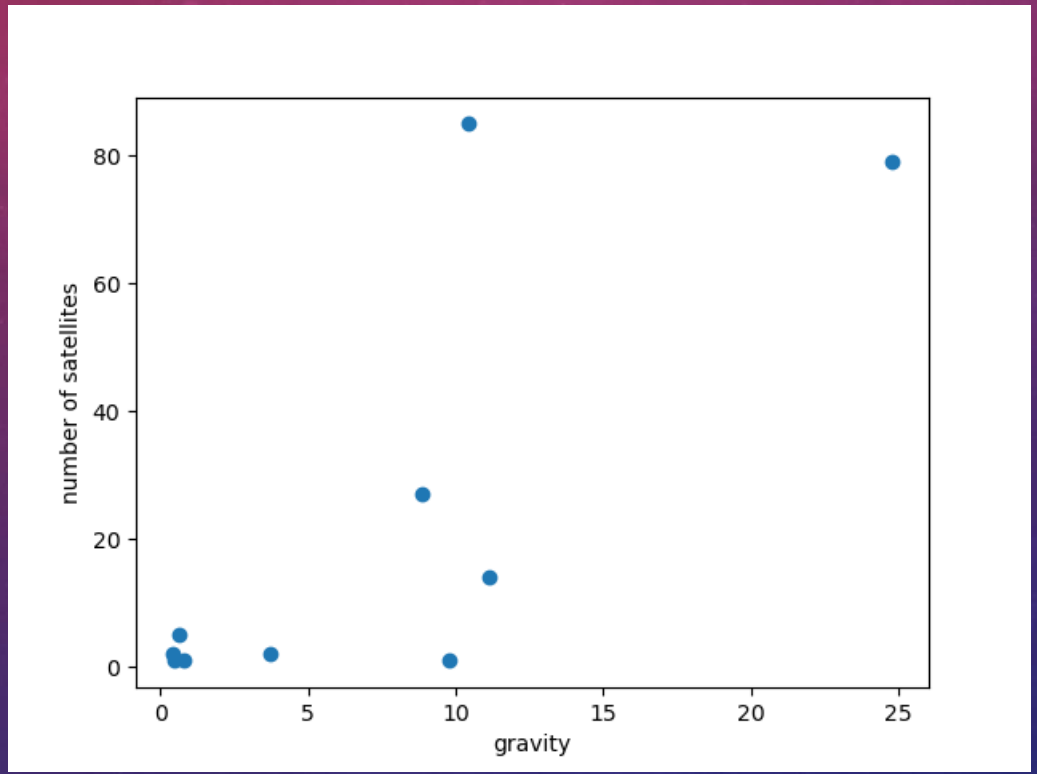
RESULTS – QUESTION 1



RESULTS – QUESTION 2

- The number of satellites of a planet is positively correlated with its gravity
- However, the correlation is not strong suggesting that gravity is only one of the factors that can affect a planet's number of satellites.

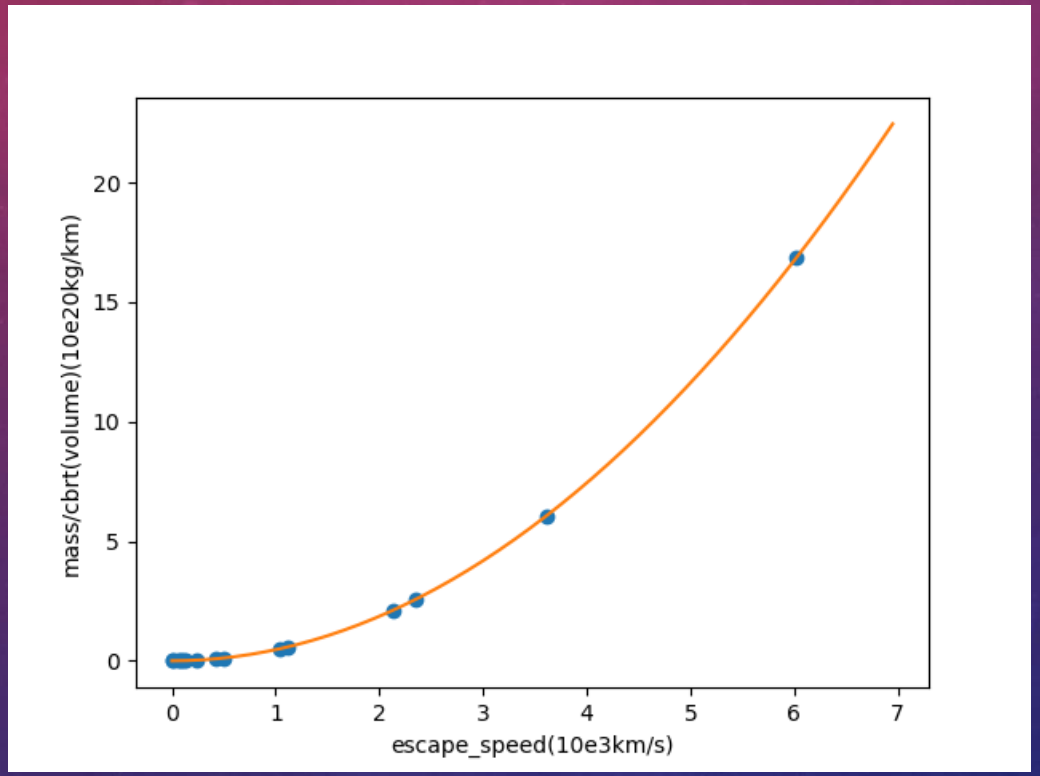
RESULTS – QUESTION 2



RESULTS – QUESTION 3

- We found that mass/radius is of the body is proportional to the square of the escape speed
- mass/radius = a*escape**2, a=4.6478*10e-11 m^3/kg/s^2
- since escape = sqrt(2GM/r) (G is the gravitational constant, M is the mass) and Volume = 4/3 pi r^3, G = 1/(2*a*cbrt(4/3pi)) = 6.674*10e-11
- This supports derived formula for escape speed $v_e = \sqrt{\frac{2GM}{r}}$
- Equivalently, $v_e^2 = C\frac{M}{r}$, where $C = 2G$
- We got 0% percent error. Such perfect proportionality suggests that some of the database values have been calculated using our formula

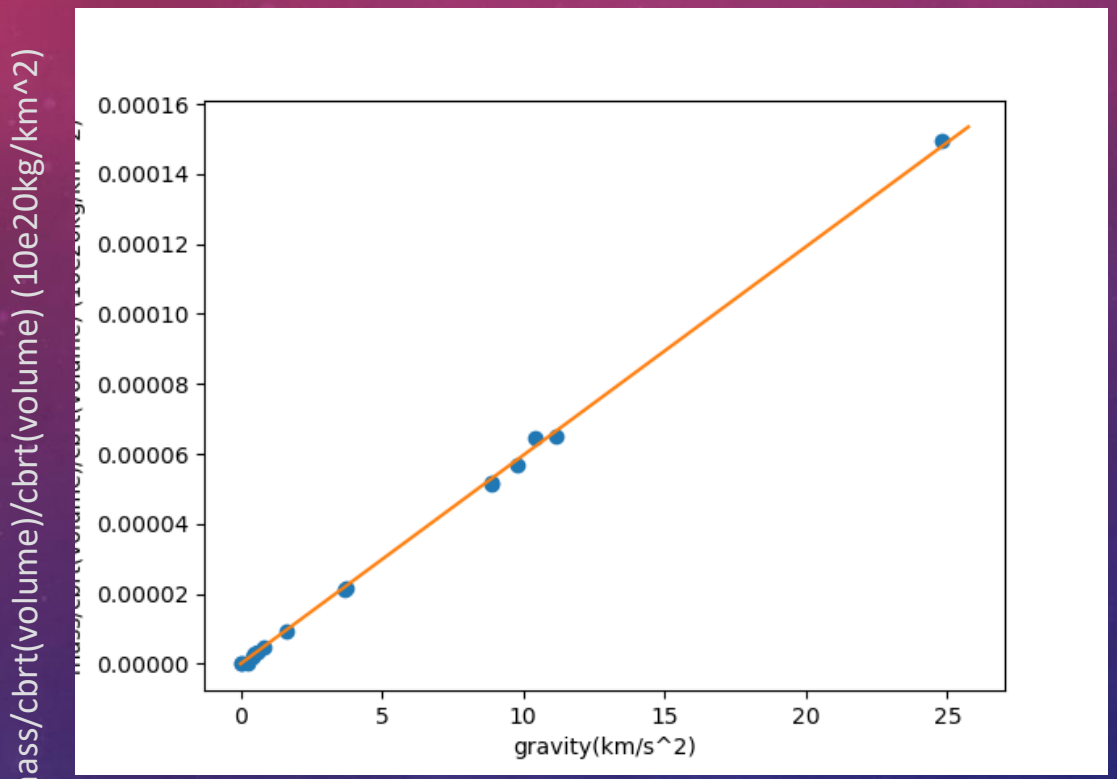
RESULTS – QUESTION 3



RESULTS – QUESTION 3

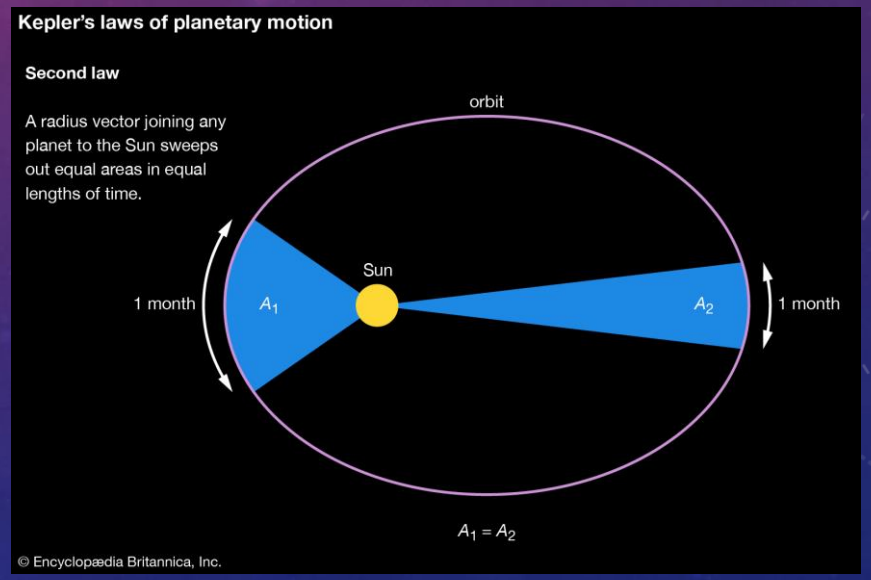
- We found that mass/radius^2 of the body is proportional its gravitational field
- The formula for a gravitational field is $F = \frac{Gm}{r^2}$
- mass/cbrt(volume)**2 = a*gravity, a = 5.96267*10e-9, since gravity = GM/r and volume = 4/3pi r^3, G = 6.454*10e-11, % error = 3.3

RESULTS – QUESTION 3



WHERE WE PLAN TO TAKE OUR INVESTIGATION

- We want to compare more attributes about the astronomer with discover dates and discovery rates
- We want find more numerical evidence supporting derived physics formulas. One direction we can take is that of Keplar's laws and elliptical orbits.



CHALLENGES

- A foreign key constraint must only reference one foreign table
- R[X] ⊆ R1[Y1] ∪…∪Rn[Yn] is a big no go
- IsMoon[moon] ⊆ (SmallMoon[mid] ∪ LargeMoon[mid]) in our project specifically
- We could have designed the tables differently so moon only references one table by combining SmallMoon and LargeMoon tables together
- Or we can write this restriction as a trigger

CHALLENGES

- Data manipulation was a challenge
- We needed to parse data from a csv
- Challenges with the format of the csv

LESSONS

- We found that in practice, cleaning the data can be a long and difficult step
- We found that foreign key constrains MUST reference only one other table
- A standard programming language, such as python, alongside a SQL is a powerful data analysis tool

QUESTIONS?