Kepler's Laws Activity Sheet: Second Law

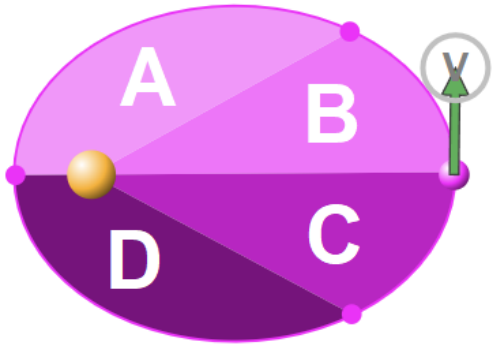
Course:	
Context:	Some basic geometric notions would be good to facilitate the discussion.
PhET sim (name and link):	Kepler's Laws: https://phet.colorado.edu/en/simulations/keplers-laws

Learning Goals

- *Explore how the velocity and position of a planet affect the shape of its orbit.*
- *Visualize what is meant by "swept area of a planet's orbit" and its relationship with equal time intervals in the context of Kepler's second Law.*
- *Describe the behavior of the planet's velocity in different moments of its orbit.*

Pre-lab Activity

Look at the following image of an ellipse to answer questions 1-4:



1. The picture represents an ellipse whose area has been divided into 4 parts. Which of these parts do you think has the greatest area? Order them from least to greatest area.

2. This ellipse represents the orbit of the pink planet moving around the yellow sun. In which part of the orbit is the planet going to move faster? Explain your reasoning.

3. Order sections A, B, C and D according to the amount of time it will take the planet to go through them.

4. Will there be a difference in the time it takes the planet to go through A+B versus D+C? Explain your reasoning.

Open Play

Allow 5 min to play with the PhET sim. *Kepler's Laws - Second Law*. Describe three main things you have discovered:

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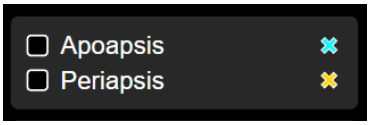
Share your discoveries with the rest of the group.

Collect and Interpret Data

Important Orbital Points



1. Activate these checkboxes and play with different orbits. Then, define periapsis and apoapsis in your own words.

Periapsis is…
Apoapsis is…

2. Search online for alternate names for these points, and how they are called in other types of orbits. Complete the table::

Type of Orbit	Name for Apoapsis	Name for Periapsis
Orbit around the Sun		
Orbit around the Earth		
Another interesting orbit? _____		

3. Create an orbit with 5 period divisions. Complete the table below.

Screenshot/Sketch of Orbit	Observations	Conclusions

Name each area with a number from 1 to 5.	The time it took the planet to travel through area: Area 1: _____ Area 2: _____ Area 3: _____ Area 4: _____ Area 5: _____	
	Size of each area: Area 1: _____ Area 2: _____ Area 3: _____ Area 4: _____ Area 5: _____	
	Velocity of the planet in each area: Area 1: _____ Area 2: _____ Area 3: _____ Area 4: _____ Area 5: _____	

4. Where the velocity of the planet is the biggest and where is the smaller?

Synthesis of Kepler's Second Law

5. Use the internet or another resource to look up the Kepler's Second Law and write it here:

    a. Based on what you learned from this activity, try to explain this law to an elementary school student using your own words. You can include pictures and screenshots of the simulation!