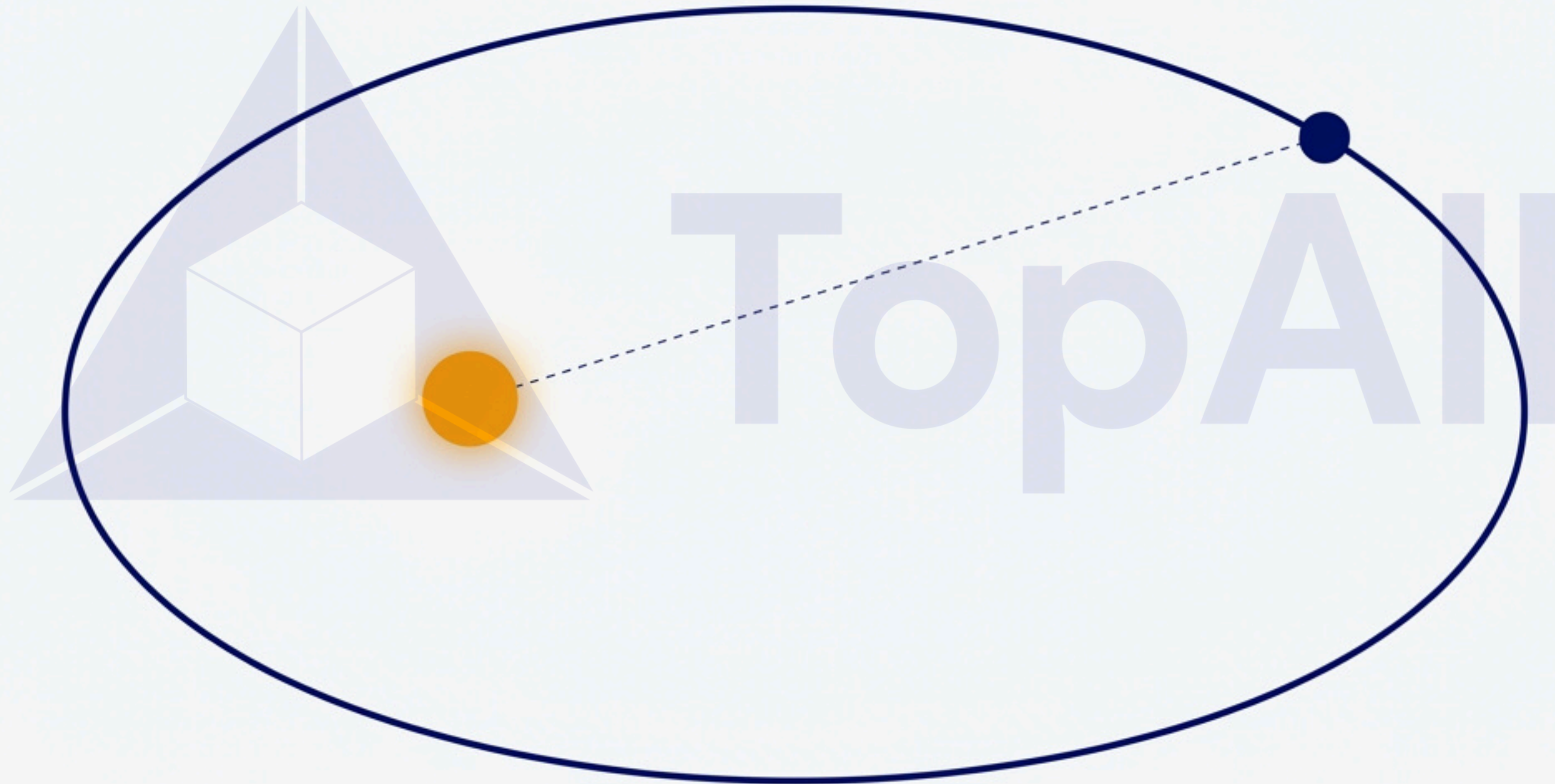


Kepler's Laws

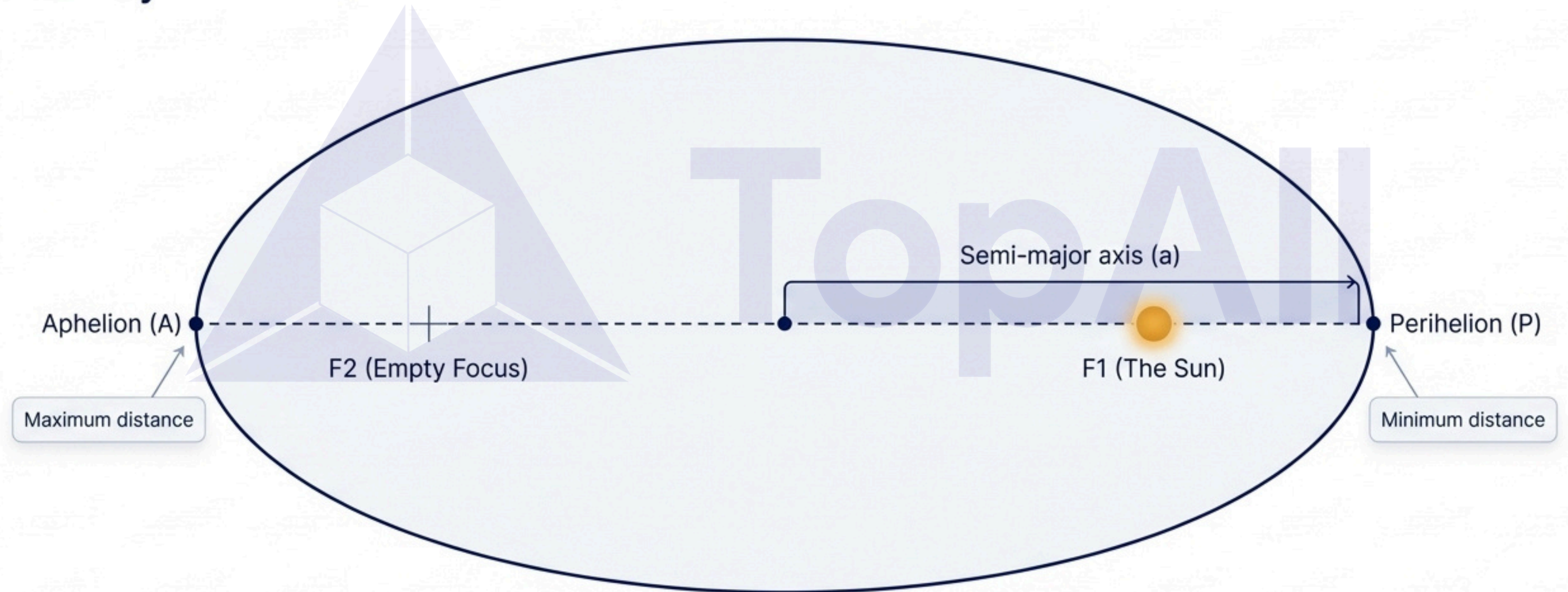
"How planets really move" in Inter, 20px



First Law: The Law of Orbits

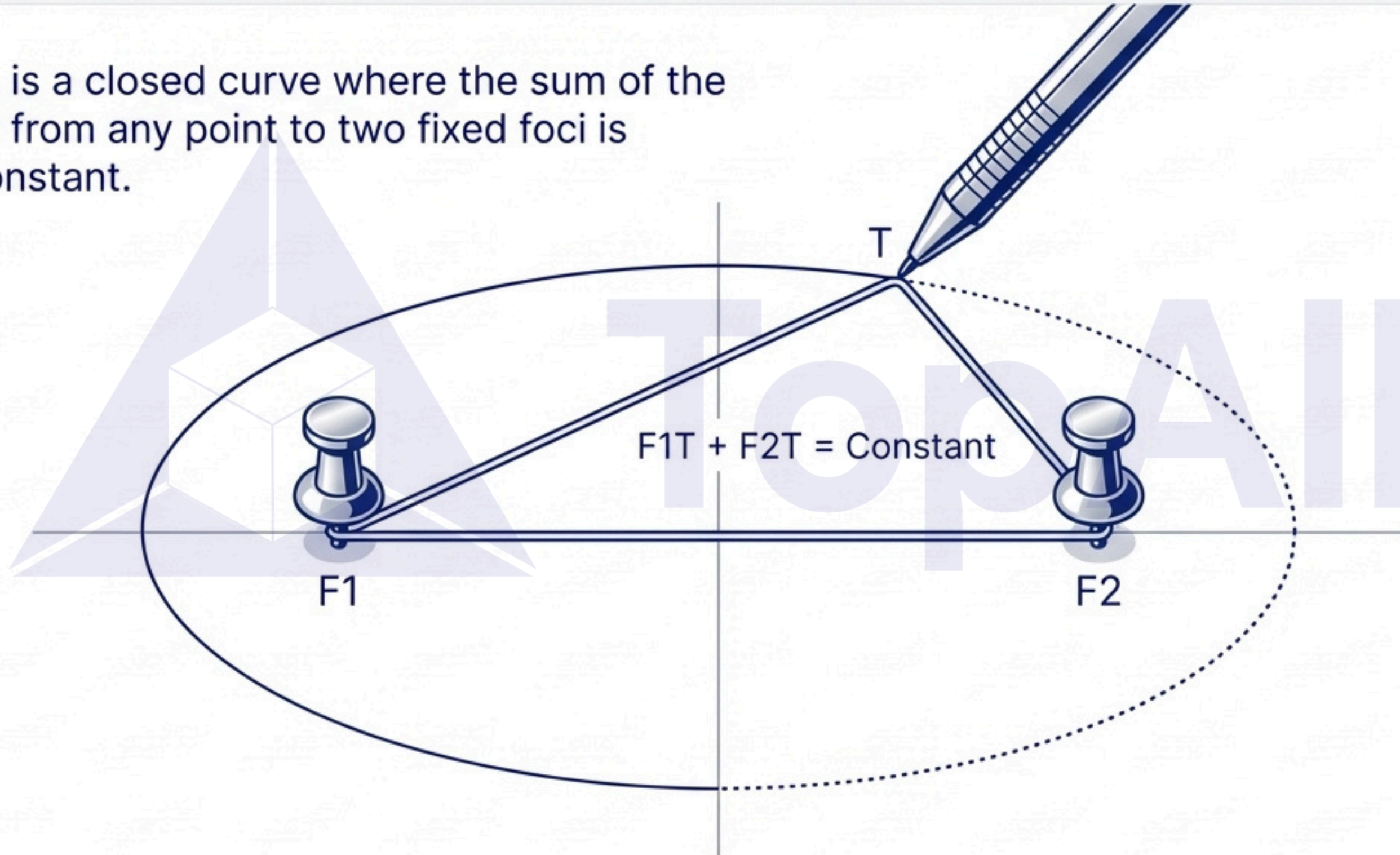
All planets move in elliptical orbits with the Sun situated at one of the foci.

Anatomy of an Orbit



What Is an Ellipse?

An ellipse is a closed curve where the sum of the distances from any point to two fixed foci is always constant.





**You've Learned the Theory.
Let's Test Them Now.**

$$E=mc^2$$



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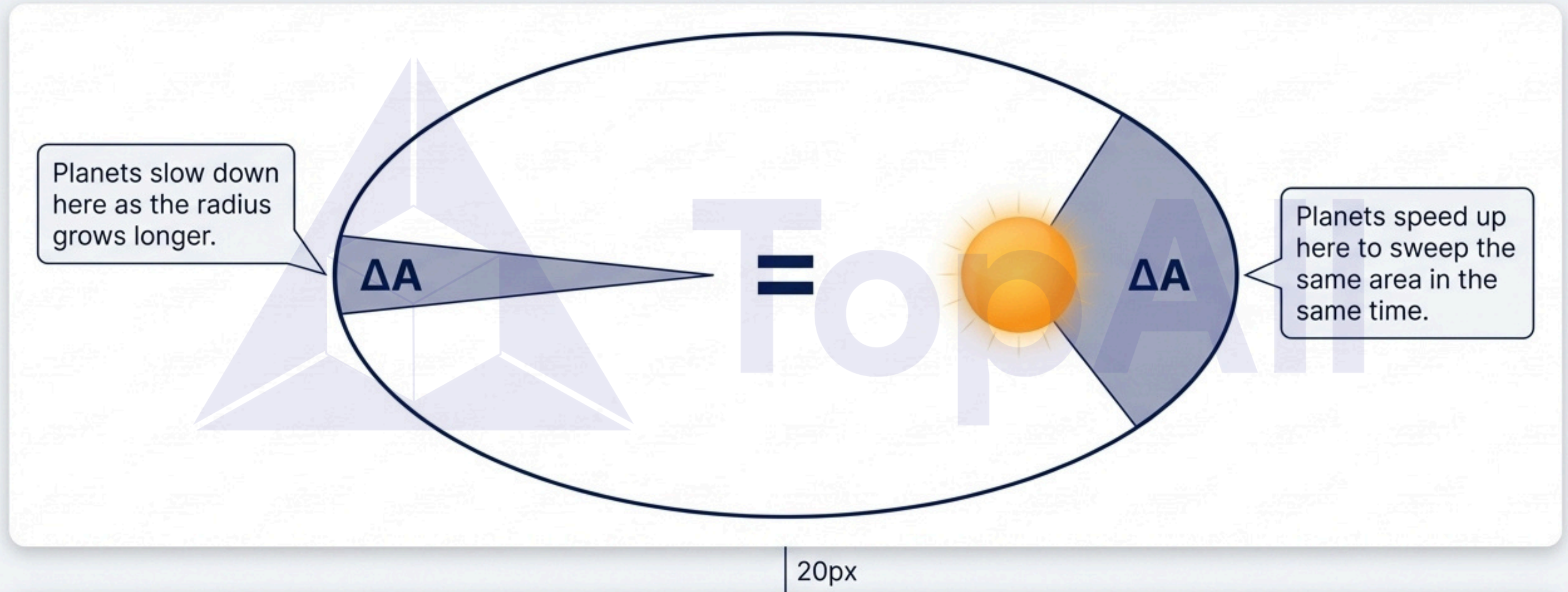
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Second Law: The Law of Areas

The line that joins any planet to the Sun sweeps equal areas in equal intervals of time.



This law is a direct consequence of the Conservation of Angular Momentum ($L = mrv$). $\Delta A / \Delta t$ is a constant.

Third Law: The Law of Periods

The square of a planet's time period is directly proportional to the cube of its semi-major axis.

 T^2

Orbital Period

(Time taken for one complete revolution)

 $\propto$ a^3

Semi-major axis

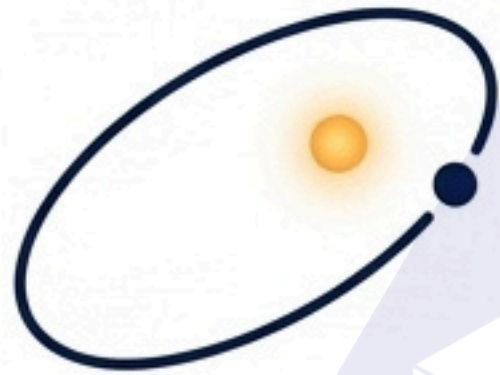
(Mean distance from the planet to the Sun)

If you know a planet's distance from the Sun, you can precisely calculate the length of its year.

$$\frac{T^2}{a^3} = \text{Constant (for all planets orbiting the same central body).}$$

The Cosmic Blueprint, Decoded

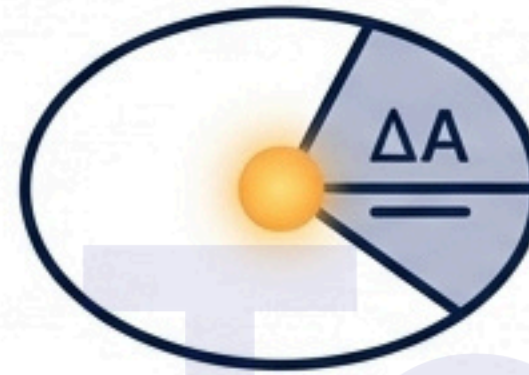
What these laws actually tell us about the universe



Law of Orbits

Outcome: Orbit Shape

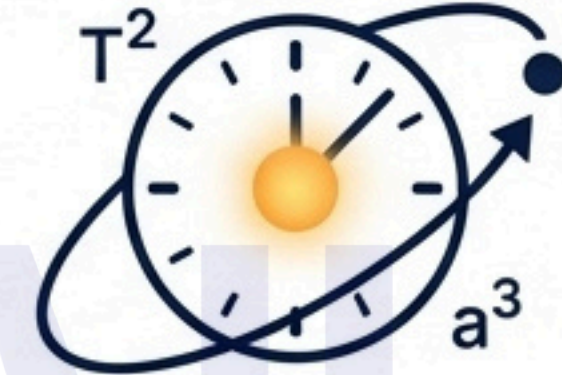
The path is an ellipse, not a perfect circle. The Sun is never perfectly in the center.



Law of Areas

Outcome: Speed Variation

Planetary speed is not constant. Gravity acts like a slingshot, accelerating planets as they get closer to the Sun.



Law of Periods

Outcome: Time-Distance Relation

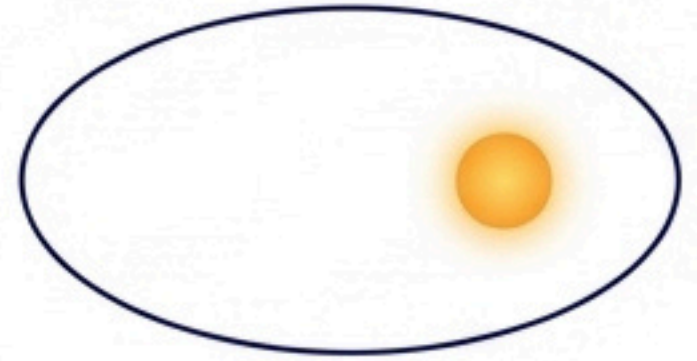
The larger the orbit, the exponentially longer the planetary year.

Key Takeaways Plus Jakarta Sans at 32px

01

Shape →

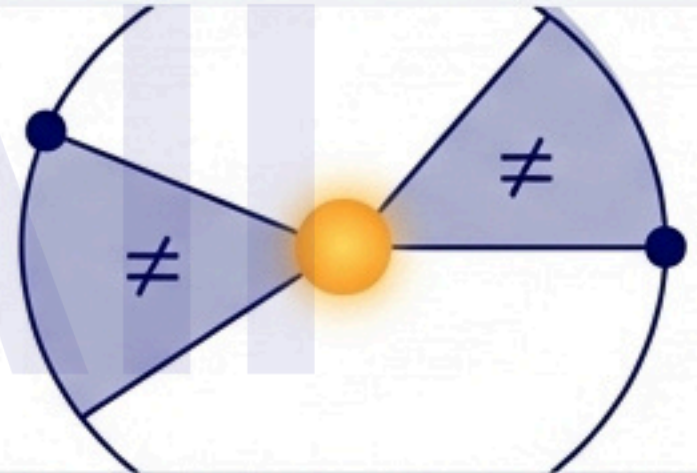
All planets move in **elliptical orbits** with **the Sun** situated at one of the foci.



02

Speed →

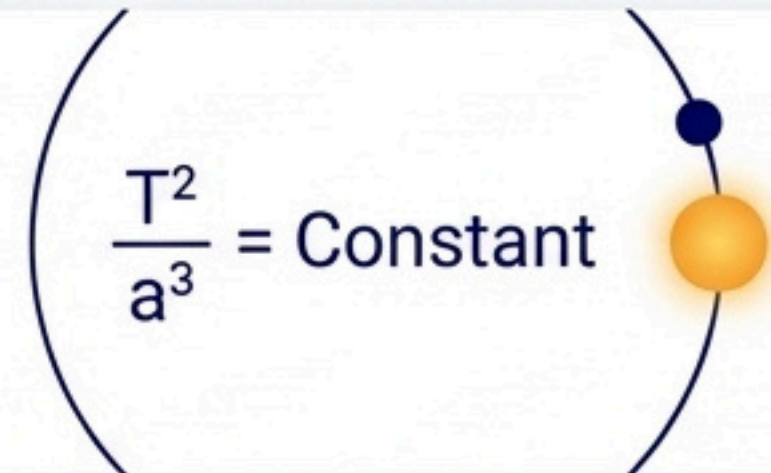
The radius vector sweeps out **equal areas in equal time intervals** (proving angular momentum is conserved).



03

Time →

The quotient **T^2 / a^3** is **constant** for all planets revolving around the same central body.





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