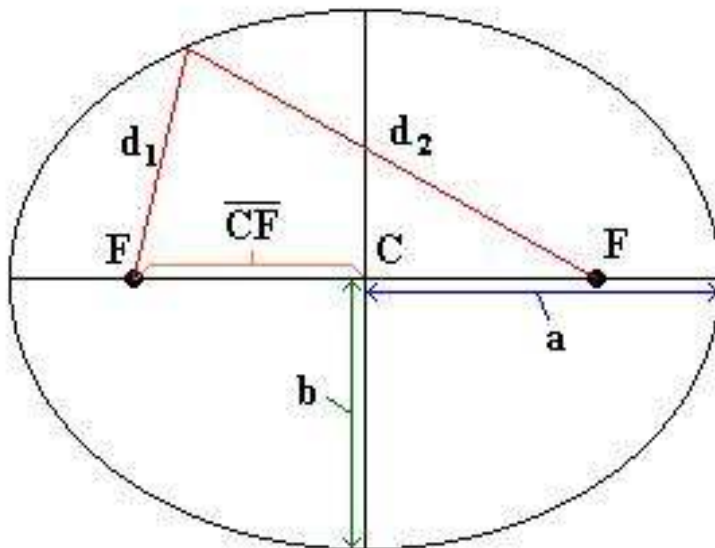Properties of an Ellipse

a = semimajor axis
b = semiminor axis
e = eccentricity
    $e = \overline{CF}/a$
F = focal point
C = center

All points on the ellipse
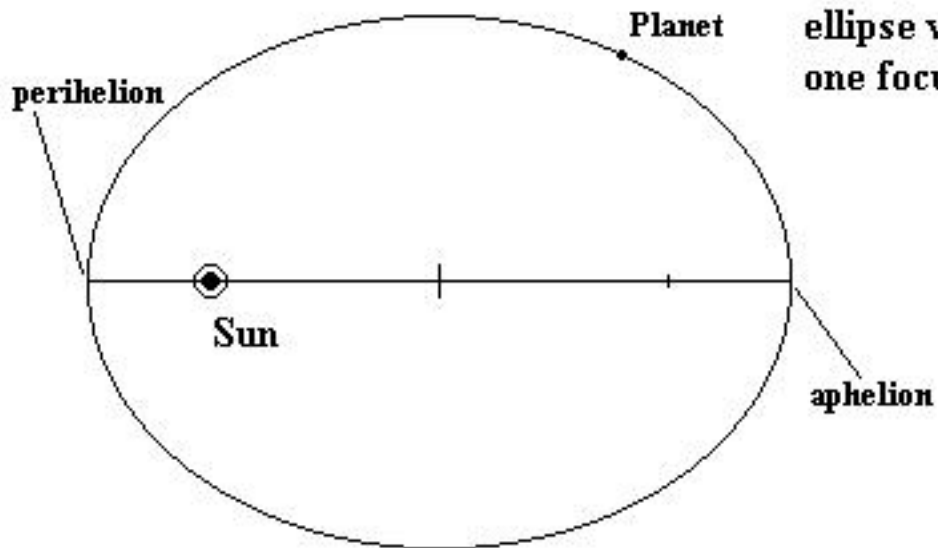have the following
property:
    $d_1 + d_2 = const.$
    $(const. = 2a)$

For the specific ellipse in this diagram:
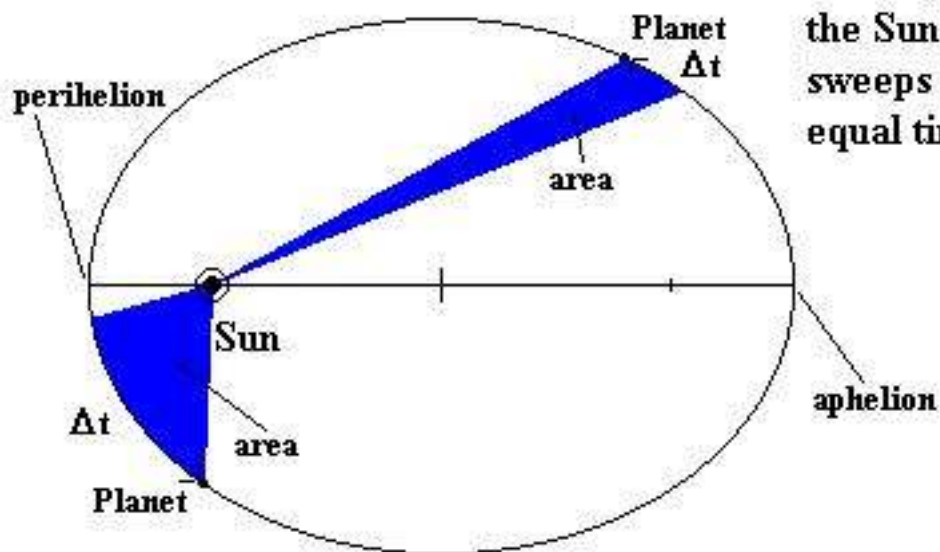 a = 132 pixels, b = 100 pixels, $\overline{CF}$ = 86 pixels, e = 0.65, const. = 264 pixels

Kepler's 1st Law

Law of Ellipses:
Each planet moves in an ellipse with the Sun at one focus.

Planet

perihelion

Sun

aphelion

Kepler's 2nd Law

Law of Areas:
An imaginary line between
the Sun and the planet
sweeps over equal areas in
equal time intervals.

perihelion

Planet
Δt

area

Sun

aphelion

Δt

area

Planet

Kepler's 3rd Law

Jupiter:
a = 5.2 AU
P = 11.9 y

Saturn:
a = 9.6 AU
P = 29.4 y

Mercury:
a = 0.4 AU
P = 0.2 y

Venus:
a = 0.7 AU
P = 0.6 y

Earth:
a = 1.0 AU
P = 1.0 y

Mars:
a = 1.5 AU
P = 1.9 Y

Harmonic Law:
$$P^2 = a^3$$
P in years, a in AU

Planet	P^2	a^3
Mercury	0.06	0.06
Venus	0.38	0.38
Earth	1.00	1.00
Mars	3.54	3.54
Jupiter	141	141
Saturn	866	872

Note: Table no.s computed with higher precision
no.s than shown in above diagram.