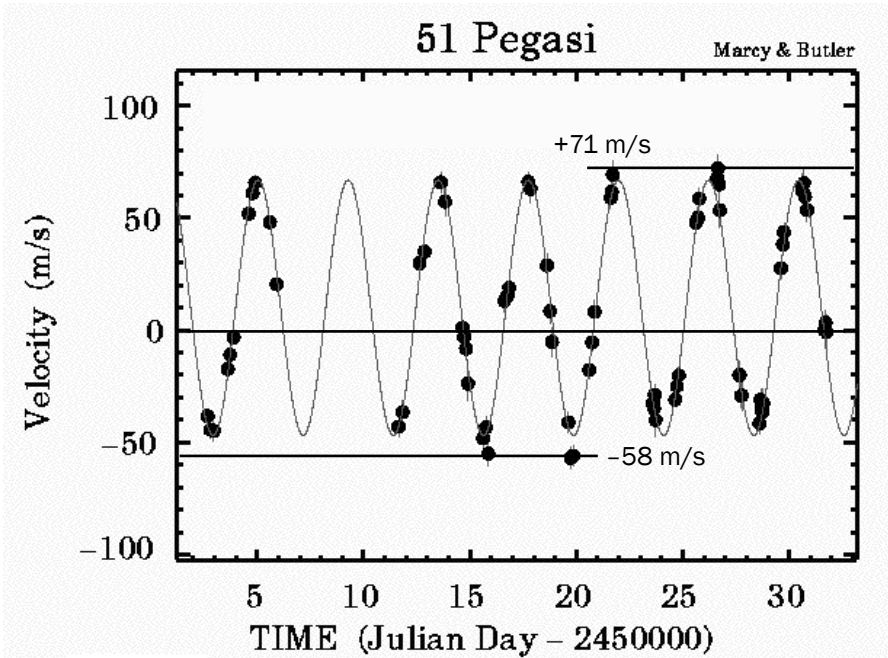


Quiz 06: The Discovery of ExoPlanet 51 Pegasi b

Answer each of the following questions using your clicker. You must respond using your clicker; papers will not be marked by hand.

You may use your lab notebook and a calculator. Each question is worth **3 points**, and there is no partial credit.

- In 1995 when this exoplanet (51 Pegasi b) was discovered, why was it so exciting to astronomers?
 - It was the first planet ever discovered orbiting a star other than our own sun.
 - It was the first planet found orbiting a star almost identical to our own sun.**
 - It was the first planet discovered to have the same mass as our own planet.
 - It was the first planet discovered (other than our own Earth) to have carbon-based life.
 - It wasn't exciting at all. By 1995, there were literally thousands of catalogued exoplanets, most of them known to be Earth-like.



When the data above are analyzed, it is determined that the **average period** of the exoplanet is **4.4 days**. Use this information, and the graph, to complete the table below. **Answer each question numerically with three significant digits.**

QUESTION	AVERAGE PERIOD IN DAYS	START WITH: <i>average days = 4.4</i>	CALCULATE AND CLICK!
57	PERIOD IN YEARS	$P = \frac{\text{average days}}{365}$	$P = \frac{4.4}{365} = 0.0121\text{yr}$
58	SEMI-MAJOR AXIS IN AU	Kepler# 3: $P^2 = a^3$ $a = \sqrt[3]{P^2} = P^{(0.67)}$	$a = P^{(0.67)} = (0.0121)^{(0.67)}$ $a = 0.519\text{AU}$
59	AVERAGE RADIAL VELOCITY	$K = \frac{v_{\max} - v_{\min}}{2}$	$K = \frac{71 - (-58)}{2} = 64.5 \frac{\text{m}}{\text{s}}$
60	MASS OF EXOPLANET	$M_{51\text{Peg}B} = \left[\left(\frac{P}{12} \right)^{(1/3)} \left(\frac{K}{13} \right) \right] M_{\text{Jupiter}}$	$M_{51\text{Peg}B} = \left[\left(\frac{0.0121}{12} \right)^{(1/3)} \left(\frac{64.5}{13} \right) \right] M_{\text{Jup}}$ $M_{51\text{Peg}B} = 0.496 M_{\text{Jup}}$

61. If the accepted value for the mass of 51 Peg b is $(0.472 \pm 0.039)M_{\text{Jupiter}}$, meaning that the mass might be as low as 0.433 or as high as 0.511 Jupiter masses. Is this calculated value for the mass within the limits of the error bars? Respond **YES** if the experimental value is within the range, and **NO** if it is not.

Examine the assumptions below, and respond **TRUE** if the assumption is reasonable and valid. Respond **FALSE** if the assumption is incorrect or unreasonable.

- True** or false: The mass of the planet is much less than the mass of the star.
- True** or **false**: The star 51 Pegasi is much larger and much hotter than our own sun.
- True** or false: The eccentricity of the planet's orbit is zero.
- True** or **false**: The planetary system is being viewed from the top down.