

The Search for Exoplanets - Exercise Materials -

Student Name: _____

Step 1.

- A. Table 1 lists data from 20 stars with confirmed exoplanets and contained within Stellarium's star database.
 - B. Start Stellarium.
 - C. Turn the Landscape off.
 - D. Lookup the stars listed and record their spectral type in the column provided in Table 1.
 - E. Using the blank graph in Figure 1, plot the count of stars for each spectral type as a vertical Bar Graph.
 - F. Exit Stellarium.
- ☐ **Question 1:** Do you observe the distribution to be similar to that stated in the introduction to this exercise? _____

Step 2.

The simulated data in Figure 2 represents the Transit data for Star A and B. The simulated data in Figures 3 represents the Radial Velocity data for Star A and B.

For the Transit Data

- G. Using the data in Figure 2, for Star A, estimate the period for any exoplanet you believe you detect and record it in Table 2. (connecting the dots on the graph may be helpful)
- H. Using the data in Figure 2, for Star B, estimate the period for any exoplanet you believe you detect and record it in Table 2.
- I. For both stars, calculate the Period in years (365.25 days per year) and then calculate the estimated Semi-major axis of the planets' orbits using Kepler's 3rd Law.
(Remember $P^2 = a^3$, assumes the host stars are one solar mass each)

Step 3.

- **Question 2:** Do you feel there is a possible exoplanet candidate for Star A from the Transit data? _____
- **Question 3:** Do you feel there is a possible exoplanet candidate for Star B from the Transit data? _____

As stated in the exercise's introduction, while the Transit method is the second most successful method, it can lead to false positives and should be verified via another method.

- **Question 4:** For Star A, if you detected a possible exoplanet, does the Radial Velocity data confirm the exoplanet's existence? _____
- **Question 5:** For Star B, if you detected a possible exoplanet, does the Radial Velocity data confirm the exoplanet's existence? _____

Exoplanet List

Host Star	Planets	Star Mag.	Discovery Year	Star Spectral Type
Epsilon Eri	Epsilon Eridani b	3.73	2000	
Fomalhaut	Fomalhaut b	1.16	2008	
61 Vir	61 Vir b	4.74	2009	
	61 Vir c		2009	
	61 Vir d		2009	
beta Gem	HD 62509 b	1.15	2006	
HIP 57050	HIP 57050 b	11.90	2010	
gamma Cep	gamma Cephei b	3.23	2002	
47 Uma (HIP 53721)	47 Ursae Majoris b	5.10	1996	
	47 Ursae Majoris c		2001	
Upsilon And	ups And e	4.09	1996	
	Upsilon Andromedae b		1996	
	Upsilon Andromedae c		1999	
	Upsilon Andromedae d		1999	
55 Cnc (HIP 43587)	55 Cancri b	5.95	1996	
	55 Cancri c		2002	
	55 Cancri d		2002	
	55 Cancri e		2004	
	55 Cancri f		2007	
HIP 79431	HIP 79431 b	11.34	2010	
51 Peg	51 Pegasi b	5.50	1995	
tau Boo	tau Boo	4.50	1996	
rho Cbr	rho CrB	5.40	1997	
14 Her	14 Herculis b	6.67	2002	
70 Vir	70 Virginis b	5.00	1996	

beta Pic	beta Pic b	3.86	2008	
alpha Ari	alpha Ari b	2.01	2011	
16 Cyg	16 Cygni b	6.20	1996	
42 Dra	42 Draconis b	3.30	2008	
Tau 1 Gru	Tau 1 Gruis b	6.03	2002	

Table 1

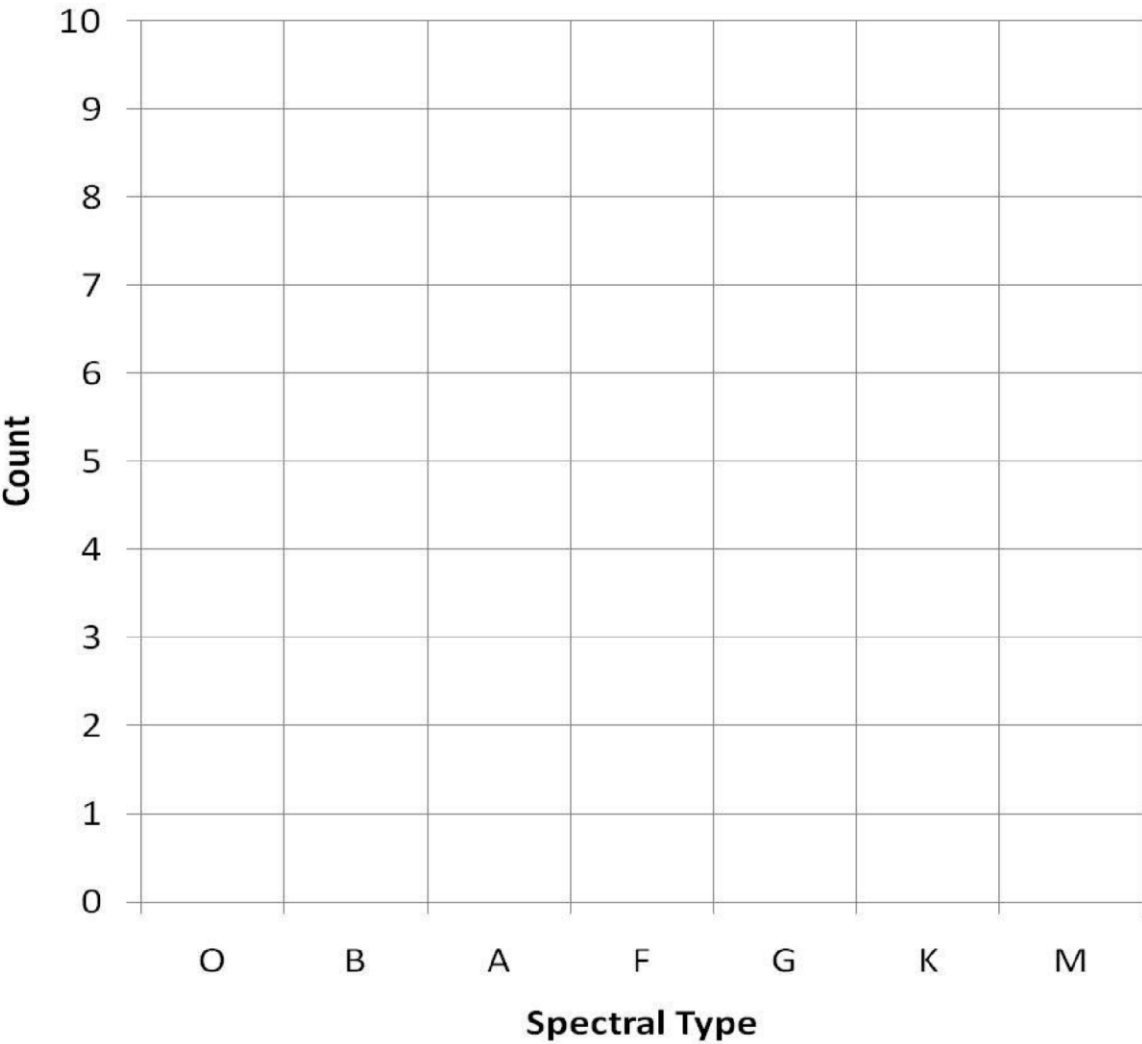


Figure 1
Transit Data

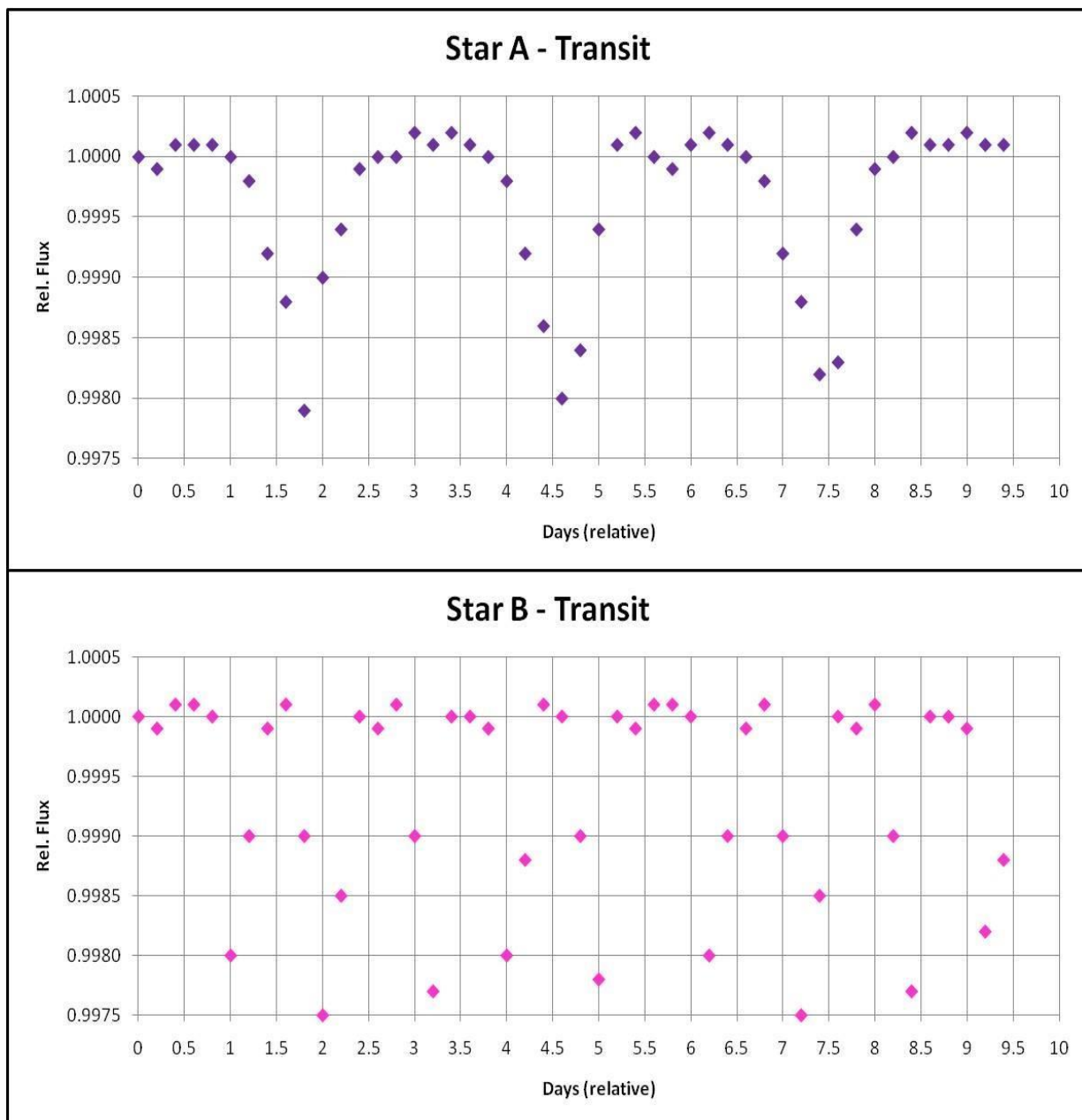


Figure 2
Radial Velocity Data

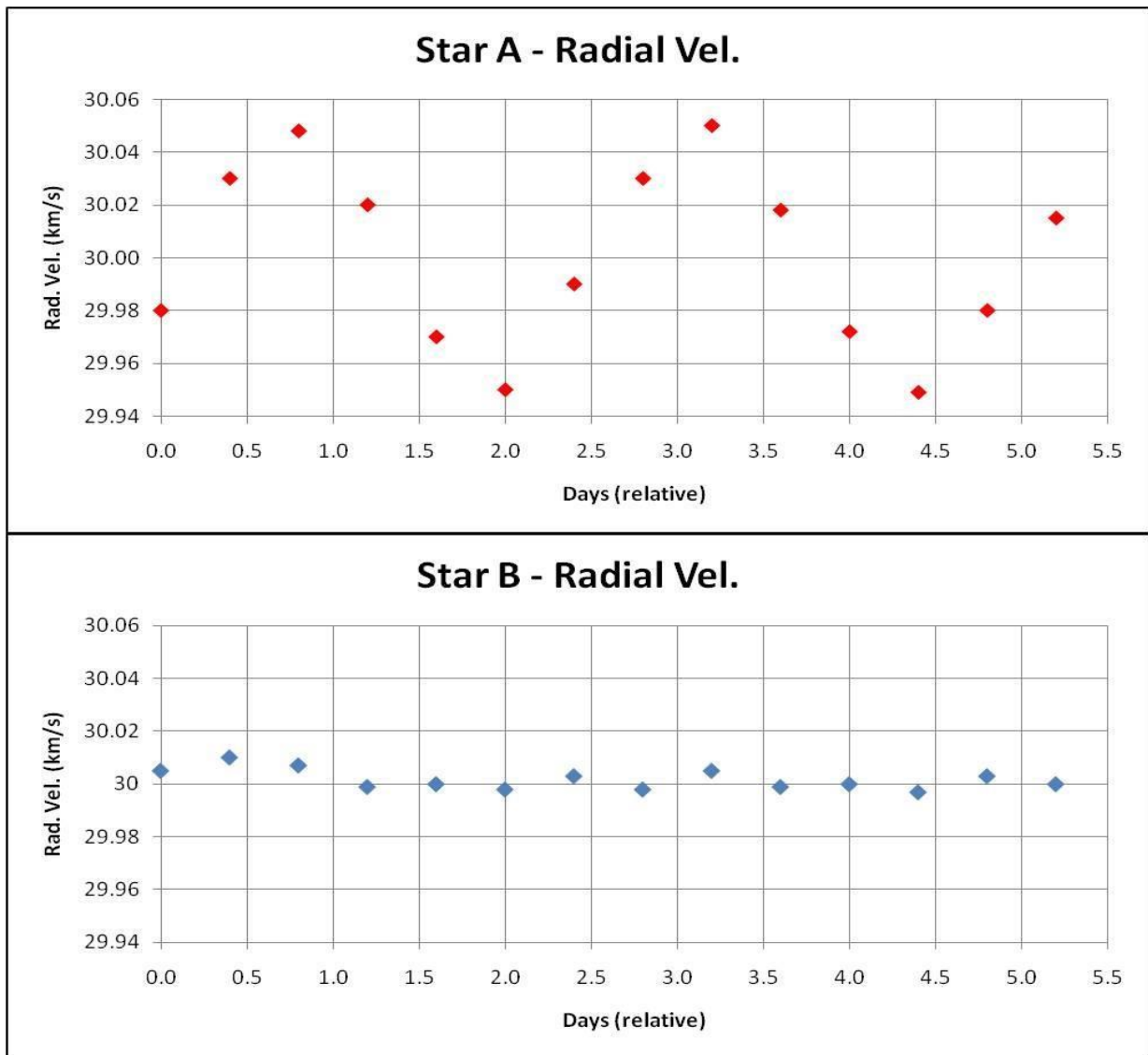


Figure 3

Period Estimate(s) Data

Star	Period (days)	Period (years)	Est. Semi Major Axis of Orbit (A.U.)
A			
B			