Name:

Building a Transit

For each team, make sure you have all the proper materials: your "star" (book light and ping pong ball), and your "planets" (modeling clay).

Construct a Transit

1) First, construct a planet out of modeling clay. Place your planet on the end of the straightened paper clip so that you have something to hold it up as it orbits the star. Note: it will be **very** difficult to get your planets to realistic scale with your "star." If the ping pong ball is roughly 3 cm in diameter, an Earth size planet to scale would be 100,000 times smaller, which is about 0.3 **micrometers**. A Jupiter size planet would be 10,000 times smaller, which is 3 **micrometers**, still much smaller than a mm. Therefore for this exercise, our planets will be very LARGE compared to the stars.

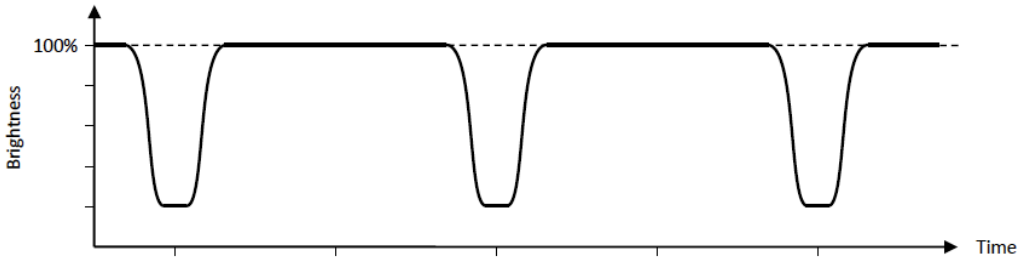
2) Next, construct an orbital path for the planet around the star that would be visible as a transit to you, the observer. Illustrate below what this looks like.

3) Now, construct an orbital path for the planet around the star that would NOT be visible as a transit to the observer. Illustrate below.

Model Different Light Curves

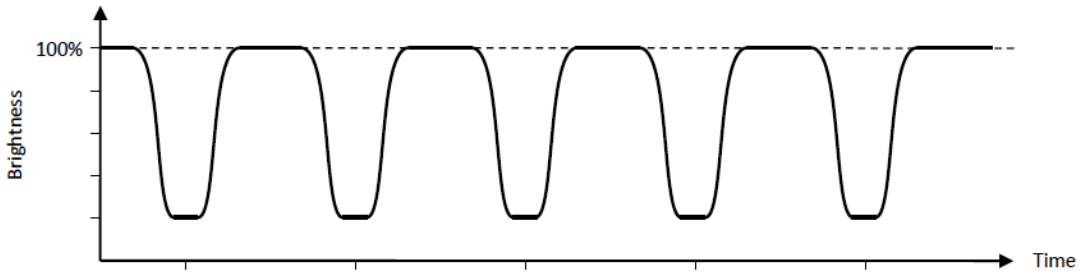
Assume the picture below (a) is the basic light curve for the transit you constructed above. On the y-axis is how bright the star is, and on the x-axis is time. When the y-axis is at 100% that means the star is at its full brightness—no dimming. Any dips below 100% mean that something, i.e. a planet passing in front, is causing the star to dim. The distance between the dips depends on the orbital period of the planet, or how far away from the star it is.

(a)



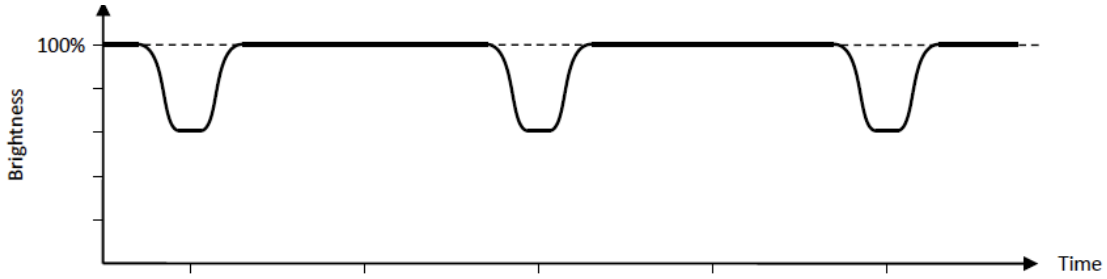
4) How would you change your transit model to get from light curve (a) above to light curve (b) below? Hint: now the dimming events from the transits are happening more often.

(b)



5) How would you change your transit model to get from light curve (a) to light curve (c) below: Hint: now the dimming of the star is **less** than before.

(c)



Challenge Questions

6) Name one astronomical object that might produce a transit signal, but is NOT a planet. We would call this transit signal a "false detection."

7) Name two important things about the planet that are recovered from the transit light curve.

8) Name two drawbacks of the transit method. Hint: will the transit method be able to find planets around ALL nearby stars, or only some?

9) Finding small planets is hard with the transit method. What is one thing you could change about your transit model that would make detecting smaller planets easier? Hint: you cannot change the planet size.