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INTD290: Number Systems in pre-Columbian Context

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1 How to Submit this Assignment

Once you answer the questions, take a picture of your work and convert it to a PDF. Submit the PDF to the assignment link on Moodle.

2 Introduction

For this asynchronous assignment, we will be using something called a *Physics Educational Technology* simulation, or PhET simulation. For an introduction to this tool, please follow this link to a tutorial video by one of my colleagues:

`https://youtu.be/m6e2y4fef1I`

3 The Simulation

To find this simulation, which teaches us how gravity and planetary orbits work, follow this link:

`https://phet.colorado.edu/en/simulation/gravity-and-orbits`

4 The Basics: circular and elliptical orbits

Instructions:

1. Starting with the link above, press the "to scale" option at the bottom of the screen. Chose the option with the star and planet.
2. Activate the path and grid options at right.
3. Click the play button and allow the planet to rotate through 360 degrees, all the way around the star. You can speed up or slow down the motion, which is just governed by gravity, with the controls.
4. Use the yellow measuring tape tool at right to measure two distances: (a) the distance from the star to the path of the planet on the *right*, and (b) the distance from the star to the path of the planet on the *left*. Are they the same number? Right = 94517000 miles. left = 91252000 miles. Not the same.
5. What would be true of the numbers if the orbit was perfectly circular? The distances would be the same and there would be no eccentricities in the orbit resulting from other celestial bodies, which is not true!

5 Gravity

Instructions:

1. Using the controls at right, display the direction of the force of gravity.
2. What happens to the path of the planet if you deactivate gravity? The planet would continue in its current direction.
3. What happens to the force of gravity if you leave it activated, but click and drag the planet farther from the star? It weakens as inverse square law
4. Display the velocity with the control at right. Reveal what happens if you let the planet follow one orbit, and then pause, and then change the length of the velocity arrow. This corresponds to changing the speed of the planet. (Changing the direction of the arrow changes the direction of the velocity).