

Astronomy Activity

How Fast are We Moving?

TEACHER NOTES

Level: *Introductory at Middle School or High School*

Objective: *This is the first lesson in a line of lessons leading up to using the Horn Telescope to detect the doppler shift associated with the Earth moving around the Sun. The speed of the Sun around the Milky Way is also determined here and can be referenced if you get to a unit on the Milky Way.*

Pre-Knowledge of Students:

- 1) Basic Algebra and calculator skills.*
- 2) Helpful to be familiar with the math of circles, $C=2\pi r$ - If not, an easy lesson to make or find online.*
- 3) Helpful to be familiar with scientific notation -If not, an easy lesson to make or find online.*
- 4) Helpful to be familiar with conversions with units. - Easy to create or find lessons.*
- 5) The teacher should give an introduction lesson on Earth motions: rotation and revolution.*

Key Terms:

Radius, Diameter, Circumference, Astronomical Unit, Light Year, Solar System, Milky Way Galaxy

Related Videos for Teacher:

[Teacher Hints and Common student errors with the “How Fast Are We Going?”](#)

Teacher Preparation:

- This is basically a math exercise. So, a 7th grade class may need much more prep time than a 12th grade class.*
- Know your students ability to work with $C=2\pi r$.*
- A Scientific Notation review, or ancillary activity is most likely necessary. There are few math or science classes that reinforce these skills with any frequency, so student confidence is low here.*
- Calculator skills with large numbers goes along with the above point. There are a lot of button presses to get the right answer. Few students are familiar with the **[EE]** or **[EXP]** button on their calculator as a simpler way to calculate with scientific notation values. Instead, they often use the **[x]** **[10^x]** without parentheses and end up with very wrong exponents.*
- The more advanced version of the activity is asking the students to search out the needed information such as the radius of the Earth, or distance to the center of the Galaxy. There can be issues with the source information, but more likely, the students will just use the number and not convert to the necessary units. “I used 25,000 in my calculator because the internet said it was 25,000 light years to the center of the Galaxy” The activity is asking for them to convert all distances to kilometers.*
- Along with the last note, a strangely common thing when they search “How far is the Sun from the center of the Milky Way Galaxy” is a passage that has a few values, including the diameter of the galaxy of 100,000 ly which is incorrectly bolded as the answer. Many students blindly use this number without reading the description of what it is for.*
- Needless to say, the advanced version requires more engagement on the students’ part, but more effort to trace mistakes on your part.*

Activity Notes:

- *The teacher should give an introduction lesson on Earth motions: rotation and revolution.*
- *The “astronomical unit” and “light year” should be defined and discussed as useful units in astronomy before this activity .*
- *The basic version of assignment still requires the students to get the needed astronomical values from a different source (previous lesson notes, textbook, internet).*
- *The advanced version requires students to access terms they should already have encountered in school. The language is intentionally “unique” to stop the students from simply using it as search words on the internet. On the other hand, they will need the internet for finding astronomical data values.*