

Order-of-Magnitude Estimation Habitable Planets (Level 2)

The Question

How many Earth-like planets are there in the Milky Way Galaxy?

Background

We often define potentially habitable planets as “Earth-like”, since as far as we know life can only develop on planets with conditions similar to our own. This generally means that the planet orbits a star similar to the Sun, which is a slightly-less-than-average star in terms of mass, that the planet has a mass similar to Earth’s, and that it is orbiting in the “habitable zone”. This is defined as the region where liquid water can exist, and for a planet of similar mass to Earth is at a radius similar to that of Earth (defined as one astronomical unit, or 1 AU). We can use these pieces of information to estimate how many potentially habitable planets are in our Galaxy!

The Solution

Education Standards

This OoM Estimation problems meets the following standards in **bold**:
Next Generation Science Standards (NGSS):

- Physical Sciences
 - **Matter & Its Interactions**
 - Motion and Stability: Forces and Interactions
 - **Energy**
 - Waves and Their Applications in Technologies for Information Transfer
- Life Sciences
 - From Molecules to Organisms: Structures and Processes
 - **Ecosystems: Interactions, Energy, and Dynamics**
 - Heredity: Inheritance and Variation of Traits
 - **Biological Evolution: Unity and Diversity**
- Earth and Space Sciences
 - **Earth's Place in the Universe**
 - **Earth's Systems**
 - Earth and Human Activity
- Engineering, Technology, and Applications of Science
 - Engineering Design

Common Core Standards (CSS):

- **Counting & Cardinality**
- **Operations & Algebraic Thinking**
- **Numbers & Operations in Base Ten**
- **Number & Operations — Fractions**
- **Measurement & Data**
- Geometry
- **Ratios & Proportional Relationships**
- The Number System
- **Expressions & Equations**
- Functions
- **Statistics & Probability**