

Order-of-Magnitude Estimation

Earth Orbiter (Level 1)

The Question

A geostationary satellite orbits the Earth once each day. About how fast is it traveling in miles per hour?

Background

Geostationary satellites are designed to remain above the same point on the Earth's surface, orbiting the Earth exactly once per day. It is possible to expand this question to an expert-level question by determining the exact distance to a satellite with an orbital period of 24 hours. Or, as an alternative starting point, most people can be guided to estimate that a satellite orbits at "a few times the Earth's radius".

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