

Order-of-Magnitude Estimation

How big is a massive star? (Level 2)

The Question

What fraction of the stellar mass of the Milky Way Galaxy is in a star that can explode in a supernova?

Background

Our Galaxy, the Milky Way, is big. It is made up of a few hundred billion stars, clouds of gas and dust, a supermassive black hole, and some unknown substance called dark matter. The sun is one of the many stars, and in fact is a somewhat “typical star”. Some stars are more massive, some are less so. Most stars will end their lifetime as a white dwarf, or the hot remnant of the stellar core. But more massive stars (about ten times more massive than the Sun) can collapse on themselves and explode in a spectacular supernova.

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