Lesson: Scientific Notation	Name:
Teacher:	Date:

Space Distance Model: Two Celestial Bodies in Scientific Notation - Project Guide

Objectives

- Apply scientific notation and negative exponents to real-world space distances.
- Build a scaled, physical model of two celestial bodies to represent distance.
- Integrate engineering, technology, and science concepts by designing, constructing, and presenting their model.
- Communicate findings and mathematical reasoning clearly in writing and verbally.

Materials

- Styrofoam balls, clay, or paper-mâché (to represent planets, moons, or the Sun)
- String, yarn, or ribbon (to represent distance)
- Ruler or measuring tape (for scale)
- Markers, colored paper, scissors, glue, tape
- Index cards (for students to write their scientific notation and trivia)
- Digital platform (optional, for research or documenting calculations)
- Research resources (books, websites, printed fact sheets about planets)
- Paint or coloring materials
- Cardboard (Platform)

Step 1 – Choose Celestial Bodies

Each group chooses one pair of celestial bodies to model. Here are recommended options with exact distances:

Option	Celestial Bodies	Distance
1	Earth → Moon	384,400 km
2	Earth → Sun	149,600,000 km
3	Venus → Earth (closest approach)	38,000,000 km

4	Earth → Mars (closest approach)	54,600,000 km
5	Sun → Mercury	91,700,000 km

Note: Students will be responsible for converting these distances into scientific notation themselves when labeling their model. *Each group will pick one pair of celestial bodies. Your main task is to convert the exact distance between them into scientific notation and display it on your model. Make sure you also research facts about each celestial body.*

Step 2 – Research & Plan (STEM Integration: Science & Technology)

1. Research basic facts about each celestial body (diameter, composition, surface features, orbit).
2. Sketch a rough layout of the model:
    - Decide scale (e.g., 1 cm = ___ km)
    - Plan size of celestial bodies relative to each other
    - Plan placement of string/yarn for distance
3. Assign roles in the group:
    - Designer/Engineer (builds the model)
    - Recorder (converts distance and labels)
    - Researcher (gathers facts/trivia)

Note: *Plan carefully! Your model should accurately show distance in a way that can be converted into scientific notation. Think like engineers.*

Step 3 – Build the Model (STEM Integration: Engineering / Design)

1. Represent each celestial body using Styrofoam balls, clay, or paper-mâché.
2. Connect them with string or yarn to represent the distance.
3. Label the string with the exact distance in km (do NOT convert yet).
4. Optional: indicate scale (e.g., 1 cm = 10,000 km).
5. Decorate or add features to make the model visually appealing.

Note: *Build carefully! Make sure your distances are accurate, and your labels are clear. Your main task is converting the distances into scientific notation once your model is complete.*

Step 4 – Convert Distance to Scientific Notation (STEM Integration: Math)

1. Once the model is built, students convert the distance into scientific notation themselves.
2. Write the scientific notation on an index card attached to the model.
3. Include calculation steps on the back of the card if desired.

Note: *Take the exact distance in km from your string label and convert it into scientific notation. Show your work clearly on the card.*

Step 5 – Add Trivia / Fun Facts (STEM Integration: Science & Technology)

- Include 3–5 interesting facts about each celestial body, such as:
  - Diameter
  - Orbit period
  - Surface features (craters, volcanoes, rings)
  - Unique characteristics (Red Planet, Earth's Moon phases, Sun's fusion process)
- Attach facts to index cards/ or sticky notes near each celestial body.

Note: *Your facts should make your model more informative. Imagine someone walking by your model for the first time — can they learn something interesting?*

Step 6 – Present & Share (STEM Integration: Engineering & Communication)

1. Display the model.
2. Present:
   - Distance in km (original)
   - Scientific notation conversion
   - Explanation of calculation steps
   - Facts and trivia about celestial bodies
   - Optional: comparison with other groups' models

Note: *Present your work confidently. Explain the distance, how you calculated scientific notation, and share at least 3 interesting facts. Be ready for questions from other groups.*

Assessment Rubric

Category	Excellent	Good	Needs Improvement

Model Accuracy	Correct celestial bodies, scaled distance, clearly labeled	Minor errors in distance or scale	Missing labels or incorrect scale
Scientific Notation	Correctly converted distance with steps shown	Minor calculation errors	Incorrect/missing
Trivia / Explanation	Accurate, complete, interesting facts	Some facts, partially complete	Missing or incorrect
Creativity / Presentation	Visually appealing, well-presented, engaging	Moderately creative, okay presentation	Minimal effort, unclear presentation

STEM Integration Summary

- Math: Students apply scientific notation, negative exponents, and compare large numbers.
- Science (Astronomy): Understand distances, planetary facts, and scale.
- Engineering / Design: Build a scaled model, plan layout, and teamwork.
- Technology: Optional digital platform for documenting calculations and research.
- Communication: Explain mathematical reasoning and science facts clearly.

Note: The project only provides the distance in km, and students' main task is converting it to scientific notation and displaying it on their model.