

Text: CORD Applied Math

Unit number 10

Title: Orbital Speed of Planets

Short Description: Students will calculate the Speed of planetary orbits around the Sun

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Lab Title

Orbital Speed of Planets

LAB PLAN

TEACHER: Teacher Prep/

- **Lab Objective**

Students will learn to calculate the speeds of three planets; Venus, Earth and Mars, as they orbit around the sun.

- **Statement of pre-requisite skills needed,** Student will need to understand how speed is calculated.

- **Speed = Distance / Time.**

- Circumference of Circle, $C = \text{Pi} \times \text{Diameter}$.
- Mph = Miles/Hour , Miles/Min., Miles/sec.

- **State Standard addressed**

8.4.B Solve problems involving operations with

- numbers in scientific notation and verify solutions.
- Units include those associated with technology, such
- as nanoseconds, gigahertz, kilobytes, teraflops, etc.

- **Vocabulary**

Speed vs. Velocity, Distance, Circumference, Pi, Orbit.

- **Materials List**

Paper pencil, calculator, links to

- **Lesson Strategies**

- Introduce Planetary distances from the sun and orbital period (year)

<https://wa-appliedmath.org/>

Speed = Distance / Time

Distance

Distance earth travels in one orbit around the sun (*circumference*)

$$\text{Circumference} = 2 \times \text{Radius} \times \pi$$

Center of Earth to Center of Sun 93,500,000 miles = radius

$$C = 2 \times 93,500,000 \text{ mi} \times 3.1416 (\pi) = \underline{587,500,000 \text{ mi orbit}}$$

Time

365.25 days (accounts for leap year.)

$$24 \text{ hr/day} \times 365.25 \text{ days/year} = \underline{8766 \text{ hr./year}}$$

Calculate Speed

$$587,500,000 \text{ mi} / 8,766 \text{ hr./year} = \underline{67,000 \text{ mi/hr.}}$$

or

$$587,500,000 \text{ mi} / 31,557600 \text{ sec} = 18.6 \text{ mi/sec}$$

Venus 67,232,360 miles 225 days (all days are earth days)
6.72 x 10⁷

$$\text{Diameter } 135,000,000 \text{ mi} \times 2 = 134,000,000 + 1,000,000 \text{ sun dia.}$$

$$135,000,000 \text{ mi} \times 3.14 = 424,000,000 \text{ mi}$$
$$424,000,000 / 5376 \text{ hr.} = \underline{78,870 \text{ mi/hr.}}$$

Mars 141,635,399 688 days

$$\text{Dia. } 284,000,000 \text{ mi} / 16,512 \text{ hr.} = \underline{17,200 \text{ m/hr}} \text{ (what if Mars was the same mass as earth)}$$

- GLEs (State Standards) addressed

Math: **COMPONENT 1.1: Understand and apply concepts and procedures from number sense.**

1.1.1 Understand and use scientific notation. W

EXAMPLES

- EX Explain the meaning of scientific notation using words, pictures, symbols, or numbers.
- EX Express and/or use equivalents among fractions, decimals, percents, integers, positive integer exponents, square roots, and/or numbers written in scientific notation.
- EX Read and translate numbers represented in scientific notation from calculators and other technology, texts, tables, and charts.
- EX Use scientific notation in a given situation.

Reading: **COMPONENT 1.1: Understand and apply concepts and procedures from number sense.**

1.1.1 Understand and use scientific notation. W

EXAMPLES

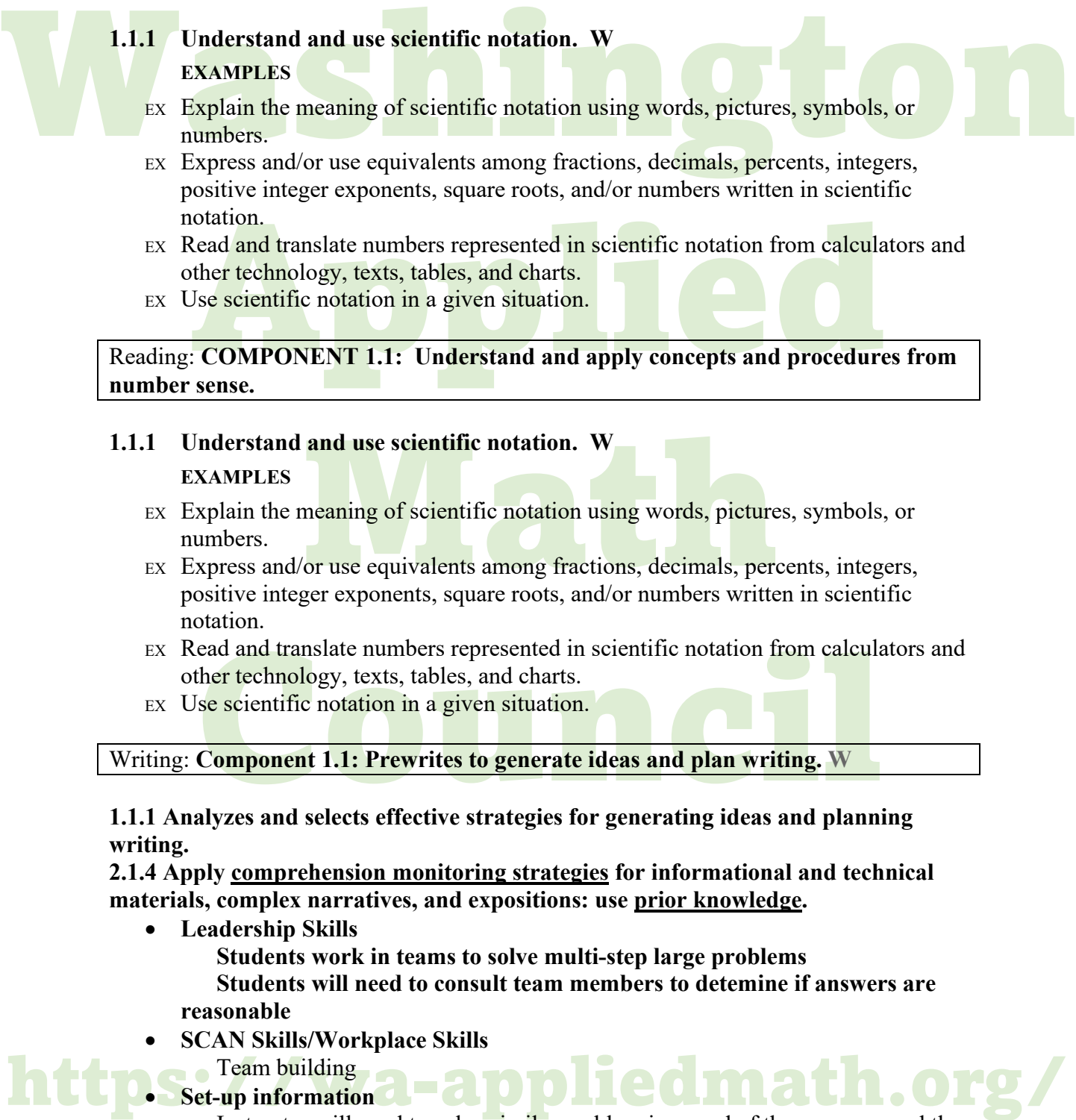
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- EX Read and translate numbers represented in scientific notation from calculators and other technology, texts, tables, and charts.
- EX Use scientific notation in a given situation.

Writing: **Component 1.1: Prewrites to generate ideas and plan writing. W**

1.1.1 Analyzes and selects effective strategies for generating ideas and planning writing.

2.1.4 Apply comprehension monitoring strategies for informational and technical materials, complex narratives, and expositions: use prior knowledge.

- **Leadership Skills**
 - Students work in teams to solve multi-step large problems
 - Students will need to consult team members to determine if answers are reasonable
- **SCAN Skills/Workplace Skills**
 - Team building
- **Set-up information**
 - Instructor will need to solve similar problem ie. speed of the moon around the earth.
- **Lab organization(-Grouping/leadership opportunities/cooperative learning expectations; -Timeline required)**



- **Teacher Assessment of student learning** (scoring guide, rubric)
Students will solve this problem using both Scientific Notation and conventional number analysis
- **Summary of learning** (to be finished after student completes lab)
 - discuss real world application of learning from lab
 - opportunity for students to share/present learning
- **Optional activities**
Find speed of different Planets. Compute time to travel distance if traveling at the Speed of light.
- **Career Applications**
Science or Technical fields

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