The Scholars' Academy

Mission Statement: To Prepare for College and Careers of the 21st Century
"Technology Today, Smarter Tomorrow: Removing Time and Place from Teaching and Learning"
27Q323 is an Accelerated College Preparatory School for Grades 6-12
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Integrated Algebra
Summer Performance Base Assessment

Title: Scientific Notation Isn't Rocket Science!

Focus Question: What are some real life applications of the laws of exponents and scientific notation?

Key Common Core Standards:

- **8.EE.1** Know and apply the properties of integer exponents to generate equivalent expressions
- **8.EE.3** Use numbers expressed in the form of a single digit times a whole number power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other
- **8.EE.4** Perform operations with numbers expressed in scientific notation
- **7.G.1** Solve problems involving scale drawings of geometric figures
- **7.G.2** Draw geometric shapes with given conditions
- **7.RP.3** Use proportional relationships top solve multistep ratio and proportion problems

Task Overview: In physics, the gravitational constant is the force that two objects exert on each other. It is why the Earth stays in place as it rotates around the sun. This constant is equal to .00000000006673 $N(m/kg)^2$. Can you imagine doing calculations with a number that small? Misplacing a 0 could be the difference between landing on the moon and getting lost in space! We commonly express numbers that are very large or very small as a single-digit number multiplied by a power of ten. We would express the gravitational constant as 6.673×10^{-11}. This is called *scientific notation*. In the three parts of this task, you will explore real-life applications of scientific notation.

Part 1: This part of the task explores one real life application of scientific notation. Please answer all questions completely on a separate sheet of paper. Show how you arrived at your solution.

There are approximately seven billion (7×10^9) people in the world.
In the 1990s researchers calculated that if there were just 100 people in the world:

- There would be 20 children
- 25 people would not have food and shelter
- 17 people would speak Chinese
- 8 would speak English

1. What fraction of people in the world does not have food and shelter?
2. How many people in the world do not have food and shelter?
3. How many more people in the world speak Chinese than speak English?

4. Approximately 3 x 10^8 people live in the USA. In the world of 100 people, how many would live in the USA?

Part 2: Using your knowledge of scientific notation and proportional reasoning, create your own problem using very large or very small numbers expressed in scientific notation. Then, solve that problem, showing all work. Use the example below as a model.

Example: The distance between Earth and Mars is approximately 2.25 x 10^6 kilometers. If the universe were only 50 kilometers, how big would the distance between Earth and Mars be?

Part 3: Find 3 objects whose sizes are expressed in scientific notation (For example: planets, bacteria). Create a scale drawing of these 3 objects so that all 3 will fit on one 8.5 by 11 in. piece of paper. You must:

- Draw your three objects on ***one*** 8.5 by 11 piece of paper.
- Clearly label each object and all measurements used. Show all work used to calculate these measurements.
- State your scale factor and show all work used to find the scale measurements of your objects
- Explain how you choose your scale factor and drew your objects in a few sentences

	Level 4	**Level 3**	**Level 2**	**Level 1**
Task 1	Student calculations for all parts of this task are correct with no errors that detract from demonstration of understanding.	Student calculations for most parts of this task are correct. One error may detract from demonstration of understanding.	Student calculations for some parts of this task are correct. Work contains some errors that detract from demonstration of understanding.	Student calculations for few parts of this task are correct. Work contains significant errors that detract from demonstration of understanding.
Task 2	Student word problem demonstrates understanding of both proportional relationships and scientific notation. All work shown is correct.	Student word problem demonstrates understanding of scientific notation only. All work shown is correct.	Student word problem demonstrates some understanding of scientific notation. Some work shown is correct.	Student word problem demonstrates limited understanding of scientific notation. Incorrect work shown is correct.
Task 3	Student scale drawing is complete and correct. All measurements and calculations are shown. Explanation is complete and accurate.	Student may be missing an explanation or the drawing is not on the right sized paper, but the scale drawing is otherwise complete and correct with all measurements and	Student is missing measurements or calculations for measurements of scale drawing. Work may show limited understanding of proportional reasoning or scale drawing.	Student work contains significant errors that demonstrate limited understanding of proportional relationships.

		work shown.		
Modeling with mathematics	Student demonstrates a deep understanding of scientific notation and how scientific notations can be used in real life contexts.	Student demonstrates deep understanding of scientific notation and how scientific notation can be used in real life contexts, but one or two numbers may not be appropriate for scientific notation.	Student demonstrates a limited understanding of scientific notation and how scientific notation can be used in real life contexts. Several numbers are not be appropriate for scientific notation.	Student demonstrates a limited understanding of scientific notation and how scientific notation can be used in real life contexts. Most numbers are not be appropriate for scientific notation.
Use appropriate tools strategically	Student demonstrates appropriate use of calculator, ruler, compass, protractor, and any other tools required to complete the task and scale drawing. All answers are expressed in scientific notation.	Student demonstrates appropriate use of calculator, ruler, compass, protractor, and any other tools required to complete the task and scale drawing. Most answers are expressed in scientific notation. Scale drawing may not be completely accurate.	Student demonstrates a limited understanding of appropriate use of calculator, ruler, compass, protractor, and any other tools required to complete the task and scale drawing. Most answers are not expressed in scientific notation and scale drawing may be messy or inaccurate.	Student demonstrates a limited understanding of appropriate use of calculator, ruler, compass, protractor, and any other tools required to complete the task and scale drawing. Most answers are not expressed in scientific notation and scale drawing is messy and inaccurate.