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DepED
DEPARTMENT OF EDUCATION

Lesson Exemplar for Mathematics

Quarter 4
Lesson
8

Lesson Exemplar for Mathematics Grade 7
Quarter 4: Lesson 8 (Week 8)
SY 2024-2025

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MATHEMATICS /QUARTER 4 / GRADE 7

I. CURRICULUM CONTENT, STANDARDS, AND LESSON COMPETENCIES	
A. Content Standards	The learners should have knowledge and understanding of operations using scientific notation. (MG)
B. Performance Standards	By the end of the quarter, the learners are able to write numbers in scientific notation and perform operations on numbers written in scientific notation.
C. Learning Competencies and Objectives	At the end of the lesson, the learners are expected to: 1. Write numbers in scientific notation to represent very large or very small numbers, and vice versa. 2. Perform operations on numbers expressed in scientific notation.
D. Content	**Scientific Notation** 1. Writing numbers in scientific notations 2. Operations on numbers in scientific notation forms
E. Integration	Earth and Space, Matter, Living Things and Their Environment

II. LEARNING RESOURCES
Dodds, C. (2012, February 6). Colin Dodds - Scientific Notation (Math Song) [Video]. YouTube. https://www.youtube.com/watch?v=AWof6knvQwE CK-12 Foundation. (n.d.). CK-12 Foundation. https://flexbooks.ck12.org/cbook/ck-12-conceptos-de-matem%C3%A1ticas-de-la-escuela-secundaria-grado-8-en-espa%C3%B1ol/section/5.16/related/lesson/operations-with-numbers-in-scientific-notation-msm7/ Operations with Scientific Notation (Addition, Multiplication, Subtraction of Numbers) - BYJUS. (2022, August 10). BYJU'S. https://byjus.com/us/math/operations-in-scientific-notation/

<table>
<tr><th colspan="2">III. TEACHING AND LEARNING PROCEDURE</th><th>NOTES TO TEACHERS</th></tr>
<tr><td>A. Activating Prior Knowledge</td><td>
DAY 1
1. Short Review
Activity 1: Do You Remember?
Instruction: Let the learners express the following into figures. After writing it, let them identify the number of significant figures in each item.
1. Five hundred forty-five thousand
2. Eighty-seven ten-thousandths
3. One hundred fifty million
4. One millionth
5. Seven hundred twenty-five and four hundredths

2. Feedback (Optional)
</td><td>
Activity 1 is intended for learners to recall the proper way of writing words into figures including decimals and to recall the concept of significant figures.

You may read each item to class, present each item using flashcards, or include this in your slide deck.

Note: If necessary, present to the class the rules for significant digits.

Answer Key:
1. 545 000; 3
2. 0.0087; 2
3. 150 000 000; 2
4. 0.000001; 1
5. 725.04; 5
</td></tr>
<tr><td>B. Establishing Lesson Purpose</td><td>
1. Lesson Purpose
Activity 2: Too Big, Too Small?
Let the learners analyze the data in the table below. After that, let them answer the question that follows.
<table>
<tr><td>Distance from Earth to Sun</td><td>150 000 000 000 meters</td></tr>
<tr><td>Mass of average human cell</td><td>0.000000000001 kilograms</td></tr>
<tr><td>Diameter of the moon</td><td>3 474 000 meters</td></tr>
<tr><td>Temperature of the core of the sun</td><td>15 700 000 Kelvin</td></tr>
<tr><td>Diameter of and electron</td><td>0.00000000000000282 meters</td></tr>
</table>
Guide Questions:
1. What do you notice with the numbers in the second column?
2. Do you think there is a way to express each number in a shorter way?
</td><td>
Activity 2 is intended to show real-life examples of numbers that are very big or very small. Give the learners a few minutes to analyze the table before asking them the guide questions. You may also add other questions, if necessary.

Answer Key:
1. The numbers are either very large or very small.
2. Yes.
</td></tr>
</table>

	2. Unlocking Content Vocabulary After accomplishing Activity 2, introduce the concept of scientific notation. **Scientific Notation** is a system of notation used to express very large or very small numbers conveniently. It uses exponents so as not to require the use of many zeros which can be confusing and lead to errors. It is written in the form $a \times 10^n$, where $1 \leq a < 10$ or the coefficient a is a number greater than or equal to 1 but it should be less than 10 and the exponent n is a positive or negative integer. It is written as a number from 1 through a number less than 10 multiplied by 10 raised to a nonzero exponent.	
C. Developing and Deepening Understanding	**DAY 2** **SUB-TOPIC 1: Writing Numbers in Scientific Notation** **1. Explicitation** Introduce the concept of writing numbers in Scientific Notation to the class by allowing them to watch the video of Scientific Notation (Math Song) thru the link below: https://www.youtube.com/watch?v=AWof6knvQwE Once done watching, ask the learners what key points on the video they remember that are related to the concept of Scientific Notation. **2. Worked Example** Example 1: The distance of Earth from the Sun is approximately **150 000 000 000** meters. Express it in scientific notation.  Image Source: https://c4.wallpaperflare.com/wallpaper/865/353/319/space-solar-system-sun-universe-wallpaper-preview.jpg Solution: First, move the decimal point of 150 000 000 000 to the **left** until there is only one non-zero digit to the left of the decimal point. Copy the significant digits to its right. So, we have, **1.50000000000 = 1.5**	You may list down the answers of the learners regarding the key points of **scientific notation** included in the video on the board. The illustrative examples are integration of concepts in science. You may add more examples, if needed.

Second, count how many places you moved the decimal point. Since you moved to the left 11 times, **n = 11**. Thus, the answer is 1.5×10^{11} meters.

Example 2: The diameter of an electron is **0.00000000000000282** meters. Write it in scientific notation.

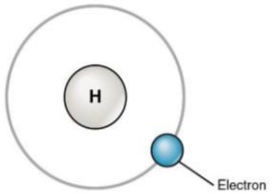

Image Source: https://philschatz.com/anatomy-book/resources/206_Electron_Shells-01.jpg

Solution:

Move the decimal point of 0.00000000000000282 to the **right** until there is only one non-zero digit to the left of the decimal point. Copy the significant digits to its right. So, **000000000000002.82 = 2.82**

Then, count how many places you moved the decimal point. Since you moved to the right 15 times, **n = 15**. Therefore, the answer is 2.82×10^{15} meters.

Example 3: The human eye blinks around 4.2×10^{6} times a year. Express it in decimal form.

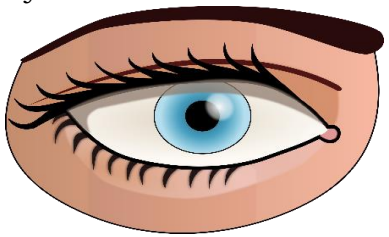

Image Source: https://openclipart.org/image/2400px/svg_to_png/18539/GusEinstein-eye.png

Solution: Since the exponent, n = 6, is **positive**, move the decimal point 6 places to the **right**, adding zeros if needed. Hence, the answer is **4 200 000 times.**

Example 4: The width of a human hair is approximately 1.7×10^{-3} cm. Write it in its decimal form.

Image Source:
https://as2.ftcdn.net/jpg/02/57/72/97/220_F_257729762_87z1xOXeY3p24RTrKGenQlyLHA2P2hc0.jpg

Solution:

Since the exponent, n = –3, is **negative**, move the decimal point 3 places to the **left**, adding zeros if needed. Therefore, the answer is **0.0017 cm.**

3. Lesson Activity

Activity 3: Transform It!

Instruction: Let the learners express the following into scientific notation/ decimal form.

a. 3940
b. 0.0062
c. 400
d. 136 000 000
e. 0.0000235
f. 7×10^{5}
g. 5.4×10^{-7}
h. 2.86×10^{4}
i. 7.11×10^{-10}
j. 9.03×10^{6}

DAY 3

SUB-TOPIC 2: Operations on Scientific Notation

1. Explicitation

After the learners accomplished Activity 3, present and explain to the class the steps in Adding/Subtracting and Multiplying/Dividing numbers expressed in scientific notation.

In adding (or subtracting) numbers expressed in scientific notation, follow these steps:

1. Rewrite the number with the smaller exponent so that it has the same exponent as the number with the larger exponent by moving the decimal point of its decimal number.

Answer Key:

a. 3.94×10^{3}
b. 6.2×10^{-3}
c. 4×10^{2}
d. 1.36×10^{8}
e. 2.35×10^{-5}
f. 700 000
g. 0.00000054
h. 28 600
i. 0.000000000711
j. 9 030 000

2. Add (or subtract) the decimal numbers. The power of 10 will not change.
3. Convert your result to scientific notation, if necessary.

In multiplying (or dividing) numbers expressed in scientific notation, here are the steps:

1. Multiply (or divide) the decimal numbers.
2. Multiply (or divide) the powers of 10 by adding (or subtracting) their exponents.
3. Convert your answer to scientific notation, if necessary.

2. Worked Example

Example 1: Add (5.7×10^4) and (4.87×10^5).
Solution: Since the given numbers have different exponents, rewrite 5.7×10^4 so that its exponent becomes 5. Because you need to increase the exponent by 1, you will need to move the decimal 1 place to the left. 5.7×10^4 becomes 0.57×10^5.

Now you have, $(0.57 \times 10^5) + (4.87 \times 10^5)$. Next is to add the decimals 0.57 and 4.87. The power of 10 stays the same. Therefore, the answer is 5.44×10^5.

Note: Always make sure that your answer is expressed properly in scientific notation. Remember that $1 \leq a < 10$.

Example 2: Calculate the difference: $(4.2 \times 10^{-2}) - (3.3 \times 10^{-3})$
Solution: Since the given has different exponents, rewrite 3.3×10^{-3} so that its exponent becomes –2. Because you need to increase the exponent by 1, you will need to move the decimal 1 place to the left. 3.3×10^{-3} becomes 0.33×10^{-2}.

Now you have, $(4.2 \times 10^{-2}) - (0.33 \times 10^{-2})$. Next is to subtract the decimals 4.2 and 0.33. The power of 10 stays the same. Therefore, the answer is 3.87×10^{-2}

Example 3: Multiply: $(3.4 \times 10^{-2})\,(6.2 \times 10^6)$.
Solution: First, multiply 3.4 and 6.2. This will give us the product **21.08**

Next, multiply the powers of 10. In multiplying powers with the same base, we add their exponents. Thus, we have, $(10^{-2})\,(10^6) = 10^{-2+6} = 10^4$.

You may add more examples, if needed.

Now, combining the results gives us 21.08×10^4.
Finally, convert the result to scientific notation by rewriting 21.08×10^4 so that $1 \leq a < 10$. Move the decimal one place to the left and increase the exponent by 1. Therefore, the answer is 2.108×10^5.

Example 4: Find the quotient when (8.4×10^5) is divided by (1.4×10^{-2}).
Solution: First, divide 8.4 and 1.4. This will give us the quotient **6**.

Next, divide the powers of 10. In dividing powers with the same base, we subtract their exponents. So, we have
$(10^5 \div 10^{-2}) = 10^{5-(-2)} = 10^{5+2} = 10^7$.

Now, combining the results gives us $\mathbf{6 \times 10^7}$ since $1 \leq a < 10$.

Note: Always make sure that the answer is expressed properly in scientific notation. Remember that $1 \leq a < 10$.

If the answer to the first step is not exact, then you may agree that answers may be rounded off up to 4 decimal places.

3. Lesson Activity

Activity 4: Compute It!

Instruction: Let the learners perform the indicated operation in each item. Ask them to show their solutions.

1. $(3.1 \times 10^3) + (4.3 \times 10^3)$
2. $(5 \times 10^{-3}) + (3.3 \times 10^{-6})$
3. $(6.36 \times 10^3) - (5.8 \times 10^{-1})$
4. $(3.48 \times 10^3)(9.8 \times 10^4)$
5. $(4 \times 10^4) \div (1.25 \times 10^{-4})$

This activity may be done by pair or by small groups (3 to 4 members). Provide enough time for them to solve and discuss their work with their partner/group.

Refer to the provided rubrics in checking the activity.

Rubrics (Maximum of 3 points for each item)

Score	Indicator/s
3	Provided a complete solution with correct procedure and arrived at the correct answer.
2	Provided a complete solution with minor error in the procedure but still arrive at the correct answer.
1	Provided an incomplete with major error in the procedures and did not arrive at the correct answer.
0	Did not attempt to solve the problem.

Answer Key:

1. 7.4×10^3
2. 5.0033×10^{-3}
3. 6.35942×10^3
4. 3.4104×10^8
5. 3.2×10^8

D. Making Generalizations	**DAY 4** **1. Learners' Takeaways and Reflection on Learning** **Activity 5: Closing the Loop!** Instruction: Let the learners answer the following questions. 1. What are the key concepts of our lesson? 2. Which part of the lesson is the easiest for you? Why? 3. Which part of the lesson is the hardest for you? Why? 4. How are we as a class today?	The activity is intended to determine what the learners have learned as well as to give feedback to their experiences during the lesson. Allot enough time to listen and process the responses of your learners. You may opt to do this activity at the end of each subtopic of the lesson. You may also add questions, if needed.

IV. EVALUATING LEARNING: FORMATIVE ASSESSMENT AND TEACHER'S REFLECTION		**NOTES TO TEACHERS**
A. Evaluating Learning	**1. Formative Assessment** **Activity 6: Solve It!** Instruction: Let the learners analyze and solve each problem. Present the rubrics of the activity to the class. 1. Daniel's computer hard disk drive holds 1.83×10^{12} bytes of information. If he buys an extra memory stick that holds 8×10^{9} bytes of information, how much memory will the computer hold altogether? Express your answer in decimal form and in scientific notation. 2. Abby is creating a mosaic in her guest room using square tiles. The width of the tile is 0.25 meters. If it took 670 tiles to cover the width of the guest room, how wide is it? Express your answer in scientific notation. Rubrics (Max of 5 points for each item)	Refer to the provided rubrics in checking students' solutions to the activity. **Answer Key:** a. 1 838 000 000 000 bytes and 1.838×10^{12} bytes b. 1.675×10^{2} meters

Score	Indicator/s
5	Provided a complete solution with correct procedure and arrived at the correct answer.
4	Provided a complete solution with one incorrect procedure but still arrive at the correct answer.
3	Provided a partially completed the solution with 2-3 incorrect procedures and arrive at the correct answer.

<table>
<tr>
<td></td>
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<table>
<tr><td>2</td><td>Provided an incomplete solution with 1-2 correct procedures but did not arrive at the correct answer.</td></tr>
<tr><td>1</td><td>Provided an incomplete solution with an attempt to solve the problem but did not arrive at the correct answer.</td></tr>
<tr><td>0</td><td>Did not attempt to solve the problem.</td></tr>
</table>
2. Homework (Optional)
</td>
<td></td>
</tr>
<tr>
<td>B. Teacher's Remarks</td>
<td>
<table>
<tr><td>Note observations on any of the following areas:</td><td>Effective Practices</td><td>Problems Encountered</td></tr>
<tr><td>strategies explored</td><td></td><td></td></tr>
<tr><td>materials used</td><td></td><td></td></tr>
<tr><td>learner engagement/ interaction</td><td></td><td></td></tr>
<tr><td>others</td><td></td><td></td></tr>
</table>
</td>
<td>The teacher may take note of some observations related to the effective practices and problems encountered after utilizing the different strategies, materials used, learner engagement, and other related stuff.

Teachers may also suggest ways to improve the different activities explored/lesson exemplar.</td>
</tr>
<tr>
<td>C. Teacher's Reflection</td>
<td>Reflection guide or prompt can be on:
▪ <u>principles behind the teaching</u>
What principles and beliefs informed my lesson?
Why did I teach the lesson the way I did?

▪ <u>students</u>
What roles did my students play in my lesson?
What did my students learn? How did they learn?

▪ <u>ways forward</u>
What could I have done differently?
What can I explore in the next lesson?</td>
<td>Teacher's reflection in every lesson conducted/facilitated is essential and necessary to improve practice. You may also consider this as an input for the LAC/Collab sessions.</td>
</tr>
</table>