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DepED
DEPARTMENT OF EDUCATION

Lesson Exemplar for Mathematics

Quarter 2
Lesson
8

Lesson Exemplar for Mathematics Grade 7
Quarter 2: Lesson 8 (Week 8)
SY 2024-2025

Development Team

Writer:
- Richard M. Lorente (Bicol University)

Validators:
- Clemente M. Aguinaldo Jr. (Philippine Normal University – North Luzon)
- Douglas A. Salazar (Mindanao State University – Iligan Institute of Technology)

Management Team

Philippine Normal University
Research Institute for Teacher Quality
SiMERR National Research Centre

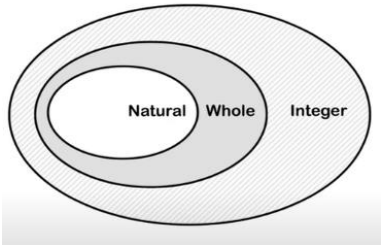
MATHEMATICS / QUARTER 2 / GRADE 7

I. CURRICULUM CONTENT, STANDARDS, AND LESSON COMPETENCIES	
A. Content Standards	The learners should have knowledge and understanding of subset of real numbers.
B. Performance Standards	By the end of the quarter, the learners are able to illustrate the different subsets of real numbers (NA).
C. Learning Competencies and Objectives	***Learning Competency:*** Illustrate the different subsets of real numbers. 1. *Lesson Objective 1. Describe and illustrate the different subsets of real numbers.* 2. *Lesson Objective 2. Find the union, and intersection of the set of real numbers and its subsets.* 3. *Lesson Objective 3. Plot numbers in a real number line.* 4. *Lesson Objective 4. Arrange real numbers in increasing or decreasing order.*
C. Content	Subsets of Real Numbers Plotting Numbers in a Number Line Ordering Real Numbers
D. Integration	Financial Literacy

II. LEARNING RESOURCES
CK-12 Foundation. (n.d.). Subsets of Real Numbers. In CK-12 Elementary/Intermediate College Algebra. https://flexbooks.ck12.org/cbook/ck-12-elementary-intermediate-college-algebra/section/1.3/primary/lesson/subsets-of-real-numbers-c-alg/ Gustafson, R., et al. (2012). Basic Algebra. Cengage Learning Asia Pte Ltd.

III. TEACHING AND LEARNING PROCEDURE		**NOTES TO TEACHERS**
A. Activating Prior Knowledge	**DAY 1** **1. Short Review** **Activity 1: Identify Me!** Before giving the task to the students, make sure to review the definitions of a union and an intersection of a set, including the symbol for each. The students can work in tandem.	

	Guide questions: 1. What are the common characteristics of the numbers in each of the following sets? a. Set A c. Set D b. Set C d. Set E 2. Can you cite specific uses of these numbers in real life? Give at least one (1). For the specific use of these numbers, students' responses may vary. As an option and to integrate financial responsibility among students, relate negative and positive numbers to debt or borrowing amount and payment or repayment. These are commonly used in financial settings and integral to understanding financial responsibility. Fractions and decimals can also be associated with proper budgeting. **2. Feedback (Optional)**	**Possible answers for the guide questions:** 1.a. Set A - The numbers are positive. 1.b. Set C - The numbers are negative. 1.c. Set D - The numbers are in fraction form. 1.d. Set E - The numbers are in decimal form.
B. Establishing Lesson Purpose	**1. Lesson Purpose** **Activity 2: Match Me!** On this part, it is very important for the students to recognize the significance of knowing and understanding the different sets of real numbers. Activity number 2 will provide an opportunity for the students to further recognize the different kinds of numbers and their relevance to real-life situations. Ask the students, "What is the difference between numbers and numerals?" A *number* represents a mathematical quantity or value, while a *numeral* represents a number. The *number* is a concept, and the *numeral* is the way we write it. Example: A number "four" can be expressed as 4 in Arabic numerals and IV in Roman numerals. The teacher may write "4" (or IV) on the board and ask the students if it is a number or a numeral. Lead students to realize that it is a numeral. Do you know that these numbers belong to a set called **Real Numbers**? Real numbers are grouped into subsets. These are Counting or Natural Numbers, Whole Numbers, Integers, Rational Numbers, and Irrational Numbers. **2. Unlocking Content Area Vocabulary** • **Natural/Counting Numbers**. The set of numbers used for counting. • **Whole numbers.** The set of counting numbers including zero.	For the students to see the purpose of the lesson, let them work with their seatmates to match the following situations with the appropriate number each represents. Before discussing the subsets of real numbers, the difference between numbers and numerals should be emphasized.

	• **Integers**. The set of natural numbers, their opposites (the negative numbers), and zero. • **Rational Numbers**. The set of numbers that can be expressed as a fraction $\frac{a}{b}$, where a and b are integers and $b \neq 0$. • **Irrational Numbers**. The set of numbers that cannot be written as a fraction $\frac{a}{b}$, where a and b are integers and $b \neq 0$ or simply, the numbers that are not rational.	
C. Developing and Deepening Understanding	**SUB-TOPIC 1: Subsets of Real Numbers** **1. Explicitation** What are the numbers we are using when counting? **Numbers** are a subset of Real Numbers. The letter N is the symbol used for natural numbers. Natural numbers are also known as **counting numbers**. This set includes all the numbers we use for counting, starting with 1 and so on. All counting numbers are positive numbers. The second subset of real numbers is the set of counting numbers, including zero. It is called the set of **whole numbers**. Whole numbers are denoted by the symbol W**.** Thus, $W = \{0, 1, 2, 3, \dots\}$. In what real-life situations can the number zero be used? If counting numbers are positive numbers, there are corresponding negative numbers like -1, -2, etc. If we combine these three sets of numbers, the counting numbers, zero, and the negative numbers, we have the third subset of real numbers which is the set of **Integers.** Commonly, we use the symbol $\boldsymbol{Z}$ for integers. $Z = \{\dots -3, -2, -1, 0, 1, 2, 3, \dots\}$ The Venn Diagram below illustrates the first three subsets of real numbers.  	The teacher may point out that letter $\boldsymbol{Z}$ is used to denote the set of integers based on the German word “zahlen” meaning, numbers.

The fourth subset of real numbers is the set of **rational numbers**. Rational numbers are often denoted by Q, from the first letter of the word "quotient"**.** These are fractions, decimals, and percents, which represent a part of a whole. They are numbers usually expressed as the indicated division of two numbers where the divisor is not equal to zero. Rational numbers are a set of numbers that can be expressed as a quotient of two integers, a and b, where b is not equal to zero.

Ask the students,

Question: Are integers rational numbers? Why?

Answer: Yes, integers are rational numbers since every integer can be written as a fraction. For instance, the integer 2 can be written as $\frac{2}{1}$. Also, 0 is equivalent to zero divided by any number except, of course, zero. Thus, rational numbers consist of fractions, decimals, percents, and/or integers.

The last subset of real numbers is the set of irrational numbers. Examples of irrational numbers are $\sqrt{2}$, and $\sqrt{3}$.

Can you describe what is the set of irrational numbers?

Irrational numbers are a subset of real numbers that cannot be expressed as a fraction of any integer and have decimal expressions that are non-repeating and non-terminating. Another example of an irrational number is pi, denoted by π which is the ratio of the circumference of a circle to its diameter. We will denote irrational numbers as Q'**.**

Can you give at least two more examples of irrational numbers? What are some real-life situations where irrational numbers are being used?

The union of the set of rational numbers, Q, and the set of irrational numbers, Q', is the set of **real numbers** denoted by the symbol R. We define R symbolically by $R = Q \cup Q'$.

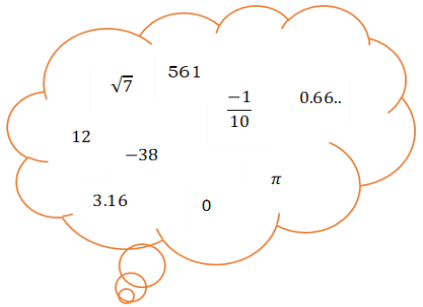
2. Worked Example

Illustrative Example 1. For the set of numbers at the right, identify all the elements belonging to the following set.

a. Natural/Counting Numbers

b. Whole Numbers

c. Integers



Teachers are encouraged to include in the discussion, why in rational numbers $\frac{a}{b}$, b should not be equal to zero.

Remember:

a. Zero divided by non-zero number is zero.

b. A non-zero number divided by zero is undefined.

c. Zero divided by zero is indeterminate.

Answers:

a. Natural/Counting Numbers = $\{12, 561\}$

b. Whole Numbers = $\{0, 12, 561\}$

c. Integers = $\{-38, 0, 12, 561\}$

d. Rational Numbers = $\{-38, \frac{-1}{10}, 0, 0.66\ldots, 3.16, 12, 561\}$

e. Irrational Numbers= $\{\sqrt{7}, \pi\}$

d. Rational Numbers
e. Irrational Numbers

3. Lesson Activity

Let the students perform activity 3. (Refer to the Worksheet). Below is the expected answer to Activity 3.

Number	Counting	Whole	Integer	Rational	Irrational
1. 6	✓	✓	✓	✓	
2. 23.15				✓	
3. –3			✓	✓	
4. 0		✓	✓	✓	
5. $\frac{2}{3}$				✓	
6. $\sqrt{81}$	✓	✓	✓	✓	
7. $\sqrt{13}$					✓
8. $-\sqrt{36}$			✓	✓	
9. $3\sqrt{3}$					✓
10. 2.151515 …				✓	

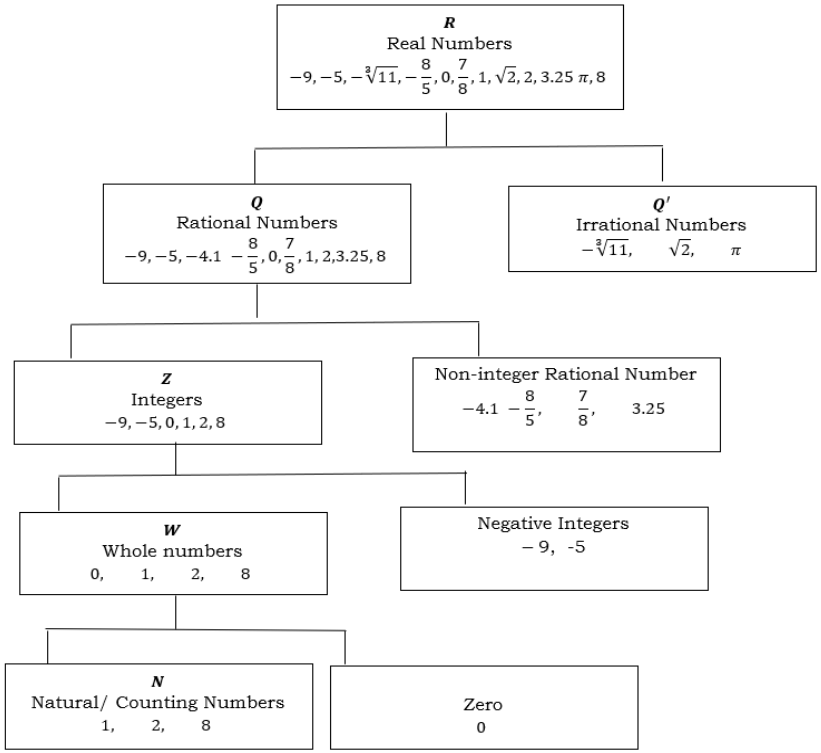
DAY 2

SUB-TOPIC 2: Union and Intersection of Subsets of Real Numbers

1. Explicitation

Figure 1 shows the relationship among the sets of numbers discussed above. Examples of each classification of numbers are also given in the corresponding boxes.

Show the diagram of real numbers to the students and discuss the given examples.



2. Worked Example

Illustrative Example 2: In each of the following, determine which one of the sets $N, W, Z, Q, Q', R, and\ \emptyset$ is equal to the given set.

a. $Z \cup Q$ c. $N \cap Q'$

b. $Z \cap Q$ d. $Q' \cup R$

Answers:

a. The union of Z and Q is the set of numbers that are either integers or rational. Since the set of integers is a subset of the set of rational numbers, the union is the set of rational numbers or Q.

b. The intersection of Z and Q is the set of numbers that are common to both integers and rational numbers. Since the set of integers is a subset of rational numbers, that is, integers belong to the set of rational numbers, the intersection of these two sets is the set of integers or Z.

c. The intersection of natural or counting numbers and irrational numbers is the set of numbers that are common to both counting and irrational numbers. Since there are no counting numbers that are irrational and there are no irrational numbers that are counting numbers, the intersection of these two sets is an empty set or null set denoted by $\emptyset$.

d. The union of irrational numbers and real numbers is the set that is either consisting of irrational or real numbers. Since irrational numbers are a subset of real numbers, the union of the two sets is the set of real numbers or R.

3. Lesson Activity

Activity 4: Knowledge Check

The sets $N, W, Z, Q, Q', and\ R$ are the sets of numbers defined in the previous lesson. Determine which one of these sets is equal to the given set.

a. $Z \cup Q$
b. $Z \cap Q$
c. $N \cap Q'$
d. $Q' \cup R$
e. $W \cap N$
f. $W \cup Z$

Answers:
a. Q
b. Z
c. $\emptyset$
d. R
e. N
f. Z

DAY 3

SUB-TOPIC 3: Locating Numbers in the Real Number Line

1. Explicitation

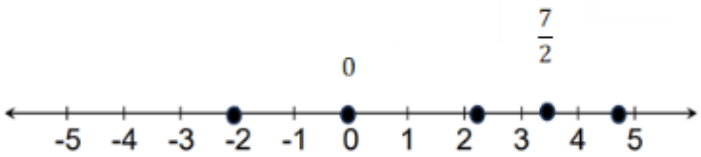
We can represent the real numbers along a line called the **real number line**. This number line is a picture or a graph of real numbers. The location of a number in a number line will help us to compare and arrange numbers in increasing or decreasing order.

Emphasize that in this lesson, $\sqrt{2}, \sqrt{4}, or\ \sqrt{9}$ refer to the positive square roots only. So, $\sqrt{9} = 3$ while $-\sqrt{9} = -3$.

2. Worked Example

Illustrative Example 3: Plot $-2, 0, \frac{7}{2}, \sqrt{23}$, and 2.25 on a number line.

Answer: To plot these numbers, it is better to convert them first to decimals. Then, draw the number line and estimate the location of the number.



	Illustrative Example 4: Remember that the number on the left of a certain number is less than the number. Further, the number on the right is greater than the number. a. -2.3 is less than 0, denoted by $-2.3 < 0$, since -2.3 is located at the left of 0. b. $\sqrt{2}$ is greater than 1, denoted by $\sqrt{2} > 1$, since $\sqrt{2}$ is located at the right of 1. Illustrative Example 5: Knowing the location of the number in the number line, we can arrange them in ascending (increasing) or descending (decreasing) order. Consider the following example. Given the set of numbers below, arrange in ascending and descending orders. $S = \{12, \frac{5}{3}, \sqrt{7}, 0, -38, -\sqrt{2}, 571, \pi, -\frac{1}{10}, 0.666\ldots, 16.34\}$. a. ascending order: $-38, -\sqrt{2}, -\frac{1}{10}, 0, 0.66.., \frac{5}{3}, \sqrt{7}, \pi, 12, 16.34, 571$ b. descending order: $571, 16.34, 12, \pi, \sqrt{7}, \frac{5}{3}, 0.66.., 0, -\frac{1}{10}, -\sqrt{2}, -38$ **3. Lesson Activity** **Activity 5. Compare and Arrange Me!** Let the students perform activity 5. (Refer to the Worksheet). Below is the expected answer to Activity 5. **1.** a. true b. false c. true d. true e. false **2.** a) $-5.2, -3, 0, \frac{2}{3}, \sqrt{5}, \pi, 3.25, 5$ b) $5, 3.25, \pi, \sqrt{5}, \frac{2}{3}, 0, -3, -5.2$	
D. Making Generalizations	**1. Learners' Takeaways** Guide the learners to answer the following questions to summarize the lesson. 1. What are the different subsets of real numbers? 2. What are the characteristics of each of the subsets of real numbers? 3. How is the set of real numbers related to its subsets, like the set of natural numbers, integers, rational numbers, and irrational numbers?	The teacher may ask questions that lead to abstractions of the lesson. The teacher may ask students to give a generalization statement.

	2. Reflection on Learning 1. How are real numbers used in real-life situations? Give specific examples. 2. Are there any questions you would like to ask related to our lesson? What are those? 3. Are there any challenges or misconceptions you encountered while studying the set of real numbers? What are those?	In this part, students may write a reflection about the importance of the lesson in real-life situations.

IV. EVALUATING LEARNING: FORMATIVE ASSESSMENT AND TEACHER'S REFLECTION		**NOTES TO TEACHERS**
A. Evaluating Learning	**DAY 4** **1. Formative Assessment** A. Determine if the following statements are true or false. 1. Natural numbers are rational numbers. 2. Integers are rational numbers. 3. Whole numbers are rational numbers. 4. Zero is a natural number. 5. Integers are irrational numbers. 6. Irrational numbers are real numbers. 7. Rational numbers are irrational numbers. B. List **all** the subsets of the real numbers to which the following numbers belong. Choose from $N, W, Z, Q, Q', and\ R$. 1. 11 3. $\sqrt{11}$ 5. $\frac{2}{7}$ 2. -15 4. $\sqrt{16}$ C. The set $N, W, Z, Q, Q', and\ R$ are the sets of numbers defined in the lesson. Determine which one of these sets is equal to the given set. 1. $Z \cup N$ 3. $Z \cap Q'$ 5. $W \cap N$ 2. $N \cap Q$ 4. $Q' \cup Z$ 6. $Q \cup Z$ D. Plot the following numbers on the number line. $-6, -\frac{5}{4}, 0, 1.25, \sqrt{5}, 6$ E. Arrange the following numbers in ascending order. $2.3, -1.3, \frac{2}{5}, \sqrt{10}, -\frac{5}{2}$	**Answers:** A. 1. true 2. true 3. true 4. false 5. false 6. true 7. false B. 1. N, W, Z, Q, R 2. Z, Q, R 3. Q', R 4. N, W, Z, Q, R 5. Q, R C. 1. Z 2. N 3. $\emptyset$ 4. R 5. N 6. Q D. Locate the numbers on the number line.

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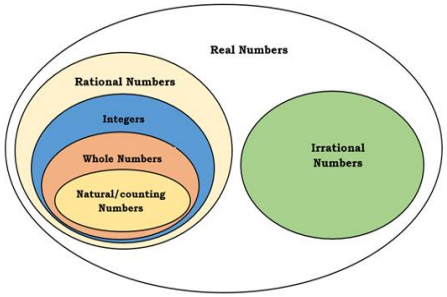
<td colspan="3">2. Homework (Optional)
Using the lesson on the subsets of real numbers, let the students create a Venn diagram to illustrate the different subsets of real numbers (Natural/counting numbers, whole numbers, integers, rational numbers, and irrational numbers).

Possible Answer:
 
</td>
<td>E.
$-\frac{5}{2}, -1.3, \frac{2}{5}, 2.3, \sqrt{10}$</td>
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<td rowspan="5">B. Teacher's Remarks</td>
<td>Note observations on any of the following areas:</td>
<td>Effective Practices</td>
<td>Problems Encountered</td>
<td rowspan="5">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>
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<tr>
<td>strategies explored</td>
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<td>others</td>
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<td>C. Teacher's Reflection</td>
<td colspan="3">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>
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