

Mathematics

Quarter 1 - Module 7: Subsets of Real Numbers



AIRs - LM

MATHEMATICS 7

Quarter 1 - Module 7: Subsets of Real Numbers

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Region I

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MATHEMATICS

Quarter 1 - Module 7: Subsets of Real Numbers



Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.



Target

Pythagoras once said that, “All things are number”. Truly, numbers are everywhere but do we really know our numbers. We are surrounded by these boundless figures but do we bother to know what they really are.

This module will help you understand real numbers and its subsets. The lessons are important in higher mathematics.

After going through this module, you are expected to:

Learning Competencies:

- illustrate the different subsets of real numbers (M7NS-lh-1)
- arrange real numbers in increasing or decreasing order and on a number line

Learning Competencies:

1. Describe and illustrate the real number system.
2. Identify the subsets of real numbers.
3. Arrange the set of real numbers in increasing or decreasing order.
4. Plot the set of real numbers on a number line.

Before you start doing the activities in this lesson, let's find out how much you already know about this module by answering the pre-assessment on the next page.

PRE – ASSESSMENT

Directions: Read each statement below carefully. Select the letter of the correct answer. Write your answer on a separate sheet of paper.

1. What number below is a natural, whole, integer, rational, and real number?
A. -8 B. $\frac{3}{4}$ C. 1.4 D. 7
2. Which of the following is **NOT** a classification of 0?
A. Integer B. Counting Number
C. Whole Number D. Rational Number
3. Which of the following statements is always true?
A. All integers are whole numbers.
B. All whole numbers are integers.
C. All rational numbers are integers.
D. Some whole numbers are not rational numbers.
4. How can 2π be classified?
A. Irrational Number B. Natural Number
C. Rational Number D. Whole Number
5. Which of the following is a classification of -8.9?
A. rational B. irrational C. integer D. whole number
6. Which of the following is **NOT** an integer?
A. -19 B. 0 C. 12.5 D. 125
7. When do we say that a number is irrational?
A. terminating B. repeating
C. repeating, non-terminating D. non-repeating, non-terminating
8. Which set of number is an example of irrational number?
A. $\sqrt{25}$ B. $\sqrt{50}$ C. $\sqrt{81}$ D. $\sqrt{121}$
9. Which of the following is a whole number but **NOT** a natural number?
A. 0 B. 7 C. 119 D. 1198
10. Which can be classified as rational number?
A. $\overline{23.23}$ B. $\sqrt{23}$ C. $\pi+2$ D. $\sqrt{2+3}$
11. Which values are in ascending order?
A. $2\frac{1}{5}, \frac{17}{7}, 2.7, \pi$ B. $2.7, 2\frac{1}{5}, \pi, \frac{17}{7}$ C. $\pi, 2\frac{1}{5}, 2.7, \frac{17}{7}$ D. $2.7, 2\frac{1}{5}, \frac{17}{7}, \pi$
12. Which is arranged in descending order?
A. $-8.4, -\frac{126}{5}, -3.7, 0.5$ B. $0.5, -3.7, -8.4, -\frac{126}{5}$
C. $-\frac{126}{5}, -8.4, -3.7, 0.5$ D. $0.5, -8.4, -\frac{126}{5}, -3.7$

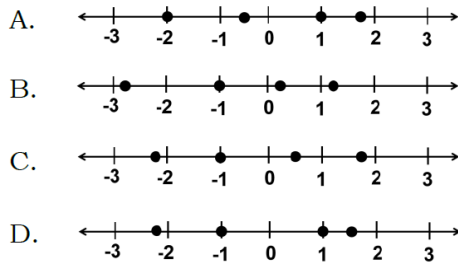
13. Which list shows the numbers in decreasing order?

- A. $\sqrt{25}$, 4.20, $\frac{1}{3}$, -0.66..., -7
B. -7, -0.66..., $\frac{1}{3}$, 4.20, $\sqrt{25}$
C. -0.66..., $\frac{1}{3}$, -7, 4.20, $\sqrt{25}$
D. $\sqrt{25}$, -0.66, 4.20, -7, $\frac{1}{3}$

14. Mathy marks the measuring tape mounted on their wall every year and record the increase in her phone. If 4 years back from the current year, the increase is 2.75 cm, $\frac{13}{5}$ cm, $2\frac{1}{5}$ cm, and $1\frac{3}{2}$ cm, respectively. If this year is 2021, what year gives the least increase?

- A. 2018
B. 2019
C. 2020
D. 2021

15. Which of the following best represents the arrangement of -2.25, -1, $\frac{1}{2}$, 1.75 on the number line?





Jumpstart

For you to understand the lesson well, a review on rational and irrational numbers is given as introduction on the subsets of real numbers.

Activity 1: Let's Groupie!

Given each number, classify it as rational or irrational. Copy the boxes below in your notebook and write the numbers on their designated group below.

19	3.4	-16	4.626578...	0	$\sqrt[3]{10}$	π	$\frac{10}{30}$	$\sqrt{3}$
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RATIONAL NUMBERS

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IRRATIONAL NUMBERS

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Were you able to recall rational and irrational numbers? If so, then you are now ready for the other kinds of numbers which will be discussed in this module.



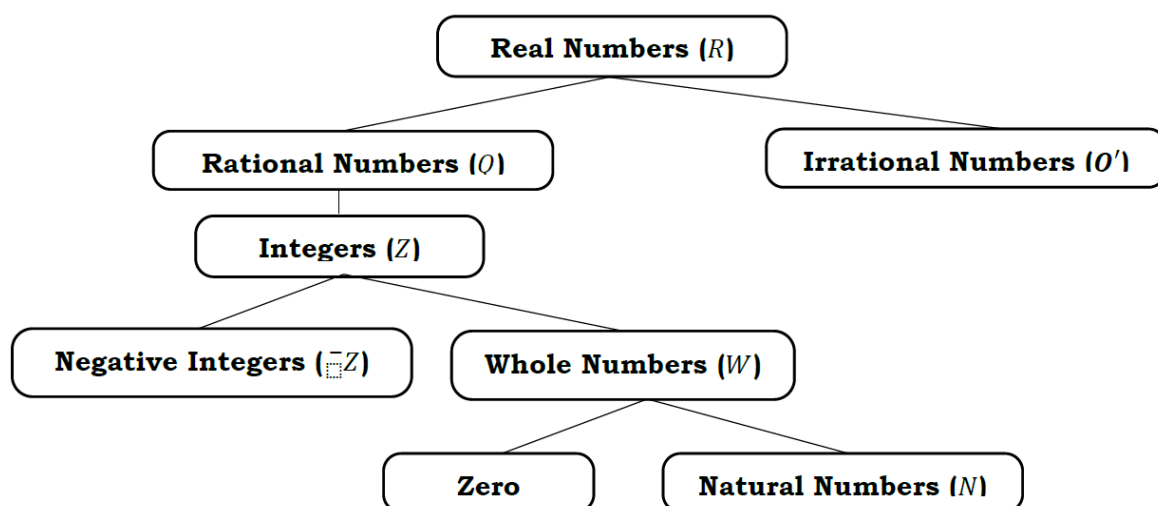
Discover

In the previous lessons, we were able to define real numbers and identify numbers as rational or irrational. **Real numbers** are the type of numbers that we use in our everyday life. They are called real numbers because they are not imaginary.

Real Number System

Real numbers are used in almost all aspects of our lives; there are different kinds of numbers used in the previous activity like fractions, decimals, whole numbers, counting numbers, and integers. Real numbers, as what is presented, follow a particular system known as the real number system.

The real number system is represented below in a tree diagram. It shows how all of the sets of numbers relate to one another.



The proper way of using these numbers is the most reasonable and practical way in providing value and meaning. In the market, when we buy meat, we prefer to use fraction or mixed numbers, for instance, $\frac{1}{2}$ kilo of chicken or $3\frac{1}{4}$ kilos of beef, but in paying the products, we use money which is in decimal form with two decimal places.

Lesson 1: Subsets of Real Numbers

Numbers are like people. They can be related to one another. The relation can be based on certain characteristics.

Let us now define each subset of real numbers and find their relationship with one another.

Name	Description	Examples
Natural Numbers (N)	These numbers are used for counting, also known as counting numbers.	{1, 2, 3, 4, 5...}
Whole Numbers (W)	These numbers are formed by adding zero to the set of natural numbers.	{0, 1, 2, 3, 4, 5...}
Integers (Z)	They are formed by adding the negatives of the natural numbers to the set of whole numbers.	{... -4, -3, -2, -1, 0, 1, 2, 3, 4...}
Rational Numbers (Q)	The set of all numbers which can be expressed in the form a/b , where a and b are integers, $b \neq 0$.	5.34, 67, 0.131313..., $\frac{3}{4}$, 9
Irrational Numbers (Q')	The set of numbers whose decimal representations are neither terminating nor repeating. These numbers cannot be expressed as a quotient of integers.	$\sqrt{2}$, 4.626578..., e and π

Example 1: Put a ✓ mark on the set of numbers to where each given number belongs.

Given	Natural Number	Whole Number	Integer	Rational Number	Irrational Number	Real Number
-25						
$\frac{5}{8}$						
- 3.7						
9π						
$\sqrt{7}$						
98						

Solution:

From the definition, all the given are real numbers. -25 and 98 are both integers and 98 can be classified as whole number and natural number. The preceding numbers together with $\frac{5}{8}$ and - 3.7 are rational numbers while 9π and $\sqrt{7}$ are irrational numbers.

So, we will check the appropriate category where they belong.

Given	Natural Number	Whole Number	Integer	Rational Number	Irrational Number	Real Number
-25			✓	✓		✓
$\frac{5}{8}$				✓		✓
-3.7				✓		✓
9π					✓	✓
$\sqrt{7}$					✓	✓
98	✓	✓	✓	✓		✓

Example 2: Tell whether each statement is true or false. Explain your answer.

- A whole number is also an integer.
Answer: **True**. Since whole number is a subset of integers, then each element of whole number is also an element of an integer.
- A whole number is a natural number.
Answer: **False**. Since zero is a whole number and not a natural number.
- Every real number is an integer.
Answer: **False**. A real number can be irrational as well as fraction and decimal.

Example 3: Write *always*, *sometimes* or *never* on the blank provided in each number.

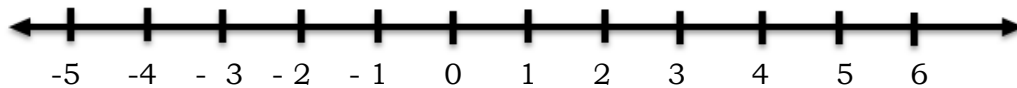
- Real numbers are _____ rational numbers.
Answer: **Sometimes**, since real numbers have two subsets then it can either be rational or irrational.
- Rational numbers are _____ real numbers.
Answer: **Always**, because set of rational numbers is a subset of real numbers.
- Integers are _____ rational numbers
Answer: **Always**, because set of integers is a subset of rational numbers.
- Irrational numbers are _____ rational numbers.
Answer: **Never**, because set of irrational numbers is not a subset of rational numbers and vice versa.

Lesson 2: Ordering Real Numbers

Knowing how to compare and order some aspects in our lives is an important skill for us to be able to decide on certain situations.

This is also true in real numbers. The skills of comparing and ordering integers, fractions, and decimals are relevant in the skills we need to learn in this lesson.

The best way to compare real numbers is by visualizing it in a number line.



From the number line, the following can be deduced:

1. The integers increase in value from left to right.
2. The smallest positive integer is 1.
3. The largest negative number is -1 .
4. The least or largest valued integer cannot be determined.
5. Zero is neither positive nor negative.
6. All negative integers are less than zero.
7. All positive integers are greater than zero.

If you have observed, as the number goes further to the left the value becomes lower and as the number goes further to the right the value becomes higher.

Example 1: Compare the given numbers by writing $>$, $<$ or $=$.

a. 23 ____ -23.7

c. $-\frac{1}{2}$ ____ -0.45

e. 3π ____ 6.28

b. 1.7 ____ $1\frac{1}{4}$

d. $\sqrt{16}$ ____ 4

f. -25 ____ $-\sqrt{26}$

Solution:

- a. Since positive number is greater than any negative number, then $23 > -23.7$.
- b. Since $1\frac{1}{4} = 1.25$, comparing with 1.7 definitely $1.7 > 1.25$.
- c. Since $-\frac{1}{2} = -0.5$, comparing -0.50 is at the left of -0.45 , $-12 < -0.45$.
- d. Since $\sqrt{16} = 4$, then the two numbers have equal values, $\sqrt{16} = 4$.
- e. Since $\pi = 3.14159265\dots$ so $3\pi \approx 9.42$, then $3\pi > 6.28$.
- f. Since $-\sqrt{26}$ is between -4 and -5 , then it is at the right of -25 , thus $-25 < -\sqrt{26}$.

Real numbers can be arranged in two ways: ascending or descending. Numbers that are arranged in **ascending order** are arranged from lowest to highest value, and **descending order** are arranged from highest to lowest value.

Example 2: Arrange the given values in ascending order.

$$-3, \quad \frac{1}{6}, \quad \sqrt{9}, \quad \frac{15}{4}, \quad 2\pi, \quad -4.5$$

Solution: 1. Change fractions, radicals and pi to decimals.

$$\frac{1}{6} = 0.1\overline{6}$$

$$\frac{15}{4} = 3.75$$

$$\sqrt{9} = 3$$

$$2\pi = 2(3.14) = 6.28$$

2. Then write the decimals in order from least to greatest.

$$0.1\overline{6}, 3, 3.75 \text{ and } 6.28$$

3. Write the decimals to their original form with their new order.

(Since it is ascending order, start arranging the negative numbers followed by the positive numbers).

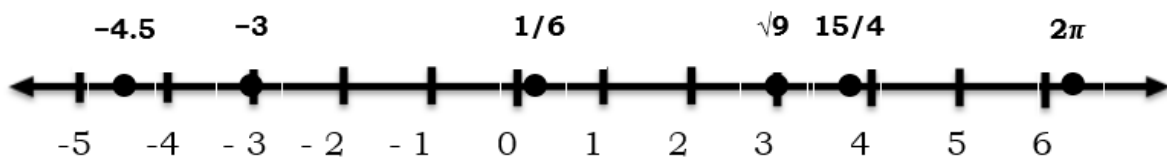
$$-4.5, \quad -3, \quad \frac{1}{6}, \quad \sqrt{9}, \quad \frac{15}{4}, \quad 2\pi$$

Another way of ordering is by plotting the points on a number line.

Let us use the above example and plot them on a number line.

$$-4.5, \quad -3, \quad \frac{1}{6}, \quad \sqrt{9}, \quad \frac{15}{4}, \quad 2\pi$$

For us to be able to plot it correctly, we will use the decimals obtained in example 2.





Explore

Activity 2. Fill Me!

- A.** Fill in the missing word in the blank. Choose the correct answer from the box.

Counting	Integers	Irrational	Rational	Whole
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1. _____ is a subset of real numbers that can be positive, negative or zero.
2. Counting numbers and zero are called _____ numbers.
3. The set of _____ numbers are numbers that cannot be expressed as a fraction.
4. Natural numbers are also called _____ numbers.
5. The subset of _____ numbers include integers, whole and counting numbers.

- B.** State whether each statement is true or false.

6. The set of rational or irrational numbers form the set of real numbers.
7. Irrationals cannot be found on the number line.
8. Fractions and decimals are rational numbers.
9. $\sqrt{5}$ is a rational number.
10. π is an example of irrational number.

- C.** Write always, sometimes or never on the blank provided in each number.

11. Integers are _____ irrational numbers.
12. Irrational numbers are _____ real numbers
13. Counting numbers are _____ rational numbers.
14. Negative numbers are _____ integers.
15. Decimals are _____ rational numbers.

Activity 3: Where do I belong?

Put a ✓ mark on the set of numbers to where each given number belongs.

Given	Natural Number	Whole Number	Integer	Rational Number	Irrational Number	Real Number
-25						
$\frac{5}{8}$						
- 3.7						
9π						
$\sqrt{7}$						
$\sqrt{7}$ $\sqrt{7}$						

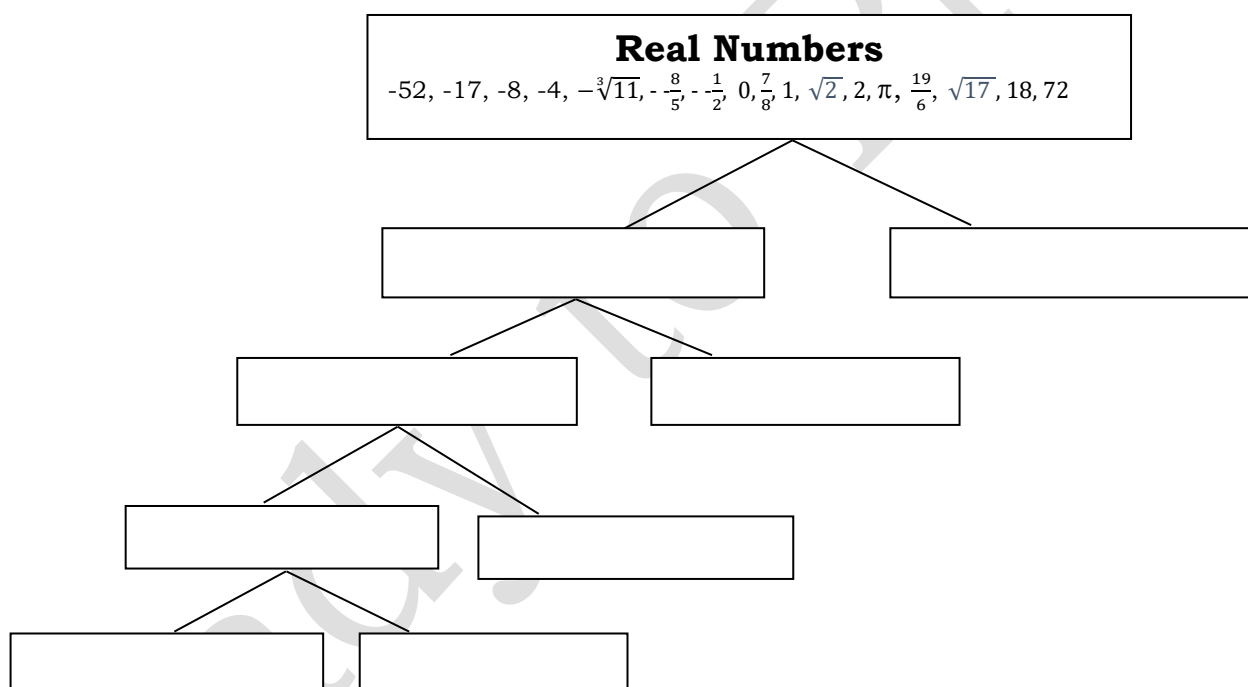


Deepen

Activity 4. I Can Do It!

Complete the scheme below by putting the correct words in the tree diagram. Choose your answer from the box. Under real numbers is a set of numbers for you to break down in their corresponding places.

Rational numbers	Integers	Irrational numbers
Whole numbers	Natural numbers	Non- integer
Zero	Negative integers	



Activity 5.

A. What Am I!

Below are some real numbers. Read each statement in column A then match the answer in column B. Write the letter to the corresponding box below to decode the message.

Column A

- The irrational number used in the formula of finding the area of a circle.
- The Dead Sea is ___m below sea level
- The boiling point of water is $\sqrt{10000}$ °C
- The normal room temperature is 3^3 °C
- Duterte is the ___th President of the Philippines
- An irrational number between 5 and 6
- The number of weight division titles Manny Pacquiao has won
- P5000 withdrawal from the bank

Column B

- 16
- 8
- π
- 5000
- 27
- $\sqrt{32}$
- 100
- 414
- 10

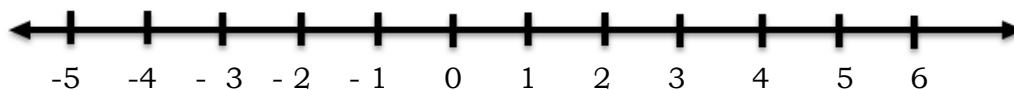
8	5	2	1	6	3	7	4

Write 2-3 sentences reflection about the decoded message. What is its impact to your life as a learner?

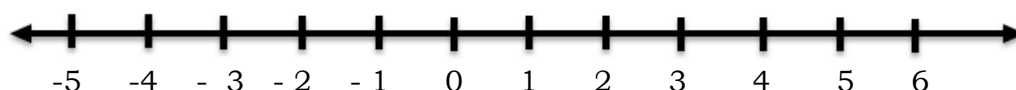
B. Arrange Me!

Arrange the following items in the order provided below and plot on the number line.

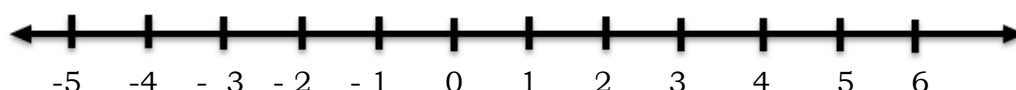
- Ascending order : - 5, 0, $\frac{29}{5}$, $-\frac{7}{2}$, 0.32



- Descending order: 6.5, $\sqrt{25}$, 2.5, π , $-\frac{3}{4}$



- Ascending order: - 4.75, $\sqrt{1}$, -1, -2π , $\frac{11}{5}$



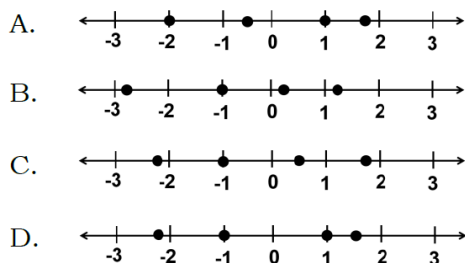


Gauge

Directions: Read each statement below carefully. Select the letter of the correct answer. Write your answer on a separate sheet of paper.

1. What number below is a natural, whole, integer, rational, and real number?
A. 12 B. $\frac{1}{3}$ C. 2.9 D. 23
2. Which statement is **NOT** true?
A. Every integer is a rational number.
B. Every decimal is an irrational number.
C. Every natural number is a real number.
D. Every counting number is a whole number.
3. Which statement is true?
A. The set of whole numbers is subset of rational numbers.
B. The set of real numbers is a subset of rational numbers
C. The set of decimal numbers are subset of irrational numbers.
D. The set of irrational numbers are subset of rational numbers.
4. Which of the following is **NOT** a classification of -13?
A. Integer B. Natural Number
C. Rational Number D. Real Number
5. How can -25 be classified?
A. irrational B. rational
C. rational, real D. irrational, real
6. What is the definition of integers?
A. natural numbers and zero
B. terminating or repeating decimals
C. whole numbers and their opposites
D. numbers you count on your fingers and toes
7. Which is in order from least to greatest?
A. $\sqrt{25}$, 4.20, $\frac{1}{3}$, -0.66..., -7 B. -7, -0.66..., $\frac{1}{3}$, 4.20, $\sqrt{25}$
C. -0.66..., $\frac{1}{3}$, -7, 4.20, $\sqrt{25}$ D. $\sqrt{25}$, -0.66, 4.20, -7, $\frac{1}{3}$
8. Which list shows the numbers in decreasing order?
A. $\sqrt{25}$, 4.20, $\frac{1}{3}$, -0.66..., -7 B. -7, -0.66..., $\frac{1}{3}$, 4.20, $\sqrt{25}$
C. -0.66..., $\frac{1}{3}$, -7, 4.20, $\sqrt{25}$ D. $\sqrt{25}$, -0.66, 4.20, -7, $\frac{1}{3}$
9. How do you describe the product of 5 and pi? Explain your answer.
A. Rational because both are rational.
B. Rational because one is irrational.
C. Irrational because one is irrational.
D. Irrational because both are irrational.

10. How do you describe the product of $\frac{2}{5}$ and -1.2 ? Explain your answer.
- Rational because both are rational
 - Rational because one is irrational
 - Irrational because one is irrational
 - Irrational because both are irrational
11. Noel's average is 94.61 which is rounded to 95, the rounded number can be classified as the numbers below except what number?
- irrational number
 - rational number
 - natural number
 - whole number
12. Height does not matter in the NBA. Over the years, there are not so tall players who achieved massive success in NBA, below are some of these players. Who among in the list below is the tallest?
- Mel Kirsch who is $\frac{4191}{25}$ cm tall.
 - Earl Boykins who is $165\frac{1}{10}$ cm tall.
 - Muggsy Bogues who is $\frac{8001}{50}$ cm tall.
 - Keith "Mister Jennings who is $165\frac{259}{50}$ cm tall.
13. The number of kilograms of chicken sold in one stall on Monday is 27.3 kilograms, $\frac{55}{2}$ kilograms on Tuesday, $\frac{81}{3}$ kg on Wednesday and $26\frac{7}{6}$ kg on Thursday. If we are to arrange the days based on the number of kilograms in descending order, what will be the arrangement?
- Monday, Tuesday, Wednesday, Thursday
 - Tuesday, Monday, Thursday, Wednesday
 - Thursday, Wednesday, Monday, Tuesday
 - Wednesday, Thursday, Monday, Tuesday
14. Dacanay Family want to travel with the least distance possible. They identified four destinations and researched on the distance from Makati. The distance of each of the four locations from Makati are as follows: Baguio = 254.9 km, La Union = $\frac{1384}{5}$ km, Benguet = $252\frac{352}{5}$ km, and Baler, Aurora = $\frac{569}{2}$ km. Which place will they more likely visit?
- Baguio
 - Baler Aurora
 - Benguet
 - La Union
15. Which of the following best represents the arrangement of -2.25 , -1 , $\frac{1}{2}$, 1.75 on the number line?



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B. Online Resources

- https://simple.wikipedia.org/wiki/Real_number
- <https://quizzes.com>

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