7 MATH

Quarter 1

PIVOT 4A LEARNER'S MATERIAL

This module is a resource of information and guide in understanding the Most Essential Learning Competencies (MELCs). Understanding the target contents and skills can be further enriched thru the K to 12 Learning Materials and other supplementary materials such as worksheets/activity sheets provided by schools and/or Schools Division Offices and thru other learning delivery modalities including radio-based and TV-based instruction (RB/TVI).

CLMD CALABARZON

Mathematics
Grade 7

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Mathematics Grade 7

PIVOT IV-A Learner's Material

Quarter 1

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Guide in Using PIVOT Learners Material

For the Parents/Guardian

This module is written in support of the blended learning to ensure attainment of standards expected to your children. This material underwent different processes and development by writers composed of classroom teachers, school heads, department heads, master teachers and supervisors.

With the different activities provided in every module, may you find this material engaging and challenging as it develops critical thinking and problem solving skills of your children.

To the Learners

Welcome to the Mathematics Module where your knowledge, skills and talents will be challenged through several tasks given on this module.

You don't have to worry if you think that the tasks are hard for you to answer because this module is designed most especially for you who would like to catch up with the lessons while you are learning at home. Get ready to embrace new knowledge and skills as you go on further learning using this module!

PARTS OF PIVOT LEARNER'S MATERIAL

	Parts of the LM	Description
Introduction	What I need to know	The teacher utilizes appropriate strategies in presenting the MELC and desired learning outcomes for the day or week, purpose of the lesson, core content and relevant samples. This allows teachers to maximize learners awareness of their own knowledge as regards content and skills required for the lesson
	What is new	
Development	What I know	The teacher presents activities, tasks , contents of value and interest to the learners. This shall expose the learners on what he/she knew, what he /she does not know and what she/he wanted to know and learn. Most of the activities and tasks must simply and directly revolved around the concepts to develop and master the skills or the MELC.
	What is in	
	What is it	
Engagement	What is more	The teacher allows the learners to be engaged in various tasks and opportunities in building their KSA's to meaningfully connect their learnings after doing the tasks in the D. This part exposes the learner to real life situations /tasks that shall ignite his/ her interests to meet the expectation, make their performance satisfactory or produce a product or performance which lead him/ her to understand fully the skills and concepts .
	What I can do	
	What else I can do	
Assimilation	What I have learned	The teacher brings the learners to a process where they shall demonstrate ideas, interpretation , mindset or values and create pieces of information that will form part of their knowledge in reflecting, relating or using it effectively in any situation or context. This part encourages learners in creating conceptual structures giving them the avenue to integrate new and old learnings.
	What I can achieve	

Sets

Lesson

I

After going through this module, you are expected to illustrate well-defined sets, subsets, universal sets, null set, cardinality of sets, union and intersection of sets and the difference of two sets.

An organized collection of objects with common characteristics is called a **set**. There are three ways to describe sets:. One is a written expression, another is through listing or rooster method and by set notation.

Learning Task 1. Identify all the possible answers for the statements below

1. All the provinces in Region IV-A	
2. Numbers greater than 8.	
3. All subjects in Grade 7.	
4. Vowels in the English alphabet.	
5. Five animals with four legs.	

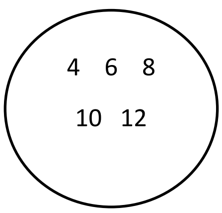
D

The members of a set can be described in different ways.

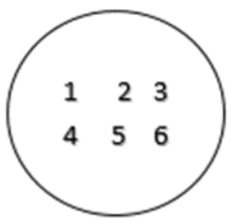
1. By definition such as the set of counting the members of a set.
2. By listing each member of a set like 1, 2, 3, 4, 5, …
3. By set notation such as Primary color = { red, yellow, blue }

Illustrative Example 1. Describe the elements of each set

Set A



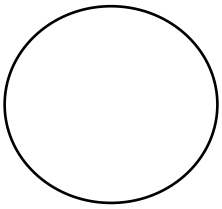
Set B



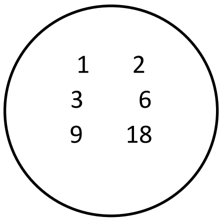
Answer: Set A: The set of even numbers from 4 to 12.

Answer: Set B: The set of counting numbers from 1 to 6.

Set C



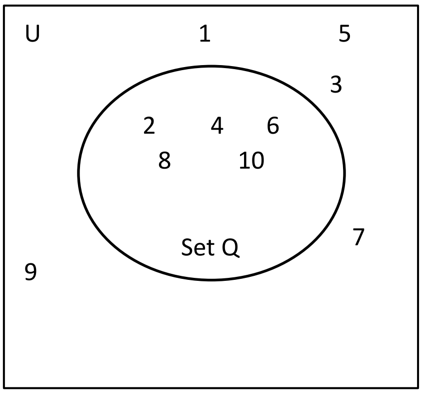
Set D



Answer: Set C: A null set

Answer: Set D: The set of factors of 18

Illustrative Example 2. Describe the subset and universal set shown below.



Answers:

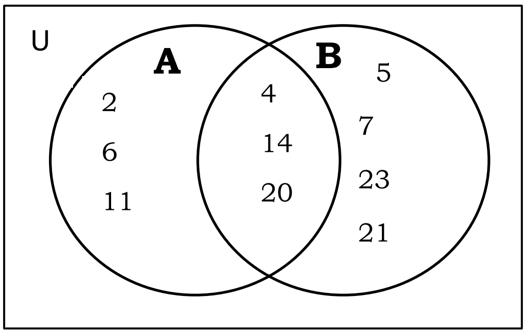
In this example, we can describe the sets this way.

Set U is the universal set:
The set numbers from 1 to 10.

Set Q is a subset of U.
The set of even numbers from 1 to 10

Illustrative Example 3. Use the diagram below to answer the questions that follow.

1. What elements are found in the union of A and B?
2. What is the cardinality of the union of A and B?
3. What elements are found in the intersection of A and B?
4. What is the cardinality of the intersection of A and B?
5. What are the elements in A' ? of B'?



Answers:

We use the symbol "U" to denote the union of sets and "∩" to denote the intersection of sets.

1. Since A = {2, 4, 6, 11, 14, 20} and B = {4, 5, 7, 14, 20, 21, 23}

   Thus, A U B = {2, 4, 5, 6, 7, 11, 14, 20, 21, 23}.

2. There are 10 elements found in the union of set A and B.
3. A ∩ B = {4, 14, 20}
4. The intersection of sets A and B has 3 elements.
5. A' = {5, 7, 21, 23}, B' = {2, 6, 11}.

Illustrative Example 4.

Given: A = {1, 2, 3, 4, 5, 6} and B = {4, 5, 6, 7, 8, 9, 10}.
Find: A – B and B – A.

To find the difference A – B, we begin by taking away every element of A that is also an element of B. Since A shares the elements 4, 5 and 6 with B, this gives us the set difference

A – B = {1, 2, 3}.

The difference B – A, consists of elements of B that are not in A. Therefore, B – A = {7, 8, 9, 10}.

Definition of Terms

A **set** is a well – defined collection of different objects. Any objects such as numbers, people, letters of the alphabet and symbols can make up a set.

A **subset** is a set whose elements are members of another set.

The **universal set** contains all the elements being considered in a given situation.

A **null set** is an empty set. It has no element. The null set is a subset of any set.

The **union of sets** is the set of all elements found in both sets. The union of A and B, denoted by A U B and read as "A union B", is the set of all elements belonging to either of the sets or in both. It is the result of adding or combining the elements of two or more sets.

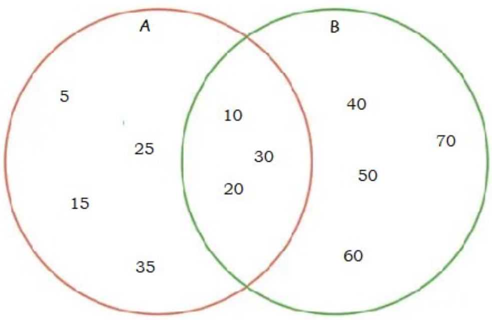
The **intersection of sets** A and B, denoted by A ∩ B, is the set of all elements common to both sets A and B. Sets with no common elements are called disjoint sets.

The **complement of set A**, denoted by A', is the set of elements that are not in set A but in the universal set.

The **cardinality of set** is the number of elements contained in a set.

The **difference of two sets**, written as A – B, is the set of all elements of A that are not elements of B.

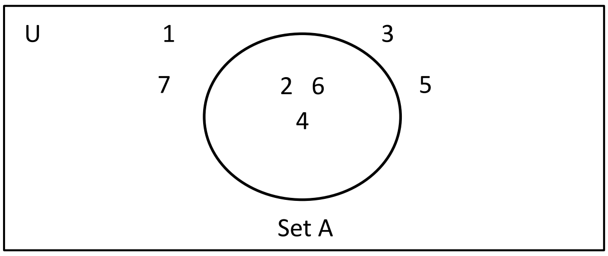
Learning Task 2



1. Describe set A
2. Describe set B
3. What is $A \cap B$? A U B ?
4. What is
5. What is the cardinality of A? B? A U B?

E

A. Describe the universal set and subset shown in the figure below.



Universal set ____

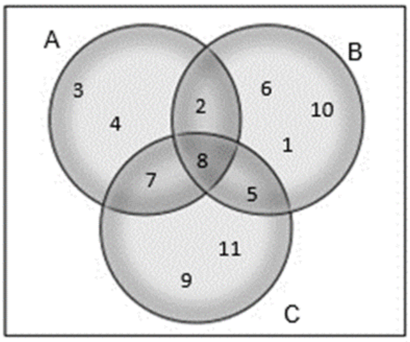
Subset ____

B. Find all the subsets of each of the following sets. Number 1 is done for you.

1. A = { m, n, p} { } , { m }, { n }, { p }, { m, n }, { m, p}, { n, p}, { m, n, p}
2. B = { x, y } ___________________________________
3. C = { 1, 2, 8 } ___________________________________
4. D = { a, b, c, d} ___________________________________
5. E = { a } ___________________________________

C. Using the figure below, find the elements found in the indicated sets.

1. A U B
2. A ∩ C
3. B U C
4. A ∩ B U C
5. (A U B) ∩ C



A

Make a survey to 20 of your classmates. Find the number of your classmates who like:

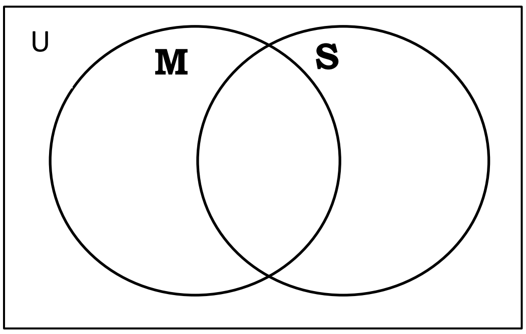
a) Math only,

b) Science only,

c) Either Math or Science, and

d) Neither Math nor Science.

Show the result of your survey using the figure.



Venn Diagram

WEEK 2

I

After going through this module, you are expected to:

1. Solve problems involving sets with the use of Venn Diagram.

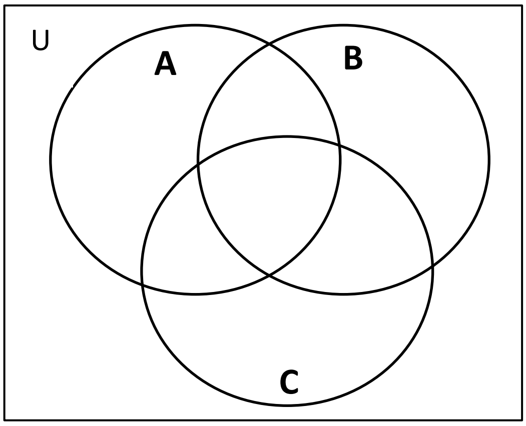
Learning Task 1

List down inside the diagram what is asked in each set:

A is the set of factors of 12

B is the set of prime numbers less than 15

C is the set of even numbers less than 15



D

Venn diagram is a diagram that uses circles to represent sets. The relation between the sets is indicated by the arrangement of circles. The Venn diagram is a way of representing sets visually and is named after its inventor, British mathematician John Venn (1834 – 1923).

Illustrative Example 1.

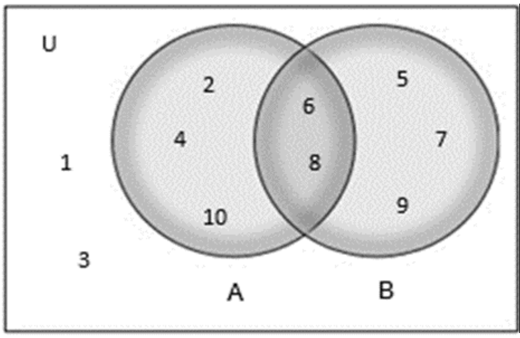
Use Venn diagram to represent the following sets.

Set U = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}

Set A = {2, 4, 6, 8, 10}

Set B = {5, 6, 7, 8, 9}

Answer



The two sets have common elements, 6 and 8, therefore we need to write these elements in the intersection of the two circles. Then write the other elements of each set in the other part of the circle. The elements of U that are not in A or B must be placed outside the two circles.

Illustrative Example 2. Use Venn diagram to represent set and set operations.

Set A = {2, 5, 6, 8, 9}

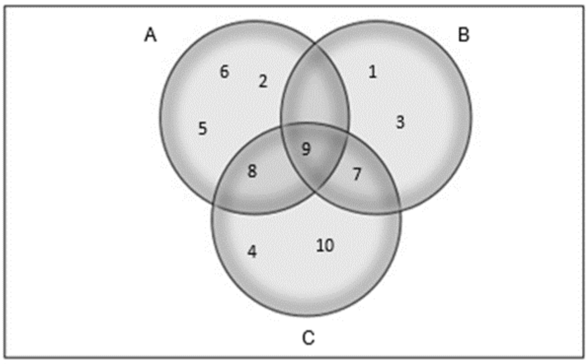
$A \cap C$ = {8, 9}

Set B = {1, 3, 7, 9}

$B \cap C$ = {7, 9}

Set C = {4, 7, 8, 9, 10}

$A \cap B \cap C$ = {9}

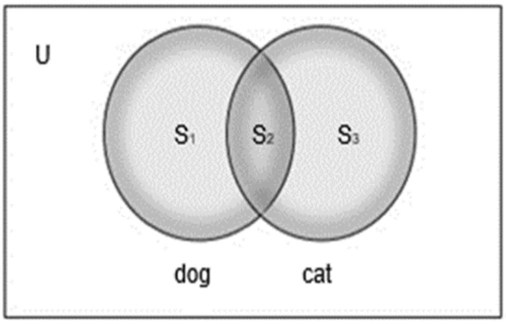


Illustrative Example 3. Sixty students of Grade 7 – Charity were asked if they have pet animals at home. Forty of the students have dogs and thirty-five have cats.

a. How many students have dogs only?

b. How many students own cats only?

c. How many students have both pet animals?



Solution:

Let S_1 = set of students with dogs only

S_2 = set of students with both pets

S_3 = set of students with cats only

Finding the elements in each region

$n(S_1) + n(S_2) + n(S_3)$ = total no. of students asked = 60

$n(S_1) + n(S_2) + n(S_3) = 60$ Subtract the two equations to find the number

$\underline{n(S_1) + n(S_2) \qquad = 40}$ of students who have cats only.

$n(S_3) = 20$

$n(S_1) + n(S_2) + n(S_3) = 60$ Subtract the two equations to find the number

$\underline{\qquad n(S_2) + n(S_3) = 35}$ of students who have dogs only.

$n(S_1) \qquad = 25$

$25 + n(S_2) + 20 = 60$ Substitute the values of S_1 and S_3 to find $n(S_2)$, the number of students who have both kinds of pet animals.

$n(S_2) = 60 – 25 – 20$

$n(S_2) = 60 – 45$

$n(S_2) = 15$

S_1 = set of students with dogs only = 21

S_2 = set of students with both pets = 15

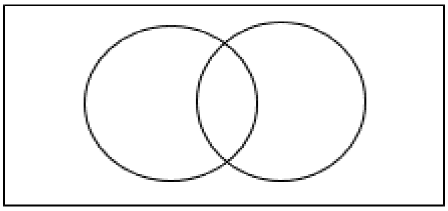
E

Learning Task 2

A. Complete the Venn diagram.

1. The set of whole numbers from 1 to 15

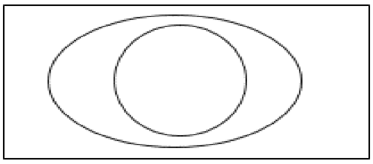
   Set A = all even numbers in this set



2. The set of whole number from 1 to 20

   Set C = all the even numbers

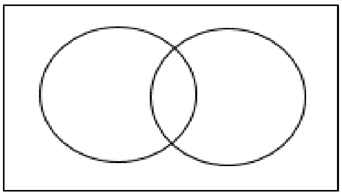
   Set D = all the multiples of 4



3. The set of whole numbers from 1 to 20

   Set E = {2, 4, 6, 7, 9, 10}

   Set F = {3, 4, 5, 9, 10, 13, 15, 16, 19, 20}



B. Solve the problems, use a Venn diagram to help you.

1. A group of 60 students were asked whether they watch TV Patrol or 24 Oras or both programs (depending on the news). Thirty – eight of these students watch TV Patrol and 32 watch 24 Oras.

   a. How many watch TV Patrol only?

   b. How many watch 24 Oras only?

   c. How many watch both news programs?

A

Learning Task 3

Using a Venn diagram, write down at least 10 of your characteristics of you and 2 of your family members' characteristic, then answer the following questions:

1. What are your similarities?
2. What are the distinct characteristic among each of you?
3. From whom did you get more of your characteristics?

WEEK 3

Absolute Value and Integers

I

After going through this module, you are expected to:

1. represent the absolute value on a number line as the distance of a number from 0; and

2. perform fundamental operations on integers

Learning Task 1 On a separate sheet of paper, illustrate a sea with the following: a crab 5ft. below sea level, a cliff 3 ft. above the sea level, and a flying bird 4 ft. above sea level. Use a vertical number line to help you out in the illustration.

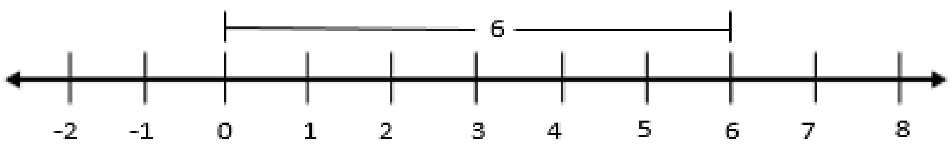
After making the drawing, study it carefully and answer the questions below.

1. What Number might be a good representation for the sea level?
2. How do represent the distance below and above the sea level?
3. How far is the cliff from the sea level?
4. How far is the bird from the sea level?
5. How far is the crab from the sea level?
6. What is the distance between the cliff and the crab?
7. What is the distance between the bird and the crab?

D

The absolute value of a number, $|n|$, is the distance of the given number on the number line from zero. The absolute value of a number disregards the direction from where it lies wit respect to zero. When we talk of distance, it is always positive. The absolute value of two, written as $|2|$, represents its distance from 0 on the number line.

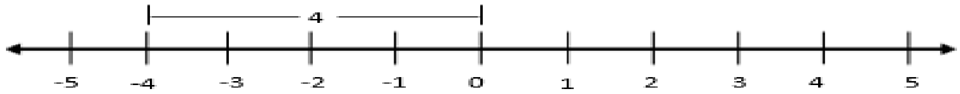
Illustrative Example 1. Represent $|6|$ on the number line.



6 is 6 units from 0.

Thus, the absolute value of 6 is 6, that is, $|6| = 6$

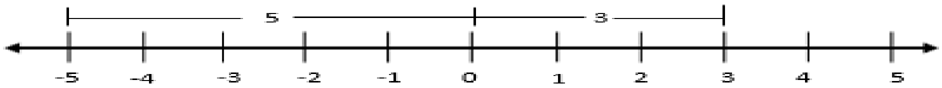
Illustrative Example 2. Represent |- 4| on the number line.



The distance of -4 from 0 is 4 units.

Therefore, the absolute value of -4 is 4, that is, |- 4| = 4

Illustrative Example 3. Represent |- 5| + |3| on the number line.



-5 is 5 units from 0, 3 is 3 units from 0.

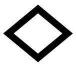
Thus, |- 5| + |3| = 5 + 3 = 8

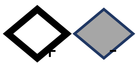
Illustrative Example 4. What is the value of - |- 5| ?

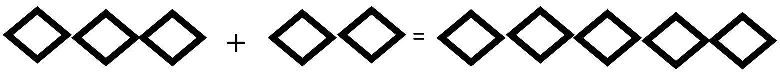
When a negative sign appears before the absolute sign, this will mean you are taking the inverse or opposite of the absolute value, thus, leading to a negative number.

ABSOLUTE VALUE IN ADDITION AND SUBTRACTION OF INTEGERS

Absolute value plays a vital role in performing operations on integers. Study the illustrations and analyze carefully the discussions that follow.

In the following illustrations,  a n d  represents positive and negative numbers, respectively. A pair of one negative and one positive is a zero pair.

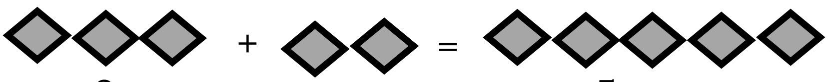
 , is a zero pair.

Illustrative Example 1. 

3 + 2 = <u>5</u>

To add two positive integers, just add the two integers and copy the positive sign of it.

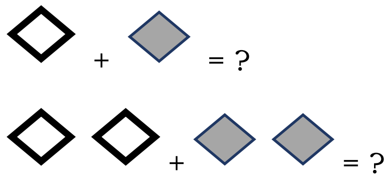
Note: An integer without negative sign is automatic a positive integer.

Illustrative Example 2. 

-3 + -2 = <u>5</u>

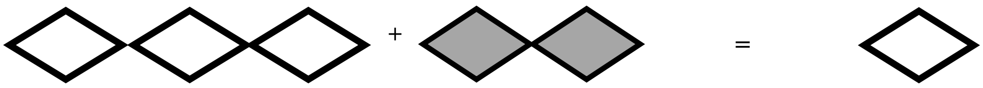
To add two negative integers, just add the two integers and copy the negative sign of it.

Observe.

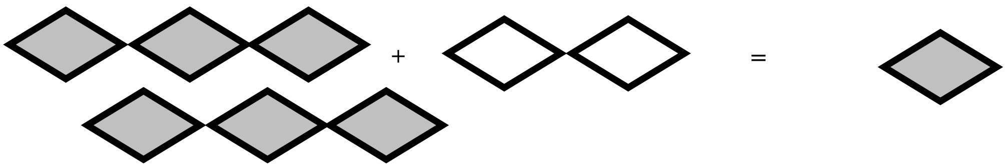


When you add the same number of positive and negative numbers, observe that the value will always be zero. Adding a number to its additive inverse or opposite will always result to zero. They are called zero pairs.

Illustrative Example 3



3	+	-2	=	1



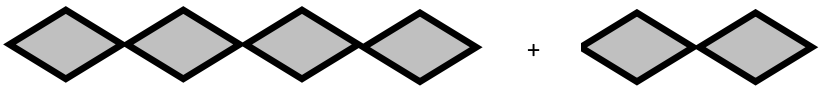
-3	+	2	=	-1

To add positive and negative integers, subtract the two integers. Copy the

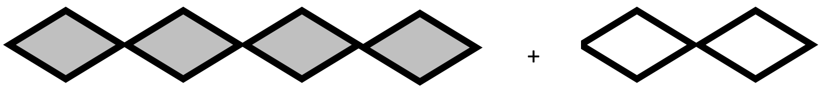
Illustrative Example 4

In subtracting integers, change the operation into addition and then change the sign of the subtrahend. Once changed, apply what you've learned in adding integers.

Illustrative Example 5



-4 + (-2) = -6



-4 + (+2) = -2

*Note: The operation will always change in addition. In changing sign, the positive (+) will be **negative (-)** and negative (-) will be **positive (+).***

E

Learning Task 2

A. Add the following.

1. $(^{+}9) + (^{+}10) =$ ____
2. $(^{-}7) + (^{-}5) =$ ____
3. $(^{+}5) + (^{-}6) =$ ____
4. $(^{+}2) + (^{+}8) =$ ____
5. $(^{-}1) + (^{+}10) =$ ____
6. $(^{-}3) + (^{-}3) =$ ____
7. $(^{+}4) + (^{-}8) =$ ____
8. $(^{-}8) + (^{+}12) =$ ____
9. $(^{-}11) + (^{+}11) =$ ____
10. $0 + (^{-}9) =$ ____

B. Subtract the following.

1. $(^{+}7) - (^{+}4) =$ ____
2. $(^{-}2) - (^{-}6) =$ ____
3. $(^{+}10) - (^{-}3) =$ ____
4. $(^{-}6) - (^{+}9) =$ ____
5. $(^{-}10) - (^{+}1) =$ ____
6. $(^{-}4) - (^{-}4) =$ ____
7. $(^{+}5) - (^{+}10) =$ ____
8. $(^{-}12) - (^{+}7) =$ ____
9. $(^{+}8) - (^{+}6) =$ ____
10. $0 - (^{-}9) =$ ____

A

Learning Task 3 . Solve each problem involving integers.

1. A mercury thermometer records a temperature of 8 degrees Fahrenheit at 10 A.M. If the temperature drops by 3 degrees Fahrenheit every hour, what will be the temperature by 2 P.M. of the same day?

2. Kate gets into the elevator on the third floor of a shopping mall. She goes up 6 floors to reach the food court. After an hour, she went down 2 floors to buy books. At which floor is she now?

WEEK 4

Properties of Operations

I

After going through this lesson, you are expected to:

1. Illustrate the different properties of operations on the set of integers

Recall the rules in adding/ subtracting and multiplying /dividing of integers.

Learning Task 1

Complete the table below by filling in the sum or product.

5 +3 = ____ , 3 + 5 = ____	(2)(7) = ____ , (7)(2) = ____
0 + 6 = ____ , 11 + 0 = ____	(1)(10) = ____ , (1)(8) = ____
(2 + 3) + 4 = ____ , 2 + (3 + 4) = ____	0·21 = ____, 5·0 = ____

D

In adding or multiplying integers, you have to consider the different properties of integers.

PROPERTIES OF ADDITION and MULTIPLICATION

Closure Property of Addition

a. (7) + (12) = 19

b. (⁻15) + (12) = ⁻3

For any integers a and b, a + b is an integer.

This is close for addition since the addends are integers, the sum is also an integer.

Closure Property of Multiplication

a.(5)(9) = 45

b.(⁻3)(8) = ⁻24

For any integers a and b, a · b is an integer.

This is close under multiplication, since the factors are integers, the product is also an integer.

Commutative Property of Addition

a. (6) + (-2) = (-2) + (6)

4 = 4

b.(-8) + (-3) = (-3) + (-8)

-11 = -11

> For any integers a and b, a + b = b + a.
>
> The order of addends will not affect the sum.

Multiplication

a.(7)(-5) = (-5)(7)

-35 = -35

b.(10)(6) = (6)(10)

60 = 60

> For any integers a and b, a ·b = b · a.
>
> The order of factors will not affect the product.

Associative Property of Addition

a. (3 + 7) + -4 = 3 + (7 + -4)

10 + -4 = 3 + 3

6 = 6

b.(-2 + 8) + 5 = -2 + (8 + 5)

6 + 5 = -2 + 13

11 = 11

> For any integers a, b, and c,
>
> (a + b) + c = a + (b + c).
>
> Different groupings of addends will not affect the sum.

Multiplication

a. [(4)(5) (7)] = (4)[(5)(7)]

(20)(7) = (4)(35)

140 = 140

b. (-2)(6) (-4) = (-2) (6)(-4)

(-12)(-4) = (-2)(-24)

48 = 48

> For any integers a, b, and c,
>
> (a · b) · c = a · (b · c).
>
> Different groupings of factors will not affect the product.

Identity Property of Addition

a. 15 + 0 = 15

b. 0 + -8 = -8

> For any integer a, a + 0 = a.
>
> The sum of any number and zero will always be equal to the number.
>
> The identity element of addition is 0.

Multiplication

a. (32)(1) = 32

b. (1)(-15) = -15

> For any integer a, a · 1 = a.
>
> The product of any number and 1 will always be equal to the number.
>
> The identity element of multiplication is 1.

Additive Inverse Property

a. (10) + (-10) = 0

b. (-2) + (2) = 0

> For any integer a, a + -a = 0.
>
> The opposite of the given integer is called its additive inverse. The sum of a number and its additive inverse is zero.

Multiplicative Inverse Property

a. $3\left[\frac{1}{3}\right] = 1$ b. $-5\left[-\frac{1}{5}\right] = 1$

> The reciprocal of the given integer is called its multiplicative inverse. The product of a number and its multiplicative inverse is one.

Zero Property of Multiplication

For any integer a, a · 0 = 0.

Any number multiplied by 0 is equal to 0

a. (-98) 0 = 0

b. 0 (12) = 0

Distributive Property of Multiplication over Addition

For any integers a, b, and c,

a (b + c) = ab + ac.

Adding first before multiplying or distributing the factor to each addend will give the same result.

a. 6 (4 + 8) = 6 (4) + 6 (8)

6 (12) = 24 + 48

72 = 72

b. -5 (-3 + 10) = -5 (-3) + -5 (10)

-5 (7) = 15 + (-50)

-35 = -35

E

Learning Task 2. Complete the following to make true statements. Then, determine the property applied.

1. 18 + __________ = 6 + 18 ________________________________
2. -40 + __________ = 0 ________________________________
3. (10 + 3) + 6 = 10 + _______ ________________________________
4. -15 + ________ = -15 ________________________________
5. ________ + 0 = 42 ________________________________
6. -2 (5 + 8) = _______ + (-16) ________________________________
7. 30 (______) = 30 ________________________________
8. [(4)(6)] 2 = 4 [___________] ________________________________
9. 15 * ________ = 0 ________________________________
10. (12)(-4) = _______ 12 ________________________________

A

Learning Task 3

Identify the property being used in each situation then express the statement in mathematical form.

1. I go to the store and buy instant noodles for 7.75 pesos, can of sardines for 16.00 pesos and 2 sachets of coffee for 12.25 pesos. How much money do I need to pay?

2. Mrs. Mijares needs to buy 2 set of 8 notebooks and 5 pens for her son and daughter for their school supply. How many items of school supplies does she

Rational Numbers

WEEK 5

I

After going through this module, you are expected to:

1. Express rational numbers from fraction form to decimal form and vice versa.
2. Perform operations on rational numbers

Remember that when we change fraction to decimals, divide the numerator by the denominator. When decimal is converted to fraction divide the decimal by powers of 10. For instance 0.5 to change to fraction write the decimal number as it is read. 0.5 is read as 5 tenths, hence in fraction it is $\frac{5}{10}$ then reduced to lowest term.

Translate the given statements into fractions and decimals.

1. two tenths ________ ________
2. three-fifths ________ ________
3. one hundred twenty-five thousandths ________ ________
4. one-fourth ________ ________
5. seven hundredths ______ _______

D

Rational numbers are numbers which can be written as a quotient of two integers a/b where b ≠ 0. Any rational number can be expressed in fraction form or decimal form.

Converting fraction into decimal form is simply dividing the numerator by the denominator.

Express $\frac{4}{5}$ in decimal form.

$$5\overline{)4.0} = 0.8$$

Therefore, $\frac{4}{5} = 0.8$.

A decimal is expressed to fraction form by using its digits disregarding the decimal point as the numerator and selecting the correct power of 10 as the denominator. The fraction is then expressed in simplest form.

Express 0.8 in fraction form.

Solution $0.8 = \frac{8}{10}$

$= \frac{4}{5}$

Therefore, $0.8 = \frac{4}{5}$.

To **add** or **subtract similar fractions**, add or subtract the numerator and copy the common denominator. Reduce to lowest term if necessary.

Add.

$$\frac{3}{8}+\frac{1}{8}$$

Subtract.

$$\frac{4}{6}-\frac{2}{6}$$

Solution:

Add/subtract the numerators and copy the common denominator.

Reduce the $\frac{3}{8}+\frac{1}{8}=\frac{4}{8}$ answer to lowest $\frac{4}{6}-\frac{2}{6}=\frac{2}{6}$ term.

Therefore, $\frac{4}{8}\div\frac{4}{4}=\frac{1}{2}$ $\frac{2}{6}\div\frac{2}{2}=\frac{1}{3}$

$\frac{3}{8}+\frac{1}{8}=\frac{1}{2}$ $\frac{4}{6}-\frac{2}{6}=\frac{1}{3}$

To add or subtract fractions with different denominators (**dissimilar fractions**), change them to equivalent fractions by finding the least common denominator LCD, then apply the rules in adding/subtracting fractions with the same denominators.

Add. $\frac{3}{4}+\frac{1}{6}$

Subtract. $\frac{4}{8}-\frac{5}{12}$

Solution:

Find the LCD.

$$\frac{3}{4}+\frac{1}{6}=\frac{?}{12}+\frac{?}{12}$$

$$\frac{4}{8}-\frac{5}{12}=\frac{?}{24}-\frac{?}{24}$$

Change to equivalent fractions.

Add the numerator and copy the denominator

$$=\frac{9}{12}+\frac{2}{12}$$

$$=\frac{11}{12}$$

Subtract the numerator and copy the denominator

$$=\frac{12}{24}-\frac{10}{24}$$

$$=\frac{2}{24}$$

Reduce the answer to lowest term.

$$=\frac{1}{12}$$

Therefore,

$$\frac{3}{4}+\frac{1}{6}=\frac{11}{12}$$

$$\frac{4}{8}-\frac{5}{12}=\frac{1}{12}$$

To **multiply** rational numbers in fraction form, simply multiply the numerators and multiply the denominators.

In symbol, $\frac{a}{b} \times \frac{c}{d} = \frac{ac}{db}$ where b and d are not equal to zero.

Multiply. $\frac{3}{4} \cdot \frac{5}{6}$

Solution:	$\frac{3}{4} \cdot \frac{5}{6} = \frac{15}{24}$	Multiply the numerators, multiply the denominators.
	$= \frac{5}{8}$	Reduce the product to lowest term.
Therefore,	$\frac{3}{4} \cdot \frac{5}{6} = \frac{5}{8}$	

Multiply. $2\frac{1}{4} \cdot 5\frac{4}{6}$

Solution:	$2\frac{1}{4} \cdot 5\frac{4}{6} = \frac{9}{4} \cdot \frac{34}{6}$	Express the mixed numbers as improper fractions.
	$= \frac{9}{4} \cdot \frac{34}{6}$	Simplify, by dividing by a common factor.
	$= \frac{51}{4}$ or $12\frac{3}{4}$	Multiply the numerators, multiply the denominators.
Therefore, .	$2\frac{1}{4} \cdot 5\frac{4}{6} = 12\frac{3}{4}$	

To **divide** rational numbers in fraction form, you take the reciprocal of the second fraction (called the divisor) and multiply it by the first fraction.

In symbol, , $\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \times \frac{d}{c} = \frac{ad}{bc}$ where b, c, and are not equal to zero.

Divide. $\frac{4}{5} \div \frac{2}{3}$ $\frac{4}{5} \div \frac{2}{3}$

Solution:	$= \frac{4}{5} \cdot \frac{3}{2} = \frac{12}{10}$	Get the reciprocal of the divisor, then proceed to multiplication. Multiply the numerators, then the denominators
	$= \frac{6}{5}$	Reduce to lowest term.
Therefore,	$\frac{4}{5} \div \frac{2}{3} = \frac{6}{5}$	

E

Learning Task 2. Perform the indicated operations.

1. $\frac{3}{7} + \frac{9}{14} =$ ____________
2. $\frac{1}{6} + \frac{3}{4} =$ ____________
3. $\frac{4}{6} + \frac{4}{18} =$ ____________
4. $\frac{4}{5} - \frac{6}{15} =$ ____________
5. $\frac{2}{5} - \frac{3}{6} =$ ____________
6. $\frac{3}{7} \times \frac{4}{5}$ = ____________
7. $\frac{5}{8} \times \left(-\frac{5}{3}\right)$ = ____________
8. $\frac{3}{4} \div \frac{2}{5}$ = ____________
9. $\frac{9}{10} \div \left(-\frac{4}{5}\right)$ = ____________
10. $3\frac{6}{7} \times 2\frac{2}{5}$ = ____________

A

Learning Task 3. Answer the following word problems.

1. It took Jose two-thirds of an hour to complete his math homework on Monday, three-fourths of an hour on Tuesday, and two-fifths of an hour on Wednesday. How many hours did it take Jose to complete his homework altogether?

2. Mika has three and seven-sixteenths cm of wire. She needs only two and five-eighths cm of wire for her project in TLE. How much wire does she need to cut?

3. At Guevarra Clan Reunion, 4 ½ kg of spaghetti was left. If there are 6 families, how much each family can take home equally?

WEEK
6

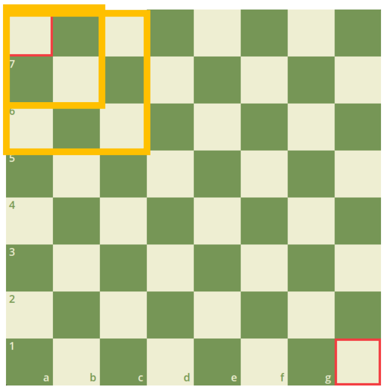
Square Root

I

After going through this module, you are expected to:

1. Describe principal roots and tells whether they are rational or irrational.
2. Determine between what two integers the square root of a number is.
3. Plot irrational numbers on the number line.

Count the total number of squares of the chess board. Prove that it has a total of 204 squares.



D

Recall that a rational number is expressed as a fraction or decimal. Every terminating or non-terminating repeating decimal represents a rational number. A **square root** of a number is a number when multiplied to itself will give you the original number. For example, the square root of 9 are +3 and -3 because when +3 and -3 are multiplied to themselves, they are equal to 9. If the square root of a number is nonterminating, non-repeating decimal, we say that it is an **irrational number**.

Every **positive number** has two square roots, one is positive and the other is negative. The **principal square root** is the positive square root of the given number or radicand. The principal root is rational if the radicand is a perfect square. If not, then the principal square root is irrational. Zero has only one square root, which is zero. In addition, negative numbers do not have real square roots. Their square roots are called imaginary numbers, which are tackled in a higher branch of Mathematics.

Square roots are the numbers that, when multiplied by themselves, equal to the number under the square root sign, the radicand. If the principal square root is irrational, the best you can do is to give an estimate of its value.

Illustrative Example 1. Find the principal root of $\sqrt{49}$

Solution: $\sqrt{49}$ = ±7 This means that the square root of 49 is either 7 or -7 because 7 x 7 = 49 and (-7)(-7) = 49.

Thus, $\sqrt{49}$ has a principal square root of 7 and it is rational.

Illustrative Example 2.

Determine whether the principal root of $\sqrt{17}$ is rational or irrational.

Solution: $\sqrt{17} = \pm\sqrt{17}$

The radicand, 17, is not a perfect square.

If the radicand is not a perfect square, then the principal square root is irrational.

Illustrative Example 3.

Between which two consecutive integers does $\sqrt{6}$ lie?

Solution: 6 lies between the consecutive perfect squares 4 and 9

$$4 < 6 < 9$$

$$\sqrt{4} < \sqrt{6} < \sqrt{9}$$

$$2 < \sqrt{6} < 3$$

Illustrative Example 4. $\sqrt{75}$ lies between what integers?

Solution: 75 lies between the consecutive perfect squares 64 and 81

$$64 < 75 < 81$$

$$\sqrt{64} < \sqrt{75} < \sqrt{81}$$

$$8 < \sqrt{75} < 9$$

Thus, the $\sqrt{75}$ is a decimal number greater than 8 but less than 9.

When a number is irrational, estimating square roots is a valuable tool. We can approximate the square root of a number by looking for two consecutive integers between which the square root lies. Irrational numbers never terminate nor repeat. The decimal form of an irrational number is always an estimate of its value.

Illustrative Example 5. Estimate the $\sqrt{10}$ to the nearest hundredth.

Solution: The principal root of $\sqrt{10}$ is between 3 and 4.

By estimation: $3.1^2 = 9.61$ and $3.2^2 = 10.24$

The $\sqrt{10}$ must lie between 3.1 and 3.2.

Continue the estimation to the hundredth place:

$3.15^2 = 9.9225$

$3.16^2 = 9.9856$

$3.17^2 = 10.0489$

10 is closer to 9.9856.

Therefore by estimation, $\sqrt{10} = 3.16$.

Illustrative Example 6. Estimate the $\sqrt{45}$ to the nearest hundredth.

Solution: The principal root of $\sqrt{45}$ is between 6 and 7. It is closer to 7.

By estimation:

$6.7^2 = 44.89$

$6.8^2 = 46.24$ The $\sqrt{45}$ must lie between 6.7 and 6.8.

Continue the estimation to the hundredth place:

$6.71^2 = 45.0241$

$6.72^2 = 45.1584$

45 is closer to 45.0241.

Therefore by estimation, $\sqrt{45} = 6.71$.

Irrational numbers are found on a number line by approximation. We can plot an irrational number on a number line using its estimated value.

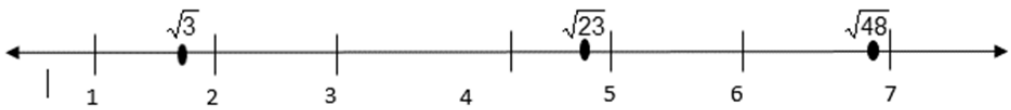
Illustrative Example 7. Plot the following irrational numbers on the number line: $\sqrt{3}$, $\sqrt{23}$, and $\sqrt{48}$.

Solution: Using the estimates,

$\sqrt{3}$ is closer to 2. $\sqrt{23}$ is closer to 5. $\sqrt{48}$ is closer to 7.

By approximation, the given irrational numbers are plotted on the number line below.

$\sqrt{3} = 1.73$ $\sqrt{23} = 4.80$ $\sqrt{48} = 6.93$

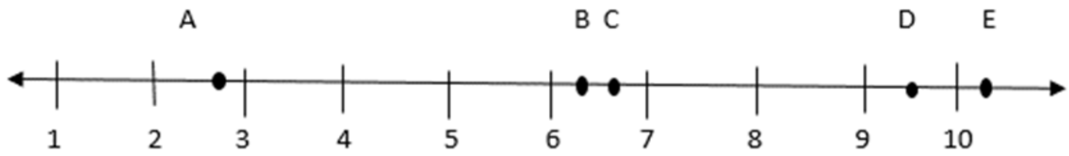


Plot the following points on a number line.

Point A = $\sqrt{7}$ Point D = $\sqrt{92}$

Point B = $\sqrt{38}$ Point E = $\sqrt{105}$

Point C = $\sqrt{43}$



Learning Task 1.

A. Write if the square root of the number is rational and I if irrational.

1. 81 2. 121 3. 29 4. 67 5. 225

B. Between what 2 integers the square root of the numbers can be found.

1. 23 2. 113 3. 339 4. 640 5. 75

E

Learning Task 2. **A.** Tell whether each of the following is a rational or irrational. If it is rational, give the principal root.

	Rational or Irrational	Principal root
1. $\sqrt{1}$	____________	____________
2. $\sqrt{8}$	____________	____________
3. $\sqrt{52}$	____________	____________
4. $\sqrt{256}$	____________	____________
5. $\sqrt{15}$	____________	____________

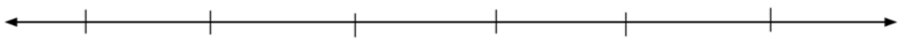
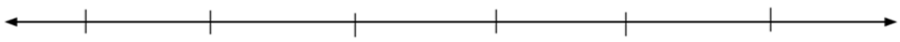
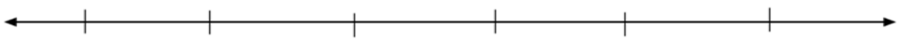
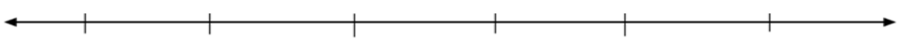
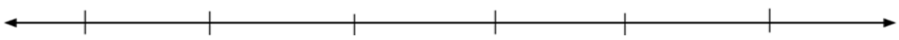
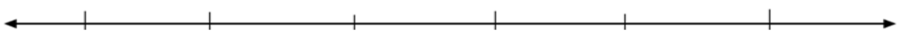
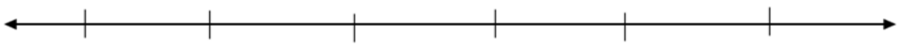
B. Between which two consecutive integers does the square root lie?

1. $\sqrt{120}$
2. $\sqrt{56}$
3. $\sqrt{19}$
4. $\sqrt{240}$
5. $\sqrt{80}$
6. $\sqrt{27}$
7. $\sqrt{199}$
8. $\sqrt{38}$
9. $\sqrt{102}$
10. $\sqrt{11}$

C. Estimate the square root to the nearest hundredth.

1. $\sqrt{138}$ = ________
2. $\sqrt{405}$ = ________
3. $\sqrt{800}$ = ________
4. $\sqrt{1150}$ = ________
5. $\sqrt{6500}$ = ________
6. $\sqrt{580}$ = ________
7. $\sqrt{300}$ = ________
8. $\sqrt{250}$ = ________
9. $\sqrt{284}$ = ________
10. $\sqrt{794}$ = ________

D. Direction: Plot following irrational numbers in the given number line.

1. $\sqrt{15}$ 
2. $\sqrt{46}$ 
3. $\sqrt{55}$ 
4. $\sqrt{60}$ 
5. $\sqrt{96}$ 
6. $\sqrt{14}$ 
7. $\sqrt{22}$ 
8. $\sqrt{75}$ 
9. $\sqrt{34}$ 
10. $\sqrt{57}$ 

A

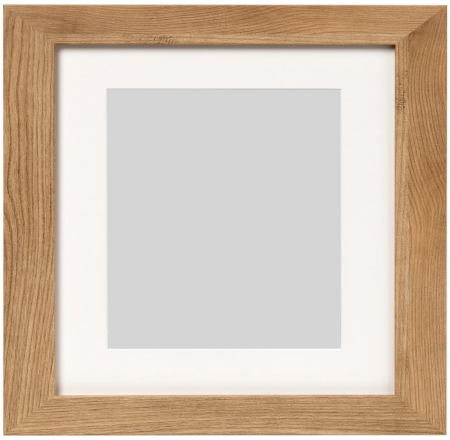
Learning Task 3

Read the problem carefully then answer the questions that follow.

Grace wants to frame a square picture which has an area of 950 square inches.

1. How long is each side of the picture?

2. She has another square picture with an area of 1200 square inches. How long is each side of this picture?



Real Numbers

I

After going through this module, you are expected to:

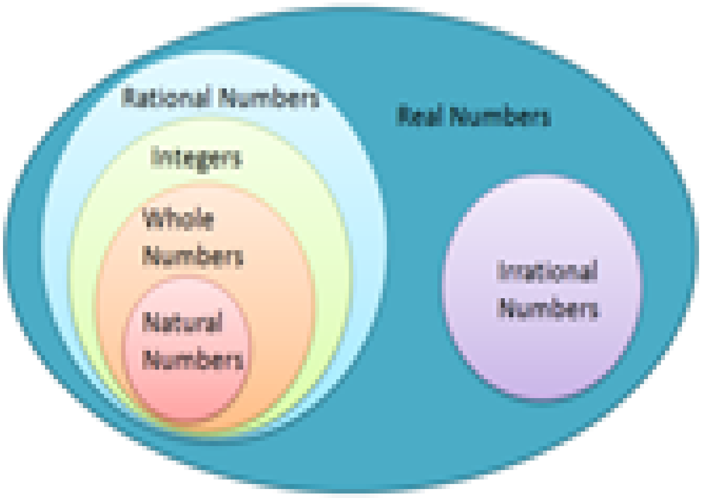
1. illustrate real numbers and its subsets.
2. arrange real numbers in increasing or decreasing order.
3. represent real-life situations involving real numbers.

Learning Task 1. Answer the following questions.

1. What is the smallest number that you know? Do you think it is really the smallest number?
2. What does zero stand for?
3. When you subtract 8 from 10, what is the difference?
4. How about if you subtract 10 from 8? Is there an answer?
5. Are fractions considered as integers?
6. Do you know fractions? Give some examples.

D

Real numbers comprise of any number that you can think or use in everyday life. It is the compilation of all types of numbers. Each real number represents a unique number along the number line. On the real number line, a point corresponds for every real number and a real number corresponds for every point.



The Venn Diagram of the Real Number System

Subsets of Real Numbers

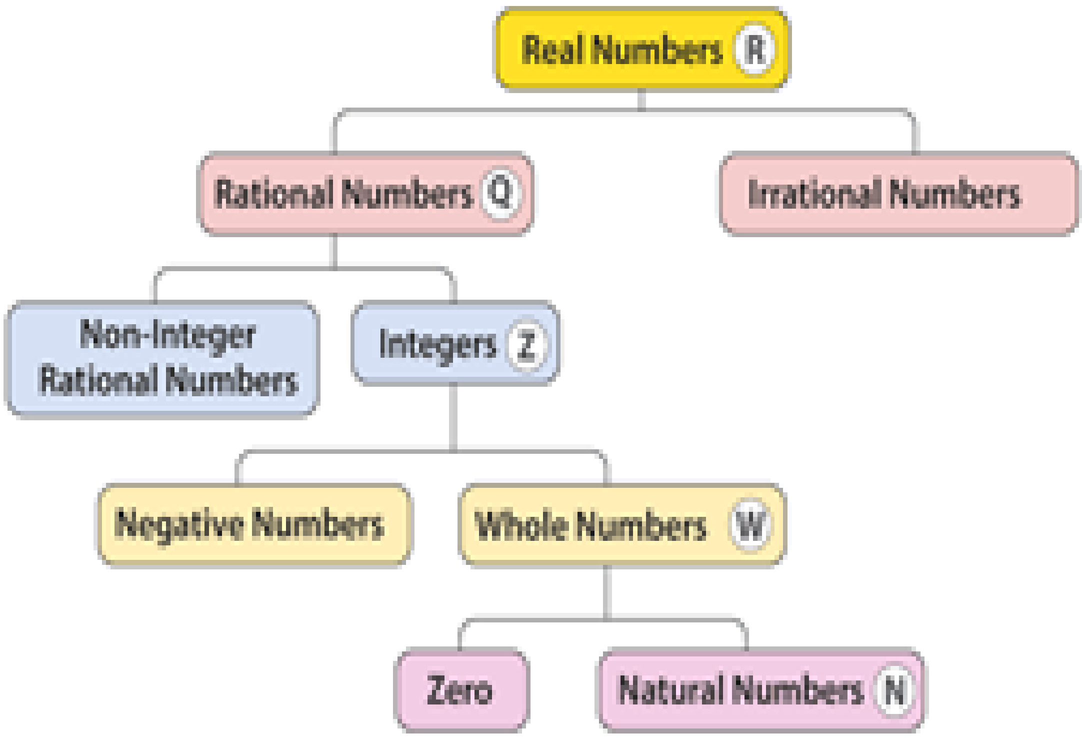
Natural or Counting Numbers. These are the numbers that we use in counting, that is {1, 2, 3, 4, 5, 6, …}. The three dots, called ellipsis, indicate that the pattern continues indefinitely. This set is also called the set of positive whole numbers and the set does not include zero.

Whole Numbers. These are the numbers consisting of the set counting numbers and zero, {0, 1, 2, 3, 4, 5, …}.

Integers. The set of natural numbers commonly called the positive integers, their opposites and zero, {…, -3, -2, -1, 0, 1, 2, 3, …}.

Rational Numbers. These are numbers that can be expressed as a quotient $\frac{a}{b}$ of two integers, provided that b $\neq 0$. e. g. { $\frac{2}{3}$, 4.35, 0, -8, - $\frac{5}{4}$, $5\frac{1}{6}$, $\sqrt{36}$, 14}

Irrational Numbers are numbers that cannot be expressed as a quotient of two integers. It includes the non – terminating and non – repeating decimals. Their exact values cannot be expressed as either terminating or repeating decimals. However, you can use a calculator to find their decimal approximation. Numbers whose roots cannot be extracted are not the only irrational numbers. For example, π is an irrational number which is approximately 3.1415926. e. g. { $\pi, 5.196152423\ldots, \sqrt{5}, -\sqrt{12}$ }.



Set of Real Numbers

Rational and irrational numbers together are called **real numbers**. Real numbers can be arranged in increasing or decreasing order, it would be easy to do this by expressing first all the real numbers in the same form.

Illustrative Example 1. Arrange the following real numbers in increasing order.

$$-4 \quad 5.8 \quad -\frac{1}{2} \quad \sqrt{50} \quad 4\frac{2}{5} \quad \sqrt{36}$$

Solution:

Express all the given real numbers in decimal form will be helpful.

$-4 = -4.00$ $\quad -\frac{1}{2} = -0.50$ $\quad 4\frac{2}{5} = 4.40$

5.8 $\quad \sqrt{50} = 7.07$ $\quad \sqrt{36} = 6$

Therefore, we can arrange the real numbers in increasing order as:

$$-4 \quad -\frac{1}{2} \quad 4\frac{2}{5} \quad 5.8 \quad \sqrt{36} \quad \sqrt{50}$$

Illustrative Example 2. Arrange the following real numbers in decreasing order.

$$\frac{9}{7} \quad -\frac{4}{3} \quad -1.65 \quad \sqrt{2} \quad 0 \quad \frac{3}{2}$$

Solution:

$\frac{9}{7} = 1.285...$ $\quad -1.65$ $\quad 0$

$-\frac{4}{3} - 1.333...$ $\quad \sqrt{2} = 1.41$ $\quad \frac{3}{2} = 1.50$

Therefore, the list of real numbers in decreasing order is:

$$\frac{3}{2}, \quad \sqrt{2}, \quad \frac{9}{7}, \quad 0, \quad -\frac{4}{3}, \quad -1.65$$

Examples of real-life situations which involve real numbers.

Illustrative Example 3.

Four students divide the pizza that they bought after class.

Represent the part that could be received by each member using real number.

Answer: $\frac{1}{4}$. (Each member will receive one part of the whole pizza which has been divided into four.)

Illustrative Example 4.

In an election for classroom officers, 11 students declared as winners. There were 60 students in the class.

Represent the part of officers to the whole class using real number.

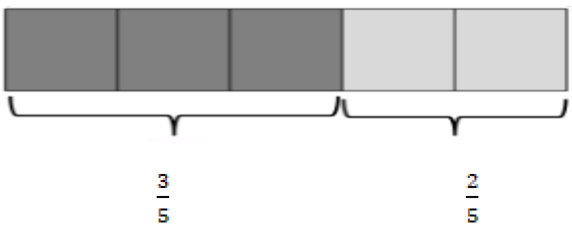
Answer: $\frac{11}{60}$ (Since 11 out of 60 students are the class officers.)

There are many problems involving real numbers that can be solved using the model approach. The following steps are suggested in solving problems.

1. Read and understand the problem.
2. Draw a sketch to visualize the problem.
3. Identify the operations that will be used.
4. Answer the question asked.
5. Check the answer if they satisfy all the conditions given in the problem.

Illustrative Example 5.

There are 60 students in a class. $\frac{3}{5}$ of them are girls. How many girls are there? How many boys?



Solution:

$\frac{1}{5} \times 60 = 12$

$3 \times 12 = 36$

Therefore, there are 36 girls.

$2 \times 12 = 24$

Therefore, there are 24 boys

The class consists of 36 girls and 24 boys a total of 60 students.

E

Learning Task 2. A. State whether each statement is true or false.

_________1. The smallest negative integer is -1.

_________2. The largest negative integer is – 1 000.

_________3. All numbers greater than zero are positive integers.

_________4. The repeating decimal 0.1616… is a rational number.

_________5. The number pi is an irrational number

_________6. Every negative integer is smaller than zero.

_________7. Irrational numbers can be found on the number line.

_________8. Decimal numbers are integers.

_________9. The real number $\sqrt{625}$ is irrational.

_________10. Zero is a natural number.

B. Arrange each set of real numbers in increasing order.

1. -1, 5, -2, $\frac{9}{2}$ _______________________

2. 2, $-\frac{9}{4}$, -3, $\frac{5}{2}$ _______________________

3. $\sqrt{64}$, 6.88, $\frac{17}{2}$, $\frac{14}{3}$ _______________________

4. 7, $\sqrt{52}$, $\frac{13}{2}$, 7.25 _______________________

5. -6.4, $-\sqrt{15}$, 3.2, -5.8 _______________________

C. Use real numbers to represent the following real-life situations.

________1. A temperature of 8 degrees below zero

________2. A gain of 6 kg in weight

________3. A sea level

________4. ₱ 50 off the original price

________5. An additional of 3 points

________6. A dropped of 8 in a heart rate

________7. A plane ascends 1 000 ft.

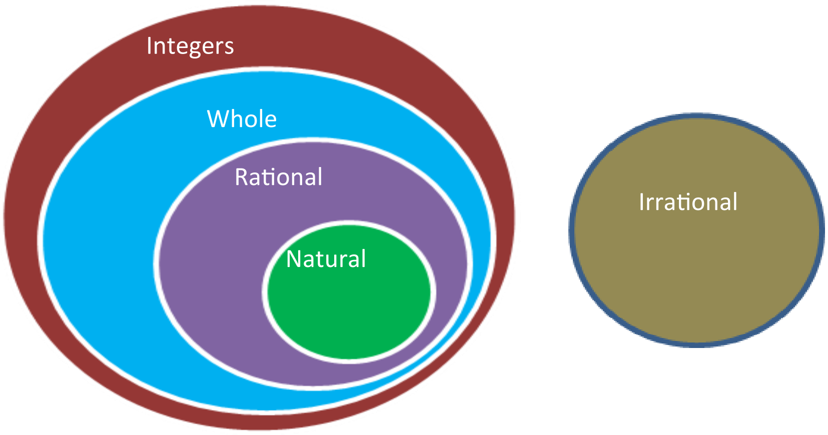
________8. Micah got a deduction of 2 points for her offense.

________9. Daniel went down 4 floors of a building.

________10. A slice of a cake that is divided into 8 equal slices.

A

Learning Task 3. Inside each set and subsets, write at least 5 examples of each kind of numbers.



Solve the following word problem.

1. Mikey worked on her mathematics homework for ¾ hour and her science homework for 7/8 hour. How long did she spend in all doing homework?

2. There are 60 students in a class. Three-fourths of them are girls. How many boys are there?

3. One day in Baguio, the temperature went from – 2 °C to 8°C. What is the change in temperature?

4. The elevation of Mt. Everest is 29 028 ft. The elevation of the Dead Sea is -485 ft. Find the difference in the elevation between Mt. Everest and the Dead Sea.

5. Angie cleans $\frac{1}{3}$ of the yard. Alex cleans $\frac{1}{4}$ of the remaining. What fraction of the yard is left unclean?

Scientific Notation

Lesson

WEEK 8

I

After going through this module, you are expected to write numbers in scientific notation and vice versa.

Learning Task 1. How do you write the following in figures?

__________1. Five hundred forty-three.

__________2. One thousand sixty-eight.

__________3. Two tenths.

__________4. Five million three hundred thousand.

__________5. Eight hundred fifty-seven thousandths.

Is there another way of writing very big or small numbers?

D

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. A scientific notation is written in the form $a \times 10^n$, where $1 \leq a < 10$. It is written as a number from 1 through 9 multiplied by 10 raised to the appropriate exponent.

We can now write numbers in scientific notation and vice versa considering the significant digits in a given number.

Illustrative Example 1.

The distance of the earth from the sun is approximately 93 000 000 miles. Write this distance in scientific notation.

Solution:

Move the decimal point of the original number **93 000 000.** to the left until the first significant digit to the left of the decimal point and copy the significant digits to its right. **9.3000000 = 9.3**

Count the number of places you have moved the decimal point (7 places) and multiply 10 raised to that exponent. The exponent is positive since **10^7**

we convert a large number to scientific notation.

Therefore, **93 000 000 = 9.3×10^7**

Illustrative Example 2. Write 0.00000000734 in scientific notation.

Solution:

Move the decimal point of the original number to the right until the first significant digit to the left of the decimal point and copy the significant digits to its right. **0.00000000734** **7.34**

Count the number of places you have moved the decimal point (9 places) and multiply 10 raised to that exponent. The exponent is negative since we convert a small number to scientific notation. **10^{-9}**

Therefore, **0.00000000734= 7.34×10^{-9}**.

Illustrative Example 3. Write 4.7×10^8 in decimal form or standard form.

Solution:

470 000 000	Move the decimal point to the right the same number of places as the exponent adding zeros as necessary. The positive exponent indicates a large number.

Therefore, $\mathbf{4.7 \times 10^8 = 470\ 000\ 000}$.

Illustrative Example 4. Write 2.51×10^{-5} in decimal form or standard form.

Solution:

0.0000251	Move the decimal point to the left the same number of places as the exponent adding zeros as necessary. The negative exponent indicates a small number.

Therefore, $\mathbf{2.51 \times 10^{-5} = 0.0000251}$.

REMEMBER:

If the number is large and you want to express it in scientific notation, what must be the sign of the exponent of 10?

If the number is small, what must be the sign of the exponent of 10?

How do you change scientific notation to decimal notation?

If the exponent of 10 is positive, where should you move the decimal point?

If the exponent is negative, where must be the decimal point be moved?

E

Learning Task 2

A. Write the following in scientific notation.

1. 275 000 = ______________
2. 0.00063 = ______________
3. 9 000 = ________________
4. 800 = __________________
5. 0.00038 = _______________
6. 86 500 = ________________
7. 4 000 000 = ______________
8. 5.75 = ___________________
9. 0.000026 = _______________
10. 45 = ____________________

B. Write the following in decimal notation.

1. 2.3×10^{7} = ______________
2. 6.9×10^{-3} = ______________
3. 3.1×10^{2} = ______________
4. 2.86×10^{-6} = ______________
5. 7.11×10 = ______________
6. 6.25×10^{5} = ______________
7. 7.51×10^{-9} = ______________
8. 5.85×10^{0} = ______________
9. 4.23×10^{-2} = ______________
10. 5.19×10^{7} = ______________

A

Learning Task 3

Answer the questions below. Express all your answers in scientific notation.

A human heart beats an average of 80 beats per minute.

a. How many heartbeats is this in an hour?

b. How many heartbeats is this in a day?

c. About how many heartbeats is this in a year?

d. About how many heartbeats is this in 80 years?

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