MODULE NO.1: SETS

Name: _____ Module # 1 No. of Days: 8
Grade & Section: _____ Teacher: _____

LEARNING TARGETS After this module, you should be able to:

- recognize well-defined sets **(K);**
- define and provide examples of the different kinds of sets and subsets **(K, A);**
- appropriately use a Venn diagram given different situation **(A);**
- represent the difference between two sets, complements of sets, unions, and intersection of sets using a Venn diagram **(A, C);**
- generate different ways on how to categorize data using a Venn diagram **(S).**

LEARNING RESOURCES/MATERIALS:

- https://www.genyo.com.ph - Genyo
- Yeap, B. H., et.al (2017). *The New Syllabus Mathematics*. Philippines: Rex Book Store, Inc.
- Microsoft Office PowerPoint Application
- Quick Response Code Scanner

ENGAGING ACTIVITY

P-A-N-T Sets!

Complete the table by providing examples of what is asked per column. Be sure to follow the rule of P.A.N.T.S where it should be done alphabetically. Try to finish it until Z! Good luck!

Letter	**P**rovinces in the Philippines	**A**quatic Animals	**N**ames of Saints	**T**hings You Have Done During the Quarantine
A				
B				
C				
D				
E				
F				
G				
H				
I				
J				
K				
L				
M				
N				
O				
P				
Q				
R				
S				
T				
U				
V				
W				
X				
Y				
Z				

a. How did you find the activity?

_____

b. Do you consider things you have written as part of the sets?

_____

c. Provide an explanation for your answer in letter B.

_____

_____

_____

GROUPIE!

Compile pictures of things that you think would be included in each group. Organize them in a PowerPoint presentation, allot one group per slide. After compiling, ask one of your classmates to critique your work by sending your PowerPoint presentation to them. Do the same with his/her work.

Group 1: set of red fruits
Group 2: set of COVID-free places in the Philippines
Group 3: set of the most influential YouTubers
Group 4: set of presidents of the Philippines

Process Questions: Based on the PowerPoint presentation sent to you, assess your classmates' work using the table below.

Name of Partner: _____

Were there differences in your answers in		**What were the differences?**
Group 1?		
Group 2?		
Group 3?		
Group 4?		

In groups where you had differences, why do you think there were such?

_____

_____

_____

_____

How would you re-define the sets wherein you and your partner had differences in answers?

_____

_____

_____

_____

LEARNING CONCEPTS

This activity will be expanded with an online discussion. Please go online on (date) at (time).

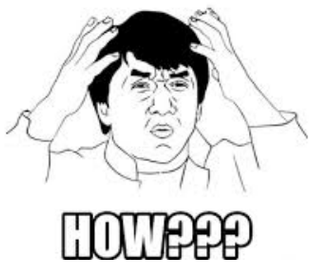
INTRODUCTION TO SETS

We often deal with groups or collections of objects in real life, such as a set of books, a group of students, a list of provinces you have visited, a collection of Mobile Legend heroes, etc.

Well-defined **SETS** may be thought of as a mathematical way to represent collections or groups of objects that are clearly defined. The individual objects found inside the set are called its **ELEMENTS**. We do not list an element more than once since an element is either a member of the set or it is not.

WELL-DEFINED SETS	NOT WELL-DEFINED SETS
• Set of male students • Set of protein-rich foods • Set of Bob Ong textbooks	• Set of beautiful students • Set of delicious foods • Set of engaging textbooks

Notice that **WELL-DEFINED SETS** are those sets that are clearly and properly defined that if asked to list elements for the set, it would not be debatable. Unlike for **NOT WELL-DEFINED SETS**, these sets may have different elements from what you would be thinking.



How do we write sets?

When writing sets, remember the acronym: CL-E-E-B. It stands for **C**apital **L**etter, **E**qual Symbol, **E**lements, and **B**racket which should look like this:

$$A = \{a, b, c, d, e\}$$

DEFINING SETS

There are two ways to define a set. These are the Listing Method and the Descriptive Method.

Listing Method – We can define a set by simply listing the elements.

Examples:

B = {BSCS, OLLCS, SFXCS, INBCS, SILCS, SFDSAI, GSCS, CSBN, RCS}
C = {2, 4, 6, 8, 10}
D = {q, u, a, r, n, t, i, e}

Descriptive Method – While it is possible to have sets with an infinite number of elements, instead of listing the elements, we can define the set by simply describing them.

Examples: *Let us define the sets from the listing method examples by describing them.*

B = {the nine (9) schools under RCBN-ES}
C = {the first five even numbers}
D = {the letters of the word 'QUARANTINE'}

VERIFYING ELEMENTS OF SETS

We already know that members of sets are called elements. Often times, we may be asked to verify if certain elements are indeed members of sets. In that case, if you want to denote that 'r' is an element of the set P = {letters of the alphabet}. How do we denote it?

We simply write: r ∈ P
Read as: "r is an element of Set P"

Notice the symbol we used to represent that it is 'an element of', ∈. It is a Greek letter called 'epsilon'. To denote the negation, you would just put ∉.

ACTIVITY

Think about it. **Why do you think sets have to be well-defined?** Provide with different points of discussion by creating a pros and cons grid.

SETS OF SETS?

Now that we know the fundamentals of sets, we will want to see if there is any way to classify them. In other words, can we make sets of sets? Turns out there are different types of sets that we can define and classify. Let us know a bit more!

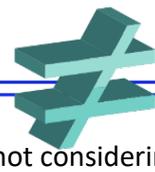
EMPTY SET

This set can also be referred to as NULL SET or VOID SET. It does not contain any element.
The symbol used to represent an empty set is – { } or ∅.

Examples:

E = {the set of months in the year with 32 days}
F = {the set of Filipinos who have gone to the Sun}
G = {the set of even numbers ending in 3}

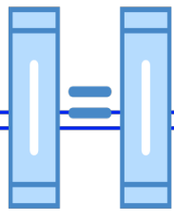
EQUAL and UNEQUAL SETS



We can say that two sets are equal if they have the same elements (not considering the order of appearance in the set). Equal sets are represented by X = Y. Otherwise, the sets are referred to as unequal set and may be denoted as X ≠ Y.

Examples:

H = {w, h, o} and I = {h, o, w} are equal sets.
J = {Tito, Vic, Joey} and K = {Tito, Vic, and Joy} are unequal sets.

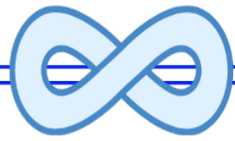


EQUIVALENT SETS

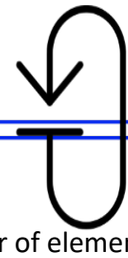
These sets are those which have an equal number of elements not considering what the elements are. The number of elements in a set may be referred to as a **CARDINALITY**.

Examples:

L = {a, b, c, d, e} and M = {v, w, x, y, z} are equivalent sets with cardinality of 5.
N = {do, re, mi, fa, so, la, ti} and O = {2, 4, 6, 8, 10, 12} are not equivalent sets since the cardinality of Set N is 7 and the cardinality of Set O is 6.



FINITE AND INFINITE SETS

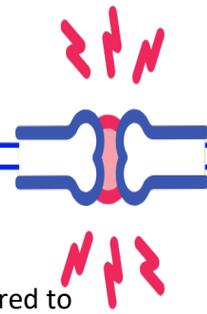


Any set which is empty or contains a definite and countable number of elements is called a finite set. Sets defined otherwise, for an uncountable or indefinite number of elements are referred to as infinite sets.

Examples:

P = {the set of factors of 24} is considered a finite set since we can enumerate them as {1, 2, 3, 4, 6, 12, 24}.
Q = {the set of prime numbers} is an infinite set because there is an unending number of prime numbers.

JOINT AND DISJOINT SETS



Two sets may have common elements. Thus, they may be referred to as joint sets. These are sets with one or more elements in common. Sets with no elements in common are called disjoint sets.

Examples: Consider the sets below.
J = {pizza, burger, spaghetti, fried chicken, fries}
K = {*palabok,* sundae, barbecue, cheeseburger, chicken sandwich}
L = {float, lasagna, spaghetti, fries, macaroni soup}

Notice that sets *J* and *L* both have spaghetti and fries as elements, whereas sets *J* and *K* have no common elements. Thus, sets *J* and *L* are said to be joint sets, whereas sets *J* and *K* are disjoint sets. Likewise, sets *K* and *L* are disjoint sets.

ACTIVITY

A. Based on the discussion with your teacher, put together three ideas that would summarize the types of sets. Provide examples of each type of set according to the summaries that you have written above. Write the sets in the descriptive method and listing method.

TYPE OF SET	SUMMARIES	EXAMPLE
Empty/Null Sets	• • •	

Finite Sets	• • •	
Infinite Sets	• • •	
Equal Sets	• • •	
Equivalent Sets	• • •	
Joint Sets	• • •	

B. During your discussion on the different types of sets, your classmate comes up with a claim that “empty sets are infinite sets”. Would you agree or disagree with your classmate? Provide an argument that would support your answer.

LEARNING CONCEPTS

In the earlier part of this module, we have learned that there are 2 ways to define a set – listing method and descriptive method. Yet these are just written representations of sets. In this next lesson, we are going to discover a pictorial representation of our sets.

VENN DIAGRAM SHAPE SORTER!

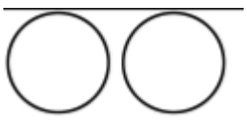
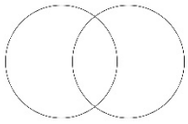
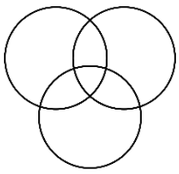
SCAN ME

1. Scan the Quick Response Code on the left.
2. It will bring you to an interactive site called "Venn Diagram Shape Sorter". The Shape Sorter activity involves using Venn Diagrams. Venn Diagrams were first developed by John Venn in the 1880s.
3. Familiarize yourself with the site. At the top, you will see three kinds of Venn Diagrams as shown below. Acquaint yourself with each kind of Venn Diagram by playing a game in each kind.
4. In your exploration, can you describe the rules that are applicable for each kind of Venn Diagram?

ACTIVITY

KNOW-WHEN!

For each example, put a heart (♥) in the appropriate box to indicate which Venn Diagram should be used.

I want to use a Venn Diagram that will let me…			
Compare the meats and fishes in our refrigerator			
Group students in our class based on birth month, age, and gender.			
Compare numbers that are multiples of 7 to the numbers that are multiples of 2.			
Compare the Samsung Galaxy A10 and the iPhone 11 Pro Max			

DIY VENN DIAGRAM

You were asked to put 7, 11, 77, 121, 88, 5, 50, 55, 110 in a Venn Diagram.

a. Provide two ways on how you would categorize the numbers in a Venn Diagram.

LEARNING CONCEPTS

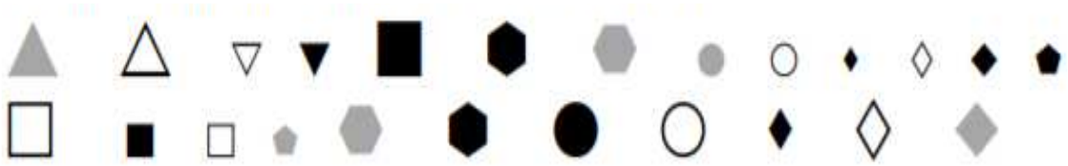
INTERSECTIONS OF SETS – It is the set of **common** elements of two or more sets.
UNION OF SETS – It is the set of **all** elements of two or more sets.

ACTIVITY

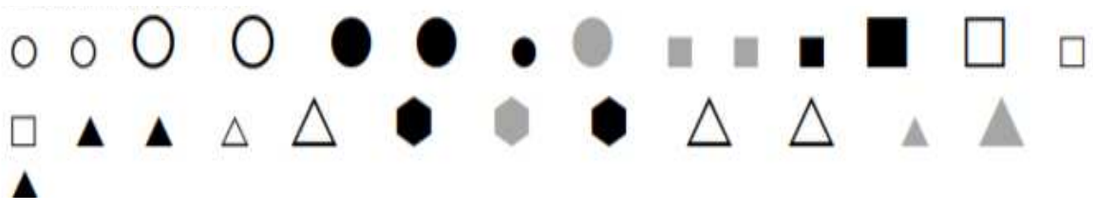
RULES OF INTERSECTIONS

Follow the directions for each.

Rule 1: Encircle each BLACK shape.
Rule 2. Underline each shape that is SMALL.
Rule 3: Draw a square around each shape that is an intersection of Rules 1 and 2.

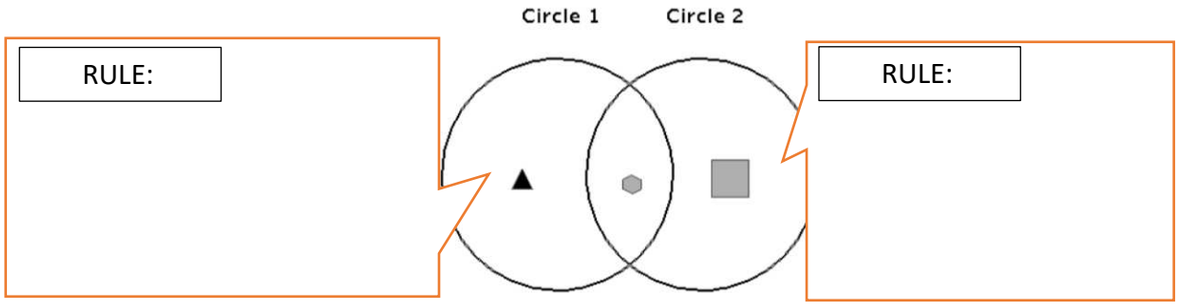


Rule 1: Encircle each shape is that BIG.
Rule 2: Underline each shape that has THREE OR MORE VERTICES.
Rule 3: Draw a square around each shape that is an intersection of Rules 1 and 2.



YOU RULE!

What possible rule/s could you think of for the Venn Diagram?



LEARNING CONCEPTS

DIFFERENCE OF TWO SETS – It is the set of all the elements in Set A that are not in Set B.
COMPLEMENT OF A SET – It refers to the elements that are NOT IN THE SET.
SUBSETS Imagine the Set P which consists of all the students in the RCBN-ES Schools, and another Set I which consists of all the Grade 7 learners enrolled in Ina ng Buhay Catholic School. We then can say Set I is a subset of Set P.

Make a Set X of all the names of the members of your family.
X =
Now, make a Set Y of all the children in your family.
Y =

Can you see the relationship of Set X and Set Y? Observe that all members of Set Y are also members of Set X. This may now be written as $Y \subset X$.

ACTIVITY

Provide 5 examples of subsets. Write the sets using the listing method.

ORDER IS IMPORTANT!!

Just like in subtracting numbers, the order of the numbers to be subtracted must be taken into consideration. 8 – 6 will not equal to 6 – 8. The same rule applies to get the differences of sets.

Explore the differences in each situation given the following sets.

Universal Set = {1, 2, 3, …,20}
A = {multiples of 2}
B = {multiples of 4}
C = {multiples of 3}
D = {multiples of 6}

a. A – B and B – A

b. C – D and D – C

Do you think there is an exemption to this rule? If so, please provide an example.

COMPLEMENTS OF A UNIVERSE

1. Consider the Set A defined as A = {2, 3, 5, 7, 11, 13} and set B defined as B = {2, 5, 7}. Determine the complement of Set B with Set A as the universal set.

2. Consider the set of integers as the universal set. Determine the complement of the set of whole numbers. Express the complement in the descriptive method.

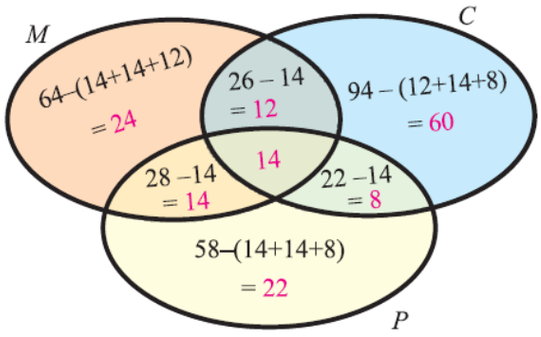
3. Given the set of numbers on a standard six-sided die, determine the set that represents the complement of the set comprised of all multiples of 3.

LEARNING CONCEPTS

SOLVING PROBLEMS WITH THE USE OF VENN DIAGRAMS

PROBLEM 1: In a survey of university students, 64 had taken mathematics course, 94 had taken chemistry course, 58 had taken physics course, 28 had taken mathematics and physics, 26 had taken mathematics and chemistry, 22 had taken chemistry and physics course, and 14 had taken all the three courses. Find how many had taken one course only.

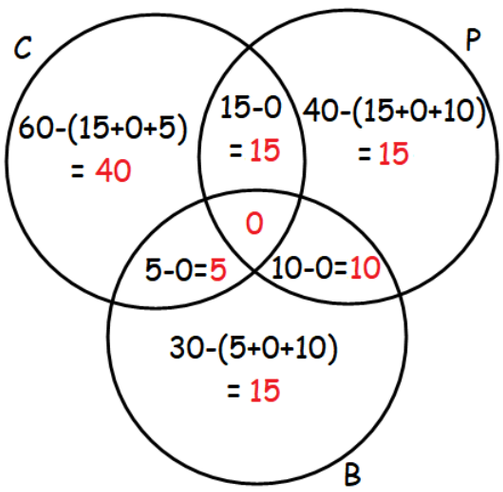
Step 1: Venn diagram related to the information given.



Step 2: From the venn diagram above, we have:
No. of students who had taken only math = 24
No. of students who had taken only chemistry = 60
No. of students who had taken only physics = 22

Step 3: Total no. of students who had taken only one course :
= 24 + 60 + 22
= 106
Hence, the total number of students who had taken only one course is 106.

PROBLEM 2: In a college, 60 students enrolled in chemistry,40 in physics, 30 in biology, 15 in chemistry and physics,10 in physics and biology, 5 in biology and chemistry. No one enrolled in all the three. Find how many are enrolled in at least one of the subjects.



From, the above venn diagram, number of students enrolled in at least one of the subjects :
= 40 + 15 + 15 + 15 + 5 + 10 + 0
= 100
So, the number of students enrolled in at least one of the subjects is 100.

Solve the following problems. Model your answers with the use of a Venn Diagram.

1. A survey of 64 informed voters revealed the following information: 45 believe that Elvis is still alive; 49 believe that they have been abducted by space aliens; 42 believe both of these things.

Venn Diagram Model:

a. How many believe neither of these things?

b. How many believe Elvis is still alive but don't believe that they have been abducted by space aliens?

2. A survey of faculty and students of RCBN School of Novaliches revealed the following information: 51 admire KathNiel; 49 admire LizQuen; 60 admire AlDub; 34 admire Kathnel and LizQuen; 32 admire LizQuen and AlDub; 36 admire KathNiel and AlDub; 24 admire all three of the love teams; and 1 admires none of the love teams.

Venn Diagram Model:

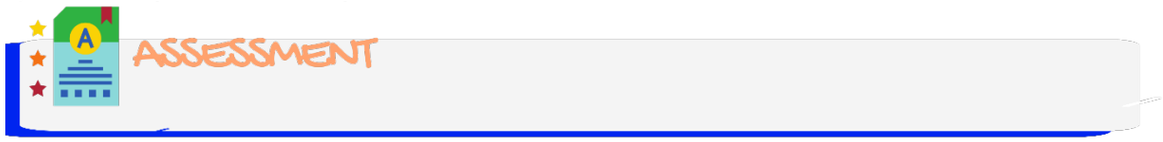
a) How many people were surveyed?

b) How many admire AlDub, but not KathNiel nor LizQuen?

c) How many admire LizQuen or AlDub?

d) How many admire exactly one of the love team?

e) How many admire exactly two of the love teams?



A. On the blank provided, write a ☺ if it is a is a set, and ☹ if it is not. If it is a set, show the correct way of writing the set in descriptive and listing method.

_____ 1. the collection of all the days in the week
Descriptive Method: _____
Listing Method: _____
_____ 2. the collection of all the beautiful flowers in Luneta Park
Descriptive Method: _____
Listing Method: _____
_____ 3. the collection of all positive factors of 36
Descriptive Method: _____
Listing Method: _____
_____ 4. the collection of all the cute dresses in H&M
Descriptive Method: _____
Listing Method: _____
_____ 5. the collection of all the colors of the rainbow
Descriptive Method: _____
Listing Method: _____

B. Refer to the sets given below, then put ∈ or ∉ on the blank to make the statements true.

P = {1, 3, 5, 7, 9}
Q = {2, 4, 6, 8, 10, 12, 14, 16}
R = {1, 4, 5, 8, 9, 11, 14, 17, 19}

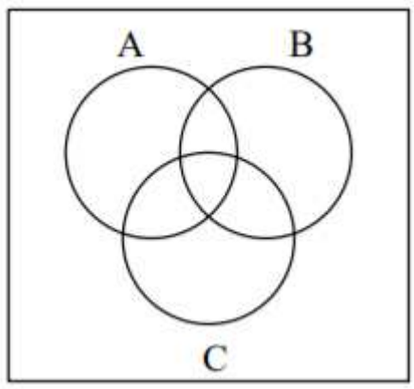
6. 4 _____ Q
7. 5 _____ R
8. 14 ____ P
9. 17 ____ Q
10. 19 ___ R

C. Refer to your NSM Singapore Math Worktext page 7, number 10. Write your answers on the space provided.

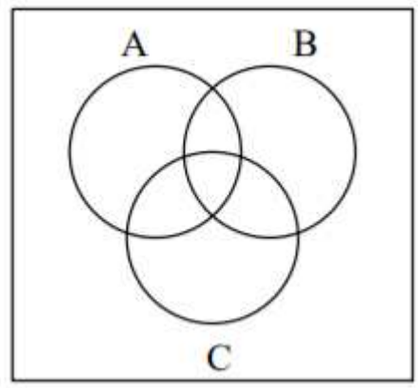
Which does not belong to the set?	Description of Set
a.	a.
b.	b.
c.	c.
d.	d.

D. Shade the region of the Venn Diagram indicated by the following sets.

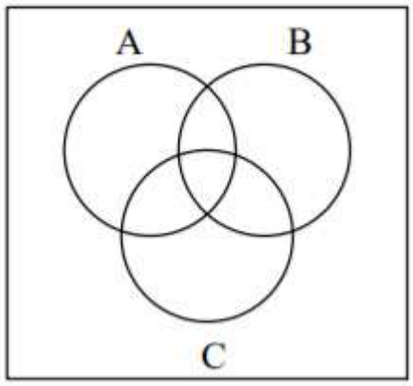
1. Shade: $(A' \cup B) \cap C$



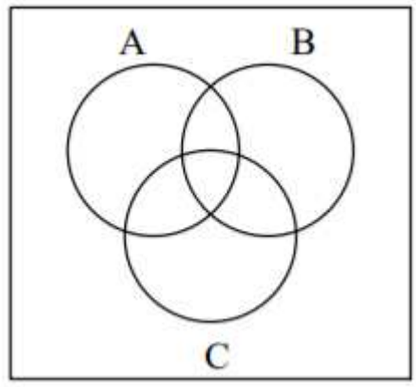
2. Shade: $(A \cap B)' \cup C$



3. Shade: $A \cup (C' \cup B)$



4. Shade: $(A \cap B') \cap C$



SYNTHESIS

In your own words, describe or define what is meant by a "well-defined set".

Based on your own description, how would you describe a "well-defined Catholic"?

SELF-CHECK!

Congratulations! You completed Module 1! Right now, let us see how you will assess yourself on the following. Kindly indicate the level of your performance in each learning target by putting a (♥) heart in the box of your choice. See the description below as your guide. You may also write your feedback and suggestions below regarding the activities.

LEARNING TARGETS	LEVEL OF PERFORMANCE				
	4	3	2	1	0
I can recognize well-defined sets.					
I can define and provide examples of the different kinds of sets and subsets.					
I can appropriately use a Venn diagram given different situations.					
I can represent the difference of two sets, complements of sets, unions and intersections of sets using a Venn diagram.					
I can generate different ways on how to categorize data using a Venn diagram.					

LEGEND:
4 – I know (can do) it well enough to make a connection that was not taught.
3 – I know (can do) everything that was taught without making mistakes.
2 – I know (can do) all easy parts, but I don't know (can't do) the harder parts.
1 – With help, I know (can do) some of what was taught.
0 – I don't know (can't do) any of them.

Write your feedback and suggestion/s below.