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A Module in GE MMW- Mathematics in the Modern World



MODULE 1

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COURSE INFORMATION	
Course Code	GE-MMW
Course Title	Mathematics in the Modern World
No of Units	3 units
Pre-requisite	None
Co-requisite	None
Contact Hours	54 hours
Mode of Delivery	Blended
Tools/Platforms	Google Classroom, Facebook messenger Facebook: Crisil Jean Azarcon
Course Description	<p>This course deals with nature of mathematics, appreciation of its practical, intellectual, and aesthetic dimensions, and application of mathematical tools in daily life.</p> <p>The course begins with an introduction to the nature of mathematics as an exploration of patterns (in nature and the environment) and as an application of inductive and deductive reasoning. By exploring these topics, students are encouraged to go beyond the typical understanding of mathematics as merely a set of formulas but as a source of aesthetics in patterns of nature, for example, and a rich language in itself (and of science) governed by logic and reasoning.</p> <p>The course then proceeds to survey ways in which mathematics provides a tool for understanding and dealing with various aspects of present-day living, such as managing personal finances, making social choices, appreciating geometric designs, understanding codes used in data transmission and security, and dividing limited resources fairly. These aspects will provide opportunities for actually doing mathematics in a broad range of exercises that bring out the various dimensions of mathematics as a way of knowing, and test the students' understanding and capacity. (CMO No. 20, series of 2013)</p>
Course Outcomes	<p>At the end of the course, the students should be able to:</p> <p>Knowledge/Competencies</p> <ul style="list-style-type: none"> • Discuss and argue about the nature of mathematics, what it is, how it is expressed, represented, and used. • Use different types of reasoning to justify statements and arguments made about mathematics and mathematical concepts. • Discuss the language and symbols of mathematics. <p>Skills</p> <ul style="list-style-type: none"> • Use a variety of statistical tools to process and manage numerical data, • Analyze codes and coding schemes used for identification, privacy, and security purposes; • Use mathematics in other areas such as finance, voting, health

	<p>and medicine, business, environment, arts and design, and recreation.</p> <p>Values</p> <ul style="list-style-type: none"> • Appreciate the nature and uses of mathematics in everyday life. • Affirm honesty and integrity in the application of mathematics to various human endeavors.
COURSE TOPICS	
Week	Topic
Module 1	The Nature of Mathematics
Lesson 1	VMGO of the University, Classroom policies, Scope of the course
Lesson 2	Mathematics in Our World
Lesson 3	Patterns and Numbers in Nature and the World
Lesson 4	The Fibonacci Sequence
Lesson 5	Uses of mathematics
	PRELIM EXAM
Module 2	Mathematical Language and Symbols
Lesson 6	Characteristics of mathematical language
Lesson 7	Mathematical Expressions
Lesson 8	Sets, Relation and Function
Lesson 9	Problem Solving and Reasoning
10	MIDTERM EXAM
Module 3	Mathematics as a Tool (Part 1)
Lesson 11	Data Management (Data Gathering & Organizing)
Lesson 12	Measures of Central Tendency and Measures of Dispersion
Lesson 13	Measures of Relative Position
Lesson 14	Probabilities & Normal Distributions Linear Regression & Correlation
15	PRE-FINAL EXAM
Module 4	Mathematics as a Tool (Part 2)
Lesson 16	Geometric Designs
Lesson 17	The Mathematics of Finance
18	FINAL EXAM
GRADING SYSTEM	<p>Non-Laboratory Subject</p> <p>Class Standing..... 40%</p> <p>Examinations..... 40%</p> <p>Requirements.....20%</p> <p>TOTAL 100%</p>
REFERENCES	<p>Printed:</p> <p>1. Aufmann, Richard, et.al. 2018. Mathematics in the Modern World, Philippine edition. Rex Bookstore.</p>

2. Reyes, Juan Apolinario. 2018. Mathematics in the Modern World. Unlimited Books Librsry Services & Publishing.
3. Sirug, Winston . 2018. Mathematics in the Modern World. Mindshapers Co.,INC.
4. Merlita Castillo Medallon, Ed. D, et.al. 2018. Mathematics in the Modern World.

E-books:

1. Barry, Patrick D. 2016. Geometry with Trigonometry. 2nd edition. Langford Lane, Kidlington OX5 1GB, UK Elsevier Ltd.
2. Bueno, David Cababaro. 2016. 2.Educational research writing: made easy. Great Books Trading.
3. Faltado, Ruben E. III. 2016. Practical research 2: quantitative research. Lorimar publishing Inc.
4. Libby, Jim. 2017. Math for real life: teaching pratical uses for algebra, geometry and trigonometry. Jefferson, North California: Mcfarland & Company, Inc.

Online References:

1. **“The Language of Mathematics PPT Presentation”**
<https://www.slideserve.com/corby/the-language-of-mathematics>
 2. <https://mathnature.com/chapter-3/section-3-1-deductive-reasoning/>
 3. **“Thinking Reasoning & Problem Solving (Human Behavior)**
“Retrieved from <https://www.slideshare.net/zohebchana/thinking-reasoning-problem-solving-human-behavior>.
July 23, 2020.
 4. **“Inductive & Deductive Reasoning slide share”**
Retrieved from
<https://www.slideshare.net/smiller5/131-inductive-and-deductive-reasoning?>
July 23, 2020
 5. **“Polya’s four-step approach to problem solving”**
Retrieved from
<http://web.mnstate.edu/peil/M110/Worksheet/PolyaProblemSolve.pdf>
 6. **Mathematics as a Tool**
<https://www.uni-bielefeld.de/ZIF/Publikationen/Mitteilungen/Aufsaeetze/2015-2-Lenhard.pdf>
 7. **Data Gathering and Organizing**
https://www.edu.gov.mb.ca/k12/cur/math/support_gr2/statistics.pdf
 8. **Measures of Central Tendency**
<https://statisticsbyjim.com/basics/measures-central-tendency-mean-median-mode/>
- VideoTutorial**
1. https://www.youtube.com/watch?v=fqFiXQN_y_k
 2. <https://www.youtube.com/watch?v=gYTWioS4mbo>

	<p>3. https://www.youtube.com/watch?v=mk8tOD0t8M0</p> <p>9. Measures of Dispersion https://www.ohio.edu/plantbio/staff/mccarthy/quantmet/lectures/lec3&4.pdf “Video tutorial” Retrieved from: 1. https://www.youtube.com/watch?v=goXdWMZxlqM 2. https://www.youtube.com/watch?v=64ELhoTvzk0</p> <p>10. Measures of Relative Position https://stattrek.com/descriptive-statistics/measures-of-position.aspx</p> <p>11. Probabilities and normal distributions https://bolt.mph.ufl.edu/6050-6052/unit-3b/normal-random-variables/standard-normal-probabilities/</p> <p>12. Linear Regression and Correlation https://milnepublishing.geneseo.edu/natural-resources-biometrics/chapter/chapter-7-correlation-and-simple-linear-regression/</p> <p>13. Mathematics as a tool (Part 2) https://www.nap.edu/read/10126/chapter/6</p> <p>14. Mathematics of Finance https://www.slideshare.net/MohammadKowshickAhme/mathematics-of-finance-70175362</p> <p>15. Simple and Compound Interest https://www.slideshare.net/hisema/simple-and-compound-interest-24834757</p> <p>Course Requirements:</p> <ul style="list-style-type: none"> • Quizzes, Activities, Exercises, Assignments • Essays • Exams (PRELIM, MIDTERM, PREFINAL, FINAL)
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I. Course Overview

This course pack is produced specifically for the GE-MMW (Mathematics in the Modern World) course intended for SDSSU Cantilan students enrolled in the Bachelor of Science in Criminology (BS Crim) program. This is the prelim-period module. It addresses the essence of mathematics in real-life scenario, and its application. Considering the course description, this course kit discusses the essence of mathematics, the understanding of its practical, intellectual, and aesthetic aspects, and the application of mathematical methods in everyday life.

II. General Instruction

This module begins with an introduction that encapsulates the topics or lessons that students of this course have to learn, understand and value. This Module is composed of five parts of which the first part pertains to the Intended Learning Outcomes (ILOs). The next part is the course direction where students are directed to focus their respective course works. The nitty-gritties of the course are also placed in the lecture and discussion which is the third part of the module. Each student taking this course is also required to answer all the exercises and

assessment task to measure whether the student have learned from the lessons. For the students to grasp all the essentials of the topics covered in a particular lesson, links, URLs, videos and other supplementary reading materials are provided in this module.

III. Academic Integrity

Academic honesty is required of all students. Plagiarism--to take and pass off as one's own work, the work or ideas of another--is a form of academic dishonesty. Penalties may be assigned for any form of academic dishonesty" (See Student Handbook/College Manual). Sanctions for breaches in academic integrity may include receiving a grade of "Failed" on a test or assignment. In addition, the Director of Student Affairs may impose further administrative sanctions.

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INSTRUCTOR INFORMATION

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Consultation Hours : **4:01-5:30 PM (TTh)**

Mode of Teaching/Learning Delivery: **Blended Learning**

Tools/Platforms : **Google Classroom, Facebook messenger and Printed Module**



Lesson 1: Vision, Mission, Goals, Objectives, Core Values

I. Introduction. This is the institution's direction on what the University hoped to achieve by the students after graduation. It will also help to develop the public commitments with the involvement of the academic community to increase general understanding of what it hopes to accomplish, why it matters, and what may need to change to realize a stronger academic program.

II. Intended Learning Outcomes:

- ✓ Internalize the Vision, Mission, Goals and Objectives of the University
- ✓ Characterize the classroom rules
- ✓ List expectations for the course

PHILOSOPHY

SDSSU believes that higher education is an instrument for the improvement of life through democratized access to quality education in the development of a well-rounded person.

VISION

A leading “glocal” University with widened academic perspectives that focus on attaining food security, supporting poverty alleviation, developing renewable energy, and conserving natural environment.

MISSION

SDSSU shall provide competency-based higher education training driven by relevant and responsive instruction, research, extension and sustainable resource management.

Particularly, SDSSU is committed to:

1. Produce competent and skilled graduates prepared for gainful employment;
2. Develop graduates who shall not only foster economic progress but also care for the environment, adhere to positive value system, and preserve cultural heritage;
3. Engage in high-impact research for instruction and develop technology for food security and renewable energy;
4. Collaborate with government and non-government agencies to help improve the lives of the marginalized groups; and
5. Promote cooperation/partnership among regional, national, and ASEAN institutions in Higher Education.

CORE VALUES

Competence

A combination of observable and measurable knowledge, skills, abilities, and personal attributes that contribute to enhance SDSSU employee and student performance and ultimately result in organizational success.

Accountability

Responsibility for own actions, decisions and commitment to accomplish work in an ethical, efficient, cost-effective and transparent manner manifesting the value of sound stewardship in the wise use of resources for common good.

Responsiveness

A prompt action, consistent communication, quality information, and a focus on providing a superior experience to stakeholders.

Excellence

The quality spectrum at exceptional levels demonstrated by learning outcomes and the development of shared culture of quality consistent with the vision, mission and goals of University.

Service

Dedication for a continuous improvement of services, stakeholder's relationships and partnership which stresses interdependence and collaboration for a sustainable success of clients and their communities in helping build a just, peaceful, stable and progressive Filipino nation.

SDSSU CARES...

These core values are not descriptions of the work we do, nor the strategies we employ to accomplish our University vision. They are the core values that underlie our works and interactions as we internalize responsibilities to fulfil our mission. They are the basic elements of how we go about our work and how we deal with stakeholders, molds students to become competent, innovative, globally competitive and service-oriented.

LESSON NO. 2

LESSON TITLE: NATURE OF MATHEMATICS (Mathematics in our World)

DURATION/ HOURS: 2 weeks

SPECIFIC LEARNING OUTCOMES:



At the end of the module, the students should be able to:

- identify patterns in nature and regular occurrences in the world;
- argue about the nature of mathematics, what it is, how it is expressed, represented, and used;
- express appreciation for mathematics as a human endeavor; and
- apply the importance of mathematics in one's life



DISCUSSION

NATURE OF MATHEMATICS

Is mathematics invented or discovered

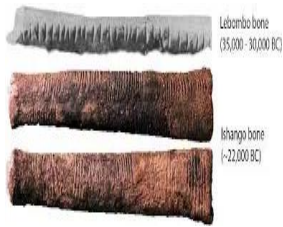


Table 1.1 Nature of Mathematics

- | |
|---|
| <ol style="list-style-type: none">It is partly invented.Much of it is discovered.It is a system of knowledge. It is a collection of objects and the relations among objects whose characteristics are discovered through accepted rules of reasoning. |
|---|

a. Mathematics is Partly Invented

The beginning of mathematics is a human invention and is nearly as old as humanity itself. It began as a method to represent thoughts about quantity, form, pattern and change. The concept of a number, for example, is an early manifestation of the concept of quantity which gradually evolved into a primitive number system to distinguish 1 cattle from 2 cattle, 3 deer from 4 deer etc.



The **Ishango bone**, a fibula of a baboon discovered in the area of Ishango near Semliki River, contained notches meant to track the lunar phases in relation to the

Sexagesimal

1	11	21	31	41	51
2	12	22	32	42	52
3	13	23	33	43	53
4	14	24	34	44	54
5	15	25	35	45	55
6	16	26	36	46	56
7	17	27	37	47	57
8	18	28	38	48	58
9	19	29	39	49	59
10	20	30	40	50	

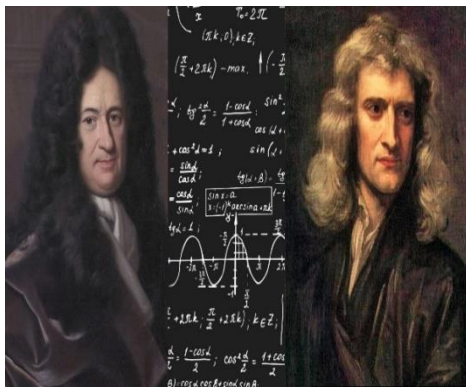
https://en.wikipedia.org/wiki/The_Babylonian_numerals

...	32	16	8	4	2	1
...	2^5	2^4	2^3	2^2	2^1	2^0
...	1	0	1	0	1	0
Sixth digit	Fifth digit	Fourth digit	Third digit	Second digit	First digit	

Value of digits in the "Binary numeral system"

menstrual cycle of women (Zaslavsky, C. 1979. Sophisticated numeration systems like the sexagesimal system of the Sumerians were inventions of people who lived in ancient.

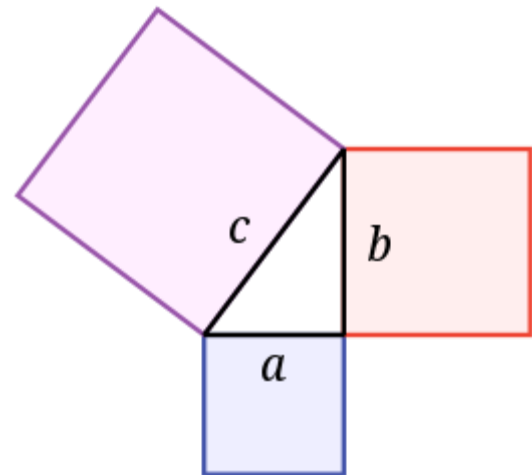
The modern binary system, for example, was introduced by Gottfried Leibniz in 1679, and came to be the foundation of binary logic due in large part to George Boole.



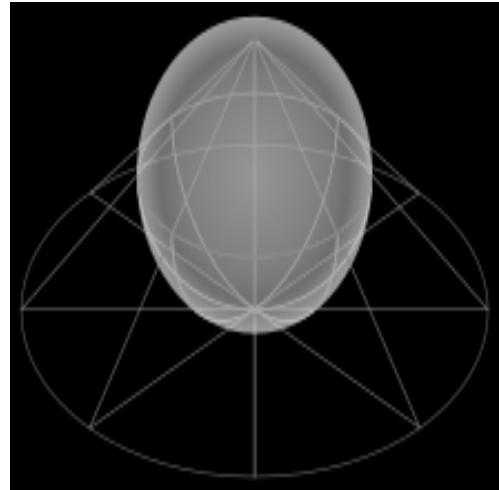
Leibniz appeared prominently again in connection with the birth of calculus. He and Sir Isaac Newton are credited to have invented calculus, or at least invented the early phase of Calculus. Newton for his part invented calculus to effectively measure rates of change over infinitesimally small intervals of time. Rate of change or instantaneous rate of change is at heart of differential calculus.

b. Much of Mathematics is Discovered

- The initial impetus for mathematics was invention, but much of what followed next were discoveries. One of the early mathematical discoveries which had a huge impact in architecture and in the history of the development of mathematics itself is the Pythagorean Theorem. Simply put, in the theorem says that given a right triangle with legs a and b and a hypotenuse c , the sum of the a^2 and b^2 is equal to c^2 .



- Plane Geometry, also called Euclidean geometry, is a fitting example of what we speak about. As a body of mathematical knowledge, the part of geometry which is invented is the set of five axioms proposed by Euclid. The deliberate thought to begin mathematics by assuming these postulates to be true is an act of human invention. But the string of proven propositions, called theorems, spawned by these axioms came to be discovered through logical reasoning.



What is Mathematics?

Mathematics has no universally accepted definition (Tobies, 2012) we shall quote some definitions proposed by famous mathematicians.

Table 1.2 Some Definitions of Mathematics

- The term MATHEMATICS is derived from two Greek words “manthanein” which means learning and “techne” an art of technique. Therefore, mathematics means the art of learning related to disciplines.
- Mathematics is defined as the science of quantity. *Aristotle* (384-322 BCE)
- It is the science of indirect measurement. *Auguste Comte* (1798-1857)
- Mathematics is a science that draws necessary conclusions. *Benjamin Pierce* (1809-1880)

NATURE OF MATHEMATICS

1. MATHEMATICS IS A SCIENCE OF DISCOVERY

Mathematics give an easy and early opportunity to make independent discoveries. It is the discovery of relationships and the expression of those relationships in symbolic form.

2. MATHEMATICS IS AN INTELLECTUAL GAME

Mathematics is mainly a matter of puzzles, paradoxes, and problem solving.

3. MATHEMATICS IS A TOOL SUBJECT

Mathematics has its integrity, its beauty, its structure and many other features that relate to mathematics as an end in itself.

4. MATHEMATICS INVOLVES AN INTUITIVE METHOD

The first step in the learning of any mathematical subject is the development of intuition. This must come before rules are stated or formal operations are introduced.

5. MATHEMATICS HAS ITS OWN LANGUAGE AND SYMBOLS

The language for communication of mathematical ideas is largely in terms of symbols and words which everybody cannot understand.

6. MATHEMATICS IS AN ABSTRACT SCIENCE

Mathematical concepts are abstract in the sense that they cannot be seen or felt in the physical world.

7. MATHEMATICS IS LOGIC

Logic is an important factor in mathematics; it governs the pattern of deductive proof through which mathematics is developed.

8. MATHEMATICS DEALS WITH ART OF DRAWING CONCLUSIONS

In mathematics the conclusions are certain and definite. Therefore, the learner can check the correct solutions.

NEEDS AND SIGNIFICANCE OF LEARNING MATHEMATICS

- Mathematics learning helps to apply mathematical concepts and the theorems to new situations.
- Mathematics provides a clear understanding of laws of nature.
- Mathematics helps in clear understanding of the culture and development of our civilization.

- Mathematics learning helps to think alternative methods of solving problems.
- Mathematics provides a framework for solving problems.
- Mathematics is a powerful tool in the hands of the learners
- Mathematics learning helps in a better understanding of the world around us.

VALUES OF TEACHING MATHEMATICS

- Develops the power to generalize and classify
- Develops the habit of self-study
- Helps students to assume responsibility for his own work
- Develops constructive imagination
- Cultivates the power of attention and concentration
- Inculcates habits of neatness and accuracy

Activity 1.1

Direction: Answer the following questions.

- 1-2. These are the two Greek words where the term mathematics is derived.
3. It is one of the natures of mathematics where it gives an easy & early opportunity to make independent discoveries.
4. What nature of mathematics states that mathematics has its integrity, its beauty, its structure and many other features that relate to Mathematics as an end in itself?
5. The first step in learning of any mathematical subject is the development of _____.
6. The language for communication of mathematical ideas is largely in terms of _____ and words which everybody cannot understand.
7. It is an important factor in mathematics, it governs the pattern of deductive proof.
- 8-10. Give 3 examples of intellectual games.
- 11-20. Discuss the importance of studying mathematics.

Patterns and Numbers in Nature and the World

In the general sense of the world, **patterns** are regular, repeated or recurring forms or designs. We see patterns everyday- from the layout of floor tiles, designs of skyscrapers, to the way we tie our shoelaces.

Mathematics and Patterns

On top of the early human's need a describe quantity, they also needed a language to describe and predict patterns in nature. The Ishango bone, for example, was an early mathematical exercise to count the cycle of lunar phases as they relate to


the menstrual cycle of adult women.






What reason compelled ancient people of Ishango to track the menstruation cycle? We cannot ever answer this with complete satisfaction, but we can make intelligent guesses based on our observations of people's cultural beliefs about menstruation in present day societies.


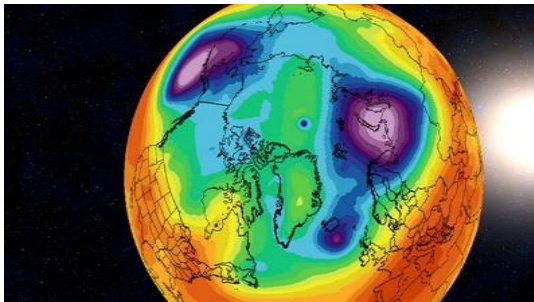

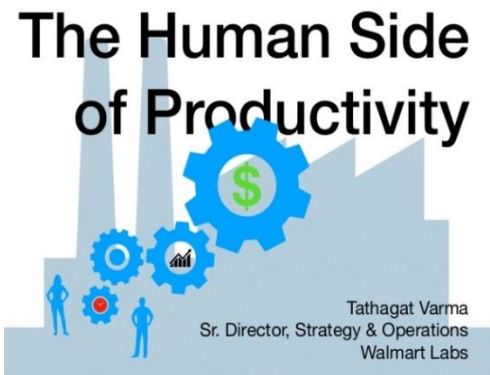
US and UK, for example, women during their period are observed to be irritable, and so it pays never to cross them during their period. Bears roaming the temperate forests of these places have a keen nose for blood, and so it is prudent for women never to enter the forest during menstruation. In Poland, to have sex with a woman in her period is sure to kill the man. In the Philippines, women are advised never to take a bath because taking a bath during one's period causes infertility.

The ancient people of Ishango probably have more strange beliefs about menstruation, possibly even stranger than our superstitions, and so, it pays to track the menstruation cycle of women.

FREQUENTLY OBSERVED PATTERNS IN NATURE AND THE WORLD

Pattern	Description
Honeycomb 	Nest built by bees. It is made from beeswax, and is composed of cells in the shape of hexagon, sometimes pentagon or heptagon.

<p>Snowflake</p> 	<p>A feathery snow crystal which nucleated from dust particles suspended in the atmosphere. Molecules in ice crystals join to form hexagonal structure, which is then repeated as the crystal accumulate more crystals and grow in size.</p>
<p>Tiger Stripes</p> 	<p>The stripes on the tiger are, in general, evenly spaced and perpendicular to the spine. The stripes help with camouflage, they allow the tiger to blend with its environment.</p>
<p>Hyena's spots</p> 	<p>The spots of hyenas are shaped and distributed in a pattern that helps also with camouflage.</p>
<p>sunflower</p> 	<p>A sunflower displays many patterns, the most prominent among them are intersecting families of spirals.</p>
<p>Snail's shell</p> 	<p>The snail's shell has the shape of a spiral. The radius of the shell increases in length as the mollusk grow inside the shell.</p>

<p>Flower's Petal</p> 	<p>The number of petals of a flower are observed to follow the following pattern: 3,5,8,13.... Which are numbers found in Fibonacci Sequence.</p>
<p>Weather Patterns</p> 	<p>Weather is observed to repeat a pattern for days, weeks, or months after which is a new weather is sets in. this sequence of weather patterns produces a cycle, such as, dry monsoon seasons, summer-autumn-winter-spring seasons, habagat-amihan wind patterns etc.</p>
<p>Human Populations</p> 	<p>The demographic distribution of people in human populations is observed to follow a pattern. Poor nations display a pyramid shaped demography with the young occupying a prominently large section of the population. But as a nation progresses economically, the base thins out in favor of the older segments of the population.</p>
<p>Human Productivity</p> 	<p>Human productivity in many organizations is observed to follow the 80:20 percent rule. Twenty percent of the members produce 80% of the organization's total output. For example, in a complete line up of 15 players in a basketball team, 3 players make 80% of the team's total points in a game. In a sales force of 50 agents who made 1 million pesos total sales, 0.8 million pesos was brought in by 10 agents. The rest managed to bring only 0.2 million pesos.</p>

Application of Population Growth

Examples:

1. The exponential growth model $A = 50e^{0.07t}$ describe the population of a city in the Philippines in thousands, t years after 19997.

Where: $e = 2.72$

Solution:

$$A = Pe^{rt}$$

$$A = 50(2.72)^{0.07t}$$

$$A = 50(2.72)^{0.07(20)}$$

$$A = 50(2.72)^{1.4}$$

$$A = 50 (4.059)$$

$$A = 203, 000 \text{ (In thousands)}$$

2. What is the population in 2037?

Solution:

$$A = Pe^{rt}$$

$$A = 50(2.72)^{0.07 (40)}$$

$$A = 50(2.72)^{2.8}$$

$$A = 50 (16.474)$$

$$A = 824, 000 \text{ (In thousands)}$$

Activity 1.2

A. Direction: Determine what comes next in the given pattern.

1. 125, 159, 95, 129, ____
2. A, E, I, ____
3. 9, 18, 54, ____
4. BIJ, CHK, DGL, ____
5. $\frac{1}{5}$, __, $\frac{4}{5}$, $\frac{8}{5}$
6. Z, W, T, Q, ____
7. O, L, H, E, ____
8. 6, 12, 24, _____, 96
9. 1200, $\frac{24}{5}$, $\frac{12}{625}$, ____
10. C, F, L, _____

- B. Direction: Substitute the given values in the formula ($A = Pe^{rt}$) to find the missing quantity. Final answer should be **WHOLE NUMBERS**. ($e = 2.72$) *See given examples above.*

Given:

1. $P = 720,000$ $r = 10\%$ per year $t = 15$ years
2. $P = 3,200,000$ $r = 5\%$ per year $t = 10$ years
3. $A = 110,000$ $r = 25\%$ per year $t = 12$ year
4. $A = 20,000$ $r = 5\%$ per year $t = 5$ years
5. $P = 250,000$ $r = 12\%$ per year $t = 18$ years

THE FIBONACCI SEQUENCE

What is a sequence?

A **sequence** is an ordered list of numbers, called **terms**, that may have repeated values. The arrangement of these terms is set by a definite rule.

Example 1: Generating a Sequence

Analyze the given sequence for its rule and identify the next three terms.

- a. 1, 10, 100, 1000
- b. 2, 5, 9, 14, 20

Solution:

- a. Looking at the set of numbers, it can be observed that each term is a power of 10: $1 = 10^0$, $10 = 10^1$, $100 = 10^2$, $1,000 = 10^3$. Following this rule, the next three terms are: $10^4 = 10,000$, $10^5 = 100,000$, $10^6 = 1,000,000$.
- b. The difference between the first and second terms (2 and 5) is 3. The difference between the second and third terms (5 and 9) is 4. The difference between the 3rd and 4th terms (9 and 14) is 5. The difference between the 4th and 5th terms is

6. Following this rule, it can be deduced that to obtain the next three terms, we should add 7, 8, 9, respectively, to the current term. Hence, the next three terms are $20+7 = 27$, $27+8 = 35$, $35 + 9 = 44$.

The Fibonacci sequence is a series of numbers that follow a unique integer sequence. These numbers generate mathematical patterns that can be found in all aspects of life. The patterns can be seen in everything from the human body to the physiology of plants and animals.

The Fibonacci sequence is derived from the Fibonacci numbers. The Fibonacci numbers are as follows:

0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144... and so on.

These numbers are obtained by adding the two previous numbers in the sequence to obtain the next higher number.

Example: $1+1 = 2$, $2+3 = 5$, $5+8 = 13$...

The formula is: $F_n = F_{n-1} + F_{n-2}$

Every 3rd number is even and the difference between each number is .618 with the reciprocal of 1.618. These numbers are known as the "Golden Ratio" or "Golden Mean"

The exact origination of the Fibonacci sequence is unknown. It is believed that contributions to the theory began in 200 BC by Indian mathematicians whose studies were based on Sanskrit Prosody. The sequence was introduced to Western European mathematics in 1202 by Leonardo of Pisa, aka "Fibonacci". His study of the sequence began with the breeding patterns of rabbits. In which he found rabbit generations duplicated in accordance with the Fibonacci numbers.

Activity 1.3

A. Answer the following questions:

1. What is Fibonacci sequence and how it is obtained?
2. Where did the study of sequence begin?
3. Who introduced the numbers to Western European mathematics?
4. What is a golden ratio/ golden mean and how it is related to the Fibonacci Sequence?

B. Direction: Let $Fib(n)$ be the n th term of the Fibonacci sequence, with $Fib(1) = 1$, $Fib(2) = 1$, $Fib(3) = 2$, and so on.

1. Find $Fib(8) =$
2. Find $Fib(19) =$
3. If $Fib(22) = 17,711$ and $Fib(24) = 46,368$, what is $Fib(23)$?
4. Evaluate the following sums:
 - a. $Fib(1) + Fib(2) =$
 - b. $Fib(1) + Fib(2) + Fib(3) =$
 - c. $Fib(1) + Fib(2) + Fib(3) + Fib(4) =$

USES OF MATHEMATICS IN OUR DAILY LIFE

Visit this YouTube video: *Decoding the Secret Patterns of Nature-Fibonacci ratio & Pi-Full Documentary* (<https://youtu.be/IXyCRP871VI>)

PRACTICAL USES OF MATHEMATICS

A. Mathematics helps organize patterns in the world.
B. Mathematics helps predict the behavior of nature and many phenomena.
C. Mathematics helps control nature and occurrences in the world for our own good.
D. Mathematics has applications in many human endeavors.

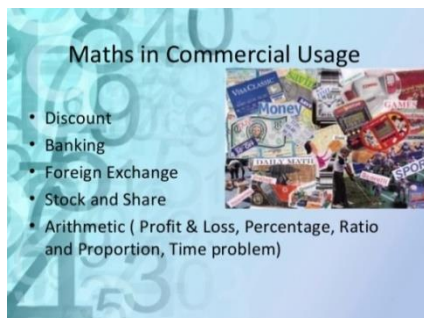
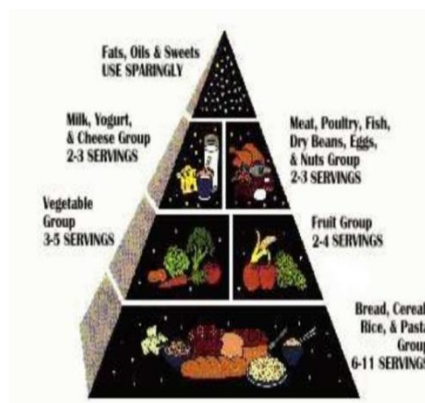
COOKING

When we cook, we need to measure the ingredients in terms of tablespoons, teaspoons, ounce, gram, kilograms etc. Messing up with the measurements can result in disastrous meals.



DIET

People who are overweight need to be conscious of their calorie intake. Especially if they are on special weight loss, diet knowledge of math is needed to calculate the total amount of calories consumed in a day.



BANKING

Banking is probably the one place where math is used more than anywhere else. No one without basic knowledge about math can't do anything in a bank.

ARTS

Math is also used by artists while making paintings, designing collages as well as during dance performances. In all these cases the size of the stage, etc play a very important role and deciding all these aspects is literally impossible without the knowledge of math.



SHOPPING

This is probably the most common use of math in which we make a list of things. We need to buy as well as make payments in the end.

GARDENING

For planning to sow seeds count the number of plants everything requires numbers. All tasks carried out inside a garden require proper measurements.



Activity 1.4

Essay Question:

Discuss the application of mathematics in your daily life. Cite some concrete examples.
(at least 250 words) *Use another sheet for your answer.*

RUBRIC FOR ESSAY WRITING

CATEGORY	10	7	4	2
Mathematical Correctness	Demonstrates complete understanding of the mathematical concept. (No errors)	Demonstrates adequate understanding of the mathematical concept (2 or 5 errors)	Demonstrates partial understanding of the mathematical concept. (6-10 errors)	Demonstrates unsatisfactory understanding of the mathematical concept. (11 or more errors)
Vocabulary	Skillful & accurate vocabulary	Adequate & appropriate vocabulary	Vague and / or weak vocabulary	Ineffective and / or incorrect vocabulary
Organization and Fluency	Writing is easy to follow with only one reading. ✓ Clear & logical idea progression ✓ Effective ✓ Skillfully fluent sentences	Writing is generally easy to follow with only one reading. ✓ Adequate idea progression ✓ Adequate transitions ✓ Fluent sentences	Writing is generally easy to follow with only one reading. ✓ Weak idea progression ✓ Ineffective transition ✓ Choppy or run-on sentences	Writing is generally easy to follow with only one reading. ✓ Little to no idea progression ✓ Incorrect or no transitions ✓ Incomplete sentences
Grammar	Meaning of writing is very clear with only one reading. Generally free of most errors	Meaning of writing is mostly clear with only one reading. Some errors	Meaning of writing is interrupted with only one reading. Accumulation of errors	Meaning of writing is constantly disrupted with only one reading. Pervasive errors

RESOURCES	<p><i>Printed:</i></p> <ol style="list-style-type: none"> 1. Aufmann, Richard, et.al. 2018. Mathematics in the Modern World, Philippine edition. Rex Bookstore. 2. Reyes, Juan Apolinario. 2018. Mathematics in the Modern World. Unlimited Books Librsry Services & Publishing. 3. Sirug, Winston . 2018. Mathematics in the Modern World. Mindshapers Co.,INC. 4. Merlita Castillo Medallon, Ed. D, et.al. 2018. Mathematics in the Modern World. <p><i>Online References:</i></p> <ol style="list-style-type: none"> 1. “The Language of Mathematics PPT Presentation” https://www.slideserve.com/corby/the-language-of-mathematics 2.https://mathnature.com/chapter-3/section-3-1-deductive-reasoning/ 3.“Thinking Reasoning & Problem Solving (Human Behavior)” “Retrieved from https://www.slideshare.net/zohebchana/thinking-reasoning-problem-solving-human-behavior. 4.http://www.exploratorium.edu/ronh/secret/secret.html <p><i>Videos</i></p> <ol style="list-style-type: none"> 1. Decoding the Secret Patterns of Nature-Fibonacci ratio & Pi-Full Documentary (https://youtu.be/IXyCRP871VI)
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