TEAM ONLINE CONSULTATION: A STRATEGIC INTERVENTION IN DEVELOPING MATHEMATICS SKILLS IN THE NEW NORMAL

Cuba, Carlo G.

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Team Online Consultation: A Strategic Intervention in Developing Mathematics Skills in the New Normal

Cuba, Carlo G.
Teacher III
Pagadian City National Comprehensive High School
carlo.cuba@deped.gov.ph
Contact Number: 09097245613

Abstract

This study investigated the effectiveness of Team Online Consultation as a strategic intervention in developing students' mathematics skills in the new normal. The focused skills are computational, critical thinking, and problem-solving. The study was conducted at Pagadian City National Comprehensive High School during S.Y. 2021 - 2022 with 48 Grade 10 students as respondents who were selected using universal sampling. The study used time-series single-group research design with the researcher-made Pretest and Post-test as the primary research instrument. The obtained test results were subjected to statistical analysis using descriptive statistics and Independent Samples t-test to know whether Team Online Consultation's strategic intervention yields favorable outcomes for students' mathematics skills. The result showed that Team Online Consultation considerably developed students' mathematics skills compared to the Modular Approach. This result implies that when the modular learning approach is supported by Team Online Consultation strategic intervention, students' mathematics skills in the new normal will be much better. Moreover, the study also revealed a significant difference in students' mathematics skills when they were taught using Team Online Consultation and Modular Approach, which led to the conclusion that the use of Team Online Consultation effectively develops students' mathematics skills in the new normal.

Keywords: *Modular Approach; Students' Mathematics Skills; Team Online Consultation*

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Context and Rationale

An unexpected situation has been brought on by the COVID-19 pandemic, which was initially discovered in Wuhan, China, in December 2019. To lessen the effects of the virus and its quickly spreading effects on the community, this global pandemic in education has resulted in the widespread closure of face-to-face interaction in the teaching-learning process from many educational institutions. According to UNESCO (2020), more than 1.2 billion students no longer attend face-to-face classes across all educational levels. In the Philippines, all public schools across the nation provide modular remote learning through the management of the Department of Education.

There have been worries about the potential impact of learning mathematics outside of the classroom on inquiry-based teaching and learning strategies for mathematics. Mathematics as a Queen of Science (Ramdani 2006) is essential to be owned by everyone as a basis for developing the mindset. Thus, mathematics should use appropriate strategies and interventions for learners to develop different mathematical skills and apply the concepts in daily life.

Since arithmetic and logical thinking constitute the foundation of science and technology, mathematics has long been recognized as a crucial subject. Due to this, educational authorities place a strong emphasis on pupils' computational and problem-solving abilities. Because terminology and symbols are utilized, learning mathematics is distinct from learning other disciplines, and the presented concepts must be understood clearly for real-life application. To succeed in mathematics, students need not only to read, attend class, and study but, most importantly, develop the different skills around it. In other words, before going forth and excelling in Math, there are basic math skills that need to be mastered.

This study focuses only on three mathematics skills that students should learn and develop to understand its concepts fully- Computational Skills (ability to use fundamental operations in mathematics effectively), Problem Solving Skills (capacity to think analytically to resolve mathematical issues) and Critical Thinking Skills (ability to apply concept, logic, and reasoning to determine the strengths and flaws of potential solutions). How these abilities may be cultivated in this new normal where face-to-face instruction is not being used is the educational system's current problem.

Face-to-face classroom settings are ideal for the teaching of mathematics. This is partly because mathematics is an abstract subject because of "its capacity to compress information into abstract and highly usable forms" (Adler and Davi 2006). It calls on students to build on their prior knowledge to understand abstract mathematical concepts and occurrences. Teachers decompress or unpack students' understanding of mathematics by utilizing pedagogical techniques like problem-solving, inquiry-based instruction, use of manipulatives, and group projects (Ball and Bass 2003). Education stakeholders have been forced to switch from face-to-face to distant learning by COVID-19 and its limitations.

The Philippines is currently transitioning to the new standard for education, and the success of this process depends on educators' ongoing innovations and other stakeholders' active participation. The Department of Education developed Modular Distance Learning to ensure educational continuity and help each school fulfill its objective and vision, which is to deliver high-quality instruction to every Filipino learner. Distance learning is a method of delivering education in which the learner and the teacher interact when they are geographically separated from one another. Three variations of this modality exist: T.V./radio-based instruction, online distance learning, and modular distance learning (Quinones 2020). All public schools presently use the

modular learning modality because, according to a Department of Education poll, learning through printed and digital modules was identified as the most favored remote learning modality (DepEd 2020). This considers students who live in remote places without access to the internet or students who lack the financial means to purchase their own internet connection.

For the learning program to be sustained, there are challenges that parents, teachers, and students encountered with modular distance learning. There is a greater likelihood that modular distance learning will still be the modality to use for the following school year. Some of the identified challenges the researcher encountered or heard from the parents are lack of access to information resources (books or internet) which makes it difficult for students to answer the learning modules, and addiction to gadgets which is caused by the boredom of the long hours staying at home, quality of printed modules, with some elements being unreadable and/or some figures' colors being inappropriate, etc. These problems were the reasons why the researcher came up with an intervention that would respond to the challenges encountered in the module distance learning with the hope that this intervention would help the students develop their mathematics skills in the new normal learning. This intervention has something to do with online distance learning. The transition to a virtual platform classroom for students in grades K through 12 calls for the remote accessibility of technology to support lesson delivery.

Today, technological advancement is a fact. With many online platforms available, like Google Meet and Zoom Application, classes can still be pushed through. These platforms, though existing for quite some times now, are presently increasing as a result of COVID-19. It is the best alternative for training and grading pupils due to its flexibility in terms of location, time, effort, and prices (Khlifi 2020). This form of instruction differs from other techniques of instruction in several ways. It is viewed as a progression of distant learning by certain scholars. Others view it as a novel teaching method that greatly contrasts traditional face-to-face instruction (Luo et al. 2019).

This study aims to develop students' mathematics skills, namely, Computational skills, Critical Thinking skills, and Problem-Solving skills in the new normal learning through a researcher-designed strategic intervention called Team Online Consultation. Furthermore, it aims to identify the effectiveness of this strategic intervention in teaching mathematics.

Innovation, Intervention, and Strategy

Team Online Consultation is a strategic intervention made to assist students' learning despite distance learning. Specifically, this intervention was designed to back up modular distance learning in ensuring that students understand the lesson and learn the concepts indicated in the Self Learning Modules (SLM) even though they are staying at home. Furthermore, this intervention would respond to some negative perceptions of parents that their students have not learned something in modular distance learning due to difficulty in understanding the concepts explained in the SLM, lacking problem-solving skills, or struggling towards self-learning.

In this study, the focus of the intervention was to develop the mathematical skills of the students, particularly computational skills (ability to use fundamental operations in mathematics effectively), critical thinking abilities (capacity to evaluate the merits and drawbacks of potential solutions using concepts, logic, and reasoning), and problem-solving skills (ability to think analytically to solve problems related to

mathematics). However, it is safe to note that this intervention can also be applied to develop the skills needed to understand other learning areas.

In this intervention, the students would undergo a diagnostic assessment to identify which among the three identified skills the students are most knowledgeable with. In the first phase of the intervention, the student respondents were teamed into three according to their most mastered skill. Three group chats were created for three different teams. Each team underwent Team Online Consultation based on the schedule set by the teacher to develop their most mastered skill using different platforms like Google Meet or Zoom Application. In the second phase of the intervention, the three teams were regrouped so that each team should compose of students with the most mastered skills from the three identified mathematics skills. Brainstorming and the teacher used group discussion for effective student interaction in both phases. Since DepEd believes that nobody should be left behind, those students who cannot visit the group chat because of the lack of internet connection were contacted and visited by the teacher in their respective homes through Teacher-Student Interactive Kumustahan program. This program would be an opportunity for the teacher to provide technical assistance and counseling to students who need it.

Note that the online consultation does not always have to be video chatting. That means the students and the teacher could brainstorm by chatting in messenger like any other online consultation form. The role of the teacher as a facilitator in applying different strategies to motivate the students to participate in the intervention is vital. The learning materials used are the Self Learning Modules (SLM), highlighting the parts where the three identified skills can be applied.

Action Research Questions

The main goal of this action research is to determine the effectiveness of Team Online Consultation in developing the mathematics skills of the Grade 10 students of Pagadian City National Comprehensive High School for S.Y. 2021 - 2022. The researcher believed that modular distance learning is an effective modality in developing vital skills for students when given emphasis and effective interventions.

Specifically, this action research sought to answer the following questions:

1. What is the level of students' mathematics skills using Team Online Consultation and Modular Approach as revealed in the pretest and post-test results?
2. Is there a significant difference in the level of students' mathematics skills when using Team Online Consultation and Modular Approach?
3. Based on the study's findings, what teaching-learning guide can be developed to enhance the students' mathematics skills?

Action Research Methods

Research Design

This study used a time-series single-group research design to generate the necessary data. This design involves successive observations throughout a programmed intervention and assesses the characteristics of the change process (Gottman, McFall, and Barnett, n.d.). Only a time series design can provide a continuous record of changes in the experimental variables throughout the whole program. Additionally, one group of test units are observed as part of this study design, which is a form of quasi-

experimental research design, which were, in this study, the forty-eight (48) Grade 10 students from two different sections, followed by a treatment, then another series of measurements over a defined period.

Participants and/or other Sources of Data and Information

The participants of the study were the forty-eight (48) Grade 10 students from two sections of Pagadian City National Comprehensive High School for S.Y. 2021 – 2022. These two sections are considered to be heterogeneous classes. The participants of the study were determined using purposive sampling since the sample respondents were the students who responded to the call for the implementation of strategic intervention Team Online Consultation after the conduct of the students' and parents' orientation. Moreover, these students had an accessible internet connection at home and gadgets to use during the intervention. The respondents were asked to participate in both learning approaches, Team Online Consultation and Modular Approach, to determine the effectiveness of Team Online Consultation and avoid bias in data gathering.

Research Instruments

Two research instruments were used in this study. The first one is the pretest/posttest from two trial runs constructed based on DepEd's most essential learning competencies and emphasizing the three identified skills- computational skills, critical thinking skills, and problem-solving skills. These tests were checked and validated by the experts composed of Master Teachers in the Pagadian City Division before distributing them to the students. The second one is the Self Learning Modules (SLM) provided by the LRMDS, highlighting the parts where the three identified skills can be applied.

Data Gathering Procedure

The researcher asked permission from the School Principal of Pagadian City National Comprehensive High School for her consent allowing the researcher to conduct the study within the school premise. After the approval, the researcher conducted an orientation for parents and students regarding the conduct of strategic intervention called Team Online Consultation and solicited their consent to participate. Since the students are the respondents of this action research, the researcher secured a letter of participation invitation from the student respondents. The participants were notified of the privacy of all the information collected. Furthermore, the researcher reminded them of the study's purpose and significance, risks and benefits, involved commitment, and confidentiality protection.

The researcher made a schedule for the Team Online Consultation approved by the school head. Also, the researcher constructed a pretest/posttest from two specific topics- Polynomial Functions and Chords, Arcs, Central Angles, and Inscribed Angles. These test materials underwent a checking process, revisions, and content validations from chosen experts composed of Master Teachers in the Division of Pagadian City. The pretest was implemented on students before the intervention, while the posttest was done after the experimental process of using the intervention. The same process is applied to the Modular Learning approach. The test materials were sent to the students through google forms. The data gathered was consolidated and analyzed to determine the effectiveness of using Team Online Consultation in developing the students' mathematics skills during this new normal learning process.

Data Analysis

The testing of data was processed in the computer using software known as the Special Package for Social Sciences (SPSS) to ensure the accuracy and reliability of the results. Specifically, Independent Samples t-Test was used to project the differences in the level of mathematics skills of the students when using Team Online Consultation and Modular Approach.

Results and Discussion

Most students consider mathematics the hardest subject, and it is a universal truth (PhilStar 2020). It is difficult to teach and study mathematics in the modern era. There will be doubts, trepidations, and fears. There could be misunderstanding and animosity against the topic. Students might not sustain essential mathematics skills. It's simple to listen to a math teacher on the radio. However, since he cannot see anything, a learner will only be able to conceive a figure or draw an illustration. watching a math instructor on television. will be significantly simpler unless a student is unable to understand a directive even with the help of a figure or an illustration (PhilStar 2020).

It's time to dispel the myth that math is the most difficult subject to learn. The foundation of students' math skills should be formidable. Its applications in real life should be realistic and valuable. Such should start from the math teachers to take the initiative like conducting strategic interventions, even in the new normal, so students' math skills will be sustained and they continue to love learning mathematics.

Level of Mathematics Skills. Table 1 shows the results in determining the level of students' mathematics skills using two different learning approaches- Team Online Consultation and Modular Approach. As reflected in Table 1, using Team Online Consultation, it posted higher post-test results (MPS = 54.46%) interpreted as Average compared to its pretest results (MPS = 36.88%). A percentage increase of 17.58% from the pretest/post-test results implies an increase in the students' learning. On the other side, when no strategic intervention was used or a purely modular approach, it still posted higher posttest results (MPS = 44.79%) interpreted as Average compared to its pretest results (MPS = 36.45%). There is a percentage increase of 8.34% from the pretest/post-test results, which implies an increase in students' learning.

Table 1: Mean Percentage Score (MPS) on the Level of Students' Mathematics Skills

Learning Approach	Test Conducted	Mean Percentage Score (MPS)	Descriptive Equivalent
Team Online Consultation	Pretest	36.88 %	Average
	Post-test	54.46 %	Average
	Percentage Increase	**17.58 %**	
Modular Approach	Pretest	36.45 %	Average
	Post-test	44.79 %	Average
	Percentage Increase	**8.34 %**	

**MPS (DM 160, s. 2012): 96 - 100% = Mastered; 86 - 95% = Closely Approximating Mastery; 66 - 85% = Moving Towards Mastery; 35 - 65% = Average; 15 - 34% = Low; 5 - 14% = Very Low; 0 - 13% = Absolutely No Mastery*

Both learning approaches are effective in developing the mathematics skills of the students. The study of Betlen (2021) entitled "Effect of Modular Learning Approach on the Academic Achievement of Students" revealed that the level of the students' academic accomplishment has been greatly raised and enhanced by employing a modular learning strategy to support the learners. However, the results in Table 1 revealed that when this modular learning approach is supported by a strategic intervention like the Team Online Consultation, the development of students' mathematics skills in the new normal would be much better.

Testing the Significant Difference in Students' Mathematics Skills. The null hypothesis states, "There is no significant difference in the level of students' mathematics skills using Team Online Consultation and Modular Approach ."The null hypothesis was tested at a 0.05 level of significance. Using Independent Samples t-test, the results of the posttests conducted from two trial runs were analyzed and interpreted with regard to their significant difference.

Table 2: Independent Samples t-Test on Testing Significant Difference between Posttest Results of Team Online Consultation and Posttest Results of Modular Approach

Variable	Mean	SD	t-value	Df	p-value	Remarks
Posttest (TOC)	11.29	3.64	-7.75	47	0.000	With Significant Difference
Post Test (Modular)	8.96	3.28				

Table 2 reflects the test of significant difference between the posttest results from two trial runs, i.e., Team Online Consultation and Modular Approach. As reflected in the table, it establishes a significant difference in the level of students' mathematics skills having a p-value lower than the 0.05 level of significance. The table *(t-value = -7.75; p-value = 0.000)* exposes significant improvement in students' mathematics skills based on the posttest results.

As observed, both learning approaches employ significant differences between the posttest results, which imply an improvement in students' mathematics skills. Looking at the mean results of the posttests in both trial runs, the use of Team Online Consultation depicted a higher value than the Modular Approach. Thus, using Team Online Consultation as a strategic intervention effectively develops students' mathematics skills in the new normal.

In the study of Dayagbil et al. (2021) entitled "Teaching and Learning Continuity Amid and Beyond the Pandemic," it was concluded that education institutions must transition to flexible teaching and learning modalities and conduct strategic plan intervention to ensure teaching and learning continuity in the new normal. This study introduced a specific strategic intervention known as Team Online Consultation to develop students' mathematics skills despite the new normal setup in education. The survey data in the study of Kalogeropoulos et al. (2021) entitled "Learning Mathematics From Home During COVID-19 Insights From Two Inquiry-Focused Schools" revealed

that the majority of students showed enthusiasm for their remote learning opportunities, with the exception of the absence of peer-to-peer arithmetic instruction. The effectiveness of the intervention, as shown in the results, was because of the maximum engagement and participation of the student respondents during the conduct of the Team Online Consultation.

This action research shows the effectiveness of Team Online Consultation in sustaining the students' mathematics skills. As shown, both learning approaches are effective in developing the mathematics skills of the students, which is evident in the percentage increase of the MPS results in both trials runs and having significant differences upon testing. Thus, it was revealed that when this modular learning approach is supported by a strategic intervention like the Team Online Consultation, the development of students' mathematics skills in the new normal would be much better. Note that it does not imply that the modular learning approach is ineffective; instead, it concludes that it would be more effective when integrated by a strategic intervention. Through this, the researcher reflected on creating lesson plans with originality and utilizing a variety of online resources to make learning more interactive were some positive aspects of working during the pandemic. through maximizing the use of technology and realizing that students can do group work without being physically close. In addition, the most critical reflection made by the teacher-researcher was that despite remote learning, it is possible to build close relationships with students. This intervention allowed the teacher and the students to become acquainted with one another and create a special classroom community.

Developing Teaching-Learning Guide to Enhance Students' Mathematics Skills. Based on the findings of the study, the researcher developed teaching-learning guides to enhance students' mathematics skills which students should acquire to unlock difficulties in learning basic and higher mathematics despite the new normal. These teaching-learning guides were designed based on the modified and enhanced learning competencies set by the Department of Education, integrating Team Online Consultation as a strategic intervention. Firstly, a teaching-learning guide in the form of a Semi-Detailed Lesson Plan was created to provide additional resources and references to teachers who will be attempting to enhance students' mathematics skills, including those skills that were not mentioned, and/or use Team Online Consultation as a strategic intervention in teaching (See Appendix C). Secondly, a diagnostic/ summative assessment tool was made to provide additional learning materials to measure the level of students' mathematics skills (See Appendix B).

Conclusions and Recommendations

The study has concluded that the use of Team Online Consultation strategic intervention significantly helps in developing the students' mathematics skills in new normal education. The study showed positive outcomes and evidence of a higher percentage increase in the mean score obtained by students from the assessment conducted using Team Online Consultation compared to the Modular approach and test of significant difference on which it was revealed that there is a significant difference between the post test results during the first trial run and the second trial run in favor of Team Online Consultation.

Over a year has passed since the ongoing COVID-19 pandemic interrupted daily life and posed unforeseen difficulties for the educational system. The adjustment made

by using distance learning modalities takes work. Although not a new concept, it has yet to be that simple regarding its application in the Philippines. For the sake of the future of the country's learners- the next generation of Filipinos, learning must not stop. As teachers, it is our duty to ensure that students' learning is not compromised and that fundamental skills, especially in learning mathematics, are sustained despite the new normal setup. This challenged the researcher to think of a strategic intervention known as Team Online Consultation, which focuses on sustaining the students' fundamental mathematics skills, such as computational skills, critical thinking skills, and problem-solving skills. These skills are essential in understanding higher mathematics.

The process of conducting the Team Online Consultation was not easily done because of the non-accessibility of some students to connect to the internet. Also, some students treat this intervention less like actual school and more like they can do it around their schedules. All these challenges were taken into consideration and action by the teacher-researcher to push through with the intervention.

Based on the findings, the researcher recommends that Team Online Consultation strategic intervention be integrated into the modified-teaching learning guide of the Department of Education. This is also a good learning strategy to use during classroom observation of teachers, especially in response to the COT indicator, which involves utilizing a variety of instructional techniques to foster higher-order thinking abilities and critical thinking. The researcher encourages the teachers to think of an intervention that would assist students' learning and sustain the students' fundamental skills not just in mathematics but in all subject areas despite the new normal.

Action Plan

Republic of the Philippines
Department of Education
Region IX, Zamboanga Peninsula
Division of Pagadian City
Pagadian City National Comprehensive High School
Banale, Pagadian City

TEAM ONLINE CONSULTATION STRATEGIC INTERVENTION ACTION PLAN
School Year 2021-2022

SUBJECT FOCUS	PROGRAM DESCRIPTION	OBJECTIVES	STRATEGIES/ ACTIVITIES	TIMELINE	RESOURCES NEEDED	PERSONS INVOLVED	SOURCE OF FUND	REMARKS/ OUTCOME
Mathematics	**Team Online Consultation** - A strategic intervention that aims to develop and sustain the mathematics skills of students despite new normal	1. Develop the fundamental skills of students in learning mathematics 2. Introduce an effective intervention for teachers to use	1. Online session integrating Team Online Consultation 2. Seminar-workshop to teachers about Team Online Consultation	September 2021 – November 2021 February 2021	Internet Connection Bond Paper Laptop Printer Ink	Teacher/ Researcher Students (Grade 10)	Self Expense	Developed students' mathematics skills (critical thinking skills, computational skills, problem-solving skills)

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Financial Report

The table below shows the financial report which was utilized before, during, and after the conduct of this action research.

General Descriptions	Quantity	Unit	Unit Price	Total Estimated Costs
Bond Paper	5	Ream	220	1,100
Ink for Printer	4	Bottles	320	1, 280
Internet Costs			1, 500	1, 500
Printing and Binding	5	Copies	100	500
Sign Pen	3	Pieces	30	90
Folder	10	Pieces	10	100
Total				**P 4, 570. 00**

Appendix A

PRETEST/ POST-TEST
POLYNOMIAL FUNCTIONS
Team Online Consultation

Instructions: Read the questions carefully and choose the letter of the correct answer.

1. What is the value of $2x^3 + 3x^2 + 4x + 7$ at x = 3?
   a. 75 b. 100 c. 125 d. 150

2. If P(x) = $2x^4 - 3x^2 + 4x + 5$, find P(4).
   a. 480 b. 485 c. 488 d. 509

3. What conclusion can be made from the conditional statement "If $f(x) = x^2 + 5$, then f(-2) = 1"?
   a. The statement is true
   b. The statement is false
   c. The statement is not clear
   d. The function cannot be solved

4. What is the remainder when $P(x) = x^3 + 5x - 4$ is divided by x - 2?
   a. 4 b. 8 c. 10 d. 14

5. The expression $x^3 - kx^2 + 5x + 3$ leaves a remainder of 5 when divided by x - 2. Find the value of k.
   a. 21 b. 16 c. 4 d. 3

6. What is P(-3) if P(x) = x + 3?
   a. 6 b. 3 c. -3 d. 0

7. The following are zeros of $P(x) = x^3 + 2x^2 - 5x - 6$, EXCEPT
   a. 2 b. 5 c. -1 d. -3

8. Simplify $\frac{x^3 - y^3}{x - y}$
   a. 3x - 3y b. 3x + 3y c. $x^2 + xy + y^2$ d. Cannot be factored

9. What is the quotient of $5x^3 + 30x + 10$ divided by 5?
   a. $x^3 + 30x + 10$
   b. $5x^3 + 6x + 10$
   c. $x^3 + 6x + 2$
   d. $x^3 + x + 1$

10. Evaluate $x^3 - 64$ when x = 4
    a. 0 b. 4 c. 8 d. 10

11. Scientists all over the world worked furiously to analyze the COVID-19 disease from every angle to come up with a vaccine. Now that the vaccines are available, many expressed their excitement to go back to the old normal just like before the pandemic happened. Suppose x be the level of preparedness of the national and local government units, the estimated number of days P(x) to near normal, is represented by a polynomial function $P(x) = 5x - 1 + 2x^3 + 3x^2$. What is the standard form of the given P(x)?
    a. $P(x) = 3x^2 + 2x^3 + 5x - 1$
    b. $P(x) = 2x^3 + 3x^2 + 5x - 1$
    c. $P(x) = -1 + 5x + 3x^2 + 2x^3$
    d. The given P(x) is already standard

12. How do you determine the degree of a polynomial?
    a. The sum of the exponents of the first term
    b. Add up the exponents of each term and select the highest sum
    c. Subtract the highest exponent to the lowest exponent
    d. Add up all the exponents present in the given polynomial function

13. How do you evaluate a polynomial function?
    a. Simplify the polynomial function according to similar terms
    b. Determine the degree of a polynomial function and perform division of polynomials
    c. Substitute the given values for the variable and perform the computation
    d. Factor the polynomial function if possible

14. When can synthetic division be used to divide polynomials?
    a. If the numerator and denominator is 1
    b. If the degree of the denominator is 1
    c. If the polynomial function cannot be solved using Long Division
    d. If the denominator is 1

15. If $P(x) = 3x^4 - x^3 + 2x^2 - 4x + 3$ and P(9) is not equal to zero, what do you call x - 9?
    a. Factor of P(x)
    b. Not a factor of P(x)
    c. A linear function
    d. An unknown function

16. A rectangle with a length of 3x + 2 cm has an area of $9x^4 + 5x^2 - 6x - 8$ sq. Cm. What is the width of the rectangle?
    a. $9x^3 + 5x^2 - 6x - 8$
    b. $-6x^3 + 4x^2 - 6x + 8$
    c. $5x^3 - 5x^2 + 8x - 11$
    d. $3x^3 - 2x^2 + 3x - 4$

17. The number of tablets sold by a shop can be modeled by the expression N(t) = 7t + 25 and price per tablet is modeled by an expression $P(t) = 3t^2 + 3t + 36$, where t is the number of months in a year. If we use this model, what is the total amount of revenue generated by the shop at the end of the year?
    a. 54, 936 b. 63, 228 c. 81, 324 d. 90, 000

18. The number of shirts sold by the shopkeeper is given by the expression 3x - 5. The price per shirt is given by the expression 2x + 1. Find the total amount of revenue earned by the shopkeeper by selling the shirts.
    a. $2x^2 - 3x - 5$ b. $3x^2 - 5x + 1$ c. $6x^2 - 7x - 5$
    d. $7x^2 + 10x + 1$

19. The area of the rectangle is given by the polynomial expression $x^3 - 2x^2 - 6x + 12$ and its length given by x - 2. What is the width of the rectangle?
    a. $x^2 + 6$ b. $x^2 + 3$ c. 6x + 12 d. 2x - 6

20. The distance covered by a bike is given by the expression $2x^2 + 6x - 20$. The time taken by the bike to cover this distance is given by the expression x - 2. Find the speed of the bike.
    a. 2x + 10 b. 6x - 20 c. 10x - 20 d. 6x - 4

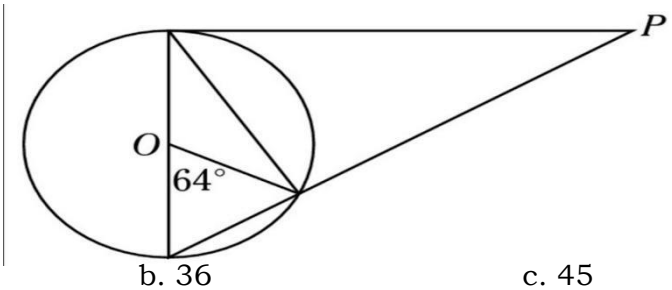
Appendix B

PRETEST/ POST-TEST
CHORDS, ARCS, CENTRAL ANGLES AND INSCRIBED ANGLES
Modular Approach

Instructions: Read the questions carefully and choose the letter of the correct answer.

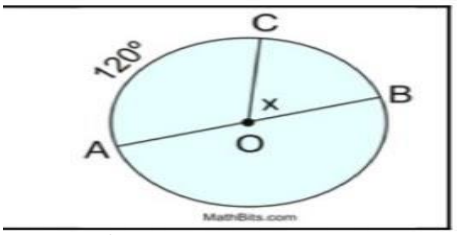
1. What is the radius of the circle when its diameter is 10 cm?
   a. 5 cm b. 10 cm c. 15 cm d. 20 cm

2. In this diagram, where O is the center of the circle, find the measure of angle P, in degrees



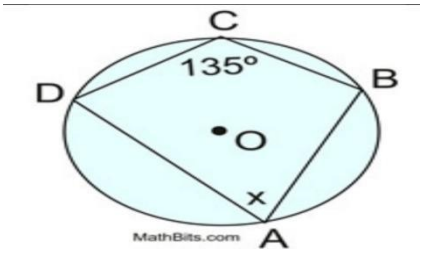
   a. 32 b. 36 c. 45 d. 58

3. Given circle O with diameter $\overline{A.B}$. Find x in degrees



   a. 40° b. 80° c. 60° d. 120°

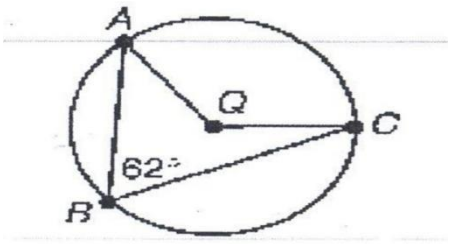
4. Given circle O with inscribed quadrilateral. Find x.



   a. 35° b. 55° c. 45° d. 65°

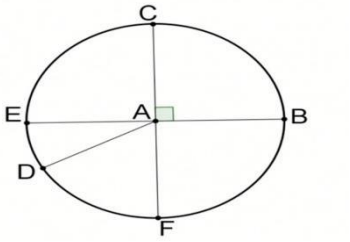
5. If a circle has a diameter of 12, then it has
   a. An arc of 6 b. A chord of 6 c. A radius of 6 d. A sector of 6

6. Given circle Q and measure of angle B is 62 degrees. Find $\widehat{A.C}$.



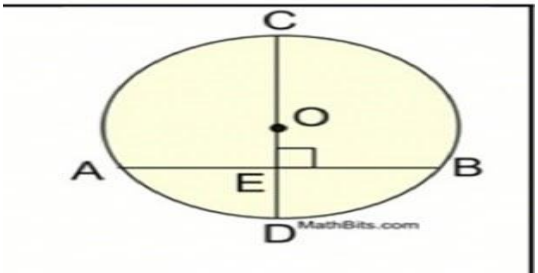
a. 62° b. 124° c. 236° d. 248°

7. In the given circle, $\bar{E}^{-}$.B. and C.F. are perpendicular, and the measure of triangle EAD = 30°. Find the measure of $\widehat{AB}$.



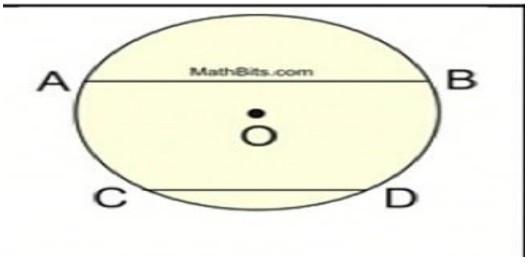
a. 30° b. 45° c. 90° d. 180°

8. Given circle O with diameter $\overline{CD}$ perpendicular to chord $\overline{A.B}$. If $\bar{A}$.E. = 8 inches, find $\overline{E.B}$.



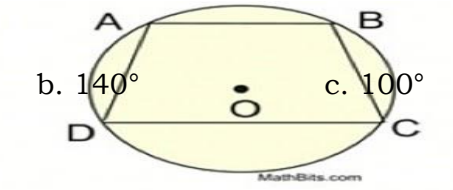
a. 8 in b. 12 in c. 10 in d. 16 in

9. Given circle O with $\overline{AB}$ || $\overline{CD}$, $\widehat{AB}$ = 8X + 50, $\widehat{AC}$ = 5X + 30, $\widehat{BD}$ = 9X - 10. Find the measure of $\widehat{CD}$?



a. 10° b. 80° c. 70° d. 130°

10. Given circle O with quadrilateral ABCD and chord CD parallel to chord A.B. The following are the given measures, $\widehat{AB}$ = 50° and $\hat{B}$.C. = 80°. Find the measure of $\widehat{CD}$.



a. 80° b. 140° c. 100° d. 150°

11. You have asked your landscaper to create a garden area in an oddly-shaped corner of your backyard. Regarding the fencing on the two sides of the corner as being radii, the corner's central angle is two-thirds of a circle. You'd like the landscaper to install a particular type of edging, of which you have $14\frac{2}{3}$ feet, as the arc of the circle, whose center is the pole where the two fences meet. What will be the depth of your new garden? (Use $\frac{22}{7}$ for pie).

a. 44 ft. b. 22 ft. c. 11 ft. d. 7 ft.

12. A central angle of 60°is plotted in a circle with a 4 cm radius. Calculate the area of the circular segment between the chord joining the ends of the two radii and its corresponding arc.

a. 8.38 b. 6.93 c. 3.46
d. 1.45

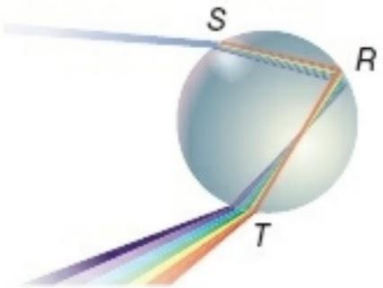
13. A circular fountain of 5 m radius lies alone in the centre of a circular park of 700 m radius. Calculate the total walking area available to pedestrians visiting the park.

a. 7, 000, 000 m^2 b. 5, 700, 831 m^2 c. 3, 251, 841 m^2 d. 1, 538, 521 m^2

14. The amphitheater has the shape of a semicircle, the spectators sit on the perimeter of the semicircle, the stage forms the diameter of the semicircle. Which of the spectators P, Q, R, S, T see the stage of the greatest viewing angle?

a. 90° b. 180° c. 270°
d. 360°

15. The diagram shows how light bends in a raindrop to make the colors of the rainbow. If the measure of arc S.T. = 144, what is the measure of angle R?

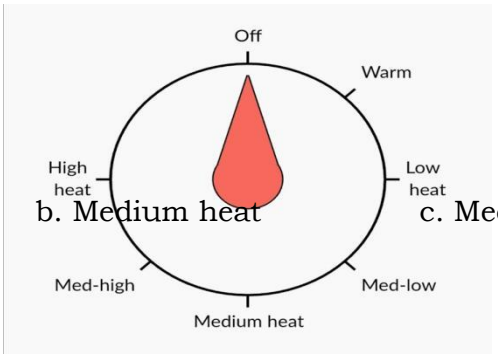


a. 40 b. 52 c. 72 d. 90

16. An angle formed by two rays whose vertex is the center of the circle

a. Arcs b. Sectors c. Central Angle d. Inscribed Angle

17. If Arianna turns the stove dial 135°to the right, what setting will the dial be on?



a. Med-high b. Medium heat c. Med-low d. Low heat

18. A regular octagon is inscribed in a circle. The angle that each side of the octagon subtends at the center is

a. 45° b. 75° c. 90° d. 60°

19. If chords A.B. and CD of congruent circles subtend equal angles at their centers, then

a. A.B. = CD b. A.B.> CD c. A.B. < CD d. None of the above

20. What is the degree of the angle subtended by the diameter of a semi-circle?

a. 90° b. 45° c. 180° d. 60°

Appendix C

A SEMI-DETAILED LESSON PLAN FOR MATH 10

(Grade 10 Students)

I. OBJECTIVES

MELC: Illustrates polynomial functions **(M10AL-IIa-1)**

At the end of the session, the Grade 10 students will be able to:

1. Define polynomial function and its standard form;
2. Identify the coefficients, leading term, leading coefficient, constant term and degree of the given polynomial function;
3. Appreciate the use of polynomial functions in solving real-life problems.

II. SUBJECT MATTER

POLYNOMIAL FUNCTIONS

A. References: e-math 7 by Orlando A. Oronce and Marilyn O. Mendoza
Mathematics Learner's Module 10 by Callanta, Melvin et al.

B. Materials: PowerPoint Presentation, Laptop, Gadgets (Cellphone)

C. Across Curriculum Teaching Areas:

Since several real-life applications will be cited in the lesson, the topic on polynomial functions will be integrated to the following learning areas - RESEARCH, ARCHITECTURE/ENGINEERING, ENTREPRENEURSHIP (TLE), and SCIENCE (CHEMISTRY). However, for in-depth discussion, the teacher will only focus on the use of polynomial functions in Research.

MELC: The learner writes a research title (CS_RS12-Id-e-2) and uses mathematical techniques to analyze the data (CS_RS12-IId-g-3)

C. Ideas: A polynomial function is a function of the form $P(x) = a_nx^n + a_{n-1}x^{n-1} + a_{n2}x^{n-2} + \ldots + a_1x + a_0$ for all $a_n \neq 0$, where a_0, a_1, …, a_n are real numbers called coefficients, a_nx^n is the leading term, a_n is the leading coefficient, and a_0 is the constant term.

D. Processes: Defining, Identifying, Arranging

E. Values: 1. Teamwork in some activities given.
2. Focus during the lesson proper.

III. LEARNING STRATEGIES

A. Preliminary Activities

1. Prayer
2. Checking of Attendance (Virtual Calling)
3. House Rules and Reminders on Safety Protocols
4. Review of the Past Lesson

- The teacher will use **KAHOOT!** application in the review of the past lesson. The class will be grouped into three using a grouping strategy called **Identity Cards.** After the game, the teacher will present a general question to the class, to sum up all the ideas.

  Groupings

  Team A (Team Computation)

  Team B (Team Critical Thinking)

  Team C (Team Problem Solving)

GENERAL QUESTION

How would you differentiate a quadratic function from a linear function?

B. Motivation

Activity: **4 PICTURES, 1 WORD**

Mechanics: The students will play this activity using the Mentimeter application (www.menti.com). Four connected pictures will be presented. The students will be asked to describe these pictures using one word.

Pictures from:
https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(20)30098-5/fulltext

https://www.pharmaceutical-technology.com/news/who-declares-covid-19-pandemic/
http://www.xinhuanet.com/english/2020-04/21/c_138996041.htm
https://www.washingtonpost.com/weather/2020/03/27

- ❖ The teacher will process the responses of the students by looking for a common concept from all of their answers. This common concept will be used by the teacher to give an idea to students on what would be the topic to discuss for this day.

  Common Concept: The use of Mathematics in this time of Pandemic.

C. Lesson Proper

- Presentation of the Lesson Objectives
- Discussion (using Team Online Consultation)

Activity: **UNPACK THE DEFINITION**

Mechanics: The definition of polynomial function will be presented. Students will unpack the definition to understand more the concept of polynomial functions by answering the guide questions.

Guide Questions

Given a polynomial function $f(x) = 2x^3 + 5x^2 + 7x - 5$

1. Is the polynomial function f(x) in a standard form? Explain your answer.
2. What is the degree of the polynomial function? Identify the leading term, leading coefficient, and constant term of the given function.
3. What makes the given function a polynomial function?

- ❖ The teacher will regroup the class into three using the second wave of **Identity Cards.** Each group will be assigned to answer one guide question. Also, the group will be given a maximum of 2 minutes to brainstorm with each other. Then, a representative from the group will share their answer with the class.

Scoring Rubrics	
5	The answer is correct, with clear and specific explanation
3	The answer is correct, but the explanation is not clear or broad
1	The answer is wrong, but the group tried to answer the question
0	No attempt by the group to answer the questions

Teacher's Activity

- The teacher will divide the class into three using the third wave of **Identity Cards.** Each group is given a different task to answer within 3-5 minutes.

- The activity is a differentiated activity called "**ALL ABOUT POLYNOMIAL FUNCTIONS.**"

- Rubrics of scoring during the discussion will be used to rate the presentation of each group. Aside from the score given by the teacher, the other two groups will be rating the presentation of the current group presenter.

First Task: PANDEMIC WORD PROBLEM

For Problem Solving Skills

Scientists all over the world worked furiously to analyze the COVID-19 disease from every angle to come up with a vaccine. Now that the vaccines from China arrived in the Philippines, many expressed their excitement to go back to the old normal, just like before the pandemic happened. Suppose x be the level of preparedness of the national and local government units, the estimated number of days f(x) to near normal, is represented by a polynomial function $f(x) = 5x - 1 + 2x^3 + 3x^2$.

1. Write the polynomial function in standard form.
2. What is the degree of the polynomial function?

- After the presentation in the first task, the teacher will cite an example of the effect of the pandemic on society, especially on the educational needs of the learners under these difficult global circumstances, and how the concept of Polynomial Functions is useful to the learners. Then, integration into Research will be done by the teacher.

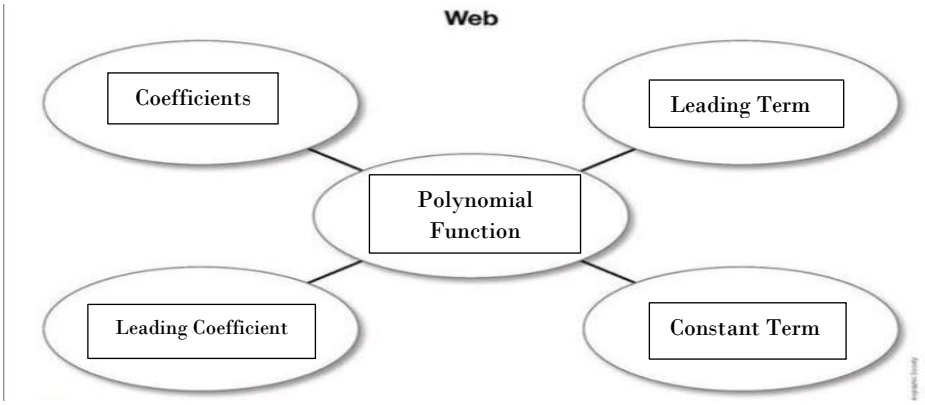
Integration to other learning areas **(RESEARCH)**

The teacher applies in-depth discussion by making a research title out of the task given, creating research questions, presenting the independent and dependent variables, and providing data analysis wherein the concept of Polynomial Function will be used to answer the research questions.

Second Task: BRAINSTORMING WEB

For computational skills

Given a polynomial function $f(x) = 6x^3 + 45x^2 + 66x - 45$, complete the brainstorming web graphic organizer.



Third Task: PICTURE IDENTIFICATION

For Critical Thinking skills

Identify the three pictures according to the correct statement of their real-life application.

PICTURES

Pictures from prezi.com

REAL LIFE APPLICATIONS

- Engineers may use polynomials functions to describe the curve of a planned structure (Architecture/Engineering)
- Polynomial functions can be used to model situations in the stock market to see how prices vary over time (Entrepreneurship)
- Gas equations relating to diagnostic parameters can usually be written as polynomial functions (Science-Chemistry)

D. Generalization

The teacher will generalize the lesson by giving process questions to the students.

Process Questions

1. How do you find our lesson for today? Explain briefly about polynomial functions.
2. How important is polynomial functions to people and the community?

IV. EVALUATION

(Through Google Forms)

Multiple Choices. Encircle the letter of the correct answer.

1. A function in the form of $P(x) = a_nx^n + a_{n-1}x^{n-1} + a_{n-2}x^{n-2} + \ldots + a_1x + a_0$ for all $a_n \neq 0$ is called
   a. Polynomial Function
   b. One-to-One Function
   c. Constant Function
   d. Logarithmic Function

For #'s 2-5, refer to the given polynomial function $f(x) = 2x^5 - 11x + 3$

2. What is the leading term?
   a. $2x^5$ b. $-11x$ c. 3 d. None of the choices
3. What is the leading coefficient?
   a. 2 b. -11 c. 3 d. None of the choices
4. What is the constant term?
   a. 2 b. -11 c. 3 d. None of the choices
5. What is the degree of the polynomial function?
   a. 1 b. 3 c. 5 d. 7

V. ASSIGNMENT

Sent through Gmail/ Messenger

Consider the given polynomial functions and fill in the table below. Submit your answer to our group chat (Group Chat Name: **MATH 10- SIR CUBA**)

Polynomial Function	Standard Form	Degree	Leading Coefficient	Constant Term
$f(x) = 2 - 13x + 2x^2$				
$f(x) = 7x^3 + 45x^2 - 45 + 66x$				

Prepared by:

Carlo G. Cuba
Teacher III, Mathematics