Mathematics Teachers' Content Preparedness, Level of Use of Active Learning Practices and Students' Achievement

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Abstract
This descriptive – correlational research was conducted to determine the Grade 7 Mathematics teachers' content preparedness, level of use of active learning practices and students' achievement. It made use of two data gathering instruments, namely: Survey Questionnaires for Teachers (SQT) and the Mathematics Achievement Test for Students (MATS). The samples included 40 teachers and 1540 students from the public secondary schools in the divisions of Ilocos Norte, Laoag City and City of Batac. Data on teachers' content preparedness were analyzed using means and the corresponding qualitative description. For the level of use of active learning practices, frequency and percentage distribution were utilized. Achievement level of student – respondents was analyzed using percentage score, frequency, percentage distribution and the assigned qualitative description. Pearson's r correlation was used to determine and test the relationship between the variables. Data were processed through the IBM Statistics SPSS Version 20. In testing the significance of r, the level of significance was set at the 0.05 probability level. Results show that the teachers' overall mean level of content preparedness to teach the prescribed learning competencies in the K to 12 Mathematics Curriculum for Grade 7 is significantly correlated with the students' achievement in mathematics. Students perform mathematical tasks better when teachers are adequately prepared in content. Further, their critical thinking ability is enhanced and problem solving skills are developed when supported by teachers with better content preparedness. Findings of the study indicate that teachers who have higher level of use of active learning practices produce high achieving Grade 7 students. With a more advanced operationalization of these active learning practices, the students find opportunities to relate knowledge and skills to wider contexts so that they will be motivated to learn and will become lifelong learners. Likewise, teachers' content preparedness is a factor that influences the level of use of storytelling, cooperative learning, instruction gaming, outdoor activity, problem solving modeling, demonstration laboratory, role playing and personalized system of instruction. The more prepared the teachers on content the higher the level of use of these active learning practices.

Keywords: Mathematics Teachers' Content Preparedness (MTCP), Active Learning Practices (ALP), Level of Use of the Active Learning Practices (LoUALP), Mathematics Achievement

Introduction

Today's society is consistently changing at rapid rates and the education sector is greatly affected. The change demands that educational paradigm must be properly aligned to the growing needs of humanity for universal adaptation and survival. To do this, all education programs have to be always re-evaluated and revised to achieve quality and excellence, to maintain efficiency and effectiveness, to guarantee access and equity, and to become more responsive and relevant for the preparation of learners. Amidst the change, however, is the willingness to accept it. When there is willingness, there is hope for progress in any field. Creativity can be developed and innovation benefits both students and teachers.

In the Philippines, many reforms have been introduced to the basic education system knowing that such changes could help improve learners' performance. However, despite these reforms and introduction of innovations, the Philippines still performs desperately low as reported in local and international standardized examinations. The local test called National Achievement Test (NAT) administered yearly by the Department of Education (DepEd) mirrors the struggle of Filipino students for quality education. Specifically, the result of this test in Mathematics is quite depressing. Antonio (2015) cited that the nationwide average Mean Percentage Score (MPS) obtained by the second year students from 2009 – 2011 was 39.89% and 46.37% by the fourth year students in 2012.

According to DepEd (2011), the implementation of the K to 12 education plan of the Philippine Basic Education Curriculum is the key to the nation's development. It provides sufficient time for mastery of concepts and skills to develop lifelong learners and to prepare graduates for tertiary education, middle-level skills development, employment, and entrepreneurship (DepEd 2013). President Benigno S. Aquino III believed that the K to 12 BEP will advance the competencies of Filipino graduates to enable them to stand at par with global practices and remain equipped with relevant skills and knowledge in their chosen profession (Cruz 2012).

Quijano (cited in Natividad 2014) explained that the K to 12 BEP could strengthen Science and Mathematics Education through its spiral progression and integrative nature. These approaches avoid disjunctions between stages of schooling, allow learners to learn topics and skills appropriate to their developmental/ cognitive stages and strengthen retention and mastery of topics and skills as they are revisited and consolidated. The successful implementation of this program, however, depends on many factors, one of which is the teacher. Undeniably, the teachers are considered the most crucial factor in implementing all instructional reforms at the grassroots level. Gillard (cited in Kimosop 2013) reiterates that teachers have an increasing measure of control over the curriculum, that is, over what is taught and how it is taught. The academic qualifications, knowledge of the subject matter, competence and skills of teaching and the commitment of the teacher have effective impact on the teaching and learning process (Rahman, Jumani, Akhter, Chisthi, Ajma 2011). It is the teacher and what the teacher knows and can do that determine student achievement (Wong & Teo 2003).

Nonetheless, teachers can only be most helpful in implementing the education reform and the attainment of better performance, particularly in the mathematics program, if

they are adequately prepared. The 2011 TIMSS considers well-prepared teachers to be one of the crucial components of effective schools (Martin & Mullins as cited in Pope 2013). The study of Wekesa (2013) established that there is a strong positive relationship between the teachers' level of classroom preparedness, practice and instructional methods and students' academic performance in Mathematics.

How students perform in a mathematics class reflects the preparation that a teacher has in terms of academic subject-matter content, pedagogical knowledge, assessment strategies, classroom management and knowledge of child and adolescent development as applied to teaching. Available research supports the idea that high quality teacher preparation is important. Well prepared teachers outperform those who are not prepared (NCATE 2008).

In addition, the twin goals of mathematics education - critical thinking and problem solving - can only be cultivated with the use of appropriate teaching practices. DepEd highly recommends the use of student-centered approaches in the implementation of the K to 12 Mathematics Curriculum. These approaches shift the focus from the teacher and delivery of course content to the student and active engagement with the material. Through active learning techniques and modeling by the teacher, students shed the traditional role as passive receptors and learn and practice how to comprehend knowledge and skills and use them meaningfully (FSU 2011).

Undeniably, the nature and quality of the teaching-learning process proceeds from the intellectual and pedagogical preparation of teachers. Hence, this study was undertaken to provide empirical data on the effect of teacher factors like content preparedness and level of use of active learning practices to the mathematics achievement of students.

Statement of the Problem

This study aimed to determine the Mathematics teachers' content preparedness in teaching the Grade 7 Mathematics Curriculum, their level of use of the different active learning practices, and their effects on the achievement of their students.
Specifically, it answered the following questions:
1. What is the teachers' perceived level of content preparedness along the following areas?
 a. Number and Number sense;
 b. Measurement;
 c. Patterns and Algebra;
 d. Geometry; and
 e. Statistics and Probability?
2. What is the teachers' level of use of the different active learning practices prescribed in the K to 12 Mathematics Curriculum?
3. What is the students' level of Mathematics achievement?
4. Is there a significant relationship between teachers' content preparedness and their level of use of the active learning practices?
 5. Is there a significant relationship between students' mathematics achievement and the teachers' level of:
    5.1. content preparedness; and
    5.2. use of the active learning practices?

Definition of Terms

The following terms were operationally defined for clarity and better understanding of the study:

Mathematics Teachers' Content Preparedness (MTCP). This refers to the teachers' perceived level of readiness to deliver instruction to be able to bring out the desired learning competencies in the K to 12 Mathematics Curriculum in number sense, measurement, algebra, geometry, statistics and probability among the student – respondents.

Active Learning Practices (ALP). This refers to the set of strategies, methodologies and techniques utilized by teachers to deliver course content and to engage students actively in the teaching and learning process. These include instruction gaming, personalized system of instruction, cooperative learning, expository, discovery, inductive discussion, discovery-inquiry, demonstration/laboratory, drill/practice, problem solving, role playing, storytelling, modeling and outdoor activity.

Level of Use of the Active Learning Practices (LoUALP). This refers to the behavior of the respondents with respect to the utilization of the different active learning practices described in terms of the following eight levels: non-use, orientation, preparation, mechanical use, routine, refinement, integration, and renewal.

Level 0: Non – Use. This is the state in which the individual has little or no knowledge of the Active Learning Practice (ALP), no involvement with it, and is doing nothing toward becoming involved.

Level I: Orientation. This refers to the state in which the individual has or is acquiring information about the ALP and/or has explored its value orientation and what it will require.

Level II: Preparation. It is the state in which the users are preparing for first use of the ALP.

Level III: Mechanical Use. This is the state in which the user focuses most effort on the short-term, day-today use of the ALP with little time for reflection. Changes in use are made more to meet user needs than needs of students and others.

Level IVA: Routine. This refers to the state in which the use of ALP is stabilized. Few if many changes, are being made in ongoing use. Little preparation or thought is being given to improve ALP use or its consequences.

Level IVB: Refinement. This is the state in which the user varies the use of the ALP to increase the impact on clients (students or others) within their immediate sphere of influence. Variations in use are based on knowledge of both short and long term consequences for clients.

Level V: Integration. This refers to the state in which the user is combining own efforts to use the ALP with related activities of other teachers to achieve a collective impact on clients within their common sphere of influence.

Level VI: Renewal. This refers to the state in which the user re-evaluates the quality of the use of the innovation, seeks major modifications of, or alternatives to, present innovation to achieve increase impact on clients, examines new developments in the field and explores new goals for self and the organization.

Mathematics Achievement.   This refers to the percentage equivalents of students' scores in the Achievement test, which are classified according to the following five levels of proficiency stipulated in DepEd Order No. 31, s. 2012:

Beginning. The student at this level struggles with his/her understanding; prerequisite and fundamental knowledge and/or skills have not been acquired or developed adequately to aid understanding.

Developing. At this level, the student possesses the minimum knowledge and skills and core understanding but need helps throughout performance of authentic tasks.

Approaching Proficiency. The student on this level has developed the fundamental knowledge and skills and core understandings and with little guidance from the teacher and/or with some assistance with peers can transfer independently through authentic performance task.

Proficient. The student in this level developed the fundamental knowledge and skills and core understandings and can transfer them independently through authentic performance task.

Advanced.   The student in this level exceeds the core requirements in terms of knowledge, skills and understanding, and can transfer them automatically and flexibly through authentic performance task.

CONCLUSION AND RECOMMENDATIONS

The following are the salient findings of the study.

Teachers' content preparedness. The perceived levels of preparedness to teach the learning competencies were determined along number and number sense, measurement, patterns and algebra, geometry and statistics and probability.

Generally teachers perceived themselves to be very well prepared to teach the prescribed competencies along number and number sense ($\bar{x}$ = *3.60*), measurement ($\bar{x}$ = *3.68),* patterns and algebra *($\bar{x}$ = 3.55),* geometry *($\bar{x}$ = 3.57)* and statistics and probability *($\bar{x}$ = 3.45)*. The lowest mean obtained ranged from *3.10 – 3.20* with a descriptive interpretation of well prepared.

Teachers' level of use of active learning practice. Cooperative learning and drill/practice recorded the highest number of respondents (10 or 20%) on the *Renewal* level. While the highest number of users is registered along *Integration* for instruction gaming (15 or 37.50%). More than one-fourth of the total respondents are at *Refinement* Level for the following: Discovery-Inductive (13 or 32.50%), Directed-Inductive (12 or 30%), Discussion (14 or 35%), Discovery-Inquiry (12 or 30%) and

Problem-Solving (13 or 32.50%). A number of the respondents are still at Levels 0 – 2. Those who are at these levels are considered non-users of the active learning practices. Story telling (10 or 25%) registered the highest number of non-users, followed by modeling and outdoor activity with 9 (22.5%) non-users each.

Mathematics achievement of the students. All, except two, students had a passing performance. One hundred (100) attained *Advanced* level, six hundred (600) *Proficiency* level, four hundred eighty eight (488) *Approaching Proficiency* level and three hundred fifty (350) *Developing* level. However, the over-all achievement was at *Approaching Proficiency* level with a mean of 56.29 and a standard deviation of 1.64.

Teachers distribution according to the level of achievement of their students. Twenty four (24) teachers have students whose achievement is in the proficient level; six (6) have students with approaching proficiency level of achievement and the rest of the teachers (10) have students with developing level of achievement.

Correlation analysis between teachers' content preparedness and the level of use on active learning practices. The overall level of teachers' content preparedness is significantly related at the 0.01 level of significance with their level of use of Instruction Gaming *(r = 0.519)*, Personalized System of Instruction *(r = 0.409)*, Cooperative learning *(r = 0.520), Demonstration/Laboratory (r = 0.462),* Problem - Solving *(r = 0.475),* Role Playing *(r = 0.435),* Storytelling *(r = 0.529),* Modeling, *(r = 0.463)* and Outdoor Activity *(r = 0.519).* Also, the overall level of teachers' content preparedness is significantly related to their level of use of Expositor *(r = 0.389),* Directed-Inductive *(r = 0.400),* and Discussion *(r = 0.367)* at the 0.05 probability level. There is no significant relationship between teachers' content preparedness and level of use of Discovery-Inductive *(r = 0.254),* Discovery-Inquiry *(r = 0.248),* and Drill and Practice *(r = 0.268).*

Correlation analysis between student achievement and mathematics teachers' content preparedness. There is a significant relationship between teachers' overall level of content preparedness and student achievement (*r = 0.375*) at the 0.05 probability level.

Correlation analysis between student achievement and teachers' level of use of active learning practices. At the 0.01 level, data analysis indicated a statistically significant positive relationship between students mathematics achievement and teachers' use of role playing *(r = 0.606),* instruction gaming (*r = 0.605),* cooperative learning *(r = 0.600)* demonstration laboratory (r = *0.594)* outdoor activity *(r = 0.555)*, modeling *(r = 0.521)*, storytelling *(r = 0.514),* expository *(r = 0.490)* personalized system of Instruction *(r = 0.489).* A significant relationship at the 0.05 level exists between students' achievement and teachers' level of use of discovery-inductive *(r = 0.348)* and the directed-inductive *(r = 0.350*) and there was no significant relationship between teachers' level of use of discussion (*r = 0.290)*, discovery-inquiry *(r = 0.322*), drill and practice (*r = 0.212)* and problem-solving (*r = 0.175)* and students' mathematics achievement.

Conclusion

On the basis of the above findings, it is concluded that teachers' content preparedness is significantly related to the students' achievement in mathematics. Students perform mathematical tasks better when teachers are adequately prepared in content. Further, their critical thinking ability is enhanced and problem solving skills are developed when supported by teachers with better content preparedness.

It can also be concluded that the teachers who have higher level of use of active learning practices produce high achieving students. With a more advanced operationalization of these active learning practices, the students find opportunities to relate knowledge and skills to wider contexts so that they will be motivated to learn and will become lifelong learners.

Moreover, teachers' content preparedness is a factor that influences the level of use of storytelling, cooperative learning, instruction gaming, outdoor activity, problem solving modeling, demonstration laboratory, role playing and personalized system of instruction. The more prepared the teachers on content the higher the level of use of these active learning practices.

Recommendations

In the light of the findings and conclusion, the following recommendations are offered: The teachers must be reflective of their teaching methodology in order to sustain their students' interest and motivation to learn mathematics. As such, they must not **only have a** wide-based knowledge of the different active learning practices but also have clear understanding on how these strategies can be effectively implemented in their classroom discussion

Teachers must be very well-prepared in the contents of the curriculum so that they can build meaningful understanding of mathematics concepts among students and that they can usher students into more advanced mathematical tasks. Teacher's mentoring program, attendance in professional trainings and enrollment for refresher courses can best serve for this purpose

School administrators must provide strong support for the personal and professional growth of their teachers. They can provide technical assistance which may help their teachers continue with their schooling and attend refresher courses and seminars on pedagogies and content

Teacher Training Institutions need to provide knowledge, experiences, and supervision to pre-service mathematics teachers to prepare them design and implement active learning practices. When teachers have feelings of preparedness for active learning practice in both their content and pedagogical knowledge, mathematics teachers are confident that they can deliver such instruction to their students.

The policy makers and developers need to provide instructional materials that are well conceived, coherent, and current. Curriculum materials can directly affect what concepts teachers will teach, the methods of instruction teachers will use, and the learning experiences teachers will provide their students.

Future researchers may conduct a similar study involving greater number of respondents to validate the significant results of this study; and

It is also encouraged that future researchers will correlate teachers' content preparedness correspondingly with the students' achievement on the same learning area. For instance, teachers' content preparedness on number sense should be correlated on students' achievement on number sense also.

APPENDICES
INSTRUMENTS OF THE STUDY

SURVEY QUESTIONNAIRE

Part I. Respondent's Background Information

A. Name_____

                                Last Name   First Name   Middle
Name

B. School _____

Part II. Preparedness on Content of Grade 7 Mathematics

Direction: Please put a check mark (√) in the appropriate column that will show how well prepared do you feel in teaching the learning competencies of Grade Seven Mathematics Curriculum as prescribed by the Department of Education.

Descriptive Interpretation	Numerical Equivalent
Not prepared	1
Moderately prepared	2
Well prepared	3
Very well prepared	4

Number Sense	1	2	3	4
describes and illustrates well-defined sets, subsets, universal set and the null set.				
defines and describes the union and intersection of sets and the complement of a set.				
uses Venn Diagrams to represent sets, subsets and set operations				
solves problems involving sets				
describes and illustrates the absolute value of a number on a number line as the distance of the number from 0.				
performs fundamental operations on integers: addition, subtraction, multiplication, division				
states and illustrates the different properties of the operations on integers (commutative, associative, distributive, identity, inverse).				
expresses rational numbers (both repeating and terminating/non-repeating and non-terminating) from fraction form to decimal form and vice versa				
performs operations on rational numbers and illustrate their properties				
describes principal roots and tells whether they are rational or irrational				
determines between what two integers the square root of a number is				
estimates the square root of a number to the nearest tenth.				
illustrates and graphs irrational numbers (square roots) on a number line with and without appropriate technology				
finds the union, intersection and complement of the set of real numbers and its subsets.				
arranges real numbers in increasing or decreasing order..				

determines the significant digits in a given situation				
writes very large or very small numbers in scientific notation				
describes and represents real-life situations which involve integers, rational numbers, square roots of a rational numbers and irrational numbers				
solves problems involving real numbers				
Measurement	1	2	3	4
describes what it means to measure				
describes the development of measurement from the primitive to the present international system of units.				
estimates or approximates the measures of quantities particularly length, weight/mass, volume, time, angle and temperature				
uses appropriate instruments to measure quantities such as length, weight/mass, volume, time, angle and temperature				
converts measurements from one unit to another for each type of measurement including the English system.				
solves problems involving measurements such as perimeter, area, weight, time, speed, temperature, volume/capacity and utilities usage (meter reading).				
Algebra	1	2	3	4
translates verbal phrases to mathematical phrases and vice versa.				
differentiates between constants and variables in a given algebraic expression.				
evaluates algebraic expressions for given values of the variables				
gives examples of polynomials, monomial, binomial, trinomial				
identifies the base, coefficient, terms and exponents in a given polynomial				
defines and interprets the meaning of an exponents where n is a positive integer				
derives inductively the laws of exponents (Exponents restricted to positive integers).				
illustrates the laws of exponents				
adds and subtracts polynomials				
multiplies and divides polynomials				
finds inductively using models; product of two binomials				
product of a sum and difference of two terms				
square of a binomial				
cube of a binomial;				
product of a binomial and a trinomial				
finds algebraically the; product of two binomials;				
product of a sum and difference of two terms				
square of a binomial				
cube of a binomial;				
product of a binomial and a trinomial				
differentiates between mathematical expressions and mathematical equations.				

|				
translates English sentences to mathematical sentences and vice versa				
differentiates between equations and inequalities				
defines and illustrates the meaning of absolute value				
finds the solution of an equation or inequality involving one variable, including one that involves absolute value				
from a given replacement;				
intuitively by guess and check				
by algebraic procedures (applying the properties of equalities and inequalities);				
graphing.				
solves problems that use equations and inequalities.				
Geometry	1	2	3	4
represents a point, line and plane using concrete and pictorial models.				
defines, identifies and names the subsets of a line.				
illustrates, names, identifies and defines the different kinds of angles.				
derives relationships of geometric figures using measurements and by inductive reasoning: supplementary angles, complementary angles, equal angles, adjacent angles, linear pairs, perpendicular lines and parallel lines.				
derives relationships between vertical angles and among angles formed by parallel lines cut by a transversal using measurement and by inductive reasoning				
uses a compass and straightedge to bisect line segments and angles and construct perpendiculars and parallels				
classifies triangles according to their angles and according to their sides				
illustrates, names and identifies different kinds of triangles and define the terms associated with a triangle.				
derives relationships among the sides and angles of a triangle using measurement and inductive reasoning.				
illustrates, names and identifies the different kinds of quadrilaterals.				
derives relationships among the angles and among the sides of a quadrilateral using measurement and inductive reasoning.				
defines and illustrates convex polygons				
derives the relationship of exterior and interior angles of any convex polygon using measurement and inductive reasoning.				
illustrates a circle and defines the terms related to it: radius, diameter, center, arc and central angle.				
Statistics and Probability	1	2	3	4
explains the basic concepts, uses and importance of Statistics.				
poses questions and problems that may be answered using Statistics.				
collects or gathers statistical data and organizes the data in a frequency table according to some systematic considerations.				
uses appropriate graphs to represent organized data: pie chart, bar graph, line graph and a histogram.				
finds the mean, median and mode of statistical data.				
describes the data using information from the mean, median and mode				
analyzes, interprets accurately and draws conclusions from graphic and tabular presentations of statistical data.				

Part III. Level of Use (LoU) of Active Learning Practices (ALP) of the K to 12 Mathematics Curriculum.

Direction: Please read the description of each level and then choose the level that best fits where your current knowledge/use of the components of the Active Learning Practices (ALP) is by checking the appropriate column.

Level 0: Non Use - I really don't know anything about this Active Learning Practice, or am not sure that it would be useful for my classes

Level 1: Orientation - I have some information about this Active Learning Practice, and am considering whether it might be useful for my classes

Level 2: Preparation - I know enough about this Active Learning Practices that I am preparing to use it for my classes

Level 3: Mechanical Use - I am using this Active Learning Practices now and am primarily focused on learning the skills necessary to use it properly and effectively for my classes

Level 4: Routine - I use this Active Learning Practice routinely without much conscious thought, and my use of this ALP is fairly routine for my classes

Level 5: Refinement - I use this Active Learning Practices regularly, and am implementing ways of varying its use to improve the outcomes derived for my classes

Level 6: Integration - I am collaborating with colleaguehis Active Learning Practices to better meet our common objectives for our classes

Level 7: Renewal - I still use this Active Learning Practices, but am exploring other strategy to replace it that will better meet the objectives for my classes

Active Learning Practices	LEVEL OF USE							
	Non-Use	Orientation	Preparation	Mechanical Use	Routine	Refinement	Integration	Renewal
	0	1	2	3	4	5	6	7
Instruction Gaming								
Personalized System of Instruction								
Cooperative Learning								
Expository								
Discovery Inductive								
Directed - Inductive								
Discussion								
Discovery- Inquiry								
Demonstration/Laboratory								
Drill/Practice								
Problem Solving								
Role Playing								
Story Telling								
Modeling								
Outdoor Activity								

ACHIEVEMENT TEST IN MATHEMATICS OF
GRADE 8 ENTRANTS

Directions: Read each of the following questions carefully. Shade the letter of the best answer in your answer sheet.

1. If G ={t, h, e, y, s, a, i, d} and F = {d, a, i, s, y} which of the following is G - F?
   a.   { }   **b.{ t, h, e}**   c. {d, a, i, s, y}   d. { t, h, e, y, s, a, i, d}
2.   If *J* is the set of the unique letters of the word "PHILIPPINES", what is the cardinality number of *J* ?
   a. 11   **b.9**   c. 7   d. 5
3. Evaluate: (-4)(-14)(-5)
       a. -280   b. -23   c. 23   d. 280
4. What best describes the given set { 0,2, 4, 6, 8, …,} ?
   a. {x | x is a counting number divisible by 2}   c. { x | x is a composite number}
   b. { x | x is a whole even number}   d. { x | x is rational number}
5. Which of the following is an ***irrational*** number?
       a. $\sqrt{289}$ b.$\sqrt{325}$ c.$\sqrt{361}$ d. $\sqrt{400}$
6. What number must be subtracted from the product of 43 and -32 to get 126?
       a. -1,250   b. -1,376   c. -1,463   d. -1,502
7. On the same day, the average temperature in four cities are as follows: Manila 30˚C, Helsinki 2˚C below freezing point, Tokyo 5˚C, and Paris -1˚C. Which city has the coldest   average temperature?
       a. Tokyo   b. Paris   c. Manila   d. Helsinki
8. Determine two consecutive integers between which $\sqrt{500}$ lie?
     a. 21 and 22 b. 22 and 23   c. 23 and 24   d. 24 and 25
9. What property is **NOT** illustrated in the given statement: 1 x 0 = 0 x 1 = 0
     a. closure   b. commutative   c. distributive   d. zero
10.   A dressmaker had 5m of cloth. She used 1 ¼ m for a skirt and 1 $\frac{5}{6}$ m for a blouse. How   much cloth was left?
     a. $1\frac{11}{12}$ m   b. $2\frac{2}{5}$ m   c. $2\frac{3}{5}$ m   d. $3\frac{1}{12}$ m
11. What is the collective term for watches, timers or clocks?
     a. barometer b. chronometer   c. micrometer   d. protractor
12. The number **0.121212…** is equivalent to _____.
       a. 1/11   b. 3/25   c. 4/33   d. 4/25
13. One day in Beijing, the temperature went from -2˚C to 8˚C. What is the change in temperature?
       a. 10˚C   b. 6˚C   c. -4˚C   d. -16˚C
14. When a binomial is squared, the result is a
       a. binomial.   b. monomial.   c. multinomial.   d. trinomial.

15. ***The ratio of two less than thrice a number and four*** when written in symbols is _____.
       a. $\frac{2-3n}{4}$ b. $2 < \frac{3n}{4}$ c. $\frac{3n-2}{4}$ d. $\frac{3n}{4} < 2$
16. Evaluate: $3x^2y^3c$ when x = 3, y = -2, and c = ⅓.
       a. -72   b. -36   c. 3   d. 72
17. What is $\frac{3^8}{3^5}$?

a. 3   b. 9   c. 27   d. 3

18. Simplify: $(5x^3)(2x^2)$.

     a. $10x^2$ b. $10x^3$ c. $10x^6$ d. $10x^5$

19. Which of the following statements is **TRUE**?

     a. $a^2.a^3 = a^5$ b. $a^2.a^3 = a^6$ c. $(a^3)^2 = a^5$ d. $a^2/a^3 = a^1$

20. What must be multiplied to $8x^3y$ to make it a perfect square?

     a. xy   b. 2xy   c. 4y   d. 8x

21. Simplify: 4x–3[x−2 (x + 3)].

     a. x + 9   b. x +18   c. 7x + 9   d. 7x +18

22. What is the degree of the polynomial $x^5 – 2x^4y^2 + 7xy^3$?

     a. 7   b. 6   c. 5   d. 4

23. Add the polynomials: $(-x^2 + 5 x + 2)$ and $(6x^2 + x)$

     a. $7x^2 + 6x + 2$ b. $5x^2 + 6x + 2$ c. $5x^2 + 6x$ d. $7x^2 + 6x$

24. Simplify: $\dfrac{8x^3y}{2x^2y}$

     a. 16x   b. 4x   c. $\dfrac{x}{4}$ d. $\dfrac{x}{16}$

25. What must be multiplied to $5x + 1$ to obtain $25x^2 + 10x + 1$?

     a.5   b. 5x   c. 5x + 1   d. 5x -1

26. $(4x – 5)^2$ is equivalent to

     a. $4x^2 – 25$ b. $16x^2 - 25$ c. $16x^2 - 20x - 25$ d. $16x^2 - 40x + 25$

27. Which statement is **TRUE** about special products?

a. The square of a binomial is a multinomial.

b. The product of a sum and difference of two like terms is a binomial.

c. The product of a binomial and a trinomial is the square of a trinomial.

     d. The terms of the cube of a binomial are all positive

28. In a tie breaking question in a Math Quiz Bee, contestants were asked to select an example of a perfect square trinomial (PST). If you are one of the contestants, which of the following polynomials will you select?

     a. $x^2 +10x +25$ b.$x^2 +8x +8$ c. $x^2 -8x - 16$ d. $2 x^2 -4x + 4$

29.   . What is the quotient of $\dfrac{15 a^2 - 5a}{5a}$?

     a.5a – 1   b. 3a - 1   c. 1 – 3a   d. 0

30.   Which best describes the skill of factoring polynomials?

a.   A method of multiplying polynomials

b.   A process of writing a polynomial as a product

c.   A way to add terms of polynomial

d.   The answer in multiplication problem

31. If the side of a square is 2x +3 units. What is its area in square units?

     a. 4x + 6   b. $4x^2 + 9$ c. $x^2 +6x + 9$ d. $4x^2 + 12x + 9$

32. Which of the following equations has -3 as the solution?

     a. 2x – 3 = − 9   b. 2x – 7 = 1   c. 3x + 1 = 10   d.− 4x + 5 = 7

33. Solve for n: 2 (n + 3) = −3n + 10

     a. 4   b. 5   c. $\dfrac{4}{5}$ d. $\dfrac{5}{4}$

34. What is the largest integral value of x that belongs to the solution of $2x < 3 - 13$?

   a. - 6   b. -5   c. - 4   d. -3

35. If $\frac{x}{3} + 2 = \frac{2x}{5}$ then the value of x is _____ .

   a. 15   b. 20   c. 30   d. 40

36. If the sum of three consecutive integers is 54, what is the smallest integer?

    a. 19   b. 18   c. 17   d. 16

37. Points A, B, and C are distinct and collinear. If the coordinates of A, B and C are 12,

    -3 and -6 respectively, which point is between the other two?

    a. A   b. B   c. C   d. insufficient given

38. How long is each side of a regular pentagon with a perimeter of 105 inches?

    a. 12 inches   b. 18 inches   c. 21 inches   d. 36 inches

39. What is the intersection of two distinct planes?

   a. line   b. plane   c. point   d. theorem

40. If ∠1 and ∠2 form a linear pair, which of the following is **TRUE**?

    a. They are complementary angles.   c. They are supplementary angles.

b. They are vertical angles.   d. They are not congruent angles.

41. A segment whose endpoints lie on the circle is called a

    a. radius.   b. chord.   c. secant.   d. tangent.

42. Which set could represent the length of sides of a triangle?

    a. 10,20,30   b. 5,14,17   c. 6,6,11   d.1,3,5

43. In ΔTRU, TR = 8 cm, RU = 9 cm, and TU = 10 cm. List the angles in order from least to   greatest measure.

a. m∠ T, m∠ R, m∠ U   c. m∠ R, m∠ T, m∠ U

b. m∠ U, m∠ T, m∠ R   d. m∠ U, m∠ R, m∠

44. JOSH is a parallelogram. If $m\angle$ J = 57°, what is the measure of m∠ H?

H   S

J   O
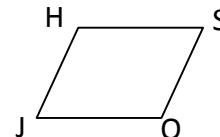
    a. 43˚   b. 57˚   c. 63˚   d. 123˚

45. If line segment *l* and *m* are parallel, what is the value of x in the figure?

    l

x

m
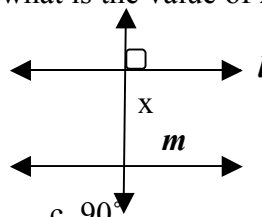
a.   70˚   b. 80˚   c. 90˚   d. 100˚

46. Which measure of central tendency is greatly affected by extreme scores? .

a. mean   b. mode   c. median   d. range

47. It is used to show the relationship of a part to the whole.

a. Bar graph   b. Circle graph   c. Line graph   d. Pictograph

48. Nine people gave contributions in pesos 100, 200, 100, 300, 300, 200, 200, 150, 100, and 100 for a door prize. What is the median contribution?

   a. Php 100   b. Php 150   c. Php 175   d. Php 200

49. What is the range of the given set of scores? **21, 17. 10, 13. 15, 7, 16 20**

a. 24   b. 21   c. 14   d. 7

50. For the set of data consisting of 8, 8, 9, 10, 10, which statement is **TRUE**?
    a. Mean = Median   c. Median = Mode
    b. Mean = Mode   d. Median < Mean

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