MALINTA NATIONAL HIGH SCHOOL
St. Jude Subd., Malinta, Valenzuela City

ACTION RESEARCH

ROTATED AND FIXED GROUPINGS: THEIR EFFECTS ON THE PERFORMANCE OF FOURTH YEAR STUDENTS TOWARD MATHEMATICS FOR SCHOOL YEAR 2006-2007

Prepared by

MR. RODERICK D. DE LEON
(Teacher III)
Malinta National High School

I. ABSTRACT

The focus of the study was to determine the effects of Rotated grouping and fixed grouping on the performance of fourth year students in Malinta National High School for the school year 2006–2007. Furthermore, the researcher wanted to find out if the Rotated grouping is more effective than the usual fixed grouping.

At the beginning of the period, the three groups recorded of having below average performance as shown in the results of their pretest. After the learning unit wherein students were administered with posttest, those students belong to controlled group and fixed group acquired average performance and students belong to rotated group acquired above average performance.

In order to determine the significant difference between and among the students belong to the defined groups the researcher used t-test for independent means at 1% margin of error. It was found that there are no significant difference on the mathematical performance of the students belongs no grouping and fixed grouping. On the other hand, the mathematical performances of fourth year students belong to rotated grouping against students belong to both no grouping and fixed grouping has significant difference. This further means that rotated grouping was more effective intervention in facilitating students' mathematical performance than fixed grouping.

Based on the thorough investigations and findings, the researcher arrived at following conclusions: (i) using rotated grouping in fourth year high school increased learning, (ii) rotated grouping engendered more learning in mathematics than fixed grouping and no grouping, (iii) in using rotated grouping, all students were given a chance to be leaders and followers and (iv) cooperative learning using rotated grouping was more effective than traditional instruction and using fixed grouping.

From the established findings of the study, it was recommended that (i) rotated grouping should be used in cooperative learning, (ii) teachers should learn the proper techniques of rotated grouping and should attend seminars related to cooperative learning and (iii) a similar study involving larger groups of respondents be undertaken to further affirm the findings of this study.

II. INTRODUCTION

The researcher used experimental research and chose his respondents by applying simple random sampling technique from a group of students which belong to the heterogeneous sections. And from those sections he selected three groups and assigned them to experience Rotated grouping, Fixed grouping, and No Grouping in which delegated to be experimental groups (first and second) and controlled group respectively.

In order to determine the effects of Rotated and Fixed Groupings on the performance of the students toward Mathematics, the researcher administered performance test prior to and after the period of study. The study covered one grading period (2^{nd} quarter).

Situation

Low performance level of fourth year students in Malinta National High School toward Mathematics

Identifying the Problem

The researcher observed that students of Malinta National High School specifically fourth year find mathematics as a very difficult subject. One time the researcher interviewed some of the students about what went wrong inside the classroom during Mathematics class. Majority of the interviewed students told that they could hardly understand the concepts. The researcher assumed that students learned more if they worked with their peers (classmates). This was observed by the researcher during the group activity. One time, the researcher talked personally with some of his students about working with their classmates. Some students said; they have learned more than what they have in their mind and the others have driven their interest upon mingling with others. However if the students were not in group, the researcher found out that half of the class got low score during their quiz and others were timid and hesitant to participate during the class discussion at all.

Those observations made by the researcher as manifested by his students, have driven him to undergo action research. The action research was about the use of cooperative learning through grouping which involves the maneuvering of students' grouping (Rotated and Fixed groups).

Statement of the Problem

The main thrust of this study was to determine the effects of Rotated Grouping and Fixed Grouping on the performance toward Mathematics among fourth year students in Malinta National High School.

The researcher wanted to find out the answers to the following questions:

1. What is the mathematical performance of the students before and after the use of fixed and rotated groupings; and the learning unit?
    a. No grouping (Traditional setting)
    b. Fixed grouping
    c. Rotated grouping

2. Is there a significant difference between and among the students who belong to fixed group, rotated group and traditional setting in their Performance toward Mathematics?

Action taken Teaching Mathematics using Rotated and Fixed Groupings

Purpose of the Study

The purpose of this study was to determine if cooperative learning through rotated grouping improves academic performance, and if students believe peer collaboration benefits them personally. Students' performance was measured prior to and after fixed grouping and rotated grouping. In rotated groups, a broad range of prior knowledge, skills and abilities were pooled together to increase the scope of learning. The result should be a deeper understanding of the material than would be possible, as an individual learner should. Additionally, cooperative learning through rotated grouping fosters interdependence. To achieve the objectives, students must rely upon interaction to one another to accomplish a task. The study would assess if students belonging to a rotated group would get greater educational benefits to group work than students belonging to a fixed group or non-grouping.

Subject of the Study

Selected fourth year students of Malinta National High School:

- Section Pearl
- Section Amethyst
- Section Emerald

Hypothesis

There is no significant difference between and among the students who belong to fixed group, rotated group and traditional setting in their Performance toward Mathematics

Definition of terms

Cooperative learning. Cooperative learning is defined by a set of processes which help people interact together in order to accomplish a specific goal or develop an end product, which is usually, content specific. It is more directive than a collaborative system of governance and is closely controlled by the teacher.

Fixed Grouping. A strategy whereby students work cooperatively and collaboratively with the fixed group.

No Grouping. A strategy whereby students do not undergo group in class activity. But they can work by pairs.

Performance Test. A test designed to measure the effects of Fixed grouping and Rotated grouping as interventions in teaching-learning process.

Rotated Grouping. A strategy whereby students work cooperatively and collaboratively during work activity; and retracked weekly to other students to form another group.

III. THE STUDY

Methodology

Fourth year students of Malinta National High School presently taking up Mathematics IV were selected for the study. This was a subject taught in a self-contained classroom. At the beginning of the school year, the students were randomly placed in the class by the committee of enrolment. This committee is made up of two teachers who were in charge of scheduling and sectioning of students. Before the third year students move to fourth year level, they were fully screened by the said committee. The committee ranked the students according to their performance in all subject areas, then they cut-off the number of students for the selection of pilot section. The pilot section contained students who had high performance in all subject areas as compared to other students. Beyond the pilot section, the rest of the students were randomly placed in the remaining seven sections. They were equally and fairly distributed to their respective sections.

From the seven randomly distributed sections, three of them were subject of the study, Amethyst, Pearl, and Emerald. The plan of investigation was scheduled and properly monitored by the researcher. (see appendix C)

Respondents of the Study

Table 1: Frequency and Percentage of Respondents according to Gender (Actual)

Gender	No Grouping (Pearl)	Fixed Grouping (Amethyst)	Rotated Grouping (Emerald)	Total
Male	29	27	31	87
Female	38	42	36	116
Total	67	69	67	203

Table 1 shows the actual respondents in each section according to gender. Section Pearl was designated as the controlled group (No Grouping), and sections Amethyst and Emerald were assigned to be the experimental groups. The section Amethyst designated as the fixed group and the rotated group was section Emerald.

The researcher assumed that there was a bias if each group of respondents was different from one another, specifically gender. To lessen the bias among the groups, the researcher made a random sampling in each of the sample in terms of gender and age of the students. The result follows.

Gender

Table 2: Frequency and Percentage of Respondents according to Gender (Equalized)

Gender	No Grouping (Pearl)	Fixed Grouping (Amethyst)	Rotated Grouping (Emerald)	Total	Percentage
Male	25	25	25	75	42%
Female	35	35	35	105	58%
Total	60	60	60	180	100%

The Table 2 shows that each group had equal percentage of male and female participants. The larger portion of each group consists of female. The total number of female respondents of each group was 35 or 58% of the total number of respondents in each group. The male constituted 25 or 42% of the total number of respondents in each group.

Age

Table 3: Frequency of Respondents according to Age

Age	No Grouping (Pearl)	Fixed Grouping (Amethyst)	Rotated Grouping (Emerald)	Total
20	0	0	0	0
19	1	2	1	4
18	6	2	6	14
17	14	13	13	40
16	30	34	34	98
15	9	9	6	24
Ave.	16.33	16.23	16.37	16.31

The Table 3 shows that each group had equal average age of 16. This meant that most of the respondents were all in the age bracket of fourth year students

The respondents of the study were one hundred eighty (180) out of 543 fourth year high school students of Malinta National High School. This was 33% of the total population of fourth year students in the school. The profiles of the respondents were drawn specifically from their age and gender.

Statistical Instruments

The researcher used **average weighted mean** to determine the performance level of the students belong to no grouping, fixed grouping, and rotated grouping. He also utilized the **t-test for independent means** at 1% margin of error to determine the significant difference on the mathematical performances between and among students belong to the aforementioned groupings. (see appendix A)

IV. FINDINGS AND RESULTS

The results of the study on effects of rotated and fixed groupings on the performance toward mathematics of fourth year students in Malinta National High School were organized into tabular form for better understanding. To determine the effects of the fixed and rotated groupings on the performance of the students toward Mathematics, the researcher administered a pretest and posttest (appendix B) before and after the learning unit.

Problem one: What is the mathematical performance of the students before and after the use of fixed and rotated groupings; and the learning unit?

a. No grouping (Traditional setting)

Table 4 shows the distributions of the mathematical performance of respondents who belonged to the traditional setting. These results were taken from sixty (60) fourth year high school students.

Table 4: Frequency Distribution of the Respondents under the Traditional Setting According to Mathematical Performance

Scores	Interpretation	Before		After	
		F	%	F	%
41 – 50	High Performance	0	0	4	7
31 – 40	Above Average Performance	0	0	20	33
21 – 30	Average Performance	3	5	17	28
11 – 20	Below Average Performance	35	58	15	25
1 – 10	Low Performance	22	37	4	7
Total Mean		12.33		26.33	

A careful examination of Table 4 shows that before the learning unit, 3 or 5% of the respondents had average mathematical performance; 35 or 58% had below average performance level; 22 students or 37% had low performance. All the respondents registered a mean score of 12.33 which indicated below average performance in Mathematics before the learning unit.

After more than a month of learning the concept of Mathematics, particularly the Polynomial function, the students increased their performance from a mean score of 12.33 to 26.33. Four out of or 7% of the respondents got high mathematical performance; 20 or 33% of the respondents got above average mathematical performance; 17 or 28% of the respondents had average performance; 15 or 25% got below average performance. However 4 or 7% got low mathematical performance.

b. Fixed grouping

Table 5: Frequency Distribution of the Respondents under the Fixed Grouping According to Mathematical Performance

Scores	Interpretation	Before		After	
		F	%	F	%
41 – 50	High Performance	0	0	7	12
31 – 40	Above Average Performance	0	0	26	43
21 – 30	Average Performance	4	7	15	25
11 – 20	Below Average Performance	30	50	12	20
1 – 10	Low Performance	26	43	0	0
Total Mean		11.83		30.17	

Table 5 shows the mathematical performance of fixed group before and after the learning unit and treatment (fixed grouping). Initially, 4 or 7% of the respondents had average mathematical performance; 30 or 50% below had average performance in Mathematics; 26 or

43% of the respondents had low performance in Mathematics. Collectively, they registered a mean score of 11.83, which indicated below average mathematical performance.

After the intervention (fixed grouping) was used in this group, the researcher administered a posttest. Out of 60 students 7 got high mathematical performance or 12% of the students; 26 or 43% of the students had above average mathematical performance; 15 or 25% of the students received average performance in mathematics. However, 12 or 20% had below average mathematical performance. None of the students belonged to the group got low mathematical performance.

The fixed group had average mathematical performance as indicated by a mean score of 30.17.

c. Rotated Grouping

Table 6: Frequency Distribution of the Respondents under the Rotated Grouping According to Mathematical Performance

Scores	Interpretation	Before		After	
		F	%	f	%
41 – 50	High Performance	0	0	9	15
31 – 40	Above Average Performance	0	0	34	57
21 – 30	Average Performance	3	5	15	25
11 – 20	Below Average Performance	33	55	2	3
1 – 10	Low Performance	24	40	0	0
Total Mean		12		33.83	

Table 6 shows the mathematical performance before and after the students underwent rotated grouping. Initially, 3 or 5% of the respondents had average mathematical performance; 33 or 55% of the respondents had below average performance in mathematics. However, 24 or 40% of the respondents were recorded to have low mathematical performance. Collectively, they registered a mean score of 12 which indicated below average mathematical performance.

After the learning unit and treatment (rotated grouping), the students recorded 9 or 15% of the respondents got high mathematical performance; 34 or 57% of the respondents had above average mathematical performance; 15 or 25% had average performance in mathematics. Only 2 or 3% of the respondents fall down to below average mathematical performance.

Collectively, the rotated group recorded an above average mathematical performance high mathematical performance as revealed by the computed mean of 33.

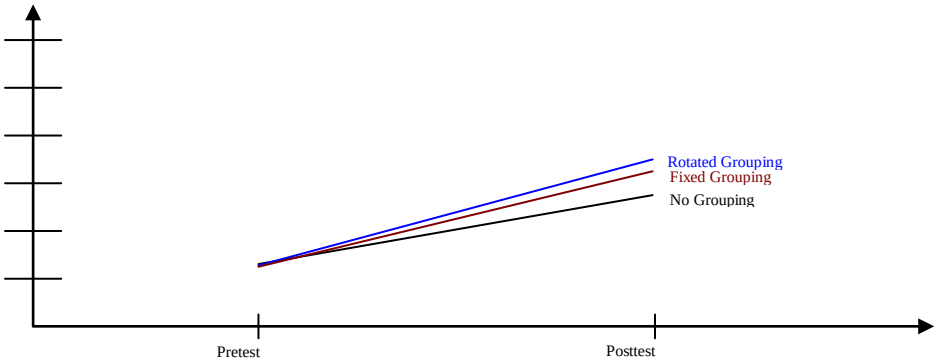


Figure 1: Graph of Mean Scores of Pretest and Posttest of Fixed Grouping, Rotated Grouping and No-Grouping set-up.

The figure 1 illustrates how the performance in Mathematics of each group improved from the pretest to the posttest. The graph clearly pictured the rapidly gained scores of the rotated

grouping and fixed grouping compared to the no-grouping set-up. It shows that students on the two experimental groups performed better than in the traditional setting.

Problem two: Is there a significant difference between and among the students who belong to fixed group, rotated group and traditional setting in their Performance toward Mathematics?

Below are the tables presenting the comparison on the performance level of the groups using the computed average weighted means. The researcher used the t-test for independent means to determine the significant difference between pairs at α 0.01 level of significant. These were the following pairs to be tested:

Table7: Test of Significant Difference between the Means of Mathematical Performance of No-Grouping set-up and Fixed Grouping.

No Grouping VS Fixed Grouping				T-test value	Critical Value at α=.01	Verbal Interpretation
(No Grouping)		(Fixed Grouping)		2.09	2.36	Not Significant
SD	Mean	SD	Mean			
10.62	26.33	9.47	30.17			

Table 7 shows that the computed t-test value of 2.09 which was lesser than the critical T-test value at α=.01 of 2.36. This means no significant difference between the no-grouping set-up and fixed grouping on mathematical performance of fourth year students of Malinta National High School.

Table 8: Test of Significant Difference between the Means of Mathematical Performance of No-Grouping set-up and Rotated Grouping.

No Grouping VS Rotated Grouping				T-test value	Critical Value at α=.01	Verbal Interpretation
(No Grouping)		(Rotated Grouping)		4.55	2.36	Significant
SD	Mean	SD	Mean			
10.62	26.33	7.17	33.83			

Table 8 shows a computed t-test value of 4.55 which is greater than the critical T-test value at α=.01 of 2.36. This means that there existed a significant difference between the no grouping set-up and rotated grouping. This concludes that rotated grouping is better than no grouping set-up on the mathematical performance of fourth year students in Malinta National High School.

Table 9: Test of Significant Difference between the Means of Mathematical Performance of Rotated grouping and Fixed Grouping.

Fixed Grouping VS Rotated Grouping				T-test value	Critical Value at α=.01	Verbal Interpretation
(Rotated Grouping)		(Fixed Grouping)		2.39	2.36	Significant
SD	Mean	SD	Mean			
7.17	33.83	9.47	30.17			

As shown in Table 9, the fixed grouping registered a standard deviation of 9.47 and computed mean of 30.17, while the recorded standard deviation of rotated grouping was 7.17 and computed mean of 33.83. It showed that the computed T-test value of 2.39 was greater than the critical T-test value at α=.01 of 2.36. This means a significant difference between the fixed grouping and rotated grouping. This further means that there was a significant difference in the effect between Rotated grouping and Fixed Grouping on the mathematical performance of fourth year students of Malinta National High School, implying that rotated grouping was more effective intervention in facilitating students' mathematical performance than fixed grouping.

V. DISCUSSION

The initial mathematical performance of the students was below average as shown by the pretest results. After the learning unit and the used of interventions (fixed and rotated groupings), both students belong to no grouping and fixed grouping received average performance while the students belong to rotated grouping increased their mathematical performance from below average to above average. It was found that there were no significant difference on the mathematical performance of students belongs to fixed grouping and no grouping. This means whether students were not in fixed grouping they will gain the same level of performance as compare to those students who were grouped in fixed grouping.

However, it was established that there was a significant difference on the mathematical performance between those students belong to rotated grouping and no grouping. The significant difference on mathematical performance level of the students was perhaps due to the fact that they enjoyed to be retracked to their classmates weekly. As one of the students said, "*I like the rotated grouping because it gives me a chance to be a leader, sometimes a member or a contributor of the group*". Others said that they could share their ideas with their peers and learned from them, as well.

It was also shown that there existed a significant difference on mathematical performance between those students belong to fixed grouping and rotated grouping in favor of the latter intervention. They probably loved to work with their classmates, thus increasing their enthusiasm to study the mathematical concept. This also implied that they experienced intermingling with other students. This resulted to further gain of different ideas from different people they met every time they are retracked to one another.

Furthermore students in rotated grouping triggered their interest to learn mathematics or to help one another and share their own ideas for a certain topic. Probably, because the students worked cooperatively and collaboratively in Rotated Grouping than in fixed grouping and they showed much enthusiasm in learning mathematics. The Rotated Grouping enhanced students' interests and drives to brainstorm topics with their classmates. Thus mathematical performance had been increased.

Conclusions

Based on the thorough investigations and findings, the researcher arrived at following conclusions:

- Using rotated grouping in fourth year high school increased learning.
- Rotated grouping engendered more learning in Mathematics than fixed grouping and no grouping.
- In using rotated grouping, all students were given a chance to be leaders and followers.
- Cooperative learning using rotated grouping was more effective than traditional instruction and fixed grouping.

Recommendations

- Based upon the findings of the study, it was recommended that Rotated grouping should be used in cooperative learning.

- Teachers should learn the proper techniques of rotated grouping. He/she should attend seminars related to cooperative learning.
- A similar study involving larger groups of respondents be undertaken to further affirm the findings of this study.

APPENDICES

A. Statistical Tools

T-test for Independent Means

$$t = \frac{\overline{x_1} - \overline{x_2}}{\sqrt{\frac{(n_1 - 1)s_1^{\,2} + (n_2 - 1)s_2^{\,2}}{n_1 + n_2 - 2} \cdot \left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

Where:

t	–	computed t-value
$\overline{x_1}$	-	first sample mean
$\overline{x_2}$	-	second sample mean
n_1	-	number of respondents on the first sample
n_2	-	number of respondents on the second sample
s_1	-	standard deviation of the first sample
s_2	-	standard deviation of the second sample

Average Weighted Mean

$$\bar{x} = \frac{\Sigma fx}{n}$$

Where:

$\bar{x}$	-	sample mean
f	-	frequency distribution
x	-	class mark
n	-	number of respondents on a sample

Degree of freedom

$$n_1 + n_2 - 2$$

Critical value at α 0.01 level of significant (df = 120) = 2.36

B. Performance Test

DIRECTIONS: Read and analyze each question. Choose the letter with the corresponding correct answer from the given choices.

1. In the quadratic function form $f(x) = ax^2 + bx + c$, if $a = 0$ what will happen to the function?
   a. linear function
   b. quadratic function
   c. constant function
   d. cubic function

2. What is the value of f(2) in the function $f(x) = 2x^2 – 3x – 17$?
   a. -2
   b. 1
   c. -1
   d. -2

3. How would you describe the graph of quadratic function $f(x) = ax^2 + bx + c$, if $a > 0$?
   a. The graph opens upward
   b. The graph opens sideward right
   c. The graph opens downward
   d. The graph opens sideward left

4. What are the zeros of $f(x) = x^2 – 5x - 14 – 5x – 14$?
   a. $\{-3,4\}$
   b. $\{-4,-1\}$
   c. $\{0,1\}$
   d. $\{-2,7\}$

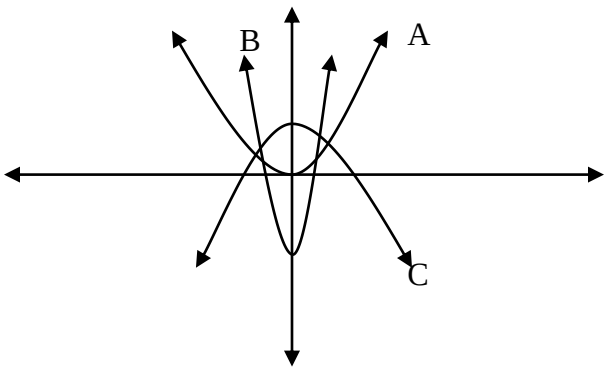
5. If the descriminant of the quadratic function $b^2 + 4ac = 0$, how will you describe its zeros?
   a. None real zeros
   b. Two real zeros
   c. One real zeros
   d. One non-real zeros

6. What is the equation of the quadratic function whose zeros are 1 and 4?
   a. $f(x) = 2x^2 + 4x – 4$
   b. $f(x) = x^2 – 5x + 4$
   c. $f(x) = -3x^2 + x – 2$
   d. $f(x) = x^2 + 4x - 5$

7. What is the maximum number of zeros of a quadratic function?
   a. three
   b. four
   c. one
   d. two

8. Which of the following points that satisfy the inequality $f(x) > x^2 – 9$?
   a. (-4, -11)
   b. (10, 3)
   c. (0, 5)
   d. (-6, 1)

Use the graph below to answer items 9 to 11

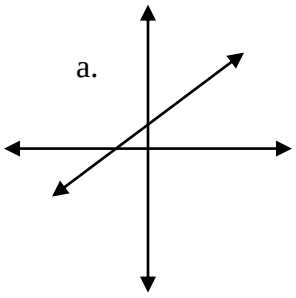


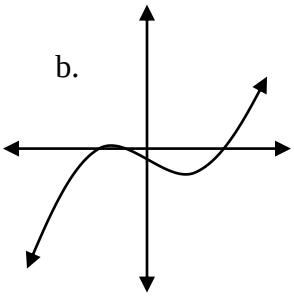
9. Which of the graphs has greater absolute value of a?
   a. A
   c. B
   b. C
   d. A and C
10. Which of the graphs has negative value of a?
   a. A
   c. B
   b. C
   d. A and B
11. How many real zeros are there in graph A?
   a. one
   c. two
   b. three
   d. none
12. Compare the graph of $f(x) = (x-2)^2 + 3$ to the graph of $f(x) = x^2$.
   a. The graph of $f(x) = (x-2)^2 + 3$ is shifted 3 units right and 2 units upward from the origin.
   b. The graph of $f(x) = (x-2)^2 + 3$ is shifted 2 units right and 2 units upward from the origin.
   c. The graph of $f(x) = (x-2)^2 + 3$ is shifted 3 units left and 2 units upward from the origin.
   d. The graph of $f(x) = (x-2)^2 + 3$ is shifted 2 units right and 3 units upward from the origin.
13. What is the point of intersection between function $f(x) = x^2$ and the x-axis?
   a. (0, 0)
   c. (1, 1)
   b. (2, 2)
   d. (3, 3)
14. What is the coordinates of the vertex of the quadratic function $f(x) = x^2 – 1$?
   a. (2, 0)
   c. (0, 2)
   b. (0, -1)
   d. (0, 1)
15. Which of the following is the same as $f(x) = 2x^2 – 16x + 10$?
   a. $f(x) = 2(x+4)^2 + 42$
   c. $f(x) = 2(x-4)^2 – 22$
   b. $f(x) = -2(x+4)^2 + 42$
   d. $f(x) = -2(x-4)^2 - 22$
16. Which of the following is equivalent to $f(x) = (x-2)^2 + 4$?
   a. $f(x) = x^2 – 4x + 8$
   c. $f(x) = x^2 + 4x + 8$
   b. $f(x) = -x^2 – 4x - 8$
   d. $f(x) = x^2 + 4x - 8$
17. How will you describe the vertex of quadratic function $f(x) = -a(x-h)^2 + k$?
   a. The vertex is the lowest point of the graph.
   b. The vertex is the highest point of the graph.
   c. The vertex has coordinates of (k, h).
   d. The vertex neither the lowest nor the highest point of the graph.
18. Which is NOT true about the quadratic function $f(x) = 2x^2 – 4$?
   a. The vertex is at (0, -4)
   b. The axis of symmetry is $x = 2$
   c. The parabola opens upward
   d. The graph of f(x) opens steeper than $g(x) = x^2 - 4$
19. What are the zeros of $3x^2\ 7x – 6$?
   a. $\left(3, \frac{2}{3}\right)$
   c. $\left(3, -\frac{2}{3}\right)$
   b. $\left(-3, \frac{2}{3}\right)$
   d. $\left(-3, -\frac{2}{3}\right)$

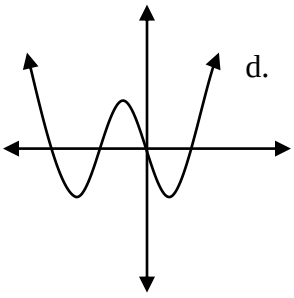
20. Which of the following has minimum point?
    a. $f(x) = 2(x+4)^2 + 42$
    b. $f(x) = -3x^2 + x - 2$
    c. $f(x) = -x^2 - 4x - 8$
    d. $f(x) = -2(x+4)^2 + 42$

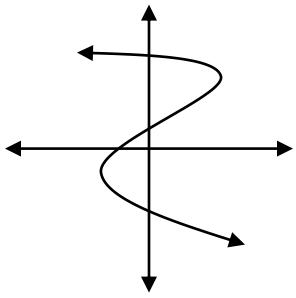
21. What must be the value of k so that $f(x) = kx^2 - 6x + 9$ has one real zero?
    a. 1
    b. 3
    c. 2
    d. 4

22. Which is **NOT** a graph of polynomial function?

a. 

b. 

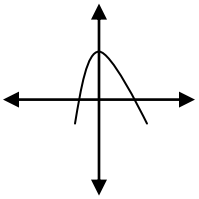
d. 



23. What is the vertex of the function $f(x) = (x - 3)^2$?
    a. (0, 2)
    b. (-2, 0)
    c. (2, 0)
    d. (0, -2)

24. What is the direction of the opening of the graph of the function $f(x) = -2x^2$?
    a. downward
    b. to the left
    c. upward
    d. to the right

25. What is the approximate value of *a* in the graph at the right?
    a. 4
    b. 1
    c. 2
    d. -1



26. What are factors of $x^2 - 4x - 21$?
    a. x-2 and x+4
    b. x-3 and x+7
    c. x-7 and x+3
    d. x-4 and x+2

27. Which of the following polynomial functions whose graph has 3 turning points?
    a. $f(x) = x^4 - 5x^3 + 3x + 1$
    b. $f(x) = x^5 + 5x^4 - 3x^3 - 6x^2 + 1$
    c. $f(x) = x^6 - 5x^2 - 4x + 20$
    d. $f(x) = 4x^2 + 30x$

28. If x -2 is a factor of $x^3 - 6x^2 + 11x - 6$, then find the other factor.
    a. $x^2 - 4x + 3$
    b. $x^2 + 6x - 6$
    c. $x^2 + 3x + 1$
    d. $x^2 - 6x + 11$

29. What is the remainder when $x^6 - 3x^2 + 3$ is divided by x + 1?
    a. 3
    b. 1
    c. 4
    d. -6

30. What is P(-2) in the function $P(x) = x^4 - x^2 - 5x - 6$?
    a. 16
    b. 7
    c. 8
    d. -3

31. If x + 2 is a factor of P(x), what is the remainder when P(x) is divided by x + 2?
    a. 1
    b. 2
    c. -1
    d. 0

32. Find the remainder when $x^{25} - x^4 + 5$ is divided by $x + 1$.
    a. 4 c. 7
    b. 5 d. 2
33. How many turning points has a graph of polynomial function $f(x) = x^3 - 2x^2 - x + 2$.
    a. 1 c. 3
    b. 2 d. 4
34. Which is **NOT** a factor of $x^4 - 5x^2 + 4$?
    a. $x + 1$ c. $x + 4$
    b. $x + 2$ d. $x - 1$
35. What is the value of *m* so that $x - 2$ is a factor of $4x^3 - 9x + m$?
    a. 11 c. -3
    b. -14 d. 10

36. How do you find the other factors of P(x) if the depressed polynomial is a quadratic?
    a. Use synthetic division c. Use quadratic formula
    b. Use factor theorem d. All of the these
37. What is the value of *k* so that $x - 1$ is a factor of $7x^4 - 8x^3 - 9x^2 + 6x + k$?
    a. 9 c. -4
    b. -5 d. 4
38. Choose the statement that is **TRUE**.
    a. A quadratic function will have four zeros.
    b. A linear function will never have a zero.
    c. All polynomial functions will have zeros.
    d. A third-degree polynomial function will have no more than three zeros.

39. How many rational zeros has $f(x) = x^3 - 6x^2 + 12x - 8$?
    a. More than 3 c. 2
    b. 3 d. 1
40. Find the value of *k* for which $x^3 - 2x^2 + 4x + k$ has a remainder of -7 when divided by $x - 1$.
    a. 3 c. 7
    b. 10 d. -10
41. What are mathematical operations involved in synthetic division?
    a. Addition and subtraction c. subtraction and division
    b. Multiplication and addition d. Division and multiplication

42. What are the possible zeros of the polynomial function $P(x) = 2x^3 - 2x + 4$?
    a. $\pm 2, \pm 4, \pm 1, \pm 1/2$ c. $\pm 4, \pm 1, \pm 2$
    b. $\pm 4/3, \pm 2, \pm 4, \pm 1/2$ d. $\pm 2, \pm 4$
43. What is the exponent of variable of a constant term?
    a. 1 c. 2
    b. 0 d. -3

44. If the graph of polynomial function passes through the x-axis twice, then how many zeros are there?
    a. 3 c. 2
    b. 5 d. 4

45. What is the domain of $f(x) = 4x^4 – 6x^3 + 2x^2 – 6$?
    a. $4 < x < 6$
    b. All positive real numbers
    c. All real numbers
    d. All negative real numbers
46. What is the degree of $P(x) = 2 – 3x + 4x^2 + 5x^3$?
    a. 0
    b. 1
    c. 2
    d. 3

47. What is the degree of the depressed expression when a polynomial of degree 4 is divided by $x – 4$?
    a. 4
    b. 3
    c. 2
    d. 1
48. What is the remainder when $P(x) = 2x^6 – 13x^5 + 75x^3 + 2x^2 – 50$ is divided by $x – 1$?
    a. 5
    b. 16
    c. 32
    d. 0
49. What is the leading coefficient of the polynomial $3 – 2x^2 + 5x^4 + 7x^6$?
    a. 2
    b. 3
    c. 5
    d. 7
50. What is the depressed polynomial when $x^3 – 3x^2 – x + 3$ is divided by $x – 1$?
    a. $x - 2$
    b. $x^2 – 2x$
    c. $x^2 – 2x – 3$
    d. $x^3 – 2x – 3$

C. Time Frame of Action Plan

Date	Procedures
June - July, 2006	* Observation of classes
	* Interviewed some students regarding the group activity
July	* Informed the Math Department head to conduct action research
	* Letter of permit to conduct action research was handed to the School Principal
August	* Pretest was administered to the selected students (subject of the study)
	* Application of the two interventions (fixed and rotated groupings) in class
	* Learning unit for the second quarter was discussed to the students
	* After the learning unit the post test was given to the concerned students
	* The post test was also their second quarter test
October	* Computation of data
	* Interpretation of data
	* Finalization of Action research paper