4-29-1997

A study to determine the effectiveness of computer assisted instruction in the basic mathematics high school curriculum

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A STUDY TO DETERMINE THE EFFECTIVENESS OF COMPUTER ASSISTED INSTRUCTION IN THE BASIC MATHEMATICS HIGH SCHOOL CURRICULUM

by
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A Thesis

Submitted in partial fulfillment the requirements of the
Master of Arts Degree in the Graduate Division
of Rowan University in Mathematics Education
May, 1997

Approved by _____
John Sooy

Date Approved April 29, 1997

ABSTRACT

Karen S. Osborne, A Study to Determine the Effectiveness of Computer Assisted Instruction in the Basic Mathematics High School Curriculum

The purpose of this study was to investigate the effectiveness of computer assisted instruction in the basic mathematics high school curriculum.

A 31 day study took place using a population of 25, 9th grade basic mathematics students from Washington Township High School. These 25 students were split into two samples. The two samples tested were a control group consisting of 12 students who received the traditional lecture-oriented instruction, with assign-study-recite a common procedure and innovation and experimentation minimal. The experimental group consisted of 13 students who received the traditional lecture oriented instruction along with CAI. Each sample was given a pre-test and a post-test to determine if CAI along with the traditional method was more effective than the traditional method of instruction.

It was determined that there was no significant difference in the students who received CAI to those who received the traditional method of instruction.

MINI-ABSTRACT

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The purpose of this study was to investigate the effectiveness of computer assisted instruction in the basic mathematics high school curriculum. The results indicated that there is no significant difference in the students who received CAI to those who received the traditional method of instruction.

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ACKNOWLEDGMENTS

The researcher is pleased to acknowledge her indebtedness to Dr. Sooy for his dedication, guidance, and expertise. Appreciation is also extended to Eileen Rosell, Business teacher from Washington Township High School who typed this thesis, and my colleagues in the Mathematics Department at Washington Township High School for their support.

In addition, I would like to thank my parents Signe and George and fiancee Glenn for their continued support and encouragement.

CHAPTER 1

Introduction to the Study

Background

Research shows that once computers have been introduced into the classroom in a meaningful way, both student understanding and time-on-task increase.[1] In order for today's students to benefit from computer technology, computer learning must begin to play a valuable role. Computers allow students to work at their desired pace and provide teachers the opportunity to work directly with slower learners. In classrooms where computers are integrated into the curriculum, the teacher assumes the role of a facilitator of learning rather than the sole source of knowledge.

Statement of the Problem

It is the purpose of this study to investigate the effectiveness of computer assisted instruction in the basic mathematics high school curriculum.

Significance of the Problem

The National Council of Teachers of Mathematics as well as other researchers studying the area of school reform, insist that computer assisted instruction is a key to improving the productivity of the nations schools.[2] This study will help determine if computer assisted instruction will improve learning in the basic mathematics curriculum. The outcome will benefit school districts who are trying to address the skills of the basic mathematics student.

Limitation of the Study

This study will be taking place at Washington Township High School, located in Sewell, New Jersey. Washington Township High School is the largest high school in Gloucester County; the total student enrollment (ninth grade through twelfth grade) is approximately 2,700 students. The township is a culturally diverse, middle to upper middle class community, comprised of people who are employed as executive, professional, trade members and technical experts.

The sample student size will be 25, 9th grade basic mathematics students. These 25 students will be placed into two samples in which the control group consist of 12 students and the experimental group consists of 13 students.

Unusual Terms:

EWT - Early Warning Test. This test is administered in the state of New Jersey to 8th grade students in the areas of Mathematics, Reading, and Writing.

HSPT(11) - High School Proficiency Test. This test is administered in the state of New Jersey to 11th grade students in the areas of Mathematics, Reading, and Writing. Successful completion of this test is a requirement for high school graduation.

Basic 9th Grade Mathematics Students - Students who failed the EWT in 8th grade in the area of mathematics are placed into this course as a 9th grade student. At Washington Township High School the course is titled HSPT9. The five cluster areas of the HSPT math exam must be covered in this course. The cluster areas are as follows:

I. Numerical Operations
II. Measurement and Geometry
III. Patterns and Functions
IV. Data Analysis
V. Fundamentals of Algebra

CAI - Computer assisted instruction.

PSI - Personalized system of instruction.

Assumption

An assumption is that the EWT and HSPT11 tests are appropriate indicators of a students' mathematical basic skills competency.

Procedures

The research will be conducted by working with a population of 25, 9th grade basic mathematics students from Washington Township High School. These 25 students will be split into two samples.

The two samples being tested, are a control group and an experimental group. The control group consists of 12 students who receive the traditional, lecture-oriented instruction, with assign-study-recite a common procedure and innovation and experimentation minimal. The experimental group consists of 12 students who receive the traditional lecture oriented instruction along with computer assisted instruction.

Each sample will be tested to determine if CAI along with the traditional method is more effective than traditional method of instruction.

CHAPTER 2

Review of Related Literature

Introduction

The purpose of this study was to investigate the effectiveness of computer assisted instruction in the basic mathematics high school curriculum. The related research examines this through such materials as the National Council of Teachers of Mathematics (NCTM), NCTM's - Standards, National Education Association literature and other relevant articles.

Review of Related Literature

Teachers need to be "as comfortable with computers as with chalkboards," declared President Clinton at a recent White House program.[3] The need for teachers to use and help their students use technology is addressed by the NCTM's professional teaching standards.

> Standard 4.5: All students will regularly and routinely use calculators, computers, manipulatives, and other mathematical tools to enhance mathematical thinking, understanding, and power.[4]

NCTM has been a leader in encouraging mathematics teachers to incorporate technology into their lessons. The Council has adopted formal positions encouraging the use of computers in mathematics classrooms.

In more classrooms today computer technology is opening up new ways for teaching mathematics. In addition, with the growing availability of the Internet in the classroom, students can search for mathematic resources. The use of computers as a tool in mathematics is essential to moving the current classroom into the 21st century.

James Denzell, Jr., General Manager of IBM Educational Systems, states that the issue today's teachers are tackling is interest and motivation.[5] The question he presents to today's educators is, "How do we make learning more exciting than

MTV?"[6] Technology stimulates students to navigate their way through those lessons taking entirely different paths.

Professor Elliot Soloway of the University of Michigan states that students learn by doing. "Construct knowledge; it used to be learning what, now it's learning how. Knowledge delivery is the old way, the notion that students are vessels to be filled up with knowledge. Now students must construct their own models. The teacher builds a scaffolding of learning environment with technology. Then the students learns by doing."[7]

Current changes in the manner in which mathematics is being taught in many schools across the nation have triggered concerns by some parents that the new curriculum ignores the "fundamentals."[8] The concern expressed by the parents needs to be addressed by explaining today's methods and curriculum more thoroughly and effectively.

Parents need to be informed that computer assisted instruction in today's classroom is essential if we want our children to keep pace with their peers elsewhere in the world. The traditional method of instruction which focused on memorization and drills does not provide the competitive edge that today's students need to enter a challenging world-wide marketplace.

The large growth of high-technology industries demands creative thinkers and team players. The most valuable employees are those who are able to work together to make timely, educated guesses and then supply reasonable mathematical principles to validate them. This means the students trained in the traditional classroom setting lacks the vital skills essential in today's job market.

It is essential that math teachers incorporate basic skills with critical thinking. With the assistance of computer instruction students are able to work on these higher order thinking skills.

In a society where most work is becoming computer based, school work cannot resist the change. Computer technology and electronic networks have slowly been infiltrating the schools.[9] Since the widespread of growth of such technology in both the home and the workplace, computer equipment is unlikely to end up in closets or even to sit idle most of the time. For both students and teachers there is valid purpose for using this equipment, the technology represents the future.

Overall, the use of technology in schools has not kept pace with the changes that are occurring in today's society. We have seen how technology has drastically changed the way business is conducted, products are produced, and medical research is analyzed, however, many elements within the schools have remained unchanged. As educators moving into the 21st century can see electronic learning is the future.

Teachers need to participate in the manner in which technology is used in the classroom. Electronic mail and word processors changed the way we view the world. The new advancement in computing are now doing the same thing.[10] Educators need to be part of the team in order to guarantee that the use of technology in the schools is a successful asset.

Review of Related Research

In 1989, Henry Jay Becker conducted a study out of Johns Hopkins University discussing the use of computers in mathematics and science classrooms. The results of his study revealed that computer use in math and science classes were generally sporadic or episodic rather than systematic and regular. When computers were used in math and science classes its role was more related to enrichment or remediation goals of the teacher than to higher priority work that focuses on the regular instructional curriculum.[11]

The 1989 survey found that in middle and junior high math classes computers were used mainly for practicing whole number arithmetic, fractions, and decimals. Other uses of computers in math that appeared modestly frequently in the sample

included the use of the Logo programming language to help students make geometric constructions and programs to help students to understand algebraic concepts.[12]

The research revealed that students in a class with classroom located computers were more likely to use them regularly throughout the school year than students in a class that must be scheduled into a lab. It was also found in the area of mathematics, intensive use of computers occurred more frequently in the laboratory setting where there were more computers because once a class had developed the routine of using computers, having enough of them for all students was more critical than the convenience of their location.

According to the survey responses, math and science teachers had two major purposes for using computers, (1) motivating students interest in the subject and (2) helping students to master basic facts and skills. Teachers' goals were partly a function of the conditions under which they used computers, the amount of computers available and whether they were available to be used in teachers' own classrooms or in a shared computer laboratory. It was found when teachers had only a few computers available they were used as a way of rewarding students for getting classwork covered and for remediating individual student's deficiencies. In contrast, those math teachers who had a large number of computers available to their class and to have computers in their own classroom, reported that learning to apply mathematics was the most important function that computers played in their classroom.

An international math study of eighth-grade achievement results which were published in the December 1996 issue of the NCTM's news bulletin is the most recent in a series of studies. It presented one of the largest, most comprehensive pictures of international mathematics and science education taken to date. The eighth-grade achievement results are only a small piece of a larger picture which may reveal important factors in academic achievement.

U.S. eighth-grade students scored slightly below average compared with their peers in 40 other countries who participated in this study.[13] German and Japanese eighth graders who scored at the top were found to be studying more quality mathematics, as opposed to quantity. Instructors in these countries often present students with a problem and ask the students to come up with their own solutions. Whereas the American mathematics curriculum features a greater number of topics at each level. This study helps to reveal how technology can be used to enhance learning.

In Tom Morgan's article, "Using Technology to Enhance Learning: Changing the Chunks",[14] he discusses how integrating technology into the curriculum is not an easy task. It requires knowledge of the subject area, an understanding of how students learn, and a level of technical expertise.

In order to enhance learning, computer assisted instruction must be used in a manner which will support the processes students use when they learn. When students learn new concepts, they incorporate them into existing chunks.[15] The cognitive interpretation of chunk - building is based on hierarchical learnings, with broader concepts at the upper levels, and more detailed information at the lower levels of the chunk. An understanding of the ways chunks are formed can help educators evaluate the best way computer assisted instruction might be used to enhance the chunk--forming or learning process.

Computer assisted instruction can provide students with repeated exposures to variations of a concept. Teachers are currently using computers effectively for teaching factual knowledge by incorporating drill and practice programs with school curriculums. Many of the programs engage students only at the lower level of Bloom's Taxonomy (Knowledge, Comprehension, Application).[16] To be productive citizens in a rapidly changing technological society, students will need to have strong critical thinking and problem-solving skills. Therefore, experiences that engage students at

higher levels of Bloom's Taxonomy (Analysis, Synthesis, Evaluation) will need to be demonstrated.[17]

It is essential that in planning and evaluating instructional applications of computer assisted instruction teachers must first ensure that computers are being used to expose students to variations of the concepts being taught. Second, they need to ensure that the applications engage students at higher levels of Bloom's Taxonomy.

In November of 1996, the National Education Association printed an article dealing with critics to computers in the classroom who claim they are a distraction from the task at hand and are incredible overhyped.[18] Members of the Maxwell Middle School in Tucson, Arizona disagree.

The Maxwell School is one of the few schools in America where "classroom" and "computing" now go together like the traditional blackboard and chalk. Maxwell currently hosts 600 students and 423 computers. Seventh and eighth grade classrooms each contain some 20 PC's.

The staff-driven curriculum is heavy on reading and writing, thematic instruction, and cooperative learning and the results are impressive. In the 1995-96 school year, Maxwell seventh graders of all abilities showed an impressive four-year boost in their Iowa Test scores, averaging 8 percent gains in English, 10 percent in reading, and 12 percent in math.

"Computers help enhance what students learn in the classroom be it reading, writing, math, and so on. It enables them to see the bigger picture quickly, how it all fits together" notes seventh grade social studies teacher Brandon Hall.[19]

The Maxwell Middle School is not a school filled with wealthy students, in fact 83 percent of the students qualify for free or reduced-price lunch.[20] Therefore, if these students did not have computers in the classroom, they'd probably never touch a computer. Making sure all students receive this opportunity in all communities, is the challenge America now faces.

CHAPTER 3

Procedures

Introduction

While conducting my research into the effectiveness of computer assisted instruction in the basic mathematics high school curriculum, the majority of the research stated that computers when used effectively will enhance the learning process. Therefore, I conducted my research using a population of 25, 9th grade basic mathematics students from Washington Township High School. These 25 students were split into two samples. The two samples tested, were a control group consisting of 12 students who received the traditional lecture-oriented instruction, with assign-study-recite a common procedure and innovation and experimentation minimal. The experimental

group consisted of 13 students who received the traditional lecture oriented instruction along with CAI.

This study took place over a 31 school day period. Each sample was given a pre-test and a post-test to determine if CAI along with the traditional method was more effective than traditional method of instruction.

Procedures

The pre-test which was administered to both groups before conducting the study, was a department mid-term exam. This mid-term exam was developed by five teachers in the math department at Washington Township High School. The five teachers who developed the mid-term exam also teach the course in which the exam was administered. The mid-term exam consisted of 45 multiple choice problems with 5 fill in questions. The basic mathematical material covered in the mid-term exam were: numerical operations, data analysis, measurements, and pre-algebra.

The post-test which was administered at the conclusion of 31 school day study was a department final exam. This final exam was developed by five teacher in the math department at Washington Township High School. The five teachers who developed the final exam also teach the course in which the exam was administered. The final exam consisted of 45 multiple choice problems and 5 fill in questions. The basic mathematical material covered in the final exam were: numerical operations, data analysis, measurements and geometry, patterns and functions, and pre-algebra.

Procedures of the Control Group

The control group which consisted of 12 students, received the traditional lecture-oriented instruction with assign-study-recite a common procedure and innovation and experimentation minimal. During the 31 school day period these students did not receive any change to the existing instructional classroom procedures. They began each 45 minute class with a warm-up problem which consisted of basic math problems to get the students focused in on the lesson to be covered in the class time. The warm-up was presented on the board and students had to copy it down in their notebook and solve, on the overhead and students had to copy it down in their notebook and solve, or a handout. The new material was covered using an overhead projector with transparencies of notes and problems that students were to copy into their notebooks. A few problems were assigned in class for the students to try before homework was assigned.

Procedures of the Experimental Group

The experimental group which consisted of 13 students, received the traditional lecture oriented instruction along with CAI. During the 31 school day period these students were moved into a math computer lab which consisted of 22 computers. These computers were networked with math computer software. The software which the experimental group used was EWT (Early Warning Test - software for math students which presented math material found on the 8th grade Early

Warning Test), HSPT for Success (High School Proficiency Test - software for math students which presented math material found on the 11th grade High School Proficiency Test) and Algebra Blaster (Pre-Algebra and Algebra I problems). The 45 minute class was conducted by assigning a student to a computer that they had to go to at different times during the class period. Some days I started class with a warm-up problem to get the class lesson started by using a computer software problem. These warm-up problems tended to be open-ended questions which were obtained through the HSPT For Success Program. (See Appendix, page). Students were asked to read the problem from the computer monitor and answer them on a worksheet. After students had time to work individually on the answer I asked students to tell me what answer they had obtained. We discussed this and then the students were told what key to press to obtain the answer the program had given. The software package allowed for the students to obtain a hint to the answer if they were confused. Other days I presented the warm-up on the board then had the students go to their assigned computer and work on a section from the EWT software package or HSPT For Success software package. When working in those software packages I told the students what area they were to work on. For both packages the areas that were covered were: numerical operations, measurement and geometry, patterns and functions, data analysis, and fundamentals of geometry. When working in these areas students were presented with 10 multiple choice problems. I had students number their worksheet and show their work and choice of an answer. As they selected an answer to each multiple choice problem the computer told them if their response was correct or incorrect. If it was incorrect the program gave the correct answer and an explanation. At the completion of the 10 multiple choice problems the program provided the students score and the students were to record if each problem was correct or incorrect by placing a check mark next to the problems that were incorrect. Students had to also record their total score out of ten problems at the top of the

worksheet. If students completed the assigned work before the rest of the class was completed, I had the student(s) work on the Algebra Blaster software package. This program contained pre-algebra and algebra problems. After students concluded the work on the computer their worksheet was placed in a folder which was kept in the classroom. The experimental group and the control group both received the same lesson. The new material was covered using an overhead projector with transparencies of notes and problems that the students were to copy into their notebooks. A few problems were assigned in class for the students to try before homework was assigned.

CHAPTER 4
Analysis of the Data

Introduction

The data obtained by a pre-test and post-test administered to 25 basic mathematics students at Washington Township High School located in Sewell, New Jersey is described in this chapter. The intent of the tests were to determine the effectiveness of computer assisted instruction in the basic mathematics curriculum.

Data analysis was performed and a t-test was administered to determine significance. The summary is reported in narrative and table form.

Results of the Tests

Table 1 shows a comparison of pre-test scores of the control group and the experimental group. There were 25, 9th grade basic mathematics students in the study. The control group consisted of 12 students and the experimental group consisted of 13 students. The mean score for the control group after taking the pre-test was 39. The mean score for the experimental group after taking the pre-test was 36.6. A two-tail t-test was administered and a t-score of -.89 was obtained. This was not significant at the .05 level.

TABLE I

A Comparison of the Pre-Test Scores of the Control Group and the Experimental Group.

	MEAN PRE-TEST SCORE	S.D.
Control Group (n=12)	39	7.3978
Experimental Group (n=13)	36.6	6.1446
t-score = -.89*		

*Not significant at the .05 level

Table 2 shows a comparison of post-test scores of the control group and the experimental group. There were 25, 9th grade basic mathematics students in the study. The control group consisted of 12 students and the experimental group consisted of 13 students. The mean score for the control group after taking the post-test was 35.8. The mean score for the experimental group after taking the post-test was 36.3. A two-tailed t-test was administered and a t-score of .17 was obtained. This was not significant at the .05 level.

TABLE 2

A Comparison of the Post-Test Scores of the Control Group and the Experimental Group.

	MEAN POST TEST SCORE	S.D.
Control Group (n=12)	35.8	8.4113
Experimental Group (n=13)	36.3	6.6506
t-score = .17*		

*Not significant at the .05 level.

As is evident in Tables 1 and 2, there is no significant difference in mean test scores between students who obtained computer assisted instruction (experimental group) to those who were administered the traditional classroom instruction (control group).

CHAPTER 5

Summary, Conclusions, and Recommendations

Introduction

The focus of this study was to determine the effectiveness of computer assisted instruction in the basic mathematics curriculum. The pre-test and post-test were tabulated and the data was analyzed. The findings were evaluated and conclusions were drawn.

Summary of Findings

The data analysis was performed and a t-test was administered and it was found that there was no significant difference in the students who received computer assisted instruction to those who received the traditional method of instruction.

When reviewing Tables 1 and 2, the control group showed a decrease in the mean scores from pre-test to post-test. While the mean scores of the experimental group stayed relatively the same from pre-test to post-test.

Conclusions

It had been stated in the research that was gathered for this study that when computer assisted instruction is used effectively in the classroom it should benefit the students learning process. After evaluating the findings I conducted some research on the word "effectively". In Webster's New World Dictionary (3rd Ed., 1988) they define effectively as producing a definite or desired result.

While performing the 31 day study some problems that arouse were: computers breaking down, the networking of the system did not allow for students to receive a computer printout of work and results, and the shortness of the study (31 days). These factors could have led to the "effectiveness" of the study.

Recommendations

In future studies dealing with computer assisted instruction in the basic mathematics curriculum, the following steps might be explored:

1. Expanding the study to more than 31 days. Which would allow for a more in depth study of this subject.

2. Using a computer lab which is open only for designated classes to come in at a certain scheduled time.

3. Having a computer technician who is available to handle problems with the equipment would be beneficial.

4. Using computer software that allows students to obtain a printout of their work and results.

5. Using computer software that has computer graphics. This would help in getting and maintaining students interest.

6. Having a technology coordinator who takes care of purchasing math software packages that meet the needs that the mathematics teachers are seeking, making sure proper implementation is being used, and that the mathematics department staff is properly trained.

APPENDIX A

PRE-TEST

DIRECTIONS: Work on all problems. Record your answer choices for problem numbers 1-45 on the scan-tron sheet. Problem numbers 46-50 are to be answered on the test paper.

1) 4,793 - 1,749
   a. 6,542
   b. 3,044
   c. 3,224
   d. 3,214

2) 74 x 5,183
   a. 388,725
   b. 430,162
   c. 435,975
   d. 383,542

3) 7.49 + 12.6 + 0.736
   a. 20.826
   b. 88.236
   c. 8.352
   d. 20,826

4) 1,305.72 ÷ 27
   a. 4,836
   b. 483.6
   c. 48.36
   d. 48.06

5) Let a = 3 and b = 5. Evaluate 14a - 2b
   a. 64
   b. 32
   c. 22
   d. 180

6) Express 4 x 4 x 4 x 4 x 4 in exponential form.
   a. 5^4
   b. 1024
   c. 4^5
   d. 4.5

7) Express 524,800 in scientific notation.
   a. 5.248×10^5
   b. 5.248×10^{-5}
   c. 52.48×10^4
   d. 5248×10^2

8) Express $8^4 \times 8^3$ in exponential form.
   a. 8
   b. 8^{12}
   c. 8^6
   d. 8^7

9) Express $x^9 \div x^5$ in exponential form.
   a. x^{13}
   b. x^3
   c. x^{40}
   d. x^{45}

10) 2 x (10 - 6) + 9 =
   a. 23
   b. 17
   c. 26
   d. 16

11) Dawn puts $8 into her savings account in June. $12 in July, $16 in August. If Dawn continues this pattern, how much money will she put into her account in December?

a. $4 b. $28
c. $32 d. $36

12) Express 5/8 as a decimal.

a. 0.625 b. 1.6
c. 0.5 d. 5.8

13) The prime factorization of 340 is

a. 10 x 34 b. 1 x 340
c. $2^3 \times 5^2 \times 17$ d. $2^2 \times 5 \times 17$

14) The GCF of 9 and 12 is

a. 108 b. 36
c. 3 d. 21

15) The LCM of 4 and 5 is

a. 20 b. 1
c. 60 d. 9

16) Express 0.65 as a fraction in lowest terms.

a. 65/100 b. 65%
c. 13/20 d. 3/5

17) Compare 3/8____2/5

a. < b. >
c. =

18) Compare 1/3____$0.0\overline{3}$

a. < b. >
c. =

19) Write 2.45×10^{-5} in standard form.

a. 245,000 b. 24,500
c. 0.0000245 d. 0.000245

20) 1/3 + 4/7

a. 5/10 b. 1/2
c. 5/21 d. 19/21

21) 5 1/6 - 2 5/8

a. 2 13/24 b. 7 19/24
c. 3 11/24 d. 2 3/8

22) 4 1/2 x 2 2/3

a. 7
b. 12
c. 8 1/3
d. 7 1/6

23) 7/12 ÷ 3/4

a. 7/16
b. 9/7
c. 3/7
d. 7/9

24) 36 in = _____ ft

a. 2
b. 5
c. 3
d. 12

25) 7 lb = _____ oz

a. 84
b. 56
c. 112
d. 16

26) 58 m = _____ cm

a. 580
b. 5.8
c. 0.58
d. 5800

27) 872 mg = _____ g

a. 0.872
b. 8.72
c. 87.2
d. 8720

28) 3 lb 9 oz
+ 8 lb 8 oz

a. 12 lb 6 oz
b. 12 lb 1 oz
c. 11 lb 1 oz
d. 11 lb 6 oz

29) Express 0.00000531 in scientific notation.

a. 5.31×10^{6}
b. 53.1×10^{7}
c. 5.31×10^{7}
d. 5.31×10^{-6}

30) Simplify 4(5 + a)

a. 20 + 4a
b. 20 + a
c. 9 + a
d. 20a

31) $(3 + 8)^{2} \times 4$

a. 88
b. 192
c. 484
d. 448

32) Order 2, -6, 7, 0, -4 from least to greatest.

a. -4, -6, 0, 2, 7
b. -6, -4, 0, 2, 7
c. 7, 2, 0, -4, -6
d. 7, 2, 0, -6, -4

HEIGHT IN INCHES

60	63	66	70
64	58	68	68

Use the data in the table above for questions 33 and 34.

33) What is the median height?

a. 58 in
b. 65 in
c. 63.375 in
d. 63.5 in

34) What is the range in heights?

a. 12 in
b. 13 in
c. 58 in
d. 70 in

35) Compare $|-3|$ ____ $|2|$

a. >
b. <
c. =

36) $-7 + -6 =$ _____

a. -1
b. 1
c. -13
d. 13

37) If the diameter of a circle is 25 m what is the radius?

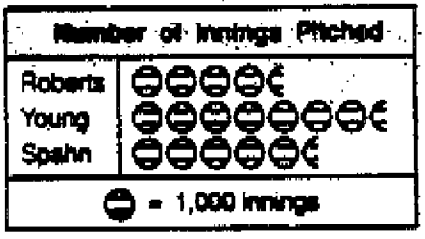
a. 12.5 m
b. 12 m
c. 5 m
d. 5.5 m

38) $-3 - (-9) =$ _____

a. 6
b. -11
c. -6
d. 11

39) $13 - 18 =$ _____

a. -31
b. -5
c. 31
d. 5



40) About how many more innings did Young pitch than Roberts?

a. 3,000
b. 2,000
c. 1,000
d. 3

41) 7×-5

a. 35 b. 2

c. -2 d. -35

42) Find the mode for 32, 25, 24, 25, 30, 24, 25

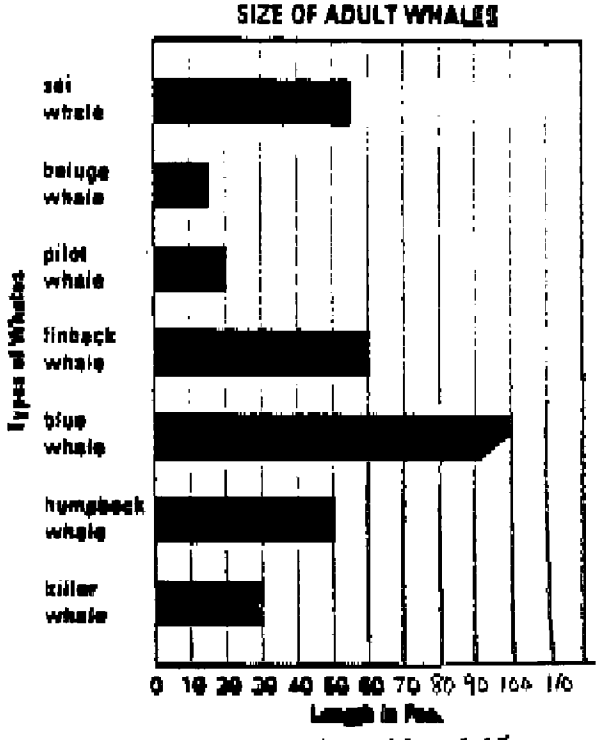
a. 26.4 b. 24

c. 24.5 d. 25

43) $-20 \div -5$

a. -4 b. 25

c. 4 d. -25



Use the data in the above graph for questions 44 and 45..

44) What is the diffference in length between the largest whale and smallest whale?

a. 85 feet b. 70 feet

c. 80 feet d. 75 feet

45) About how many times greater in length is the finbach whale than the beluga whale?

a. 2 times b. 4 times

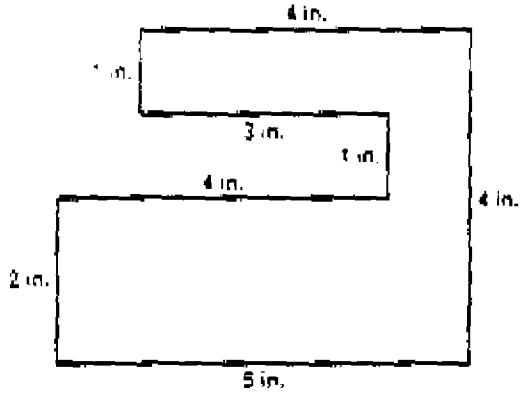
c. 3 times d. 5 times

Part 2 - HSPT Math 9
Mid-Term Exam

Name_____ Date_____

DIRECTIONS: Solve questions 46-50 and write the answer on the line provided.

46) Find the perimeter.



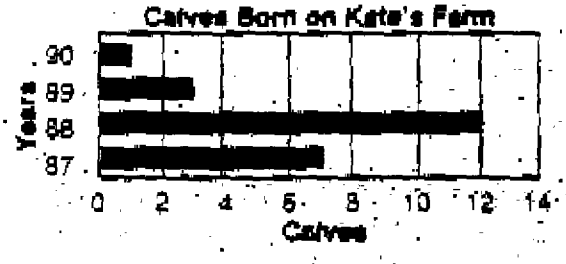
perimeter = _____

47) Joe's test scores were: 92, 85, 95, and 80.
Find the mean.

Mean = _____

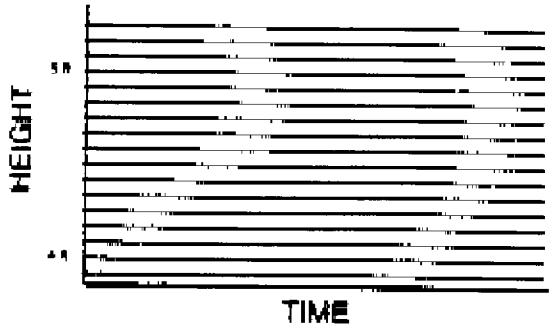
48) Use the data in the table below. How many more births were there in 1987 than in 1990?

answer = _____

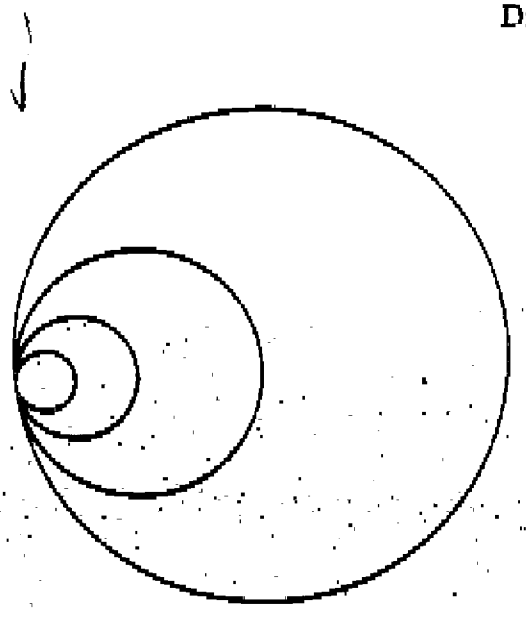


49) Sketch a graph on the axes below that shows the following situation.

The students in a school planted a tree on Arbor Day. The tree was 4 feet tall. It grew 3 inches that summer. During the next winter, it didn't grow at all. The following summer it grew 5 inches. Graph the growth of the tree from the time it was planted to the end of the second summer.



50) Look at the figure below. Each circle has a diameter twice the size of the smaller circle. The diameter of the largest circle is 36 units. What is the diameter of the smallest circle? Diameter = _____



APPENDIX B

POST TEST

Name: _____

Directions: Work on all problems. Record your answer choices for problem numbers 1-45 on the scantron sheet. Problem numbers 46-50 are to be answered on the test paper.

1) $4x + 7 = 23$
a. 4 b. 9
c. 10 d. 5

2) $3:2 = s:50$
a. 50 b. 15
c. 75 d. 100

3) $-9 - 4 =$
a. -5 b. -13
c. 5 d. 13

4) The original amount was $535 the new amount is $642. What is the percent of increase
a. 17% b. 20%
c. 0% d. 50%

5) Write a symbol for 
a. $\overline{GH}$ b. $\overleftrightarrow{GH}$
c. $\overleftarrow{GH}$ d. $\overrightarrow{GH}$

6) Two angles that add up to 180° are called
a. Complementary angles b. Adjacent angles
c. Vertical Angles d. Supplementary Angles

7) Express 38% as a decimal
a. 38 b. .0038
c. 0.38 d. 3800

8) A triangle has three angles. The measure of angle 1=53°, the measure of angle 2=92° the measure of angle 3 = _____
a. 35° b. 5°
c. 88° d. 128°

9) An equilateral triangle can also be a right triangle.
a. True b. False

10) The width of a dining room floor in a scale drawing is 7in. The actual width is 35ft What is the Scale of the floor plan?
a. 1in: 5ft b. 1 in: 2ft.
c. 7in: 35 ft d. 2 in: 1 ft

11) The scale drawing is 1 inch: 5 ft. Find the drawing length that would be used to represent an actual length of 40 ft

a. 2 in
b. 8 in.
c. 120 in.
d. 6 in.

12) Express 0.7 as a percent.

a. 7%
b. 0.7%
c. 70%
d. 700%

13) 14 is what percent of 80?

a. 17%
b. 6%
c. 7.5%
d. 20%

14) 22% of 45 is

a. 990
b. 99
c. 9.9
d. 90

15) Last week a coat at Lacy's cost $200. The week it is on sale for $175. What is the percent of the **decrease**?

a. 50%
b. 12.5%
c. 0.125%
d. 25%

16) 364 is 7% of what number?

a. 52
b. 25.48
c. 254.8
d. 5200

17) A watch is on sale for 25% off of $149.99. What isthe sale price?

a. $37.50
b. $37.49
c. $112.49
d. $112.50

18) What percent of 140 is 28?

a. 20%
b. 25%
c. 2%
d. 0.2%

19) Round 0.093 to the underlined place-value position.

a. 0.09 b. 1.0
c. 0.1 d. 0.08

20) Estimate 0.73 x 4

a. 28 b. 2.8
c. 0.28 d. 4

21) Find the value of 5 x (3 + 4.2) - 6.2

a. 13.2 b. 30
c. 29.8 d. 30.2

22) Add 4.6 + 17 + 0.83

a. 1.46 b. 21.33
c. 14.6 c. 22.43

23) Subtract 0.568 - 0.393

a. 0.175 b. 21.33
c. 0.23 d. 22.43

24) What is the perimeter of a rectangular yard that is 24 feet wide and 36 feet long?

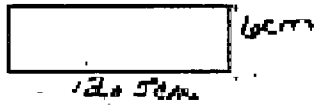
a. 60 ft b. 144ft
c. 96ft d. 120ft

25) Divide 43.6 ÷ 1000

a. 0.0436 b. 0.436
c. 436,000 d. 43,6000

26) Find the area of the rectangle.

a. 75cm^2 b. 18.5 cm^2
c. 37cm^2 d. 72.5 cm^2



27) Find the mean. Round to the nearest tenth 14, 13, 10, 9, 16

a. 12.4 b. 12
c. 10.0 d. 12.5

28) Find a fraction equivalent to 3/8.

a. 15/40 b. 3/4
c. 6/4 d. 12/16

29) Simply the fraction 27/54

a. 1/2
b. 1/3
c. 9/18
d. 13/27

30) Add. 13 1/2 + 7 2/3

a. 22 1/2
b. 20 1/6
c. 21 1/3
d. 21 1/6

31) Subtract 9-5 3/4

a. 3 3/4
b. 3 1/4
c. 4 1/4
d. 4 3/4

32) Multiply 5 5/6 x 2 4/5

a. 17 2/5
b. 4 2/3
c. 3 1/2
d. 16 1/3

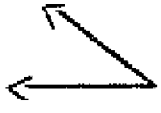
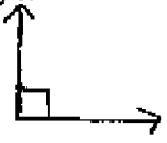
33) Divide 3 1/2 $\div$ 3/4

a. 5 1/2
b. 4 2/3
c. 2 5/8
d. 1 2/3

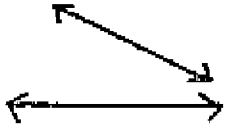
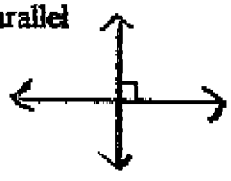
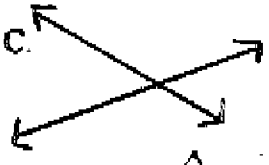
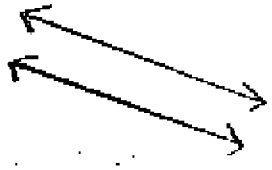
34) Change 0.35 to a fraction.

a. 1/3
b. 1/35
c 7/20
d. 1/4

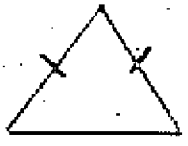
35) Find an example of an obtuse angle.

A. 
B. 
C. 
D. 

36) Find the pair of lines that are parallel

A. 
B. 
C. 
D. 

37) Which best classifies this triangle?



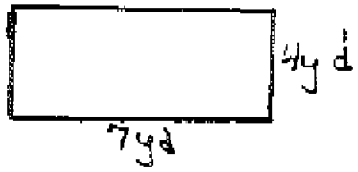
a isosceles
b. equilateral
c. obtuse
d. right

38) Complimentary angles are two angles whose sum is _____

a. 180°
b. 90°
c. 45°
d. 100°

40) Find the total cost of carpeting the rectangular room if carpet costs $16.50 per square yard.

a. $181.50
b. $4158.00
c. $462.00
d. $44.50



41) What percent of 16 is 4?

a. 25%
b. 100%
c. 4%
d. 50%

42) Solve the proportion $\frac{2}{5} = \frac{7}{x}$

a 17 1/2
b. 2 4/5
c. 1 3/7
d. 3

43) Find 35% written as a fraction in simplest form.

a. 1/4
b. 1/3
c. 5/7
d. 7/20

44) Find 5/8 written as a percent.

a. 5%
b. 50%
c. 625%
d. 62.5%

45) Find 9.3% written as a decimal.

a. 0.93
b. 0,093
c. 9,3
d. 0.0093

Part 2 - HSPT Math 9
Final Exam

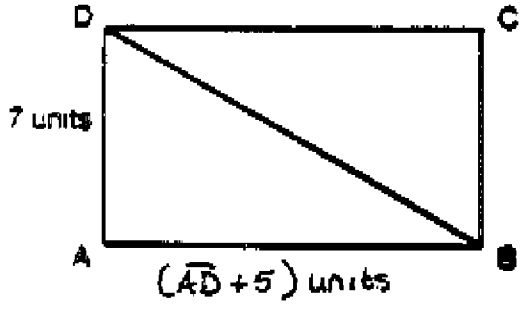
Name _____ Date _____

DIRECTIONS: Solve questions 46-50 and write the answer on the line provided.

46) A flag pole is 15 feet 6 inches tall. How many inches of rope will you need to reach from the bottom of the pole to the top?

Answer = _____

47) What is the area of triangle ABD?



Answer = _____

48) Draw a picture of a pentagon.

Answer = _____

49) The formula for area of a rectangle is A = lw, where l = length and w = width. A rectangle has an area of 336 cm^2 and a width of 14 cm. Find the length of this rectangle.

Answer = _____

50) Find the unknown

Answer = _____

APPENDIX C

HSPT FOR SUCCESS

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INSTRUCTIVISION

OPEN-ENDED QUESTION

OPEN-ENDED QUESTION

At West High School, test grades are uniformornly scored using at 0 to 100 range. Tracy scores 90,78, and 84 on her first three math tests. After taking a fourth test, what is the lowest possible average that Tracy can achieve?

What is the highest possible average she can achieve?

Explain how you found your answer.

EXPLANATION

If Tracy were to receive a zero on her fourth test her average would be

$$\frac{90 + 78 + 84 + 0}{4} = 63\%$$

If Tracy were to receive a hundred on her fourth terst her average would be

$$\frac{90 + 78 + 84 + 100}{4} = 88\%$$

APPENDIX D

HSPT FOR SUCCESS

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INSTRUCTIVISION

SKILL BUILDERS

IV. DATA ANALYSIS

Gina's Pizza is having a contest for free pizza pies. From Monday through Friday customers are asked to fill in a coupon. On Friday, Gina will draw five coupons, and the winners will each get a pizza. The number of customers entering on the five days is 17, 19, 23, 15, and 26. If you entered the contest, what is the probability of winning a pizza?

(A) 5%
(B) 10%
(C) 20%
(D) 25%

V. ALGEBRA

Evaluate 3a + 1 + 5 B-6 if a = 4 and b=3

(A) 2
(B) 10
(C) 14
(D) 22

I. NUMERICAL OPERATIONS

10 *pi* is between _____.

(A) 20 and 30
(B) 30 and 40
(C) 40 and 50
(D) 50 and 60

II. PATTERNS

VIDEOVIDEOVIDEO.....
If this pattern is continued, what symbol will be in the 99th position?

(A) V
(B) I
(C) D
(D) E

III. GEOMETRY

Which of these is the measure of an obtuse angle?

(A) 15 degrees
(B) 45 degrees
(C) 160 degrees
(D) 320 degrees

APPENDIX E

EWT SUCCESS

I. NUMERICAL OPERATIONS

Brian collects baseball cards. He keeps his collections in pages of plastic pockets in a looseleaf binder. He fits 24 cards on 3 pages. If he purchases 40 cards at a flea market, how many pages will be need to hold these new cards?

(A) 4
(B) 5
(C) 6
(D) 7

II. MEASUREMENT AND GEOMETRY

A triangle contains two 45 degree angles. What is the measure of the third angle in the triangle.

(A) 180 degrees
(B) 135 degrees
(C) 90 degrees
(D) 45 degrees

III. PATTERNS AND FUNCTIONS

What digit is in the 16th decimal place of the decimal form of 2/3?

(A) 2
(B) 3
(C) 5
(D) 6

IV. DATA ANALYSIS

In the game of BINGO there are a total of 75 BINGO balls as follows: "B" balls numbered 1-15, "I" balls numbered 16-30, "N" balls numbered 31-45, "G" balls numbered 46-60 and "O" balls numbered 61-75. When the cage is spun, the caller randomly selects the first ball. What is the probability that this ball will have the letter "B" on it?

(A) 5/75
(B) 1/15
(C) 5/15
(D) 1/5

V. PRE-ALGEBRA

The equation $4a + 2 = 50$ represents correctly which idea expressed in the following sentences?

(A) 4 more than 2 times a number is 50
(B) 4 times 2 less than a number is 50
(C) 2 less than 4 times a number is 50
(D) 2 more than 4 times a number is 50

Endnotes

[1]Dorothy Varygiannes, "Mathematics Instruction Guide: Linking Classroom Experiences to Current Statewide Assessments" (New Jersey State Department of Education, January 1996) E-1.

[2]Thomas Toch, "Wired for Learning." U.S. News and World Report, 28 October 1991: 76-79.

[3]"Getting Teachers Up to Speed on the Information Superhighway," National Council of Teachers of Mathematics News Bulletin, July/August 1996, p.1

[4]"Standard 4.5," New Jersey Core Curriculum Content Standards for Mathematics, pp.4-18.

[5]Thomas J. Kerr, "Computers in Schools: The Classroom Comeback." School and College, September 1990, p.17.

[6]Kerr et. al., 17.

[7]Kerr et, al., 18.

[8]Jack Price, "Helping Parents Understand Change." National Council of Teachers of Mathematics News Bulletin, March 1996, p. 3.

[9]Allan Collins, "The Role of Computer Technology in Restructing Schools." Phi Delta Kappan, September 1991, p. 28.

[10]Kerr et. al., 21.

[11]Henry J. Baker, "Mathematics and Science Uses of Computers in American Schools," Journal of Computers in Mathematics and Science Teaching. Summer 991, pp. 19-25.

[12]Baker et. al., 20.

[13]Marcia A. Thompson, "Eighth-Grade Achievement Results Announced for International Math Study," National Council of Teachers of Mathematics News Bulletin, December 1996, p. 1.

[14]Tom Morgan, "Using Technology to Enhance Learning: Changing the Chunks," Learning and Leading with Technology, February 1996, pp. 49-51.

[15]R. L. Klatzky (1980), Human Memory: Structures and Process, San Francisco: W. H. Freeman.

[16]Bloom B.S. (ed.), (1956), Taxonomy of Educational Objective: Handbook I. Cognitive Domain, New York: David McKay.

[17]Bloom et. al.

[18]Dave Winans, "Techno Hype-or Help?" National Education Association, November 1996, pp. 4-5.

[19]Winans et. al., 4.

[20]Winans et. al., 5.

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"New Jersey Core Curriculum Content Standards for Mathematics."

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Varygiannes, Dorothy. "Mathematics Instruction Guide: Linking Classroom Experiences to Current Statewide Assessments." New Jersey State Department of Education (January 1996) E-1.