SABBATICAL LEAVE REPORT

ACADEMIC YEAR 1977-78

Submitted by

Donald E. Brook
Mathematics Department
October, 1978

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I want to thank the Board of Trustees and staff at Mount San Antonio College for the opportunity to grow in my professional subject matter area. The 1977-78 academic year spent at the University of Montana was a fruitfull and rewarding adventure both professionally and psychologically. The course work completed is listed below and an official university transcript is included in Appendix A.

Fall Quarter (1977-78)

1. Operations Research (Math 314) . . . . 3 units
2. Mathematical Statistics (Math 341) . . . . 3 units
3. Introduction to Programming (Computer Science 101) . . . . 4 units

Winter Quarter (1977-78)

1. Operations Research (Math 315) . . . . 3 units
2. Mathematical Statistics (Math 342) . . . . 3 units
3. Fortran Programming (Computer Science 103) . . . . 3 units

Spring Quarter (1977-78)

1. Operations Research (Math 316) . . . . 3 units
2. Mathematical Statistics (Math 343) . . . . 3 units
3. Computer Simulation (Computer Science 373) . . . . 3 units

EVALUATION OF OPERATIONS RESEARCH

The Operations Research Class gave me an opportunity to study the applications of mathematics in many broad and unrelated disciplines. My previous academic background, both undergraduate and graduate study had focused on mathematical theory. Mathematical applications were motivational sidelights to be mentioned in passing. In contrast, instructors for Math 314 centered around problems taken from business and management disciplines. Mathematics was used as a tool in problem solving. Techniques for mathematical modeling were studied as outlined in Appendix B.

A large percentage of the students who take mathematics at Mount San Antonio College are not math majors, so my exposure to current work in applications of mathematics will enrich my teaching.

Recent developments in mathematics and particularly in its applications have given a strong impetus to graph theory. The type of graphs studied in Math 314 were not the traditional graphs of lines and curves but rather the type of drawings associated with organizational flow charts, electrical circuits, maps, etc. In fact, the most famous graph problem is the "four color map conjecture" (just recently proved true). Graph theory now makes its appearance in such diverse fields as economics, psychology, and biology.

The second quarter of Operations Research, sometimes called Management Science, centered around the topic of linear programming. This topic is introduced in our College Algebra Course (Math 1 or Math 1-C) currently taught at Mt. San Antonio College so that further, in depth, study has made me a better authority and more up to date on current uses of this topic. The use of computers to aid in the tedious calculations will be beneficial in my instruction when Mt. San Antonio College upgrades its computer system to include terminals for instructional use.

The third quarter of Operations Research, sometimes referred to as Industrial Engineering, developed the probabilistic concepts of Decision Theory, Stochastic Processes, and Queuing Theory. The instructor of the course showed how he has used these concepts to solve such unrelated problems as student registration, school busing, and farming techniques. The interactive computer system at the University of Montana put the solutions to these problems within the realm of possibility. When instructors are working and solving actual problems, it makes the students stop and consider that maybe Math is useful after all.

EVALUATION OF MATHEMATICAL STATISTICS

My previous background in statistics was limited to one lower division course taken in the late fifties, plus what I could pick up from math formulas. When teaching statistics, I felt like a piano teacher teaching beginning piano having only taken beginning piano myself. The theory covered in this course at the University of Montana has given me a broader base and better understanding of what my Math 13 students at Mt. San Antonio College will encounter as they prepare for entrance to a four year college. More than one-half of the topics listed in Appendix C are introduced (minus the theory) in the Math 13 course here at Mt. San Antonio College. Not only will I be a better, more confident teacher of statistics, but textbook selection will be based on a broader understanding of what is now being required at the universities.

It is very likely that emphasis in teaching introductory statistics will switch from descriptive to inferential statistics as more students purchase hand held calculators with preprogrammed statistical subroutines. My work at the University of Montana prepared me for this change and also gave me insight into the more far reaching realm of interactive computing. As more and more companies and corporations go to interactive computing, our students will be expected to interpret the volumes of data organized and stored by computers.

EVALUATION OF COMPUTER SCIENCE COURSES

As an undergraduate in the fifties, I attended four years at an institution of higher learning without having even seen a computer face to face, much less know how to operate one. As a graduate student in the sisties, I continued my studies in pure mathematics still ignorant of the then blossoming discipline of computer science. As a mathematics teacher in the seventies, I came to the stark realization that I was becoming obsolete. The vast majority of my students were entering non-math disciplines which required them to know something about computer science. Another concern was the fact that I was not prepared to teach the Fortran course offered in my very own Mathematics Department at Mt. San Antonio College.

Humbled by my deficiencies in computer science, I enrolled in "Introduction to Programming" (Computer Science 101) at the University of Montana and started what proved to be a fascinating year of computer involvement. A course outline for Computer Science 101 is in Appendix D. This course would have been more appropriately named BASIC since the whole quarter was devoted to learning the BASIC language. But why learn Basic? The answer is multifaceted. Basic is a problem solving language that is conversational in form and easy to learn. It has wide application in the scientific, business, and educational communities. The Basic language can be used to solve both simple and complex mathematical problems from the user's terminal and is particularly suited for timesharing. I became one of many students from different kinds of academic disciplines who, with no previous computer science background, began commanding results from the computer and getting them. Just as it's not necessary to know mechanical laws for automobile engines to drive one, so too it wasn't necessary to learn the theory of computers to start making a full fledged computer work for us. The anticipated benefits for Mt. San Antonio College as a result of my taking the course depend on what kind of computer system is eventually adopted for student and/or instructional use. But even assuming the worst i. e. I never get to use a computer terminal at Mt. San Antonio College, the college will benefit from my relating to students that perfection is still a useful goal. Many times students do poorly in algebra because of their carelessness with positive and negative signs and chidings from the instructor only prompt student comments like "I'll never use this anyway." This type of self-fulfilling prophesy can be countered with the fact that a large percentage of them will end up using computers in one way or another and they will quickly learn that a misplaced sign, comma, or any other symbol, will leave them facing a computer error message and a boss that won't understand their backlog of work.

With a mastery of the Basic language under my belt, I was ready to tackle the more advanced language of FORTRAN (Fortran Programming course outline is in Appendix D). FORTRAN is an algorithmic language in common use and most compilers have a FORTRAN compiler. As mentioned earlier in the report, the Mathematics Department at Mt. San Antonio College offers a course in Fortran Programming so my enthusiasm was not only for content but also on teaching techniques. The first two weeks of Computer Science 103 was spent learning how to use the Fortran language in conjunction with a card reader. I experienced the frustration of operating a key punch machine and submitting my program cards to Batch and waiting for results. This process was inevitably followed by the debugging blues and a renewal of the whole demeaning process. After being duly initiated into computer science our instructor gave us the privilege of learning Fortran via an interactive computer system. It felt like the difference between the horse and buggy compared to the automobile. The class progressed much faster and learned more than it could have under the old system. I sincerely hope that by the time I teach Fortran at Mt. San Antonio College that we will be using an interactive computer system rather than the old holey card deck.

After learning two computer languages it seemed worthwhile to learn how computers are used by various disciplines. For this reason I enrolled in "Computer Simulation" (Computer Science 373) and have included a course outline in Appendix D. We studied simulation of physical, social, and mathematical experiments and I had a chance to use the simulation techniques in a statistics experiment related to my Math 343 course. I was able to simulate a probablistic decision theory problem without involving any real deep mathematical theory. This technique would work very well with our lower division students at Mt. San Antonio College. Many of the techniques covered in Computer Science 373 would be very useful for teaching our students in Elementary Statistics (Math 13) taught at Mt. San Antonio College. These simulation techniques have the advantage of not requiring advanced calculus for their formulation but the problems are relevant enough to be considered important.

The remainder of my sabbatical leave obligation involved a direct benefit to the students of Mt. San Antonio College interested in improving their algebra skills. Over the past few years I have written scripts and produced visual material aimed at the creation of video tapes to cover the entire elementary algebra course content. After completing production of these video tapes, I needed time to write a course outline syllabus and worksheets to compliment the video tapes. These documents have been included in Appendix E, F, and G, respectively.

SUMMARY

The sabbatical gave me a chance to build and update my subject matter knowledge as pointed out in the previous paragraphs. But other more subtle benefits should be reported. After returning to the role of student for a year and then coming back to teach, I find myself emphasizing with the students situations more so than before I went on sabbatical. After having both good and poor professors at the University of Montana, I find myself trying harder to do a better job from the students point of view. I had the opportunity to be an ambassador for junior colleges and Mount San Antonio College in particular. I participated in a colloquim as a speaker on Big Sky versus Big City community colleges and dispelled many misconceptions about California community colleges.

Looking back at a very busy year, how do you put a price tag on the benefits for Mount San Antonio College? Is a better statistics teacher worth X more dollars? Is an informed mathematics instructor, knowledgeable about computers in education worth Y more dollars? Are video worksheet materials worth Z more dollars? What is the value placed on excellence? Mount San Antonio College has built a reputation on excellence that is priceless, so I will not attempt to attach X + Y + Z dollars to the benefits to the college for my sabbatical but rather thank those responsible for making it possible and reassure them that I will continue working to uphold Mount San Antonio College's excellence.

APPENDIX A

SABBATICAL LEAVE REPORT

ACADEMIC YEAR 1977-78

Submitted by

Donald E. Brook
Mathematics Department
October, 1978

Student Number 18200774
Name BROOK, DONALD EDWIN
M ☒ F ☐
Home Address 2083 SALTO
HACIENDA HEIGHTS, CA 91745

Major

Birth Date and Place 7 JULY 1938
LOS ANGELES, CALIFORNIA
Parent or Guardian RULON E. BROOK
Parent's Address 14301 CORNISHCREST
WHITTIER, CA. 91745

Entered 9-26-77
From: CALIFORNIA HIGH SCHOOL
Located at SHITTIER, CALIFORNIA
Date Graduated JUNE 1956 Rank in Class
☐ resident ☒ non resident

Degree and Major Date

GPA Rank

Completed requirements for regular standard teaching certificate.
Date , Major , Minor

UNIVERSITY OF MONTANA—Missoula, Montana 59801

NO OTHER PERSON MAY HAVE ACCESS TO THIS INFORMATION WITHOUT WRITTEN CONSENT OF THE STUDENT.

Official if signed and sealed Honorable dismissal granted

Course & No.	TITLE	CR	GR	PT
ADMIT GRAD NON-DEGREE - FALL 1977				
18200774 BROOK, DONALD EDWIN				
AUTUMN QUARTER 1977				
CS 101	PROGRAMMING	4	A	16
MATH 314	OPERATIONS RES	3	A	12*
MATH 341	MATH STATISTICS	3	A	12*
CUM 4.00 10 40	Q 4.00 10 40			
CR EARNED 10				
18200774 BROOK, DONALD EDWIN				
WINTER QUARTER 1978				
CS 103	FORTRAN	03	A	12
CUM 4.00 13 52	Q 4.00 3 12			
CR EARNED 13				
MISSOULA WINTER 1978				
MATH 342	MATHEMATICAL STATS	3	B	9*
MATH 315	OPERATIONS RESEARCH	3	A	12*
CUM 3.84 19 73				
CR EARNED 19				
18200774 BROOK, DONALD EDWIN				
SPRING QUARTER 1978				
CS 373	COMP SIMULATION	3	A	12
CUM 3.86 22 85	Q 4.00 3 12			
CR EARNED 22				
MISSOULA - SPRING 1978				
MATH 316	OPERATIONS RESEARCH	3	A	12*
MATH 343	MATHEMATICAL STATIST	3	B	9*
CUM 3.78 28 106				
CR EARNED 28				

*GRADUATE CREDIT

OCT 17 1978

Philip J. Bain
DIRECTOR O...

Course & No.	TITLE	CR	GR	PT

*GRADUATE CREDIT

APPENDIX B

SABBATICAL LEAVE REPORT

ACADEMIC YEAR 1977-78

Submitted by

Donald E. Brook
Mathematics Department
October, 1978

OUTLINE FOR OPERATIONS RESEARCH
(Synthesized from class notes)

I. First Quarter (Math 314)

A. Elements of Mathematical Modeling
1. Primitive Problem
2. Simplification and Verbal Model
3. Translation and Math Model
4. Solution Techniques
5. Verification and Interpretation

B. Graph Theory
1. Planar and Connected Graphs
2. Euler and Hamiltonian Paths
3. Spanning Tree
4. Matchings (Bipartite and Maximal)
5. Directed Graphs

C. Algorithms
1. Kruskel's - Minimal Spanning Tree
2. Matching
3. Dykstra's - Shortest Path

II. Second Quarter (Math 315)

A. Linear Programming
1. Geometric Interpretation
2. Types of Solutions
3. Simplex Method
4. Two Phase Method

B. Integer Programming
1. Branch and Bound Algorithm
2. Dakin's Algorithm
3. Use of Integer Programming in Model Formulation

C. Use of Computer for Algorithms

III. Third Quarter (Math 316)

A. Boysian Decision Theory
1. Laplaces Criterion
2. Wald Criterion
3. Hurwicz Criterion
4. Savages Criterion

Outline for Operations Research (Continued)

B. Stochastic Processes
   1. Discrete Time- finite state
   2. Discrete Time - continuous state
   3. Finite Continuous Time - discrete state
   4. Markov Chains

C. Queuing Theory
   1. Poisson Arrivals
   2. Exponential Service
   3. Deterministic

ARPENDIX C

SABBATICAL LEAVE REPORT

ACADEMIC YEAR 1977-78

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October, 1978

OUTLINE FOR MATHEMATICAL STATISTICS

(Synthesized from class notes)

I. First Quarter (Math 341)

A. Probability
1. Axioms
2. Combinatorial Analysis
3. Conditional Probability and Independence

B. Random Variables
1. Discrete
2. Continuous
3. Jointly Distributed

C. Expectation

II. Second Quarter (Math 342)

A. Limit Theorems
1. Chebyshev's Inequality
2. Central Limit Theorems
3. Law of Large Numbers

B. Estimation with Normal Models
1. Maximum Likelihood Estimation
2. Confidence Intervals
3. Point Estimation and Functions of Parameters
4. Regression

C. Test of Statistical Hypotheses
1. Wilcoxon Test
2. Run Test for Randomness
3. Kolmogorov - Smirnov Goodness of Fit Test
4. Power of a Statistical Test

III. Third Quarter (Math 343)

A. Multivariate Distributions
1. Multivariate Distributions of Continuous Type
2. Bivariate Normal Distribution
3. Sampling from Bivariate Distributions
4. Sample Correlation Coefficient

B. Chi-Square Tests of Models
1. Testing Probabilistic Models
2. Comparisons of Several Distributions
3. Contingency Tables

APPENDIX D

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OUTLINE FOR COMPUTER SCIENCE COURSES

(Synthesized from class notes)

I. Introduction to Programming (Computer Science 101)

A. Computer Components
1. Buffer
2. Terminal
3. Storage

B. BASIC - (computer language)
1. Login procedures (Password)
2. Program Storage
3. Flow Charts

C. BASIC - syntax
1. If statements
2. Loops
3. Matrix Format
4. Files
5. Astrings
6. Goto Statements

II. Fortran Programming (Computer Science 103)

A. Fortran Program Cards

B. Use of Edit Language

C. Fortran Programming
1. Loops
2. Decision Statements
3. Subprograms
4. Declarations
5. Files

III. Computer Simulation (Computer Science 373)

A. System Simulation
1. Monte Carlo Method
2. Nunerical Computation Techniques for Continuous and Discrete Models
3. Distributed Lag Models
4. Cobweb Models

B. Continuous System Simulation
1. Differential Equations
2. Analog Computers
3. Hybrid Computers
4. Digital - Analog Simulators

Outline for Computer Science Courses (Continued)

C. System Dynamics
   1. Exponential Growth and Decay Models
   2. Modified Exponential Growth Models
   3. Logistic Curves
   4. Representation of Time Delays

D. Probability Concepts in Simulation
   1. Stochastic Variables
   2. Discrete Probability Functions
   3. Continuous Probability Functions

APPENDIX E

SABBATICAL LEAVE REPORT

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Mathematics Department
October, 1978

COURSE OUTLINE FOR ELEMENTARY ALGEBRA (MATH 51VT)

0. Introduction

I. Operations with Signed Numbers
   - A. Addition and Subtraction
   - B. Multiplication and Division
   - C. Classification of Real Numbers
     1. Counting Numbers
     2. Integers
     3. Rational Numbers
     4. Irrational Numbers

II. Basic Laws of Algebra
   - A. Commutative Laws for Addition and Multiplication
   - B. Associative Laws for Addition and Multiplication
   - C. Distributive Law
   - D. Laws for Zero and One

III. Introduction to Algebra
   - A. Variables
   - B. Like and Unlike Terms
   - C. Coefficients

IV. Parentheses and Order

V. Solving Equations
   - A. Principles for Solving Equations
     1. Addition Principle
     2. Multiplication Principle
     3. Use of Both Addition and Multiplication Principles
     4. Principle of Zero Products
   - B. Equations with Parentheses
   - C. Literal Equations
   - D. Introduction to Word Problems

VI. Polynomials
   - A. Introduction
   - B. Arithmetic of Polynomials
     1. Addition and Subtraction
     2. Multiplication
     3. Special Products
   - C. Factoring Polynomials
     1. Common Factors
     2. Trinomials
     3. Difference of Squares
     4. Solution of Special Quadratic Equations

VII. Graphs and Systems of Equations

A. Graphs
   1. Cartesian Plane
   2. Graphs of Lines
   3. Graphs of Parabolas

B. Use of Graphs
   1. Visual Representation of Solutions
   2. Problem Solving
   3. Solution of Systems of Equations

C. Systems of Equations
   1. Solutions by Graphing
   2. Addition - Subtraction Method
   3. Substitution Method
   4. Use in Problem Solving

VIII. Review of Polynomials

IX. Fractional Expressions and Equations

A. Introduction to Algebraic Fractions

B. Basic Operations
   1. Reducing Fractions
   2. Multiplication and Division
   3. Lowest Common Denominator

C. Complex Fractions

D. Division of Polynomials

X. Radical Expressions

XI. Quadratic Equations

APPENDIX F

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Mathematics Department
October, 1978

COURSE SYLLABUS FOR ELEMENTARY ALGEBRA (MATH 51VT)

O. INTRODUCTION

This syllabus is intended to give you, the student, a preview of what Elementary Algebra is like. It is our hope that this sneak preview will dispell some of the fears that you may have concerning the illusive topic, titled "Elementary Algebra."

I. ADDITION, SUBTRACTION, MULTIPLICATION, AND DIVISION OF SIGNED NUMBERS

One of the first tasks for you to work on will be to familiarize yourselves with the rules for operating with signed numbers (positive and negative numbers). Many students have forgotten some of the necessary arithmetic skills, especially those related to operations with fractions and decimals, so some time will be spent reviewing the basic operations while learning how to add, subtract, multiply, and divide with positive and negative numbers. Emphasis will be placed on intuitive concepts rather than relying heavily on formal rules. Often times, what one says is not what one means. The instructor will attempt to overlook this fault for the sake of performance. Students should concentrate on being able to add, subtract, multiply, and divide positive and negative numbers rather than memorize specific rules with unfamiliar terminology. Student constructed flash cards of problems from the first two homework assignments would make excellent drill for those who feel they need more practice.

II. BASIC LAWS OF ALGEBRA

The title of this section is a bit deceptive. The eleven basic laws you will study are really the basis for arithmetic. But since algebra is an abstract extension of arithmetic we rely heavily on the laws of arithmetic that you have probably taken for granted. Simple concepts such as "3 + 4 is the same number as 4 + 3" are given names so that they can be referred to as the basis for algebraic operations. As you enter the unfamiliar world of algebraic symbols you will feel some security in being able to fall back on the simple reliable laws of arithmetic. Please note the proper spelling of the terminology so that there will be continuity in classwork and homework papers.

In the past, some students have thought of these exercises as time consuming, hoop jumping routines given by fuddy duddy math teachers. But ignorance of the rules is no excuse, whether it be the tax rules set down by the IRS or the rules of arithmetic applied to algebra.

III. INTRODUCTION TO ALGEBRA

This will be the first real dose of algebra in the course. Not only will you be working with the familiar arabic numerals, but now you will begin to see the illusive letter "x". It is at this point that you should begin to apply the basic rules covered in the previous lessons. Algebra can be thought of as a language and one of the first concepts of a language is a word. Babies learn words before they put them into phrases and then sentences. So you, as algebraic babes, will be exposed to the algebraic equivalent of words before going on to phrases and sentences. The first two lessons will be tied together by the third lesson which will set the pattern for the whole course. Your studies of algebra will be like a spiral i.e. old topics will be an interwoven and necessary part of new topics covered later. You will be constantly seeing previous concepts and lessons as a necessary part of new material.

IV. PARENTHESES AND ORDER

At this point in your education you take for granted the grouping of alphabetical letters to form words and words spaced to form phrases. With practice you will be able to recognize algebraic words and phrases just as easily as their english counterparts. Also there are certain agreements that we will make to avoid confusion much in the same vain that we all agree to drive on the right hand side of the road.

There are ambiguities in the english language that are not tolerable in the language of algebra. For this reason, parentheses will be introduced. Let's illustrate with an example. While shopping for a refrigerator you encounter the following sign at a country auction:

GUARANTEED USED APPLIANCES

What is meant by this sign? As a prospective purchaser you think the sign means GUARANTEED (USED APPLIANCES). But the auctioneer might think of the sign as meaning (GUARANTEED USED) APPLIANCES. We will avoid this type of confusion in the language of algebra by adopting specific rules for the use of parentheses.

V. SOLVING EQUATIONS

People who have studied algebra remember that they worked with equations even if they don't remember anything else about the subject. The study of equations is the first broad area in the course where algebraic techniques will be used in the solution of practical problems. The knowledge gained from the previous four sections will be focused to give you insight into how deductive reasoning is used in mathematics. We will start with very elementary equations whose solutions you can visualize without algebraic techniques and work up to more complicated forms. Eventually the techniques will be applied to the manipulation of scientific equations.

VI. POLYNOMIALS

At this point the course will change direction somewhat to build up a background for the use of algebra as a broader tool. To use an analogy, up to this point we have been studying the trees but now we want to study forests. You will be asked to think of algebraic expressions as individual entities and learn how to add, subtract, and multiply them. The arithmetic of polynomials would be an appropriate term for this part of the course.

VII. GRAPHS AND SYSTEMS OF EQUATIONS

It has been said that "a picture is worth a thousand words". In the topic of graphs we will exploit this concept to better understand algebraic relationships. Our studies will be restricted to graphs (pictures) of straight lines and one type of simple, smooth curve. The concept of a graph will then help us to understand systems (more than one) of equations. It will be at this point that we can get more involved with practical applications.

VIII. REVIEW OF POLYNOMIALS

The original introduction to polynomials was restricted to polynomials of one variable (letter like x). This review will incorporate the idea of polynomials with more than one variable (letters like x, y, and z). This section should give students a chance to relate the various algebraic ideas to one another and start to see the interconnections between all the techniques learned so far.

IX. FRACTIONAL EXPRESSIONS AND EQUATIONS

Many students seem to dread the idea of working with fractions because they remember having difficulty working with the concepts. You will be amazed to find how easy fractions are now that you have learned the basic laws which govern numbers. We will first review very simple fractional operations such as:

$$\frac{1}{2}+\frac{3}{4},\quad \frac{1}{2}\cdot\frac{3}{4},\quad \frac{1}{2}\div\frac{3}{4}$$

Once you have remastered these arithmetic fractions, then we can branch out to algebraic fractions and apply the techniques learned to solving fractional equations.

X. RADICAL EXPRESSIONS

Not all numbers are expressible as whole numbers or fractions. This was known as far back as two thousand years ago by the Greeks. Many simple concepts involve the use of radical expressions such as those associated with the square root operation. For example, the length of the diagonal for a square of any integral measure is only expressible as a radical expression. Emphasis will be placed on radicals associated with the square root operation to the virtual exclusion of third, fourth, and fifth roots. As with all the other topics preceding this one, we will rely heavily on the basic laws covered in the first two sections.

XI. QUADRATIC EQUATIONS

Actually you have been solving quadratic equations prior to this section, but they were limited so that the work did not involve radicals. Now that you have completed the section on radicals, it will no longer be necessary to spoon feed you with only non-radical quadratic equations. The practical problems in this section should emphasize the need for the techniques of solving any arbitrary quadratic equation.

XII. CLOSING COMMENTS

The subcategories of the course, as outlined above, will give you a broad enough background for preparation to enter an intermediate algebra course. In intermediate algebra, your knowledge of elementary algebra will be expanded as well as new topics introduced. For example, the idea of an equality (equation) will be expanded to include inequalities. New factoring forms will be introduced and graphs will be expanded beyond straight lines and the smooth curve called a parabola.

APPENDIX G

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Math 51 VIDEO TAPE WORKSHEET

Addition and Subtraction of Real Numbers - Tape 23 (#1)

(20 minutes)

Name ______________________

Instructor ______________________

Class days __________ hours __________

I. Kinds of Numbers

1) List the counting numbers ____, ____, ____, . . .

2) List the integers . . ., ____, ____, ____, ____, ____, . . .

3) What are real numbers ? ______________________

II. Addition of Real Numbers

1) (+3) + (-4) = 2) (-3) + (+4) = 3) (-3)+(-4)= 4) (+3)+(+4)=

5) How do you add two negative numbers? ______________________

6) (-2)+( ) = 8) (-2)+( ) = 10) (+2)+( ) =

7) (-2.3)+( ) = 9) (-2.3)+( ) = 11) (+2.3)+( ) =

12) To add fractions with unlike denominators, you must ______________________

____

13) $(-\frac{3}{4}) + (-\frac{1}{2})$

$(-\frac{3}{4}) + (\quad)$

____ or ____

14) $(-\frac{3}{4}) + (+\frac{1}{2})$

$(-\frac{3}{4}) + (+\frac{1}{2} \cdot \frac{\;}{\;})$ Multiply both numerator and denominator by ____

$(-\frac{3}{4}) + (\quad) =$ ____ or ____

15) $(-\frac{1}{2} \cdot \frac{\;}{\;}) + (+\frac{3}{4})$ Multiply both numerator and denominator by ____?

$(\quad) + (+\frac{3}{4})$

________?

III. Subtraction of Real Numbers

1) One Rule Rewrite subtraction as an addition problem by ______________________

____

2) (-1) - (-3) Subtraction Problem

(-1) + ( ) Addition Problem

?

3) (-1) - ( ) Subtraction Problem

(-1) + ( ) Addition Problem

?

4) (+1) - ( ) Subtraction Problem

(+1) + ( ) Addition Problem

?

5) (+3) - ( ) Subtraction Problem

(+3) + ( ) Addition Problem

?

Math 51 VIDEO TAPE WORKSHEET

Multiplication and Division of Real Numbers - Tape 24 (#2) (20 minutes)

Name ____________________

Instructor ____________________

Class days __________ Hours __________

I Real Numbers

1) All numbers found on the number line are ______________ numbers.

2) The Rational Numbers are ____

____

3) Pi (π) is an ____________________ number.

II Multiplication of Real Numbers

A. Like Signs

1) A positive number times a positive number is a ___________ number.

2) A negative number times a negative number is a ___________ number.

B. Unlike Signs

1) A positive number times a negative number is a ___________ number.

2) A negative number times a positive number is a ___________ number.

C. Examples

1) $(-3)(\quad) =$

2) $(-3)\cdot(\quad) =$

3) $(-3) \times (\quad) =$

4) $(-4)(\quad) =$

5) $(+4)(\quad) =$

6) $(-3.1)(\quad) =$

7) $(+3.1)(\quad) =$

8) $(+\frac{3}{4})(+\frac{1}{2}) \doteq$

$\frac{+3\cdot 1}{+4\cdot 2} =$

9) $(-\frac{3}{4})(\quad) =$

III Division of Real Numbers

A. Three kinds of Division Symbols

B. Rules for Division are the same as rules for ______________________?

C. Examples (show work for #4)

1) $\frac{-12}{-3} =$

2) $\frac{-12}{\quad} =$

3) $\frac{+12}{\quad} =$

4) $\frac{-11.73}{-2.3} =$

5) $\frac{+11.73}{\quad} =$

6) $\frac{-\frac{3}{4}}{\quad} = (-\frac{3}{4}) \div (\quad) = (-\frac{3}{4}) \cdot (\quad)$

$=$ ________ or ________

7) $\frac{+\frac{3}{4}}{-\frac{1}{2}} = (+\frac{3}{4}) \cdot (\quad) =$

8) $\frac{3}{2}$ is an ______________ fraction

9) $1\frac{1}{2}$ is a ______________ Number

10) Is $\frac{3}{2}$ reduced to lowest terms?

Math 51 VIDEO TAPE WORKSHEET

Name________________________

Basic Laws of Algebra - Tape 10 (#3) 17 minutes

Instructor: Mr. Brook

Class days__________Hours______

1. The fact that $3 + 5 = 5 + 3$ is an example of the ________________Law for Additior
2. The fact that $3(5) = 5(3)$ is an example of the _____________ Law for Multiplicatio
3. The fact that $(3 + 5) + 7 = 3 + (5 + 7)$ is an example of the ________________ Law for Addition.
4. The fact that $(2 \cdot 3) \cdot 4 = 2 \cdot (3 \cdot 4)$ is an example of the ________________ Law for Multiplication
5. Distributive Law: $2(3 + 8) = \underline{\ ?\ } \cdot 3 + \underline{\ ?\ } \cdot 8$
6. The opposite of 2 is _______________.
7. The opposite of -2 is ______________.
8. The opposite of -3.7 is _____________.
9. (Any number) + (Its opposite) = __________________.
10. The result of adding opposites is always __________________.
11. The reciprocal of 2 is __________________.
12. The reciprocal of -3 is __________________.
13. (Any number) (Its reciprocal) = ______________.
14. (Any number) + 0 = ________________.
15. (Any number) (1) = ________________.
16. The identity for addition is ________________.
17. The identity for multiplication is ________________.

Write the <u>FULL</u> name of the law illustrated by the following (these are not on the tape)

18. $(3 + 4) + 5 = 5 + (3 + 4)$ ____________________________________
19. $2(3 + 4) = 2 \cdot 3 + 2 \cdot 4$ ____________________________________
20. $5 + 3 \cdot 1 = 5 + 3$ ____________________________________
21. $(3 + 4) + 5 = 3 + (4 + 5)$ ____________________________________
22. $(2 \cdot 3) 4 = 4 \cdot (2 \cdot 3)$ ____________________________________

Math 51 VIDEO TAPE WORKSHEET

Name____________________

Instructor: Mr. Brook

TERMS - Tape 15 (#4) 16 minutes

Class days________ Hours______

1. The basic building blocks of Algebra are ____________________.

2. Numbers and ________________ are terms.

3. The combination of numbers and/or ______________ with only the operations of ____________ and __________ are terms.

4. The expression $x \cdot x \cdot x \cdot x = x^{?}$ because there are four __________ factors of x.

5. The degree of the term $x \cdot x \cdot x$ is _________.

6. The degree of a term is the number of __________ factors in the term.

7. In the term $3x^2$

   a. 3 is the numerical ____________________ of the term.
   b. The literal factors are ________________.
   c. The degree of the term is ________________.

8. $7x$ and $-3x$ are _______________ terms.

9. $-2x$ and $5y$ are ______________ terms.

10. $-8x$ and $-4x^2$ are ____________ terms.

11. $.6xy^2$ and $-7.2xy^2$ are ____________ terms.

12. Combine ____________ terms but don't combine _________ terms.

13. $7x + 3x = (\ ? + ?)\ ? = ?$

14. Combine like terms by adding their ______________________________.

15. How do you combine $4x + 3y$?

16. $1 \cdot x = ?$

17. The numerical coefficient of x is ________________.

18. $4x + x = 4x + ?$
    $= (? + ?)\ ?$
    $= ?$

19. How do you combine $-7xy^2 - 3x^2y$?

20. How do you combine $-7x - 3x$?

Math 51 Video Tape Worksheet

Parentheses and Order

Tape 26 (#5)
17 minutes

Name ______________________

Instructor ______________________

Class Days ____________ Hours ____________

1. $4 + 4 \cdot 2 = ?$

2. $4 + (4 \cdot 2) = ?$

3. $(4 + 4) \cdot 2 = ?$

4. Work multiplication or division before addition and subtraction unless __________ indicate otherwise.

5. $5 \cdot (3 + 2)$

   $5 \cdot ?$

   $?$

6. $3 + (2 \cdot 5)$

   $3 + ?$

   $?$

7. $5(2x) = (5 \cdot 2)x$ because of the ______________ Law for ______________.

   $5(2x) = ?$

8. $5(2 + x) = 5 \cdot 2 + 5x$ because of the ______________ Law.

9. $5 + (2 + x) = (5 + 2) + x$ because of the ______________ Law for ______________.

10. $3[2 - 5(x + 3)] = 3[2 - 5x - 15]$ because of the ______________ Law.

    $= 3[-5x - 15 + 2]$ because of the ______________ Law for ______________

    $= 3[-5x \quad ? \quad]$

    $= \; ? \quad ?$

11. $\{3[x + (2x + 5)] + 2\}\,(4 - 8)$

    $\{3[? + ?\ ] + 2\}\ (\ ?\ )$

    $\{9x + ? + 2\}\ (\ ?\ )$

    $\{9x + ?\ \}\ (\ ?\ )$

    $? \qquad ?$

12. Think of $-(2x + 5)$ as $-1(2x + 5)$ then distribute -1 to get $\underline{\quad ? \quad ? \quad}$

13. Think of $-(3x - 4)$ as $-1(3x - 4)$ then distribute -1 to get $\underline{\quad ? + ? \quad}$

14. Rules for removing parentheses

    a) Plus sign in front of parentheses then __________ parentheses and simplify.

    b) Minus sign in front of parentheses then ______________

    c) Number in front of parentheses then ______________

15. This one is not on the tape. Remove parentheses and simplify. SHOW WORK on back side of this sheet.

    $1 - \{2 - [2(3 + 2 \cdot 4) + 5] \cdot 4\}$

Math 51 Video Tape Worksheet

Solving Equations Using the Addition Principle

Video Tape 52 (#6) 18 minutes

Name ______________________
Instructor ______________________
Class Days ________ hours ________

I. Sentences

A. Algebra, among other things is a ________________.

1) $-3 + 2 = 5$ is a ______________ sentence.
2) $-3 + 2 = -1$ is a ______________ sentence.
3) $x + 2 = 5$ is an ______________ sentence.

B. The values that make a sentence a true statement are called ________________.

C. An equation is an ________________ sentence involving the equal symbol.

D. A solution for $-3x - 7 = 2(x + 4)$ is ______________.

Check $-3(?) - 7 \stackrel{?}{=} 2\,(? + 4\,)$

$? - 7 \stackrel{?}{=} 2\,(\quad)$

$\_\_\_ = \_\_\_$

II. Addition Principle: If $p = a$ then ______________.

III. Solving Equations

A. Solve $x + 4 = -7$

$x + 4 = -7$ ________________________________ Why?
$(x + 4) + ? = -7 + ?$ ________________________________ Why?
$x + [\quad] = -7 + ?$ ________________________________ Why?
$x + ? = -7 + ?$ ________________________________ Why?
$x = -7 + ?$ ________________________________ Why?
$x = ?$ ________________________________ Why?

The solution is ______________________

B. $x + (-3) = 2 - 7$

$x + (-3) + ? = 2 - 7 + ?$

$x + ? = ?$

$x = ?$ The solution is ____________

Check $(\quad) + (-3) \stackrel{?}{=} 2 - 7$

$\_\_\_ = \_\_\_$

C. Solve $x + 3/2 = -5/3$

$x + 3/2 + ? = -5/3 + ?$

$x =$

Check $(\quad) + 3/2 \stackrel{?}{=} -5/3$

Math 51 Video Tape Worksheet

Solving Equations Using the Multiplication Principle

Video Tape 53 (#7) 19 Minutes

Name ______________

Instructor ______________

Class days _____ hrs. _____

I. Multiplication Principle: If p = a then ____________________.

$\frac{-12}{4} = -2 - 1$ so $\frac{-12}{4} + 5 = -2 - 1 + 5$

This is an error on the tape. This is an example of the additio[n] principle - not the mult. princi[ple]

Correction: $\frac{-12}{4} \cdot 5 = (-2 - 1) \cdot 5$ is an example of the Multiplication Principle.

II. Reciprocal of a Number

Number	Reciprocal
3	
$\frac{1}{3}$	
$\frac{-1}{5}$	

Number	Reciprocal
$\frac{3}{4}$	
$1\frac{1}{3}$	

The reciprocal of a negative number is a ______________ number.
(positive or negative)

III. Solving Equations

$3x = -51$	______________	Why?
$?\,(3x) = ?\,(-51)$	______________	Why?
$\{\quad\}\,x = ?\,(-51)$	______________	Why?
$?\,x = ?\,(-51)$	______________	Why?
$x = ?\,(-51)$	______________	Why?
$x =$	______________	Why?

The solution is ________ Check: $3(\quad) \stackrel{?}{=} -51$

$\_\_\_ = \_\_\_$

IV. Dividing is ____________________ by the reciprocal.

$3x = -51$

$\frac{3x}{?} = \frac{-51}{?}$

$x =$

V.

$21 = -2/3x$	______________	Why?
$?\,(21) = ?\,(-2/3x)$	______________	Why?
$?\,(21) = \{\qquad\}x$	______________	Why?
$?\,(21) = ?\,x$	______________	Why?
$?\,(21) = x$	______________	Why?
$? = x$	______________	Why?

The solution is ____________ or ____________

VI.

$-x = 7$

$?\,x = 7$

$-1(?x) = -1(7)$

$1x = ?$

So x = ?

The solution is ____________

Check: $-(?) \stackrel{?}{=} 7$

$\_\_\_ = \_\_\_$

Math 51 Video Tape Worksheet

Solving Equations Using the Addition and Multiplication Principles

Videotape 54 (#8)   20 minutes

Name ______________

Instr. ______________

Class days ________ hrs. ________

A. When solving equations use the ______________ Principle first.

1.) $-3x + 7 = -29$ ______________ Why?

2.) $(-3x + 7) + ? = -29 + ?$ ______________ Why?

3.) $-3x + \{\quad\} = -29 + ?$ ______________ Why?

4.) $-3x + ? = -29 + ?$ ______________ Why?

5.) $-3x = -29 + ?$ ______________ Why?

6.) $-3x = ?$ ______________ Why?

7.) $?\,(-3x) = ?\,(\quad)$ ______________ Why?

8.) $\{\quad\}\,x = ?\,(\quad)$ ______________ Why?

9.) $?\,x = ?\,(\quad)$ ______________ Why?

10.) $x = ?\,(\quad)$ ______________ Why?

11.) $x =$ _____ ______________ Why?

12.) The solution is ______________

B. Get all x terms on one side and all ______________ terms on the other side.

1.) $5x - 3 = -8x$

2.) $-5x + 5x - 3 =$ _______ $-8x$

3.) $-3 = ?$

4.) $-1/13\,(-3) = ?\,(\,?\,)$

5.) $?$ _____ $= x$

6.) The solution is ___________

Check: $5\,(\,?\,) - 3 \stackrel{?}{=} -8\,(\,?\,)$

$? \;-3 \stackrel{?}{=} \;?$

_______ = _______

C. Solve the following equation

$x - 1 = 12 - 3x$

$4x - 1 = ?$

$4x = ?$

$1/4(4x) = ?\,(\,?\,)$ ← Multiply both sides by the __________ of the numerical coefficient of x.

$x =$ _______

Check: $(\quad) - 1 \stackrel{?}{=} 12 - 3\,(\quad)$

$? - 4/4 \stackrel{?}{=} 48/4 - ?$

_______ = _______

Math 51 Video Worksheet

Equations with Parentheses Tape 56(#9) 18 minutes

Name ____________
Instructor ____________
Class days ________ hours ________

THREE RULES FOR REMOVING PARENTHESES

I. $x + (3 - y)$
$x +$ ________

When there is a + sign in front of the parentheses, the parentheses may be removed without any change.

II. $x - (3 - y)$
x ________

When there is a - sign in front of the parentheses, we can remove the parentheses provided we ________ the signs of all terms in the parentheses.

III. $x + 2(3 - y)$
$x +$ ______

When there is a number in front of the parentheses, we can remove the parentheses provided we ________ each term by the number in front of the parentheses. This is an example of the use of the __________ Law.

EQUATIONS WITH PARENTHESES -- Solve $27 = 3(5x - 2)$ Remove the parentheses using the ____________ Law.

$27 = 15x$ ___?
$27 + ? = 15x - ? + ?$

Get all x terms on one side and all non x terms on the other side by adding ________ to both sides.

$? = 15x$
$?(\ ) = ?(15x)$
$? = x$
$? = x$

Multiply both sides by the __________ of the coefficient of x.
Reduce by dividing out like factors of __________.

CHECK: Is ___?___ a solution of $27 = 3(5x - 2)$

$27 \stackrel{?}{=} 3[5(\ ) - 2]$
$27 \stackrel{?}{=} 3(? - 2)$
$27 \stackrel{?}{=} 3(\ )$
$27 \stackrel{?}{=} ?$

HINTS

1. Remove __________________
2. Combine ____________ terms.
3. Get all x terms on __________
4. Get all non x terms on ______
5. Multiply both sides by the __________ of the _____ of x.

Solve $3 - (x + 2) = 5 + (x + 2)$ First remove __________ using appropriate Laws.

$3 - x - 2 = \ ?$

Now combine _______ terms on the left side, then combine ______ terms on the right side.

$1 - x = ?$
$1 - x + ? = \ ?$

Get all x terms on one side of the equation by adding ________ to both sides of the equation.

$1 = 7 + ?$
$? + 1 = ? + 7 + ?$

Get all non x terms on the opposite side by adding __________ to both sides of the equation.

$-6 = ?\ x$
$?(-6) = ?(?x)$

Multiply both sides of equation by the ____________ of the ____________ of x.

Continued on other side!

CHECK: Is -3 a solution of $3 - (x + 2) = 5 + (x + 2)$

$$3 - [(\ ) + 2] \stackrel{?}{=} 5 + [(\ ) + 2]$$

$$3 - (\ ) \stackrel{?}{=} 5 + (\ )$$

$$3 + (\ ) \stackrel{?}{=} ?$$

$$\_\_\_\_ = \_\_\_\_$$

The following equation is not on the tape. Solve $2 - (x - 5) = 5 + 2(x + 2)$

Show At Least Four Steps To Get The Idiot Equation

$$\_\_\_\_\_\_\_\_\_\_ = \_\_\_\_\_\_\_\_\_\_$$

$$\_\_\_\_\_\_\_\_\_\_ = \_\_\_\_\_\_\_\_\_\_$$

$$\_\_\_\_\_\_\_\_\_\_ = \_\_\_\_\_\_\_\_\_\_$$

$$\_\_\_\_\_\_\_\_\_\_ = \_\_\_\_\_\_\_\_\_\_$$

Show your <u>CHECK</u>::

$$2 - [(\ ) - 5] \stackrel{?}{=} 5 + 2\,[(\ ) + 2]$$

$$2 - [? - 15/3] \stackrel{?}{=} 5 + 2\,[? + 6/3]$$

$$6/3 + (\ ) \stackrel{?}{=} 15/3 + ?$$

$$\_\_\_\_\_ = \_\_\_\_\_$$

Math 51 VIDEO TAPE WORKSHEET

Solving Equations Using the Principle of Zero Products

Video Tape 58 (#10) 20 Minutes

Name ____________

Instr. ____________

Class days ________ hrs. ________

1.) If the product of two numbers is zero then what are the numbers? ____________

2.) Principle of Zero Products If a b = c then ____________ or ____________.

3.) If the product of two numbers is one then what are the numbers? ____________

4.) (True or False) If the product of two numbers is one then one of the numbers is one. ____

5.) a = 0 is a sentence or equation. b = 0 is a sentence or equation

a = 0 or b = 0 is a ______________ sentence

6.) Solve $(2x - 5)(x + 4) = 0$

__________ = 0 or __________ = 0 because of the principle of __________

Show the rest of the simplification

__________ or __________

__________ or __________

CHECK: Is 5/2 a solution?

$\{2(\quad) -5\}\{(\quad) +4\} \stackrel{?}{=} 0$

$\{\quad\}\{\quad\} \stackrel{?}{=} 0$

$(\quad)(\quad) \stackrel{?}{=} 0$

Is -4 a solution?

$\{2(\quad) -5\}\{(\quad) +4\} \stackrel{?}{=} 0$

$\{\quad\}\{\quad\} \stackrel{?}{=} 0$

$=$

7.) Solve $0 = 5x(5x + 6)$

__________ = 0 or __________ = 0 because of the principle of __________

Show work and check

__________ or __________

__________ or __________

__________ or __________

Is 0 a solution?	Is -6/5 a solution?
$0 \stackrel{?}{=} 5(\quad)\{5(\quad) + 6\}$	$0 \stackrel{?}{=} 5(\quad)\{5(\quad) + 6\}$
$0 \stackrel{?}{=} ?\ \{? + 6\}$	$0 \stackrel{?}{=} ?\ \{? + 6\}$
$0 \stackrel{?}{=}$ ______	$0 \stackrel{?}{=}$ ______

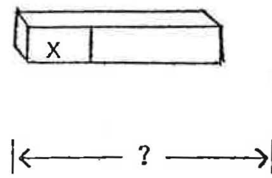
8.) The following equation is not on the video tape. Solve $(2x - 3)(3x - 5) = 0$ SHOW WORK AND CHECK

Math 51 Video Tape Worksheet
Introduction to Word Problems   Video Tape 60 (#11)   20 min.

Name ____________________
Instr. ____________________
Class days ________ hrs. ______

I. Mathematics among other things is a ______________________________.

II. Let ? = length of one piece
? = length of other piece



______ + ______ = ______ and solve for x
SHOW WORK

Now answer the question. Length of 1st piece is ____________________
Length of 2nd piece is ____________________

III. Let ? = length of one piece
= length of piece 2' longer

______ + (______) = ? and solve for x
SHOW WORK

Now answer the question. Length of 1st piece is ____________________
Length of 2nd piece is ____________________

IV. Vocabulary

Mathematical Symbol	English Equivalent
1.	equals, is, the result is
2.	________, add, increased by, more
3.	________, subtract, decreased by, diminished, less
4.	________, multiply, times, ________ (Hint: two letter word)
5.	________, division, divided by, divided into

V. Integers

A. Consecutive Integers:
Let x = 1st integer
? = 2nd consecutive integer
? = 3rd consecutive integer

B. Consecutive $\left\{\begin{matrix}\text{even}\\\text{odd}\end{matrix}\right\}$ integers:
Let x = 1st odd integer
? = 2nd consecutive odd integer
? = 3rd consecutive odd integer

Solve for x. SHOW WORK

x + (   ) + (   ) = ?

The 3 consecutive odd integers are ______, ______, and ______.

continued on other side

FORMULAS

I. Geometric Figures

A) P of Δ = ____________ P of ▭ = ____________

P of □ = ____________ C of ⊙ = ____________

B) A of Δ = ____________ A of ▭ = ____________

A of □ = ____________ A of ⊙ = ____________

C) Volume

D) Sum of angles of triangle = ____________.

II. Distance D = ____________

III. Interest I = ____________

IV. Temperature $C = \frac{5}{9}(\qquad)$

THE FOLLOWING PROBLEM IS NOT ON THE TAPE

1)
1) Read the problem
2) Re-read the problem
3) Draw a picture
4) Label unknowns
5) Write equation or formula
6) Solve equation (SHOW WORK)
7) Apply solution to the problem.

A sixteen foot board is cut into 3 pieces. The 2nd piece is 3 feet longer than the 1st piece and the 3rd piece is twice as long as the 1st piece. Find the length of the 3rd piece.

Math 51 Video Tape Worksheet

Literal Equations 64(#12) 17 minutes

Name____________________
Instructor__________________
Class days________ hours______

I. Literal equations are equations with ______________.

A. $F = \frac{9}{5}C + 32$ If the temperature reading is 85^0C then the Fahrenheit reading is ____________________.

B. $C = \frac{5}{9}(F - 32)$ If the temperature reading is 72^0F then the Centigrade reading is ____________________.

C. If you remember one of the above equations, you can derive the other.

II. Solving Literal Equations A. Solve $F = \frac{9}{5}C + 32$ for C

A. $F + (\ ?\ ) = \frac{9}{5}C + 32 + ?$

$F - ? = \frac{9}{5}C$

$\frac{5}{9}(\quad) = \frac{5}{9}(\quad)$

_______ $= C$

B. Solve $C = \frac{5}{9}(F - 32)$ for F

$C = ? - ?$

$C + ? = \frac{5}{9}F - ? + ?$

$?(C + ?) = ?\ (\frac{5}{9}F)$

$? + ? = F$

C. Solve $D = rt$ for t.

1) What is the coefficient of t? ______

2) What is the reciprocal of the coefficient of t? _________

3) Multiply both sides by above

$?(d) = ?(rt)$

$? = t$

D. $A = \frac{1}{2}bh$ is the formula for the Area of a _______________

1) The coefficient of b is ___________.

2) The reciprocal of the coefficient of b is _____________

3) $?\ (a) = ?\ (\frac{1}{2}bh)$

$? = b$

E. The formula for the Volume of a box is V = _______________. Solve for h.

1) The coefficient of h is ________________________

2) The reciprocal of the coefficient of h is _____________

3) Multiply both sides by the reciprocal of the coefficient of h

$?(V) = ?\ (\quad)$

$= h$

F. The following is not on the tape.

The formual for the circumference of a circle is $C = \pi d$.
Solve for d (<u>Show</u> <u>some</u> <u>work</u>)

Math 51 Video Tape Worksheet

Introduction to Polynomials 70 (#13) 19 min.

Name ______________

Instructor ______________

Class days __________ hours ________

I. Names of Polynomials

A. A monomial is a polynomial of ______ term(s).

B. A binomial is a polynomial of ______ term(s).

C. A trinomial is a polynomial of ______ term(s).

D. A polynomial of 4 terms is called a ________________.

II. Concept of Term -

A. $3xy^2$

The numerical coefficient is __________.

The 3 literal factors are ____________.

The degree is ________ because

______________________________.

B. Zero exponents

$2^0 = ?$ $x^0 = ?$

C. Degree

$4x^3$ is a ____ degree term because there are three _________ factors.

$4x^2$ is a ______ degree term because there are ________________.

$4x$ is a _______ degree term because there are ________________.

$4x^0$ is a ______ degree term because there are ________________.

4 is a _________ degree term.

$-2xy$ is a ______ degree term because there are ________________.

$\frac{1}{2}x^2y$ is a ______ degree term because there are three ________ factors.

$3x^2y^3$ is a ______ degree term because there are _____ _____ factors.

What is the degree of the binomial $-3xy + 2x$? ______________.

III. The degree of a polynomial is the degree of the ______________

______________________.

IV. Descending & Ascending Order.

A. Arrange $2x^2 - 3x^3 + 2 + 4x$ in descending order:

____

In ascending order:

____

V. A polynomial represents a number

A. If $x = -1$ then $2x^2-3x^3+2+4x$ equals $2(\quad)^2 - 3(\quad)^3 + 2 + 4(\quad)$

$2(\quad) - 3(\quad) + 2 + ?$

?

B. Not on tape:

What number does $2x^2 - 3x^3 + 2 + 4x$ represent when $x = -2$?

SHOW WORK

What is the degree of the trimonial $4x + 7 - x^3y$? ____________.

The degree of the polynomial $2x^2 - 3x^3 + 2 + 4x$ is ____________.

Math 51 Video Tape Worksheet

Addition and Subtraction of Polynomials 71(#14)
18 minutes

Name________________
Instructor________________
Class days________ hours________

I. Let $P = 4x^2 - 5$ and $Q = -3x^2 - x + 4$ then

A. Add P + Q horizontally $\longleftrightarrow$ Add vertically

$P + Q = (\qquad) + (\qquad)$

$$\begin{array}{rr} P & 4x^2 + ?\,x - 5 \\ +\ Q & -3x^2 \quad - x + 4 \\ \hline P+Q & ? \qquad ? \quad ? \end{array}$$

B. P - Q horizontally $\longleftrightarrow$ Subtract vertically

$P - Q = (\qquad) - (\qquad)$

$P - Q = \ ? \quad ? \quad ? \quad ? \quad ?$

$P - Q =$ ________________

$$\begin{array}{rr} P & 4x^2 + ?\,x - 5 \\ -\ Q & -3x^2 \quad - x + 4 \\ \hline P-Q & (?) \quad (?) \quad (?) \end{array}$$

C. P + [Q + T] horizontally

$P + [Q + T] = (\qquad) + [(\qquad) + (\qquad)]$

$=$

D. P + [Q + T] vertically $\longrightarrow$

$$\begin{array}{r} 4x^2 + ?\,x - 5 \\ -3x^2 \quad - x + 4 \\ ?x^3 + ?\,x^2 + ?\,x - 7 \\ \hline ? \qquad ? \qquad ? \qquad ? \end{array}$$

II. The following are not on the tape but use the same polynomials P,Q,T, given on the tape.

A. Find P - [Q - T] =

B. Find [P - Q] - T =

C. Are the results to part A and part B equal? ____________

D. Is subtraction of polynomials associative? ____________

Math 51 Assignment #1

I Addition

1.) (-2) + (+3) =

2.) (+3) + (+2) =

3.) (-3) + (-2) =

4.) (-3) + (+2) =

5.) (+3) + (-2) =

6.) (-2) + (-3) =

7.) (+2) + (+3) =

8.) (+2) + (-3) =

9.) (-3) + (-6) =

10.) (+23) + (-18) =

11.) (+35) + (-26) =

12.) (+2.09) + (-8.4) =

13.) (+8.5) + (-2.17) =

14.) (-3/4) + (+1/2) =

II Subtraction

1.) (-2) - (+3) =

2.) (+3) - (+2) =

3.) (-3) - (-2) =

4.) (-3) - (+2) =

5.) (+3) - (-2) =

6.) (-2) - (-3) =

7.) (+2) - (+3) =

8.) (+2) - (-3) =

9.) (-3) - (-6) =

10.) (+23) - (-18) =

11.) (+35) - (-26) =

12.) (+2.09) - (+8.4) =

13.) (-8.5) - (-2.17) =

14.) (-3/4) - (+1/2) =

III Fruit Cocktail

1.) (+4) - (-2) =

2.) (-9) + (+4) =

3.) (+17) + (-8) =

4.) (+7) - (+25) =

5.) (-21) + (-13) =

6.) (-1.01) + (+.1) =

7.) (+.1) - (-.01) =

8.) (+1/2) - (-1/3) =

Math 51 Assignment #2

I Multiplication

1.) $(+4)(-6)$

2.) $(-8)(+5)$

3.) $(-4)(-5)$

4.) $(-17)(-5)$

5.) $(-9)(+4)$

6.) $(-1)(-1)(-1)$

7.) $(+.1)(-.01)$

8.) $(-3.12)(+.21)$

9.) $(+3/5)(-5/7)$

II Division

1.) $\frac{+16}{-4}$

2.) $\frac{-12}{+3}$

3.) $\frac{-27}{-9}$

4.) $\frac{+84}{+7}$

5.) $\frac{-63}{+7}$

6.) $\frac{+42}{-7}$

7.) $\frac{+1}{-1}$

8.) $\frac{0}{-3}$

9.) $\frac{-3}{0}$

10.) $\frac{-.1}{-.1}$

11.) $\frac{+17.823}{-4.57}$

12.) $\frac{-1/2}{-3/4}$

III Fruit Cocktail (Unnecessary parentheses and signs have been omitted)

1.) $3 - 1$

2.) $3(-1)$

3.) $-3 - 1$

4.) $-3(-1)$

5.) $\frac{-3}{-1}$

6.) $7 - 28$

7.) $-28 - 7$

8.) $-28(-7)$

9.) $\frac{-28}{-7}$

10.) $-7 \cdot 8$

11.) $.1 - 1$

12.) $1/3 - 1/2$

13.) $1/3(-1/2)$

14.) $1/3 \cdot 0$

15.) $\frac{0}{1/3}$

ALGEBRA

I NUMBERS

A. Real Numbers

B. Natural Numbers (Counting Numbers)

C. Integers

II BINARY OPERATIONS

A. Laws

i. Commutative Law for Addition

ii. Commutative Law for Multiplication

iii. Associative Law for Addition

iv. Associative Law for Multiplication

v. Distributive Law

vi. Opposites

vii. Reciprocals

viii. Laws for One and Zero

B. Addition

i. Two positives

ii. Two negatives

iii. Positive and Negative

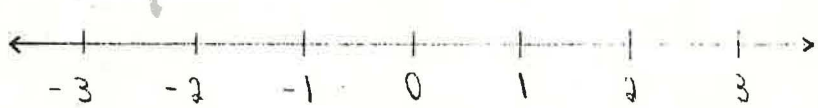
C. Subtraction

D. Multiplication

i. Like Signs

ii. Unlike Signs

E. Division



NUMBERLINE

MATH 51 Notes - Solving Equations Using Both The Addition and Multiplication Principles

I. Solve $3x + 6 = 28$ ________ Why?

$3x + 6 = 28$ ________ Why?

$[3x + 6] + (-6) = 28 + (-6)$ ________ Why?

$3x + [6 + (-6)] = 28 + (-6)$ ________ Why?

$3x + 0 = 28 + (-6)$ ________ Why?

$3x = 28 + (-6)$ ________ Why?

$3x = 22$ ________ Why?

$\frac{1}{3}(3x) = \frac{1}{3}(22)$ ________ Why?

$\left[\frac{1}{3} \cdot 3\right] x = \frac{1}{3}(22)$ ________ Why?

$1x = \frac{1}{3}(22)$ ________ Why?

$x = \frac{1}{3}(22)$ ________ Why?

$x = \frac{22}{3}$ ________ Why?

The solution is $\frac{22}{3}$. NOW CHECK

Check Example I $3x + 6 = 28$

$3(\ \ ) + 6 \stackrel{?}{=} 28$

II. Solve $4x - 3 = 6x$

Check Example II

$4x - 3 = 6x$

$4(\ \ ) - 3 = 6(\ \ )$

III. Solve $x - 1 = 16 - 4x$

Check Example III

$x - 1 = 16 - 4x$

$(\ \ ) - 1 = 16 - 4(\ \ )$

IV. Solve $4y + 4 + y = 6y + 20 - 4y$

Check Example IV

$4y + 4 + y = 6y + 20 - 4y$

$4(\ \ ) + 4 + (\ \ ) = 6(\ \ ) + 20 - 4(\ \ )$

INSTRUCTIONS: Place the element of the truth set in the properly numbered square at the bottom of this sheet.

1. $2X + 6 = -14$
2. $3X + 20 = 5$
3. $2X + (-8) = 4$
4. $-2X - 3 = 9$
5. $-9 - 3X = -42$
6. $22 = 7X - 13$
7. $2X - 2 = 0$
8. $-X = +1$
9. $8 - 7X = -6$
10. $3 + 2X = 17$
11. $2 - 10 = 2X$
12. $0 = -X$
13. $3X - 7 = -7$
14. $\frac{1}{2}X - (-4) = 3$
15. $2X - 7 = -21$
16. $3X = 30$
17. $-6 - X = -10$
18. $\frac{2}{3}X - 3 = -5$
19. $\frac{2}{3}X - 3 = -1$
20. $\frac{3}{4}X - 6 = 0$
21. $\frac{5}{6}X + 7 = 17$
22. $\frac{1}{2}X + \frac{1}{2} = -4$
23. $\frac{1}{2}X + \frac{1}{2} = 5$
24. $\frac{2}{3}X + \frac{3}{2} = -\frac{23}{6}$
25. $\frac{1}{3}X + \frac{2}{3} = -3$

HINTS------------

1. The sum of the first row is -4.
2. The sum of the third row is -13.
3. The sum of the fifth row is -7.
4. The sum of rows two and four are both positive.
5. The sum of column one is the opposite of the sum of row three.
6. The sum of column two is the same as the answer for problem 22.
7. The sum of column five is the same as the answer for problem 20.
8. The sum of column three is the opposite of the sum of column four.

Columns	1.	2.	3.	4.	5.	Sums
Row 1	1	2	3	4	5	
Row 2	6	7	8	9	10	
Row 3	11	12	13	14	15	
Row 4	16	17	18	19	20	
Row 5	21	22	23	24	25	
Sums						

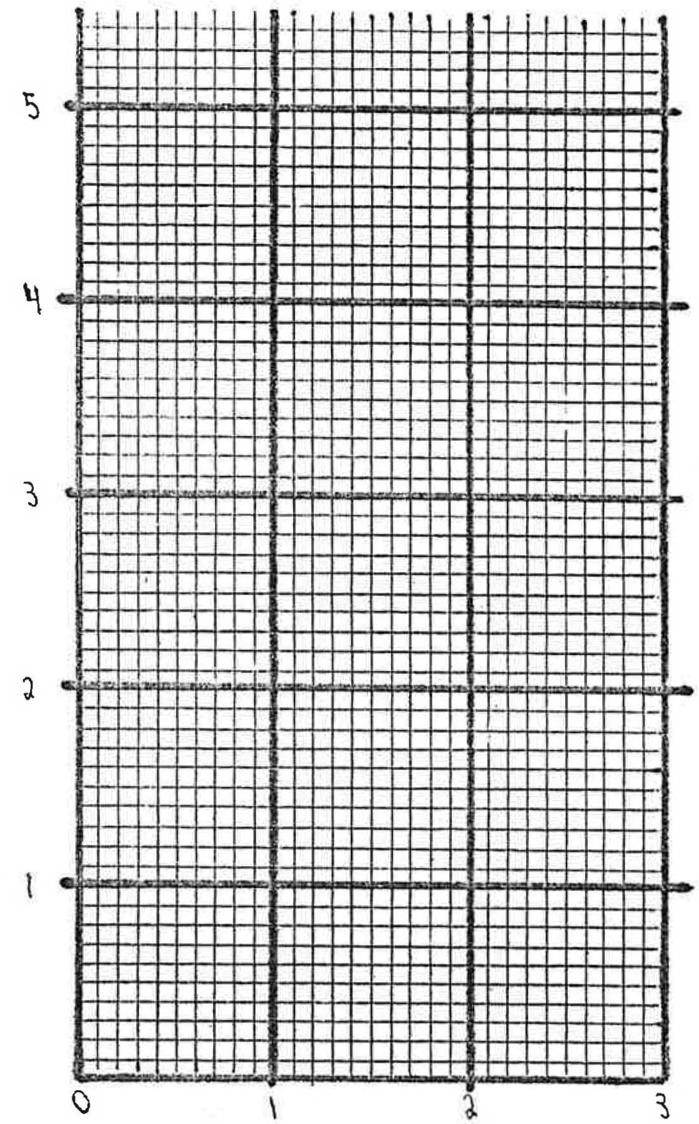
Total

Worksheet for Video Tape: Introduction To Graphs

Name ______________________
Class Days __________ Hours __________
Instructor ______________________

SIZE OF CUT OUT SQUARE	LENGTH OF BASE (L)	WIDTH OF BASE (W)	AREA OF BASE (LW)	HEIGHT (H)	VOLUME (LWH)
0					
.1					
.2					
.3					
.4					
.5					
.6					
.7					
.8					
.9					
1.0					
1.1					
1.2					
1.3					
1.4					
1.5					
1.6					
1.7					
1.8					
1.9					
2.0					

Instructions: While watching the video tape, fill in the following table. Mr. Brook will help you calculate a few of the values, the rest you must do on your own. Then transfer the tabulated values on to the graph provided. If you have trouble at any time feel free to ask one of the tutors for help. After you have finished filling in the table and plotting the points on the graph draw a smooth curve through your points. What size of cut out square will yield the largest volume?



ALGEBRA

I. Cartesian Plane

a. X axis

b. Y axis

c. Origin

d. Point

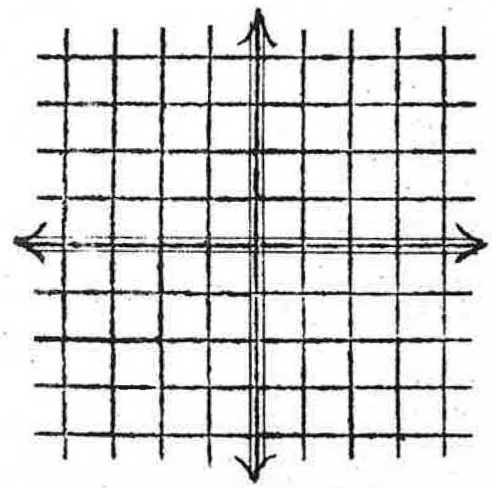
e. coordinates

f. abscissa

g. ordinate

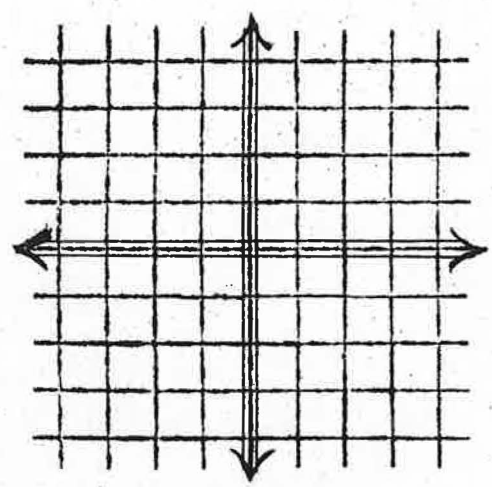
h. quadrant

i. Graphing points



Sketch and label the points whose coordinates are:

1. (3, 4)
2. (4, 3)
3. (-3, -4)
4. (2, -3)
5. (-3, 2)
6. (0, 2)
7. (-2, 0)



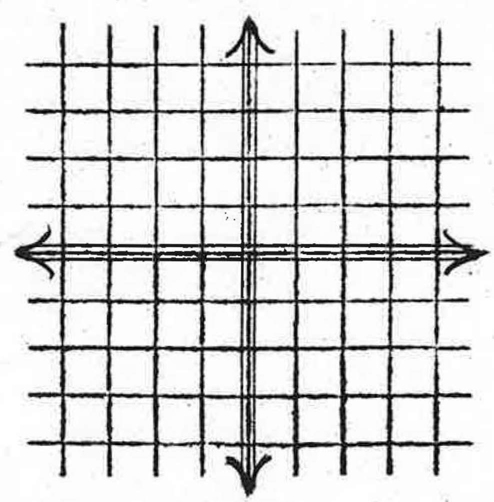
What quadrants are the above points in.

1.   2.   3.   4.   5.   6.   7.

II. Equations in Two Variables

A. Solutions for equations in two variables.

1. Is (3, -2) a solution for $y = -2x + 4$?
2. Is (-2, 3) a solution for $y = -2x + 4$?
3. Find six more solutions for $y = -2x + 4$.
4. Graph all six solutions. Label the points!



ALGEBRA

I. Write in words the method for finding the y-intercept of the graph for $2x - 3y = 7$.

____

____

____

The y-intercept for $2x - 3y = 7$ is (-, -).

II. Write in words the method for finding the x-intercept of the graph for $2x - 3y = 7$.

____

____

____

The x-intercept for $2x - 3y = 7$ is (-, -).

III. Solve $2x - 3y = 7$ for y

IV. Write an equation of a line parallel to the graph of $2x - 3y = 7$.

V. Find the simultaneous solution for:

$$2x + 3y = 7$$
$$3x + 4y = -1$$

Hint: Multiply top equation by 3. Multiply bottom equation by -2 then add the corresponding sides together.

VI. Write in words the method for finding an equation whose graph is parallel to $2x - 3y = 7$.

____

____

____

____

VII. Find the simultaneous solution for:

$$2y = 4x - 6$$
$$3x - 2y = 4$$

Hint: Solve the top equation for y and substitute this value into the 2nd equation.