

COURSE OUTLINE

<u>MAT031</u>		<u>Basic Algebra - Brush-Up</u>		<u>1</u>	
Course Number		Course Title		Credits	
<u>4/Week</u>	<u>0/Week</u>	<u>0/Week</u>	<u>0/Week</u>	<u>4 sessions</u>	<u>3.75 hours each</u>
Class or	Laboratory	Laboratory Shop,	Work	Semester	
Lecture	Work Hours	Studio or Clinic	Experience	Length	
<u>Not Applicable</u>				<u>Not Applicable</u>	
Performance on an Examination/Demonstration				Telecourse	

Required Materials:

Workbook: MAT034 – Basic Algebra Student Lab Workbook  
 Author: Goldstein  
 Publisher: Mercer County Community College

Scientific Calculator

Catalog Description:

Supervised independent study designed for students who have studied the fundamentals of algebra, but who need to minimally refresh their skills so as to prepare for subsequent mathematics courses. Topics include exponents, polynomials, factoring, first-degree equations with an emphasis on simple verbal problems, quadratic equations and rational numbers. [The Brush-Up foundations course does not fulfill mathematics elective credit requirements.]

Latest Review: Spring 2005

Prerequisites:  
 MAT033 or CPST placement

Co-requisites:  
 None

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Course Coordinator: Donna Goldstein

General Objectives of the Course

1. To allay math anxiety many students possess.
2. To expand students' understanding and appreciation of the numerous applications math has in our lives.
3. To prepare students for higher level math courses.
4. To develop study skills that can transcend mathematics.
5. To develop greater self-confidence and self-esteem in our students.

**UNIT I**      Review of Basics

Approximate time: 1 session

Basic Algebra Student Lab Workbook - Labsheets Refresher #1 and #2, 1.6 - 1.8

At the conclusion of this unit the student should be able to:

1. Define the following terms.
  - a. exponent
  - b. order of operations
  - c. whole numbers
  - d. natural numbers
  - e. rational numbers
  - f. irrational numbers
  - g. real numbers
  - h. double negative rule
  - i. absolute value
  - j. reciprocals
  - k. variable
  - l. equation
  - m. expression
  - n. division by zero
  - o. undefined
  - p. associative properties of addition and multiplication
  - q. commutative properties of addition and multiplication
  - r. identity properties of addition and multiplication
  - s. inverse properties of addition and multiplication
  - t. distributive property
2. Know and be able to apply the rules of Order of Operation.
3. Understand that brackets and fraction bars are signs of inclosure.

4. Know the meaning of the symbols  $<$ ,  $\leq$ ,  $>$ ,  $\geq$  and apply those symbols in within and expression.

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5. Distinguish between an expression and an equation.
6. Graph rational numbers on the number line.
7. Explain the difference between a number and its additive inverse.
8. Understand the relationships among the natural, whole, integer, rational, irrational and real numbers.
9. Demonstrate the understanding of the order of real numbers.
10. Find the absolute value of a real number.
11. Explain using a number line and perform the addition, subtraction, multiplication and division of signed numbers.
12. Use the order of operations with signed numbers to evaluate an expression.
13. Translate words and phrases involving the operations of numbers into mathematical expressions and vice versa.
14. Translate simple sentences into mathematical equations.
15. Recognize when the properties of real numbers are being used and knowing how to apply these properties.

**UNIT II**     Linear Equations and Inequalities

Approximate time: 1 session

Basic Algebra Student Lab Workbook - Labsheets 2.3, 2.4, 2.5, 2.7, 3.1 - 3

At the conclusion of this unit the student should be able to:

1. Define the following terms.
  - a. 4 steps to solve a linear equation
  - b. linear or first degree equation
  - c. solution
  - d. least common denominator
  - e. formulas – perimeter of rectangle, area of a rectangle, area of a triangle
  - f. vertical angles
  - g. addition property of inequalities
  - h. multiplication property of inequalities
  - i. linear equation in two variables
  - j. ordered pair

- k. table of values
- l. rectangular coordinate system
- m. quadrants
- n.  $x$ - intercept

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- o.  $y$ - intercept
  - p. horizontal and vertical lines
  - q. slope
  - r. parallel lines
  - s. perpendicular lines
  - t. consecutive integers
  - u. linear equation in two variables
2. Solve a linear equation in one variable.
  3. Write the four steps needed to solve a linear equation.
  4. Solve linear equations with fractional and decimal coefficients.
  5. Analyze a verbal problem of application to set up an equation and then solve the problem.
  6. Determine whether or not their solution makes sense.
  7. Know the meaning and be able to draw supplementary, complementary and vertical angles.
  8. Apply formulas in finding solutions to verbal problems.
  9. Solve literal equations for a specific variable.
  10. Solve verbal problems which generate linear equations.
  11. Solve and graph the solution set of linear inequalities.
  12. Explain the addition and multiplication properties of inequalities.
  13. Translate phrases such as “is at least” and “is at most” into inequalities.
  14. Given the graph of an interval, write it as an inequality.
  15. Interpret circle, bar and line graphs.
  16. Write a solution to a linear equation in two variables as an ordered pair.
  17. Draw and label a Cartesian plane (rectangular coordinate system).
  18. Plot points in a coordinate system.
  19. Graph a linear equation in two variables by plotting points.

20. Find the intercepts of a linear equation.
21. Recognize horizontal and vertical lines from equations and graph those lines.

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22. Use the slope formula to find the slope of a slanted line, a horizontal line, and understand that the slope of a vertical line is undefined.

**UNIT III     Exponents and Polynomials**

Approximate time: 1 session

Basic Algebra Student Lab Workbook - Labsheets 4.1- 4.5, 4.8

At the conclusion of this unit the student should be able to:

1. Define the following terms.
  - a. polynomial
  - b. monomial
  - c. binomial
  - d. trinomial
  - e. term
  - f. factor
  - g. like terms
  - h. product rule of exponents
  - i. quotient rule of exponents
  - j. power rule of exponents
  - k. base
  - l. exponent
  - m. FOIL
  - n.  $a^0$  and  $a^{-n}$
  - o. scientific notation
2. Recognize and combine like terms.
3. Write a polynomial in one variable in descending order.
4. Determine the degree of a term and of a polynomial.
5. Add and subtract polynomials.
6. Evaluate and exponential expression.
7. Apply the product, quotient and power rule of exponents.
8. Multiply two binomials using FOIL.
9. Explain in writing what FOIL means and its application and limitations.

10. Multiply polynomials.
  11. Know the steps of how to square a binomial to get a trinomial square.
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12. Recognize the product of the sum and difference of two terms through observation.
  13. Apply the rules of exponents with 0 and negative exponents.
  14. Know how to change negative exponents to positive exponents and vice versa.
  15. Express numbers in scientific notation.
  16. Express a number in scientific notation as a number in standard form.
  17. Understand and be able to explain how scientific notation is helpful.
  18. Use scientific notation in computation.
  19. Solve verbal problems involving scientific notation.

**UNIT IV**     Factoring and Applications

Approximate time: .5 session

Basic Algebra Student Lab Workbook - Labsheets 5.1 - 5.7

At the conclusion of this unit the student should be able to:

1. Define the following terms.
  - a. factor
  - b. greatest common factor
  - c. term
  - d. factoring
  - e. prime polynomial
  - f. monomial factor
  - g. trinomial factor
  - h. difference of two squares
  - i. sum and difference of two cubes
  - j. perfect trinomial square
  - k. quadratic equation
  - l. zero-factor property
  - m. pythagoreann formula
2. Understand that factoring is the reverse process of the distributive property of real numbers.
3. Find and factor the greatest common factor of a polynomial.
4. Factor by grouping.

5. Factor a trinomial or recognize that the trinomial is not factorable (prime).
  6. Factor trinomials by grouping.
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7. Factor the difference of two squares.
  8. Factor a trinomial square.
  9. Recognize that a quadratic equation may have 2 solutions and solve the equation by factoring.
  10. Use the zero-factor property to find solutions of quadratic equations.
  11. Solve an equation with more than two factors by factoring.
  12. Analyze and solve verbal problems which involve linear and quadratic models.

**UNIT V**     Rational Expression and Roots

Approximate time: .5 session

Basic Algebra Student Lab Workbook - Labsheets - 6.1 - 6.2, 8.1

At the conclusion of this unit the student should be able to:

1. Define the following terms.
  - a. rational expression
  - b. undefined rational expressions
  - c. lowest terms
  - d. fundamental property of rational expressions
  - e. reciprocal
  - f. square root of a number
  - g. principal square root
  - h. radical sign
  - i. radicand
  - j. radical expression
  - k. rational root
  - l. irrational root
  - m.  $\sqrt[n]{a}$
  - n. nonnegative
2. Explain what numbers make a rational expression undefined and why.
3. Determine when a rational expression is undefined.
4. Evaluate a rational expression for a given value of the variable.

5. Express a rational expression in lowest terms.

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6. Recognize when two rational expressions are equivalent except for the values of the variable which would make the denominator zero.
7. Add and subtract rational expressions and write in lowest terms.
8. Multiply and divide rational expressions and write in lowest terms.
9. Find reciprocals of rational expressions.
10. Find square roots.
11. Determine if the root is irrational, rational, or not a real number.
12. Explain what is meant by the principle square root.
13. Find approximations of irrational square roots.
14. Square a radical.
15. Explain what is meant by  $\sqrt[n]{a}$  and find roots of higher power.
16. Solve verbal problems involving radicals.

Assignments

The student is expected to do the following:

1. Take class notes on algebraic procedures and algorithms with which he/she is not entirely familiar
2. Solve all designated problems on the labsheets to reinforce the skills presented during the workshop session. Assigned problems not finished during class time should be completed at home, prior to the subsequent meeting.
3. Complete all supplemental exercises recommended by the instructor for additional practice.
4. Seek help, as is needed, from the instructor, or from a tutor or using on-line support in the Math Learning Center,.
5. Take the MAT034 Basic Algebra final exam upon completion of the Brush-Up course.

Evaluation and Grading

Students' grades will be determined by their performance on the MAT034 Basic Algebra final exam administered at the end of the four sessions. A score of 71% (a minimum of 25 out of 35 questions correct) is required to pass the final and the MAT031 Brush-Up course.

Upon passing MAT031, students will be exempt from MAT034 and may move ahead to one-hundred level mathematics courses.