BROWARD COMMUNITY COLLEGE
COURSE OUTLINE

LAST REVIEW: 2008-09 *(i.e. 2003-2004)* **NEXT REVIEW:** 2013-14 *(i.e. 2008-2009)* **STATUS:** A *(A, I, D)*

COURSE TITLE: INTEGRATED ARITHMETIC AND ALGEBRA

COMMON COURSE NUMBER: MAT 0020L

CREDIT HOURS: 8

CLOCK HOURS: *(Voc. Course ONLY)*

CONTACT HOUR BREAKDOWN *(per 16 week term)*

Lecture: 96 Lab:

Clinic: Other:

PREREQISITE(S): None.

COREQUISITE(S): MAT 0020

PRE/COREQUISITE(S):

COURSE DESCRIPTION: *(750 characters, maximum)*

A course designed to satisfy the requirements of both MAT 0012 and MAT 0024 in one semester. Topics to be studied include arithmetic with whole numbers, integers & rational numbers, linear equations and inequalities in one variable, factoring, laws of exponents, and basic linear graphing. Problem solving involving real-life scenarios is an integral part of this course. This course will teach students to understand and communicate concepts of algebra in the language of mathematics, both orally and written. This course helps prepare students for college-level mathematics and math-based courses. It is nontransferable. Due to the nature of this course, calculators are not permitted. To pass the course, students must pass a mandatory Florida State Examination.

UNIT TITLES

1. Whole Numbers: Operations and Applications
2. Integers: Operations and Applications
3. Fractions & Mixed Numbers: Operations and Applications
4. Decimal Numbers: Operations and Applications
5. Linear Equations and Inequalities in One Variable
6. Ratios, Rates, Proportions, and Percents
7. Rules of Integer Exponents
8. Polynomial Expressions, Quadratic Expressions, & Quadratic Equations
9. Rational Expressions
10. Radical Expressions
11. Geometric Calculations, Charts and Graphs
12. Measurements and Unit Analysis
13. The Rectangular Coordinate System
14. Lines, Slope, & Graphical Solutions to Systems of Linear Equations
15. Sets (Optional)

EVALUATION:

Please provide a brief description (250 characters maximum) that details how students will be evaluated on the course outcomes.

Written Quizzes/Examinations.
Cumulative Final Examination.

****** Complete the following only if course is seeking general education status ******

GENERAL EDUCATION Competencies and Skills *:

Please highlight in green font all Competencies/Skills from the list below that apply to this course. In the box to the right of the Competency/Skill, enter all specific learning outcome numbers (i.e. 1.1, 2.7, 5.12) that apply.

1. Read with critical comprehension	
2. Speak and listen effectively	
3. Write clearly and coherently	
4. Think creatively, logically, critically, and reflectively (analyze, synthesize, apply, and evaluate)	
5. **Demonstrate and apply literacy in its various forms:** *(highlight in green ALL that apply)* (1. technological, 2. informational, 3. mathematical, 4. scientific, 5. cultural, 6. historical, 7. aesthetic and/or 8. environmental)	
6. Apply problem solving techniques to real-world experiences	
7. Apply methods of scientific inquiry	
8. Demonstrate an understanding of the physical and biological environment and how it is impacted by human beings	
9. Demonstrate an understanding of and appreciation for human diversities and commonalities	
10. Collaborate with others to achieve common goals.	
11. Research, synthesize and produce original work	
12. Practice ethical behavior	
13. Demonstrate self-direction and self motivation	
14. Assume responsibility for and understand the impact of personal behaviors on self and society	
15. Contribute to the welfare of the community	

* *General Education Competencies and Skills endorsed by '05-'06 General Education Task Force*

Common Course Number: MAT 0020

Unit 1 Whole Numbers: Operations and Applications

General Outcome:

1.0 The student shall be able to perform operations involving whole numbers and solve appropriate word problems without the aid of a calculator.

Specific Measurable Learning Outcomes:
Upon successful completion of this unit, the student shall be able to:

1.1 Graph whole numbers on a number line.

1.2 Identify the place values of each digit of a whole number.

1.3 Write whole numbers using words, and vice versa.

1.4 Round whole numbers to a given place value.

1.5 Determine which of two whole numbers is greater using inequality symbols.

1.6 Identify the properties and words/phrases associated with the operations of addition, subtraction, multiplication, division, and exponentiation of whole numbers (e.g. sum, quotient, less than, a multiple of, cubed).

1.7 Translate word phrases into mathematical expressions, and vice versa (e.g. five less than twice a number = $2n - 5$).

1.8 Apply "shortcut rules" for divisibility by 2, 3, 4, 5, 6, 9, and 10.

1.9 Add, subtract, multiply, divide, and exponentiate whole numbers.

1.10 Estimate sums, differences, products, and quotients of whole numbers by rounding.

1.11 Simplify numerical expressions using the order of operations.

1.12 Define the terms "prime number" and "composite number."

1.13 Explain why the number one (1) is not prime.

1.14 Determine whether a whole number is prime, composite, or neither.

1.15 Determine all factors of whole numbers.

1.16 Determine the prime factorization of whole numbers.

1.17 Solve appropriate arithmetic word problems using operations on whole numbers.

Common Course Number: MAT 0020

Unit 2 Integers: Operations and Applications

General Outcome:

2.0 The student shall be able to perform operations involving integers and solve appropriate word problems without the aid of a calculator.

Specific Measurable Learning Outcomes:
Upon successful completion of this unit, the student shall be able to:

2.1 Graph integers on a number line.

2.2 Define the term "absolute value" with respect to distance.

2.3 Define the term "nonnegative," and be able to distinguish it from the term "positive."

2.4 Evaluate the absolute value of numbers and of numerical expressions (e.g. $\left|3-6^2\right|$).

2.5 Determine which of two integers is greater using inequality symbols.

2.6 Identify the properties and words/phrases associated with the operations of addition, subtraction, multiplication, division, and exponentiation of integers.

2.7 Translate word phrases into mathematical expressions, and vice versa.

2.8 Add, subtract, multiply, divide, and exponentiate integers.

2.9 Simplify numerical expressions using the order of operations.

2.10 Solve appropriate arithmetic word problems using operations on integers.

Common Course Number: MAT 0020

Unit 3 Fractions & Mixed Numbers: Operations and Applications

General Outcome:

3.0 The student shall be able to perform operations involving fractions and mixed numbers and solve appropriate word problems without the aid of a calculator.

Specific Measurable Learning Outcomes:
Upon successful completion of this unit, the student shall be able to:

3.1 Identify a fraction's numerator and denominator, and explain what each represents.

3.2 Represent fractions pictorially, and determine the fraction represented by a figure (e.g. the portion of a shaded figure).

3.3 Determine when a fraction is undefined.

3.4 Define the terms "proper fraction," "improper fraction," and "mixed number."

3.5 Identify fractions as proper or improper.

3.6 Write improper fractions as mixed numbers, and vice versa.

3.7 Graph fractions and mixed numbers on a number line.

3.8 Determine equivalent representations of integers, fractions and mixed numbers.

3.9 Reduce fractions and mixed numbers to lowest terms.

3.10 Determine the least common denominator of two fractions.

3.11 Identify which of two fractions/mixed numbers is greater using inequality symbols.

3.12 Determine the reciprocal of integers, fractions, and mixed numbers.

3.13 Identify the properties and words/phrases associated with the operations of addition, subtraction, multiplication, division, and exponentiation of fractions and mixed numbers.

3.14 Translate word phrases into mathematical expressions, and vice versa.

3.15 Add, subtract, multiply, divide, and exponentiate fractions and mixed numbers.

3.16 Simplify complex fractions.

3.17 Simplify numerical expressions using the order of operations.

3.18 Solve appropriate arithmetic word problems using operations on fractions and mixed numbers.

Common Course Number: MAT 0020

Unit 4 Decimal Numbers: Operations and Applications

General Outcome:

4.0 The student shall be able to perform operations involving decimal numbers and solve appropriate word problems without the aid of a calculator.

Specific Measurable Learning Outcomes:
Upon successful completion of this unit, the student shall be able to:

4.1 Graph decimal numbers on a number line.

4.2 Identify the place values of each digit of a decimal number.

4.3 Round a decimal number to a given place value.

4.4 Rewrite terminating decimal numbers as a fraction or a mixed number, and vice versa.

4.5 Rewrite appropriate fractions as repeating decimals.

4.6 Define the terms “rational number,” “irrational number,” and “real number.”

4.7 Identify decimal numbers and square roots as rational or irrational.

4.8 Identify which of two decimal numbers is greater using inequality symbols.

4.9 Identify the properties and words/phrases associated with the operations of addition, subtraction, multiplication, division, and exponentiation of decimal numbers.

4.10 Translate word phrases into mathematical expressions, and vice versa.

4.11 Add, subtract, multiply, divide, and exponentiate decimal numbers.

4.12 Estimate sums, differences, products, and quotients of decimal numbers by rounding.

4.13 Add, subtract, multiply, divide, and exponentiate rational numbers presented in any mixture of formats, and simplify numerical expressions using the order of operations (e.g. $\frac{1}{2} - 0.8^2$).

4.14 Evaluate the mean, median, mode, and range of lists of real numbers.

4.15 Solve appropriate arithmetic word problems using operations on real numbers.

Common Course Number: MAT 0020

Unit 5 Linear Equations and Inequalities in One Variable

General Outcome:

5.0 The student shall be able to (1) solve linear equations and inequalities in one variable, (2) express solutions to linear inequalities in one variable using inequality notation, interval notation, and a number-line graph and (3) solve appropriate word problems.

Specific Measurable Learning Outcomes:
Upon successful completion of this unit, the student shall be able to:

5.1 Define the terms "variable," "linear equation," "solution to an equation in one variable," and "solution to an inequality in one variable."

5.2 Determine if a given variable value is a solution to an equation or inequality in one variable.

5.3 Solve one-step and multi-step linear equations and inequalities in one variable.

5.4 Solve linear equations and inequalities in one variable with variables on both sides of the equal sign.

5.5 Solve linear equations and inequalities in one variable requiring use of the distributive property.

5.6 Identify linear equations in one variable as conditional, a contradiction, or an identity.

5.7 Solve proportionalities.

5.8 Solve appropriate algebraic and geometric word problems by modeling them with linear equations in one variable or proportionalities.

5.9 Solve literal equations for a specified variable.

5.10 Present solutions to linear inequalities in one variable in three ways: Inequality notation, interval notation, and graphically on a number line.

5.11 Present already-solved, three-part linear inequalities in one variable (e.g. $-3 < y \leq 5.3$) in interval notation and graphically on a number line. **(OPTIONAL)**

Common Course Number: MAT 0020

Unit 6 Ratios, Rates, Proportions, and Percents

General Outcome:

6.0 The student shall be able to (1) write, simplify, and manipulate ratios, rates, and percentages, (2) create and solve proportions, and (3) solve appropriate word problems without the aid of a calculator.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

6.1 Define the terms “ratio,” “rate,” and “proportion.”

6.2 Write ratios using reduced-fraction notation.

6.3 Write rates using reduced-fraction notation.

6.4 Determine if two rational numbers are proportional.

6.5 Solve proportions.

6.6 Solve appropriate word problems using ratios, rates, and proportions.

6.7 Define the term “percent.”

6/8 Rewrite a percent as a decimal number and as a fraction or a mixed number, and vice versa.

6/9 Solve basic percent problems using linear equations in one variable and/or proportions (e.g. Twelve is 15% of what number? What percent of 10 is 35?).

6.10 Solve appropriate word problems involving percents, including percent increase/decrease, taxes, commissions, and simple interest.

Common Course Number: MAT 0020

Unit 7 Rules of Integer Exponents

General Outcome:

7.0 The student shall be able to simplify product and quotient expressions incorporating variables with integer exponents using appropriate rules of integer exponents.

Specific Measurable Learning Outcomes:
Upon successful completion of this unit, the student shall be able to:

7.1 Define the terms “base,” “exponent,” and “power.”

7.2 Identify the base and exponent (or power) of exponential expressions.

7.3 Apply the product rule for exponents to simplify appropriate variable expressions.

7.4 Apply the quotient rule for exponents to simplify appropriate variable expressions.

7.5 Apply the power rules for exponents to simplify appropriate variable expressions.

7.6 Apply the zero-exponent rule to simplify appropriate variable expressions.

7.7 Apply the negative-exponent rule to simplify appropriate variable expressions.

7.8 Apply any combination of exponent rules to simplify appropriate variable expressions.

7.9 Express standard numbers in scientific notation and vice versa.

7.10 Multiply and divide numbers written in scientific notation.

Common Course Number: MAT 0020

Unit 8 Polynomial Expressions, Quadratic Expressions, & Quadratic Equations

General Outcome:

8.0 The student shall be able to (1) identify, perform operations on, and factor polynomial expressions; (2) solve quadratic equations in one variable; and (3) solve appropriate word problems.

Specific Measurable Learning Outcomes:
Upon successful completion of this unit, the student shall be able to:

8.1 Identify polynomial expressions.

8.2 Define the terms “leading term (of a polynomial)” and “degree (of a polynomial).”

8.3 Identify the leading term and the degree of polynomials.

8.4 Recognize if a given polynomial is a monomial, binomial, or trinomial.

8.5 Evaluate the numerical value of polynomial expressions given the value of the variable.

8.6 Identify and combine like terms of polynomials.

8.7 Add, subtract, and multiply polynomials.

8.8 Divide polynomials by monomials.

8.9 Factor out positive and negative GCFs of polynomials’ terms.

8.10 Factor polynomial expressions by grouping.

8.11 Factor binomial expressions that are differences of perfect squares.

8.12 Factor binomial expressions that are sums and differences of perfect cubes.

8.13 Identify quadratic polynomial expressions.

8.14 Factor non-prime quadratic trinomials, including perfect square trinomials.

8.15 Solve non-prime polynomial equations in one variable by factoring.

8.16 Solve appropriate algebraic and geometric word problems by modeling them with non-prime quadratic equations in one variable.

Common Course Number: MAT 0020

Unit 9 Rational Expressions

General Outcome:

9.0 The student shall be able to identify and simplify rational expressions.

Specific Measurable Learning Outcomes:
Upon successful completion of this unit, the student shall be able to:

9.1 Define the term "rational expression."

9.2 Identify rational expressions.

9.3 Determine value(s) of the variable for which rational expressions are undefined.

9.4 Simplify rational expressions by canceling common monomial and binomial factors of the numerator and denominator.

9.5 Multiply rational expressions. **(OPTIONAL)**

9.6 Divide rational expressions. **(OPTIONAL)**

Common Course Number: MAT 0020

Unit 10 Radical Expressions

General Outcome:

10.0 The student shall be able to identify, simplify, and perform operations of addition and subtraction on radical expressions.

Specific Measurable Learning Outcomes:
Upon successful completion of this unit, the student shall be able to:

10.1 Define the terms “square root,” “radical,” and “radicand.”

10.2 Define the terms “n^{th} root” and “index.” **(OPTIONAL)**

10.3 Simplify square root numerical expressions.

10.4 Determine approximate square roots of numerical expressions.

10.5 Explain why the square root of a negative number is not real.

10.6 Simplify n^{th} root numerical expressions. **(OPTIONAL)**

10.7 Explain why any even root of a negative number is not real. **(OPTIONAL)**

10.8 Simplify square root variable expressions.

10.9 Simplify n^{th} root variable expressions. **(OPTIONAL)**

10.10 Add & subtract square root expressions.

10.11 Add & subtract higher-order radical expressions with identical indices. **(OPTIONAL)**

10.12 Explain what the Pythagorean Theorem says and means.

10.13 Solve appropriate word problems using the Pythagorean Theorem.

Common Course Number: MAT 0020

Unit 11 Geometric Calculations, Charts, and Graphs

General Outcome:

11.0 The student shall be able to name and calculate various measurements associated with basic two-dimensional shapes without the aid of a calculator, and interpret data illustrated on bar graphs, line graphs, and pie charts without the aid of a calculator.

Specific Measurable Learning Outcomes:
Upon successful completion of this unit, the student shall be able to:

11.1 Identify a triangle, parallelogram, rectangle, square, trapezoid and circle.

11.2 Define the terms “perimeter,” “area,” “radius,” “diameter,” and “circumference.”

11.3 Calculate the perimeter of triangles, parallelograms, rectangles, squares, and trapezoids (with appropriate units).

11.4 Approximate π to at least 2 decimal places.

11.5 Calculate the circumference of circles (with appropriate units).

11.6 Calculate the area of triangles, parallelograms, rectangles, squares, trapezoids, and circles (with appropriate units).

11.7 Identify a bar graph, and analyze and interpret data illustrated by a bar graph.

11.8 Identify a line graph, and analyze and interpret data illustrated by a line graph.

11.9 Identify a pie chart, and analyze and interpret data illustrated by a pie chart.

Common Course Number: MAT 0020

Unit 12 Measurements and Unit Analysis

General Outcome:

12.0 The student shall be able to identify and convert among units of measurement without the aid of a calculator.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

12.1 Recognize standard U.S. system units of length, area, volume, and weight.

12.2 Convert between different U.S. system units for a given measurement using unit analysis.

12.3 Recognize standard metric system units of length, area, volume, and weight.

12.4 Convert between different metric system units for a given measurement using decimal-point translation. **(OPTIONAL)**

12.5 Given the conversion factors, convert between U.S. system and metric system units for a given measurement using unit analysis.

12.6 Convert between the Celsius and Fahrenheit units of temperature measurement. **(OPTIONAL)**

Common Course Number: MAT 0020

Unit 13 The Rectangular Coordinate System

General Outcome:

13.0 The student shall be able to (1) identify the quadrants of the rectangular coordinate system, (2) plot points corresponding to ordered-pair coordinates, and (3) identify the ordered-pair coordinates of points plotted on the rectangular coordinate system.

Specific Measurable Learning Outcomes:
Upon successful completion of this unit, the student shall be able to:

13.1 Identify and draw the rectangular coordinate system axes.

13.2 Identify and name each quadrant of the rectangular coordinate system.

13.3 Define the term "origin," and identify the origin of the rectangular coordinate system.

13.4 Plot points on the rectangular coordinate system representing given ordered-pair coordinates.

13.5 Plot points on the axes representing given ordered-pair coordinates.

13.6 Give the ordered-pair coordinates of points plotted on the rectangular coordinate system.

Common Course Number: MAT 0020

Unit 14 Lines, Slope, & Graphical Solutions to Systems of Linear Equations

General Outcome:

14.0 The student shall be able to (1) evaluate and interpret the slope of a line, (2) graph lines given two points or a point and the slope, (3) use the slope to determine additional points on a line, (4) graph horizontal and vertical lines, and (5) determine the solution to a system of linear equations graphically.

Specific Measurable Learning Outcomes:
Upon successful completion of this unit, the student shall be able to:

14.1 Explain what it means to be a solution to an equation in two variables.

14.2 Determine if a given ordered pair is a solution to an equation in two variables.

14.3 Define the terms “x- (or horizontal) intercept” and “y- (or vertical) intercept.”

14.4 Sketch the graphs of linear equations in two variables given any two points.

14.5 Sketch the graphs of linear equations in two variables given the x- and y-intercepts.

14.6 Identify and determine the x- and y-intercepts of graphs of linear equations of two variables.

14.7 Sketch horizontal and vertical lines using their equations.

14.8 Determine the equations of horizontal and vertical lines.

14.9 Define the term “slope.”

14.10 Evaluate the slopes of horizontal, vertical, and diagonal lines.

14.11 Interpret the practical meaning of slope in appropriate word problems.

14.12 Sketch graphs of linear equations in two variables given any point and the slope.

14.13 Use the slope to determine additional points on the graphs of lines.

14.14 Explain what it means to be a solution to a system of linear equations in two variables.

14.15 Determine if a given ordered pair is a solution to a system of linear equations in two variables.

14.16 Solve systems of linear equations in two variables having exactly one solution by graphing.

Common Course Number: MAT 0020

Unit 15 Sets (Optional)

General Outcome:

15.0 The student shall be able to identify & create sets, and perform basic operations on sets.

Specific Measurable Learning Outcomes:
Upon successful completion of this unit, the student shall be able to:

15.1 Define the terms “set” and “element.”

15.2 Create a set by listing its elements.

15.3 Identify elements and non-elements of a set using the notation $\in$ and $\notin$.

15.4 Define the term “empty (or null) set.”

15.5 Determine if a given set is finite or infinite.

15.6 Define the term “subset.”

15.7 Identify whether a set is or is not a subset of another using the notation $\subseteq$ and $\not\subseteq$.

15.8 Determine the number of distinct subsets there are of a given set.

15.9 Define the terms “universal set (or universe),” “complement,” “union,” and “intersection.”

15.10 Determine the complement of any set by listing its elements.

15.11 Determine the union of any two sets by listing its elements.

15.12 Determine the intersection of any two sets by listing its elements.

15.13 Define the term “disjoint.”

15.14 Determine if any two sets are disjoint.