NASSAU COMMUNITY COLLEGE

DEPARTMENT OF MATHEMATICS/COMPUTER SCIENCE/
INFORMATION TECHNOLOGY

Course Outline for

MAT 002
Introductory Algebra

Curriculum	Interdisciplinary
Lab hours	None
Semesters offered	Indicated in Catalog
Length of semester	15 Weeks
Class hours	4.5
Credits	0
Texts	Introductory Algebra, Custom 4th edition by Elayn Martin – Gay. Published by Prentice Hall

PREREQUISITE

A grade of S in MAT 001 or by placement

CATALOG DESCRIPTION

A non-credit course required of students having deficiencies in mathematics. Fundamental processes of arithmetic and algebra, factoring, linear and fractional equations, exponents, radicals and quadratic equations, right triangle trigonometry will be covered. Hand held calculators will be used.

ADDITIONAL RESOURCES - MATH CENTERS

As part of this course, students should avail themselves to further study and/or educational assistance that is available in the Mathematics Center in B-l30, the Math Success Center in B-109 (subject to budget approval), and the Math Anxiety Center in B-l26. These activities and the use of the resources provided are deemed an integral part of the course, and will help the student master necessary knowledge and skills.

OBJECTIVES

- To provide students with a background in elementary algebra.
- To encourage all students to use a scientific calculator that computes square roots and has a +/- key (Strongly recommended – TI 30X11S). All students must bring a calculator to class each day. It will be used during class and for all exams. **Starting fall 2011, no graphing calculators and algebraic manipulators (such as the TI83/TI 89/TI 92) are allowed.**

DEPARTMENTAL EXIT EXAM

A departmental computerized exit exam will be administrated at the end of the semester. Faculty are responsible to administer and proctor their own exit exams. See the MAT 002 Syllabus and Department Exit Exam memo for more details.

DEPARTMENTAL POLICY

- **ALL FACULTY SHOULD ADMINISTER A MINIMUM OF THREE IN-CLASS EXAMS EACH SEMESTER.** Additional exams and quizzes may be given at the instructor's discretion. These dated grades must be recorded by the instructor on the hard copy class roster. All students should receive frequent feedback as to their performance during the semester.
- **FOR A STUDENT TO BE ELIGIBLE FOR BOTH ATTEMPTS AT THE EXIT EXAMS, STUDENTS MUST CONFORM TO THE ATTENDANCE POLICY ESTABLISHED AND ANNOUNCED BY THE INSTRUCTOR AT THE START OF THE SEMESTER AND THEY MUST MAINTAIN A MINIMUM AVERAGE OF 70% ON THEIR IN-CLASS EVALUATIONS. STUDENTS NOT MEETING BOTH OF THESE REQUIREMENTS ARE NOT ELIGIBLE TO TAKE EITHER ATTEMPT AT THE EXIT EXAM.**
- Students not maintaining the minimum eligibility requirements in the course should be required to attend the Math Success Center on a regular basis and/or to use approved online resources outside of the classroom until their performance in the course improves.
- Faculty teaching remedial math classes will be required to use the Early Warning System.
- All students should be encouraged to use the Math Success Center.

TOPICS

Using Martin – Gay

Sections	*Topic*
1.8	Simplifying expressions
2.1	The addition property of equality
2.2	The multiplication property of equality
2.3	Further solving linear equations
2.4	An introduction to problem solving
2.5	Formulas and problem solving
2.6	Percent and mixture problem solving (only objective A: solving percent equations)
2.7	Linear inequalities and problem solving
3.1	Exponents
3.2	Negative exponents and scientific notation
3.3	Introduction to polynomials
3.4	Adding and subtracting polynomials
3.5	Multiplying polynomials
3.6	Special products
3.7	Dividing polynomials (only objective A: dividing by a monomial)
4.1	The greatest common factor (not objective D: factoring by grouping)
4.2	Factoring trinomials of the form $x^2 + bx + c$
4.5	Factoring perfect square trinomials and the difference of two squares
4.6	Solving quadratic equations by factoring (not objective B: solving equations with degree greater than two by factoring)
4.7	Quadratic equations and problem solving (a = 1 only)
5.1	Simplifying rational expressions (with minimal factoring)
5.2	Multiplying and dividing rational expressions (with minimal factoring, not objective D: converting between units of measure)

5.3 Adding and subtracting rational expressions with the same denominator and least common denominators (with minimal factoring)
5.4 Adding and subtracting rational expressions with different denominators (with minimal factoring)
5.6 Proportion and problem solving with rational equations
6.1 Reading graphs and the rectangular coordinate system (not objective C: creating scatter diagrams)
6.2 Graphing linear equations
6.3 Intercepts
6.4 Slope and rate of change
6.5 Equations of lines
7.2 Solving systems of linear equations by substitution
7.3 Solving systems of linear equations by addition
8.1 Introduction to radicals (not objective C: finding nth roots)
8.2 Simplifying radicals
8.3 Adding and subtracting radicals
8.4 Multiplying and dividing radicals (only objective A: multiplying radicals and objective B: dividing radicals)
8.6 Radical Equations and Problem Solving (only objective A: Using the Pythagorean Theorem)
9.3 Solving quadratic equations by the quadratic formula

NOTE TO THE INSTRUCTOR

- Briefly review the real number system and order of operations with integers in Chapter 1. Use the attached review sheets as needed.
- There is important information for the students in the front of the custom texts which includes study skills, Math Center information and Math Interact.
- Cover the Pythagorean Theorem and the sum of angles of a triangle.
- It may be possible to cover several sections in one lecture. Some topics may require several lectures. There should be frequent evaluations of each student's progress. To attain this goal, it is suggested that an exam is given at the completion of each chapter.
- Use the attached sample problems as a guide when covering algebraic fractions.
- If you have any questions, contact a member of the MAT 002 Committee:

Jessica Bosworth
Dorothy Kugler
Christopher Roethel
JoAnne Taormina
Sue Trabucco

DATE LAST REVISED: 04/15/2011

APPROVED FOR: Spring 2012 semester

MAT 002
Review:

Exponents: Repeated multiplications may be written in an abbreviated form by using exponents.

i.e. $3 \cdot 3 \cdot 3 \cdot 3 = 3^4$. The 3 is called the base and 4 is called the exponent or power of 3 (the base)

Find the value of each of the exponential expressions:

a) $2^5 =$ b) $\left(\frac{4}{3}\right)^3 =$ c) $(0.1)^2 =$

Order of Operations:

Many numerical problems involve more than one operation. Sometimes, grouping symbols, such as parenthesis, are utilized to indicate the order in which the operations should be done. **If grouping symbols are present, simplify within the group, doing the innermost parenthesis first.** If no grouping symbols are used, we apply the following order of operations:

1. Evaluate all exponents.
2. Perform any multiplication or division operations in the order in which they occur, working from left to right.
3. Perform any addition or subtraction operations in the order in which they occur, working from left to right.

Note: Fractions are simplified by evaluating the numerator and denominator separately.

Find the value of each expression:

a) $5 + 3 \cdot 6 =$

b) $3 \cdot 2 + 8 \div 4 =$

c) $4 \cdot 5 - 2(3 - 1) =$

d) $3\left[2 + 5(2^3)\right] =$

e) $\frac{8 + 2(8^2 - 4)}{4 \cdot 3 - 10} =$

Converting Words to Symbols using $=,\ \neq,\ <,\ \leq,\ >,\ \geq$

a) Nine equals eleven minus two. _____

b) Twelve is less than twenty-two. _____

c) Three is not equal to four. _____

d) Eight is greater than five. _____

e) Two is greater than or equal to two. _____

Converting Symbols to Words

a) $4 < 7$ _____

b) $1 \geq 0$ _____

c) $3 \neq 7$ _____

Variables: letters used to represent numbers.

Algebraic Expression: is a way of representing a calculation with numbers, using letters to stand for some of

the numbers i.e. $0.2B$, $\frac{x+3}{6}$, $2n-6$, $3x^2+2(x-4)$

Evaluating Algebraic Expressions: We evaluate algebraic expressions by giving particular values to the variables in the expression.

Evaluate each expression if $x=3$ and $y=4$:

a) $2x+4y$

b) $2x^2-3y$

c) $\frac{9y-8x}{2x-y}$

d) $(6x-10)(2y-x)$

Equation: An equation is a statement that two expressions are equal. Depending on the value of the variable,

the statement can be true or false i.e. $x+4=10$, $2y=16$

Solving an equation means to find the values of the variable that make the equation true. Such values of the variables are called the solutions of the equation.

Decide whether the given number is a solution of the equation:

a) Is 2 a solution to the following equation: $p-1=3$?

b) Is 7 a solution to the following equation: $2k+3=15$?

c) Is $\frac{1}{2}$ a solution to the following equation: $6x-3=0$?

Important Vocabulary to Know

Natural Numbers (counting numbers) $\{1,\ 2,\ 3,\ 4,\ 5,...\}$

Whole Numbers $\{0,\ 1,\ 2,\ 3,\ 4,\ 5,...\}$

Integers- The natural numbers, their opposites and 0 form the set of integers:

$$\{...,-3,-2,-1,\ 0,\ 1,\ 2,\ 3...\}$$

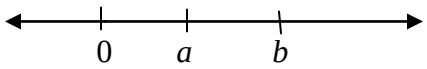
Rational Numbers are numbers that can be expressed as fractions with denominators not equal to 0, i.e. $\frac{5}{12}$

- This set includes all integers since any integer can be written as a fraction, i.e. -6 is a rational number since it could be written as $\frac{-6}{1}$
- This set includes terminating decimals, i.e. 0.23 is a rational number since it could be written as $\frac{23}{100}$.
- This set includes decimal numbers that repeat in a fixed block of digits, i.e. $0.333\ldots$ is a rational number since $0.333... = 0.\overline{3} = \frac{1}{3}$.

Irrational numbers are numbers that cannot be expressed as fractions with denominators not equal to 0.These numbers include non-repeating, non-terminating decimals i.e. $\sqrt{3}$

Real Numbers- $\{$all numbers that are either rational or irrational$\}$

Ordering of the Real Numbers- For any two real numbers *a* and *b*, *a* is less than *b* if *a* is to the left of *b* on a number line.



Opposite of a Real Number- each real number, except 0, can be paired with another real number that is the same distance from 0 on the number line, but in opposite directions. i.e. 5 and -5 are opposite numbers

Double Negative Rule: $-(-x) = x$ for all values of *x*. Except for 0, the opposite of a number is found by changing the sign of the number.

Absolute value is the distance between 0 and the number on the number line. The absolute value of a number can never be negative. i.e. $|2| = 2 \quad |-3| = 3 \quad |0| = 0$

Fill – in the chart below

Simplify:

a) $|-8|$

b) $-|-10|$

c) $-|12-4|$

Number	Reciprocal	opposite
8		
	-3	
		$\frac{7}{2}$
0.5		
		-7
	$\frac{5}{6}$	

Operations with signed numbers

Addition

1. $10+(-3)=$
2. $-4+(-8)=$
3. $-2+[(-6)+(-3)+1]=$
4. $[(-3)+(+8)]+[5+(-1)+(-6)]=$
5. $5-7=$
6. $3-6+8-2=$
7. $2-5+(-3)-7+1=$

Subtraction

8. $-6-(3-4)=$
9. $(10-3)-(6-9)=$
10. $5-[(4-2)-(10-15)]=$
11. $(1-2)-[4-(6-8)-3]=$
12. $(3-7)+8-2+[(-3-5)-(2-5)]=$

Evaluate if $x=-2$ and $y=3$

13. $x+y$
14. $x-y$
15. $y-x$

Multiplication

16. $2(6-8)=$
17. $-3(10-7)-2(1-3)=$
18. $(2)(-1)-(8-9)=$
19. $(-2-4)(-3)-(-5)=$

Evaluate if $x=-2$ and $y=3$

20. xy
21. x^3
22. $3y-2x$
23. $2x^2-3xy$

Division

24. $\dfrac{(-3)(4)}{-2-1} =$

25. $\dfrac{6-(2)(-1)}{8-2\cdot 5} =$

26. $\dfrac{6-2\cdot 4}{18-20} =$

27. $\dfrac{4^2-2(13-5)}{2-1}$

28. $\dfrac{(4-3)-(8+2)}{2(-3-6)} =$

29. $\dfrac{2+[3(1-4)-(4-6)]}{5-2\cdot 5} =$

Evaluate if $x=-1 \quad y=2$ and $z=-3$

30. $4xyz$

31. $3x-2y$

32. $\dfrac{xz+yz}{x}$

33. $z^2+2xz-x^2$

34. $\dfrac{2y-8x}{yz}$

35. $\dfrac{x^2+1}{z+y-x}$

MAT 002
Algebraic Fractions

1) Reduce each algebraic fraction:

a) $\frac{12a^2b}{-8ac}$ b) $\frac{-20x^2y^2}{-90xy^2}$ c) $\frac{-32a^3b^3}{48a^3b^3}$ d) $\frac{5xy}{45x^2y^2}$ e) $\frac{x^2-9}{3x+9}$

2) Multiply each algebraic fraction:

a) $mn \cdot \frac{8}{m^2n^2}$ b) $\frac{24x}{35y} \cdot \frac{14y}{8x}$ c) $\frac{12x}{5y} \cdot \frac{15y^2}{36x^2}$ d) $\frac{6r^2}{5s^2} \cdot \frac{10rs}{6r^3}$

e) $\frac{30m^2}{18n} \cdot \frac{6n}{5m}$ f) $\frac{24a^3b^2}{7c^3} \cdot \frac{21c^2}{12ab}$ g) $\frac{5xy}{x^2y} \cdot \frac{xy^2}{25}$

3) Divide each algebraic fraction:

a) $\frac{3x}{5y} \div \frac{21x}{2y}$ b) $\frac{7ab^2}{10cd} \div \frac{14b^3}{5c^2d^2}$ c) $\frac{xy^2}{x^2y} \div \frac{x}{y^3}$ d) $\frac{6a^2b^2}{8c} \div 3ab$

e) $\frac{16c^3}{21d^2} \div \frac{24c^4}{14d^3}$ f) $24x^3y^2 \div \frac{36xy^2}{2y}$

Add or subtract each algebraic fraction:

Part 1

a) $\frac{2}{x} + \frac{3}{x}$ b) $\frac{11}{4c} + \frac{5}{4c} - \frac{6}{4c}$ c) $\frac{3x}{4} + \frac{2x}{4}$ d) $\frac{12y}{5} - \frac{4y}{5}$

e) $\frac{2c}{5} - \frac{3d}{5}$ f) $\frac{x}{2} - \frac{y}{2} + \frac{z}{2}$ g) $\frac{19c}{12d} + \frac{9c}{12d}$ h) $\frac{2x+6}{x+2} + \frac{3x+4}{x+2}$

i) $\frac{4x+12}{16x} + \frac{8x+4}{16x}$ j) $\frac{5x-4}{3} - \frac{2x+1}{3}$ k) $\frac{12a-15}{12a} - \frac{9a-6}{12a}$

Part 2

a) $\frac{x}{3} + \frac{x}{2}$ b) $\frac{d}{3} - \frac{d}{5}$ c) $\frac{5x}{6} - \frac{2x}{3}$ d) $\frac{y}{6} + \frac{y}{5} - \frac{y}{2}$

e) $\frac{ab}{5a} + \frac{ab}{4a}$ f) $\frac{8x}{5x} - \frac{3x}{4x} + \frac{7x}{10x}$ g) $\frac{5a}{6} - \frac{3a}{4}$ h) $\frac{a}{7} + \frac{b}{14a}$

i) $\frac{3x}{2} + \frac{x-4}{4x^2}$ j) $\frac{2}{x} + \frac{3x+2}{4}$ k) $\frac{a-3}{a} + \frac{2a+7}{6a}$

l) $\frac{3x}{2} + \frac{2x-1}{x+1}$ m) $\frac{3y-4}{y} + \frac{y-2}{y-1}$ n) $\frac{a-b}{4a} + \frac{a+b}{6b}$

ANSWERS - ALGEBRAIC FRACTIONS

1) a) $\frac{3ab}{-2c}$ b) $\frac{2x}{9}$ c) $\frac{-2}{3}$ d) $\frac{1}{9xy}$ e) $\frac{x-3}{3}$

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2) a) $\frac{8}{mn}$ b) $\frac{6}{5}$ c) $\frac{y}{x}$ d) $\frac{2}{s}$ e) $2m$ f) $\frac{6a^2b}{c}$ g) $\frac{y^2}{5}$

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3) a) $\frac{2}{35}$ b) $\frac{acd}{4b}$ c) $\frac{y^4}{x^2}$ d) $\frac{ab}{4c}$ e) $\frac{4d}{9c}$ f) $\frac{4x^2y}{3}$

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4) Part 1

a) $\frac{5}{x}$ b) $\frac{5}{2c}$ c) $\frac{5x}{4}$ d) $\frac{8y}{5}$ e) $\frac{2c-3d}{5}$ f) $\frac{x-y+z}{2}$

g) $\frac{7c}{3d}$ h) 5 i) $\frac{3x+4}{4x}$ j) $\frac{3x-5}{3}$ k) $\frac{a-3}{4a}$

Part 2

a) $\frac{5x}{6}$ b) $\frac{2d}{15}$ c) $\frac{x}{6}$ d) $\frac{-2y}{15}$ e) $\frac{9b}{20}$ f) $\frac{31}{20}$

g) $\frac{a}{12}$ h) $\frac{2a^2+b}{14a}$ i) $\frac{6x^2+x-4}{4x^2}$ j) $\frac{3x^2+2x+8}{4x}$ k) $\frac{8a-11}{6a}$

l) $\frac{3x^2+7x+-2}{2(x+1)}$ m) $\frac{4y^2-9y+4}{y(y-1)}$ n) $\frac{2a^2+5ab-3b^2}{12ab}$