

STUDENT LEARNING OUTCOMES:

Students will be able to:

- Perform operations on and simplify numerical and algebraic expressions
 - Substitution and evaluation, exponential notation, and operations on polynomials
- Solve linear equations and inequalities
 - Includes translating word problems into algebraic equations and solving them and solving systems of equations in two variables
- Factor polynomials using one or more techniques and apply these techniques to solve quadratic equations and to simplify rational expressions
- Perform operations on and simplify radicals and roots (including Pythagorean Theorem)
- Write and graph linear equations in the Cartesian coordinate plane using various techniques and properties of linear equations

MATH 020: DAY-BY-DAY COURSE OUTLINE: The following topics have been removed from the departmental midterm exam and the final exam (CEAFE):

- **Function notation**
- **Rates, proportions, and percent**
- **Scientific notation, including 2-step multiplication/division problems**

I. THE REAL NUMBER SYSTEM AND INTRODUCTION TO ALGEBRA (3 sessions):

Day 1:

Introduction: sets of integers, rational, irrational and real numbers
The real number line
Absolute value
Comparing, ordering ($<$, $=$, $>$), and trichotomy (*e.g.*, $-1 < 0 < 5$)
Addition of real numbers and properties of addition
Subtraction of real numbers

Day 2:

Multiplication of real numbers and properties of multiplication
Division of real numbers
Powers of real numbers with natural number exponents
Order of operations, including multiple grouping symbols and exponents

Day 3:

The concept of variable and constant; defining like and unlike terms
Definition of algebraic expressions and like terms:
Term:
 Numerical coefficient (including implied 1 and -1)
 Literal part
 Monomial, binomial, polynomial
 Like and unlike terms
The substitution principle for evaluating formulas and algebraic expressions

II. LINEAR EQUATIONS AND INEQUALITIES IN ONE VARIABLE, TOGETHER WITH APPLICATIONS (9 sessions):

Day 4:

Simplifying expressions by combining like terms:

Using the distributive property to remove parentheses (expansion)

Using the distributive property to combine like terms (contraction)

Definition and solution of a linear equation in one variable

Solving linear equations using:

Addition/Subtraction and Multiplication/Division Principles of Equality

Language translation problems (e.g., “three less than twice a number is what?”)

Day 5-6:

Solving a linear equation involving parentheses, fractions, and decimals; identities and contradictions

Day 7:

Solving and graphing linear inequalities

Days 8-9:

Solving word problems (application problems) using linear equations:

a. Solving literal equations for a given variable, including perimeter and area formulas

b. Translating from English to algebra, (e.g., “15 is 12 less than 2 times a number” “30 subtracted from 7 times a number is 4”)

Day 10-11:

More algebra word problems, including consecutive integer problems, averages, perimeter and area problems, and linear inequality problems

Day 12:

UNIT TEST I (non-departmental): General review, which should include at least the following: order of operations, substitution, signed numbers, translation problems, solving linear equations, and solving and graphing linear inequalities

(12 classes total, including Unit Test I)

III. EXPONENTS AND OPERATIONS WITH POLYNOMIALS AND SPECIAL PRODUCTS (7 sessions)

Day 13:

The 7 exponent rules, including negative exponents (no rational exponents)

Day 14:

Addition and subtraction of polynomials

Day 15:

Multiplication of polynomials:

a. A monomial times a monomial, including exponents and variables

b. A monomial times a polynomial (the distributive property)

c. A binomial times a binomial: FOILing

Day 16:

Multiplication of polynomials:

- d. A binomial times a binomial: Special Products
 - i. Perfect square trinomials
 - ii. Difference of two squares
- e. A binomial times a trinomial (e.g., $(3x - 5)(x^2 - 6x + 4)$)

Day 17:

Division of Polynomials:

- a. A monomial by a monomial
- b. A polynomial by a monomial, where quotient has no remainder (*i.e.*, no division by more than a monomial)

Day 18:

UNIT TEST II (Exponents, operations on polynomials)

(18 classes total, including Unit Test II)

IV. FACTORING AND APPLICATIONS (7 sessions):**Day 19:**

Factor, prime factor, and greatest common factor;
Factoring a polynomial that has a common factor in each of its terms;
Factoring by grouping, with up to 4 terms, & terms with multiple variables
(e.g., $45cw + 63cz - 20dw - 28dz$; $21ab - 14ax + 15by - 10xy$).

Day 20:

Factoring trinomials of the form $x^2 + bx + c$.

Day 21:

Factoring trinomials of the form $ax^2 + bx + c$.

Day 22:

Factoring perfect square trinomials;
Factoring the difference of two squares;
Factoring completely, including multi-step problems such as $36x^2y - 100y^3$ (GCF + difference of two squares)

Day 23:

Solving quadratic equations by factoring, including multi-step factoring
(e.g., $4b^2 + 8b = 0$).

Day 24:

Solve multi-step quadratic equations (e.g., $x^2 + 2x = 15$; $10x^2 = 490$)

Day 25-26:

Review for Departmental Midterm

(26 classes total)

V. DEPARTMENTAL MIDTERM

Day 27:

DEPARTMENTAL MIDTERM (1 session)

(27 classes total, including Midterm; 15 classes left)

VI. ROOTS AND RADICALS (4 sessions):

Day 28:

Finding roots

Simplifying radicals

Day 29:

Addition and subtraction of radicals

Day 30:

Multiplication and division of radicals (without conjugates), simplified completely

Day 31:

Pythagorean Theorem: given any two sides, find the third side

VII. CARTESIAN GEOMETRY (8 sessions):

Day 32:

The Cartesian coordinate system;

Ordered pairs of real numbers and finding points in a plane, given a table

Day 33:

Definition and solution of a linear equation in two variables ($ax + by = c$)

Graphing a linear equation:

a. By finding two points

b. By the x- and y-intercepts method

c. Equations of horizontal and vertical lines (e.g., find the equation of the horizontal line passing through the point (-5,3); find the equation of the vertical line passing through the point (-5,-2))

Days 34-35:

Concept of the slope of a straight line:

Slope formula

Finding the slope of a line on a graph given its equation

Finding the slope of a line using $y = mx + b$

Given possible graphs of a line, use slope and y-intercept to select correct graph

Slopes of horizontal and vertical lines (slopes of lines parallel to the x- and y-axes).

Day 36:

Finding equations of lines:

Using the slope-intercept formula ($y = mx + b$)

Using the point-slope formula

Given two points on the line

Day 37:

Systems of two linear equations in two variables, including rational coefficients:
Three possibilities: intersecting lines, parallel lines, coincident lines
Substitution method
Addition method

Day 38:

UNIT TEST III (non-departmental): Roots and radicals; Cartesian geometry, including finding equations of lines and finding correct graph given equation)

Day 39:

Rational expressions as a review of factoring: simplification, multiplication and division

(39 classes total, including Unit Test III)

VIII. FINAL WEEK OF CLASS

Day 40:

Further review of rational expressions and solving quadratic equations

Day 41:

Review of Test III and review for Final Exam

Day 42:

Review for Final Exam

Please be advised that while the instructor may change the order and the pacing, the instructor is still responsible for covering in time all topics represented before the respective departmental midterm & final exams. A.J.S. Last edited: 3/01/2017