

Math Standards I

August 2008

COURSE DESCRIPTION:

Math Standards I is a course for students who have not made satisfactory progress towards passing the New Jersey High School Proficiency Assessment (HSPA) in mathematics as indicated by their Grade Eight Proficiency Assessment (GEPA) results. Students enrolled in this course during their freshmen year will use this time to work on basic mathematics and test taking skills necessary to achieve a level of proficiency in their standardized testing.

Topics addressed by this course include Algebra, Real Numbers, Solving Equations, Problem Solving, Geometry, Polynomials, Factoring, Fractions, Functions and Systems of Linear Equations.

CORE CURRICULUM CONTENT STANDARDS:

STANDARD 4.1 (NUMBER AND NUMERICAL OPERATIONS) ALL STUDENTS WILL DEVELOP NUMBER SENSE AND WILL PERFORM STANDARD NUMERICAL OPERATIONS AND ESTIMATIONS ON ALL TYPES OF NUMBERS IN A VARIETY OF WAYS.

STANDARD 4.2 (GEOMETRY AND MEASUREMENT) ALL STUDENTS WILL DEVELOP SPATIAL SENSE AND THE ABILITY TO USE GEOMETRIC PROPERTIES, RELATIONSHIPS, AND MEASUREMENT TO MODEL, DESCRIBE AND ANALYZE PHENOMENA.

STANDARD 4.3 (PATTERNS AND ALGEBRA) ALL STUDENTS WILL REPRESENT AND ANALYZE RELATIONSHIPS AMONG VARIABLE QUANTITIES AND SOLVE PROBLEMS INVOLVING PATTERNS, FUNCTIONS, AND ALGEBRAIC CONCEPTS AND PROCESSES.

STANDARD 4.4 (DATA ANALYSIS, PROBABILITY, AND DISCRETE MATHEMATICS) ALL STUDENTS WILL DEVELOP AN UNDERSTANDING OF THE CONCEPTS AND TECHNIQUES OF DATA ANALYSIS, PROBABILITY, AND DISCRETE MATHEMATICS, AND WILL USE THEM TO MODEL SITUATIONS, SOLVE PROBLEMS, AND ANALYZE AND DRAW APPROPRIATE INFERENCES FROM DATA.

STANDARD 4.5 (MATHEMATICAL PROCESSES) ALL STUDENTS WILL USE MATHEMATICAL PROCESSES OF PROBLEM SOLVING, COMMUNICATION, CONNECTIONS, REASONING, REPRESENTATIONS, AND TECHNOLOGY TO SOLVE PROBLEMS AND COMMUNICATE MATHEMATICAL IDEAS.

STANDARD 8.1 (COMPUTER AND INFORMATION LITERACY) ALL STUDENTS WILL USE COMPUTER APPLICATIONS TO GATHER AND ORGANIZE INFORMATION AND TO SOLVE PROBLEMS.

STANDARD 8.2 (TECHNOLOGY EDUCATION) ALL STUDENTS WILL DEVELOP AN UNDERSTANDING OF THE NATURE AND IMPACT OF TECHNOLOGY,

ENGINEERING, TECHNOLOGICAL DESIGN, AND THE DESIGNED WORLD AS THEY RELATE TO THE INDIVIDUAL, SOCIETY, AND THE ENVIRONMENT.

STANDARD 9.1 (CAREER AND TECHNICAL EDUCATION) ALL STUDENTS WILL DEVELOP CAREER AWARENESS AND PLANNING, EMPLOYABILITY SKILLS, AND FOUNDATIONAL KNOWLEDGE NECESSARY FOR SUCCESS IN THE WORKPLACE.

STANDARD 9.2 (CONSUMER, FAMILY, AND LIFE SKILLS) ALL STUDENTS WILL DEMONSTRATE CRITICAL LIFE SKILLS IN ORDER TO BE FUNCTIONAL MEMBERS OF SOCIETY.

CUMULATIVE PROGRESS INDICATORS:

STANDARD 4.1 - MATHEMATICS

Building upon knowledge and skills gained in preceding grades, by the end of Grade 12, students will:

A. Number Sense

1. Extend understanding of the number system to all real numbers.
2. Compare and order rational and irrational numbers.
3. Develop conjectures and informal proofs of properties of number systems and sets of numbers.

B. Numerical Operations

1. Extend understanding and use of operations to real numbers and algebraic procedures.
2. Develop, apply, and explain methods for solving problems involving rational and negative exponents.
3. Perform operations on matrices.
 - Addition and subtraction
 - Scalar multiplication
4. Understand and apply the laws of exponents to simplify expressions involving numbers raised to powers.

C. Estimation

1. Recognize the limitations of estimation, assess the amount of error resulting from estimation, and determine whether the error is within acceptable tolerance limits.

STANDARD 4.2 - MATHEMATICS

Building upon knowledge and skills gained in preceding grades, by the end of Grade 12, students will:

A. Geometric Properties

1. Use geometric models to represent real-world situations and objects and to solve problems using those models (e.g., use Pythagorean Theorem to decide whether an object can fit through a doorway).
2. Draw perspective views of 3D objects on isometric dot paper, given 2D representations (e.g., nets or projective views).
3. Apply the properties of geometric shapes.
 - Parallel lines, transversal, alternate interior angles, corresponding angles
 - Triangles
 - a. Conditions for congruence

- b. Segment joining midpoints of two sides is parallel to and half the length of the third side
- c. Triangle Inequality

- Minimal conditions for a shape to be a special quadrilateral
 - Circles, arcs, central and inscribed angles, chords, tangents
 - Self-similarity
4. Use reasoning and some form of proof to verify or refute conjectures and theorems.
 - Verification or refutation of proposed proofs
 - Simple proofs involving congruent triangles
 - Counterexamples to incorrect conjectures

B. Transforming Shapes

1. Determine, describe, and draw the effect of a transformation, or a sequence of transformations, on a geometric or algebraic object, and, conversely, determine whether and how one object can be transformed to another by a transformation or a sequence of transformations.
2. Recognize three-dimensional figures obtained through transformations of two-dimensional figures (e.g., cone as rotating an isosceles triangle about an altitude), using software as an aid to visualization.
3. Determine whether two or more given shapes can be used to generate a tessellation.
4. Generate and analyze iterative geometric patterns.
 - Fractals (e.g., Sierpinski's Triangle)
 - Patterns in areas and perimeters of self-similar figures
 - Outcome of extending iterative process indefinitely

C. Coordinate Geometry

1. Use coordinate geometry to represent and verify properties of lines.
 - Distance between two points
 - Midpoint and slope of a line segment
 - Finding the intersection of two lines
 - Lines with the same slope are parallel
 - Lines that are perpendicular have slopes whose product is -1
2. Show position and represent motion in the coordinate plane using vectors.
 - Addition and subtraction of vectors

D. Units of Measurement

1. Understand and use the concept of significant digits.
2. Choose appropriate tools and techniques to achieve the specified degree of precision and error needed in a situation.
 - Degree of accuracy of a given measurement tool
 - Finding the interval in which a computed measure (e.g., area or volume) lies, given the degree of precision of linear measurements

E. Measuring Geometric Objects

1. Use techniques of indirect measurement to represent and solve problems.
 - Similar triangles
 - Pythagorean theorem
 - Right triangle trigonometry (sine, cosine, tangent)
2. Use a variety of strategies to determine perimeter and area of plane figures and surface area and volume of 3D figures.
 - Approximation of area using grids of different sizes
 - Finding which shape has minimal (or maximal) area, perimeter, volume, or surface area under given conditions using graphing calculators, dynamic geometric software, and/or spreadsheets
 - Estimation of area, perimeter, volume, and surface area

STANDARD 4.3 - MATHEMATICS

Building upon knowledge and skills gained in preceding grades, by the end of Grade 12, students will:

A. Patterns

- 1. Use models and algebraic formulas to represent and analyze sequences and series.
 - • Explicit formulas for n^{th} terms
 - • Sums of finite arithmetic series
 - • Sums of finite and infinite geometric series
- 2. Develop an informal notion of limit.
- 3. Use inductive reasoning to form generalizations.

B. Functions and Relationships

- 1. Understand relations and functions and select, convert flexibly among, and use various representations for them, including equations or inequalities, tables, and graphs.
- 2. Analyze and explain the general properties and behavior of functions of one variable, using appropriate graphing technologies.
 - Slope of a line or curve
 - Domain and range
 - Intercepts
 - Continuity
 - Maximum/minimum
 - Estimating roots of equations
 - Intersecting points as solutions of systems of equations
 - Rates of change
- 3. Understand and perform transformations on commonly-used functions.
 - Translations, reflections, dilations
 - Effects on linear and quadratic graphs of parameter changes in equations
 - Using graphing calculators or computers for more complex functions
- 4. Understand and compare the properties of classes of functions, including exponential, polynomial, rational, and trigonometric functions.
 - Linear vs. non-linear
 - Symmetry
 - Increasing/decreasing on an interval

C. Modeling

- 1. Use functions to model real-world phenomena and solve problems that involve varying quantities.
 - Linear, quadratic, exponential, periodic (sine and cosine), and step functions (e.g., price of mailing a first-class letter over the past 200 years)
 - Direct and inverse variation
 - Absolute value
 - Expressions, equations and inequalities
 - Same function can model variety of phenomena
 - Growth/decay and change in the natural world
 - Applications in mathematics, biology, and economics (including compound interest)
- 2. Analyze and describe how a change in an independent variable leads to change in a dependent one.

3. Convert recursive formulas to linear or exponential functions (e.g., Tower of Hanoi and doubling).

D. Procedures

1. Evaluate and simplify expressions.
 - Add and subtract polynomials
 - Multiply a polynomial by a monomial or binomial
 - Divide a polynomial by a monomial
2. Select and use appropriate methods to solve equations and inequalities.
 - Linear equations . algebraically
 - Quadratic equations . factoring (when the coefficient of x^2 is 1) and using the quadratic formula
 - All types of equations using graphing, computer, and graphing calculator techniques
3. Judge the meaning, utility, and reasonableness of the results of symbol manipulations, including those carried out by technology.

STANDARD 4.4 – MATHEMATICS

Building upon knowledge and skills gained in preceding grades, by the end of Grade 12, students will:

A. Data Analysis

1. Use surveys and sampling techniques to generate data and draw conclusions about large groups.
 - Advantages/disadvantages of sample selection methods (e.g., convenience sampling, responses to survey, random sampling)
2. Evaluate the use of data in real-world contexts.
 - Accuracy and reasonableness of conclusions drawn
 - Bias in conclusions drawn (e.g., influence of how data is displayed)
 - Statistical claims based on sampling
3. Design a statistical experiment, conduct the experiment, and interpret and communicate the outcome.
4. Estimate or determine lines of best fit (or curves of best fit if appropriate) with technology, and use them to interpolate within the range of the data.
5. Analyze data using technology, and use statistical terminology to describe conclusions.
 - Measures of dispersion: variance, standard deviation, outliers
 - Correlation coefficient
 - Normal distribution (e.g., approximately 95% of the sample lies between two standard deviations on either side of the mean)

B. Probability

1. Calculate the expected value of a probability-based game, given the probabilities and payoffs of the various outcomes, and determine whether the game is fair.
2. Use concepts and formulas of area to calculate geometric probabilities.
3. Model situations involving probability with simulations (using spinners, dice, calculators and computers) and theoretical models, and solve problems using these models.
4. Determine probabilities in complex situations.
 - Conditional events
 - Complementary events
 - Dependent and independent events
5. Estimate probabilities and make predictions based on experimental and theoretical probabilities.

6. Understand and use the law of large numbers. (that experimental results tend to approach theoretical probabilities after a large number of trials).

C. Discrete Mathematics. Systematic Listing and Counting

1. Calculate combinations with replacement (e.g., the number of possible ways of tossing a coin 5 times and getting 3 heads) and without replacement (e.g., number of possible delegations of 3 out of 23 students).
2. Apply the multiplication rule of counting in complex situations, recognize the difference between situations with replacement and without replacement, and recognize the difference between ordered and unordered counting situations.
3. Justify solutions to counting problems.
4. Recognize and explain relationships involving combinations and Pascal's Triangle, and apply those methods to situations involving probability.

D. Discrete Mathematics. Vertex-Edge Graphs and Algorithms

1. Use vertex-edge graphs and algorithmic thinking to represent and solve practical problems.
 - Circuits that include every edge in a graph
 - Circuits that include every vertex in a graph
 - Scheduling problems (e.g., when project meetings should be scheduled to avoid conflicts) using graph coloring
 - Applications to science (e.g., who-eats-whom graphs, genetic trees, molecular structures)
2. Explore strategies for making fair decisions.
 - Combining individual preferences into a group decision (e.g., determining winner of an election or selection process)
 - Determining how many Student Council representatives each class (9th, 10th, 11th, and 12th grade) gets when the classes have unequal sizes (apportionment)

STANDARD 4.5 – MATHEMATICS

At each grade level, with respect to content appropriate for that grade level, students will:

A. Problem Solving

1. Learn mathematics through problem solving, inquiry, and discovery.
2. Solve problems that arise in mathematics and in other contexts (cf. workplace readiness standard 8.3).
 - Open-ended problems
 - Non-routine problems
 - Problems with multiple solutions
 - Problems that can be solved in several ways
3. Select and apply a variety of appropriate problem-solving strategies (e.g., .try a simpler problem. or .make a diagram.) to solve problems.
4. Pose problems of various types and levels of difficulty.
5. Monitor their progress and reflect on the process of their problem solving activity.

B. Communication

1. Use communication to organize and clarify their mathematical thinking.
 - Reading and writing
 - Discussion, listening, and questioning
2. Communicate their mathematical thinking coherently and clearly to peers, teachers, and others, both orally and in writing.
3. Analyze and evaluate the mathematical thinking and strategies of others.

4. Use the language of mathematics to express mathematical ideas precisely.

C. Connections

1. Recognize recurring themes across mathematical domains (e.g., patterns in number, algebra, and geometry).
2. Use connections among mathematical ideas to explain concepts (e.g., two linear equations have a unique solution because the lines they represent intersect at a single point).
3. Recognize that mathematics is used in a variety of contexts outside of mathematics.
4. Apply mathematics in practical situations and in other disciplines.
5. Trace the development of mathematical concepts over time and across cultures (cf. world languages and social studies standards).
6. Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.

D. Reasoning

1. Recognize that mathematical facts, procedures, and claims must be justified.
2. Use reasoning to support their mathematical conclusions and problem solutions.
3. Select and use various types of reasoning and methods of proof.
4. Rely on reasoning, rather than answer keys, teachers, or peers, to check the correctness of their problem solutions.
5. Make and investigate mathematical conjectures.
 - Counterexamples as a means of disproving conjectures
 - Verifying conjectures using informal reasoning or proofs.
6. Evaluate examples of mathematical reasoning and determine whether they are valid.

E. Representations

1. Create and use representations to organize, record, and communicate mathematical ideas.
 - Concrete representations (e.g., base-ten blocks or algebra tiles)
 - Pictorial representations (e.g., diagrams, charts, or tables)
 - Symbolic representations (e.g., a formula)
 - Graphical representations (e.g., a line graph)
2. Select, apply, and translate among mathematical representations to solve problems.
3. Use representations to model and interpret physical, social, and mathematical phenomena.

F. Technology

1. Use technology to gather, analyze, and communicate mathematical information.
2. Use computer spreadsheets, software, and graphing utilities to organize and display quantitative information.
3. Use graphing calculators and computer software to investigate properties of functions and their graphs.
4. Use calculators as problem-solving tools (e.g., to explore patterns, to validate solutions).
5. Use computer software to make and verify conjectures about geometric objects.
6. Use computer-based laboratory technology for mathematical applications in the sciences.

STANDARD 8.1 – TECHNOLOGICAL LITERACY

Building upon knowledge and skills gained in preceding grades, by the end of Grade 12, students will:

A. Basic Computer Skills and Tools

1. Create a multi-page document with citations using word processing software in conjunction with other tools that demonstrates the ability to format, edit, and print.

2. Create documents including a resume and a business letter using professional format.
3. Construct a spreadsheet, enter data, use mathematical or logical functions to manipulate and process data, generate charts and graphs, and interpret the results.
4. Given a database, define fields, input data from multiple records, produce a report using sort and query, and interpret the data.
5. Produce a multimedia project using text, graphics, moving images, and sound.
6. Produce and edit page layouts in different formats using desktop publishing and graphics software.
7. Develop a document or file for inclusion into a website or web page.
8. Discuss and/or demonstrate the capability of emerging technologies and software in the creation of documents or files.
9. Merge information from one document to another.

B. Application of Productivity Tools

Social Aspects

1. Describe the potential and implications of contemporary and emerging computer applications for personal, social, lifelong learning, and workplace needs.
2. Exhibit legal and ethical behaviors when using information and technology, and discuss consequences of misuse.
3. Make informed choices among technology systems, resources, and services in a variety of contexts.
4. Use appropriate language when communicating with diverse audiences using computer and information literacy.

Information Access and Research

5. Select and use specialized databases for advanced research to solve real world problems.
6. Identify new technologies and other organizational tools to use in personal, home, and/or work environments for information retrieval, entry, and presentation.
7. Evaluate information sources for accuracy, relevance, and appropriateness.
8. Compose, send, and organize e-mail messages with and without attachments.

Problem Solving and Decision Making

9. Create and manipulate information, independently and/or collaboratively, to solve problems and design and develop products.
10. Identify, diagnose, and suggest solutions for non-functioning technology systems.
11. Identify a problem in a content area and formulate a strategy to solve the problem using brainstorming, flowcharting, and appropriate resources.
12. Integrate new information into an existing knowledge base and communicate the results in a project or presentation.

STANDARD 8.2 – TECHNOLOGICAL LITERACY

Building upon knowledge and skills gained in preceding grades, by the end of Grade 12, students will:

A. Nature and Impact of Technology

1. Use appropriate data to discuss the full costs, benefits and trade-offs, and risks related to the use of technologies.
2. Explain how technological development is affected by competition through a variety of management activities associated with planning, organizing, and controlling the enterprise.
3. Provide various examples of how technological developments have shaped human history.

B. Design Process and Impact Assessment

1. Analyze a given technological product, system, or environment to understand how the engineering design process and design specification limitations influenced the final solution.
2. Evaluate the function, value, and appearance of technological products, systems, and environments from the perspective of the user and the producer.
3. Develop methods for creating possible solutions, modeling and testing solutions, and modifying proposed design in the solution of a technological problem using hands-on activities.
4. Use a computer assisted design (CAD) system in the development of an appropriate design solution.
5. Diagnose a malfunctioning product and system using appropriate critical thinking methods.
6. Create a technological product, system, or environment using given design specifications and constraints by applying design and engineering principles.

C. Systems in the Designed World

1. Explain the life cycle of a product from initial design to reuse, recycling, remanufacture, or final disposal, and its relationship to people, society, and the environment, including conservation and sustainability principles.
2. Analyze the factors that influence design of products, systems, and environments.
3. Compare and contrast the effectiveness of various products, systems, and environments associated with technological activities in energy, transportation, manufacturing, and information and communication.

STANDARD 9.1 – CAREER EDUCATION AND CONSUMER, FAMILY AND LIFE SKILLS

Building upon knowledge and skills gained in preceding grades, by the end of Grade 12, students will:

A. Career Awareness/Preparation

1. Re-evaluate personal interests, abilities, and skills through various measures including self assessments.
2. Evaluate academic and career skills needed in various career clusters.
3. Analyze factors that can impact an individual's career.
4. Review and update their career plan and include the plan in a portfolio.
5. Research current advances in technology that apply to a selected occupational career cluster.

B. Employability Skills

1. Assess personal qualities that are needed to obtain and retain a job related to career clusters.
2. Communicate and comprehend written and verbal thoughts, ideas, directions, and information relative to educational and occupational settings.
3. Select and utilize appropriate technology in the design and implementation of teacher-approved projects relevant to occupations and/or higher educational settings.
4. Evaluate the following academic and career skills as they relate to home, school, community, and employment:
 - ♣ Communication
 - ♣ Punctuality
 - ♣ Time management
 - ♣ Organization
 - ♣ Decision making
 - ♣ Goal setting
 - ♣ Resources allocation
 - ♣ Fair and equitable competition
 - ♣ Safety
 - ♣ Employment application skills
 - ♣ Teamwork
5. Demonstrate teamwork and leadership skills that include student participation in real world applications of career and technical education skills.

All students electing further study in career and technical education will also:

1. Participate in a structured learning experience that demonstrates interpersonal communication, teamwork, and leadership skills.
2. Participate in simulated industry assessments, when and where appropriate.
3. Prepare industry-specific technical reports/projects that incorporate graphic aids, when and where appropriate.
4. Demonstrate occupational health and safety skills related to industry-specific activities.

STANDARD 9.2 – CAREER EDUCATION AND CONSUMER, FAMILY AND LIFE SKILLS

Building upon knowledge and skills gained in preceding grades, by the end of Grade 12, students will:

A. Critical Thinking

1. Apply communications and data analysis to the problem-solving and decision making processes in a variety of life situations.
2. Describe and apply constructive responses to criticism.
3. Apply the use of symbols, pictures, graphs, objects, and other visual information to a selected project in academic and/or occupational settings.
4. Recognize bias, vested interest, stereotyping, and the manipulation and misuse of information while formulating solutions to problems that interfere with attaining goals.
5. Apply knowledge and skills needed to use various means of transportation within a community.

B. Self-Management

1. Revise and update the personal growth plan to address multiple life roles.
2. Apply project planning and management skills in academic and/or occupational settings.
3. Compare and contrast methods for maximizing personal productivity.

C. Interpersonal Communication

1. Model interpersonal and effective conflict resolution skills.
2. Communicate effectively in a variety of settings with a diverse group of people.

D. Character Development and Ethics

1. Analyze how character influences work performance.
2. Identify and research privileges and duties of citizens in a democratic society.
3. Discuss consequences and sanctions when on-the-job rules and laws are not followed.
4. Compare and contrast a professional code of ethics or code of conduct from various work fields and discuss similarities and differences.
5. Apply a professional code of ethics to a workplace problem or issue.

E. Consumer and Personal Finance

1. Analyze factors that influence gross and net income.
2. Design, implement, and critique a personal financial plan.
3. Discuss how to obtain and maintain credit.
4. Prepare and use skills for budget preparation, making predictions about income and expenditures, income tax preparation, and adjusting spending or expectations based on analysis.
5. Use comparative shopping techniques for the acquisition of goods and services.
6. Analyze the impact of advertising, peer pressure, and living arrangements on personal purchasing decisions.
7. Evaluate the actions a consumer might take in response to excess debt and personal financial status.
8. Analyze the interrelationships between the economic system and consumer actions in a chosen career cluster.

F. Safety

1. Engage in an informed discussion about rules and laws designed to promote safety and health.
2. Describe and demonstrate basic first aid and safety procedures.
3. Analyze the occurrence of workplace hazards.
4. Practice the safe use of tools and equipment.
5. Implement safety procedures in the classroom and workplace, where appropriate.
6. Discuss motor vehicle safety, including but not limited to, New Jersey motor vehicle laws and regulations, methods of defensive driving, and the importance of personal responsibility on public roads/streets.

SUGGESTED ACTIVITIES THAT ADDRESS THESE STANDARDS MAY INCLUDE BUT ARE NOT LIMITED TO:

4.1

Extending understanding of real number system to include rational and irrational numbers.
Evaluation expressions containing powers, roots, and factorials.
Applying absolute values, exponents, and approximations in real-life situations.
Translating numbers between standard notation and scientific notation.
Applying reflexive, transitive, and symmetric properties.
Simplifying expressions using the associative and commutative properties of arithmetic operations.
Applying primes, factors, and multiples in real-life situations.
Identifying equivalent and nonequivalent forms of fractions, decimals, and percents.
Demonstrating an understanding of the relationships between ratios, proportions, and percents.

4.2

Describing and giving examples of geometric and algebraic terms.
Applying properties, definitions, and relationships to identify and classify two-dimensional shapes.
Applying properties, definitions, and relationships to identify and classify three-dimensional shapes.
Identifying the relationships between geometric figures and relate them to algebraic concepts.
Using the rectangular coordinate system to determine the effects on figures of transformations.
Developing and applying strategies for determining area and surface area.
Using vectors to show the position of an object.
Developing and applying strategies for determining volume.
Solving problems by applying the Pythagorean Theorem.

4.3

Constructing, recognizing and extending patterns.
Evaluating algebraic expressions using independent and dependent variables.
Applying algebraic operations to solve inequalities that reflect real- life situations.
Applying algebraic operations to solve linear equations that reflect real- life situations.
Using domain and range of relations and functions to solve problems.
Finding and graphing the slope of a line.
Applying basic transformations to graphs of function.

4.4

Determining the probability of a simple and compound event.
Determining measures of central tendencies, range, rank, and frequency.
Selecting appropriate graphical representations of statistical measure.
Determine the number of possible combinations and outcomes by using tree diagrams.
Representing information using networks.
Analyzing and applying iterative processes to solve problems. (Fractals)
Analyzing and applying recursive processes to solve problems. (Compound interest)

4.5

Organizing information using illustrations, charts, or graphs, discovering patterns and arranging data.
Calculating with and using manipulative.
Estimating values.
Substituting simpler numbers.
Translating sentences into equations.

Applying formulas, definitions, and rules.

Working in reverse.

Constructing proportions or ratios.

NJCCC STANDARDS

- STANDARD 4.1** (NUMBER AND NUMERICAL OPERATIONS) ALL STUDENTS WILL DEVELOP NUMBER SENSE AND WILL PERFORM STANDARD NUMERICAL OPERATIONS AND ESTIMATIONS ON ALL TYPES OF NUMBERS IN A VARIETY OF WAYS.
- STANDARD 4.2** (GEOMETRY AND MEASUREMENT) ALL STUDENTS WILL DEVELOP SPATIAL SENSE AND THE ABILITY TO USE GEOMETRIC PROPERTIES, RELATIONSHIPS, AND MEASUREMENT TO MODEL, DESCRIBE AND ANALYZE PHENOMENA.
- STANDARD 4.3** (PATTERNS AND ALGEBRA) ALL STUDENTS WILL REPRESENT AND ANALYZE RELATIONSHIPS AMONG VARIABLE QUANTITIES AND SOLVE PROBLEMS INVOLVING PATTERNS, FUNCTIONS, AND ALGEBRAIC CONCEPTS AND PROCESSES.
- STANDARD 4.5** (MATHEMATICAL PROCESSES) ALL STUDENTS WILL USE MATHEMATICAL PROCESSES OF PROBLEM SOLVING, COMMUNICATION, CONNECTIONS, REASONING, REPRESENTATIONS, AND TECHNOLOGY TO SOLVE PROBLEMS AND COMMUNICATE MATHEMATICAL IDEAS.
- STANDARD 8.1** (COMPUTER AND INFORMATION LITERACY) ALL STUDENTS WILL USE COMPUTER APPLICATIONS TO GATHER AND ORGANIZE INFORMATION AND TO SOLVE PROBLEMS.
- STANDARD 8.2** (TECHNOLOGY EDUCATION) ALL STUDENTS WILL DEVELOP AN UNDERSTANDING OF THE NATURE AND IMPACT OF TECHNOLOGY, ENGINEERING, TECHNOLOGICAL DESIGN, AND THE DESIGNED WORLD AS THEY RELATE TO THE INDIVIDUAL, SOCIETY, AND THE ENVIRONMENT.
- STANDARD 9.1** (CAREER AND TECHNICAL EDUCATION) ALL STUDENTS WILL DEVELOP CAREER AWARENESS AND PLANNING, EMPLOYABILITY SKILLS, AND FOUNDATIONAL KNOWLEDGE NECESSARY FOR SUCCESS IN THE WORKPLACE.
- STANDARD 9.2** (CONSUMER, FAMILY, AND LIFE SKILLS) ALL STUDENTS WILL DEMONSTRATE CRITICAL LIFE SKILLS IN ORDER TO BE FUNCTIONAL MEMBERS OF SOCIETY.

DESIRED RESULTS**Goals (Cumulative Progress Indicators)**

- Extend understanding of the number system to all real numbers.
- Compare and order rational and irrational numbers.
- Develop conjectures and informal proofs of properties of number systems and sets of numbers.
- Extend understanding and use of operations to real numbers and algebraic procedures.
- Evaluate and simplify expressions.

- Use coordinate geometry to represent points on a line.
- Use a variety of strategies to determine perimeter and area of plane figures and surface area and volume of 3D figures.
- Learn mathematics through problem solving, inquiry, and discovery.
- Solve problems that arise in mathematics and in other contexts (cf. workplace readiness standard 8.3).
 - Open-ended problems
 - Non-routine problems
 - Problems with multiple solutions
 - Problems that can be solved in several ways
- Select, apply, and translate among mathematical representations to solve problems.
- Trace the development of mathematical concepts over time and across cultures (cf. world languages and social studies standards).

Enduring Understandings

- Numeric fluency includes both the understanding of and the ability to appropriately use numbers.
- Computational fluency includes understanding the meaning and the appropriate use of numerical operations.
- One representation may sometimes be more helpful than another; and, used together, multiple representations give a fuller understanding of a problem.
- Mathematical models can be used to describe and quantify physical relationships.

Essential Questions

- How do mathematical ideas interconnect and build on one another to produce a coherent whole?
- How can we use mathematical models to describe physical relationships?
- How can we compare and contrast numbers?

Knowledge (the students will know:)

- The real number system includes both rational and irrational numbers.
- Appropriate use of numerical types.
- How to compare and contrast numbers.
- How to use mathematical models to describe and quantify physical relationships.
- The Five-Step Method approach to problem solving.

Skills (the students will be able to:)

- Understand basic terminology of Algebra related to numbers and sets.
 - Variable, values of the variable, variable expression, numerical expression, numeral, value of the expression, substitution principle, simplifying the expression, evaluating the expression, grouping symbol, parentheses, brackets, fraction bar, equation, sides of the equation, open sentence, domain, solution, root, satisfy the sentence, solution set, translating words to symbols, key words, formulas, number line, origin, positive side, negative side, integers, whole numbers, real numbers, positive numbers, negative numbers, graph of the number, coordinate, opposite, absolute value.
- Simplify numerical expressions and evaluate algebraic expressions.
- Simplify expressions with and without grouping symbols.
- Find solution sets of equations over a given domain.
- Translate phrases into variable expressions.

- Translate word sentences into equations.
- Translate simple word problems into equations.
- Use the five-step plan to solve word problems over a given domain.
- Graph real numbers on a number line.
- To compare real numbers.
- Use opposites and absolute values.

ASSESSMENT EVIDENCE

- Teacher generated quizzes and tests.
 - Multiple Choice Questions
 - Open-ended Questions
 - Writing Exercises
 - Quantitative Comparison Questions
- Book generated activities, quizzes, and tests.
- Homework
- Seat Work
- Class Participation
- Alternative Assessment

LEARNING ACTIVITIES

Traditional Strategies:

- Lecture
- Black/White Board Work
- Use of Open-ended problems, written and oral exercises, and quantitative comparison activities.
- Vocabulary

Alternative Assessment:

- Cooperative Learning
- Students relate infinite and finite sets to set in real life.
- Students draw graphs to demonstrate sets and elements.
- Students develop their own mathematical language by making up names or symbols for numerical expressions.
- Use of technology based resources
 - Computer-based learning activities
 - Calculators
 - Smart board software
 - Geometer's Sketchpad

NJCCC STANDARDS

- STANDARD 4.1** (NUMBER AND NUMERICAL OPERATIONS) ALL STUDENTS WILL DEVELOP NUMBER SENSE AND WILL PERFORM STANDARD NUMERICAL OPERATIONS AND ESTIMATIONS ON ALL TYPES OF NUMBERS IN A VARIETY OF WAYS.
- STANDARD 4.2** (GEOMETRY AND MEASUREMENT) ALL STUDENTS WILL DEVELOP SPATIAL SENSE AND THE ABILITY TO USE GEOMETRIC PROPERTIES, RELATIONSHIPS, AND MEASUREMENT TO MODEL, DESCRIBE AND ANALYZE PHENOMENA.
- STANDARD 4.3** (PATTERNS AND ALGEBRA) ALL STUDENTS WILL REPRESENT AND ANALYZE RELATIONSHIPS AMONG VARIABLE QUANTITIES AND SOLVE PROBLEMS INVOLVING PATTERNS, FUNCTIONS, AND ALGEBRAIC CONCEPTS AND PROCESSES.
- STANDARD 4.5** (MATHEMATICAL PROCESSES) ALL STUDENTS WILL USE MATHEMATICAL PROCESSES OF PROBLEM SOLVING, COMMUNICATION, CONNECTIONS, REASONING, REPRESENTATIONS, AND TECHNOLOGY TO SOLVE PROBLEMS AND COMMUNICATE MATHEMATICAL IDEAS.
- STANDARD 8.1** (COMPUTER AND INFORMATION LITERACY) ALL STUDENTS WILL USE COMPUTER APPLICATIONS TO GATHER AND ORGANIZE INFORMATION AND TO SOLVE PROBLEMS.

DESIRED RESULTS**Goals (Cumulative Progress Indicators)**

- Extend understanding and use of operations to real numbers and algebraic procedures.
- Evaluate and simplify expressions.
- Use coordinate geometry to represent and verify distance between two points.
- Learn mathematics through problem solving, inquiry, and discovery.
- Solve problems that arise in mathematics and in other contexts (cf. workplace readiness standard 8.3).
 - Open-ended problems
 - Non-routine problems
 - Problems with multiple solutions
 - Problems that can be solved in several ways
- Select and apply a variety of appropriate problem-solving strategies (e.g., .try a simpler problem. or .make a diagram.) to solve problems.
- Select, apply, and translate among mathematical representations to solve problems.
- Perform addition and subtraction on matrices.

Enduring Understandings

- Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole.
- Computational fluency includes understanding the meaning and the appropriate use of numerical operations.
- A quantity can be represented numerically in various ways. Problem solving depends upon choosing wise ways.

Essential Questions

- What makes an algebraic algorithm both effective and efficient?
- How do operations affect numbers?
- How do mathematical ideas interconnect and build on one another to produce a coherent whole?
- How can we use mathematical models to describe physical relationships?

Knowledge (the students will know:)

- How to apply the order of operations.
- The difference between subtraction and the addition of opposites.
- The difference between division and the multiplication of inverses.
- Appropriate application of numerical operations.

Skills (the students will be able to:)

- Understand basic concepts and terminology of Algebra related to working with real numbers.
 - Property, Closure Properties, Commutative Properties, Associative Properties, terms, factors, Properties of Equality, Reflexive Property, Symmetric Property, Transitive Property, identity elements, Identity Properties, additive inverse, Property of Opposites, Property of the Opposite of a Sum, definition of subtraction, Distributive Property, Multiplicative Property of Zero, Multiplicative Property of -1, Property of Opposites in Products, consecutive integers, odd integers, even integers, reciprocal, multiplicative inverse, sum, difference, product, quotient, definition of division.
- Use number properties to simplify expressions.
- Add real numbers using a number line or properties about opposites.
- Add real numbers using rules for addition.
- Subtract real numbers and to simplify expressions involving differences.
- Use distributive property to simplify expressions.
- Multiply real numbers.
- Write equations to represent relationships among integers.
- Simplify expressions involving reciprocals.
- Divide real numbers and to simplify expressions involving quotients.

ASSESSMENT EVIDENCE

- Teacher generated quizzes and tests.
 - Multiple Choice Questions
 - Open-ended Questions
 - Writing Exercises
 - Quantitative Comparison Questions
- Book generated activities, quizzes, and tests.

- Homework
- Seat Work
- Class Participation
- Alternative Assessment

LEARNING ACTIVITIES

Traditional Strategies:

- Lecture
- Black/White Board Work
- Use of Open-ended problems, written and oral exercises, and quantitative comparison activities.
- Vocabulary

Alternative Assessment:

- Cooperative Learning
- Students relate infinite and finite sets to set in real life.
- Students draw graphs to demonstrate sets and elements.
- Students develop their own mathematical language by making up names or symbols for numerical expressions.
- Use of technology based resources
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- STANDARD 4.5** (MATHEMATICAL PROCESSES) ALL STUDENTS WILL USE MATHEMATICAL PROCESSES OF PROBLEM SOLVING, COMMUNICATION, CONNECTIONS, REASONING, REPRESENTATIONS, AND TECHNOLOGY TO SOLVE PROBLEMS AND COMMUNICATE MATHEMATICAL IDEAS.
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DESIRED RESULTS**Goals (Cumulative Progress Indicators)**

- Select and use appropriate methods to solve linear equations – algebraically.
- Understand and perform transformations on commonly-used functions.
- Use functions to model real-world phenomena and solve problems that involve varying quantities.
- Learn mathematics through problem solving, inquiry, and discovery.
- Solve problems that arise in mathematics and in other contexts (cf. workplace readiness standard 8.3).
 - Open-ended problems
 - Non-routine problems

- Problems with multiple solutions
- Problems that can be solved in several ways
- Select and apply a variety of appropriate problem-solving strategies (e.g., .try a simpler problem. or .make a diagram.) to solve problems.
- Select, apply, and translate among mathematical representations to solve problems.
- Recognize that mathematical facts, procedures, and claims must be justified.
- Use reasoning to support their mathematical conclusions and problem solutions.
- Select and use various types of reasoning and methods of proof.

Enduring Understandings

- The symbolic language of algebra is used to communicate and generalize the patterns in mathematics.
- Reasoning and/or proof can be used to verify or refute conjectures or theorems in algebra.
- In many cases, there are multiple algorithms for finding a mathematical solution.
- Context is critical when using estimation.

Essential Questions

- How can change be best represented mathematically?
- How can patterns, relations, and functions be used as tools to best describe and help explain real-life situations?
- How can we decide when to use an exact answer and when to use an estimate?

Knowledge (the students will know:)

- Properties of equality
- Five step plan to solve word problems
- Algebraic proofs

Skills (the students will be able to:)

- Understand basic concepts and terminology of Algebra related to numbers and sets.
 - Addition Property of Equality, Subtraction Property of Equality, Multiplication Property of Equality, Division Property of Equality, solving equations, transforming equations, equivalent equations, inverse operations, theorem, proof.
- Solve equations using addition or subtraction.
- Solve equations using multiplication or division.
- Solve equations by using more than one transformation.
- Use the five step plan to solve word problems.
- Solve equations with the variable on both sides.
- Organize the facts of a problem in a chart.
- Solve problems involving cost, income and value.
- Prove statements in algebra.

ASSESSMENT EVIDENCE

- Teacher generated quizzes and tests.
 - Multiple Choice Questions
 - Open-ended Questions
 - Writing Exercises
 - Quantitative Comparison Questions

- Book generated activities, quizzes, and tests.
- Homework
- Seat Work
- Class Participation
- Alternative Assessment

LEARNING ACTIVITIES

Traditional Strategies:

- Lecture
- Black/White Board Work
- Use of Open-ended problems, written and oral exercises, and quantitative comparison activities.
- Vocabulary

Alternative Assessment:

- Cooperative Learning
- Students relate infinite and finite sets to set in real life.
- Students draw graphs to demonstrate sets and elements.
- Students develop their own mathematical language by making up names or symbols for numerical expressions.
- Use of technology based resources
 - Computer-based learning activities
 - Calculators
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DESIRED RESULTS**Goals (Cumulative Progress Indicators)**

- Learn mathematics through problem solving, inquiry, and discovery.
- Adding and subtracting polynomials.
- Use a variety of strategies to determine perimeter and area of plane figures and surface area and volume of 3D figures.
- Use geometric models to represent real-world situations and objects and to solve problems using those models (e.g., use area problems to determine carpet size or paint volume).
- Multiplying a polynomial by a monomial or binomial.
- Solve problems that arise in mathematics and in other contexts (cf. workplace readiness standard 8.3).
 - Open-ended problems
 - Non-routine problems
 - Problems with multiple solutions
 - Problems that can be solved in several ways
- Select and apply a variety of appropriate problem-solving strategies (e.g., .try a simpler problem. or .make a diagram.) to solve problems.
- Apply mathematics in practical situations and in other disciplines.

- Pose problems of various types and levels of difficulty.
- Select, apply, and translate among mathematical representations to solve problems.

Enduring Understandings

- Measurements can be used to describe, compare, and make sense of phenomena.
- Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole.
- Mathematical models can be used to describe and quantify physical relationships.

Essential Questions

- How can measurements be used to solve problems?

Knowledge (the students will know:)

- Order of Operations.
- Product Rule for Exponents.
- Power Rule for Exponents.
- Uniform Motion problems.
- Area problems.
- Problems with no solutions.

Skills (the students will be able to:)

- Understand basic concepts and terminology of Algebra related to numbers and sets.
 - Exponent, base, exponential form, n^{th} power of b , Order of Operations, monomial, constant monomial, constant, polynomial, binomial, trinomial, coefficient, numerical coefficient, like terms, simplified, in simplest form, degree of a variable in a monomial, degree of a monomial, degree of a polynomial, Product Rule for Exponents, Power Rule for Exponents, uniform motion.
- Write and simplify expressions involving exponents.
- Add and subtract polynomials.
- Multiply monomials.
- Find powers of monomials.
- Multiply a polynomial by a monomial.
- Multiply polynomials.
- Transform a formula.
- Solve some word problems involving uniform motion.
- Solve some problems involving area.
- Recognize problems that do not have solutions.

ASSESSMENT EVIDENCE

- Teacher generated quizzes and tests.
 - Multiple Choice Questions
 - Open-ended Questions
 - Writing Exercises
 - Quantitative Comparison Questions
- Book generated activities, quizzes, and tests.
- Homework
- Seat Work

- Class Participation
- Alternative Assessment

LEARNING ACTIVITIES

Traditional Strategies:

- Lecture
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- Vocabulary

Alternative Assessment:

- Cooperative Learning
- Students relate infinite and finite sets to set in real life.
- Students draw graphs to demonstrate sets and elements.
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DESIRED RESULTS**Goals (Cumulative Progress Indicators)**

- Learn mathematics through problem solving, inquiry, and discovery.
- Dividing a polynomial by a monomial.
- Use inductive reasoning to form generalizations.
- Use functions to model real-world phenomena and solve problems that involve varying quantities.
 - Linear, quadratic, exponential, periodic (sine and cosine), and step functions.
- Select and use appropriate methods to solve equations and inequalities.
 - Linear equations – algebraically
 - Quadratic equations – factoring (when the coefficient of x^2 is 1) and using the quadratic formula.
- Solve problems that arise in mathematics and in other contexts (cf. workplace readiness standard 8.3).
 - Open-ended problems
 - Non-routine problems
 - Problems with multiple solutions
 - Problems that can be solved in several ways

- Select and apply a variety of appropriate problem-solving strategies (e.g., .try a simpler problem. or .make a diagram.) to solve problems.
- Select, apply, and translate among mathematical representations to solve problems.

Enduring Understandings

- Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole.
- The symbolic language of algebra is used to communicate and generalize the patterns in mathematics.
- In many cases, there are multiple algorithms for finding a mathematical solution, and those algorithms are frequently associated with different cultures.

Essential Questions

- How do mathematical ideas interconnect and build on one another to produce a coherent whole?
- What makes a computational strategy both effective and efficient?
- What makes an algebraic algorithm both effective and efficient?

Knowledge (the students will know:)

- Prime factorization.
- Rules for simplifying fractions.
- Quotient rule for exponents.
- Monomial factorization.
- The FOIL method.
- Special factorizations.
- Solve equations using factoring.

Skills (the students will be able to:)

- Understand basic terminology of Algebra related to numbers and sets.
 - Factor, factor set, prime factor, prime, prime factorization, common factor, greatest common factor (GCF), Property of Quotients, Quotient rule for exponents, evenly divisible, divisible, greatest monomial factor, quadratic term, linear term, quadratic polynomial, difference of two squares, perfect square trinomial, irreducible, prime polynomial, Zero Product Property, polynomial equation, linear equation, quadratic equation, cubic equation.
- Factor integers and find the GCF of integers.
- Simplify quotients of monomials and find the GCF of several monomials.
- Divide polynomials by monomials and find monomial factors of polynomials.
- Find the product of two binomials mentally.
- Simplify products of the form $(a + b)(a - b)$ and factor differences of two squares.
- Find squares of two binomials and factor perfect square trinomials.
- Factor quadratic trinomial whose quadratic coefficient is 1 and whose constant term is positive.
- Factor quadratic trinomial whose quadratic coefficient is 1 and whose constant term is negative.
- Factor general quadratic trinomials with integral coefficients.
- Factor a polynomial by grouping terms.
- Factor polynomials completely.
- Use factoring in solving polynomial equations.
- Solve problems by writing and factoring quadratic equations.

ASSESSMENT EVIDENCE

- Teacher generated quizzes and tests.
 - Multiple Choice Questions
 - Open-ended Questions
 - Writing Exercises
 - Quantitative Comparison Questions
- Book generated activities, quizzes, and tests.
- Homework
- Seat Work
- Class Participation
- Alternative Assessment

LEARNING ACTIVITIES

Traditional Strategies:

- Lecture
- Black/White Board Work
- Use of Open-ended problems, written and oral exercises, and quantitative comparison activities.
- Vocabulary

Alternative Assessment:

- Cooperative Learning
- Students relate infinite and finite sets to set in real life.
- Students draw graphs to demonstrate sets and elements.
- Students develop their own mathematical language by making up names or symbols for numerical expressions.
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DESIRED RESULTS**Goals (Cumulative Progress Indicators)**

- Learn mathematics through problem solving, inquiry, and discovery.
- Divide a polynomial by a polynomial.
- Understand and apply the laws of exponents to simplify expressions involving numbers raised to powers.
- Solve problems that arise in mathematics and in other contexts (cf. workplace readiness standard 8.3).
 - Open-ended problems
 - Non-routine problems
 - Problems with multiple solutions
 - Problems that can be solved in several ways
- Select and apply a variety of appropriate problem-solving strategies (e.g., .try a simpler problem or make a diagram) to solve problems.
- Select, apply, and translate among mathematical representations to solve problems.

Enduring Understandings

- Mathematical models can be used to describe and quantify physical relationships.\
- The magnitude of numbers affects the outcome of operations on them.

- One representation may sometimes be more helpful than another; and, used together, multiple representations give a fuller understanding of a problem.
- Measurements can be used to describe, compare, and make sense of phenomena.
- Algebraic representation can be used to generalize patterns and relationships.

Essential Questions

- How can we use mathematical models to describe physical relationships?
- How do operations affect numbers?
- How can we use physical models to clarify mathematical relationships?
- What makes an algebraic algorithm both effective and efficient?

Knowledge (the students will know:)

- Multiplication rule for fractions.
- Exponent rule for a power of a quotient.
- Division rule for fractions.
- Addition rule for fractions.
- Subtraction rule for fractions.
- Polynomial long division.

Skills (the students will be able to:)

- Understand basic terminology of Algebra related to numbers and sets.
 - Fraction, algebraic fraction, numerator, denominator, multiplication rule for fractions, exponent rule for a power of a quotient, division rule for fractions, least common denominators, addition rule for fractions, subtraction rule for fractions, mixed expression, polynomial long division.
- Simplify algebraic fractions.
- Multiply algebraic fractions.
- Divide algebraic fractions.
- Express two or more algebraic fractions with their least common denominator.
- Add and subtract algebraic fractions.
- Write mixed expressions as fractions in the simplest form.
- Divide polynomials

ASSESSMENT EVIDENCE

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LEARNING ACTIVITIES

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DESIRED RESULTS**Goals (Cumulative Progress Indicators)**

- Learn mathematics through problem solving, inquiry, and discovery.
- Understand and apply the laws of exponents to simplify expressions involving numbers raised to powers.
- Use models and algebraic formulas to represent and analyze sequences and series.
 - Explicit formulas for n^{th} terms
- Create and use representations to organize, record, and communicate mathematical ideas.
 - Concrete representations (e.g., base-ten blocks or algebra tiles)
 - Pictorial representations (e.g., diagrams, charts, or tables)
 - Symbolic representations (e.g., a formula)

- Develop, apply, and explain methods for solving problems involving rational and negative exponents.
- Solve problems that arise in mathematics and in other contexts (cf. workplace readiness standard 8.3).
 - Open-ended problems
 - Non-routine problems
 - Problems with multiple solutions
 - Problems that can be solved in several ways
- Select and apply a variety of appropriate problem-solving strategies (e.g., .try a simpler problem. or .make a diagram.) to solve problems.
- Select, apply, and translate among mathematical representations to solve problems.

Enduring Understandings

- Mathematical models can be used to describe and quantify physical relationships.
- Patterns and relationships can be represented graphically, numerically, symbolically, or verbally.
- Algebraic representation can be used to generalize patterns and relationships.
- Computational fluency includes understanding the meaning and the appropriate use of numerical operations.
- A quantity can be represented numerically in various ways. Problem solving depends upon choosing wise ways.

Essential Questions

- How do mathematical ideas interconnect and build on one another to produce a coherent whole?
- What makes a computational strategy both effective and efficient?
- How can patterns, relations, and functions be used as tools to best describe and help explain real-life situations?
- How are patterns of change related to the behavior of functions?
- How can we use mathematical models to describe physical relationships?

Knowledge (the students will know:)

- Proportion problems.
- Fractional equations.
- Percent problems.
- Mixture problems.
- Work problems.
- Negative exponents.
- Scientific notation.

Skills (the students will be able to:)

- Understand basic terminology of Algebra related to numbers and sets.
 - Ratio, proportion, means, extremes, fractional equation, percent, negative exponents, zero exponent, scientific notation.
- Solve problems involving ratios.
- Solve problems using proportions.
- Solve equations with fractional coefficients.
- Solve fractional equations.

- Work with percents and decimals.
- Solve problems involving percents.
- Solve mixture problems.
- Solve work problems.
- Use negative exponents.
- Use scientific notation.

ASSESSMENT EVIDENCE

- Teacher generated quizzes and tests.
 - Multiple Choice Questions
 - Open-ended Questions
 - Writing Exercises
 - Quantitative Comparison Questions
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- Homework
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- Alternative Assessment

LEARNING ACTIVITIES

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- STANDARD 4.5** (MATHEMATICAL PROCESSES) ALL STUDENTS WILL USE MATHEMATICAL PROCESSES OF PROBLEM SOLVING, COMMUNICATION, CONNECTIONS, REASONING, REPRESENTATIONS, AND TECHNOLOGY TO SOLVE PROBLEMS AND COMMUNICATE MATHEMATICAL IDEAS.
- STANDARD 8.1** (COMPUTER AND INFORMATION LITERACY) ALL STUDENTS WILL USE COMPUTER APPLICATIONS TO GATHER AND ORGANIZE INFORMATION AND TO SOLVE PROBLEMS.

DESIRED RESULTS**Goals (Cumulative Progress Indicators)**

- Use coordinate geometry to represent and verify properties of lines.
 - Finding the intersection of two lines
 - Lines with the same slope are parallel
 - Lines that are perpendicular have slopes whose product is -1
- Understand relations and functions and select, convert flexibly among, and use various representations for them, including equations or inequalities, tables, and graphs.
- Analyze and explain the general properties and behavior of functions of one variable, using appropriate graphing technologies.
 - Slope of a line or curve
 - Domain and range

- Intercepts
- Continuity
- Maximum/minimum
- Estimating roots of equations
- Intersecting points as solutions of systems of equations
- Rates of change
- Learn mathematics through problem solving, inquiry, and discovery.
- Solve problems that arise in mathematics and in other contexts (cf. workplace readiness standard 8.3).
 - Open-ended problems
 - Non-routine problems
 - Problems with multiple solutions
 - Problems that can be solved in several ways
- Select and apply a variety of appropriate problem-solving strategies (e.g., .try a simpler problem. or .make a diagram.) to solve problems.
- Select, apply, and translate among mathematical representations to solve problems.

Enduring Understandings

- Coordinate geometry can be used to represent and verify geometric/algebraic relationships.
- Algebraic representation can be used to generalize patterns and relationships.
- Patterns and relationships can be represented graphically, numerically, symbolically, or verbally.
- Algebraic and numeric procedures are interconnected and build on one another to produce a coherent whole.

Essential Questions

- What makes an algebraic algorithm both effective and efficient?
- How are patterns of change related to the behavior of functions?
- How can patterns, relations, and functions be used as tools to best describe and help explain real-life situations?
- How can change be best represented mathematically?
- How can we best represent and verify geometric/algebraic relationships?

Knowledge (the students will know:)

- x,y coordinate plane.
- Standard form of linear equations.
- Slope-intercept form of linear equations.
- Parallel lines.
- Perpendicular lines.
- Collinear lines.
- Functions.

Skills (the students will be able to:)

- Understand basic terminology of Algebra related to numbers and sets.
 - One variable equation, two variable equation, solution, ordered pair, number plane, horizontal axis, vertical axis, origin, plot, x-axis, y-axis, graph of the ordered pair, coordinates, x-coordinate, abscissa, y-coordinate, ordinate, point, coordinate axes, coordinate plane, quadrants, graph of an equation, linear equation , standard form, nonlinear equation, slope, rise, run, vertical change, horizontal change, slope intercept

form, y-intercept, parallel line, perpendicular line, collinear lines, function, domain range, arrow notation, function notation, table of values, graph, equation, value of a function, linear function, quadratic function, parabola, minimum point, least value, axis of symmetry, maximum point, greatest value, direct variation, inverse function.

- Solve equations in two variables over given domains of the variables.
- Graph ordered pairs and linear equations in two variables.
- Find the slope of a line.
- Use the slope-intercept form of a linear equation.
- Find an equation of a line given the slope and one point on the line.
- Find an equation of a line given two points on the line.
- Understand what a function is and to define a function by using tables and graphs.
- Define a function by using variables.
- Use direct variation to solve problems.
- Use inverse variation to solve problems.

ASSESSMENT EVIDENCE

- Teacher generated quizzes and tests.
 - Multiple Choice Questions
 - Open-ended Questions
 - Writing Exercises
 - Quantitative Comparison Questions
- Book generated activities, quizzes, and tests.
- Homework
- Seat Work
- Class Participation
- Alternative Assessment

LEARNING ACTIVITIES

Traditional Strategies:

- Lecture
- Black/White Board Work
- Use of Open-ended problems, written and oral exercises, and quantitative comparison activities.
- Vocabulary

Alternative Assessment:

- Cooperative Learning
- Students relate infinite and finite sets to set in real life.
- Students draw graphs to demonstrate sets and elements.
- Students develop their own mathematical language by making up names or symbols for numerical expressions.
- Use of technology based resources
 - Computer-based learning activities
 - Calculators
 - Smart board software
 - Geometer's Sketchpad

NJCCC STANDARDS

- STANDARD 4.1** (NUMBER AND NUMERICAL OPERATIONS) ALL STUDENTS WILL DEVELOP NUMBER SENSE AND WILL PERFORM STANDARD NUMERICAL OPERATIONS AND ESTIMATIONS ON ALL TYPES OF NUMBERS IN A VARIETY OF WAYS.
- STANDARD 4.2** (GEOMETRY AND MEASUREMENT) ALL STUDENTS WILL DEVELOP SPATIAL SENSE AND THE ABILITY TO USE GEOMETRIC PROPERTIES, RELATIONSHIPS, AND MEASUREMENT TO MODEL, DESCRIBE AND ANALYZE PHENOMENA.
- STANDARD 4.3** (PATTERNS AND ALGEBRA) ALL STUDENTS WILL REPRESENT AND ANALYZE RELATIONSHIPS AMONG VARIABLE QUANTITIES AND SOLVE PROBLEMS INVOLVING PATTERNS, FUNCTIONS, AND ALGEBRAIC CONCEPTS AND PROCESSES.
- STANDARD 4.4** (DATA ANALYSIS, PROBABILITY, AND DISCRETE MATHEMATICS) ALL STUDENTS WILL DEVELOP AN UNDERSTANDING OF THE CONCEPTS AND TECHNIQUES OF DATA ANALYSIS, PROBABILITY, AND DISCRETE MATHEMATICS, AND WILL USE THEM TO MODEL SITUATIONS, SOLVE PROBLEMS, AND ANALYZE AND DRAW APPROPRIATE INFERENCES FROM DATA.
- STANDARD 4.5** (MATHEMATICAL PROCESSES) ALL STUDENTS WILL USE MATHEMATICAL PROCESSES OF PROBLEM SOLVING, COMMUNICATION, CONNECTIONS, REASONING, REPRESENTATIONS, AND TECHNOLOGY TO SOLVE PROBLEMS AND COMMUNICATE MATHEMATICAL IDEAS.

DESIRED RESULTS**Goals (Cumulative Progress Indicators)**

- Select and use appropriate methods to solve equations and inequalities.
 - Linear equations – algebraically
 - Quadratic equations – factoring (when the coefficient of x^2 is 1) and using the quadratic formula
 - All types of equations using graphing, computer, and graphing calculator techniques
- Learn mathematics through problem solving, inquiry, and discovery.
- Solve problems that arise in mathematics and in other contexts (cf. workplace readiness standard 8.3).
 - Open-ended problems
 - Non-routine problems
 - Problems with multiple solutions
 - Problems that can be solved in several ways

- Select and apply a variety of appropriate problem-solving strategies (e.g., .try a simpler problem. or .make a diagram.) to solve problems.
- Select, apply, and translate among mathematical representations to solve problems.

Enduring Understandings

- In many cases, there are multiple algorithms for finding a mathematical solution, and those algorithms are frequently associated with different cultures.
- Coordinate geometry can be used to represent and verify geometric/algebraic relationships.

Essential Questions

- How do mathematical representations reflect the needs of society across cultures?
- How can we best represent and verify geometric/algebraic relationships?

Knowledge (the students will know:)

- Solve systems of linear equations using the graphing method.
- Solve systems of linear equations using the substitution method.
- Solve systems of linear equations using the elimination (addition or subtraction) method.
- Wind and current problems.
- Puzzle problems.

Skills (the students will be able to:)

- Understand basic concepts and terminology of Algebra related to numbers and sets.
 - System of linear equations, solve a system, solution, system of simultaneous equations, the graphing method, the substitution method, the elimination (addition or subtraction) method.
- Use graphs to solve systems of linear equations.
- Use the substitution method to solve systems of linear equations.
- Use systems of linear equations in two variables to solve problems.
- Use addition or subtraction to solve systems of linear equations.
- Use multiplication along with addition-or-subtraction method to solve systems of linear equations.
- Use systems of linear equations to solve wind and water current problems.
- Use systems of equations to solve digit, age and fraction problems.

ASSESSMENT EVIDENCE

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 - Open-ended Questions
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 - Quantitative Comparison Questions
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EVALUATION/ASSESSMENT OF CURRICULUM:

This course of study will be evaluated/assessed by instructional staff during the first year of implementation for the purpose of necessary revision at the end of the first year. In addition, this course of study will be reviewed according to the Five Year Curriculum Review schedule. (See attached)

RESOURCES/BIBLIOGRAPHY:

“New Jersey Core Curriculum Content Standards for Technological Literacy” New Jersey State Department of Education, 2004

“New Jersey Mathematics Curriculum Framework”, Joseph G. Rosentein, Janet H. Caldwell, Warren D. Crown, 2004

Algebra – Structure and Method – Book 1, Brown, Dolciani, Sorgenfrey, Cole, McDougal Littell, 2000

Algebra- Tools for a Changing World, Allan Bellman, Sadie Chavis Bragg Ed.D, Suzanne H. Chapin, ED.D. Theodore Gardella, Bettye Hall, William Handlin Sr., and Edward Manfre, Prentice Hall, 1998