

Outcome 1: (Introduction to Algebra)

Students will be able to simplify and evaluate numerical and variable expressions using appropriate properties and order of operations.

Assessment:

Skills/Content	Suggested Teaching Strategies/Learning Strategies	Suggested Mini-Assessments
<p>The student will be able to:</p> <ol style="list-style-type: none"> 1. Simplify numerical expressions: <ol style="list-style-type: none"> a). Use order of operations b). Use exponents 2. Understand use of variables: <ol style="list-style-type: none"> a). Evaluate variable expressions b). Translate word phrases into algebraic expressions. 3. Define and use properties to simplify numerical and algebraic expressions. 4. Evaluate equations using a given replacement set. 	<ol style="list-style-type: none"> 1. Demonstrate the basic expression $5+3 \times 7$. Show the order of operations. Define the rules to simplify the expression accurately. 2. Demonstrate flashcards with words and corresponding math symbol e.g. $>$ greater than. Have students model (in front of class) a verbal expression and its matching mathematical expression. Then evaluate expressions with a given replacement set. 3. Model commutative and associative properties with beans or similar objects. 4. Students work in pairs to solve given equations with a given replacement set. 	<ol style="list-style-type: none"> 1. Send students to the board to do sample problems. 2. Have students write a mathematical expression using letters x, y, z and any numbers. Then have them exchange their expressions with another student and evaluate if $x=1$, $y=2$ and $z=0$. 3. Challenge: Have students give examples of why the commutative property does not work for subtraction and division. 4. Give each student a card with a different number on it. Have each student create an equation with that number as a solution.

Outcome 2: (Real Numbers)**Students will be able to perform the four basic operations over the real number system.****Assessment:**

Skills/Objectives	Suggested Teaching Strategies/Learning Strategies	Suggested Mini-Assessments
<p>The student will be able to:</p> <ol style="list-style-type: none"> 1. Identify all number sets within the real number system. 2. Graph and compare real numbers on a number line. 3. Evaluate opposites and absolute values of real numbers. 4. Use number properties to simplify expressions: 	<ol style="list-style-type: none"> 1. Given a number line, students will locate examples of the different number systems: e.g. integers, whole numbers, natural numbers, rational and irrational numbers. 2. After locating a number on the number line, students will place a point and label it with its coordinate. By locating pairs of numbers on the number line, students will discover that the larger number is always to the right. 3. Use the number line to locate opposites. Relate absolute value to distance from the origin. 4. Given an expression, students will determine the best way to simplify, using the associative and commutative properties. 	<ol style="list-style-type: none"> 1. Using a number line drawn on the board, students will identify 5 numbers from the different number sets. 2. Have students use a number line to answer questions such as: <ul style="list-style-type: none"> • Which numbers are 3 units from the origin? • Which numbers are 4 units from the graph of x? Given a set of numbers students will use the number line to graph and order them from least to greatest. 3. Same as number 2 above. 4. In small groups, students will create a set of problems involving simplifying expressions using the associative and commutative properties.

Outcome 2: (Real Numbers) (continued) Students will be able to perform the four basic operations over the real number system.

Assessment:

Skills/Objectives	Suggested Teaching Strategies/Learning Strategies	Suggested Mini-Assessments
<p>The student will be able to:</p> <p>5. Add and subtract real numbers: a) Additive identity b) Additive inverse</p> <p>6. Multiply real numbers: a). Distribute property b). Multiplicative identity c). Multiplicative inverse</p> <p>7. Divide real numbers: a). Reciprocals</p>	<p>5. Using unit tiles of two different colors students will evaluate sums and differences of real numbers, incorporating additive inverses and additive identity.</p> <p>6. Using algebra or unit tiles, and the distributive property, students will evaluate products of real numbers.</p> <p>7. Students will identify the reciprocals of given sets of real numbers. Using examples such as $\frac{8}{2}$ is the same as $8 \times \frac{1}{2}$, students will discover the rule for division.</p>	<p>5. Using a diagram of a football field, students will record gains and losses to determine net gain/loss.</p>

Outcome 3: (Linear Equations) Students will be able to solve linear equations in a single variable over the real number system to include positive and negative integers, fractions, or decimals.

Assessment:

Skills/Objectives	Suggested Teaching Strategies/Learning Strategies	Suggested Mini-Assessments
<p>Student will be able to:</p> <ol style="list-style-type: none"> 1. Solve equations using properties of equality: <ol style="list-style-type: none"> a) One step equations involving a single operation b) Two step equations involving 2 operations c) Equations involving the need to combine like terms d) Equations involving grouping symbols and use of the distributive property e) Equations involving variables on both sides f) Literal equations and formulas g) Absolute value equations 2. Use applications: <ol style="list-style-type: none"> a) Solve word problems by developing equations using the 5 step plan b) Set up and solve: <ol style="list-style-type: none"> i. Single number problems ii. Multiple number problems iii. Sum and difference problems iv. Perimeter and angle problems v. Consecutive integer problems vi. Motion problems vii. Coin mixture problems viii. Cost and income problems ix. Percent and interest problems x. Age problems 	<ol style="list-style-type: none"> 1. a-e Use balance scale as a model for an equation. The scale provides an illustration and reinforcement for the algebraic properties of equality. Begin with one step equations and extend models. 1. f. Use real life situations to reflect common formulas: such as, $d=r \cdot t$ Manipulate the formula to solve for each variable; e.g., solve for rate given distance and time. 1. g. Use the number line to establish absolute value as a measure of distance regardless of direction. 2. a. Create a word bank of terminology that will be needed. <ul style="list-style-type: none"> • Create formula bank. • Establish 5-step plan. 2. b. Use coin manipulatives to distinguish between number of coins and monetary value. Use diagrams to organize perimeter and angle problem information. Develop motion problem scenarios to describe same direction, opposite direction and round trip situations. 2. b. Use examples from the mall to illustrate percent applications. Students may bring advertisements from newspapers as well. Have students compare interest rates from local banks as an introduction to interest problems. 	<ol style="list-style-type: none"> 1. a-e Students will work in pairs using algebra tiles to model an algebraic equation. Students will then write and solve equations modeled at various stations throughout the room. 1. f. Students will design a problem that will utilize a formula, create a solution and present the problem and the solution to the class. 1. g. Students will explain the sequence of solving absolute value equations as a function of distance. 2. Given a definition of variables and an equation, students will be able to create a word problem scenario. Students will be able to solve a sampling of word problems using the 5-step plan.

Outcome: 4 (Inequalities) Students will be able to solve and graph linear inequalities in a single variable over the real number system.

Assessment:

Skills/Objectives	Suggested Teaching Strategies/Learning Strategies	Suggested Mini-Assessments
<p>The student will be able to:</p> <ol style="list-style-type: none"> 1. Define: $<$, $>$, equal to or less than, equal to or greater than, not equal to... 2. Graph inequalities on the number line. 3. Properties of inequalities 4. Solve and graph inequalities on the number line: <ol style="list-style-type: none"> a) Describe in set notation 5. Solve and graph compound inequalities: <ol style="list-style-type: none"> a) Intersection (conjunction) b) Union (disjunction) 	<ol style="list-style-type: none"> 1. Demonstrate concept of $>$, $<$ or $=$ with algebra balance (with 4 pans 2 for positive weights and 2 for negative weights) 2. Create two inequalities given any two points on the number line. Use temperature and racing speed as examples. 3. Use Algebra balance. Relate to properties for equation...similarities and differences. 4. Relate to solving and graphing linear equations...similarities and differences. (Single element solution set vs. infinite element solution se.) e.g., (5) vs. $(x : x > 5)$. Compare graphs. 5. Explain the use of “and” and “or” using real life examples and Venn diagrams. Key words: Intersection = “and” Union = “or” Given the two inequalities $x > 1$ and $x < 5$; $I = (x : x > 1 \text{ and } x < 5)$ $U = (x : x > 1 \text{ or } x < 5)$ Demonstrate with graphs of different colors. Special case: a. empty set intersections ϕ (No graph) b. Whole number line unions...all numbers 	<ol style="list-style-type: none"> 1. Have students demonstrate specific inequalities ($8 > 3$, etc.) by using a balance. 2. Match inequalities with their corresponding graphs. 3. Show two equivalent inequalities. Ask students to identify what transformation was used to get from the first to the second (matching, multiple choice, etc.). 4. Solve an inequality, justifying each step. Then graph solution set on the number line. 5. Match solution sets with corresponding graphs.

Outcome: 5 (Graphing Linear Equations and Inequalities) Students will be able to graph equations and inequalities in the coordinate plane.

Assessment:

Skills/Objectives	Suggested Teaching Strategies/Learning Strategies	Suggested Mini-Assessments
<p>The student will be able to</p> <ol style="list-style-type: none"> 1. Define coordinate plane: <ol style="list-style-type: none"> a) Recognize and use appropriate terminology b) Plot points associated with given ordered pairs. 2. Recognize and define relations and functions: <ol style="list-style-type: none"> a) Determine domain and range b) Use of function notation c) Establish criteria for a relation to be a function 3. Solve linear equation in 2 variables: <ol style="list-style-type: none"> a) Define standard form b) Recognize a linear equation as a relation c) Solve for domain or range d) Solve and graph using a table of values 4. Determine the slope of a line: <ol style="list-style-type: none"> a) Define slope b) Link slope to rate of change c) Use slope formula 	<ol style="list-style-type: none"> 1. Students work in small groups to define one of the terms. Each group presents their definition and an example to the class. 2. Teacher draws a function machine explaining how input is the domain and output is the range. Use function notation to represent the changes in values from input to output. 3. Students work in pairs on a given linear equation (such as $y=3x+5$), finding 4 ordered pairs that are solutions to the equation. Plot on a coordinate plane and graph. If available have students check their graphs using a graphing calculator. 4. Teacher leads a discussion on a comparison of different ski slopes, rooflines or roller coasters. Introduce slope and rate of change. 	<ol style="list-style-type: none"> 1. Students will create a battleship field from -10 to 10 on a piece of graph paper. Students pair up and play. 2. Create a worksheet with pictures of graphs and points. Students will identify the domain, and the range and decide if the graph is a function or a relation. 3. Students create their own function rule for x and y. They complete a function table and graph the function on a coordinate plane. Students then trade function rules with a classmate and create a table and graph for this function. Assess by comparing results. 4. Use 2 different colored dice. One is for x-values and one is for y values. Students roll dice. Plot the ordered pair. Students roll dice again and plot 2nd ordered pair. Students then graph the line, and calculate the slope of the line.

Outcome 5: (continued) (Graphing linear equations and inequalities) Students will be able to graph equations and inequalities in the coordinate plane.

Assessment:

Skills/Objectives	Suggested Teaching Strategies/Learning Strategies	Suggested Mini-Assessments
<p>The student will be able to:</p> <p>5. Relate slope to graph of a line</p> <ol style="list-style-type: none"> Determine the slant/direction of the line given the slope Recognize the slope of vertical and horizontal lines Recognize parallel and perpendicular lines by their slope <p>6. Write the equation of a linear relation given:</p> <ol style="list-style-type: none"> Point on the line and slope of the line Two points on the line Slope and y-intercept Point on the line and the equation of a parallel line <p>*Point on the line and the equation of a perpendicular line</p> <p>7. Graph a linear equation</p> <ol style="list-style-type: none"> In slope-intercept form Using x and y-intercepts. <p>8. Graph a linear inequality</p>	<p>5. Students are given 2 points and asked to:</p> <ul style="list-style-type: none"> - graph the points - connect with a line - compare the slant of the line with the value of the slope. <p>Extend this concept to horizontal, vertical, parallel and perpendicular lines.</p> <p>6 a-b Demonstrate the connection between the slope formula and the point-slope equation of a line. Demonstrate its use given a slope and a point or 2 points.</p> <p>c. Demonstrate the slope-intercept form of an equation and show how to graph.</p> <p>d-e Demonstrate how to find the slope given an equation. Use this information to write equations of parallel or perpendicular lines.</p> <p>7. Students write the linear equation in slope-intercept form, $y = mx + b$. They identify the slope and the point that is the y-intercept, and then graph the equation using that point and the slope.</p> <p>8. Teacher writes $y = 2x - 3$ and $y > 2x - 3$ on the board. Each student is to find 1 point which satisfies 1 of the 2 sentences. Each student writes his/her point underneath the appropriate sentence. As a class, graph the equation and discuss how the inequality is different.</p>	<p>5. At the blackboard, students sketch graphs of lines given various slope values.</p> <p>6. a-b. Students formulate an equation of a line given either a point and slope, or 2 points.</p> <p>c. Students graph lines on the blackboard given slopes and y intercepts.</p> <p>d-e. Give students pairs of equations. They must determine if lines are perpendicular, parallel or neither.</p> <p>7. Students work in pairs helping each other to identify the slope and the y-intercept of several linear equations and then graph the lines accurately.</p> <p>8. Students practice graphing and shading inequalities.</p>

Outcome: 5 (continued) (Graphing Linear Equations and Inequalities) Students will be able to graph equations and inequalities in the coordinate plane.

Assessment:

Skills/Objectives	Suggested Teaching Strategies/Learning Strategies	Suggested Mini-Assessments
<p>The student will be able to:</p> <p>9. Solve a system of 2 linear equations:</p> <ul style="list-style-type: none"> a) By graphing b) By substitution c) By linear combination d) Use appropriate method to solve a word problem defined by a system of equations 	<p>9. Display 3 systems of equations on the board each demonstrating a different type of solution: i.e. parallel lines no solution, intersecting lines, 1 solution, and coinciding lines, infinite solutions.</p>	<p>9. Students graph 2 lines and discuss solution sets.</p>

Outcome : 6 (Polynomials) expressions.

Students will be able to perform addition, subtraction, multiplication and division of polynomial

Assessment:

Skills/Objectives	Suggested Teaching Strategies/Learning Strategies	Suggested Mini-Assessments
<p>The student will be able to:</p> <ol style="list-style-type: none"> 1. Introduce polynomials: <ol style="list-style-type: none"> a). Define b). Classify by type and degree 2. Simplify polynomial expressions 3. Add and subtract polynomials 4. Multiply monomials: <ol style="list-style-type: none"> a). Product rule for exponent b). Power rule for exponents 5. Multiply polynomial by a monomial 6. Multiply a binomial by a binomial: <ol style="list-style-type: none"> a) Vertical method b) FOIL method c) Binomial squared d) Sum and difference of 2 binomials 	<ol style="list-style-type: none"> 1. Given examples of different polynomials, students will identify each according to the number of its terms, and then determine its degree. 2. Have the students demonstrate how to recognize like terms in order to simplify polynomial expressions. 3. For addition, have students identify like terms from both polynomials and then add. For subtraction, have students rewrite the second polynomial using the distributive property with -1, then identify and combine like terms. 4. Define Product and Power rule for exponents using examples such as $(-3x^2)(4x^5) = (-3 \cdot 4)(x^{2+5})$ and $(-3x^2)^3 = (-3)^3(x^2)^3 = (-3)^3(x^{2 \cdot 3})$ 5. Demonstrate by use of the distributive property and product rule of exponents the multiplication of a polynomial by a monomial. 6. Students will work in pairs using tiles or manipulatives to demonstrate that $(2x+5)(3x+2)$ has a rectangular area of $6x^2 + 19x + 10$. Then demonstrate both vertical and FOIL methods for finding products of binomials. 	<ol style="list-style-type: none"> 1. Have students identify the type and degree of the polynomials on the board. 2. At the board have students identify and underline the like terms, and then simplify the expression. 3. Simplify addition and subtraction of polynomials. 4. Have students determine which statements are true by use of examples. <ol style="list-style-type: none"> 1). $a^n \cdot a^n = a^n \cdot a^n$ 2). $a^n \cdot a^n = a^n + a^n$ 3). $(ab)^n \cdot n = a^n \cdot b^n$ 4). $(a+b)^n \cdot n = a^n \cdot b^n$ 5). $a^n + a^n = a^n \cdot a^n$ 5. Send students to do sample problems at the board. 6. Have students discover the rules for <ul style="list-style-type: none"> • Squaring a binomial • Sum and difference of two binomials

Outcome: 6 (continued) (Polynomials)

Students will be able to perform addition, subtraction, multiplication and division of polynomial expressions.

Assessment:

Skills/Objectives	Suggested Teaching Strategies/Learning Strategies	Suggested Mini-Assessments
<p>The student will be able to:</p> <p>7. Multiply trinomial by binomial</p> <p>8. Divide monomial by a monomial:</p> <p>a) Quotient rule for exponents</p> <p>b) Zero exponents</p> <p>c) Negative exponents</p> <p>d) Scientific notation</p> <p>9. Divide polynomials by monomials</p>	<p>7. Use the distributive property or vertical method of multiplication to extend use to trinomials.</p> <p>8. a. Define quotient rule for exponents</p> <p>8. b.c. Using examples develop zero and negative exponent rules.</p> <p>8. d. Demonstrate the use of scientific notation for writing large and small numbers.</p> <p>9. Use addition property of fractions with symmetric property of equality to show division of a polynomial by a monomial, i.e.</p> $\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$ <p>therefore: $\frac{a+b}{c} = \frac{a}{c} + \frac{b}{c}$</p>	<p>7. Have students practice simplifying trinomial multiplications.</p> <p>8. Find examples of large and small numbers in newspapers and magazines to convert to scientific notation.</p> <p>9. Have students rewrite polynomial division as a sum of quotients and simplify.</p>

Outcome: 7 (Factoring) Students will be able to utilize a variety of factoring techniques to solve polynomial equations.

Assessment:

Skills/Objectives	Suggested Teaching Strategies/Learning Strategies	Suggested Mini-Assessments
<p>The student will be able to:</p> <ol style="list-style-type: none"> 1. Find prime factorization of integers: <ol style="list-style-type: none"> a) Define prime and composite b) Identify primes 1-100 2. Find greatest common factor: <ol style="list-style-type: none"> a) Given 2 or more integers b) Given 2 or more monomials 3. Factor <ol style="list-style-type: none"> a) Greatest monomial factor of a polynomial b) Difference of 2 squares c) Trinomials d) Grouping with 4 or more terms e) Combined factoring 4. Solve equations by factoring: <ol style="list-style-type: none"> a) Quadratic equations b) Higher degree equations 5. Solve word problems <ol style="list-style-type: none"> a) Area b) $D=RT$ 	<ol style="list-style-type: none"> 1. Use factor trees to determine prime factorization of integers. 2.a. Use prime factorization to establish GCF of 2 or more integers. 2. b. Use algebra tiles to determine monomial GCF. 3. Use algebra tiles to form a rectangle. The dimensions of the rectangle will be the factors of the polynomial. Create and use a flow chart to describe factoring sequence. 4. Use the graphing calculator to illustrate that the roots of a polynomial equation are the x–intercepts of the graph. 5. Model real life situations utilizing quadratic equations. <ul style="list-style-type: none"> • Ask students to determine the placement of an area rug in a room measuring 9m x 12m so that a uniform strip will remain uncovered. • Have students determine the height of an arrow shot into the air given its rate and time, using $h=vt-16t^2$ 	<ol style="list-style-type: none"> 1. Students will be able to determine primes from 1 – 100 by recreating the Sieve of Eratosthenes. 2. Student will be able to determine GCF of higher order expressions such as $(132x^4, 220x^5, \text{ and } 88x^7)$ 3. Students will be able to match trinomial to one (or both) of its factors in a matching game. Students will be able to link FOIL and factoring together in a round-robin game. <ol style="list-style-type: none"> 1) Each student selects 2 factors. 2) Papers are passed. Students FOIL. 3) Papers are passed. Students factor. 4) Process repeated until each student has completed all problems. 5) Compare original problems to outcomes. 4. Students will work in pairs. Each student will solve 5 quadratic equations. After solving, students will exchange paper and check by use of graphing calculators. *Students will play a card game by matching quadratic equations to their roots. 5. Students will work in groups of 4. Each will be responsible for problems of varying types. Students must establish a sketch, identify and solve the equation and express answer in terms of the problems. Each group will be called upon to present one problem.

Outcome: 8 (Rational expressions)

Students will multiply, divide and simplify rational expressions, solve rational equations, and use proportions to solve word problems.

Assessment:

Skills/Objectives	Suggested Teaching Strategies/Learning Strategies	Suggested Mini-Assessments
<p>The student will be able to:</p> <ol style="list-style-type: none"> 1. Identify and define a rational expression. 2. Determine the values for which the expression is undefined. 3. Simplify rational expressions using factoring and cancellation properties. 4. Multiply rational expressions. 	<ol style="list-style-type: none"> 1. Provide examples of rational expressions using simple numerical fractions and fractions containing polynomials. 2. Introduce the general rule: If $a/b = c$, then $b \cdot c = a$ ($b \neq 0$). Show why $6/0$ must be undefined (or meaningless). Introduce rational expressions containing polynomial denominators and discuss when these expressions would be undefined. (Set denominator = to zero and solve). Connect this concept to “domain” of a function. 3. Use a 2 step procedure: <ul style="list-style-type: none"> - Factor numerator and denominator completely. - Divide out common factors in numerator and denominator. Give examples of when not to divide. (e.g., in $2/2x-1$ 2's cannot be divided out) 4. Introduce the general rule: $(a/b)(c/d) = ac/bd$ ($b \neq 0, d \neq 0$). When multiplying rational expressions containing polynomials, use 3 step procedure: <ol style="list-style-type: none"> a. Factor numerators and denominators completely. b. Divide out common factors in numerators and denominators. c. Multiply numerators. Multiply denominators. 	<ol style="list-style-type: none"> 1. Rewrite division problems as rational expressions. (For example $2 \div 5$ as $2/5$.) 2. Find the domain of given rational expressions. 3. Give several examples of correctly and incorrectly simplified rational expressions. Students identify the correct ones and amend the incorrect ones. 4. Multiply rational expressions containing an assortment of monomial and polynomial numerators and denominators. Answer should be in simplified form. Students should be able to explain their steps.

Outcome: 8 (continued) (Rational expressions)

Students will simplify rational expressions, rational equations and use proportions to solve word problems.

Assessment:

Skills/Objectives	Suggested Teaching Strategies/Learning Strategies	Suggested Mini-Assessments
<p>The student will be able to:</p> <p>5. Divide rational expressions using reciprocals.</p> <p>6. Divide polynomials using long division.</p> <p>7. Find Least Common Denominator for rational expressions.</p> <p>8. Add or subtract rational expressions using Least Common Denominator.</p>	<p>5. Introduce the general rule: $(a/b) \div (c/d) = (a/b)(d/c)$ ($b \neq 0, c \neq 0, d \neq 0$). (Division equals multiplication by reciprocal.) When dividing rational expressions containing polynomials, use 4-step procedure:</p> <ul style="list-style-type: none"> - Rewrite division problem as multiplication (use reciprocal) Repeat steps a,b,c in #4. <p>6. Show examples of division of a polynomial by a polynomial. Review the long division algorithm for integers. Relate the algorithm to division of a polynomial by a binomial. Give examples. (Use area concept from geometry.)</p> <p><i>Optional strategies:</i> Model long division by use of algebra tiles and/or synthetic division.</p> <p>7. Review procedure for finding LCM of monomial expressions. Find the LCM of two (or more) polynomial expressions that:</p> <ul style="list-style-type: none"> - a) Share common factors - b) Have no common factors <p>LCD = LCM of the denominators.</p> <p>8. Introduce the General Rule: $a/b + c/b = \frac{a+c}{b}$ ($b \neq 0$). Give addition and subtraction examples using monomial denominators and more complex polynomial denominators. Use 3-step procedure:</p> <ul style="list-style-type: none"> - a) Create equivalent rational expressions using the LCD - b) Add (or subtract numerators of these equivalent rational expressions. - c) (Denominator is LCD) <p>- Simplify, if possible</p>	<p>5. Divide rational expressions and be able to explain steps. Give examples that were incorrectly done. Have students identify what went wrong.</p> <p>6. Divide polynomials by monomials. Describe steps for the long division algorithm. Use long division to divide a polynomial by a binomial.</p> <p>7. Student should be able to find the LCD of rational expressions containing an assortment of polynomial denominators and explain the difference between a common denominator and the <u>least common denominator</u>.</p> <p>8. Students should be able to find the perimeter of a polygon given the lengths of the sides in rational expression form.</p>

Outcome: 8 (Rational expressions)

Students will simplify rational expressions, rational equations and use proportions to solve word problems.

Assessment:

Skills/Objectives	Suggested Teaching Strategies/Learning Strategies	Suggested Mini-Assessments
<p>The student will be able to:</p> <p>9. Identify ratios and solve proportions: a) Solve word problems involving ratio and proportion</p> <p>10. Solve rational equations: a) Fractional coefficients b) Fractional equations c) Determine extraneous solutions</p>	<p>9. Consider ratios as rational expressions, and proportions as equations involving two rational expressions. Introduce Cross Product Property: If $a/b = c/d$, then $ad=bc$ ($b \neq 0, d \neq 0$). Demonstrate the usefulness of this property in solving word problems in which a proportion is involved. (Scale drawings, population problems, etc.)</p> <p>10.a-b. Multiply both sides of the equation by the LCD and solve the resulting equation by standard techniques. c. Test solutions in original equation to validate. (f any solution yields a denominator of zero, it is extraneous and must be discarded)</p>	<p>9. Students should be able to create and solve word problems involving proportions.</p> <p>10. Given a specific replacement set, students should be able to identify an extraneous solution.</p>

Outcome: 9 (Irrational numbers)

Students will be able to simplify radical expressions and perform operations on expressions containing radicals.

Assessment:

Skills/Objectives	Suggested Teaching Strategies/Learning Strategies	Suggested Mini-Assessments
<p>The student will be able to:</p> <ol style="list-style-type: none"> 1. Define irrational numbers 2. Identify and define terms with respect to radicals. 3. Define square root: <ol style="list-style-type: none"> a) Principal square root b) Perfect square c) Approximating square roots 4. Simplifying numerical and algebraic square roots. 5. Add and subtract square roots 6. Multiply square roots: <ol style="list-style-type: none"> a) Monomial by monomial b) Polynomial by monomial c) Binomial by binomial 7. Divide square roots: <ol style="list-style-type: none"> a) Rationalize monomial denominators b) Rationalize binomial denominators by use of a conjugate. 	<ol style="list-style-type: none"> 1. Using a calculator compare $\sqrt{25}$ to $\sqrt{26}$ as basis for distinguishing between rational and irrational numbers. 2. Use $\sqrt{15}$ to establish terminology: such as index, radicand, and radical. 3. Link the quadratic equation $x^2=25$ to the square root problem $\sqrt{25}$ distinguishing between the 2 roots. - Approximate $\sqrt{20}$ as being between $\sqrt{16}$ and $\sqrt{25}$. 4. Using a perfect square as a model: such as $\sqrt{16} = \sqrt{4} \cdot \sqrt{4}$ or $\sqrt{x^4} = \sqrt{x^2} \cdot \sqrt{x^2}$ establish that the square root of the product is the same as the product of its square roots.. 5. Use the concept of combining like terms as a basis for addition/subtraction of radicals. 6. Introduce the rules for multiplication $\sqrt{a} \cdot \sqrt{b} = \sqrt{ab}$ $\sqrt{a} \cdot \sqrt{a} = a$ Apply these rules for each level of multiplication. Apply the concept of FOIL to binomials. Distinguish between the product of a binomial squared and the product of a pair of conjugates. 7. Introduce the need to remove all radicals from the denominators of radical expressions. Demonstrate the process referring to the rule $\sqrt{a} \cdot \sqrt{a} = a$ and the concept of conjugates. 	<ol style="list-style-type: none"> 1. Students will be able to explain the difference between decimal forms of rational numbers and decimal forms of irrational numbers. 2. Students will be able to recognize parts of given radical. 3. Students will demonstrate the ability to approximate square roots in a flash card/instant recall game. 4. Students will be able to determine the original radicand given the simplified form. 5. Students will be able to determine if radical terms may or may not be added/subtracted. 6. Given a variety of multiplication problems, students will be able to apply basic rules to a multi-step process. Give students a set of problems. Working in pairs, they can then solve and check each other's work. 7. Put 5 problems with incorrect solutions on the board. Have students review these problems, identify errors and correct.