Introduction to the Instructor TERM 1

This calendar of lessons was prepared as a textbook independent sequence of lessons and the order of topics can be modified based on the textbook selection.

The columns to the left are entitled **New** for the lesson number and **PI** for the **content performance indicator(s)** covered in the lesson. The content performance indicators were matched to the NYSED-Mathematics Core Curriculum, MST Standard 3 Pre-kindergarten – Grade 12; Revised 2005 document, Integrated Algebra section, pages 94-100.

CONTENT INDICATORS tell the instructor WHAT to teach while PROCESS INDICATORS tell the instructor HOW to teach it. Process indicators are also listed in the NYSED Mathematics Core Curriculum document, however because they involve problem solving, representation, communication, connections, and reasoning and proof, they are part of all lessons not just a select few and are not indicated as part of any individual lesson in this document. As the instructor prepares each lesson, the PROCESS STRANDS must be included on a regular and an ongoing basis. The complete list of process and content indicators can be found at www.emsc.nysed.gov or you may find this document on the AMAPS website at www.amaps.org beginning in July 2007.

Instructors are strongly advised to consult the Integrated Algebra Sample Tasks document, also available at the sites listed above. These sample tasks serve to further clarify the scope and depth of the content and process strands alike.

It should be noted that the use of a variety of hands-on manipulative devices as well as extensive use of the graphing calculator, for the purpose of student exploration and discovery of mathematical concepts, is strongly evident in the Mathematics Core Curriculum document. These materials should be available for classroom use.

New	PI	Integrated Algebra Term 1 Curriculum FOR FALL 2007 Prepared Exclusively by AMAPS
1	AA1	Lesson #1 AIM: How do we use the symbols of algebra and the order of operations to evaluate numerical expressions? Students will be able to: 1. list the symbols of operation 2. state and write the definition of each symbol of operation 3. create a list of the various words used for each operation 4. create a list of the symbols used to compare values 5. state and write the definition of each symbol of comparison 6. state and write the laws of the order of operations 7. evaluate numerical expressions using the rules for the order of operations 8. discover that parentheses are used as grouping symbols 9. identify and employ grouping symbols to change the value of a numerical expression 10. evaluate numerical expressions with parentheses using the rules for order of operations 11. translate a quantitative verbal phrase into an algebraic expression Writing for Understanding: 1) Explain why an "order of operations" is needed. 2) Under what circumstances will adding a set of parentheses into a numerical expression change the value of the expression?

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2	AN6	Lesson #2 AIM: How do we add and subtract within the set of signed numbers? Students will be able to: 1. state what elements are included in the set of counting, whole and signed numbers 2. use signed numbers to represent opposite situations 3. find the opposite of given numbers 4. determine if two numbers are opposite 5. create a number line showing the ordering of signed numbers 6. investigate the geometric meaning of the absolute value of a number 7. state in writing the meaning of absolute value 8. evaluate expressions containing signed numbers, absolute values, exponents, and parentheses 9. demonstrate signed number addition using a number line or other manipulative tool(s) 10. state and write the concepts that govern the addition of signed numbers 11. add signed numbers by applying the concepts that govern addition of signed numbers 12. state and write the definition of subtraction both in words and in symbols i.e., $x - y = x + (-y)$ 13. state the rules for addition of signed numbers 14. subtract two signed numbers using a number line or other manipulative tool(s) 15. state and write the concepts that govern the subtraction of signed numbers 16. subtract signed numbers by applying the concepts that govern subtraction of signed numbers Writing for Understanding: 1) Explain the relationship between opposite numbers. 2) Why is it that the absolute value of negative five has the same value as the absolute value of positive five?
3		Lesson #3 AIM: How do we multiply and divide signed numbers? Students will be able to: 1. state and write the concepts that govern the multiplication of signed numbers 2. compute the product of a series of signed numbers 3. state and write the concepts that govern the division of signed numbers 4. compare the rules for division of signed numbers with those for multiplication 5. compute the quotient of two signed numbers Writing for Understanding: 1) Some people say that multiplication is like doing repeated additions. a) Explain how this could be. b) Determine whether or not multiplication with signed numbers could be thought of as repeated additions. 2) Explain how the concepts that govern the addition of signed numbers compare with the concepts that govern the multiplication of signed numbers. 3) Describe the connection between the multiplication of a pair of signed numbers and division of a pair of signed numbers.

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4	AA1 AA2	Lesson #4 AIM: How do we evaluate algebraic expressions given numerical values from the set of Integers? Students will be able to: 1. define, both orally and in writing, the terms: variable, coefficient, exponent (for positive integral values only), base, power, algebraic expression 2. distinguish between variables and coefficients 3. describe the process of evaluating an algebraic expression 4. evaluate simple algebraic expressions given value(s) for the variable(s) 5. evaluate algebraic expressions containing exponents and parentheses by selecting and applying appropriate concepts for operating with signed numbers and the order of operations 6. write verbal expressions that match given mathematical expressions Writing for Understanding: 1) Write one similarity and one difference between a numerical and an algebraic expression. 2) Explain the steps needed to evaluate an algebraic expression. 3) What is wrong with the statement "Two negatives make a positive"?
5	AA21 AA29	Lesson #5 AIM: How do we determine if a number is a solution of an open sentence? Students will be able to: 1. define each of the following terms: sentence, open sentence, variable, statement, domain, solution set, both orally and in writing 2. compare and contrast a statement with an open sentence 3. explore the difference between statements and non-statements 4. distinguish between open and closed sentences 5. determine the truth value of numerical statements, both for an equality or an inequality, by applying the order of operations 6. create the solution set of open sentences given the domain 7. use set builder notation and/or interval notation to illustrate the elements of a set, given the elements in roster form Writing for Understanding: 1) What makes a statement different from an open sentence? 2) Determine if it is possible for the solution set for an open sentence to have more elements in it than the domain set has. Support your answer with evidence.

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6	AA4 AA3 AA1, AA2	Lesson #6 AIM: How do we translate an English sentence into an algebraic expression? Students will be able to: 1. recall the meaning of a variable both orally and in writing 2. select and use variables to represent unknown quantities 3. translate a verbal sentence into an equation, inequality, or an algebraic expression 4. communicate the difference between an algebraic expression, an equation, and an inequality, in writing Writing for Understanding: 1) Harry solved an equation and got 10 as the answer for the variable. Then he asked his teacher, "If a variable is supposed to be able to be different values, why is x called a variable in this equation, when we know that the answer for x is 10?" How would you answer Harry's question? 2) Explain the difference between an equation and an inequality.
7	AN1	Lesson #7 AIM: What are the properties of Real numbers? Students will be able to: 1. define: the commutative property, the associative property, the additive identity and the additive inverse property, as well as the multiplicative identity and multiplicative inverse property 2. identify the identity elements for multiplication and addition 3. identify examples of the properties given a list of expressions illustrating the properties of real numbers 4. create original examples that illustrate the properties of real numbers either in writing or by using manipulatives such as algebra tiles Writing for Understanding: 1) How is commuting to school each day like the commutative property of addition? 2) What role do the parentheses play in the associative property? 3) Explain the difference between the multiplicative identity and the multiplicative inverse.

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8	AN1	Lesson #8 AIM: What are properties of an operation defined by a table? Students will be able to: 1. label statements illustrating the commutative, associative, and distributive property, identity element and inverses of numbers for addition or multiplication 2. discover what is meant by closure of a set under a given operation 3. given an operation on a set indicated by a table, a. determine the result of that operation on any 2 elements in the set b. determine whether that set is commutative for the given operation c. determine whether the set is closed under the given operation d. determine the identity element e. determine the inverse of an element Writing for Understanding: 1) Why are the operations of addition, multiplication, subtraction, and division called binary operations? What might be considered a unary operation? 2) In Biology we learn that eye color is an inherited trait for humans, yet brown eyed parents can have a blue eyed child. Explain how this could be considered an example of a system that is not closed.
9	AA21 AA22	Lesson #9 AIM: How do we solve an equation of the type x + a = b? Students will be able to: 1. describe the 'balance' required for an expression to be considered an equation 2. define a solution of an equation, the solution set, and state what is meant by solving an equation 3. translate verbal sentences into equations of the type x + a = b 4. solve equations of the type x + a = b, where a and b are rational numbers, by isolating the variable using inverses, by guess and check, by manipulating algebra tiles 5. communicate in writing how the additive inverses facilitate solving the equation 6. check the solutions and write the solution set Writing for Understanding: 1) What is the advantage of solving an equation algebraically over solving it by the guess and check method? 2) You could solve 6 = x+9 by subtracting 9 from each side, or by subtracting 6 from each side. Describe why it is better to subtract the 9.

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10	AA21 AA22 AA25	Lesson #10 AIM: How do we solve an equation of the type ax = b? Students will be able to: 1. translate verbal sentences into equations of the type ax = b 2. solve equations of the type ax = b, where a and b are rational signed numbers, by isolating the variable using reciprocals, guess and check, by manipulating algebra tiles 3. investigate the connections between solving equations of the form ax=b and x+a=b 4. select and apply the appropriate isolation method for solving equations of the form ax=b as compared to solving equations of the form x+a=b 5. communicate in writing how the use of multiplicative inverses (reciprocals) facilitate solving the equation 6. check the solutions and write the solution set Writing for Understanding: 1) What does it mean for a value to 'satisfy' an equation? 2) How are the words 'root' and 'solution' related to each other?
11	AA21 AA22 AA25	Lesson #11 AIM: How do we solve equations of the type ax + b = c? Students will be able to: 1. isolate the variable using properties of inverses and identities 2. solve equations of the type ax + b = c where a, b, and c are rational signed numbers 3. check the solutions and write the solution set Writing for Understanding: 1) How is solving an equation like working the order of operations backwards?
12	AN1 AA3	Lesson #12 AIM: What is meant by the distributive property? Students will be able to: 1. state the distributive property 2. use the distributive property to evaluate numerical expressions 3. use the distributive property to change the form of an algebraic expression 4. state the property justifying steps in a number proof Writing for Understanding 1) Why is it appropriate that the word *distribute* is found in the name of the Distributive Law?. 2) Explain the circumstances when the distributive property is used. Illustrate you answer with an example. 3) Explain the error: -4 (x+3) = -4x + 12.

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13	AA13	Lesson # 13 AIM: How do we add monomials and add polynomials? Students should be able to: 1. define and identify a monomial and polynomials 2. identify: coefficients, variables, exponents, and the degree of a polynomial 3. discover through a modeling activity the meaning of like terms 4. sort a list of monomials into like terms 5. create and state the procedure for addition of monomials 6. extend the rules for addition of monomials to addition of polynomials Writing for Understanding 1) Describe the 'job' of the coefficient in combining a pair of like terms. 2) Ellen asked Sonia: "Why don't we don't add the exponents when we add like terms?" What answer should Sonia give to Ellen?
14	AA13	Lesson #14 AIM: How do we subtract monomials and subtract polynomials? Students will be able to: 1. create and state the procedure for subtraction of monomials 2. extend the rules for subtraction of monomials to the subtraction of polynomials 3. use the rules to subtract monomials and subtract polynomials Writing for Understanding: 1) Explain the procedure for subtracting monomials and polynomials.
15	AA3 AA22 AA21	Lesson #15 AIM: How do we solve equations containing like terms on one side of the equal sign? Students will be able to: 1. recall the definition of the solution of an equation, a solution set, and state what is meant by solving an equation 2. compare an equation containing like terms on one side to equations of the form ax=b and x+a=b 3. state the procedure for combining like terms 4. solve algebraically equations which contain like terms on one side 5. distinguish between an algebraic expression and an equation, both orally and in writing 6. check the solutions and write the solution set Writing for Understanding: 1) Compare and contrast: simplifying an expression and solving an equation.

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16	AA21 AA22	Lesson #16 AIM: How do we solve equations which contain variables on both sides of the equal sign? Students will be able to: 1. discover the procedure for solving equations with variables on both sides of the equation, using diagrams or manipulative models 2. apply previously learned procedures for isolating the variable to solve such equations 3. describe how combining like terms facilitates solving equations with variables on both sides 4. solve equations which contain variables on both sides 5. check solutions and write the solution set Writing for Understanding: 1) Gary said that using additive inverses to solve an equation is like adding a zero to the equation. Write a paragraph agreeing or disagreeing with Gary. Support your argument with evidence.
17	AA22 AA21	Lesson #17 AIM: How do we solve equations which contain parentheses? Students will be able to: 1. recall that parentheses are used as grouping symbols 2. use the distributive property to remove parentheses from an equation 3. justify the equivalence of an equation before a set of parentheses have been removed with the resulting equation once the parentheses have been removed by using the distributive law 4. communicate the effect of distributing the negative sign when using the distributive law 5. use the distributive law and previously learned techniques to solve equations containing parentheses 6. check solutions and write the solution set Writing for Understanding: 1) What does it mean to “distribute a negative sign over the parentheses”? 2) Describe the steps used to solve equations which contain parentheses. 3) Discuss the statement: “When solving some equations there are several things you could do as a first step.”

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18	AA23 AA21	Lesson #18 AIM: How can we solve a literal equation? Students will be able to: 1. define a literal equation 2. compare and contrast a literal equation with an equation containing only one variable 3. investigate and apply the procedure for solving a literal equation 4. solve a literal equation for an indicated variable (the subject) 5. apply the solution of literal equations to real world problems Writing for Understanding: 1) Look up the word literal in an English dictionary. How does the English meaning relate to its mathematical meaning? 2) State one similarity and one difference in the procedure for solving a literal equation as compared with the procedure for solving an equation in one variable.
19	AA4 AA5 AA21	Lesson #19 AIM: How can we solve verbal number problems using equations? Students will be able to: 1. translate English sentences into mathematical sentences 2. solve a variety of types of verbal problems, including problems involving rates, leading to first degree equations 3. investigate alternate representations and solutions of the problem situation 4. justify the answer using the conditions in the problem 5. write the answer to the problem in a complete sentence Writing for Understanding: 1) How is the legend created in the solution of a verbal problem like the legend that is found on a road map? 2) Explain the steps in solving any verbal problem.

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20	AA8 AA13 AA4	Lesson #20 AIM: How do we solve problems involving consecutive integers? Students will be able to: 1. interpret the meaning of consecutive as it applies to integers by making comparisons to real life situations that involve the concept of consecutive items 2. create an algebraic representation for consecutive integers 3. write the algebraic representation for expressing consecutive integers (the legend) 4. justify why the representation for even and odd consecutive integers is the same 5. create an equation that may be used to solve a given verbal problem 6. identify, in writing, the meaning of the variable used in the equation 7. solve the equation using previously learned techniques 8. state and justify the complete solution by referring back to the original conditions of the verbal situation Writing for Understanding 1) Look up the word consecutive in an English dictionary. How does the English meaning of consecutive relate to the mathematical meaning of consecutive integers?
21	AA8 AA13 AA4	Lesson #21 AIM: How do we solve problems involving consecutive even or odd integers? Students will be able to: 1. interpret the meaning of consecutive as it applies to even or odd integers by making comparisons to real life situations that involve the concept of consecutive even or odd items 2. create an algebraic representation for consecutive even or odd integers 3. write the algebraic representation for expressing consecutive even or odd integers (the legend) 4. justify why the representation for even and odd consecutive integers is the same 5. create an equation that may be used to solve a given verbal problem 6. identify, in writing, the meaning of the variable used in the equation 7. solve the equation using previously learned techniques 8. state and justify the complete solution by referring back to the original conditions of the verbal situation Writing for Understanding 1) Justify why the representation for even and odd consecutive integers is the same.

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22	AA6 AA4 AA5	Lesson #22 AIM: How do we solve more complex verbal problems leading to linear equations? Students will be able to: 1. create a model that can be used to represent the problem situation by using a diagram, charting, manipulative tools, and/or a graphic organizer 2. interpret the model into an algebraic representation for the situation (the legend) 3. create an equation that may be used to solve a given verbal problem 4. identify, in writing, the meaning of the variable used in the equation 5. solve the equation using previously learned techniques 6. state and justify the complete solution by referring back to the original conditions of the verbal situation Writing for Understanding: 1) Create your own verbal problem for the equation C = 1.75g. Show the legend and the solution for your verbal problem.
23	AA6 AR7 AA21 AM2	Lesson #23 AIM: How do we solve verbal problems involving objects moving in opposite directions using a linear equation? Students will be able to: 1. to read the problem 2. describe the problem situation in their own words 3. create a model that can be used to represent the problem situation by using a diagram, charting, manipulative tools, and/or a graphic organizer 4. interpret the model into an algebraic representation for the situation (the legend) 5. create an equation that may be used to solve a given verbal problem 6. identify, in writing, the meaning of the variable used in the equation 7. solve the equation using previously learned techniques 8. state and justify the complete solution by referring back to the original conditions of the verbal situation 9. solve problems involving conversions within measurement systems, given the relationship between units Writing for Understanding 1) What is the relationship between distance, rate and time? 2) Patty said: "If I want an answer that is in miles per hour then I know that I should be multiplying distance by time." Write a note to her, describing in detail, the nature of the error she has made.

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24	AA6 AA13 AA4 AM2	Lesson #24 AIM: How do we solve verbal problems involving objects moving in the same direction? Students will be able to: 1. read the problem 2. describe the problem situation in their own words 3. create a model that can be used to represent the problem situation by using a diagram, charting, manipulative tools, and/or a graphic organizer 4. interpret the model into an algebraic representation for the situation (the legend) 5. create an equation that may be used to solve a given verbal problem 6. identify, in writing, the meaning of the variable used in the equation 7. solve the equation using previously learned techniques 8. state and justify the complete solution by referring back to the original conditions of the verbal situation 9. solve problems involving conversions within measurement systems, given the relationship between units Writing for Understanding: 1) Explain the meaning of the term “overtake” as it is used in a motion problem.
25	AA6 AR7 AA1	Lesson #25 AIM: How do we solve verbal problems involving coin/value leading to linear equations in one variable? Students will be able to: 1. describe the problem situation in their own words 2. explore the relationship between number of coins and value of a coin and write the relationship in their own words 3. create a trial and error chart that models the conditions of the coin problem with at least three trials 4. connect the trial and error chart to an algebraic representation for the situation (the legend) 5. create an equation that may be used to solve the given coin problem 6. identify, in writing, the meaning of the variable used in the equation 7. solve the equation using previously learned techniques 8. state and justify the complete solution by referring back to the original conditions of the verbal situation Writing for Understanding: 1) Little four-year old Rosie is so proud of herself. She traded one quarter for two dimes and now she thinks she has more money because she has two coins. Write her a little poem that will tell her the difference between the number of coins and the value of the coins.

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26	AN5 AA26	Lesson #26 AIM: How do we solve verbal problems involving proportions that lead to linear equations? Students will be able to: 1. explore the relationship between a ratio and a proportion 2. express a ratio and a proportion using different forms 3. determine when to apply the concepts of ratio and proportion to solve verbal problems leading to linear equation 4. apply ratio and proportion to the solution of verbal problems involving geometry 5. apply the theorem "In a proportion, the product of the means is equal to the product of the extremes" to solve proportions 6. express answers to verbal problems in written form Writing for Understanding: 1) Explain the meaning of ratio and describe a real-life situation using ratio.
27	AN5 AM3	Lesson #27 AIM: How do we solve verbal problems involving finding percent of a number? Students will be able to: 1. describe the problem situation in their own words 2. solve simple problems involving percentage such as sales tax, discounts, interest, etc 3. compute total cost with tax or sales price, after a discount, using a single multiplication 4. compute percent of change 5. define what is meant by the greatest possible error 6. compute the percent error, given an error in the linear measurement, when computing an area or a volume Writing for Understanding: 1) A coat was on sale for 50% off. The next week the store posted a sign that there would be an additional markdown of 50% off the sale price. Does that mean that the coat is now free? Explain.
28	AN5 AA26	Lesson #28 AIM: How do we solve more difficult verbal problems involving percentage using equations? Students will be able to: 1. convert fractions and decimals into percents 2. solve percentage problems that require finding the percentage 3. compute the percent increase/decrease 4. solve percentage problems that require finding the whole quantity Writing for Understanding: 1) Artie pays $300 to rent a room. His landlord increased his rent to $375 and told Artie that this was the 20% increase allowed by law. Artie disagreed saying that a $75 increase was the same as a 25% increase. Who was right? Explain.

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29	AA5 AA21 AA24 AA29	Lesson #29 AIM: How do we solve a linear inequality in one variable? Students will be able to: 1. recall (from lesson#1) and state the four inequality symbols 2. explore the similarities and differences between the solution set of an equation and the solution set of an inequality 3. discover the properties that govern the solution of an inequality 4. justify, orally and in writing, the fact that the inequality sign is reversed when an inequality is multiplied or divided by a negative number 5. apply the properties of inequalities to solve an inequality 6. use set builder notation and/or interval notation to illustrate the elements of the solution set 7. graph the solution set of each inequality solved on a number line 8. check a member of the solution set in the original inequality Writing for Understanding: 1) Explain the similarities and differences between solving an equation and solving an inequality. 2) Explain the similarities and differences between the number line graphs of the solution of an equation and an inequality.
30	AA5 AA21 AA24	Lesson #30 AIM: How do we solve an inequality using more than one property of inequality? Students will be able to: 1. investigate the method for solving a two step inequality or one containing parentheses as compared to solving a two step equation or an equation containing parentheses 2. apply the method(s) discovered to solve first degree inequalities using more than one property of inequality (include fractional coefficients) 3. create an argument that justifies the fact that the inequality sign is reversed when an inequality is multiplied or divided by a negative number 4. use set builder notation and/or interval notation to illustrate the elements of the solution set 5. graph the solution set of each inequality solved 6. check a member of the solution set in the original inequality Writing for Understanding: 1) Write a letter to a friend explaining why an inequality sign reverses direction when an inequality is multiplied or divided by a negative number.

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31	AA5 AA21 AA24	Lesson #31 AIM: How can we solve a verbal problem which leads to an inequality? Students will be able to: 1. read the problem 2. describe the problem situation in their own words 3. create a model that can be used to represent the problem situation by using a diagram, charting, manipulative tools, and/or a graphic organizer 4. interpret the model into an algebraic representation for the situation (the legend) 5. explain the difference between the situation as an inequality and the situation if it were an equation 6. create an inequality that may be used to solve the given verbal problem 7. identify, in writing, the meaning of the variable used in the equation 8. solve the inequality using previously learned techniques, express the solution set using set builder notation 9. state and justify the complete solution by referring back to the original conditions of the verbal situation 10. verify at least one solution by checking it in the original conditions of the problem Writing for Understanding: 1) Write a reason that explains why the prefix 'in' was used for the word inequality. 2) Create a real-world situation which can be modeled by an inequality. Clearly indicate reasons for your choice.
32	AA12 AA2 AA3	Lesson #32 AIM: How do we multiply monomials? Students will be able to: 1. define an exponent and distinguish it from a coefficient 2. investigate the behavior of exponents for multiplication of monomials 3. discover and write the concepts that govern the behavior of exponents under multiplication of like bases 4. apply the law of exponents for multiplication of like bases 5. explore the behavior of the coefficients of the monomials and compare it to the behavior of the exponents when monomials are multiplied 6. multiply monomials containing integral, fractional, or decimal coefficients and positive integral exponents Writing for Understanding: 1) Barbara asked Rhonda: "Why is it that we add the exponents when we are multiplying like terms?" What answer should Rhonda give to Barbara?

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33	AA12 AA2 AA3	Lesson #33 AIM: How do we divide monomials? Students will be able to: 1. investigate the behavior of exponents for division of monomials 2. discover and write the concepts that govern the behavior of exponents under division of like bases 3. describe the unique role of the multiplicative identity element in the division of monomials 4. apply the law of exponents for division of like bases 5. explore the behavior of the coefficients of the monomials and compare it to the behavior of the exponents when monomials are divided 6. divide monomials containing integral, fractional, or decimal coefficients and positive integral exponents Writing for Understanding: 1) Reducing an algebraic fraction requires both the operations of division and subtraction. Explain why this is? 2) What does it mean for an exponent to be zero? How could this happen?
34	AA12	Lesson #34 AIM: What is the meaning of a negative exponent and a zero exponent? Student will be able to: 1. recall the rule for division of monomials 2. connect the rule for division of monomials to the creation of the zero and negative exponents 3. communicate the meaning of a negative exponent and a zero exponent, orally and in writing 4. simplify numerical expressions containing zero, negative and positive integral exponents 5. evaluate algebraic expressions containing zero, negative and positive integral exponents 6. justify the steps used to simplify or evaluate expressions exponents by citing appropriate concepts that govern the process Writing for Understanding: 1) Explain the meaning of a negative exponent. How does it happen?

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35	AN4	Lesson #35 AIM: How do we write use scientific notation to compute products and quotients? Students will be able to: 1. explain what is meant by writing numbers in scientific notation 2. discuss the historical context for writing numbers in scientific notation 3. explain in writing the benefits to writing numbers in scientific notation 4. convert numbers into and out of scientific notation 5. perform multiplication and division with numbers written in scientific notation Writing for Understanding: 1) Describe the historical context for writing numbers in scientific notation. 2) Explain why it is beneficial to write numbers in scientific notation. 3) Explore how your calculator displays a number in scientific notation. Write the steps needed to convert the number back to standard form. 4) Which number is larger, 1.23×10^{2} or 9.02×10^{-2} ? Justify your answer.
36	AA13	Lesson #36 AIM: How do we multiply a polynomial by a monomial? Students will be able to: 1. explore multiplication of a polynomial by a monomial using diagrams or manipulative tools such as algebra tiles 2. create the rules that govern multiplication of a polynomial by a monomial 3. state the rules used for multiplication of a polynomial by a monomial 4. connect the property used for multiplication of a polynomial by a monomial to the distributive law 5. select and apply the appropriate law of exponents for multiplication of like powers in multiplying a polynomial by a monomial 6. apply discovered concepts to multiplication of a polynomial by a monomial Writing for Understanding: 1) How does the distributive law apply to multiplying a polynomial by a monomial?

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37	AA14 AA21	Lesson #37 AIM: How do we divide a polynomial by a monomial? Students will be able to: 1. explore division of a polynomial by a monomial using diagrams or manipulative tools such as algebra tiles 2. create the rules that govern division of a polynomial by a monomial 3. state the rules used for division of a polynomial by a monomial 4. connect the unique role of the multiplicative identity element in the division of monomials to the division of a polynomial by a monomial 5. connect the property used for division of a polynomial by a monomial to the distributive law 6. select and apply the appropriate law of exponents for division of like powers in multiplying a polynomial by a monomial 7. apply discovered concepts to division of a polynomial by a monomial 8. check the quotient with an appropriate multiplication Writing for Understanding: 1) How does the distributive law apply to dividing a polynomial by a monomial?
38	AA13	Lesson #38 AIM: How do we find the product of polynomials? Students will be able to: 1. discover the rules that govern the product of two binomials or a polynomial by a binomial, using diagrams or manipulative tools, like algebra tiles 2. state the property used to multiply two binomials or a polynomial by a binomial 3. multiply two binomials or a binomial by a polynomial in vertical form or horizontal form 4. explain the relationship between the product of polynomials and the distributive law 5. define descending and ascending order of a polynomial 6. express products in descending order Writing for Understanding: 1) How is multiplying a pair of binomials like using the distributive law twice? 2) Under what circumstances will the product of a pair of binomials result in a binomial expression?
39	AG1 AA13	Lesson #39 AIM: What is meant by the perimeter of triangles, squares, and rectangles? Students will be able to: 1. define perimeter, both orally and in writing 2. algebraically represent perimeter given sides in monomial or polynomial form 3. create models to represent and solve perimeter problems involving triangles, squares and rectangles 4. assign an appropriate unit value to the perimeter and justify that selection Writing for Understanding: 1) Design a real life situation in which you would need to calculate the perimeter of a polygon. Be sure to describe your situation in complete sentences.

New	PI	Integrated Algebra Term 1 Curriculum FOR FALL 2007 Prepared Exclusively by AMAPS
40	AG1 AG5 AA6 AA22	Lesson #40 AIM: How do we find the area of a rectangle and square? Students will be able to: 1. define area and state units of measure for area 2. informally develop the formulas for finding the area of a rectangle and square, using geobooards, diagrams or other manipulative tools 3. state formulas for finding area of a rectangle and a square 4. solve numerical and algebraic problems involving the area of a rectangle and square Writing for Understanding: 1) Describe two different situations: one in which you must compute an area and one in which you must compute the perimeter. In addition, describe how the units of measure tell if the answer is an area measure or if it is a perimeter measure.
41	AG1 AA6 AA22	Lesson #41 AIM: How do we find the area of parallelograms and triangles? Students will be able to: 1. informally develop the formula for finding the area of a parallelogram and triangle, using geobooards, diagrams, paper folding or other manipulative tools 2. state the connection between the area of a rectangle and the area formulas for a parallelogram and a triangle 3. state formulas for area of a parallelogram and a triangle 4. solve numerical and algebraic problems involving the area of a parallelogram and triangle Writing for Understanding: 1) Explain the relationship between the area of a parallelogram and the area of a triangle. 2) Explain why the formulas for the area of a parallelogram and the area of a rectangle are the same.
42	AG1 AA6 AA22	Lesson #42 AIM: How do we find the area of a trapezoid? Students will be able to: 1. informally develop the formula for finding the area of a trapezoid, using geobooards, diagrams or other manipulative tools 2. define the altitude and a diagonal of a trapezoid 3. state the connection between the area of a trapezoid and the area of a triangle 4. solve numerical and algebraic problems involving the area of a trapezoid Writing for Understanding: 1) Explain how the formula for the area of a trapezoid is developed.

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43	AG1 AA6 AA22	Lesson #43 AIM: How do we find the circumference of a circle? Students will be able to: 1. state the relationship between the radius and diameter of a circle 2. discover that Pi is the ratio of the circumference to its diameter 3. discover the formula for the circumference of a circle 4. compute the circumference of a circle, in terms of π or to the nearest square unit, given its radius or diameter 5. compute the radius or diameter given the circumference of a circle 6. solve verbal problems involving circumference of a circle 7. compute the length of a semicircle and quarter circle given the length of a radius or diameter Writing for Understanding: 1) When do we need to find the circumference of a circle? 2) Which idea is *circumference* most closely related to, area or perimeter? Explain your choice. 3) Explain how to determine whether $C=\pi d$ or $C=2\pi r$ is used in finding the circumference of a circle.
44	AG1 AA6 AA22	Lesson #44 AIM: How do we find area of a circle? Students will be able to: 1. use the fact that pi is the ratio of the circumference to the diameter to create the formula for the area of a circle 2. state the formula for finding the area of a circle 3. find the area of a circle, semi circle and quarter circle in terms of π or to the nearest square unit, given its radius or diameter 4 solve verbal problems that require finding the area of a circle 5. compute the area of a circle, given its circumference 6. compute the radius and diameter of a circle given its area 7. compute the circumference of a circle given its area Writing for Understanding: 1) Use the internet to look up the history of the number pi. Write three facts that you were surprised to learn.

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45	AG1 AA6 AA22	Lesson #45 AIM: How can we find the area of complex figures? Students will be able to: 1. connect the area of complex figures to the area of simple polygons 2. divide a complex figure into simpler figures to compute the area by adding and/or subtracting the areas of the simpler figures 3. discover that the area of a region between two figures can be computed by subtracting the area of the outer figure and the area of the inner figure 4. verify results by computing areas using alternate methods 5. apply discovered concepts to compute shaded area problems Writing for Understanding: 1) Describe how simple polygons can help to find the area of a complex geometric shape. 2) For complex shapes, when does subtracting an area help to get the total area?
46	AG2 AA6 AA22 AM3	Lesson #46 AIM: How do we find the surface area of a solid figure? Students should be able to: 1. identify a rectangular solid and a cube 2. compare and contrast a rectangle with a rectangular solid and a square with a cube 3. define the terms: face, edge, vertex, surface area 4. discover the number of faces, edges and vertices in a rectangular solid or a cube 5. create formulas for the surface area of a rectangular solid and for a cube 6. find the surface area of rectangular solids and cubes including appropriate units of measure 7. describe situations in which it is necessary to compute surface area 8. solve real world verbal problems that require finding the surface area of a rectangular solid or a cube 9. solve problems involving conversions within measurement systems, given the relationship between units 10. calculate relative error in measuring square and cubic units, when there is an error in the linear measure Writing for Understanding: 1) Give examples of real life situations that require finding surface area. 2) Choose a solid figure. Describe connections between that solid and another simple polygon.

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47	AG2 AA6 AA22 AM2 AM3	Lesson #47 AIM: What is meant by the volume of a rectangular solid and a cube? Students will be able to: 1. define volume and give examples for the meaning of volume 2. explain why the unit of measure for volume is 'cubic" 3. discover formulas for the volume of rectangular solids and cubes 4. explain, in their own words, that the volume of a rectangular solid and a cube can be expressed as the product of area of the base and its height 5. solve real world verbal problems involving rectangular solids and cubes 6. solve problems involving conversions within measurement systems, given the relationship between units 7. calculate relative error in measuring square and cubic units, when there is an error in the linear measure Writing for Understanding: 1) Describe a real-life situation when finding the area of a solid is necessary and when finding the volume of a solid is necessary. 2) Explain the similarities and differences between the formulas for the surface area and the volume of a cube.
48	AG2 AA6 AA22	Lesson #48 AIM: What is meant by the volume of prisms, pyramids, right circular cylinders, cones and spheres? Students will be able to: 1. identify prisms, pyramids, right circular cylinders, cones and spheres 2. define the terms: face, edge, vertex, surface area and volume as the terms apply to prisms, pyramids, right circular cylinders, cones and spheres 3. discover that the volume of cylinder (or prism) is the product of the area of its base and its height 4. investigate the relationship between the area of a cone (or pyramid) and its related right circular cylinder (or its related prism) 5. create general formulas for the volume of these solids 6. apply the volume formulas to compute volumes in real world problems and textbook exercises Writing for Understanding: 1) How many cones filled with sand will be needed to fill a cylinder that is of equal radius and height to the cone? Explain.

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49	AG2 AA6 AA22 AM2	Lesson #49 AIM: What is the effect of changing a linear dimension of a figure on its perimeter, area or volume? Students will be able to: 1. investigate patterns that result in perimeter, area, or volume when a linear dimension is changed 2. make a conjecture and support it with evidence from the investigation 3. solve problems related to computing the change in perimeter or area of a triangle, rectangle, square, and/or circle as a result of a change in a dimension 4. solve problems related to the change in volume of a rectangular solid as a result of a change in its linear dimension 5. solve problems involving conversions within measurement systems, given the relationship between units Writing for Understanding: 1) Ace Manufacturing company sells cereal in boxes. The company wants to use new boxes with twice the volume of cereal as the old boxes. The product manager sent a memo to the box manufacturing department instructing them to double all the dimensions of the old cereal box so that the new boxes will now hold twice the volume. Discuss the effect that his changes will have on the volume of the boxes.
50	AA20 AA23	Lesson #50 AIM: What is meant by factoring? Students will be able to: 1. discover the relationship between applying the distributive law and factoring 2. recall the meaning of a numerical factor 3. extend the meaning of a numerical factor to a common monomial factor in mathematical expressions 4. express polynomials in factored form by factoring out the greatest common factor (include examples where the GCF is a power) 5. check the factoring by using the distributive law 6. develop a technique for identifying prime algebraic expressions 7. justify when an expression has been factored using the greatest common factor Writing for Understanding: 1) Explain what is meant by factoring an expression.

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51	AA20	Lesson #51 AIM: How do we factor quadratic trinomials (only for a=1)? Students will be able to: 1. recall the procedure for multiplying two binomials 2. explore the relationship between the coefficients of a quadratic trinomial and the constant terms in its binomial factors using diagrams and/or manipulative tools such as algebra tiles 3. express quadratic trinomials in factored form (where a=1) as the product of two binomials by applying discovered concepts 4 express perfect square trinomials as the square of a binomial 5. check the factoring by multiplying Writing for Understanding: 1) Sharon remembered that when multiplying binomials there is a relationship between the coefficients of a quadratic trinomial and the constant terms in its factors. Explain how she could use this relationship when she tries to factor a quadratic trinomial. 2) Describe the conditions needed for a trinomial to be a perfect square trinomial.
52	AA19	Lesson #52 AIM: How do we factor the difference of two squares? Students will be able to: 1. discover that the difference of two perfect squares is a special case of a quadratic polynomial 2. identify the factors of a difference of two perfect squares as a pair of conjugates and compare and contrast these factors 3. communicate reasons why the product of a pair of conjugates results in a binomial expression instead of a trinomial expression 4. factor binomials that are the difference of two perfect squares where a=1 5. check the factoring by multiplying 6. argue that the sum of two perfect squares is not factorable Writing for Understanding: 1) How do you recognize a pair of conjugates? 2) Explain why when factoring the difference of two squares, the binomial factors are conjugates of each other.
53	AA20 AA19	Lesson #53 AIM: How can algebraic expressions be factored completely? Students will be able to: 1. discover that a polynomial can have more than two factors 2. differentiate between "factoring" and "factoring completely" 3. express polynomials in complete factored form 4. check the factoring by multiplying Writing for Understanding: 1) Compare factoring completely to reducing a fraction completely.

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54	AG4 AA28	Lesson #54 AIM: How do we recognize and solve quadratic equations? [Teachers may opt for two days on this lesson.] Students will be able to: 1. argue that if the product of two factors is zero then at least one of the factors must be equal to zero (the Multiplication Property of Zero) 2. state the definition of a quadratic equation and write quadratic equations in standard form 3. connect the property of zero and the process of factoring in order to solve quadratic equations 4. state the procedure used for solving quadratic equations 5. state that a quadratic equation has two roots, or two solutions, or two zeros 6. check both solutions of a quadratic equation Writing for Understanding: 1) Explain the difference between a linear equation and a quadratic equation. 2) Describe the circumstances under which a quadratic equation would have only one unique real root. 3) Why must we transform a quadratic equation into standard form before we can find its roots?
55	AA15 AA19	Lesson #55 AIM: How can we reduce fractions? Students will be able to: 1. explore the mathematical consequences of division by zero 2. state that a fraction is undefined when its denominator equals zero 3. determine for which values of a variable an algebraic fraction is undefined 4. find the common factor between the numerator and denominator 5. explain how the multiplicative identity element (1) is instrumental in reducing fractions to an equivalent form 6. express numerical fractions and algebraic fractions involving monomials in lowest terms 7. reduce algebraic fractions whose numerators and denominators are binomial additive inverses Writing for Understanding: 1) Explain why a fraction with a zero denominator is undefined. 2) What would happen if we allowed division by zero? 3) Explore the values of the fraction $\frac{1}{x}$ where x is four different numbers less than .001. List your findings in a table and use this to explain what an “undefined fraction” means.

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56	AA16	Lesson #56 AIM: How can we reduce algebraic fractions involving polynomials? Students will be able to: 1. state that the numerator and denominator of algebraic fractions involving polynomials must be factored before reducing 2. describe how the multiplicative identity element (1), in the form of an algebraic fraction, can be used to reduce the algebraic fraction to lowest terms 3. reduce algebraic fractions involving polynomials, including fractions whose numerator and denominator have factors that are additive inverses Writing for Understanding: 1) Explain why fractions are equivalent when the numerator and denominator are divided by the same non-zero quantity.
57	AA12 AA14 AA18	Lesson #57 AIM: How can we multiply and divide fractions containing monomial expressions? Students will be able to: 1. bridge the method used to multiply and divide numerical fractions into a method for multiplication and division of algebraic fractions containing monomials 2. find products and quotients of algebraic fractions in lowest terms, including monomials containing powers 3. state in words the procedure used to multiply and divide algebraic fractions 4. explain under what circumstances a fraction is in simplest form Writing for Understanding: 1) How is dividing out like factors from the numerator and denominator of a fraction related to the multiplicative identity element of 1? 2) Molly reduced the fraction $\frac{x+4}{2}$ and said that the answer was x+2. Identify and explain the error in her thinking.
58	AA18	Lesson #58 AIM: How can we multiply and divide fractions containing polynomials expressions? Students will be able to: 1. recall the method used to multiply and divide fractions with monomials 2. express algebraic expressions in factored form 3. express products and quotients of algebraic fractions, containing polynomials, in lowest terms 4. state in words the procedure used to multiply and divide algebraic fractions 5. justify the circumstances needed for a fraction to be in simplest form by referring back to the role of the multiplicative identity element Writing for Understanding: 1) How do you know when an algebraic fraction has been reduced to lowest terms?

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59	AA17	Lesson #59 AIM: How can we combine fractions with like and unlike monomial denominators? Students will be able to: 1. bridge the method used to combine numerical fractions with like and unlike denominators into a method for combining algebraic fractions with like and unlike monomial denominators 2. express the sums and differences of algebraic fractions in lowest terms 3. develop a method for finding the LCD for unlike monomial denominators 4. combine fractions with unlike monomial denominators and express the result in lowest terms Writing for Understanding: 1) The numerator and the denominator of a fraction have different 'jobs' to perform. Describe these differences. 2) How is adding algebraic fractions like adding numerical fractions?
60	AA17	Lesson #60 AIM: How can we combine fractions with like polynomial denominators? Students will be able to: 1. bridge the method for combining numerical fractions with like denominators into a method for combining fractions with like polynomial denominators 2. combine fractions with monomial numerators and like polynomial denominators and express the resulting fraction in lowest terms 3. combine algebraic fractions with polynomial numerators and like polynomial denominators 4. state the procedure used to add or subtract fractions with polynomial numerators and like polynomial denominators and express the resulting fraction in lowest terms Writing for Understanding: 1) Describe the procedure used to combine fractions with unlike denominators. 2) When combining: $\frac{x+3}{2x-5}-\frac{x-4}{2x-5}$, Tim wrote: $\frac{x+3-x-4}{2x-5}$. Comment on the validity of his work and be sure to give evidence to support your comments.
61	AA25	Lesson #61 Aim: How do we solve equations with fractional coefficients? Students will be able to: 1. discover that the LCD for the denominators of the terms of the equation can be used as the 'least common multiplier' to clear the equations of fractions 2. solve equations with fractional coefficients using the least common multiplier 3. state in words the procedure used to solve equations with fractional coefficients 4. explain the difference between combining fractions and solving an equation with fractional coefficients Writing for Understanding: 1) Explain the differences between solving an equation with fractional coefficients and combining algebraic fractions.