ALGEBRA II CURRICULUM FRAMEWORKS

(Grade 8 Algebra II, High School Algebra II, Honors Algebra II)

ALGEBRA (encompasses 45-52% of MCA test items)			
Standard 1: Understand the concept of function, and identify important features of functions and other relations using symbolic and graphical methods where appropriate.			
Curriculum Benchmark	**MCA III Test Item Specifications**	**Where Benchmark is Taught/Assessed in Holt "Algebra 2" Student Edition**	**Notes**
Understand the definition of a function. Use functional notation and evaluate a function at a given point in its domain. (9.2.1.1) For example: If $f(x)=\frac{1}{x^2-3}$, find $f(-4)$.	• Vocabulary allowed in items: relation, domain, range and vocabulary given at previous grades	Holt "Algebra 2" 2007 SE pages: Lesson 1.6 (44-50); Lesson 1.7 (51-57)	
Distinguish between functions and other relations defined symbolically, graphically or in tabular form. (9.2.1.2)	• Vocabulary allowed in items: relation, domain, range and vocabulary given at previous grades	Holt "Algebra 2" 2007 SE pages: Lesson 1.6 (44-50)	
Find the domain of a function defined symbolically, graphically or in a real-world context. (9.2.1.3) For example: The formula $f(x) = \pi x^2$ can represent a function whose domain is all real numbers, but in the context of the area of a circle, the domain would be restricted to positive x.	• Vocabulary allowed in items: relation, domain, range and vocabulary given at previous grades	Holt "Algebra 2" 2007 SE pages: Lesson 1.6 (44-50)	
Obtain information and draw conclusions from graphs of functions and other relations. (9.2.1.4) For example: If a graph shows the relationship between the elapsed flight time of a golf ball at a given moment and its height at that same moment, identify the time interval during which the ball is at least 100 fee above the ground.	• Vocabulary allowed in items: relation, domain, range and vocabulary given at previous grades	Holt "Algebra 2" 2007 SE pages: Lesson 1.7 (51-57)	

ALGEBRA II CURRICULUM FRAMEWORKS

(Grade 8 Algebra II, High School Algebra II, Honors Algebra II)

ALGEBRA (encompasses 45-52% of MCA test items) (continued)			
Curriculum Benchmark	**MCA III Test Item Specifications**	**Where Benchmark is Taught/Assessed in Holt "Algebra 2" Student Edition**	**Notes**
Identify the vertex, line of symmetry and intercepts of the parabola corresponding to a quadratic function, using symbolic and graphical methods, when the function is expressed in the form $f(x) = ax^2 + bx + c$, in the form $f(x) = a(x - h)^2 + k$, or in factored form. (9.2.1.5)	• Vocabulary allowed in items: line of symmetry, parabola, quadratic, vertex and vocabulary given at previous grades	Holt "Algebra 2" 2007 SE pages: Lesson 5.1 (315-322); Lesson 5.2 (323-330); Lesson 5.3 (333-340)	
Identify intercepts, zeros, maxima, minima and intervals of increase and decrease from the graph of a function. (9.2.1.6)	• Vocabulary allowed in items: maximum, minimum, interval, zeros and vocabulary given at previous grades	Holt "Algebra 2" 2007 SE pages: Lesson 5.3 (333-340); Lesson 6.4 (432-435); Lesson 6.7 (455-459)	
Understand the concept of an asymptote and identify asymptotes for exponential functions and reciprocals of linear functions, using symbolic and graphical methods. (9.2.1.7)	• Vocabulary allowed in items: asymptote and vocabulary given at previous grades	Holt "Algebra 2" 2007 SE pages: Lesson 7.1 (490-496); Lesson 7.6 (531-535); Lesson 8.4 (592-599)	
Make qualitative statements about the rate of change of a function, based on its graph or table of values. (9.2.1.8) For example: The function $f(x) = 3^x$ increases for all x, but it increases faster when $x > 2$ than it does when $x < 2$.	• Vocabulary allowed in items: vocabulary given at previous grades	Holt "Algebra 2" 2007 SE pages: Lesson 6.9 (471)	
Determine how translations affect the symbolic and graphical forms of a function. Know how to use graphing technology to examine translations. (9.2.1.9) For example: Determine how the graph of $f(x) = \|x - h\| + k$ changes as h and k change.	• Vocabulary allowed in items: vocabulary given at previous grades	Holt "Algebra 2" 2007 SE pages: Lesson 1.8 (59-66); Lesson 2.6 (134-139); Lesson 2.9 (158-162); Lesson 5.1 (315-322); Lesson 6.8 (460); Lesson 7.7 (537-543); Lesson 9.3 (672)	

ALGEBRA II CURRICULUM FRAMEWORKS

(Grade 8 Algebra II, High School Algebra II, Honors Algebra II)

ALGEBRA (encompasses 45-52% of MCA test items) (continued)			
Standard 2: Recognize linear, quadratic, exponential and other common functions in real-world and mathematical situations; represent these functions with tables, verbal descriptions, symbols and graphs; solve problems involving these functions, and explain results in the original context.			
Curriculum Benchmark	**MCA III Test Item Specifications**	**Where Benchmark is Taught/Assessed in Holt "Algebra 2" Student Edition**	**Notes**
Represent and solve problems in various contexts using linear and quadratic functions. (9.2.2.1) For example: Write a function that represents the area of a rectangular garden that can be surrounded with 32 feet of fencing, and use the function to determine the possible dimensions of such a garden if the area must be at least 50 square feet.	• Vocabulary allowed in items: quadratic and vocabulary given at previous grades	Holt "Algebra 2" 2007 SE pages: Lesson 2.6 (137-139); Lesson 2.7 (142-148); Lesson 5.7 (368-372); Lesson 5.8 (374-380)	
Represent and solve problems in various contexts using exponential functions, such as investment growth, depreciation and population growth. (9.2.2.2)	• Vocabulary allowed in items: growth factor, decay, exponential and vocabulary given at previous grades	Holt "Algebra 2" 2007 SE pages: Lesson 7.6 (532-535); Lesson 7.7 (540-543); Lesson 7.8 (545-551)	
Sketch graphs of linear, quadratic and exponential functions, and translate between graphs, tables and symbolic representations. Know how to use graphing technology to graph these functions. (9.2.2.3)	• Items do not require the use of graphing technology • Vocabulary allowed in items: quadratic, exponential and vocabulary given at previous grades	Holt "Algebra 2" 2007 SE pages: Lesson 2.3 (105-112); Lesson 2.4 (115-123); Lesson 2.6 (134-140); Lesson 2.7 (144-148); Lesson 5.3 (333-339); Lesson 5.8 (374-380); Lesson 7.1 (490-496); Lesson 7.6 (531-535); Lesson 7.7 (537-543); Lesson 7.8 (545-550)	
Express the terms in a geometric sequence recursively and by giving an explicit (closed form) formula, and express the partial sums of a geometric series recursively. (9.2.2.4) For example: A closed form formula for the terms t_n in the geometric sequence 3, 6, 12, 24, ... is $t_n = 3(2)^{n-1}$, where $n = 1, 2, 3, \ldots$, and this sequence can be expressed recursively by writing $t_1 = 3$ and $t_n = 2t_{n-1}$, for $n \geq 2$. Another example: The partial sums s_n of the series $3 + 6 + 12 + 24 + \ldots$ can be expressed recursively by writing $s_1 = 3$ and $s_n = 3 + 2s_{n-1}$, for $n \geq 2$.	• Vocabulary allowed in items: recursive, geometric series and vocabulary given at previous grades	Holt "Algebra 2" 2007 SE pages: Lesson 12.4 (890-898); Lesson 12.5 (900-906)	

ALGEBRA II CURRICULUM FRAMEWORKS

(Grade 8 Algebra II, High School Algebra II, Honors Algebra II)

ALGEBRA (encompasses 45-52% of MCA test items) (continued)			
Curriculum Benchmark	**MCA III Test Item Specifications**	**Where Benchmark is Taught/Assessed in Holt "Algebra 2" Student Edition**	**Notes**
Recognize and solve problems that can be modeled using finite geometric sequences and series, such as home mortgage and other compound interest examples. Know how to use spreadsheets and calculators to explore geometric sequences and series in various contexts. (9.2.2.5)	• Vocabulary allowed in items: vocabulary given at previous grades	Holt "Algebra 2" 2007 SE pages: 890-898	
Sketch the graphs of common non-linear functions such as $f(x)=\sqrt{x}$, $f(x)=\lvert x\rvert$, $f(x)=\frac{1}{x}$, $f(x) = x^3$, and translations of these functions, such as $f(x)=\sqrt{x-2}+4$. Know how to use graphing technology to graph these functions. (9.2.2.6)	• Vocabulary allowed in items: vocabulary given at previous grades	Holt "Algebra 2" 2007 SE pages: Lesson 1.9 (67-73); Lesson 2.9 (158-162); Lesson 5.1 (315-322); Lesson 5.2 (323-330); Lesson 6.7 (453-459); Lesson 6.8 (460-465); Lesson 7.7 (537-543); Lesson 8.4 (592-599); Lesson 8.7 (619-627); Lesson 9.3 (672-678)	

ALGEBRA II CURRICULUM FRAMEWORKS

(Grade 8 Algebra II, High School Algebra II, Honors Algebra II)

ALGEBRA (encompasses 45-52% of MCA test items) (continued)			
Standard 3: Generate equivalent algebraic expressions involving polynomials and radicals; use algebraic properties to evaluate expressions.			
Curriculum Benchmark	**MCA III Test Item Specifications**	**Where Benchmark is Taught/Assessed in Holt "Algebra 2" Student Edition**	**Notes**
Evaluate polynomial and rational expressions and expressions containing radicals and absolute values at specified points in their domains. (9.2.3.1)	• Vocabulary allowed in items: polynomial and vocabulary given at previous grades	Holt "Algebra 2" 2007 SE pages: Lesson 2.9 (161-162); Lesson 6.1 (408, 410); Lesson 8.4 (597-598); Lesson 8.7 (619-626)	
Add, subtract and multiply polynomials; divide a polynomial by a polynomial of equal or lower degree. (9.2.3.2)	• Vocabulary allowed in items: polynomial, degree of a polynomial and vocabulary given at previous grades	Holt "Algebra 2" 2007 SE pages: Lesson 6.1 (406-411); Lesson 6.2 (414-420); Lesson 6.3 (422-428)	
Factor common monomial factors from polynomials, factor quadratic polynomials, and factor the difference of two squares. (9.2.3.3) For example: $9x^6 - x^4 = (3x^3 - x^2)(3x^3 + x^2)$.	• Vocabulary allowed in items: polynomial, monomial and vocabulary given at previous grades	Holt "Algebra 2" 2007 SE pages: Lesson 6.4 (430-435)	
Add, subtract, multiply, divide and simplify algebraic fractions. (9.2.3.4) For example: $\frac{1}{1-x}+\frac{x}{1+x}$ is equivalent to $\frac{1+2x-x^2}{1-x^2}$.	• Vocabulary allowed in items: vocabulary given at previous grades	Holt "Algebra 2" 2007 SE pages: Lesson 8.2 (577-582); Lesson 8.3 (583-590)	
Check whether a given complex number is a solution of a quadratic equation by substituting it for the variable and evaluating the expression, using arithmetic with complex numbers. (9.2.3.5) For example: The complex number $\frac{1+i}{2}$ is a solution of $2x^2 - 2x + 1 = 0$, since $2\left(\frac{1+i}{2}\right)^2 - 2\left(\frac{1+i}{2}\right)+1=i-(1+i)+1=0$.	• Vocabulary allowed in items: complex number and vocabulary given at previous grades	Holt "Algebra 2" 2007 SE pages: Lesson 5.5 (350-355); Lesson 5.9 (382-389)	

ALGEBRA II CURRICULUM FRAMEWORKS

(Grade 8 Algebra II, High School Algebra II, Honors Algebra II)

ALGEBRA (encompasses 45-52% of MCA test items) (continued)			
Curriculum Benchmark	**MCA III Test Item Specifications**	**Where Benchmark is Taught/Assessed in Holt "Algebra 2" Student Edition**	**Notes**
Apply the properties of positive and negative rational exponents to generate equivalent algebraic expressions, including those involving n^{th} roots. (9.2.3.6) For example: $\sqrt{2}\times\sqrt{7}=2^{\frac{1}{2}}\times7^{\frac{1}{2}}=14^{\frac{1}{2}}=\sqrt{14}$. Rules for computing directly with radicals may also be used: $\sqrt[3]{2}\times\sqrt[3]{x}=\sqrt[3]{2x}$.	• Vocabulary allowed in items: n^{th} root and vocabulary given at previous grades	Holt "Algebra 2" 2007 SE pages: Lesson 8.6 (610-617)	
Justify steps in generating equivalent expressions by identifying the properties used. Use substitution to check the equality of expressions for some particular values of the variables; recognize that checking with substitution does not guarantee equality of expressions for all values of the variables. (9.2.3.7)	• Vocabulary allowed in items: vocabulary given at previous grades	Holt "Algebra 2" 2007 SE pages: Lesson 2.1 (90-93)	

ALGEBRA II CURRICULUM FRAMEWORKS

(Grade 8 Algebra II, High School Algebra II, Honors Algebra II)

ALGEBRA (encompasses 45-52% of MCA test items) (continued)			
Standard 4: Represent real-world and mathematical situations using equations and inequalities involving linear, quadratic, exponential and n^{th} root functions. Solve equations and inequalities symbolically and graphically. Interpret solutions in the original context.			
Curriculum Benchmark	**MCA III Test Item Specifications**	**Where Benchmark is Taught/Assessed in Holt "Algebra 2" Student Edition**	**Notes**
Represent relationships in various contexts using quadratic equations and inequalities. Solve quadratic equations and inequalities by appropriate methods including factoring, completing the square, graphing and the quadratic formula. Find non-real complex roots when they exist. Recognize that a particular solution may not be applicable in the original context. Know how to use calculators, graphing utilities or other technology to solve quadratic equations and inequalities. (9.2.4.1) For example: A diver jumps from a 20 meter platform with an upward velocity of 3 meters per second. In finding the time at which the diver hits the surface of the water, the resulting quadratic equation has a positive and a negative solution. The negative solution should be discarded because of the context.	• Vocabulary allowed in items: quadratic, n^{th} root and vocabulary given at previous grades	Holt "Algebra 2" 2007 SE pages: Lesson 5.3 (333-339); Lesson 5.4 (341-347); Lesson 5.5 (350-355); Lesson 5.6 (356-363); Lesson 5.7 (366-373)	
Represent relationships in various contexts using equations involving exponential functions; solve these equations graphically or numerically. Know how to use calculators, graphing utilities or other technology to solve these equations. (9.2.4.2)	• Vocabulary allowed in items: exponential and vocabulary given at previous grades	Holt "Algebra 2" 2007 SE pages: Lesson 7.1 (490-496); Lesson 7.5 (522-528); Lesson 7.6 (531-536); Lesson 7.7 (537-543); Lesson 7.8 (545-551)	
Recognize that to solve certain equations, number systems need to be extended from whole numbers to integers, from integers to rational numbers, from rational numbers to real numbers, and from real numbers to complex numbers. In particular, non-real complex numbers are needed to solve some quadratic equations with real coefficients. (9.2.4.3)	• Vocabulary allowed in items: quadratic, complex, non-real and vocabulary given at previous grades	Holt "Algebra 2" 2007 SE pages: Lesson 5.5 (350-355)	

ALGEBRA II CURRICULUM FRAMEWORKS

(Grade 8 Algebra II, High School Algebra II, Honors Algebra II)

ALGEBRA (encompasses 45-52% of MCA test items) (continued)			
Curriculum Benchmark	**MCA III Test Item Specifications**	**Where Benchmark is Taught/Assessed in Holt "Algebra 2" Student Edition**	**Notes**
Represent relationships in various contexts using systems of linear inequalities; solve them graphically. Indicate which parts of the boundary are included in and excluded from the solution set using solid and dotted lines. (9.2.4.4)	• Vocabulary allowed in items: boundary and vocabulary given at previous grades	Holt "Algebra 2" 2007 SE pages: Lesson 3.3 (199-204)	
Solve linear programming problems in two variables using graphical methods. (9.2.4.5)	• Vocabulary allowed in items: constraint, boundary, feasible region and vocabulary given at previous grades	Holt "Algebra 2" 2007 SE pages: Lesson 3.4 (205-211)	
Represent relationships in various contexts using absolute value inequalities in two variables; solve them graphically. (9.2.4.6) For example: If a pipe is to be cut to a length of 5 meters accurate to within a tenth of its diameter, the relationship between the length x of the pipe and its diameter y satisfies the inequality $\lvert x-5\rvert \le 0.1y$.	• Vocabulary allowed in items: vocabulary given at previous grades	Holt "Algebra 2" 2007 SE pages: Lesson 2.9 (158-163)	
Solve equations that contain radical expressions. Recognize that extraneous solutions may arise when using symbolic methods. (9.2.4.7) For example: The equation $\sqrt{x-9}=9\sqrt{x}$ may be solved by squaring both sides to obtain $x-9=81x$, which has the solution $x=-\frac{9}{80}$. However, this is not a solution of the original equation, so it is an extraneous solution that should be discarded. The original equation has no solution in this case. Another example: Solve $\sqrt[3]{-x+1}=-5$.)	• Vocabulary allowed in items: extraneous and vocabulary given at previous grades	Holt "Algebra 2" 2007 SE pages: Lesson 8.8 (628-635)	
Assess the reasonableness of a solution in its given context and compare the solution to appropriate graphical or numerical estimates; interpret a solution in the original context. (9.2.4.8)	• Vocabulary allowed in items: vocabulary given at previous grades	Holt "Algebra 2" 2007 SE pages: Problem Solving application such as: Lesson 1.5 (37); Lesson 2.5 (126); Lesson 3.4 (207-208); Lesson 4.5 (280-281); Lesson 5.7 (368-369); Lesson 6.6 (447-448); Lesson 7.7 (540); Lesson 8.5 (602); Lesson 9.3 (675); Lesson 10.7 (770-771); Lesson 11.6 (839); Lesson 12.2 (872-873); Lesson 13.6 (968); Lesson 14.6 (1029)	

ALGEBRA II CURRICULUM FRAMEWORKS

(Grade 8 Algebra II, High School Algebra II, Honors Algebra II)

DATA ANALYSIS AND PROBABILITY (encompasses 18-26% of MCA test items)

Standard 1: Display and analyze data; use various measures associated with data to draw conclusions, identify trends and describe relationships.

Curriculum Benchmark	MCA III Test Item Specifications	Where Benchmark is Taught/Assessed in Holt "Algebra 2" Student Edition	Notes
Describe a data set using data displays, including box-and-whisker plots; describe and compare data sets using summary statistics, including measures of center, location and spread. Measures of center and location include mean, median, quartile and percentile. Measures of spread include standard deviation, range and inter-quartile range. Know how to use calculators, spreadsheets or other technology to display data and calculate summary statistics. (9.4.1.1)	• Vocabulary allowed in items: box-and-whisker plot, quartile, percentile, inter-quartile range, standard deviation, central tendency and vocabulary given at previous grades		
Analyze the effects on summary statistics of changes in data sets. (9.4.1.2) For example: Understand how inserting or deleting a data point may affect the mean and standard deviation. Another example: Understand how the median and interquartile range are affected when the entire data set is transformed by adding a constant to each data value or multiplying each data value by a constant.	• Vocabulary allowed in items: quartile, percentile, inter-quartile range, standard deviation, central tendency and vocabulary given at previous grades		
Use the mean and standard deviation of a data set to fit it to a normal distribution (bell-shaped curve) and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets and tables to estimate areas under the normal curve. (9.4.1.4) For example: After performing several measurements of some attribute of an irregular physical object, it is appropriate to fit the data to a normal distribution and draw conclusions about measurement error. Another example: When data involving two very different populations is combined, the resulting histogram may show two distinct peaks, and fitting the data to a normal distribution is not appropriate.	• Vocabulary allowed in items: standard deviation, normal distribution, normal curve and vocabulary given at previous grades		

ALGEBRA II CURRICULUM FRAMEWORKS

(Grade 8 Algebra II, High School Algebra II, Honors Algebra II)

DATA ANALYSIS AND PROBABILITY (encompasses 18-26% of MCA test items) (continued)			
Standard 2: Explain the uses of data and statistical thinking to draw influences, make predictions and justify conclusions.			
Curriculum Benchmark	**MCA III Test Item Specifications**	**Where Benchmark is Taught/Assessed in Holt "Algebra 2" Student Edition**	**Notes**
Identify and explain misleading uses of data; recognize when arguments based on data confuse correlation and causation. (9.4.2.2)	• Vocabulary allowed in items: causation and vocabulary given at previous grades		
Design simple experiments and explain the impact of sampling methods, bias and the phrasing of questions asked during data collection. (9.4.2.3)	• Vocabulary allowed in items: vocabulary given at previous grades		

ALGEBRA II CURRICULUM FRAMEWORKS

(Grade 8 Algebra II, High School Algebra II, Honors Algebra II)

DATA ANALYSIS AND PROBABILITY (encompasses 18-26% of MCA test items) (continued)			
Standard 3: Calculate probabilities and apply probability concepts to solve real-world and mathematical problems.			
Curriculum Benchmark	**MCA III Test Item Specifications**	**Where Benchmark is Taught/Assessed in Holt "Algebra 2" Student Edition**	**Notes**
Select and apply counting procedures, such as the multiplication and addition principles and tree diagrams, to determine the size of a sample space (the number of possible outcomes) and to calculate probabilities. (9.4.3.1) For example: If one girl and one boy are picked at random from a class with 20 girls and 15 boys, there are 20 x 15 = 300 different possibilities, so the probability that a particular girl is chosen together with a particular boy is 1/300.	• Vocabulary allowed in items: vocabulary given at previous grades		
Calculate experimental probabilities by performing simulations or experiments involving a probability model and using relative frequencies of outcomes. (9.4.3.2)	• Vocabulary allowed in items: simulation and vocabulary given at previous grades		
Understand that the Law of Large Numbers expresses a relationship between the probabilities in a probability model and the experimental probabilities found by performing simulations or experiments involving the model. (9.4.3.3)	• Vocabulary allowed in items: simulation and vocabulary given at previous grades		
Use random numbers generated by a calculator or a spreadsheet, or taken from a table, to perform probability simulations and to introduce fairness into decision making. (9.4.3.4) For example: If a group of students needs to fairly select one of its members to lead a discussion, they can use a random number to determine the selection.	• Vocabulary allowed in items: simulation and vocabulary given at previous grades		
Apply probability concepts such as intersections, unions and complements of events, and conditional probability and independence, to calculate probabilities and solve problems. (9.4.3.5) For example: The probability of tossing at least one head when flipping a fair coin three times can be calculated by looking at the complement of this event (flipping three tails in a row).	• Vocabulary allowed in items: intersections, unions, complements of events, conditional and vocabulary given at previous grades		

ALGEBRA II CURRICULUM FRAMEWORKS

(Grade 8 Algebra II, High School Algebra II, Honors Algebra II)

DATA ANALYSIS AND PROBABILITY (encompasses 18-26% of MCA test items) (continued)			
Curriculum Benchmark	**MCA III Test Item Specifications**	**Where Benchmark is Taught/Assessed in Holt "Algebra 2" Student Edition**	**Notes**
Describe the concepts of intersections, unions and complements using Venn diagrams. Understand the relationships between these concepts and the words AND, OR, NOT, as used in computerized searches and spreadsheets. (9.4.3.6)	• Vocabulary allowed in items: intersections, unions, complements and vocabulary given at previous grades		
Understand and use simple probability formulas involving intersections, unions and complements of events. (9.4.3.7) For example: If the probability of an event is p, then the probability of the complement of an event is 1 – p; the probability of the intersection of two independent events is the product of their probabilities. Another example: The probability of the union of two events equals the sum of the probabilities of the two individual events minus the probability of the intersection of the events.	• Vocabulary allowed in items: intersections, unions and complements of events and vocabulary given at previous grades		
Apply probability concepts to real-world situations to make informed decisions. (9.4.3.8) For example: Explain why a hockey coach might decide near the end of the game to pull the goalie to add another forward position player if the team is behind. Another example: Consider the role that probabilities play in health care decisions, such as deciding between having eye surgery and wearing glasses.	• Vocabulary allowed in items: vocabulary given at previous grades		
Use the relationship between conditional probabilities and relative frequencies in contingency tables. (9.4.3.9) For example: A table that displays percentages relating gender (male or female) and handedness (right-handed or left-handed) can be used to determine the conditional probability of being left-handed, given that the gender is male.	• Vocabulary allowed in items: conditional and vocabulary given at previous grades		