

Math I End of Course Exam Recommendations
 Math Workgroup: November 15th and 16th, 2013
 NDE Workgroup: April 14th, 2014
 Recommended Content for Math I End of Course Exam

① Primary Standard	② Secondary Standard	③ Content Cluster Summary
<p>HSA.SSE.A.1 Interpret expressions that represent a quantity in terms of its context.* HSA.SSE.A.1.a Interpret parts of an expression, such as terms, factors, and coefficients.</p>		<p>The following knowledge, skills, and abilities are represented in these standards:</p> <ul style="list-style-type: none"> • Understand the meaning of expressions and use the structure of an expression to solve problems • Solve problems involving quadratic expressions.
<p>HSA.SSE.A.2 Use the structure of an expression to identify ways to rewrite it. <i>For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.</i></p>		
<p>HSA.SSE.B.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.* HSA.SSE.B.3.a Factor a quadratic expression to reveal the zeros of the function it defines. HSA.SSE.B.3.b Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.</p>		

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<p>HSA.CED.A.1 Create equations and inequalities in one variable and use them to solve problems. <i>Include equations arising from linear and quadratic functions and simple rational and exponential functions.</i></p>		<p>The following knowledge, skills, and abilities are represented in these standards:</p> <ul style="list-style-type: none"> • Apply concepts about expressions, inequalities, and systems of equations to solve real world situations • Understand the relationships described by equations, inequalities, and systems of equations and the effect of change to variable(s) in these relationships.
<p>HSA.CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.</p>	<p>HSA.REI.D.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).</p>	
<p>HSA.CED.A.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. <i>For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.</i></p>		
<p>HSA.CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. <i>For example, rearrange Ohm's law ($V = IR$) to highlight resistance R.</i></p>		

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<p>HSA.REI.A.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.</p>		
<p>HSA.REI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.</p>		
<p>HSA.REI.B.4 Solve quadratic equations in one variable. HSA.REI.B.4.a Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form. HSA.REI.B.4.b Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.</p>		<p>The following knowledge, skills, and abilities are represented in these standards:</p> <ul style="list-style-type: none"> • Solve inequalities, linear, quadratic equations and systems of equations • Construct logical arguments to justify the steps used in solving an equation
<p>HSA.REI.C.6 Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.</p>		

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<p>HSF.IF.B.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. <i>For example, if the function $h(n)$ gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.</i>*</p>	<p>HSF.IF.B.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. <i>Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</i>*</p>	<p>The following knowledge, skills, and abilities are represented in these standards:</p> <ul style="list-style-type: none"> • Use graphs to model quantitative relationships, based on numerical, verbal, and algebraic representation • Explain the rate of change in functions as they relate to real world representations.
<p>HSF.IF.B.6 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.*</p>	<p>HSS.ID.C.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.</p>	
<p>HSF.IF.C.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*</p> <p>HSF.IF.C.7.a Graph linear and quadratic functions and show intercepts, maxima, and minima.</p>	<p>HSS.ID.B.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.</p> <p>HSS.ID.B.6.a Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.</p> <p>HSS.ID.B.6.c Fit a linear function for a scatter plot that suggests a linear association.</p>	

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HSF.IF.C.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

HSF.IF.C.8.a Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.

HSF.IF.C.8.b Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)12^t$, $y = (1.2)^t/10$, and classify them as representing exponential growth or decay.

HSF.IF.C.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.*

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<p>HSF.BF.A.1 Write a function that describes a relationship between two quantities.*</p> <p>HSF.BF.A.1.a Determine an explicit expression, a recursive process, or steps for calculation from a context.</p>	<p>HSF.IF.A.1 Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$.</p> <p>HSF.IF.A.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.</p>	<p>The following knowledge, skills, and abilities are represented in these standards:</p> <ul style="list-style-type: none"> • Describe the relationship of a function and impact of change on the function. • Use graphs to display functions
<p>HSF.BF.A.2 Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.*</p>	<p>HSF.IF.A.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. <i>For example, the Fibonacci sequence is defined recursively by $f(0) = f(1) = 1$, $f(n+1) = f(n) + f(n-1)$ for $n \geq 1$.</i></p>	
<p>HSF.BF.B.3 Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.</p>		

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<p>HSF.LE.A.1 Distinguish between situations that can be modeled with linear functions and with exponential functions.</p> <p>HSF.LE.A.1.a Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.</p> <p>HSF.LE.A.1.b Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.</p> <p>HSF.LE.A.1.c Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.</p>		<p>The following knowledge, skills, and abilities are represented in these standards:</p> <ul style="list-style-type: none"> • Model and construct linear and exponential functions • Understand the restrictions of a linear and exponential function
<p>HSF.LE.A.2 Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).</p>		
<p>HSF.LE.B.5 Interpret the parameters in a linear or exponential function in terms of a context.</p>		

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<p>HSS.ID.A.1 Represent data with plots on the real number line (dot plots, histograms, and box plots).</p>		
<p>HSS.ID.A.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.</p>		<p>The following knowledge, skills, and abilities are represented in these standards:</p>
<p>HSS.ID.A.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).</p>		<ul style="list-style-type: none"> • Understand central tendency in real world problems • Analyze data based on various data displays
<p>HSS.ID.B.5 Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.</p>		

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