



SOUTHERN LEHIGH SCHOOL DISTRICT

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Scope and Sequence for **Economic Applications of Mathematics**

Standards for Mathematical Practice:

MP1 Make sense of problems and persevere in solving them.
MP2 Reason abstractly and quantitatively.
MP3 Construct viable arguments and critique the reasoning of others.
MP4 Model with mathematics.

MP5 Use appropriate tools strategically.
MP6 Attend to precision.
MP7 Look for and make use of structure.
MP8 Look for and express regularity in repeated reasoning.

N.RN – Number and Quantity – The Real Number System

CCSSM	PA Core Standards for Mathematics
Use properties of rational and irrational numbers. N.RN.3 Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.	CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.

N.Q – Number and Quantity – Quantities

CCSSM	PA Core Standards for Mathematics
Reason quantitatively and use units to solve problems. N.Q.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N.Q.2 Define appropriate quantities for the purpose of descriptive modeling. N.Q.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	CC.2.1.HS.F.3 Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs and data displays. CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems. CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method.

A.SSE – Algebra – Seeing Structure in Expressions

CCSSM	PA Core Standards for Mathematics
Interpret the structure of expressions. A.SSE.1 Interpret expressions that represent a quantity in terms of its context. a. Interpret parts of an expression, such as terms, factors, and coefficients. b. Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret $P(1+r)^n$ as the product of P and a factor not depending on P.	CC.2.2.HS.D.1 Interpret the structure of expressions to represent a quantity in terms of its context.
Write expressions in equivalent forms to solve problems. A.SSE.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. c. Use the properties of exponents to transform expressions for exponential functions. <i>For example the expression 1.15^t can be rewritten as $(1.15^{1/12})^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%</i>	CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.

A.APR – Algebra – Arithmetic with Polynomials and Rational Expressions

CCSSM	PA Core Standards for Mathematics
Perform arithmetic operations on polynomials. A.APR.1 Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.	CC.2.2.HS.D.3 Extend the knowledge of arithmetic operations and apply to polynomials. CC.2.2.HS.D.5 Use polynomial identities to solve problems. CC.2.2.HS.D.6 Extend the knowledge of rational functions to rewrite in equivalent forms.

A.CED – Algebra – Creating Equations

CCSSM	PA Core Standards for Mathematics
Create equations that describe numbers or relationships. A.CED.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</i> A.CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. A.CED.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> A.CED.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>	CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.

A.REI – Algebra – Reasoning with Equations & Inequalities

CCSSM	PA Core Standards for Mathematics
Understand solving equations as a process of reasoning and explain the reasoning. A.REI.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.	CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable. CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method.
Solve equations and inequalities in one variable. A.REI.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. A.REI.4 Solve quadratic equations in one variable. - 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. - 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. Solve systems of equations. A.REI.6 Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. Represent and solve equations and inequalities graphically. A.REI.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). A.REI.11 Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions. A.REI.12 Graph the solutions to a linear inequality in two variables as a half plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.	CC.2.2.HS.D.10 Represent, solve and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.

F.IF – Functions – Interpreting Functions

CCSSM	PA Core Standards for Mathematics
Understand the concept of function and use function notation. F.IF.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 $y = f(x)$. F.IF.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. F.IF.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>	CC.2.2.HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context.
Interpret functions that arise in applications in terms of the context. F.IF.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> F.IF.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> F.IF.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. <i>This section continues on the next page...</i>	CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations. <i>This section continues on the next page...</i>

F.IF – Functions – Interpreting Functions – *Continued...*

CCSSM	PA Core Standards for Mathematics
F.IF.4 – F.IF.6 <i>Continued...</i> Analyze functions using different representations. F.IF.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. a Graph linear and quadratic functions and show intercepts, maxima, and minima. e Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. F.IF.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. 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. b Use the properties of exponents to interpret expressions for exponential functions. <i>For example, identify percent rate of change in functions such as $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)^{12t}$, $y = (1.2)^{t/10}$, and classify them as representing exponential growth or decay.</i> F.IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). <i>For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.</i>	CC.2.2.HS.C.2 <i>Continued...</i>

F.BF – Functions – Building Functions

CCSSM	PA Core Standards for Mathematics
Build a function that models a relationship between two quantities. F.BF.1 Write a function that describes a relationship between two quantities. a. Determine an explicit expression, a recursive process, or steps for calculation from a context. b. Combine standard function types using arithmetic operations. <i>For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.</i> F.BF.2 Write arithmetic sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.	CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.

F.LE – Functions – Linear, Quadratic, and Exponential Models

CCSSM	PA Core Standards for Mathematics
Construct and compare linear, quadratic, and exponential models and solve problems. F.LE.1 Distinguish between situations that can be modeled with linear functions and with exponential functions. a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. F.LE.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). F.LE.3 Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.	CC.2.2.HS.C.5 Construct and compare linear, quadratic and/or exponential models to solve problems.
Interpret expressions for functions in terms of the situation they model. F.LE.5 Interpret the parameters in a linear or exponential function in terms of a context.	CC.2.2.HS.C.6 Interpret functions in terms of the situation they model.

S.ID – Statistics and Probability – Interpreting Categorical & Quantitative Data

CCSSM	PA Core Standards for Mathematics
Summarize, represent, and interpret data on a single count or measurement variable. S.ID.1 Represent data with plots on the real number line (dot plots, histograms, and box plots). S.ID.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. S.ID.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).	CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable.

S.ID – Statistics and Probability – Interpreting Categorical & Quantitative Data

CCSSM	PA Core Standards for Mathematics
Summarize, represent, and interpret data on two categorical and quantitative variables. S.ID.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. S.ID.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. <i>Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.</i> b. Informally assess the fit of a function by plotting and analyzing residuals. c. Fit a linear function for a scatter plot that suggests a linear association.	CC.2.4.HS.B.2 Summarize, represent, and interpret data on two categorical and quantitative variables.
Interpret linear models. S.ID.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. S.ID.8 Compute (using technology) and interpret the correlation coefficient of a linear fit. S.ID.9 Distinguish between correlation and causation.	CC.2.4.HS.B.3 Analyze linear models to make interpretations based on the data. CC.2.4.HS.B.5 Make inferences and justify conclusions based on sample surveys, experiments, and observational studies.

Southern Lehigh School District Learning Target for Economic Applications of Mathematics

Goals and Decision Making of Personal Financial Management

- How do I really become financially successful?
- What is the importance of investing in yourself?
- How can I make smart financial decisions?
- How do I set goals?

Careers and Planning

Applied Mathematical Concepts: Algebraic modeling; Correlation; Linear functions; Direct variation and writing equations of linear functions

- What is an income?
- Why some jobs pay more than others?
- What are human capital and opportunity costs?
- What is the difference between dreams and plans?

Budgeting

Applied Mathematical Concepts: Algebraic modeling; Correlation; Linear functions; Direct variation and writing equations of linear functions; Reading, interpreting, and creating graphs

- Why should I have a budget?
- How can I fund my goals?
- What are all these taxes and deductions and how are they calculated?
- Why are W-2's, W-4's and tax forms important and how is everything calculated?
- What is the mathematical difference between net and gross pay?

Saving and Investing

Applied Mathematical Concepts: Algebraic modeling; Correlation; Linear, quadratic and exponential functions; Calculating simple and compound interest using linear and exponential equations; Reading, interpreting, and creating graphs; Percentages and Growth

- Pay yourself first, early, and often
- Why should I have a savings plan?
- Save, invest, or both?
- How do I read and interpret the financial pages?
- What is simple interest vs. compound interest and how can these be computed?
- What are the advantages and disadvantages of investing in the stock market?

Credit

Applied Mathematical Concepts: Algebraic modeling; Correlation; Linear, quadratic and exponential functions; Calculating simple and compound interest using linear and exponential equations; Reading, interpreting, and creating graphs; Percentages and Growth

- Should I use cash or credit?
- What is credit and how is interest calculated?
- How do I make smart credit choices?
- How do I apply for credit?
- What is APR and how do I calculate my interest?
- Do I have any consumer credit protection when using credit?

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Southern Lehigh School District Learning Target for Economic Applications of Mathematics

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Transportation Issues

Applied Mathematical Concepts: Algebraic modeling; Correlation; Linear, quadratic and exponential functions; Calculating simple and compound interest using linear and exponential equations; Reading, interpreting, and creating graphs; Percentages and Growth

- How do I get a set of wheels and what are the costs?
- What do I want and calculating what can I afford?
- What are the advantages and disadvantages of a loan or a lease?
- What is car insurance and how is it determined and calculated?

Housing Issues

Applied Mathematical Concepts: Linear, quadratic and exponential functions; Calculating simple and compound interest using linear and exponential equations; Reading, interpreting, and creating graphs; Percentages and Growth

- Should I buy or rent a place to live?
- How can I determine what I can really afford as a percentage of salary and debt?
- How do I shop for a mortgage and calculate the interest that I will pay?

Risk Protection

Applied Mathematical Concepts: Algebraic modeling; Correlation; Linear, quadratic and exponential functions; Calculating simple and compound interest using linear and exponential equations; Reading, interpreting, and creating graphs; Percentages and Growth

- Why insurance and calculating how it works?
- What kind of life insurance do I need, and how is it calculated?
- What are the various types of insurance and how important are they?
- What are premiums, co-pays, and deductibles, and how are they determined and calculated?