Financial Decision Making in Mathematics

In Financial Decision Making in Mathematics, students will learn to apply the principles of finance to the monetary decisions of an individual or family unit. This course addresses the ways in which individuals or families obtain, budget, save, and spend monetary resources over time, taking into account various financial risks and future life events. Components of personal finance may include checking and savings accounts, credit cards and consumer loans, investments, social security benefits, insurance policies, and income tax management. They will practice 21st century skills including, but not limited to, critical thinking, problem solving, use of appropriate technology, information and media literacy, and communication.

Developing real life skills. The student develops and applies skills including reasoning, planning, and communication to make decisions and solve problems in applied situations involving numerical reasoning, statistical analysis, finance, and mathematical selection.

    The student is expected to:
- (A) gather data, conduct investigations, and apply mathematical concepts and models to solve problems in mathematics and finance;
- (B) demonstrate reasoning skills in developing, explaining, and justifying sound mathematical arguments, and analyze the soundness of mathematical arguments of others; and
- (C) communicate with and about mathematics orally and in writing as part of independent and collaborative work, including making accurate and clear presentations of solutions.

Mathematical decision making in finance. The student creates and analyzes mathematical models to make decisions related to income, banking and investing, credit, income taxes, insurance, spending, and household budgeting.

    The student is expected to:
- (A) determine, represent, and analyze mathematical models for various types of income calculations to determine the best option for a given situation;
- (B) determine, represent, and analyze mathematical models for expenditures, including those involving credit, to determine the best option for a given situation; and
- (C) determine, represent, and analyze mathematical models and appropriate representations for various types of loans and investments to determine the best loan or investment plan for a given situation.

Cluster #1: Income
- Analyze the differences among various types of incomes and understand how the options impact the choices for employment
- Identify the education and training requirements for post high school careers and explore financing those requirements
- Compare and contrast employer benefit packages in order to make decisions regarding employment
- Demonstrate the knowledge of the many avenues required in acquiring gainful employment including on-line resources

During this Cluster students will be applying the content from the following Ohio Learning Standards 2017:

CREATING EQUATIONS   **A.CED**
Create equations that describe numbers or relationships.
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. Focus on applying linear and simple exponential expressions.
    b. Focus on applying simple quadratic expressions.
    c. Extend to include more complicated function situations with the option to graph with technology.
A.CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.
    a. While functions will often be linear, exponential, or quadratic, the types of problems should draw from more complicated situations.

Cluster #2: Banking and Investment
- Apply a decision making process to personal financing choices
- Learn about the variety of investment options by analyzing the pros and cons of each
- Explain the advantages of compound versus simple interest
- Describe the relationship between financial investment risk and return
- Understand banking procedures and services including: checking and savings accounts (maintaining and reconciling), payment methods, loans, debit cards and on-line banking, and investments

During this Cluster students will be applying the content from the following Ohio Learning Standards 2017:

QUANTITIES   **N.Q**
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.

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   a. While functions will often be linear, exponential, or quadratic, the types of problems should draw from more complicated situations.

REASONING WITH EQUATIONS AND INEQUALITIES   **A.REI**
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.
Understand solving equations as a process of reasoning and explain the reasoning.
A.REI.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

Cluster #2 CONTINUED
Banking and Investment

BUILDING FUNCTIONS   **F.BF**
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 context.
       i. Focus on linear and exponential functions.
       ii. Focus on situations that exhibit quadratic or exponential relationships.
    b. Combine standard function types using arithmetic operations. 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.

INTERPRETING FUNCTIONS   **F.IF**
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. Key features include the following: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.
    a. Focus on linear and exponential functions.
    b. Focus on linear, quadratic, and exponential functions.
F.IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. 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.
    a. Focus on linear and exponential functions.
    b. Focus on linear, quadratic, and exponential functions.
    c. Emphasize the selection of a type of function for a model based on behavior of data and context.
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.
Analyze functions using different representations.
F.IF.7 Graph functions expressed symbolically and indicate key features of the graph, by hand in simple cases and using technology for more complicated cases. Include applications and how key features relate to characteristics of a situation, making selection of a particular type of function model appropriate.
    a. Graph linear functions and indicate intercepts.
    b. Graph quadratic functions and indicate intercepts, maxima, and minima.
    c. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
    d. Graph polynomial functions, identifying zeros, when factoring is reasonable, and indicating end behavior.

Cluster #2 CONTINUED
Banking and Investment

  e. Graph simple exponential functions, indicating intercepts and end behavior.
  f. Graph exponential functions, indicating intercepts and end behavior, and
  trigonometric functions, showing period, midline, and amplitude.

LINEAR, QUADRATIC, AND EXPONENTIAL MODELS   **F.LE**
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. Show 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.3 Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly or quadratically.

Cluster #3: Credit
- Analyze the benefits and costs of consumer credit
- Compare sources of consumer credit such as auto loans, consumer loans, credit cards, etc.
- Evaluate the terms and conditions of credit cards and consumer loans
- Demonstrate awareness of consumer protection and information

During this Cluster students will be applying the content from the following Ohio Learning Standards 2017:

REASONING WITH EQUATIONS AND INEQUALITIES   A.REI
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.
Understand solving equations as a process of reasoning and explain the reasoning.
A.REI.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

Cluster #4:   Taxes
- Examine the components of paying taxes at the local, state and federal levels
- Analyze cost and benefits of paying taxes
- Understand the terminology and complete the appropriate tax related forms
- Select appropriate tax strategies for different financial and personal situations

During this Cluster students will be applying the content from the following Ohio Learning Standards:

CREATING EQUATIONS   A.CED
Create equations that describe numbers or relationships.
A.CED.1 Create equations and inequalities in one variable and use them to solve problems. Include equations and inequalities arising from linear, quadratic, simple rational, and exponential functions.
- **a**. Focus on applying linear and simple exponential expressions.
- **b.** Focus on applying simple quadratic expressions.
- **c**. Extend to include more complicated function situations with the option to solve with technology.

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**. Focus on applying linear and simple exponential expressions.
- **b**. Focus on applying simple quadratic expressions.
- **c.** Extend to include more complicated function situations with the option to graph with technology.

A.CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.
- **a**. While functions will often be linear, exponential, or quadratic, the types of problems should draw from more complicated situations.

SEEING STRUCTURE IN EXPRESSIONS   A.SSE
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.

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Cluster #5:   Insurance
- Examine different types of insurance
- Compute insurance costs and deductibles
- Compute payments on insurance premiums and insurance claims
- Analyze personal risk management in areas such as: health, life, auto, home/renters, disability, and salary Indemnity
- Evaluate how insurance protects financial loss
- Compare and contrast various types of insurance

During this Cluster students will be applying the content from the following Ohio Learning Standards:

LINEAR, QUADRATIC, AND EXPONENTIAL MODELS   F.LE
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.

Cluster #6: Household Budgeting
- Create and use a budget
- Understand terminology when setting up a budget
- Visualize and interpret a budget using a pie chart, a bar graph, and budget line graph
- Demonstrate knowledge of basic principles of consumer finance
- Compute cost of electric, gas, oil, and water for home
- Compute the cost of using specific appliances for specific lengths of time and cost of energy savings
- Compute cost of phone, internet and cable television and compare different plans for these services
- Develop and interpret a cash flow chart
- Compute and analyze cost of personal budget includes items such as: clothes, recreation, auto, travel, and household items
- Learn to periodically review a yearly budget plan and make adjustments

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Understand solving equations as a process of reasoning and explain the reasoning.
A.REI.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

Cluster #6 (cont'd)
INTERPRETING FUNCTIONS   F.IF
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