

Appendix B: Financial Literacy and Mathematics Education

Financial literacy describes the knowledge, tools and skills that are essential to effectively manage one's fiscal resources for a lifetime of financial well-being.

Mathematical knowledge is the first step to developing financial literacy. Financial literacy provides early opportunities for meaningful mathematical modeling. The recent economic downturn has placed a spotlight on the need for increased financial education for school-aged students as well as adults. A 2009 survey conducted by the Financial Industry Regulatory Authority (FINRA) showed that about half of the Americans surveyed have trouble keeping up with their monthly expenses. This same group surveyed is unable to save a portion of their income for emergencies or retirement (FINRA 2009). This inability to save money has even greater implications as the average life expectancy increases and impacts the extent to which individuals must save to financially prepare for their future.

“Research shows that low levels of financial literacy are associated with high levels of indebtedness, lower wealth accumulation, and less retirement savings” (The President's Advisory Council on Financial Capability 2012). Those with low levels of financial literacy are also particularly vulnerable to predatory lending. In response to these troubling statistics, there have been movements in many states across the country to increase the financial education of Americans beginning in elementary school and continuing through post-secondary education.

24 California has not adopted its own standards for financial literacy; however there are
25 two sets of national standards which teachers may choose to base their instruction
26 upon. Jump\$tart Coalition® for Personal Financial Literacy created and maintains the
27 *National Standards in K-12 Personal Finance Education*, available at:
28 http://jumpstart.org/assets/files/standard_book-ALL.pdf. The standards describe
29 financial knowledge and skills that students should be able to exhibit. The Jump\$tart
30 standards are organized under six major categories of personal finance:

- 31 • Financial Responsibility and Decision Making
- 32 • Income and Careers
- 33 • Planning and Money Management
- 34 • Credit and Debt
- 35 • Risk Management and Insurance
- 36 • Saving and Investing

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38 The second set of national standards available to teachers is the *National Standards for*
39 *Financial Literacy* published by the Council for Economic Education (CEE), available at:
40 [http://www.councilforeconed.org/wp/wp-content/uploads/2013/02/national-standards-for-](http://www.councilforeconed.org/wp/wp-content/uploads/2013/02/national-standards-for-financial-literacy.pdf)
41 [financial-literacy.pdf](http://www.councilforeconed.org/wp/wp-content/uploads/2013/02/national-standards-for-financial-literacy.pdf). These standards are organized under six major categories of
42 personal finance as well:

- 43 • Earning Income
- 44 • Buying Goods and Services
- 45 • Saving
- 46 • Using Credit

- 47 • Financial Investing
- 48 • Protecting and Insuring

49

50 The standards within each category provide expectations for students' financial
51 knowledge and skills at each grade level, but leave it to stakeholders to determine the
52 methods for delivery. For example, under Jump\$tart's category *Planning and Money*
53 *Management*, the standards call for students to develop a plan for spending and saving,
54 keep and use a system for financial records, apply consumer skills to purchase
55 decisions, and several other important money management tools. A recent study
56 supported by the National Endowment for Financial Education® and the Citi Foundation
57 shows that students who receive cumulative, or repeated, financial education
58 demonstrate more positive financial behaviors as adults. In addition, the study
59 documents a positive impact of early exposure to financial education (Serido and Shim
60 2011). In some cases, students have very positive role models at home when it comes
61 to financial decision-making; however other students can greatly benefit from learning
62 about these concepts and tools at school.

63

64 There are multiple resources on the Web available to teachers free of charge to support
65 financial education in schools. Links to these resources can be found at the end of this
66 appendix as well as on the CDE's K-12 Financial Literacy Resources Webpage at
67 <http://www.cde.ca.gov/eo/in/fl/finlitk12.asp>.

68

69 The regular school day often does not allow time for a separate course in financial
70 education; however financial literacy concepts can be integrated into other core content
71 areas. Mathematics courses are often considered a natural fit for the integration of
72 financial literacy exercises and skills. The California Common Core Standards for
73 Mathematics (CA CCSSM) provide multiple entry points for the incorporation of
74 problems or exercises that teach important financial literacy concepts and skills. The
75 opportunity to teach financial literacy concepts is even more evident in the CA CCSSM's
76 emphasis on real-world problems. This includes the use of mathematical modeling
77 which is included in every grade level in the standards (see "Appendix D. Mathematical
78 Modeling" for more information). In addition, the Standards for Mathematical Practice
79 (MP) emphasize the analytical skills that students will use when solving problems that
80 involve financial literacy concepts. While financial literacy can have a place in the
81 mathematics classroom, analyzing financial situations and making decisions based on
82 the analysis is not mathematics per se. Certainly the *computational* aspects of finance
83 problems and the various terms, definitions, and mathematical meanings constitute the
84 mathematics in these problems; however, the decision-making aspects are not
85 necessarily mathematics but provide opportunities for students to hone their financial
86 decision-making skills.

87

88 Teachers must find an appropriate balance when considering the integration of financial
89 literacy into the mathematics classroom. Standard 2.OA.1 asks students to "Use
90 addition and subtraction within 100 to solve one-and two-step word problems involving
91 situations of adding to, taking from, putting together, taking apart, and comparing with

92 unknowns in all positions.” Students in second grade may have some experience with
 93 doing chores at home to earn an allowance. They may have also had to make some
 94 choices about how to spend their money. This standard paired with students’
 95 experiences provides opportunity to discuss concepts within the CEE’s financial literacy
 96 standard topics of *Earning Income* and *Buying Goods and Services* as well as
 97 Jump\$tart’s financial literacy categories of *Income and Careers* and *Planning and*
 98 *Money Management*. Consider the following word problem:

99
 100 Lucy gets an allowance of \$5 per week. She also walks her neighbor’s dog every day,
 101 earning \$15 per week. In addition, Lucy received a birthday gift of \$20 from her aunt. In
 102 all, Lucy has three different sources of income this week. Use the table to input Lucy’s
 103 income under column A.

104
 105

Column A		Column B	
Income		Expenses	
Source(s)	Amount (\$)	Item	Amount (\$)
Allowance	\$5		
Dog Walking	\$15		
Birthday money	\$20		
		Savings	\$5

	Total: \$40		Total:
How much is left over?			
(Column A Total minus Column B Total): \$_____			

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107 Lucy must decide how to spend her money. At the end of the week, she would also like
 108 to have \$5 left over put in her savings account. She comes up with a list of choices:

- 109 • Trip to the movies: \$14
- 110 • Birthday gift for her brother: \$10
- 111 • Favorite Magazine: \$4
- 112 • Donation to the local food bank: \$5
- 113 • Materials for a school assignment: \$7
- 114 • Pay her sister back for money she loaned: \$6

115

116 Follow up Financial Literacy Questions:

117 Does Lucy have enough money for all of these things? How would you suggest that she
 118 spends her money? Use column B in the chart to show your suggestions for Lucy's
 119 expenses (Adapted from Federal Reserve Bank of Cleveland 2007).

120

121 The standards for mathematics in middle school allow for more in-depth exercises that
 122 address financial literacy concepts. The seventh grade standard 7.EE.4.b. calls for
 123 students to "Solve word problems leading to inequalities of the form $px + q > r$ or $px + q$
 124 $< r$, where p , q , and r are specific rational numbers. Graph the solution set of the

125 inequality and interpret it in the context of the problem. *For example: As a salesperson,*
126 *you are paid \$50 per week plus \$3 per sale. This week you want your pay to be at least*
127 *\$100. Write an inequality for the number of sales you need to make, and describe the*
128 *solutions.”* This standard has the potential to address several financial literacy
129 categories in the Jump\$tart standards, including: *Financial Responsibility and Decision*
130 *Making, Income and Careers, Planning and Money Management* as well as *Saving and*
131 *Investing* as well as the CEE’s financial literacy topics: *Earning Income, Buying Goods*
132 *and Services, and Saving*. Consider the following problem:

133

134 Darla works as a salesperson. Her monthly salary is \$1000, and she can make an
135 additional \$25 per sale. In order to pay her monthly bills, she must make at least \$2750
136 per month. How many sales will she need to make per month to meet her month
137 financial obligation? [Write an inequality for the number of sales she will need to make
138 and describe the solutions.]

139

$$1000 + 25x \geq 2750$$

140 Darla would like to save an additional \$200 per month over the next year for a down
141 payment for a car. Considering the information above, how many sales will she need to
142 make per month? [Write an inequality for the number of sales she will need to make and
143 describe the solutions.]

144

$$1000 + 25x \geq 2750 + 200$$

145

146 Once she purchases the car, her monthly car payment will be \$300 per month. How
147 many sales will she need to make per month to meet her month bills including the car

148 payment. [Write an inequality for the number of sales she will need to make and
149 describe the solutions.]

150
$$1000 + 25x \geq 2750 + 300$$

151 Follow-up financial literacy questions:

- 152 1. What additional costs come with car ownership that Darla must consider?
153 2. What risk is Darla taking when basing her total income needed on the number of
154 sales that she makes on top of her base salary?
155 3. Look at Darla's monthly expenses sheet below. Where might she cut some costs
156 in order to afford her car if her sales are lower than expected in any given
157 month?

158

Column B	
Expenses	
Item	Amount (\$)
Rent	\$1200
Utility Bills	\$280
Cell Phone Bill	\$75
Entertainment	\$150
Bus Fares	\$105
Groceries	\$450
Credit Card Payments	\$240
Charitable Contributions	\$100

Clothing Purchases	\$150
	Total: \$2750

159

160 In higher mathematics, the standards allow for a more sophisticated discussion of
 161 financial management and decision-making. For instance, the early use of recursively
 162 defined sequences (F-IF.3.) allows for a simpler and more intuitive discussion of

163 compound interest $a_0 = P$
 $a_{n+1} = a_n \cdot (1+r)$, discount $a_0 = S$
 $a_{n+1} = a_n \cdot (1+r)^{-1}$ and amortization of debt

164 $a_0 = P$
 $a_{n+1} = a_n \cdot (1+r) - \text{payment}$

165 In the conceptual category of Statistics and Probability, standard S.MD.5b. calls for
 166 students to “Evaluate and compare strategies on the basis of expected values. For
 167 example, compare a high-deductible versus low-deductible automobile insurance policy
 168 using various, but reasonable, chances of having a minor or major accident.” This
 169 standard provides an excellent opportunity to address the CEE’s financial literacy topic
 170 of *Protecting and Insuring* and Jump\$tart’s focus area of *Risk Management and*
 171 *Insurance*. Consider the following problem:

172

173 The average cost of the repairs to a car is around \$4000 per accident.

174 Suppose that “Cost-Save Insurance Company” assess your risk for an accident as 5%,
 175 based on your driving history and can offer you an annual automobile insurance policy
 176 for a \$400 per year premium and will pay out \$5000 in the case of an accident. “Don’t

177 Blame Us Insurance Company” also assesses your risk to be 5% and offers you an
 178 insurance policy for \$500 per year premium that will give you a payout of \$8000 in the
 179 case of an accident. Use expected values to decide which insurance company makes
 180 the most money from your insurance policy in the long run.

181

182 Solution:

183 The expected value uses probabilities to assess the long-term profit that the insurance
 184 company makes on each policy it sells. In this simple example, let X represent the
 185 money you, the consumer, pays to the company. Then with 95% probability you will
 186 pay the premium and with 5% probability the insurance company will make the payout
 187 (minus the premium). The expected values then become:

188

189 For Cost-Save:

$$190 \quad E(X) = -400 \times 0.95 + (5000 - 400) \times 0.05 = -150$$

191

192 For Don't Blame Us:

$$193 \quad E(X) = -500 \times 0.95 + (8000 - 500) \times 0.05 = -100$$

194

195 This means that both companies make money, but that in the long-term, Cost-Save
 196 makes more money as “on average” over the long run you will pay them \$150 as
 197 opposed to \$100.

198

199 Follow-Up Financial Literacy Questions:

200 1. What factors come into play when choosing between the two car insurance

201 policies? Possible answers:

202 a. Yearly income and affordability.

203 b. Cost of the car.

204 c. Size of payout.

205 d. Risk of an accident.

206 2. Which policy do you think is a better one to buy?

207 a. If I could only afford to pay \$400 per year, then I would need to go with

208 Cost-Save, but then I would only get a payout of \$5000 in case of an

209 accident... so that might be worrisome.

210 b. If I had the money I could possible buy the Don't Blame Us policy, since

211 then I feel more secure being insured for more money, \$8000.

212

213 Financial literacy education in the early years of schooling can provide students with a

214 foundation for a lifetime of intelligent decisions regarding how to earn, save, and invest

215 money. In many cases, there is not enough time in the regular school day to offer a

216 course in financial literacy; therefore it is important to leverage opportunities in other

217 core subject areas to infuse financial literacy lessons where appropriate. The CA

218 CCSSM open many doors to examine and practice financial literacy topics, especially

219 through the application of the Standards for Mathematical Practice and real-world

220 problems. It is important for mathematics instructors to find the appropriate balance

221 between teaching the mathematical standards and concepts and financial literacy skills.

222

223 The following chart provides information about financial literacy word problems created
224 by The Math Forum @ Drexel that align to both sets of national financial literacy
225 standards as well as the content and mathematical practices standards of the CCSSM.
226 To access the actual word problems, please visit <http://mathforum.org/pow/financialed/>

Grade Level	Problem name	Standards for Mathematical Practice	CA CCSSM	CEE National Standard	Jump\$tart Standard
Grade K	The Yard Sale	1. Make sense of problems and persevere in solving them. 3. Construct viable arguments and critique the reasoning of others.	Kindergarten: Operations & Algebraic Thinking: Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.	Standard 1: Planning and Money Management: Organize personal finances and use a budget to manage cash flow: Apply consumer skills to purchase decisions.	Planning and Money Management: Standard 4: Apply consumer skills to purchase decisions
Grade 1	Jordan's Jobs	1. Make sense of problems and persevere in solving them. 3. Construct viable arguments and critique the reasoning of others.	Grade 1: Operations & Algebraic Thinking: Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem	Standard 1: Planning and Money Management: Organize personal finances and use a budget to manage cash flow: Apply consumer skills to purchase decisions.	Planning and Money Management: Standard 4: Apply consumer skills to purchase decisions

The *Mathematics Framework* was adopted by the California State Board of Education on November 6, 2013. The *Mathematics Framework* has not been edited for publication.

Grade Level	Problem name	Standards for Mathematical Practice	CA CCSSM	CEE National Standard	Jump\$tart Standard
Grade 2	Money Matters	1. Make sense of problems and persevere in solving them. 3. Construct viable arguments and critique the reasoning of others.	Grade 2: Operations & Algebraic Thinking: Represent and solve problems involving addition and subtraction.	Standard 1: Planning and Money Management: Organize personal finances and use a budget to manage cash flow: Apply consumer skills to purchase decisions.	Planning and Money Management: Standard 4: Apply consumer skills to purchase decisions
Grade 3	Miracle Miranda and the Mascot	1. Make sense of problems and persevere in solving them. 3. Construct viable arguments and critique the reasoning of others. 5. Use appropriate tools strategically. 7. Look for and make use of structure.	Grade 3: Operations and Algebraic Thinking: Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.	Standard 2: Income and Careers: Use a career plan to develop personal income potential: Explore career options.	Income & Careers: Standard 2: Identify sources of personal income

Grade Level	Problem name	Standards for Mathematical Practice	CA CCSSM	CEE National Standard	Jump\$art Standard
Grade 4	Building Bouquets	1. Make sense of problems and persevere in solving them. 3. Construct viable arguments and critique the reasoning of others.	Grade 4: Operations & Algebraic Thinking: Find all factor pairs for a whole number in the range 1-100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1-100 is a multiple of a given one-digit number.	Standard 2: Income and Careers: Use a career plan to develop personal income potential: Explore career options.	Income & Careers: Standard 2: Identify sources of personal income
Grade 5	Super Deal Salsa	1. Make sense of problems and persevere in solving them. 3. Construct viable arguments and critique the reasoning of others. 5. Use appropriate tools strategically. 6. Attend to precision.	Grade 5: Perform operations with multi-digit whole numbers and with decimals to hundredths: Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.	Standard 1: Planning and Money Management: Organize personal finances and use a budget to manage cash flow: Apply consumer skills to purchase decisions.	Planning and Money Management: Standard 4: Apply consumer skills to purchase decisions

Grade Level	Problem name	Standards for Mathematical Practice	CA CCSSM	CEE National Standard	Jump\$tart Standard
Grade 6	Buying Cola	1. Make sense of problems and persevere in solving them. 3. Construct viable arguments and critique the reasoning of others.	Grade 6: Ratios & Proportional Relationships: Understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship. For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is $3/4$ cup of flour for each cup of sugar." "We paid \$75 for 15 hamburgers, which is a rate of \$5 per hamburger."	Standard 1: Planning and Money Management: Organize personal finances and use a budget to manage cash flow: Apply consumer skills to purchase decisions.	Planning and Money Management: Standard 4: Apply consumer skills to purchase decisions
Grade 7	That's Interesting!	1. Make sense of problems and persevere in solving them. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically.	Algebra: Seeing Structure in Expressions: Use the properties of exponents to transform expressions for exponential functions. 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%.	Standard 3: Savings and Investing: Implement a diversified investment strategy that is compatible with personal goals: Evaluate investment alternatives.	Savings and Investing: Standard 3: Evaluate investment alternatives

Grade Level	Problem name	Standards for Mathematical Practice	CA CCSSM	CEE National Standard	Jump\$tart Standard
Grade 8	Saving Your Raise	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically.	Grade 8. Expressions and Equations: Know and apply the properties of integer exponents to generate equivalent numerical expressions.	Standard 2: Savings and Investing: Implement a diversified investment strategy that is compatible with personal goals: Explain how investing builds wealth and helps meet financial goals.	Savings and Investing: Standard 2: Explain how investing builds wealth and helps meet financial goals.
Grade 9	Dinner at Pepe's	1. Make sense of problems and persevere in solving them. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics.	Grade 9: Algebra: Reasoning with Equations and Inequalities: 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. Algebra: Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and	Standard 1: Financial Responsibility and Decision Making: Apply reliable information and systematic decision making to personal financial decisions. Take responsibility for personal financial decisions.	Financial Responsibility and Decision Making: Standard 5: Develop communication strategies for discussing financial issues.

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Grade Level	Problem name	Standards for Mathematical Practice	CA CCSSM	CEE National Standard	Jump\$tart Standard
Grade 10	Credit Card Savings	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically.	Algebra: Use the properties of exponents to transform expressions for exponential functions. 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%.; Mathematics II. Building Functions: Build a function that models a relationship between two quantities.	Standard 3: Credit and Debt: Maintain creditworthiness, borrow at favorable terms, and manage debt: Describe ways to avoid or correct debt problems.	Credit and Debt: Standard 1: Identify the costs and benefits of various types of credit.
Grade 11	A Great Way to Make Money?	1. Make sense of problems and persevere in solving them. 3. Construct viable arguments and critique the reasoning of others.	Statistics & Probability: Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.	Standard 3: Savings and Investing: Implement a diversified investment strategy that is compatible with personal goals: Evaluate investment alternatives.	Savings and Investing: Standard 3: Evaluate investment alternatives

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Grade Level	Problem name	Standards for Mathematical Practice	CA CCSSM	CEE National Standard	Jump\$art Standard
Grade 12	College Savings	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics.	Algebra: Use the properties of exponents to transform expressions for exponential functions. 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%. Calculus Standards: Students demonstrate an understanding of the interpretation of the derivative as an instantaneous rate of change.	Standard 2: Savings and Investing: Implement a diversified investment strategy that is compatible with personal goal: Explain how investing builds wealth and helps meet financial goals.	Savings and Investing: Standard 2: Explain how investing builds wealth and helps meet financial goals.

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Financial Literacy Curriculum Resources

California Department of Education Grades K-12 Financial Literacy Resources

<http://www.cde.ca.gov/eo/in/fl/finlitk12.asp>

The Council for Economic Education

<http://www.econedlink.org/lessons/economic-lesson-search.php?type=educator>

Federal Reserve Bank of Cleveland. *A Kids Guide to Money*

http://www.clevelandfed.org/Learning_Center/Online_Activities/great_minds_think/Great_Minds_Think.pdf

Federal Reserve Bank of New York. *Econ Explorers: Journal for Students*

http://www.newyorkfed.org/education/econ_student.pdf

Federal Reserve Bank of New York. *It's All About Your \$: Teachers Guide.*

http://www.newyorkfed.org/education/its_all_about_your_money.pdf

The Department of the Treasury. *Money Math: Lessons for Life*

http://www.treasurydirect.gov/indiv/tools/tools_moneymath.pdf

The Federal Reserve

<http://federalreserveeducation.org/resources/classroom/lesson-plans/>

The Federal Reserve Bank of Dallas. *Building Wealth: A Beginners Guide to Securing your Financial Future*

<http://www.dallasfed.org/assets/documents/cd/wealth/wealth.pdf>

The Federal Reserve Bank of Atlanta

http://www.frbatlanta.org/pubs/extracredit/lessons_activities.cfm

The Federal Reserve Bank of Philadelphia

<http://www.philadelphiafed.org/education/teachers/lesson-plans/>

The Math Forum @ Drexel

<http://mathforum.org/>