

Chapter



Your Best Interest: Finding the Right Place to Save Money

The Bottom Line

What is the effect on your future savings when you change values such as principal, interest rate, and time in simple and compound interest formulas?

Using linear, step, and exponential functions, students will see how the money in savings accounts and other saving options (e.g., money market accounts) can change over time. They will explore how banks set up savings accounts, and they will discover that some types of accounts may not be good for making money, and in fact may result in losing money.

Standards Met in This Chapter

CCSSM Standards and Practices

F.BF.1: Write a function that describes a relationship between two quantities.

F.IF.7: Graph functions expressed symbolically and show key features of the graph by hand in simple cases or using technology for more complicated cases; Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

MP.7: Look for and make use of structure.

MP.8: Look for and express regularity in repeated reasoning.

(National Governors Association Center for Best Practices and Council of Chief State School Officers [NGA Center and CCSSO] 2010)

Jump\$tart Standards

Spending and Saving: Apply strategies to monitor income and expenses, plan for spending and save for future goals.

Standard 1: Develop a plan for spending and saving.

Financial Decision Making: Apply reliable information and systematic decision making to personal financial decisions.

Standard 1: Recognize the responsibilities associated with personal financial decisions.

(Jump\$tart Coalition for Personal Financial Literacy 2015)

Balance Sheet

This chapter is about helping students to understand savings options. The first of its two activities consider interest as it pertains to saving, with a focus on the impact of associated fees and penalties. The second activity turns to different ways to save money at various interest rates and to the benefits of making regular deposits to accounts. Students calculate compound interest, graph exponential functions that are nearly linear functions, graph step functions, apply the compound interest formula to financial situations, write exponential functions, solve exponential equations, and analyze functions using tables and graphs.

The following three sections describe the mathematical and financial literacy concepts addressed by the activities in this chapter, as well as the knowledge and experiences that high school students may bring to the lesson and take from it upon its completion.

Mathematics

This lesson includes various kinds of functions: *linear*, *step*, and *exponential*. Savings accounts in banks are based on compound interest, typically compounded daily, and therefore grow exponentially. The formulas to calculate types of interest are provided in figure 1.1; they are also included on the Savings Accounts Reference Page at the end of this chapter.

Formulas for Calculating Interest

Simple Interest: $A = P(1 + r)$

Compound Interest: $A = P\left(1 + \frac{r}{n}\right)^{nt}$

Variables:

- A represents amount of money, based on the other variables
- P represents principal amount (initial investment)
- r represents annual nominal interest rate (not reflecting the compounding)
- n represents number of periods the interest is compounded per year
- t represents number of years the money is invested

Fig. 1.1. Formulas for calculating simple and compound interest

The first activity in this chapter (accompanied by Activity Sheet 1.1) uses the compound interest formula for students to explore the value of money placed in a savings account across several scenarios and asks students to look for patterns in resulting amounts (MP.8; NGA Center and CCSSO 2010). When interest rates are low, such as 0.01% (0.0001), the amount in an account looks flat over time. For example, the graph for $f(x) = 0.0001x + 250$ looks nearly equivalent to the graph for $g(x) = 250$ in the short term (F.IF.7). This provides an opportunity for students to look at situations that essentially can be represented by constant functions (linear functions with a slope of 0). Additionally, students will find that account holders who do not maintain minimum balances often are charged monthly fees. If a bank deducts a fee at the end of every month, the situation might be represented by a step function. For example, in an account with no growth for 30 days and a fee deduction of \$5, followed by no change for 30 days and a fee deduction of \$5, and so on, the resulting amounts can be represented by a step function. Students will compare these situations to the way in which these functions are represented to notice common features within a family of functions (MP.7).

In the second activity (accompanied by Activity Sheet 1.2), students explore and interpret compound interest, apply the compound interest formula to financial situations, write expressions, solve exponential equations, and analyze functions using tables and graphs (F.BF.1 and F.IF.7). Specifically, students will write expressions for functions that describe the relationship between two quantities when considering the amount and variables such as the annual interest rate, number of years invested, fees, and regular deposits (MP.7). They will write functions, including piecewise functions (specifically step functions), to describe interest rate scenarios (F.BF.1).

Financial Literacy

Teenagers tend to have little income, so it is often difficult for them to think about saving. Yet the impact of saving over time is an important concept to understand when managing one's finances. Saving is different from investing. A savings plan (savings account) involves little or no risk, but it also provides little or no opportunity to make money (through interest); an investing plan involves more risk but can provide a higher rate of return (Faulkenberry n.d.). Savings accounts, checking accounts, and certificates of deposit (CDs) are all safe ways to save because their assets are insured by the Federal Deposit Insurance Corporation (FDIC). Savings accounts are liquid assets, which means that savings can be turned into cash quickly if that cash is needed to fix a flat tire or to buy concert tickets. On the other hand, investing focuses on long-term goals, with a main goal of making money from the money that is invested. Investors often do not know how much money they will earn from an investment, and they could even lose money! Investments are therefore riskier than savings options but offer more potential to make money.

Additionally, interest rates and bank fees have changed dramatically in the past decade, thereby changing the landscape of saving and investing. In recent years, the annual percentage yield (APY) for savings accounts has been so low that when considered in combination with fees, it is often *not* a good idea to open a savings account. Table 1.1 illustrates some alarming numbers from savings accounts at large national banks.

Table 1.1. Basic savings accounts facts and figures (March 2016)

	Basic Savings APY	Minimum Opening Balance	Fees	Fees Waived When Minimum Daily Balance Is . . .
JPMorgan Chase	0.01%	\$25	\$5/month	\$300, or recurring deposit of \$25 or account holder is under 18
Bank of America	0.01%	\$25	\$5/month	\$300
Citibank	0.01%	\$500	\$4.50/month	\$500 or more
Wells Fargo	0.01%	\$25	\$5/month	\$300, or recurring deposit of \$25 or account holder is under 18
HSBC North America Holdings	0.01% (compounded quarterly)	\$0.01 or \$1.00 to earn APY	\$0	N/A

Savings accounts are no longer a reasonable option for growing money, and they can be a way to *lose* money. Note that if you maintained only the minimum balance for most of the banks listed in the table, your money would be gone within a year (an important discovery included in the first activity of this chapter). Why do savings accounts still exist? They are liquid assets, and the money in them is perhaps less likely to be spent than if it were in a checking account or a piggy bank. So savings accounts can be effective for budgeting or planning for future expenses but not for accumulating more money.

Some other ways of saving yield slightly higher interest (e.g., CDs and money market accounts), which enable savings to grow slightly. However, these options often mean the money is more difficult to access at a moment’s notice (meaning it is less liquid). In the second activity in this chapter, students explore these different savings options. Together, the explorations in this chapter lead students to consider the importance of long-term goals and of saving early.

Student Knowledge and Experience

High school students may have varying knowledge of the advantages and disadvantages of different saving strategies. Specifically, investigating these options can help students to recognize that (1) there are significant differences with different savings options and (2) there are major advantages to saving at a younger age. Teaching students about the difference between needs and wants as well as the mathematics and the financial benefits of saving and minimizing debt can help plant a seed for good practices in the future—practices that help students of all backgrounds.

Mathematically, high school students should be familiar from earlier grades with the idea that re-writing an expression can provide insight into its meaning. Students in middle school generally spend a great deal of time on linear equations and functions, including writing equivalent expressions.

Did you know?
 Businessman and investor Warren Buffett made his first investment by age eleven and by age thirteen was running a small business. At age seventy-six, he announced that he would give an estimated \$62 billion away to charity (Biography.com n.d.).

Lesson Plan

Learning Targets

- Analyze and compare savings options and the functions that can be used to best model them.
- Determine the effects of changing initial investments, term lengths, and interest rates on savings accounts.

Resources and Tools

Activity Sheet 1.1: Savings Account or Piggy Bank? (pp. 20–23)

Activity Sheet 1.2: More Saving Options (pp. 24–31)

Savings Accounts Reference Page (p. 32)

(Available for download and printing at <http://www.nctm.org/more4U>)

Calculators and/or computers for spreadsheet functionality

Key Language

annual nominal interest rate: Annual rate of interest that does not take into account the compounding of interest within the year.

annual percentage yield (APY): Annual rate of interest that takes into account the compounding of interest within the year.

compound interest: Interest that is earned on the starting balance (principal) *and* on interest previously earned.

growth factor: The factor by which a quantity multiplies itself over time.

interest rate: The percentage of the principal that is charged to a borrower (as interest) by a lender.

investing: Expending money with an expectation of future financial gain.

principal: Original amount of money invested (or loaned).

saving: Holding onto money, rather than spending it.

simple interest: Interest based on the starting balance (principal) only.

Sales Pitch

Ask students to each record on sticky notes some answers to this question (with each idea recorded on a separate sticky note):

- Why might a young person want to start saving money NOW?

Have students bring their sticky notes to the front of the room and place them on the board in one of two categories: “Needs” and “Wants.” Point out that people save money for both wants and needs, and that sometimes needs must be prioritized over wants. Tell the students that saving money requires knowing both how to save and how to invest. Explain that knowing how to save and invest money is important in being able to have the things we really want to have, even if it means giving up things in the short term.

Bring or show a piggy bank and a sock with some cash in each. Explain to students that you are wondering if you want to save for a want or need, how might you best save your money? Should you keep your money in the piggy bank or a sock, or are you better off putting your money in a savings account at the bank? Invite students to share arguments on both sides of this decision.

Opening

Explain to students that the series of activities in this lesson will explore savings, including how savings accounts work, and other ways to save money. Ask students to think about how much money they think they would have in 6 months if they deposited \$200 in a savings account today.

Ask them to write down an answer and save it for later. Explain to students that the advantages and disadvantages of savings accounts are continually changing.

The Fine Print

This lesson has two parts. Part 1 focuses on the amount of interest earned in a regular savings account; part 2 compares several savings options. Each part of the lesson is expected to take approximately one class period (45 to 60 minutes).

Part 1: Savings Account or Piggy Bank?

Hand out **Activity Sheet 1.1: Savings Account or Piggy Bank?** to the class, and read together the information in the tinted box at the top of the first page. Also, share the **Savings Accounts Reference Page**, either projecting it for the class or providing copies to students (either to each student or to small groups).

Have students work with a partner or in a small group to answer questions 1–3. After students complete question 3, ask them to discuss what they noticed. Talk about the fact that current savings rates are so low, account holders don't actually make any significant amount of money; and, if account holders can't maintain the minimum balance, they actually lose money.

Next, introduce the fact that, if students shop around, they can find special accounts that encourage youth to save money. Have students complete question 4 on Activity Sheet 1.1. After they complete question 4, ask the following questions:

- How do these interest rates (and the removal of any fees) affect the balance?
- For these types of accounts, is it better to go with the savings account or with the piggy bank?
- How long will it take the four young people in question 4 to earn \$20 in a youth account?

Have students return to their small groups to address this question by completing question 5 and then the rest of Activity Sheet 1.1. Share responses to the final two questions (6 and 7). Then return to the question from the Opening section in which students were asked to think about how much money they think they would have in 6 months if they deposited \$200 in a savings account today. Ask students to share their responses and reflect on how accurate their initial responses were. Emphasize key points about saving and savings accounts:

- Saving at a bank is a way to be sure money is safe (and to be less tempted to spend it!).
- You should pay attention to the fees and rates in selecting a savings account and find the best rates you can (or keep your money at home).
- Savings accounts are not the best way to make money (as compared to investing). (Note that chapter 7 contains activities for students to compare the rates of return on different types of investments.)

Part 2: More Saving Options

In the second activity of this chapter, students compare three savings options. This part of the lesson can be taught with all students doing all three types of savings options, or it can be done using a jigsaw, creating expert groups for each savings option. (The lesson as described below uses the jigsaw method.) Explain that savings accounts do not have to be opened at a physical bank; they can instead be opened online. There also are two other common ways to save: certificates of deposit (CDs) and money market accounts. Students will consider these options in the context of saving to buy a car.

Standards for Mathematical Practice: Students use MP.8 as they look for patterns across the savings scenarios and generate generalized expressions to describe the patterns.

Standards for Mathematical Practice: Students demonstrate MP.7 as they compare how different types of functions are represented, noticing common features within a family of functions.

Place students into expert groups, and give each group a copy of one of the first three options from **Activity Sheet 1.2: More Savings Options**. (One-third of the small groups will focus on each of the three possible savings options: online savings accounts, CDs, and money market accounts.) Ask students to read and discuss the type of savings plan they will be considering. Explain to students that they will need to complete questions 1–6 on their sheet, and then they will be moved to different groups to consider additional savings options. One efficient way to regroup students is to have students line up in three lines, with each line including all those who examined the same type of savings plan. Have the first student in each of the three lines form group 1 and so on. Give each student a few minutes to explain his or her type of savings to the others in the mixed group. After each student has done so, ask students to work together in their groups to complete questions 7 through 10, comparing their options to the other options.

Give each student a copy of the final pages of Activity Sheet 1.2 (the Analysis of Options section). Ask students to reflect on their discussions, to consider what they find to be advantages and disadvantages of each option, and to record the advantages and disadvantages in the table. Then ask students the following questions:

- What are the advantages and disadvantages for each option?
- How do the varying interest rates affect the amount saved?
- How else might you increase the amount of money you have saved at the end of two years?

One answer to this last question is to continue adding money to a savings account. Challenge students to figure out how much they would save if they added \$25 each month (see question 3 in the Analysis of Options section of Activity Sheet 1.2). Ask the following questions:

- How did adding \$25/month affect the function?
- How did adding \$25/month affect the amount saved?

Ask students to complete the last page of Activity Sheet 1.2 on their own. After students have answered the final questions, have students pair-share what they decided to do to save for the car they hope to buy.

Closing the Deal

Explain to students that we all need be on a path to gain financial security, which means (1) having the ability to prepare for future needs and wants, (2) being able to make responsible financial decisions, and (3) living comfortably within a budget. Ask students to list the factors they need to consider when selecting a savings account that are related to these aspects of financial security. Listen for students to mention the aspects of an account (such as interest rates, fees/penalties, access to savings, and balance requirements); they may also take into consideration how much to save in general in order to pay able to pay for their wants and needs later.

Growth Opportunities

1. *Contrast saving and investing.* Have students watch “Saving vs. Investing” (<https://www.youtube.com/watch?v=SoHgDXLj9hY>) as a way to help them recognize the difference between savings and investing.
2. *Consider short-term and long-term needs.* To get a better sense of reasons for saving and reasons for investing have students revisit their original list of needs and wants and consider which are short term and which are long term. Discuss how the length of time to save may impact which options are better choices.

Standards for Mathematical Practice: As students determine how the change of the situation (money being added to the principal each month) changes the functions, they demonstrate MP.7.

3. *Celebrate America Saves Week*. Founded in 2007, this is a program coordinated by American Saves and American Savings Education Council that promotes good savings habits. Educators and youth organizations can sign up to participate in America Saves Week using this website: <http://americasavesweek.org>.
4. *Read an article about the “Top Seven Reasons to Save Money Now.”* This article (Caldwell 2015) can support the classroom discussion with additional background on the major reasons why people save their money.
5. *Read “3 Reasons Why You Should Save More Money”* (McWhinnie 2014). In contrast to the purely practical concerns of the Caldwell article above, this article talks about how saving money can help us to increase our happiness, reach our dreams, and cope with emergencies.

References and Resources

- Biography.com [website]. “Warren Buffett Biography” (no date). <http://www.biography.com/people/warren-buffett-9230729>.
- Caldwell, Miriam. “Learn the Most Important Reasons to Save Your Money.” About.com [website] (2014). <http://moneyfor20s.about.com/od/reasonsandwaystosave/tp/Top-7-Reasons-to-Save-Money.htm>.
- Chen, Tim. “Maximize Your Opportunities To Earn The Highest Interest Rates On Savings Accounts.” *Forbes* magazine, January 13, 2013. <http://www.forbes.com/sites/moneybuilder/2013/01/13/maximize-your-opportunities-to-earn-the-highest-interest-rates-on-savings-accounts/#2715e4857a0b2b9e4d56157b>.
- Faulkenberry, Ken. “What Is the Difference Between Saving and Investing?” *Arbor Asset Allocation Model Portfolio AAAMP Blog RSS* (no date). <http://www.arborinvestmentplanner.com/what-is-the-difference-between-saving-and-investing/>.
- Hamm, Trent. “Personal Finance 101: Money Market Accounts Versus Normal Savings Accounts.” The Simple Dollar.com [website] (2014). <http://www.thesimpledollar.com/personal-finance-101-money-market-accounts-versus-normal-savings-accounts/>.
- Investopia.com. “Certificate of Deposit (CD)” [web video] (2014). <http://www.investopedia.com/video/play/certificate-deposit-cd/>.
- Jump\$tart Coalition for Personal Financial Literacy. *National Standards in K–12 Personal Finance Education*. 4th ed. Washington, D.C.: Jump\$tart Coalition for Personal Financial Literacy, 2015.
- McWhinnie, Eric. “3 Reasons Why You Should Save More Money.” *The Cheat Sheet*, December 30, 2014. <http://wallstcheatsheet.com/personal-finance/3-reasons-why-you-should-save-more-money.html?a=viewall>.
- “Money Market Account Basics” [web video]. YouTube.com, October 31, 2013. <https://www.youtube.com/watch?v=-Fp9ErhZIGs>.
- My Money Coach [website]. “10 Reasons Why You Should Save Money (Even When Borrowing Is Cheap & Easy)” (no date). <http://www.mymoneycoach.ca/saving-money/why-save-money>.
- National Governors Association Center for Best Practices and Council of Chief State School Officers (NGA Center and CCSSO). *Common Core State Standards for Mathematics*. Washington, D.C.: NGA Center and CCSSO, 2010.

Ross, Allison. "CD Early Withdrawal Can Come at a Hefty Cost." Bankrate.com [website] (no date). <http://www.bankrate.com/finance/cd/cd-early-withdrawal-penalties-sock-1.aspx>.

"Saving vs. Investing" [web video]. YouTube.com, June 7, 2013. <https://www.youtube.com/watch?v=SoHgDXLj9hY>.

Wesley, Daniel. "Choosing a Certificate of Deposit (CD) vs. a Savings Account." CreditLoan.com [website] (no date). <http://visualeconomics.creditloan.com/2010-01-26-choosing-a-certificate-of-deposit-cd-vs-a-savings-account/>.



Activity Sheet 1.1

Savings Account or Piggy Bank?

Most banks and credit unions offer savings accounts as a simple way for consumers to keep the money they save safe. But is a savings account the best way to keep your money safe, or are you better off putting cash in a piggy bank? This is the question you will answer at the end of this activity.

1. On May 1st, Harry, Larry, Sherri, and Mary each decide to put aside some money, and they are wondering if they should put their money in a savings account. For the questions in this activity, you can look up and use current interest rates and fees or use the common 2015 interest rate and fee for the most basic savings account listed below:

Minimum to open an account: \$25

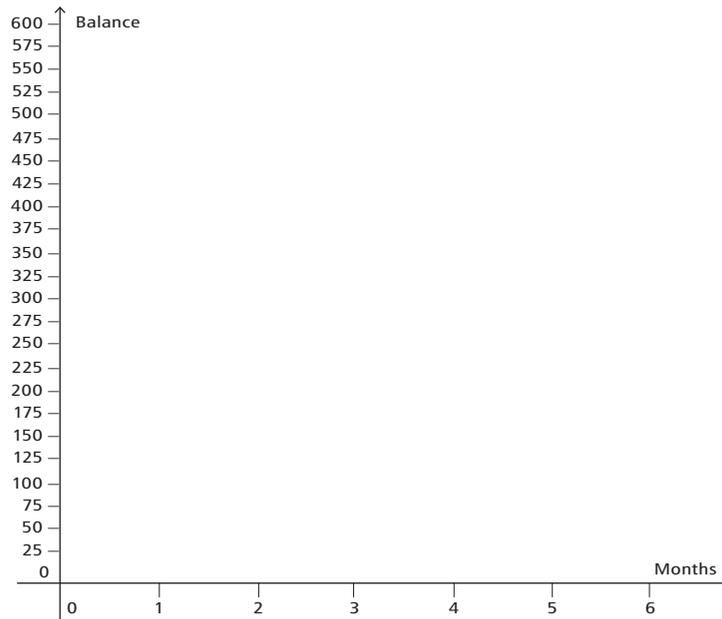
Annual nominal interest rate: 0.01% (interest is compounded daily)

Monthly fee: \$5 fee per month, waived if balance is over \$300

a. Complete the table for each student's balance with your chosen interest rate. Note that May, July, August, and October each have 31 days, and June and September have 30 days.

Person	Starting Balance	End of May	End of June	End of July	End of August	End of September	End of October
Harry	\$150						
Larry	\$500						
Sherri	\$325						
Mary	\$275						

b. Graph each person's balance on the graph on the following page with time in months plotted on the horizontal axis and balance plotted on the vertical axis.



2. Describe and write a function that best models the following:

a. Balance as a function of time when not subjected to monthly fees

b. Balance as a function of time when subjected to monthly fees

3. Based on your mathematical models, for whom do you suggest depositing money in a bank savings account (and why)? For whom do you suggest putting money in a piggy bank (and why)?

SAVINGS ACCOUNT:

PIGGY BANK:

4. **Youth Accounts.** Some banks offer better rates for young people! You can start a savings account with no minimums, no fees, and higher interest rates. Explore how these differences affect the money saved and earned in savings accounts.

a. At Best Bank USA, a Youth Savings Account earns a 0.75% annual nominal interest rate compounded daily. Write a function to model the balance from Best Bank savings accounts for young people.

b. Complete the table using this information from Best Bank USA.

Person	Starting Balance	End of May	End of June	End of July	End of August	End of September	End of October
Harry	\$150						
Larry	\$500						
Sherri	\$325						
Mary	\$275						

c. Compare the results in this table to the table in question 1a. What do you notice?

d. Even Better Bank offers a Youth Savings Account for youth up to age 21. Youth earn a 4.00% annual nominal rate compounded daily on the first \$1000 and 0.75% afterwards. Write a **piecewise function** that models the amount of money earned from Even Better Bank Youth Savings Accounts.

e. Complete the table using Even Better Bank terms.

Person	Starting Balance	End of May	End of June	End of July	End of August	End of September	End of October
Harry	\$150						
Larry	\$500						
Sherri	\$325						
Mary	\$275						

f. Compare the results from this table with the table in question 1a and with the table in question 4b. What do you notice?

5. **Savings vs. Investing.** Harry, Larry, Sherri, and Mary want to know how long it will take them to make \$20 if they have their savings in one of these Youth Accounts. Use your work from question 4 to determine the time needed for each person to earn \$20 at Best Bank USA and to earn \$20 at Even Better Bank. Enter your answers in the table below.

Person	Time (in days) to earn \$20 at BEST BANK	Time (in days) to earn \$20 at EVEN BETTER BANK
Harry		
Larry		
Sherri		
Mary		

6. Is putting money in a general savings account a good way to make more money? Is putting money in a youth savings account a good way to make more money? Explain.

7. Name two reasons to start saving money early (as a child or young teenager).



Activity Sheet 1.2

More Saving Options

Option #1: Online Savings Accounts

Online Savings Accounts Fast Facts: Online savings accounts often have better rates than savings accounts offered by physical banks because online banks do not have the same overhead (operating expenses) that physical banks have. As with savings accounts at physical banks, you can withdraw your money from online savings accounts as you need it.

You want to buy a car when you graduate from high school, which is two years away. After working three jobs in the summer and adding to the money you already saved, you have \$6000. You have to decide how much money to put into savings and how much money to use for needs or fun over the next two years.

1. Without doing any calculations, respond to the following questions.
 - a. How much would you like to spend on a car in two years?

 - b. How much of the \$6000 would you need to put into a savings account in order to afford your car?

 - c. Where is the best place to save money if you would like it to earn more money?

Suppose that you deposit \$3000 in an online savings bank that offers 0.85% annual nominal interest rate compounded daily with no fees. Explore how your money would accrue over a two-year period.

2. Write a function to model the growth of the savings option.

3. What will be the balance in your account at the end of two years?

4. What is the growth factor for this savings option?

5. If you have to withdraw money from the account at the end of one year, what effect would that have on the amount you saved at the end of that year?

6. What are the pros and cons of using an online savings account to save money?

7. How is an online savings account similar to and different from a CD?

8. How is an online savings account similar to and different from a money market deposit account?

9. Revisit your responses to question 1, and update your responses as needed.

a. How much would you like to spend on a car in two years?

b. How much of the \$6000 would you need to put into a savings account in order to afford your car?

c. Where is the best place to save money if you would like it to earn more money?

10. What changes did you make and why?

4. What is the growth factor for the CD option?

5. If you have to withdraw money from the CD at the end of one year, what impact would that have on the amount you saved at the end of that year?

6. What are the pros and cons of using a CD to save your money?

7. How is a CD similar to and different from an online savings account?

8. How is a CD similar to and different from a money market deposit account?

9. Revisit your responses to question 1, and update your responses as needed.

a. How much would you like to spend on a car in two years?

b. How much of the \$6000 would you need to put into a CD in order to afford your car?

c. Where is the best place to save money if you would like it to earn more money?

10. What changes did you make and why?

Option #3: Money Market Deposit Accounts

Money Market Deposit Accounts Fast Facts: Money market deposit accounts pay a higher interest rate than savings accounts, and the rate varies based on how much money you deposit (the more you deposit, the higher the rate). They require a higher deposit than other options. You can access your money at any time, but limits are set (such as 3–6 withdrawals a month).

You want to buy a car when you graduate from high school, which is two years away. After working three jobs in the summer and adding to the money you already saved, you have \$6000. You have to decide how much money to put into a money market deposit account and how much money to use for needs or fun over the next two years.

1. Without doing any calculations, respond to the following questions.
 - a. How much would you like to spend on a car in two years?

 - b. How much of the \$6000 would you need to put into a money market deposit account in order to afford your car?

 - c. Where is the best place to save money if you would like it to earn more money?

Suppose that you deposit \$3000 in a money market account that offers 1% annual nominal interest rate compounded daily. Explore how your money would accrue over a two-year period.

2. Write a function to model the growth of the money market option.

3. How much money will you have in your account at the end of two years?

4. What is the growth factor for this money market option?

5. If you have to withdraw money from the account at the end of one year, what impact would that have on the amount you saved at the end of that year?

6. What are the pros and cons of using a money market deposit account to save money?

7. How is a money market deposit account similar to and different from a CD?

8. How is a money market deposit account similar to and different from an online savings account?

9. Revisit your responses to question 1, and update your responses as needed.

a. How much would you like to spend on a car in two years?

b. How much of the \$6000 would you need to put into a money market deposit account in order to afford your car?

c. Where is the best place to save money if you would like it to earn more money?

10. What changes did you make and why?

Analysis of Options

1. Complete the table below, comparing the advantages and disadvantages of each type of saving option.

Summary of Findings

Saving Option	<i>Advantages</i>	<i>Disadvantages</i>
Online savings account		
Certificate of deposit		
Money market deposit account		

Paying for the Car

One thing that is true for online savings accounts and money market accounts but is not true for CDs is that you can continue to add to your principal at any time. For example, you can add \$25 every month to your account. Use the table below to see how your money accrues in a savings account if you deposit \$25 a month for 6 months. Use an annual nominal interest rate of 0.9% compounded daily and \$3000 as a starting principal.

	May	June	July	August	September	October
Beginning balance						
Interest earned						
+ Deposit						
New balance						

- Write a function to model the balance in the account that includes the additional \$25 per month.
- How much money would you have in your account at the end of two years?
- If you want to purchase a car that costs \$5000, how would you save your money to reach that goal? Include the starting principal amount you would need, the savings option(s) you would use (online savings account, CD, money market deposit account), the additional amount of money you would deposit each month, and why.
- If you want to purchase a car that costs \$10,000, how would you save your money to reach that goal? Include the starting principal amount you would need, the savings option(s) you would use (online savings account, CD, money market deposit account), the additional amount of money you would deposit each month, and why.
- For the car you are hoping to purchase, how much money will you need to deposit and which option(s) would you use to reach your goal?

Savings Accounts Reference Page

- *Transaction limits*—By law, you are permitted 6 withdrawals or outgoing transfers per month from a savings account. If you use it more than this, you are subject to fees. (If you use your debit card more than 6 times, you will pay a fee.)
- *Compounding interest*—Savings account interest rates are compounded daily (usually, though this is not guaranteed).
- *Annual percentage yield (APY)*—This is the amount you would earn if you invested a principal value for a full year. This rates takes compounding of interest within the year into account.
- *Variable rates*—Savings account rates are subject to change without notice and can shift daily at the discretion of the bank or credit union.
- *Fees*—Banks charge fees for your savings accounts if you fall below a certain amount of money. The table below shows the fee structure for 5 of the largest banks in the United States.

Table 1.2. Basic savings accounts figures from five big banks in the United States (February 2015)

	Basic Savings APY	Minimum Balance	Fees	Fees Waived When . . .
JPMorgan Chase	0.03%	\$25	\$4/month	\$300 or add \$25 or under 18
Bank of America	0.01%	\$25	\$5/month	\$300
Citibank	0.01%	\$100	\$10/month	\$500 or more
Wells Fargo	0.01%	\$25	\$5/month	\$300 or recurring deposit of \$25 or more
HSBC North America Holdings	0.01% (compounded quarterly)	\$1 or \$100 to earn APY	Not posted	\$500

Compound Interest: $A = P\left(1 + \frac{r}{n}\right)^{nt}$

Simple Interest: $A = P(1 + r)$

Variables:

- *A* represents amount of money, based on the other variables.
- *P* represents principal amount (initial investment).
- *r* represents annual interest rate.
- *n* represents number of periods the interest is compounded per year.
- *t* represents number of years the money is invested.

(Sometimes the variable *i* is substituted into the formula, where $i = \frac{r}{n}$).