



MIDDLE SCHOOL | UNIT 3 Paying Yourself First

Title

Earning Money By Saving Money

LEARNING OBJECTIVES

Students will:

- **calculate** compound interest using the simple interest and future value formulas.
- **research** realistic interest rates for savings accounts.
- **create** compound interest problems for peers along with answer keys showing solutions.

Content Area

Math

Grades

6–8

Overview

How much will your money be worth in the future? Students learn two ways to calculate the future value of a savings account (repeating the calculation for simple interest and using the future value formula). After solving the provided problem, students conduct research to determine the interest rates paid on savings accounts at three financial institutions. In small groups, they create their own compound interest problems for peers.

Themes

Personal Finance: Saving and compound interest

Math: Rate calculations including simple and compound interest

Common Core Math Standards

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.

7.NS.A.3 Solve real-world and mathematical problems involving the four operations with rational numbers.

6.EE.C.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another.

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6.EE.A.2.C Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems.

6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.

7.EE.B.3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form.

Connect

How does this connect to the student?

Considering very few adults in the United States identify themselves as savers, deciding to save money for use in the future can be especially hard for students. Learning that the money they save can grow over time because of interest can provide an incentive to reluctant savers. Knowing that their money is not only safe but growing in an account can encourage them to put money aside to save more regularly.

How does this connect to careers?

Financial Institution Branch

Manager: When someone opens a savings account at a local financial institution, they will likely meet with the manager of that particular branch. This person makes sure the person opening the account completes the appropriate forms and understands the account they are opening. People with this job also oversee the day-to-day operations of the branch and assist people with loans and other banking matters.

How does this connect to technology?

It wasn't too long ago that people had to walk into a physical branch of a financial institution in order to open a savings account. Technology, however, has changed the way that many people conduct their banking. Many financial institutions now conduct most or all of their transactions online without the use of physical branches. Doing so allows them to reduce expenses, which means they are often able to offer better or more competitive interest rates than institutions with in-person branches.

Key Terms

Personal Finance: simple interest, compound interest, financial institutions, savings account, principal, APY (annual percentage yield)

Math: interest, rate, percent, simple interest, compound interest

Prepare

Background: Students are often asked to perform interest rate calculations that come from a textbook or other source and have little connection to their life or the “real world.” In particular, students are very unlikely to find a financial institution that offers **simple interest** (interest paid only on the original amount of money) on a **savings account**. They are much more likely to earn compound interest (interest earned on both the original amount and interest earned over time). Different financial institutions do vary, though, in how frequently interest is compounded. In addition to the issue of simple versus **compound interest**, the rate paid on savings accounts can vary significantly with fluctuations in the discount rate set by the Federal Reserve’s Board of Governors. This means that interest rate problems could include unrealistic rates for current economic conditions.

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In order to make interest rate calculations more meaningful for students, this activity invites students to research the rates being offered by a variety of institutions and perform calculations based on these actual rates. When locating financial institutions to compare, encourage students to consider local banks and credit unions as well as institutions that are only available online. They might also find that some financial institutions offer introductory rates to encourage new account holders. Most institutions publish their current rates on their websites. Alternatively, students could call a local branch to obtain information.

In conducting their research, students will also need to take care to make sure they are finding out the actual **interest rate** (the rate at which interest is accrued on an account) and—along with it—the frequency at which it is compounded (i.e., daily, monthly, quarterly). This is different from the **annual percentage yield or APY** which is often published. The APY is different from the interest rate in that it takes into account the frequency at which interest is compounded. APY is a helpful number for making apples-to-apples comparisons, but it does not work in the compound interest formula that is the basis for this activity.

Materials:

- **Compound Interest Two Ways Student Capture Sheet**—one copy per student
- **Our Compound Interest Research and Problems Student Capture Sheet**—one copy per student
- **Make it Computer and Internet Access**
- [How Can You Get the Most From Your Money? Unit 3 Student Video](#)
- **Calculators (optional)**—one per student

Engage

- Provide students with this scenario: a friend wants to borrow \$20 so they can make some purchases in a video game. Ask what factors they would consider when deciding whether or not to lend money to their friend..
 - Anticipated responses: if they think the friend will pay it back, if the friend is good at doing what they say they will, etc.
- Add to the conversation a new hypothetical: what if your friend says they will pay you back \$25 instead of just the original \$20. Does this change the likelihood that you will lend them the money?
- Explain to students that when a person borrows money and pays back more than was borrowed, the difference is called **interest**. Share that interest is usually calculated as a percentage known as the **interest rate**. Interest is usually charged to people who borrow money for things like a vehicle or a home. **Financial institutions** such as banks or credit unions also pay interest to people who keep their money in a **savings account** (an account at a financial institution that generally earns interest and can only have a limited number of transactions per month).
- Discuss how saving money in an account at a financial institution is like lending the bank or credit union the money. Make sure students understand that when deposits are made at a financial institution, the money doesn't just sit in a safe or in boxes with people's names on them. Rather, the financial institution uses those funds to make loans to other people. Because the bank is—in essence—borrowing your money, it pays you interest for allowing them to use it.
- Ask students why they think savers earn interest. In other words, why do banks and credit unions pay people to keep their money there? Explain that financial institutions use the deposits from savers to cover the loans made to borrowers. At this level, students should understand that a financial institution must make more money from loans than it pays out in deposits in order to stay in business.

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Teach

- Inform students that the interest financial institutions pay (and charge) is compound interest. Play the video [How Can You Get the Most From Your Money?](#)
- Check for understanding by asking students if they would rather earn simple or compound interest. Would they rather earn a higher or lower rate of interest?
 - Answers: compound; higher
- Let students know that interest on savings accounts is calculated using a formula. One way to calculate interest is to repeatedly calculate simple interest. Show the equation for simple interest and explain the variables in the equation.

$$I = prt$$

Where: I = interest earned

p = principal or beginning amount

r = annual interest rate (expressed as a decimal)

t = time interest is earned

- Offer the following example: Tristan opens an account with \$100 he earned from winning an art contest. The bank will pay 4% interest and compound it annually. Ask students how they would calculate the amount Tristan would have in his account at the end of ten years.
- Distribute **Compound Interest Two Ways Student Capture Sheet** to each student. Guide students through the solution by having them calculate simple interest each year and add the interest earned to get a new balance (see **Compound Interest Two Ways Student Capture Sheet Answer Key**). Assign one student to keep track of how long it takes students (or the class as a whole if doing it together) to arrive at the answer using this method.
- Ask students if they think this is an efficient method for calculating interest. Would they prefer an easier or faster way?
- Introduce students to the formula for calculating the future value of Tristan's savings account with compound interest.

$$A = P(1 + r/n)^{nt}$$

Where: A = the future value of the account with interest

P = principal or beginning amount

r = annual interest rate (expressed as a decimal)

n = number of times interest is compounded per year

t = number of years the money is invested

- In small groups, invite students to solve the problem again with this new formula. Remind students to use the **order of operations**, as needed. Do they get the same answer as using the simple interest formula many times over? Discuss differences in their answers which can usually be accounted for because of rounding. Also, compare the amount of time it took to get the answer using the simple interest method versus the future value formula.
- Ask students to reread the original problem and consider whether or not it is a realistic situation. Is the interest rate realistic? How much money might a middle school student have in order to open an account? Do they think people would leave money in an account and never add more to it? Consider new calculations to show the difference in the final amount with other compounding frequencies such as quarterly (n=4) and monthly (n=12).
- Inform students that they will be creating and solving their own interest rate calculations for their peers. Divide students into small groups and distribute a copy of **Our Compound Interest Research and Problems Student Capture Sheet** to each student. Make sure students know that they should be finding out the interest rate as opposed to the APY (see Background above).
- Allow time for students to conduct their research and prepare their problems. If desired, invite students to exchange problems with another group and solve them.

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Conclude

- Discuss the information students uncovered when researching the interest rates. Compile a list of the financial institutions, rates, and compounding frequency on the board or in an electronically displayed document. Was there much difference in the rates they found? Did some financial institutions offer a higher rate or compound more frequently than others? Was the original question (offering 4% interest) a realistic one? If they were selecting a financial institution to open their own savings account, which might they choose and why?
- Direct students to submit an exit ticket answering the question: How can researching interest rates on savings accounts help me?

Extend

- **Mathematics:** Challenge students to create graphs showing the growth of savings accounts over time. Graphs with multiple scenarios can show the difference between simple interest and/or different account terms such as interest rates and compounding frequency.
- **Mathematics:** Advanced students can be prompted to find the connection between the formula for simple interest and future value. They could also rearrange the formula to isolate for the present value, rate, or periods. [Math is Fun](#) has several examples.
- **Technology:** Invite students to compare several online interest calculators. Which do they prefer and why? Do they think it is important for students to be able to perform interest calculations when they can easily be done online?
- **Research:** Direct students to research interest rates over time. What influences the rates that are paid by financial institutions? Challenge them to explain the correlation between interest rates on savings and interest rates on loans. Which would they rather do: earn more money on savings or pay less on loans?
- **Family:** Encourage students to talk to their family members about savings accounts. If students already have them, they might investigate the interest rate they are currently earning and compare this to the ones discovered in the activity. Is it competitive? Students without accounts could use their findings and discuss the possibility of opening an account with a parent or guardian. Among the factors they should consider is how much money they could realistically deposit in an account. Students should also be aware that some financial institutions offer different accounts for minors. Anyone under the age of 18 is also required to have an adult open the account with them, as they are not of legal age to sign a contract.

Compound Interest Two Ways

Problem: Tristan opens an account with \$100 he earned from winning an art contest. The bank will pay 4% interest and compound it yearly. How much will Tristan have in his account after ten years if he adds no more money to it over time?

The Simple Interest Method: Use the formula for simple interest to find out how much Tristan earns each month. Add the interest earned to the amount he had before, and use this new amount as your principal for the next year.

	Principal (starting amount)	Interest Earned ($I=prt$)	Ending Balance (Principal + Interest Earned)
Year 1	\$100		
Year 2			
Year 3			
Year 4			
Year 5			
Year 6			
Year 7			
Year 8			
Year 9			
Year 10			

The Compound Interest Formula Method: Write the formula for compound interest below when provided by your teacher. Solve the problem again using this formula.

Compound Interest Two Ways | Answer Key

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The Simple Interest Method: Use the formula for simple interest to find out how much Tristan earns each month. Add the interest earned to the amount he had before, and use this new amount as your principal for the next year.

	Principal (starting amount)	Interest Earned ($I=prt$)	Ending Balance (Principal + Interest Earned)
Year 1	\$100	\$4	\$104.00
Year 2	\$104.00	\$4.16	\$108.16
Year 3	\$108.16	\$4.33	\$112.49
Year 4	\$112.49	\$4.50	\$116.99
Year 5	\$116.99	\$4.68	\$121.67
Year 6	\$121.67	\$4.87	\$126.54
Year 7	\$126.54	\$5.06	\$131.60
Year 8	\$131.60	\$5.26	\$136.86
Year 9	\$136.86	\$5.47	\$142.08
Year 10	\$142.08	\$5.68	\$147.76*

*Answers may vary depending on how students round the amount. Using a spreadsheet to do the calculations, for example, may lead to a final answer of \$148.02.

The Compound Interest Formula Method: Write the formula for compound interest below when provided by your teacher. Solve the problem again using this formula.

$$A = P (1 + r/n)^{nt}$$

$$A = 100(1 + .04/1)^{1 \cdot 10}$$

$$A = 100(1 + .04)^{10}$$

$$A = 100(1.04)^{10}$$

$$A = 100 \times 1.48$$

$$A = \$148$$

Our Compound Interest Research and Problems

Directions: Conduct research to locate the interest rates paid on savings accounts at three financial institutions. Also, find out how often the interest is compounded. Use this information to write three unique interest rate problems for your classmates to solve. On a separate sheet of paper, create an answer key showing the correct answer and the steps you took to get that answer.

Interest Rates at Three Financial Institutions

Name of Financial Institution	Annual Interest Rate	Compounding Frequency

Problem 1

Problem 2

Problem 3