$ # $ + $ — $ % $ ¾ $ ~ $²

Money Math
Lessons for Life

Written by

Mary C. Suiter
Sarapage McCorkle
Center for Entrepreneurship and Economic Education
University of Missouri—St. Louis

Mathematics Consultant

Helene J. Sherman
University of Missouri—St. Louis

Cover Design by

Sandy Morris

Sponsored by

Citigroup Foundation
Department of the Treasury
Jump$tart Coalition for Personal Financial Literacy
University of Missouri—St. Louis

ISBN 978-0-9709279-1-0

$³ = $ ¢ $ ½ $ + $ ∞ $ ÷ $

The Secret to Becoming a Millionaire

Lesson Description	Students learn how saving helps people become wealthy. They develop "rules to become a millionaire" as they work through a series of exercises, learning that it is important to: (1) save early and often, (2) save as much as possible, (3) earn compound interest, (4) try to earn a high interest rate, (5) leave deposits and interest earned in the account as long as possible, and (6) choose accounts for which interest is compounded often. This lesson assumes that students have worked with percents and decimal equivalents.
Objectives	Students will be able to: 1. define saving, incentive, interest, and opportunity cost. 2. solve problems using interest rate, fractions, decimals, and percentages. 3. calculate compound interest. 4. explain the benefits of compound interest. 5. explain the opportunity cost of saving. 6. describe a savings bond investment.
Mathematics Concepts	percent, decimal, data analysis, number sense, solving equations, problem solving
Personal Finance Concepts	interest, interest rate, compounding, wealth, saving, savings, inflation, purchasing power
Materials Required	• copies of Activities 1-1 through 1-5 for each student • transparencies of Visuals 1-1 through 1-7 • calculator for each student • computers
Time Required	4 - 6 days

Procedure

Get Ready

1. Ask the following. Do you want to be a millionaire? What is a millionaire? Explain that a **millionaire** is a person who has wealth totaling one or more million dollars, noting that **wealth** is the total value of what a person owns minus what he or she owes. How could you become a millionaire? (*win the lottery, win a sweepstakes, inherit a million dollars, earn a high income*) Read the following scenario to the class.

Last week, Mrs. Addle told her students that they could become millionaires if they followed the rules she provided them. As a matter of fact, she guaranteed that if they followed her rules exactly, they would be millionaires in 47 years! Misha and the rest of her classmates thought that Mrs. Addle was crazy. If she had rules that would guarantee that someone could be a millionaire, why was she teaching seventh-grade math? Why wasn't she rich and retired? Why didn't she follow her own rules? Mrs. Addle told the students to go home and talk to their families about what she had said.

Misha went home and told her family what Mrs. Addle had said. Misha's mother knew a lot about money and financial matters. She just smiled at Misha and said that Mrs. Addle was correct. When Misha returned to class the next day, Mrs. Addle asked what the students' families said. Of the 25 students in Mrs. Addle's class, 20 students said that their parents and other family members agreed with Mrs. Addle. The other five students forgot to ask.

2. Explain that to learn more about being a millionaire, the students must review what a percent is. (Note: If needed, Visual 1-1 includes a review.)

3. Point out that in the story, there are 25 students in Misha's class, and 20 students discovered that their families agreed with Mrs. Addle. Ask the following questions. (Note: Step-by-step calculations are provided on Visual 1-2.)

   a. What percent of the students' families thought that Mrs. Addle was correct? (*80%*)
   b. What percent of the students failed to do their homework? (*20%*)

Get Going

1. Explain that you will share Mrs. Addle's secrets with them. When they become millionaires, they can donate money to the school's math department! Discuss the following.

a. How do you earn income? (*mow lawns, baby-sit, walk pets, rake leaves, do chores around the house*)
b. What do you do with your income? (*save it, spend it, save some and spend some*)
c. Why do you spend your income? (*to buy things that they want now, such as movies, food, and clothes*)
d. Why do you save your income? (*to buy things they want in the future*)

2. Explain that when people earn income, they can spend it or save it. When they are **spending**, they spend their money today for goods and services, but they give up the chance to use that money to buy goods and services in the future. When **saving**, they give up goods and services now to have other goods and services in the future. When people make choices, the highest-valued alternative choice that is given up is their **opportunity cost**. Read the following scenario.

   Next year, you want to take a family and consumer science class, a woodworking class, and a photography class. However, you only have room in your schedule for one of these three. Which would you choose? What would be your second choice?

3. Have several students share their first and second choices. Explain that their second choice is their opportunity cost—it is the highest-valued alternative class. When people save, the goods and services that they would have purchased now—the highest-valued alternative—represent their opportunity cost. When they spend now, their opportunity cost is goods and services they could have in the future.

4. Assign Activity 1-1. When they are finished, have students share answers. *(1. $360, $720, $1080, $1440, $1800, $2160; 2. The items they would have purchased each day with $2. This is their opportunity cost. 3. A + (B x 180) where A = previous year balance and B = the amount deposited each day; 4. Save more each day.*) Point out that students have different opportunity costs because their tastes and priorities are different.

5. Display Visual 1-3. Have students deduce what has changed in each case. They should develop Rules 1 and 2 to become a millionaire. (*In the first case, the saver is saving for a longer period; therefore, Millionaire Rule 1 is to start saving early. In the second case, the saver is saving $4 per day instead of $2 per day; therefore, Millionaire Rule 2 is to save more or to save as much as possible.*) Write the two rules on the board.

6. Discuss the following.

   a. How many of you have savings accounts in banks? (*Answers will vary.*)
   b. What are the benefits of placing your savings in a bank? (*The money is safe in the bank, and the bank pays interest.*)
   c. What is interest? (*Students may or may not know the exact definition of interest*.)

7. For homework, students who have savings accounts may bring in a statement from their savings accounts. Have all students look for ads in local newspapers and listen to television and radio ads about banks. Tell them to write down any information about interest rates.

Keep It Going

1. Assign Activity 1-2. Allow students to share their answers. (*1. $396, $831.60, $1310.76, $1837.84, $2417.62, $3055.38; 2. (A+360) + [(A+360) x .10] where A is the previous year's ending balance, or, 1.10 (A+360); 3. These amounts are higher because they earn interest on the deposit and interest on the interest earned in previous years.*)

2. Point out that the 10% amount that Uncle Mort pays is an incentive. An **incentive** is a reward that encourages people to behave in a particular way. This incentive encourages people to save and keep their savings. How much of an incentive did Uncle Mort pay the first year? (*$360 x .10 = $36*)

3. Explain that banks provide an incentive for people to save. When people make deposits to savings accounts, banks are able to use the money to loan to others. In return, the banks pay

Teaching Tip:

Show students how just a little bit of money can add up to a lot of cash with careful saving and investing. Ask your students to save their pocket change for one month.

Assuming your students save $1 a day, they should have $30 after one month of saving. If your students invest $30 worth of change every month for 10 years, how much money will they have if they invest their money in the following ways:

- ***Savings account with a 2% annual rate of return***
- ***Money market fund with a 5% annual rate of return***
- ***Mutual fund with a 9% annual rate of return***

What can your students buy with this money? Will it be enough to purchase a car when they turn 22?

interest to savers. **Interest** is a payment for the use of money. Bankers don't usually tell people that they will earn a specific sum of money. Savers are told the interest rate to be received. The **interest rate** is the annual interest payment on an amount expressed as a percentage. For example, a bank might pay a 4% interest rate on a savings account. Uncle Mort pays 10%.

4. Write the word "compounding" on the board. Ask students what they think this word means and how it applies to becoming a millionaire. Allow students to look the word up in the dictionary and in newspaper advertisements. Guide students to recognize that leaving interest earned on savings in the savings account so that the saver earns interest on the original deposit and interest on the interest is called earning **compound interest**. Have students develop Millionaire Rule 3 and write it on the board. (*Earn compound interest.*)

5. Explain that banks pay compound interest on savings, although it may not be as much as Uncle Mort pays. Discuss the following.

   a. Give examples of the interest rates local banks are paying from the statements, ads, and ad information brought from home. (*Answers will vary; however, the rates are likely to be much lower than the 10% that Uncle Mort pays.*)
   b. What would happen to the amount of accumulated savings if Uncle Mort paid only 5%? (*It would be less.*)

6. Display Visual 1-4. Explain that this table illustrates what would happen if a bank paid 5% interest compounded annually. Point out that comparing the savings results at 5% with the savings results for 10% (*$2571.12 at 5% compared to $3055.78 at 10%*) gives us another rule for becoming a millionaire. Discuss the following.
   a. Based on the comparison between accumulated savings with 5% interest and with 10% interest, what is the fourth rule of becoming a millionaire? (*Try to earn a high interest rate.*) Add this rule to the list on the board.
   b. What would happen to accumulated savings if the deposits and interest were left in the account, earning 5% interest for another six years? (*It would increase.*)

c. What is the fifth rule of becoming a millionaire? (*Leave deposits and interest in the account for as long as possible.*) Add this rule to the board.

7. Have students consider how they used their calculators to solve these problems. Guide them to develop a recursive equation such as [ANS + 0.05(ANS)] = ending balance for each year or [ANS + 0.05(ANS)] + 360 = beginning balance for each successive year.

8. Review the basic rules for becoming a millionaire. Write the following rules on the board.
   (1) Save early and often.
   (2) Save as much as possible.
   (3) Earn compound interest.
   (4) Try to earn a high interest rate.
   (5) Leave deposits and interest in the account as long as possible.

Graph It (Optional)

1. Tell students they will create four line graphs on the same set of axes. These graphs should show the amount of savings earned over time: (a) when saving $360 per year for six years in a bank, (b) when saving $360 for 10 years in a bank, (c) when saving $720 per year for six years, and (3) when saving $360 per year for six years at a 5% interest rate per year. They determine the dependent and independent variables and label the axes appropriately. They should retain these graphs for later use. They may use a graphing calculator, a computer, or paper and pencil to create the graphs.

2. Have students create a circle graph that shows the percent of total savings that resulted from deposits by the saver and the percent that resulted from compound interest when saving $360 per year for six years at a 5% interest rate. They may use a graphing calculator, a computer, or paper, pencil, and a protractor.

Check It — Assessment

Display Visual 1-4, and assign Activity 1-3 to each student. When students are finished, display Visual 1-5 so they can check their answers.

Keep Going

1. Have students refer to the savings account and advertisement information they brought from home. Discuss the following.

    a. Do the ads or account statements tell consumers that the interest rate is compounded annually? Semi-annually? Quarterly? (*Answers will vary.*)
    b. What do you think these terms mean? (*annually - once per year; semi-annually - twice per year; quarterly - four times per year*)
    c. How do you think semi-annual or quarterly compounding might affect accumulated savings? (*Answers may vary.*)
    d. How do you think quarterly interest payments would be calculated? (*Answers may vary.*)

2. Assign Activity 1-4 to groups of 4 or 5 students. Tell the groups to work together to complete the activity. Display Visual 1-6 to check and correct their answers.

3. Display Visual 1-4 again. Ask students to compare this table with the quarterly compounding table they completed. Discuss the following.

    a. What was the total amount deposited by the saver in each case? (*$2160*)
    b. How much interest was earned with interest compounded annually? (*$411.12*)
    c. How much interest was earned with interest compounded quarterly? (*$419.54*)
    d. How much additional interest was earned through quarterly compounding? (*$8.42*)
    e. What do you think would happen if interest were compounded daily? (*more accumulated savings at the end of the year*)

f. What is the sixth and final rule for becoming a millionaire? (*Deposit money in accounts for which interest is compounded most often.*) Add the rule to the list on the board.

4. Review all rules to becoming a millionaire.

   (1) Save early and often.
   (2) Save as much as possible.
   (3) Earn compound interest.
   (4) Leave deposits and interest in the account for as long as possible.
   (5) Try to earn high interest rates.
   (6) Choose accounts for which interest is compounded often.

Teaching Tip:

Be sure to tell your students that people put their savings in many places. Many people choose to invest their savings in stocks. Buying stocks means buying some ownership (equity) in a company. On average, over time, stocks have earned higher returns than savings accounts. Stockholders receive returns from dividends (a portion of business profit paid to stockholders) and capital gains (the amount of the sale of stock that exceeds the original price paid by the stockholder).

Tell students to look at the stock tables in the financial pages of a newspaper. Point out that the yield (Yld.) is the return from dividends stated as a percentage. Have students compare the dividend yield to interest rates on savings accounts. Then, point out that most stock investors are interested in capital gains; that is, the increased value of the stock from the time it was purchased. Have students research how much stocks, on average, have increased over time. Information on the growth of the S&P 500 can be found by searching for S&P 500 History on the internet.

Compute It

1. Divide students into pairs. Explain that their task is to discover combinations of interest rate, deposit, and years of savings that will lead to the goal of becoming millionaires. They may use a financial calculator, spreadsheet financial functions on the computer, or use a financial calculator on a bank's website.

2. Once they have decided what program to use, they should enter various combinations of deposit amounts, interest rates, years of saving, and how often interest is compounded and note the impact on accumulated savings.

3. Have student pairs share the combinations with which they would be happiest. Discuss whether these combinations are realistic with questions such as "Is it reasonable to expect an interest rate of 20%?" or "What amount of monthly income do you think a person must earn in order to save $3000 per month?"

Wrap It Up

Discuss the following to highlight important information.

1. What does a percentage represent? (*some part of a hundred*)

2. How can 55% be expressed as a decimal? (*.55*) a fraction? (*55/100*)
3. What is interest? (*payment for the use of money*)
4. What is an interest rate? (*the annual interest payment on an account expressed as a percentage*)
5. What is compounding? (*paying interest on previous interest*)
6. What is saving? (*income not spent today to be able to buy goods and services in the future*)
7. What is opportunity cost? (*the highest-valued alternative that is given up*)
8. What is the opportunity cost of saving? (*goods and services given up today*)
9. What are some rules about saving that can help you become a millionaire? (*Start saving early and save regularly. Save as much as you can. Earn compound interest. Leave the deposit and interest earned in the account as long as possible. Try to earn a high interest rate. Seek savings options that compound interest often.*)

Check It/Write It — Assessment

Explain that students' work with the computer or calculator helped them see the impact of the various rules on the quest to become a millionaire. Divide the students into small groups and tell them to answer the following questions in writing, as a group.

1. What happens to accumulated savings if the deposit amount increases? (*Savings would increase. Saving larger amounts generates greater savings in the future.*)
2. What happens to accumulated savings if the interest rate increases? (*It would increase.*)
3. What happens to accumulated savings if the number of compounding periods per year increases? Why? (*It would increase because every time compounding occurs, the saver is earning interest on interest earned.*)
4. What happens to accumulated savings if the number of years increases? (*It would increase*.)
5. What is the key to becoming a millionaire? (*Save as much as possible for as long as possible earning a high interest rate that is compounded frequently*.)

Going Beyond — A Challenge Activity

1. Remind students that one of the important rules about saving is to try to earn a high interest rate. To do that, savers must investigate various savings options available. If people save in a piggy bank, they don't earn any interest on their savings, and it isn't particularly safe. If people place their savings in a savings account at the bank, they earn interest and it is usually safe because of deposit insurance. However, the interest rate is usually lower on these accounts than some other savings options.

2. Explain that people can put their money in a certificate of deposit or CD. A certificate of deposit is a savings account that pays higher interest than a regular bank savings account. However, when people put their money in a CD, they promise to leave the savings in the account for a certain amount of time, such as six months, a year, or five years.

3. Explain that many people save by buying savings bonds issued by the United States government. When people buy a savings bond, they are lending money to the government to help finance programs or projects. Savings bonds come in different denominations, such as $50, $100, or $500. They are considered to be a very safe way to save money; that is, they are virtually risk-free.

4. Point out that the newest type of U.S. savings bond is the I Bond. I Bonds are inflation-indexed and designed for savers who want to protect themselves from inflation. Define **inflation** as an increase in the average level of prices in the economy. (A simpler definition is an increase in most prices.)

5. Explain that inflation reduces the purchasing power of savings. **Purchasing power** is the ability to buy things with an amount of money. People save because they want to buy things in the future. If they can buy a certain amount of things with $1000 today, people want to be able to buy at least the same things in the future with their savings. Discuss the following.

a. If you saved $1000 today to buy a $1000 computer next year, would you be able to buy it if your savings earned 5% and the price of the computer stayed the same? (*Yes because you'd have approximately $1050 to buy the $1000 computer.*)
b. If you saved $1000 today to buy a $1000 computer next year, would you be able to buy it if your savings earned 5% and the price of the computer increased 3%? (*Yes because you'd have approximately $1050 to buy the computer that would cost $1030.*)
c. If you saved $1000 today to buy a $1000 computer next year, would you be able to buy it if you savings earned 5% and the price of the computer increased 7%? (*No because you'd have approximately $1050 to buy the computer that would cost $1070.*)

6. Summarize by pointing out that inflation reduces the purchasing power of accumulated savings. If people's savings are going to have the same purchasing power in the future, then the interest/earnings on the savings must be equal to or greater than the inflation rate. For example, if the inflation rate is 4%, then the interest rate must be at least 4% so the saver could still be able to buy the same amount of things in the future with the money (principal).

7. Explain that this is exactly what the inflation-indexed I Bond is designed to do—protect the purchasing power of an individual's principal AND pay fixed earnings. The I Bond interest rate has two parts: a fixed interest rate that lasts for 30 years and an inflation rate that changes every six months. For example, an I Bond may pay a fixed interest rate of 2%. Inflation may be measured at an annual rate of 3% for the first six months and 2.5% for the second half of the year. The combined interest rate for the first six months would be 2% + 3%. The combined interest rate for the second half of the year would be 2% + 2.5%.

8. Give each student a copy of Activity 1-5, and assign. Display Visual 1.7 to check answers.

Check It — Assessment

1. Divide the students into small groups. Assign each group a different savings instrument. For example, money market funds, treasury bonds, treasury bills, savings accounts, and certificates of deposits. Ask students to do some research to answer the following questions.

    a. What is this savings instrument called?
    b. Does it require a minimum balance?
    c. Are there fees or penalties if you withdraw your money before a specified time?
    d. Is this savings method more or less risky than savings bonds?
    e. What is the interest rate on this savings instrument?
    f. Is interest compounded annually, semi-annually, quarterly, daily?
    g. How is the purchasing power of the savings protected from inflation?

2. Tell students that each group must prepare a brief presentation in which they compare the advantages and disadvantages of the savings instrument they researched with the advantages and disadvantages of an I Bond.

It's Never Too Late

Saving is income not spent now. The accumulated amount of money saved over a period of time is called savings. Suppose there are 180 days in a school year, and you begin saving $2.00 each day in your bank beginning in the 7th grade. You save all the money each year. Your bank fills up and you start saving in an old sock. Answer the following questions.

1. Calculate the amount of savings that you have at the end of each year. Please show your work on the back of this sheet. Record your answers for each year in the "SAVINGS" column of the table below.

GRADE LEVEL	SAVINGS
7th grade	
8th grade	
9th grade	
10th grade	
11th grade	
12th grade	

2. What would you have to give up each day in order to save $2.00? What do we call the item you would give up?

3. Write a formula to represent the calculations that you made for each year.

4. According to the formula, what will happen if you increase B?

Uncle Mort Makes It Better

Suppose that on the first day of eighth grade you receive the following message from Uncle Mort. "I am proud that you've been saving. I will pay you 10% on the balance that you saved in the seventh grade and 10% on the balance of your saving at the end of each year." You have $360 in your bank. Answer the following questions.

1. Calculate how much money you will have at the end of each year. Show your work on the back of this page. Write your answers in the "SAVINGS" column in the table below.

GRADE LEVEL	SAVINGS
7th grade	
8th grade	
9th grade	
10th grade	
11th grade	
12th grade	

2. Write a formula to represent the amount of savings accumulated at the end of each year.

3. How do the amounts you've calculated compare to your previous savings calculations? Why?

The Miracle of Compounding

1. Write the basic percent equation that you have used in this lesson to solve for the part of the whole. Use the variables a, b, and c, where a is the percent, b is the whole, and c is the part of the whole.

2. Read the following sentences. Write an appropriate formula to use to solve for the percent of allowance spent OR the amount spent.

   - Mary received her weekly allowance of $10.
   - Mary used two one-dollar bills and two quarters.
   - Mary spent one-fourth of her allowance.

3. Answer the following questions, using the information on the overhead projector.

   a. How much did the total amount of savings increase from seventh grade until graduation from high school?

   b. How much did the saver actually deposit in the account during the 6 years?

   c. Rewrite the percent equation from #1 to find the percent of the whole.

   d. Use the equation in (c) to find the percent of the total accumulated savings that savers deposited.

   e. What amount of the savings accumulated as a result of interest and compounding?

   f. What percent of the total accumulated savings is this amount?

   g. Approximately 16% of the total amount of the savings accumulated because of interest earned on savings, even though the account only earned 5% interest per year. Why did this happen?

   h. What would happen if the saver kept the money in the account for ten more years?

Confounding Compounding

Uncle Mort has taught you a lot about saving. Now he's encouraging you to open a savings account. He says that it's best to have interest compounded as often as possible. You still aren't too certain what compounded more than once a year means or how it is done. Uncle Mort sends you an e-mail message with the following example.

> Suppose that a bank offers a 5% interest rate, compounded semi-annually. At the end of six months, the bank will multiply your balance by ½ the interest rate and add that amount to your account. So, if you have $180 in the bank after six months, the bank will add $4.50 to your account. Your new balance will be $184.50. At the end of the next six months, if you still have $184.50 in your account, the bank will add $4.61 to your account. Your new balance will be $189.11.

1. What decimal amount would you use to calculate quarterly interest?

2. Suppose that the bank pays a 5% interest rate, compounded quarterly. You deposit $360 at the beginning of each grade. Complete the following table to calculate the total savings you'll have at the end of each year. The first two rows are completed for you.

Grade Level	Deposit Plus Previous Balance	First Quarter Interest	Subtotal	Second Quarter Interest	Subtotal	Third Quarter Interest	Subtotal	Fourth Quarter Interest	Accumulated Savings
7th	**$ 360.00**	**$4.50**	**$364.50**	**$4.56**	**$369.06**	**$4.61**	**$373.67**	**$4.67**	**$ 378.34**
8th	**738.34**	**9.23**	**747.57**	**9.34**	**756.91**	**9.46**	**766.37**	**9.58**	**775.95**
9th									
10th									
11th									
12th									

3. How many dollars were deposited during the six years? _____

4. How much interest was earned? _____

Mary's Dilemma

Mary Andrews received a $100 I bond for her birthday. Her uncle bought the electronic savings bond at the government's TreasuryDirect.gov website. He sent it to a special account that Mary's parents set up for her.

Her uncle explained that the fixed interest rate on the bond is 2.0%. Inflation was recently measured at an annual rate of 2.6%, and economists predict that it will stay the same for the rest of the year. Interest is paid every month, but earnings are compounded semi-annually. With her parents' help, Mary can check her I Bond every six months to see how much interest she has earned on her bond.

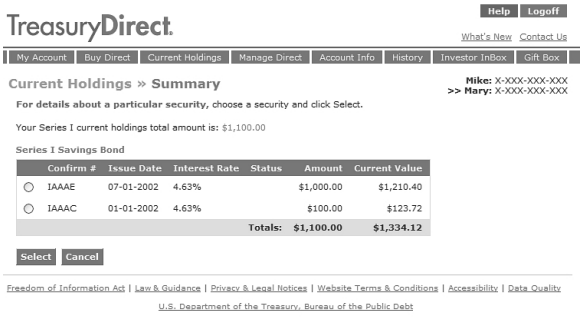
Mary is very confused by all this jargon. All she wants to know is what the bond will be worth on her next birthday. Using what you have learned about semi-annual compounding and I Bonds, help Mary determine the value of her bond at the end of one year.

Answer the following questions on the back of this handout.

1. What is the combined interest rate?

2. Use the combined interest rate to estimate how much interest Mary would earn that year.

3. For the first half of the year, how much interest will Mary earn from the fixed interest rate?



4. For the first half of the year, how much interest will Mary earn from the inflation rate?

5. How much will her bond be worth after six months?

6. For the last half of the year, how much interest will she earn from the fixed interest rate?

7. For the last half of the year, how much interest will Mary earn from the inflation rate?

8. How much will her bond be worth after the second six months?

9. How much interest will Mary's bond earn for the year?

10. Why does the interest earned exceed the amount you estimated in #2?

- The word percent means "per hundred."
- A percent is like a ratio because it compares a number to 100.
- A percent is a part of a whole.
- A number followed by a percent symbol (%) has a denominator of 100. This means that it is easy to write as a fraction or a decimal. For example, if you earned a 90% on your last test, you also earned 90/100 that is the same amount as the decimal .90.

To find the percent, we use the following equation.

$$\mathbf{a\% = c \div b} \text{ and } \mathbf{a\% \cdot b = c}$$

where **a** is the percent,

b is the whole, and

c is the part of the whole.

Addle's Answers

- **What percent of the students' families thought that Mrs. Addle was correct?**

  In this example, 25 is the whole and 20 is the part of the whole, so we know **b** and **c**. Now, we must solve for **a**.

  $$a \div 100 = 20 \div 25$$

  What percent of 25 is 20?

  $$a\% \cdot 25 = 20$$
  $$(a \div 100) \cdot 25 = 20$$
  $$.25a = 20$$
  $$a = 20 \div .25$$
  $$a = 80\%$$

  80% of the students learned that their families agreed with Mrs. Addle.

- **How can 80% be stated as a decimal?**

  $80\% = 80 \div 100 = .80$ *or* $8 \div 10 = .8$

- **What percent of the students failed to do their homework?**

  - The whole is represented by 100%.
  - The part of the whole that did the homework is 80%, so 20% didn't.
    or, $(a/100) \cdot 25 = 5$,
  - so that $.25a = 5$,
  - so that $a = 5 \div .25$,
  - therefore, a = 20 or 20% of the students didn't complete the homework.

- **How can 20% be stated as a decimal?** (*by converting 20% to 20/100 or 2/10 which equals 0.2*)

Millionaire Rules 1 and 2

Grade Level	Accumulated Savings
3rd grade	$ 360
4th grade	720
5th grade	1080
6th grade	1440
7th grade	1800
8th grade	2160
9th grade	2520
10th grade	2880
11th grade	3240
12th grade	3600

Millionaire Rule 1:

Grade Level	Accumulated Savings
7th grade	$ 720
8th grade	1440
9th grade	2160
10th grade	2880
11th grade	3600
12th grade	4320

Millionaire Rule 2:

Compound Interest

A	B	C	D	E
Year	Beginning Amount	Interest Rate (5%)	Annual Interest	End-of-Year Amount
7th grade	$ 360.00	0.05	$ 18.00	$ 378.00
8th grade	738.00	0.05	36.90	774.90
9th grade	1,134.90	0.05	56.75	1,191.65
10th grade	1,551.65	0.05	77.58	1,629.23
11th grade	1,989.23	0.05	99.46	2,088.69
12th grade	2,448.69	0.05	122.43	2,571.12

Answers to Activity 1-3

1. a% · b = c; a = percent; b = whole; c = part of whole

2. 25% · $10 = $2.50

3a. $2,571.12 - $360 = $2,211.12

3b. $360 · 6 years = $2,160

3c. a% = c ÷ b

3d. $2,160/$2,571.12 = 84%

3e. $2,571.12 - $2,160 = $411.12

3f. $411.12/$2,571.12 = 16%

3g. The interest was compounded. The saver earned interest on both deposits and accumulated interest.

3h. The amount of savings would increase even more.

Answers to Activity 1-4

1. 0.05/4 = .0125
2.

Grade Level	Deposit Plus Previous Balance	First Quarter Interest	Subtotal	Second Quarter Interest	Subtotal
7th	$ 360.00	$4.50	$364.50	$4.56	$369.06
8th	738.34	9.23	747.57	9.34	756.91
9th	1135.95	14.20	1150.15	14.38	1164.53
10th	1553.83	19.42	1573.25	19.66	1592.91
11th	1992.98	24.91	2017.89	25.22	2043.11
12th	2454.51	30.68	2485.19	31.06	2516.25

Grade Level	Third Quarter Interest	Subtotal	Fourth Quarter Interest	Accumulated Savings
7th	$4.61	$373.67	$4.67	$ 378.34
8th	9.46	766.37	9.58	775.95
9th	14.56	1179.09	14.74	1193.83
10th	19.91	1612.82	20.16	1632.98
11th	25.54	2068.65	25.86	2094.51
12th	31.45	2547.70	31.84	2579.54

3. $2160.00

4. $419.54

Answers to Activity 1-5

1. $2.0\% + 2.6\% = 4.6\%$

2. $\$100 \cdot 4.6\% = \$100 \cdot .046 = \$4.60$

3. $2.0\% \div 2 = .02 \div 2 = 0.01$; $\$100 \cdot .01 = \$1.00$

4. $2.6\% \div 2 = .026 \div 2 = .013$; $\$100 \cdot .013 = \$1.30$

5. $\$100 \cdot [1 + (4.6\% \div 2)]$
   $\$100 \cdot [1 + (.046 \div 2)]$
   $\$100 \cdot 1.023\% = \$102.30$

6. $\$102.30 \cdot .01 = \$1.02$

7. $\$102.30 \cdot .013 = \$1.33$

8. $\$102.30 \cdot 1.023 = \$104.65$

9. $\$104.65 - \$100 = \$4.65$

10. Because of compounding, in the second half of the year, Mary earns interest on her principal AND on the interest earned in the first half of the year.