

Lesson/Unit Title	Millionaire In The Making – Risks & Rewards
Day(s)	5-6 days
Grade Levels	10-12
Curriculum Areas	Entrepreneurship Personal Finance
Website(s)	<p>http://lei.ncee.net/ NCEE website for “Learning, Earning and Investing” book. Although site promotes the sale of the book, some of the links connect you to free activities, resources, etc.</p> <p>http://lei.ncee.net/interactives/compound/compound_teacherguide.pdf Teacher’s Guide to Compound Interest Calculator</p> <p>http://millionairetv.com/ Website from the popular television show—a fun way to introduce unit by playing the online game!</p> <p>http://biz.yahoo.com/special/400_05.html Forbes magazine list of America’s wealthiest!</p> <p>http://whatpeopleearn.parade.com/index.html Play the online “Salary Showdown” interactive earnings game from Parade magazine’s March 13, 2005 article (www.parade.com, then click on “Archives”)</p>
Teacher Resources	<ul style="list-style-type: none"> • “Who Wants To Be a Millionaire?” online game • PowerPoint “Why Save?” • PowerPoint “Who Wants To Be A Millionaire?” • “<i>Learning, Earning, and Investing-High School</i>,” National Council on Economic Education, 2004 <ul style="list-style-type: none"> ◦ Lesson 1- Why Save? ◦ Lesson 12 – Building Wealth Over the Long Term • “<i>Mathematics & Economics Connections for Life</i>” Grades 9-12, National Council on Economic Education, 2001 <ul style="list-style-type: none"> ◦ Lesson 14 – The Mathematics of Savings • “<i>Practical Business Math Procedures</i>” 8th Edition, McGraw-Hill <ul style="list-style-type: none"> ◦ Chapter 12 – Compound Interest and Present Value • (optional) Calculator to perform mathematical applications
Unit Overview	<p>In the unit, students will become familiar with different types of investments, as well as risks and rewards involved with investing. At the unit’s completion, students will be able to:</p> <ul style="list-style-type: none"> • Identify advantages/disadvantages of types of investments • Identify various reasons why people save • Demonstrate and apply the formulas for calculating simple and compound interest • Apply the “Rule of 72” to determine how much time it takes for a given amount of savings to double. • Compare Present Value to Future Value for different types of investments

	<p>Daily Lesson Overview:</p> <p>Day 1: Is becoming a millionaire as easy as the game?</p> <p>Day 2: Why Save?</p> <p>Day 3-4: The Mathematics of Saving</p> <p>Day 5: Risk vs. Reward (Return) / Building Wealth Over the Long Term</p> <p>Day 6: Unit Assessment</p>
<p>Nebraska Frameworks Essential Learnings</p>	<p>Business Administration (Pages 45-46)</p> <p>Economics and Personal Finance BE 12.5.1</p> <p>Students will understand basic economic and financial principles in order to make wise domestic and global economic decisions related to their personal financial affairs, the successful operation of organizations and the economic activities of the country. They will demonstrate competency by applying economic and personal financial reasoning to <i>individual</i>, business and government practices.</p> <p>Example Indicators -- Personal Finance</p> <p><i>Personal Decision Making/Resource Management</i> – use a sound decision-making process as it applies to the roles of consumers, workers and citizens</p> <p><i>Savings and Investing</i> – evaluate saving and investment options to meet short- and long-term goals, including knowledge of present and future value of money.</p>
<p>Link to Nebraska Standards</p>	<p><u>Reading/Speaking/Listening</u></p> <ul style="list-style-type: none"> Students will locate, evaluate, and use primary and secondary resources for research (12.1.2) <p><u>Mathematics</u></p> <ul style="list-style-type: none"> Students will justify solutions to mathematical problems. (12.2.2) Students will perform estimations and computations of real numbers mentally, with paper and pencil, and with technology. (12.2.3)
<p>NBEA Curriculum Standards</p>	<p>Personal Finance: (Pages 63-67)</p> <p>IV. Saving and Investing</p> <p>Achievement Standard: Evaluate savings and investment options to meet short- and long-term goals</p> <p>Level 1: Performance Expectations</p> <ul style="list-style-type: none"> Describe how and why people save Identify the opportunity cost of saving Differentiate between saving and investing Distinguish between simple and compound interest <p>Level 2: Performance Expectations</p> <ul style="list-style-type: none"> Describe the advantages/disadvantages of different savings and investing plans Identify risk/return trade-offs for saving and investing Analyze the power of compounding and the importance of starting early in implementing a plan of saving and investing

National Economics Standards	Standard 2: Marginal costs/Marginal benefits Standard 4: Role of Incentives
National Personal Finance Standards	Standard 4: Saving and Investing
Nebraska Math Standards	<p>12.2 Computation/Estimation</p> <p>12.2.1 Solve theoretical and applied problems using numbers in equivalent forms</p> <p>12.2.2 Justify solutions to mathematical problems</p> <p>12.2.3 Perform estimations and computations of real numbers, mentally, with paper and pencil, and with technology</p> <p>12.4.7 Students will apply deductive reasoning to arrive at a conclusion.</p>
Teaching Strategies, Procedures and Activities	<p><u>Day 1</u> Is becoming a millionaire as easy as the game? - Students will identify famous millionaires (Warren Buffet, Bill Gates, Michael Dell, Sam Walton, famous athletes and entertainers), how they became millionaires (Hard work? Inheritance? Entrepreneurial efforts? Special talents or skills? Luck?), and play “Who Wants To be a Millionaire?” online.</p> <p>Step 1: Bell Ringer: “Name a famous millionaire and the source of their wealth”</p> <p>Step 2: What do people <i>really</i> earn? Play “Salary Showdown” online! http://whatpeopleearn.parade.com/index.html</p> <p>Step 3: Is acquiring wealth as easy as winning a game? winning at gambling or lottery? Let’s play “Who Wants To Be a Millionaire?” online game! http://millionairetv.com/</p> <p>Step 4: Closure – Ask students what they think should be done with the “winnings” from the game. How can they put that money to work for them?</p> <p><u>Day 2</u> Why Save? - Students will define saving and identify reasons why people save. Students will be able to apply the formula for calculating simple interest and compare compound interest to the same time period.</p> <p>Step 1: Bell Ringer - Read and highlight a copy of, “<i>Saving, not spending, is the first step on the way to millionaire’s club</i>,” Jonathan Wegner, Sunday World Herald, June 11, 2006 www.omaha.com (must register online to access archives)</p> <p>Step 2: PowerPoint – “Why Save?” Use Lesson 1 from <i>Learning, Earning and Investing-High School</i> from the National Council on Economic Education, 2004. (See attached “Why Save?” PowerPoint). Discuss and complete attached Activity 1 – “A Conversation with Friends.”</p>

Step 3: Complete the “Bean Counting” activity (see below) from Lesson 1 – Why Save? Page 3 of Learning, Earning and Investing-High School from the National Council on Economic Education, 2004 to compare simple interest to compound interest. Continue using “Why Save?” PowerPoint to demonstrate how interest is calculated.

Step 4: Complete several example problems in class
Example 1: David deposited \$50 in a savings account for 3 years at an annual interest rate of 4%. What is David’s simple interest?

$$\text{Interest (I)} = \text{Principal (P)} \times \text{Rate (R)} \times \text{Time (T)}$$

$$\mathbf{\$6.00} = \$50 \times .04 \times 3$$

Example 2: If the bank where David has his money compounded his interest yearly at the same 4% rate, how much interest would he earn at the end of six years?

	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>
	\$50.00	\$52.00	\$54.08
	<i>X .04</i>	<i>X .04</i>	<i>X .04</i>
<i>Interest</i>	\$ 2.00	\$ 2.08	\$ 2.16
<i>Beginning Balance</i>	+50.00	+52.00	+54.08
<i>New Principal</i>	\$52.00	\$54.08	\$56.24

$$\text{Interest earned} = \text{Year 3 Balance } \$56.24 - \text{Initial investment } \$50.00 = \mathbf{\$6.24 \text{ interest earned}}$$

Step 5: Assignment 1: Simple vs. Compound Interest worksheet (see below). Students will complete several problems to practice their skill at calculating different investment situations for simple interest earning and compound interest earnings for a yearly basis.

Day 3 – The Mathematics of Savings – Students will continue to compare types of investments and how they can grow over time. Students will be introduced to the Rule of 72 and use the rule to determine how much time it will take for their investments to double.

Students will apply mathematics concepts and processes to situations involving personal savings:

- Explain that, because of interest compounding, funds saved today by a 22 year-old will accrue to sums that are multiples of the original investment upon reaching retirement age
- Explain the mathematics that underlies the mechanical calculations of such things as the future value of savings and the future value of an annuity.

Step 1: Bell Ringer – “Pennies Warm-up-Activity 14.1” from Mathematics & Economics: Connections for Life – Grades 9-12 (See Below)

Another Problem: Yesterday, David invested his money at 4% for six years. After 3 years, interest rates raise to 5%, what will his new interest earnings be at the end of six years?

Interest (I) = Principal (P) X Rate (R) X Time (T)

$$\$6.00 = \$50 \quad X \quad .04 \quad X \quad 3 \text{ (Years 1, 2, 3)}$$

$$\$7.50 = \$50 \quad X \quad .05 \quad X \quad 3 \text{ (Years 4, 5, 6)}$$

Interest after 6 years = \$6.00 + \$7.50 = \$13.50

Step 2: Continuing with the slides in the “Why Save?” PowerPoint, demonstrate how interest works by introducing the “Rule of 72”

Example 1: Compound Interest at 4%

To Find out how many years it will take for an investment to double at this rate, use the following formula:

$$72 / \text{Rate} = \text{Years to Double}$$

$$72 / 4 = \mathbf{18 \text{ Years}}$$

Example 2: Compound Interest at 10%

$$72 / 10 = \mathbf{7.2 \text{ Years}}$$

What does that tell you about interest rates? The higher the interest rate, the less time it will take to double the investment.

Is a higher interest rate a safe investment? No. Usually safer investments have a lower return. Safer investments such as savings accounts pay very little interest, but there is little risk for loss of that investment.

Step 3: Continue with the slides in the “Why Save?” PowerPoint to define Present Value and Future Value.

Step 4: Using Lesson 14 from “Mathematics and Economics: Connection for Life”, National Council on Economic Education, Visual 14.2, Discuss Future Value and Present Value and demonstrate how to calculate each. Pass out Day 3 – Handout

The future value of savings formula is that which is used by a calculator to compute the amount to which a given amount of savings invested today at an interest rate of “r” will accumulate in “n” years time. Another formula in Visual 14.2 is used to calculate the future value of an annuity after “n” years when a constant monthly payment is made and invested at a monthly interest rate of “r/12”. These formulas underlie the financial computations that are made mechanically by financial calculators and computers.

Provide each student with a copy of Activity 14.1 from Lesson 14” from Mathematics and Economics: Connection for Life, National Council on Economic Education. This activity looks at the benefit of making a commitment to saving at an early age. Students will find that if they are able to invest \$5000 at a 9 percent rate of interest at age 22 (the age at which a typical person might start their first year of full-time employment after earning a 4-year degree), they can expect a sum of \$241,636 when retiring at age 67.)

Step 5: Assignment 2 – Part s 1& 2: Students will calculate their future earnings for various investment situations.

Day 4 Mathematics of Saving (cont.) - Students will be able to explain the difference between present value and future value and calculate the growth in an investment.

Step 1: Bell Ringer – Students will choose a local financial institute on-line to check current interest rates on savings accounts.

Step 2: Go over the Assignment 2 Parts 1 & 2 problems in class to review how to use the Future Value of Savings formula to calculate investment accumulations.

Step 3: Assignment 2 – Part 3: Complete a case scenario calculating and explaining expected savings at retirement age. (Activity 14.2 from “Mathematics & Economics – Connections for Life” Grades 9-12, National Council on Economic Education)

Day 5 Risk vs. Reward & Building Wealth Over the Long Term- Students will be able to explain the time value of money. Students will be able to evaluate various investment opportunities to determine the risk level involved with each situation and what gains they might have by taking the risk.

Step 1: Bell Ringer - Present students with this scenario- You have \$4,000 that you’ll need six months from now. What will you do with it? Have students work with a partner to come up with four investment options and list them in order from lowest risk to highest risk.

Step 2: Continue with “*Why Save*” PowerPoint – beginning at slide 22– Define the “Time Value” of money and how it affects investments.

Step 3: Using the PowerPoint presentation, discuss the “*Three Rules for Building Wealth*” and how one could become a millionaire over the long term (*Lesson 12 from Learning, Earning and Investing, NCEE*)

	<p>Step 4: Assignment 3 –“ <i>Risk vs. Reward</i> “ - Students will analyze various investment situations and determine which investment they would make in terms of risk and return trade-off.</p> <p>Day 6 Unit Assessment - Students will demonstrate their knowledge of savings, simple vs. compound interest, present value vs. future value, risk</p> <p>Step 1: Bell Ringer – Play <i>The Millionaire Game</i> PowerPoint as a review for this unit (attached). Students will have 15 “millionaire in the making” questions to answer as a review of the entire unit.</p> <p>Step 2: Assessment – Students will take an assessment over the Investment unit including multiple choice question and three essay questions.</p>
<p>Assignments</p>	<p>Assignment 1: Interest Calculation Worksheet –Students will practice calculating simple and compound interest</p> <p>Assignment 2: Part 1 - Saving for Your Future – Students will use the future value of savings formula to calculate their investment accumulation after various periods of time.</p> <p>Assignment 2: Part 2 – Who Wants To Be a Millionaire? This exercise asks students to imagine making a commitment to investing \$300 each month in a retirement account for 45 years. This could involve personal retirement contributions of \$150 per month (\$1800 a year) that are matched by an employer</p> <p>Assignment 3: Risk vs. Reward – Students will analyze various investment situations to determine the risk involved and what the trade-off or return might be for the investment.</p>
<p>Math Applications</p>	<p>Day 2: Students will understand what part of their income can be used for saving:</p> <p>Disposable income = consumption + saving Saving = disposable income - consumption</p> <p>Students will learn to calculate simple interest:</p> <p>Interest (the amount of interest received on saving) = <i>Principal</i> (amount of initial saving) x <i>Rate</i> (of interest being paid on saving) x <i>Time</i> (in years)</p> <p>Calculating Compound Interest <i>Step 1:</i> Calculate the simple interest and add it to the principal. Use the new principal amount for the next period (yearly, quarterly, daily) to calculate interest. Repeat for the total number of periods.</p>

Step2: Compound amount – Original Principal = **Compound Interest**

Day 3: Mathematics of Saving

Students will calculate the amount of time it will take to double their savings.

Rule of 72

72 divided by the rate (of interest being paid on savings) = **the number of years it will take for savings to double** when interest is allowed to compound!

Days 3 and 4: Students will apply the formula for Future Value of Savings to calculate earnings from savings.

The Future Value of Savings

The *Future Value (FV)* of savings “*n*” years from today, when the *Present Value (PV)* of current savings is deposited today at an annual interest rate of “*r*”

The Future Value formula is expressed as:

$$FV = PV \cdot (1 + r)^n \quad \text{where } r \text{ is in decimal form.}$$

Future Value of an Annuity

Future Value =

$$\text{Constant Annual Payment} \cdot \frac{\{(1 + \text{interest rate})^n - 1\}}{\text{interest rate}}$$

$$FV = PMT \frac{\{(1 + r)^n - 1\}}{r}$$

FV is *future value*, *PMT* is *constant annual payment*, *r* is the *interest rate* expressed in decimal form, and *n* is number of years in the future for which the computation is being made.

Assessment	Lesson/Unit Evaluation Criteria		Points
	Bell Ringers		15
	Participation		10
	Assignment 1: Interest Calculation Worksheet		10
	Assignment 2: Part 1&2 - Savings for Your Future		20
	Assignment 2: Part 3 - Who Wants to Be A Millionaire?		20
	Assignment 3: Risk vs. Reward		15
	Assessment		35
	Unit Possible Points		125

	<p>Grading Scale:</p> <p>A = 90-100% B = 80- 89% C = 70- 79% D = 60- 69% F = 0- 59%</p> <p>Instructor comments:</p>
Teacher's Name:	Lisa Fox
School:	Hitchcock County Unified School District, Trenton, NE

Millionaire in the Making Unit

Day 2 - Step 2 “Why Save” PowerPoint – Lesson 1, Activity 1 From Learning, Earning, and Investing, National Council on Economic Education

“A Conversation among Friends”

Name _____

Amanda, Barbara, Duane, Joshua and Taylor are talking about money. Their teacher, Ms. Barnett, has asked them to think about saving money. Read their conversation. Then answer the questions that follow.

Joshua: Last week I bought this really cool basketball jersey for \$28. The week before, the price had been \$35. I saved \$7.

Amanda: But Josh, you spent \$28. I don't think this is what Ms. Barnett means by saving.

Duane: I think Ms. Barnett means that saving is not spending our money now.

Taylor: Yeah, I think Duane is right. But it is SOOOO hard to save! I don't really have very much money. And I want a lot of stuff.

Barbara: Well, my parents want me to save some of my allowance. They said that if I have \$100 saved at the end of the year, they would add \$100 to it.

Amanda: Wow! That's pretty generous. Are you going to do it?

Barbara: I'm going to try. I started a savings account at the bank.

Duane: I don't have a savings account, but I try not to spend all the money I have because I want to buy a nice Christmas present for my mom.

Joshua: I've heard that you get interest on money you put into a savings account at a bank. Is that right, Barbara?

Barbara: Yeah, I think so, but I don't know much about it.

Taylor: I really do want a new car, and my parents said I have to save my money for it. They won't buy it for me.

Amanda: I want a digital camera, and my parents told me the same thing.

Joshua: I just don't know how I can save any money. There are too many things to spend my money on now. I don't know if I want to give up spending.

Duane: You're right, Josh. It's hard to give up spending, especially when we don't have much money just now.

Taylor: I heard some guy on TV the other day say that people should pay themselves first. I wonder what he meant by this.

QUESTIONS FOR DISCUSSION

In your small group, choose a representative to take notes and report the results of your discussion to the class. Then discuss and record your responses to the following questions.

A. What do you think is meant by this statement: “Pay Yourself First?”

B. What are some reasons why people save?

Millionaire in the Making Unit
Day 2 - Step 3 Bean Counting Activity

Simple vs. Compound Interest – Bean Counting Activity

INTEREST EARNED ON AN INITIAL \$100 SAVED AT 8% INTEREST RATE

Year	Simple Interest Adds	Total Saving Using Simple Interest	Compound Interest Adds	Total Saving Using Compound Interest
1	8.00	108.00	\$8.00	\$108.00
2	8.00	116.00	9.00	117.00
3	8.00	124.00	9.00	126.00
4	8.00	132.00	10.00	136.00
5	8.00	140.00	11.00	147.00
6	8.00	148.00	12.00	159.00
7	8.00	156.00	12.00	171.00
8	8.00	164.00	14.00	185.00
9	8.00	172.00	15.00	200.00

Objective and Directions: Using the data from the above table, the class will calculate the accumulation of simple and compound interest.

1. Divide the class into two groups – Simple Group and Compound Group
Have each group appoint an accountant.
2. Give each group 200 beans and a jar. 1 Bean = \$1.00
3. Have each group put 100 beans in their jar.
4. With the remaining beans, the Simple Group should count out 9 groups of 8 beans. The Compound Group should count out 9 groups of beans according to the chart above or by what is on the PowerPoint Screen for this lesson. (Year 1 = 8 bean; Year 2 = 9 beans; and so on through Year 9)
5. Proceed in rounds, with each round representing a year starting with year 1 and working up to year 9.
6. The accountants should record the amount of savings and interest held by their group after each round. After 9 rounds, the simple interest should total \$172 and the compound interest total should be \$200. Students should be able to visibly see the affects of compound interest on their investment.

QUESTIONS FOR DISCUSSION

1. What did you notice about the accumulation of simple interest? Compound interest?

It increased by the same amount each year. - \$8.00

It increased by more each year. The \$100 initially saved doubled after nine years.

Millionaire in the Making Unit

Day 2 – Assignment 1

Simple vs. Compound Interest

Name _____

Directions: Complete each of the following problems and show your work.

1. If you are going to invest \$200 for 1 year at a rate of 8%, how much interest will you earn?

$$\begin{array}{ccccccccc}
 \mathbf{P} & & \mathbf{X} & & \mathbf{R} & & \mathbf{X} & & \mathbf{T} & = & \mathbf{I} \\
 \\
 (200) & & X & & .08 & & X & & 1 & = & \$16.00
 \end{array}$$

2. If you leave that same \$200 investment in the bank 10 years, how much interest will you have earned at the end of the 10 year period? What will be the total in your savings account at the end of 10 years?

Year	Principal	Rate	Time	Interest	New Balance
1	\$200	.08	1	\$16.00	\$216.00
2	\$200	.08	1	\$16.00	\$232.00
3	\$200	.08	1	\$16.00	\$248.00
4	\$200	.08	1	\$16.00	\$264.00
5	\$200	.08	1	\$16.00	\$280.00
6	\$200	.08	1	\$16.00	\$296.00
7	\$200	.08	1	\$16.00	\$312.00
8	\$200	.08	1	\$16.00	\$328.00
9	\$200	.08	1	\$16.00	\$344.00
10	\$200	.08	1	\$16.00	\$360.00

$$\begin{array}{ll}
 \textit{Total in Savings at the end of 10 years:} & \mathbf{\$360.00} \\
 \textit{Interest Earned:} & \mathbf{\$360.00 - \$200 = \$160.00}
 \end{array}$$

3. What would be your total interest and savings if the amount invested were compounded annually?

Year	Principal	Rate	Time	Interest	New Balance
1	\$200	.08	1	\$16.00	\$216.00
2	\$216	.08	1	\$17.28	\$233.28
3	\$233.28	.08	1	\$18.66	\$251.94
4	\$251.94	.08	1	\$20.16	\$272.10
5	\$272.10	.08	1	\$21.77	\$293.87
6	\$293.87	.08	1	\$23.51	\$317.37
7	\$317.37	.08	1	\$25.39	\$342.76
8	\$342.76	.08	1	\$27.42	\$370.19
9	\$370.19	.08	1	\$29.61	\$399.80
10	\$399.80	.08	1	\$31.98	\$431.78

$$\begin{array}{ll}
 \textit{Total in Savings at the end of 10 years:} & \mathbf{\$431.78} \\
 \textit{Interest Earned:} & \mathbf{\$431.78 - \$200 = \$231.78}
 \end{array}$$

Millionaire in the Making Unit

Day 3 – Bell Ringer

VISUAL 14.1 – Warm-up

1. You have to start a savings account with pennies you accumulate during a 3 week period. Each day you save twice as many pennies as you saved the day before. After 21 days how many pennies will you have to start your savings account? Assume that you begin on Day 1 with 1 penny.

- a. Keep your penny count in the following table:

Pennies	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
WEEK 1	<i>1</i>	<i>2</i>	<i>4</i>	<i>8</i>	<i>16</i>	<i>32</i>	<i>64</i>
WEEK 2	<i>128</i>	<i>256</i>	<i>512</i>	<i>1024</i>	<i>2048</i>	<i>4096</i>	<i>8192</i>
WEEK 3	<i>16384</i>	<i>32768</i>	<i>65536</i>	<i>131072</i>	<i>262144</i>	<i>524288</i>	<i>1048576</i>

Total = 2097151 pennies = \$20,971.51

- b. Is this a reasonable savings plan? Why or why not?

This is an unreasonable savings plan because you will not be able to acquire that many pennies each day.

- c. Describe what you believe to be characteristics of a reasonable savings plan.

Answer could include saving a modest amount regularly, placing money in an interest accumulating situation, and not removing money from the account.

Activity 14.1 – Warm-up from “Mathematics & Economics – Connections for Life” Grades 9-12, National Council on Economic Education

Millionaire in the Making Unit

Day 3 – Handout

Visual 14.2 – Partial Handout from “Mathematics & Economics – Connections for Life” Grades 9-12, National Council on Economic Education

The Future Value of Savings

The *Future Value (FV)* of savings “*n*” years from today, when the *Present Value (PV)* of current savings is deposited today at an annual interest rate of “*r*”

The Future Value formula is expressed as:

$$\mathbf{FV = PV \cdot (1 + r)^n}$$
 where *r* is in decimal form.

Future Value of an Annuity

$$\mathbf{Future\ Value = Constant\ Annual\ Payment \cdot \frac{\{(1 + interest\ rate)^n - 1\}}{interest\ rate}}$$

$$\mathbf{FV = PMT \frac{\{(1 + r)^n - 1\}}{r}}$$

Where *FV* is future value, *PMT* is constant annual payment, *r* is the interest rate expressed in decimal form, and *n* is number of years in the future for which the computation is being made.

Future Value of an Annuity with a Monthly Payment

To calculate the future value of an annuity when the constant payment is made monthly,

$$\mathbf{FV = Monthly\ PMT \frac{\{(1 + r/12)^{n * 12} - 1\}}{r/12}}$$

Millionaire in the Making Unit

Day 3 – Activity 1

Activity 14.1 from “Mathematics & Economics – Connections for Life” Grades 9-12, National Council on Economic Education

Millionaire in the Making – Activity 1

SAVING FOR YOUR FUTURE

Name _____

The future value, “n” years from today, of an amount that is saved at an interest rate equal to “r” today, can be found by substituting the amount that you have saved today for PV (present value) in the following formula:

$$FV = PV * (1+r)^n$$

Where “r” is expressed in decimal form.

Suppose you have been able to save up \$5000 at age 22. You are told by your friend, who was just hired as a financial consultant, that if you invest this money in the stock market, you can expect to receive an average annual return of 9% on the funds. The trick is, however, that you can’t touch the money until you have reached retirement age, at age 67. That means this money will be invested for 45 years. You decide that, although you would certainly like to use the money for a new wardrobe and a trip to Tahiti, it is a good idea to make a commitment to saving early on in your professional career.

1. Assuming that this \$5000 is invested for 45 years at 9% interest, what will be your accumulation at age 67?

$$\$5000 * (1 + .09)^{45}$$

$$\$241,636$$

2. How can you explain this?

The “miracle” of compound growth. Interest is not only being earned on the original amount invested, it is also being earned on previous interest earnings. Note that this result, subject to the normal differences associated with rounding, is the same as that which is obtained from a financial calculator, such as “How much will my savings be worth?” at www.kiplinger.com.

Millionaire in the Making Unit

Day 3 – Assignment 2 – Part 1

Activity 14.2 from “Mathematics & Economics – Connections for Life” Grades 9-12, National Council on Economic Education

1. Using the data from Activity 1, calculate what your investment will grow to if you wait until age 32 to begin saving. (This means waiting 10 years to start saving and only have 35 years to save until retirement age). How does this change the accumulation?

The earnings will fall to \$882,535

$$\$5000 * (1.09)^{35} = \$882,535$$

2. What about if the time period is 25 years?

The growth fall further to \$336,337

$$\$5000 * (1.09)^{25} = \$336,337$$

3. What happens if the time period remains at 45 years, but the annual interest rate is 6 percent instead of 9 percent? This can be thought of as the difference between investing in the stock market and investing in intermediate- or long-term Treasury securities.

The accumulation falls to \$826,798.

$$\$5000 * (1.06)^{45} = \$826,798$$

Assignment 2 – Part 2

Using the formula from Activity 14.3, determine how much your current savings will be worth when you reach the normal retirement age of 67. If you currently do not have any savings, assume you have \$1,000 gifted to you from your teacher for being such an excellent Personal Finance student.

1. Use the Rule of 72 to determine how long it will take for your current savings (or \$1,000) to double.

$$3\% = 72 / 3 = 24 \text{ years}$$

$$9\% = 72 / 9 = 8 \text{ years}$$

$$6\% = 72 / 6 = 12 \text{ years}$$

$$12\% = 72 / 12 = 6 \text{ years}$$

2. Calculate your growth using the following rates:

$$3\% = \$1000 * (1.03)^{50} = \$4384$$

$$6\% = \$1000 * (1.06)^{50} = \$18,420$$

$$9\% = \$1000 * (1.09)^{50} = \$74,358$$

$$12\% = \$1000 * (1.12)^{50} = \$289,002$$

Millionaire in the Making Unit

Day 3 – Assignment 2 – Part 3

Activity 14.2 from “Mathematics & Economics – Connections for Life” Grades 9-12, National Council on Economic Education

Assignment 2 – Part 3

Who Wants To Be a Millionaire?

Name _____

An annuity refers to a periodic payment or receipt of income that commonly finances retirement. One way to use an annuity formula is to calculate the future value of period savings. Suppose that you are able to save \$300 a month beginning at age 22. Suppose further that these funds are invested at an annual rate of 9% for the next 45 years. The following formula, can be used to determine the amount to which these monthly retirement contributions will accumulate by the end of 45 years.

$$FV = \text{Monthly PMT} \frac{\{(1 + r/12)^{n * 12} - 1\}}{r/12}$$

Substitute \$300 for the monthly payment, .09 for r, and 45 for n (this makes the exponent in the numerator $45 * 12 = 540$)

1. What is the future value of \$300 saved and invested each month at an annual rate of 9% for 45 years?

\$2, 221,464

$$\frac{300 \{(1 + .09/12)^{45 * 12} - 1\}}{.09/12}$$

This is due to the miracle of compound growth. This occurs because interest accrues on itself by a remarkable amount over a long time series.

2. Does it surprise you that you can be a millionaire by saving a relatively modest amount each month? ***Answers will vary.***

Do you think that saving \$300 a month is a viable goal once you reach age 22? One way to think of this is to imagine that you go to college and earn \$25,000 per year in your first job. Since these are pre-tax dollars, suppose that you only take home 70% of this amount.

3. Calculate your annual after-tax income given these assumptions.

$$\mathbf{\$17,500 \text{ per year.} = \$25,000 \times .70}$$

4. Convert this annual after-tax income into a monthly income. What is your monthly take-home pay? ***\$1458 per month = \$17,500 / 12***

5. Suppose that you were to save \$300 each month. How much income does that leave for your other monthly expenditures? ***\$1158 is left = \$1458 - \$300***

6. Instead of saving \$300 per month by yourself, suppose you are able to reach this goal by contributing \$150 yourself with an equal match from your employer. How much would you have to save each week, on average, to reach this goal? ***About \$35 per week, or \$5 per day.***

7. Does this seem achievable? ***This should seem quite realistic to many students. It is common for many businesses to contribute to employee retirement funds.***

Millionaire in the Making Unit

Day 4 – Assignment 3

(Adapted from *Contemporary Economics – Personal Finance Guide*, Thomson South-Western, 2005)

Risk vs. Reward

Name _____

Directions Consider each of the possible investments below and answer:

Which would you choose if you had \$500 to invest?

Explain each of your choices in terms of the risk and return trade-off.

1. Your brother asks to borrow your \$500 to buy a lawnmower to start a grass-cutting service in your neighborhood next summer. He offers to pay you \$600 after one year.

I would / would not accept this offer because.....

2. You could buy 10 shares of stock in a large corporation that has paid a \$3 per share dividend every year for the past ten years.

I would / would not accept this offer because.....

3. You could deposit your money in a bank account that is insured by the government. It offers \$10 in interest for a one-year, \$500 deposit.

I would / would not accept this offer because.....

Millionaire in the Making Unit

Day 5 – Assessment

Why Save? Assessment

Name _____

Multiple-Choice Questions. Write the letter of the choice that correctly answers the question in the blank at the left.

- _____ 1. Which of the following is the best definition of saving?
- Putting your money under your mattress.
 - Disposable income minus consumption spending.*
 - The interest paid on a savings account.
 - The discount received from buying something on sale.
- _____ 2. Which of the following is a reason to save?
- Having to go to the bank before making a purchase.
 - Your parents place a dollar into your savings for every dollar you save.*
 - The penalty for taking your savings out of the bank.
 - Not being able to buy something right now.
- _____ 3. If you have \$100 in savings for one year at an interest rate of 4 percent, how much interest will you earn at the end of the year?
- \$4.00*
 - \$5.00
 - \$6.00
 - \$7.00
- _____ 4. If you divide the interest rate paid on savings into 72, the result tells you how many years it will take for your savings to double if you receive compound interest. At a compound interest rate of 4 percent, how many years will it take to double your money?
- 6 years
 - 7.2 years
 - 12 years
 - 18 years*
- _____ 5. What are the three rules for building wealth over the long term?
- Start early, buy and hold, and diversify.*
 - Seek liquidity, loans and limits.
 - Trade early, trade often, trade confidently.
 - Short buy, short cover and buy on margin.

Essay Questions

1. Explain in your own words what this statement means: “Pay Yourself First.”

Paying yourself first means making saving a priority over spending. The decision on how much to save is made before the decision on how much to spend on consumption. Paying yourself first allows a person to more easily achieve goals for saving. The recommended amount to save is 10% of your income.

2. Johnson is 24 years old and has just started her job as a business education teacher. She had never thought much about becoming financially independent until she attended a seminar called Three Rules to Help Teachers Become Millionaires. Based on what you have learned in this unit, explain the three rules that Johnson learned to consider.

Johnson should have learned about the importance of starting to save at an early age. She also should have learned that it is important to buy and hold allowing her savings to grow from compound interest. Finally, she should have learned that the savings plan she chooses should provide for diversification. By investing in a mutual fund, for example, she would be able to own many different financial assets at the same time.

3. Tyrel has saved \$3000. He intends to use it to make a down payment on a car. But he wants to buy the car in six months, not right now. He is thinking about using the \$3,000 in the meantime to buy stock in a company he has been studying. Use the concepts of risk and reward to explain why they may not be his best alternative. Suggest a better alternative for him to consider.

All investments need to have careful consideration about the risks and rewards involved with the investment. Buying stock usually involves more risk than putting money into a savings account or a certificate of deposit. Investing over time and spreading the risk over several alternatives (that is, diversifying) helps to reduce the risks associated with holding stocks. Tyrel is planning to use his \$3,000 relatively soon. If he buys stock now in one company, he gets none of the benefits that come with diversification. A better idea would be to place the \$3,000 in a savings account or a certificate of deposit. The rewards would be less, but the risks would be near zero. Tyrel could count on having his \$3,000, plus a bit more, in six months.