Comparing simple and compound interest

GRADE 11

In this lesson, students compare various savings and investment vehicles by calculating simple and compound interest.

Prerequisite knowledge: students should have background knowledge of exponents, as well as of simple and compound interest. This lesson is meant to consolidate their knowledge as they make comparisons.

Subject

MCR3U – Mathematics

Suggested timing

70 minutes

Financial literacy objectives

At the end of this lesson, students will:

- compare various savings and investment vehicles and strategies;
- calculate simple and compound interest earned on saving vehicles.

Curriculum expectations

Mathematics, Grades 11 and 12 (2007)
Mathematics (MCR3U)

Discrete Functions

Solve problems, using a scientific calculator, that involve the calculation of the amount, A (also referred to as future value, FV), the principal, P (also referred to as present value, PV), or the interest rate per compounding period, i, using the compound interest formula $A = P(1 + i)^n$ [or $FV = PV(1 + i)^n$] then discuss with class.

Assessment

Collect: simple and compound interest worksheet (Appendix A)

What you need

- Worksheet (Appendix A)
- Scientific calculator
- Computer, Internet access, LCD projector, speakers

Minds on

Review the concept of earning interest by explaining that money is not free to borrow.

- If you wish to borrow money, you must pay a cost, which also means that if you lend your money to someone else (invest), you can *earn* that cost (money). This extra money that you either pay or recieve is called *interest*.

Watch the following video in class: http://www.inspirefinanciallearning.ca/index.php/tools-videos/videos/funny-money-building-long-term-wealth/

Ask students why the host character says that some things we buy are more money "losers" and others are more "makers"? What does each category have in common?

What are some of the risks and rewards you see with each investment category?

Context for learning

Bill Fold is a character who is constantly getting himself into financial scrapes. Use the scenario below to provide students with a context for learning.

Bill Fold has been saving coins in a tin can for a number of years. His friend tells him that he should make his money work for him. If he takes his savings to his local financial institution, his money can start working for him by paying him interest. How much money can he earn? What does his friend mean when he says compounding is his best friend?

Action

- Distribute worksheet (Appendix A) to students.
- Explain the goal and purpose of the lesson to compare different accounts offering different rates and calculations of interest. Students will be able to choose which account will make them the most amount of money.
- Ask for a volunteer to read aloud the definition of simple interest from the worksheet to the class.
- Review the topic of simple interest by sharing a few examples of bank accounts that provide this type of interest and showing a calculation on the board.
  - Example 1: suppose you would like to invest $3000 in a bank account that offers an interest rate of 3% per year. How much money would you have in your bank account after 2 years of investment?
- Ask for another volunteer to read aloud the definition of compound interest from the worksheet to the class.

Action (cont'd)

- Explain compound interest by providing more examples on the board:
    - Example 2: suppose you would like to invest $1000 in a bank account that offers an interest rate of 5% compounded **annually**. How much money would you have at the end of 3 years?
    - Example 3: suppose you would like to invest $1000 in a bank account that offers an interest rate of 5% compounded **semi-annually** (twice a year). How much money would you have at the end of 3 years?
- Ask for a volunteer to read through the directions on the handout.
- Individually, have students complete the worksheet to determine which type of account is most lucrative.
- Explain to students that they will require a graphing calculator for *Part C* of their worksheet. Students are to follow the instructions on the worksheet to use the calculator. Have students request to borrow a calculator from the teacher once they have reached this part of the worksheet.
- Note: students should have a background knowledge of exponents for this activity, as well as of simple and compound interest. This lesson is meant to consolidate their knowledge as they make comparisons.
- Students display their knowledge using algebra, and justify their calculations using a TI83/84 Calculator. It should be assumed that the calculator and this function has already been introduced.

Consolidation/ debrief

Students are asked to share their findings with the class; critical questions are introduced by the teacher.

1. Do compound interest accounts always make more than simple interest accounts?
2. What type of interest do you think banks use to attract your business? Remember, people use banks both to save and to borrow.
3. Most credit card companies compound their interest (i.e. what you did not pay off when due) monthly. From what you have seen today, consider how easy it would be for unpaid credit card debt to become unmanageable.

Simple and compound interest worksheet

Part A – equations

Simple interest is always calculated on the original amount put in.

$$I = Prt$$

i: interest (the amount of new money gained in the account)
P: principal (the amount originally put into the account)
r: rate (the interest rate given, as a decimal)
t: time (the number of years the account is active)

Compound interest re-calculates the amount of interest after a certain amount of time, known as the *compounding period*. In other words, if you compound annually (every year), the interest for the second year is calculated on the original amount PLUS the interest made in the first year!

$$A = P(1 + i)^n$$

A: final value (the total amount in the account at the end of the investment)
P: principal value (the amount originally put into the account)
i: interest rate (the interest rate given, as a decimal)
- If compounding occurs more than once per year, given rate must be divided by the number of compounding periods per year *first*, then inserted into the formula as i.

n: number of compounding periods *total*

Simple and compound interest worksheet (cont'd)

Part B – choosing an account

You have $10,000 to put into one of the three accounts below. Find out how much each account would be worth after 10 years.

1. Look at the accounts on the chart below and note their specifics rates. Begin by **predicting** which account will give you the most money. How did you come to this prediction?

Account 1	Account 2	Account 3
Simple interest	Compounded annually	Compounded monthly
Rate = 1.2%	Rate = 1.2%	Rate = 1.2%

2. Which account gives you the most money after 10 years?

3. By how much, in dollars, does the best account above outperform the worst account above? (Show your work, please).

Simple and compound interest worksheet (cont'd)

Part C – graphing

Use your calculator to graph the following:

- A simple interest account, starting with $1,000, at a rate of 5%.
- A compound interest account, starting with $1,000, at a rate of 5% annually.
- Note: these interest rates are far above what is usually offered for personal accounts.

Before graphing, answer:

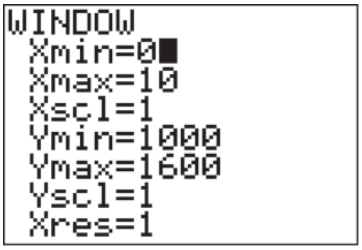
4. What will your x-value represent?

5. What will your y-value represent? Is this the same thing for both accounts?

6. What type of functions are the graphs of your accounts (ie linear, exponential, quadratic, etc.)?

Explain your answer.

Press **WINDOW** and set your parameters like this:



Press **GRAPH** to see your graph.

7. Does a compound interest account yield more money than a simple account right away? Explain why or why not.

8. When did the compound interest account begin to be more lucrative than the simple interest account?

Simple and compound interest worksheet (cont'd)

Part D – reflection questions

9. What similarities do you see between the two types of interest?

10. What is the difference between I (simple interest) and A (compound interest)?