

Unit E: Understanding the Use of Money and Obtaining Credit

Lesson 1: Understanding the Time Value of Money

Student Learning Objectives: Instruction in this lesson should result in students achieving the following objectives:

1. Understand the time value of money.
2. Understand the concept of compounding.
3. Understand the concept of discounting.

Recommended Teaching Time. 2 hours.

Recommended Resources: The following resources may be useful in teaching this lesson:

Decisions & Dollars. Alexandria, Virginia: The Council for Agriculture Education, 1993. (Curriculum Binder, Unit I)

List of Equipment, Tools, Supplies, and Facilities:

Writing surface
PowerPoint Projector
PowerPoint Slides
Samples of seed, plant, and fruit/grain from a specific plant

Terms:

Compound interest
Compounding
Discounting
Loan
Interest rate
Simple interest
Time value of money

Interest Approach: Show students the seeds, plant, and fruit/grain of a specific plant. Discuss similarities and differences between the items. Ask the students if each of these items is worth the same amount of money. Discuss why or why not these items are worth the same or different values. For example, grain from wheat is worth more than a wheat seed or wheat plant because the grain can be sold to make bread. Help students realize that this item is similar to money, as time changes, the value of it changes.

Summary of Content and Teaching Strategies

Objective 1: Understand the time value of money.

Anticipated Problem: What is the time value of money?

PowerPoint Slide #3

- I. The **time value of money** means that the value of an Afghani at one point in time is higher than the value of the same Afghani at a different point in time.
 - A. An **interest rate** serves as the mechanism for comparing the time value of money.
 1. Interest rate is the exchange price between the current and future value of the Afghani.
 2. Interest rates represent risk and inflation.

PowerPoint Slide #4

3. Interest is paid in return for using money.
 - a. Interest is paid on **loans**. A loan is when money is borrowed by a business or individual from an institution or another individual. When money is borrowed from a bank, non-governmental organization (NGO) or other institution interested is paid by the borrower to the institution.
 - b. When money is placed into savings at a bank or other institution, interest is paid by the institution to the person who placed it in savings.

PowerPoint Slide #5

- B. Another way to view the time value of money is that 1000 Afghani may purchase more or less items at different points in time.

*****Use the PowerPoint Presentation to discuss the information. Tell students about some of your life experience by sharing how the price of items has changed. If you'd like, ask a guest speaker to talk about their life experience as well. The discussion may lead into the reasons that some of these prices have changed. Try to engage students in this discussion as well, they may know of some price changes in their lifetime as well.**

Objective 2: Understand the concept of compounding.

Anticipated Problem: What is compounding?

PowerPoint Slide #6

- II. **Compounding** calculates the future value of money by considering its present value.
 - A. **Compound interest** refers to interest being added to the principal. As the principal increases, so do the interest payments. Compounding is the process of describing the calculation of compound interest.
 - B. **Simple interest** means that only the original principal earns interest over the life of the transaction.

PowerPoint Slide #7

1. To determine the amount of money earned through simple interest, use the following equation: $FV = PV + n(PV \times i)$, where FV = future value, PV = present value, n = number of conversion periods, and i = interest rate.

PowerPoint Slide #8

2. As an example, if an institution gave a 5-year loan for 10000 AFS and the institution charged 3% simple interest on the loan, how much money would they receive upon full payment of the loan including interest?

a. Answer:

$$\begin{aligned} FV &= PV + n(PV \times i) \\ &= 10000 + 5(200 \times 0.03) \\ &= 10000 + 5(6) \\ &= 10000 + 30 \\ &= 10030 \text{ AFS} \end{aligned}$$

PowerPoint Slide #9

- C. **Compound interest** means that the sum of the original principal and any previous interest earned earns interest over the life of the transaction.
1. To determine the amount of money earned through compound interest, use the following equation: $FV = PV \times (1 + i)^n$, where FV = future value, PV = present value, n = number of conversion periods, and i = interest rate.

PowerPoint Slide #10

2. An example is if an institution gave a 5-year loan for 10000 AFS and the institution charged 3% compound interest on the loan, how much money would they receive upon full payment of the loan including interest?

a. Answer:

$$\begin{aligned} FV &= PV \times (1 + i)^n \\ &= 10000 \times (1 + 0.03)^5 \\ &= 10000(1.03)^5 \\ &= 10000(1.159) \\ &= 11590 \text{ AFS} \end{aligned}$$

*****Use the PowerPoint Presentation to discuss the information. As you explain the equations to students, challenge them to calculate the correct answer before you show the answer. After discussing simple and compound interest, ask students if they which type of interest sounds better. Specific questions you might ask include:**

-If you loan money to a friend, would you rather charge them simple or compound interest? Why?

-If you are receiving a loan from a friend, would you rather pay them simple or compound interest? Why?

Objective 3: Understand the concept of discounting.

Anticipated Problem: What is discounting?

PowerPoint Slide #11

III. **Discounting** compares the present value of money that is received in the future.

- A. The discount is a result of the investor waiting to receive the future payment rather than receiving it now and investing it in an alternative way.
1. To determine the present value of money earned in the future use the following equation: $PV = FV(1 + i)^{-n}$.

PowerPoint Slide #12

2. An example is if farmland near Helmund has been selling for 10000 AFS per hectare, and has been increasing at the rate of 5% per year, what was its price 6 years ago?
 - a. Answer:

$$\begin{aligned} PV &= FV(1 + i)^{-n} \\ &= 10000(1 + .05)^{-6} \\ &= 10000(1.05)^{-6} \\ &= 10000(0.746) \\ &= 7460 \text{ AFS per hectare} \end{aligned}$$

*****Use the PowerPoint Presentation to discuss the information. Discuss or brainstorm with students other situations that the discounting equation can be used.**

Review/Summary: Guide students in completing worksheet WS 1-1. Check students work and discuss as a group to ensure student understanding. If further practice is needed, create more problems for students to complete.

Evaluation: A sample written test is attached.

Answers to Test:

Part One: Matching

1 = f, 2 = b, 3 = c, 4 = a, 5 = e, 6 = d

Part Two: Completion

1 = future
2 = return
3 = risk, inflation
4 = purchases, earning

Part Three: Short Answer

$$\begin{aligned} FV &= PV \times (1 + i)^n \\ &= 750 \times (1 + .04)^2 \\ &= 750 \times (1.04)^2 \\ &= 750 \times 1.08 \\ &= 810 \text{ AFS} \end{aligned}$$

Understanding the Time Value of Money

Instructions. Using the equations below, answer the following questions.

Calculating Simple Interest	$FV = PV + n(PV \times i)$
Compounding	$FV = PV \times (1 + i)^n$
Discounting	$PV = FV(1 + i)^{-n}$

1. A bank gave a 5-year loan for 50000 AFS and the institution charged 5% compound interest on the loan, how much money would they receive upon full payment of the loan including interest?
 2. A friend gave a 1 year loan for 10000 AFS and they will charge 4% simple interest on the loan, how much money would they receive upon full payment of the loan including interest?
 3. If you deposit 500 AFS in a bank account for 5 years at 6% interest compounded annually, how much interest will you earn?
 4. You placed a sum of money in a savings account 6 years ago and left it untouched until today. If 4150 AFS is in your bank account now and the interest rate is 5% per year, how much money did you place in your account 6 years ago?

Understanding the Time Value of Money

Instructions. Using the equations below, answer the following questions.

Calculating Simple Interest

$$FV = PV + n(PV \times i)$$

Compounding

$$FV = PV \times (1 + i)^n$$

Discounting

$$PV = FV(1 + i)^{-n}$$

1. A bank gave a 5-year loan for 50000 AFS and the institution charged 5% compound interest on the loan, how much money would they receive upon full payment of the loan including interest?

$$\begin{aligned} FV &= PV \times (1 + i)^n \\ &= 50000 \times (1 + 0.05)^5 \\ &= 50000(1.05)^5 \\ &= 50000(1.276) \\ &= 63800 \text{ AFS} \end{aligned}$$

2. A friend gave a 1 year loan for 10000 and they will charge 4% simple interest on the loan, how much money would they receive upon full payment of the loan including interest?

$$\begin{aligned} FV &= PV + n(PV \times i) \\ &= 10000 + 1(10000 \times 0.04) \\ &= 10000 + 1(400) \\ &= 10000 + 400 \\ &= 10400 \text{ AFS} \end{aligned}$$

3. If you deposit 500 AFS in a bank account for 5 years at 6% interest compounded annually, how much interest will you earn?

$$\begin{aligned} FV &= PV \times (1 + i)^n \\ &= 500 \times (1 + .06)^5 \\ &= 500 \times (1.06)^5 \\ &= 500 \times (1.338) \\ &= 669 \text{ AFS} \end{aligned}$$

4. You placed a sum of money in your account 6 years ago and forgot about it until today. If 4150 AFS is in your bank account now and the interest rate is 5% per year, how much money did you place in your account 6 years ago?

$$\begin{aligned} PV &= FV(1 + i)^{-n} \\ &= 4150(1 + .05)^{-6} \\ &= 4150(1.05)^{-6} \\ &= 4150(0.746) \\ &= 3095.90 \text{ AFS} \end{aligned}$$

Test

Name_____

Test Understanding the Time Value of Money

Part One: Matching

Instructions. Match the term with the correct response. Write the letter of the term by the definition.

- | | |
|------------------------|------------------|
| a. time value of money | d. discounting |
| b. compound interest | e. compounding |
| c. simple interest | f. interest rate |

- _____ 1. Exchange price between current and future value of money.
- _____ 2. Interest added to principal, and paid as additional interest.
- _____ 3. Only original principal earns interest.
- _____ 4. Afghani is worth more at one time than at another time.
- _____ 5. Process of calculating compound interest.
- _____ 6. Compares present value of money that is received in the future.

Part Two: Completion

Instructions. Provide the word or words to complete the following statements.

- 1. Discount is as a result of an investor waiting to receive _____ payment rather than receiving it now.
- 2. Interest is paid in _____ for borrowing money.
- 3. Interest rates represent _____ and _____.
- 4. The time value of money concept states that \$1 may purchase more or less items at different points in _____.

Part Three: Short Answer

Instructions. Use complete sentences and correct spelling to provide the information below.

- 1. If you deposit 750 AFS in a bank account for 2 years at 4% interest compounded annually, how much interest will you earn?