

## Lesson B2–4

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# Calculating Interest Rates

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**Unit B.** Starting and Operating the Agribusiness

**Problem Area 2.** Financing the Agribusiness

**Lesson 4.** Calculating Interest Rates

### **New Mexico Content Standard:**

**Pathway Strand:** Agribusiness Systems

**Standard: III:** Apply generally accepted accounting principles and skills to manage budget, credit, and optimal application of AFNR business assets.

**Benchmark: III-A:** Use key accounting fundamentals to accomplish dependable book-keeping and associated files.

**Performance Standard: 4.** Evaluate credit uses and options. **7.** Determine cost of doing business.

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

1. Describe percentages and how they are calculated.
2. Explain applications using percentages.
3. Explain how to calculate interest.
4. Discuss applications using interest calculation in agricultural business management.

**List of Resources.** The following resources may be useful in teaching this lesson:

Elliott, Jack. *Agribusiness: Decisions and Dollars*. Albany, New York: Delmar Publishers, 1997.

Hokanson, Clifford M. *Applied Problems in Mathematics for Agriculture*. Danville, Illinois: Interstate Publishers, Inc., 1984.

Newman, Michael E., and Walter J. Wills. *Agribusiness Management and Entrepreneurship*. Danville, Illinois: Interstate Publishers, Inc., 1994.

Smith, John. VAS 30106 *Surveying in Agriculture*. Urbana, Illinois: Vocational Agricultural Services, 1993.

Thurrow, Larry. VAS 6015 *Mathematical Applications in Agriculture*. Urbana, Illinois: Vocational Agricultural Service, 1992.

## List of Equipment, Tools, Supplies, and Facilities

Writing surface

Copies of Student Lab Sheets

Calculators

**Terms.** The following terms are presented in the lesson (shown in bold italics):

Compound interest

Denominator

Interest

Interest rate

Percentage

Principal

Rate

Ratio

Simple interest

Time

**Interest Approach.** Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situations.

*Discuss the following questions with your students: What are some agricultural occupations which might require calculating interest rates? What are some situations that might require the need to figure interest cost? What are the different kinds of interest rates?*

# Summary of Content and Teaching Strategies

**Objective 1:** Describe percentages and how they are calculated.

**Anticipated Problem:** What are percentages and how are they calculated?

- I. Frequent calculations performed in agricultural business management involve percentages, ratios, interest rates, return on investment, and depreciation.
  - A. **Percentage** can be defined as a fraction with 100 being the denominator.
    1. You can find percentage by dividing the number by another number to find the decimal figure and then multiplying by 100.
    2. The formula for percentage is  $A/B \times 100 = \%$
    3. The **denominator** is the bottom number in a fraction.
    4. Examples of percentages:  $9\% = 9/100$ ;  $53\% = 53/100$ ;  $16.5\% = 16.5/100$
  - B. Percentages, decimals, and fractions are usually interchangeable.
    1. Always move the decimal point over two places to the left when converting percentages to decimal form. Examples of percentages as decimals:  $9\% = .09$ ;  $53\% = .53$ ;  $16.5\% = .165$
    2. Examples of converting fractions to percentages:  
 $1/4 = 25/100 = 25\%$   
 $3/5 = 60/100 = 60\%$   
 $13/10 = 130/100 = 130\%$   
 $37/50 = 74/100 = 74\%$

*Many techniques can be used to help students master this objective. Students need text materials to help them understand calculating percentages. Chapter 6 in VAS Unit 6015 Mathematical Applications in Agriculture is recommended.*

**Objective 2:** Explain applications using percentages.

**Anticipated Problem:** How are percentages used in agriculture?

- II. There are many times in agriculture when you need to determine the percentage of a given number.
  - A. You want to depreciate a newly constructed barn that has been valued at \$54,000. Your depreciation schedule recommends 20% depreciation this year. How will you determine that value?

Step 1: Convert the depreciation percentage to a decimal

$$20\% = .20$$

Step 2: Multiply the value of the barn by the decimal amount.

$$\$54,000 \times .20 = \$10,800 \text{ depreciation for this year}$$

- B. You have a herd of 75 beef cows that are calving. Out of the 75 cows, 69 had live calves. How would you determine the birth rate percentage for your herd?

Step 1: Divide the number of live calves by the number of cows.

$$69/75 = .92$$

Step 2: Convert the decimal form to a percentage. Move the decimal point two spaces to the right and add a percent sign (%).

$$.92 = 92\%$$

- C. Your local farm supply company has a special discount of 15% on oil. What is the net sale amount of a case of oil regularly priced at \$48.00?

### **Method 1**

Step 1: Convert the discount percentage to a decimal.

$$15\% = .15$$

Step 2: Multiply the regular price of the oil by the sale discount.

$$\$48.00 \times .15 = \$7.20 \text{ discount}$$

Step 3: Subtract the discount from the regular price of the oil.

$$\$48.00 - \$7.20 = \$40.80 \text{ price you will pay with the discount}$$

### **Method 2**

Step 1: Convert the discount percentage to a decimal.

$$15\% = .15$$

Step 2: Subtract the decimal value from one.

$$1 - .15 = .85$$

Step 3: Multiply the sum from Step 2 times the regular price of the oil.

$$.85 \times \$48.00 = \$40.80 \text{ price you will pay with the discount}$$

- D. According to a recent publication, farm real estate values in your county have dropped from \$2,800 per acre last year to \$2,350 per acre this year. What is the percentage change in real estate value between those two years?

Step 1: Subtract the price per acre this year from the price last year.

$$\$2,800 \text{ per acre} - \$2,350 \text{ per acre} = \$450 \text{ per acre decrease}$$

Step 2: Divide the per acre decrease by the price from last year.

$$\$450 \text{ per acre decrease} / \$2,800 \text{ per acre last year value} = .1607$$

Step 3: Move the decimal point two spaces to the right and add a percent sign.

$$0.1607 = 16.07\% \text{ decrease in value of farm real estate}$$

*Several techniques can be used to help students understand this objective. Text materials will enhance student understanding of percentage applications in agriculture. Chapter 6 in VAS Unit 6015 Mathematical Applications in Agriculture is suggested. Use LS: B2–4A and LS: B2–4B to help student’s understanding of fractions, decimals, and percentages.*

**Objective 3:** Explain how to calculate interest.

**Anticipated Problem:** How is interest calculated?

- III. **Interest** is a cost involved when an item is purchased on credit or with borrowed money, or an income when someone else uses your invested money.
- A. **Interest rate** is the annual percent of change for borrowing money.
- B. Two major ways of calculating interest are simple and compound.
1. The **simple interest** method, also called “add in interest method,” is calculated by using the original principal for the entire time period (in years) at the determined rate.
    - a. The formula for calculating simple interest is  $\text{simple interest} = \text{principal} \times \text{rate} \times \text{time}$ . An example is demonstrated in the next objective.
    - b. The **principal** is the total dollar amount borrowed.
    - c. The **rate** is interest rate or percentage charged for using the principal.
    - d. **Time** is the number of years the money is borrowed.
  2. The **compound interest** method is based on the changing principal balance for the length of time the money was borrowed. An example is demonstrated in the next objective.
    - a. This method results in higher payments.

- b. This method accrues “interest on interest” which results in the principal increasing over the time. Interest is paid more than once during a term.
  - c. Money can be compounded annually, semiannually, monthly, or daily.
  - d. The formula for determining future value on compound interest is: future value = present value  $\times$  (1 + rate)  $\times$  term.
- C. Ratios are used in agriculture when analyzing financial records, production strategies, and agricultural mechanization problems.
1. **Ratios** are comparisons of two quantities.
  2. The comparisons can be of two like or unlike numbers.
  3. Examples of financial ratios include:
    - a. The current ratio in financial statements is the comparison of current assets to current liabilities.  
 Current ratio = current assets/current liabilities  
 $\$80,000/\$32,000 = 2.50/1 = \$2.50$  in current assets for every \$1.00 in liabilities.
    - b. Debt-equity ratio measures the relationship between owned and borrowed capital  
 Debt-equity ratio = total liability/net worth  
 $\$180,000/\$400,000 = .45/1$  or 45%. For every \$.45 in liabilities, there is \$1.00 in equity or net worth.

*Use a variety of techniques to help students master this objective. Providing text materials will aid students in learning about calculating interest. Chapter 6 in VAS Unit 6015 Mathematical Applications in Agriculture and Chapter 3 in Agribusiness Management and Entrepreneurship are recommended.*

**Objective 4:** Discuss applications using interest calculation in agricultural business management.

**Anticipated Problem:** How is calculating interest used in agriculture?

IV. Many times in agriculture, it will be beneficial to know how to calculate interest on money you plan to borrow or invest.

A. Examples of simple interest problems include:

1. Find the interest amount on \$3,000 at 8% interest for one year.

Step 1: Interest = principal  $\times$  rate  $\times$  time

Step 2: Interest = 3,000  $\times$  .08  $\times$  1  
 Convert 8% to decimal form (.08) for formula.

Step 3: Interest = \$240 paid for the use of \$3,000 for one year.

2. Find the future value of \$5,000 invested at 6% for three years using simple interest.

Step 1: Interest earned = principal  $\times$  rate  $\times$  time

Step 2: Interest earned =  $5,000 \times .06 \times 3 = \$900$

Convert 6% to decimal form (.06) for formula.

Step 3: Future value = interest earned + principal

FV =  $\$900 + \$5,000$

FV =  $\$5,900.00$

3. Find the interest on \$2,000 borrowed at 9% for 73 days.

Step 1: Interest = principal  $\times$  rate  $\times$  time

Step 2: Interest =  $2,000 \times .09 \times (73/365)$

Convert 9% to decimal form (.09) for formula.

Convert 73 days to years by dividing by 365 days/year.

Step 3: Interest =  $2,000 \times .09 \times .20$

Interest =  $\$36.00$

B. Example of a compound interest problem:

1. You invest \$1,000 at 8% compounded annually for five years. What is the future value?

Step 1. Future value = present value  $\times (1 + \text{rate})^n$ .

The reinvested amount is represented as 1 within the formula; n = number of years.

Step 2. FV =  $1,000 \times (1 + .08)^5$

FV =  $1,000 \times (1.08 \times 1.08 \times 1.08 \times 1.08 \times 1.08)$

FV =  $1,000 \times 1.46933$

FV =  $\$1,469.33$

Step 3. The interest earned can be calculated by subtracting the original investment of \$1,000 from the future value of \$1,469.33. Therefore, the amount of compounded interest earned in this example is \$469.33.

*Numerous techniques can be used to assist students in understanding the applications of calculating interest in agriculture. Assigned text material will help student learning. Chapter 6 in VAS unit 6015 Mathe-*

*mathematical Applications in Agriculture and Chapter 1 in Agribusiness: Decisions and Dollars are recommended. Use LS: B2–4C to evaluate student understanding of calculating interest.*

**Review/Summary.** Focus the review and summary of the lesson around the student learning objectives. Call on students to explain the content associated with each objective. Use their responses as the basis for determining any areas that need to be covered again. Questions at the ends of the chapters in the recommended textbooks may also be used in the review process. Use the lab activities in reviewing and reinforcing student learning.

**Application.** Application can involve the following student activities:

LS: B2–4A Calculating Decimals, Fractions, and Percentages

LS: B2–4B Calculating Percentages

LS: B2–4C Calculating Interest

**Evaluation.** Evaluation should focus on student achievement of the objectives for the lesson. Various techniques can be used, such as student performance on the application activities. A sample written test is attached.

## **Answers to Sample Test:**

### **Part One: Matching**

1=c, 2=g, 3=e, 4=a, 5=f, 6=b, 7=d, 8=h

### **Part Two: Problems**

1=\$28,800 ( $.03 \times \$2,400 \times 400$ )

2=\$1,350 ( $\$15,000 \times .75 \times .12$ )

3=4.375 acres per hour ( $1.25 \times 3.5$ )

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# Test

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## Lesson B2–4: Calculating Interest Rates

### Part One: Matching

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

- |                |              |                      |
|----------------|--------------|----------------------|
| a. percentage  | d. principal | g. ratios            |
| b. denominator | e. rate      | h. compound interest |
| c. interest    | f. time      |                      |

- \_\_\_\_\_ 1. Cost involved when an item is purchased on credit or with borrowed money.
- \_\_\_\_\_ 2. Comparison of two quantities.
- \_\_\_\_\_ 3. The percent charged for borrowing money.
- \_\_\_\_\_ 4. A fraction with 100 as the denominator.
- \_\_\_\_\_ 5. Term for number of years money is borrowed.
- \_\_\_\_\_ 6. The bottom number in a fraction.
- \_\_\_\_\_ 7. Term for total amount of dollars borrowed.
- \_\_\_\_\_ 8. When interest is based on the changing principal balance over the length of time.

### Part Two: Problems

*Instructions.* Find the answer to the following problems. Show all work, including formulas.

1. An auctioneer charges a 3% sales commission for selling your land. If you sold 400 acres at \$2,400 per acre, how much commission would you pay the auctioneer?
2. You borrow \$15,000 for 9 months to pay for a new car at a rate of 12%. How much interest did you pay in buying your vehicle?
3. Many field operations become increasingly efficient as the length of the field increases. If a tillage operation is 125% more efficient on field A than on field B, how many acres can be covered per hour on field A if 3.5 acres can be tilled per hour on field B?

# Lab Sheet

## Calculating Decimals, Fractions, and Percentages

Understanding decimals, fractions, and percentages is important in agriculture.

**Purpose:**

To learn how to convert fractions to decimals and percentages.

**Materials:**

- Lab sheet
- Writing utensil
- Calculator

**Procedure:**

1. Supply the missing answers in the following table

| Fraction                      | Decimal | Percentage |
|-------------------------------|---------|------------|
| _____                         | .4      | _____      |
| _____                         | _____   | 12.5%      |
| _____                         | .025    | _____      |
| 1/3000                        | _____   | _____      |
| _____                         | _____   | .06%       |
| _____                         | 1.35    | _____      |
| 1 <sup>6</sup> / <sub>7</sub> | _____   | _____      |
| _____                         | 1.47    | _____      |
| _____                         | _____   | 524%       |
| _____                         | .2145   | _____      |

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# Lab Sheet

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## Calculating Percentages

Calculating percentages is used in numerous agriculture applications.

**Purpose:**

To develop skills in calculating percentages.

**Materials:**

Lab sheet  
Writing utensil  
Calculator

**Procedure:**

1. Calculate the percentage problems below.
2. Show all work, including formulas.

**Percentage Problems**

1. A feeder pig sale barn charges a sales commission of \$2.25 per head. If a farmer's pigs sold for an average of \$42.50 per head, what is the percent of commission charged?
2. Sales tax amounting to \$132.50 was charged on the purchase of a \$3,450 baler. What was the sales tax percentage?
3. The cash price for a truck is \$14,600. If 6.5% sales tax must be paid, what is the total cost of the truck?
4. For taxation purposes, a township assesses real estate at 35% of its market value. If a vegetable farmer's land is assessed at \$74,625, what is the assessed market value of the land?

5. A chemical company sales force is paid a fixed salary of \$600 per month plus 7% commission on sales. What is the total earning for one year if a salesperson sold \$22,500 worth of chemicals?
6. A greenhouse owner planted 2,000 poinsettias to be sold at an average price of \$5 each. If she anticipated an 85% survival rate of plants, what are her anticipated sales in dollars?
7. Complete the following mathematical sentences.
- 5 is \_\_\_\_\_% of 25.
- 115 is 15% of \_\_\_\_\_.
- 102% of 21 is \_\_\_\_\_.
- 42 is \_\_\_\_\_% of 48.
- 300% of \_\_\_\_\_ is 18.

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# Lab Sheet

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## Calculating Interest

The ability to calculate interest is important in the agriculture industry.

**Purpose:**

To develop skills in calculating interest.

**Materials:**

Lab sheet

Writing utensil

Calculator

**Procedure:**

1. Complete the problems below. Round all dollar amounts to the nearest whole cent and percentages to the nearest tenth of a percent.
2. Show all work, including formulas.

**Interest Problems**

1. What is the amount of simple interest due on a loan of \$3,200 at 8.5% for 180 days?
2. Find the principal of a loan if \$425 of interest is accumulated in 310 days at 10% (simple interest).
3. In order to finance the purchase of a \$18,000 pick-up truck, a farmer needs to borrow \$12,000 to close the deal. If 11% interest is charged on a 9-month loan, what amount of simple interest would be paid?