# LEARNING UNIT OBJECTIVES

### LU 10–1: Calculation of Simple Interest and Maturity Value

1. Calculate simple interest and maturity value for months and years *(p. 258)*.
2. Calculate simple interest and maturity value by **(a)** exact interest and **(b)** ordinary interest *(pp. 259–260)*.

### LU 10–2: Finding Unknown in Simple Interest Formula

1. Using the interest formula, calculate the unknown when the other two (principal, rate, or time) are given *(pp. 260–262)*.

### LU 10–3: U.S. Rule—Making Partial Note Payments before Due Date

1. List the steps to complete the U.S. Rule *(pp. 262–263)*.
2. Complete the proper interest credits under the U.S. Rule *(p. 263)*.

# VOCABULARY PREVIEW

Here are key terms in this chapter. After completing the chapter, if you know the term, place a checkmark in the parenthesis. If you don't know the term, look it up and put the page number where it can be found.

**Adjusted balance . ( ) Banker's Rule . ( ) Exact interest . ( ) Interest . ( ) Maturity value . ( ) Ordinary interest . ( ) Principal . ( ) Simple interest . ( ) Simple interest formula . ( ) Time . ( ) U.S. Rule . ( )**

## *As Big Banks Converge, Depositors Find Deals At Smaller Institutions*

BY JANE J. KIM
AND JOSEPH DE AVILA

AS THE BIG BANKS get bigger, it may be time for savers to shop around.

**Citigroup** Inc.'s decision this week to gobble up most of ailing **Wachovia** Corp. is the latest in a string of blockbuster acquisitions that have transformed the banking landscape. A huge chunk of consumer deposits are now consolidated in three banking behemoths—Citigroup, **Bank of America** Corp. and **J.P. Morgan Chase** & Co.—not known for wooing consumers with high interest rates and low fees.




*"Good news for people who hide their money under mattresses."*



In today's economy, choosing a bank is not an easy choice. In the *Wall Street Journal* clip, "As Big Banks Converge, Depositors Find Deals at Smaller Institutions," the article indicates big bank mergers may mean better interest rates at smaller banks. You need to shop around.

In this chapter, you will study simple interest. The principles discussed apply whether you are paying interest or receiving interest. Let's begin by learning how to calculate simple interest.

# Learning Unit 10–1: Calculation of Simple Interest and Maturity Value

LO 1

Jan Carley, a young attorney, rented an office in a professional building. Since Jan recently graduated from law school, she was short of cash. To purchase office furniture for her new office, Jan went to her bank and borrowed $30,000 for 6 months at an 8% annual interest rate.

The original amount Jan borrowed ($30,000) is the **principal** (face value) of the loan. Jan's price for using the $30,000 is the interest rate (8%) the bank charges on a yearly basis. Since Jan is borrowing the $30,000 for 6 months, Jan's loan will have a **maturity value** of $31,200—the principal plus the interest on the loan. Thus, Jan's price for using the furniture before she can pay for it is $1,200 interest, which is a percent of the principal for a specific time period. To make this calculation, we use the following formula:

$$\text{Maturity value } (MV) = \text{Principal } (P) + \text{Interest } (I)$$

$$\$31{,}200 = \$30{,}000 + \$1{,}200$$

Jan's furniture purchase introduces **simple interest**—the cost of a loan, usually for 1 year or less. Simple interest is only on the original principal or amount borrowed. Let's examine how the bank calculated Jan's $1,200 interest.

## Simple Interest Formula

To calculate simple interest, we use the following **simple interest formula:**

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

In this formula, rate is expressed as a decimal, fraction, or percent; and time is expressed in years or a fraction of a year.

**EXAMPLE** Jan Carley borrowed $30,000 for office furniture. The loan was for 6 months at an annual interest rate of 8%. What are Jan's interest and maturity value?

Using the simple interest formula, the bank determined Jan's interest as follows:

In your calculator, multiply $30,000 times .08 times 6. Divide your answer by 12. You could also use the % key—multiply $30,000 times 8% times 6 and then divide your answer by 12.

**Step 1.** Calculate the interest.

$$I = \underset{(P)}{\$30{,}000} \times \underset{(R)}{.08} \times \underset{(T)}{\frac{6}{12}}$$
$$= \$1{,}200$$

**Step 2.** Calculate the maturity value.

$$MV = \underset{(P)}{\$30{,}000} + \underset{(I)}{\$1{,}200}$$
$$= \$31{,}200$$

Now let's use the same example and assume Jan borrowed $30,000 for 1 year. The bank would calculate Jan's interest and maturity value as follows:

**Step 1.** Calculate the interest.

$$I = \underset{(P)}{\$30{,}000} \times \underset{(R)}{.08} \times \underset{(T)}{1 \text{ year}}$$
$$= \$2{,}400$$

**Step 2.** Calculate the maturity value.

$$MV = \underset{(P)}{\$30{,}000} + \underset{(I)}{\$2{,}400}$$
$$= \$32{,}400$$

Let's use the same example again and assume Jan borrowed $30,000 for 18 months. Then Jan's interest and maturity value would be calculated as follows:

**Step 1.** Calculate the interest.

$$I = \underset{(P)}{\$30{,}000} \times \underset{(R)}{.08} \times \underset{(T)}{\frac{18^1}{12}}$$
$$= \$3{,}600$$

[1]This is the same as 1.5 years.

**Step 2.** Calculate the maturity value.

$$MV = \underset{(P)}{\$30{,}000} + \underset{(I)}{\$3{,}600}$$
$$= \$33{,}600$$

Next we'll turn our attention to two common methods we can use to calculate simple interest when a loan specifies its beginning and ending dates.

LO 2

## Two Methods for Calculating Simple Interest and Maturity Value

**Method 1: Exact Interest (365 Days)** The Federal Reserve banks and the federal government use the **exact interest** method. The *exact interest* is calculated by using a 365-day year. For **time,** we count the exact number of days in the month that the borrower has the loan. The day the loan is made is not counted, but the day the money is returned is counted as a full day. This method calculates interest by using the following fraction to represent time in the formula:

$$\text{Time} = \frac{\text{Exact number of days}}{365}$$

Exact interest

**From the *Business Math Handbook***

| | |
|---|---|
| July 6 | 187th day |
| March 4 | − 63rd day |
| | 124 days (exact time of loan) |
| March | 31 |
| | − 4 |
| | 27 |
| April | 30 |
| May | 31 |
| June | 30 |
| July | + 6 |
| | 124 days |

For this calculation, we use the exact days-in-a-year calendar from the *Business Math Handbook*. You learned how to use this calendar in Chapter 7, p. 182.

**EXAMPLE** On March 4, Peg Carry borrowed $40,000 at 8% interest. Interest and principal are due on July 6. What is the interest cost and the maturity value?

**Step 1.** Calculate the interest.

$$I = P \times R \times T$$
$$= \$40{,}000 \times .08 \times \frac{124}{365}$$
$$= \$1{,}087.12 \text{ (rounded to nearest cent)}$$

**Step 2.** Calculate the maturity value.

$$MV = P + I$$
$$= \$40{,}000 + \$1{,}087.12$$
$$= \$41{,}087.12$$

**Method 2: Ordinary Interest (360 Days)** In the **ordinary interest** method, time in the formula $I = P \times R \times T$ is equal to the following:

$$\text{Time} = \frac{\text{Exact number of days}}{360}$$

Ordinary interest

Since banks commonly use the ordinary interest method, it is known as the **Banker's Rule.** Banks charge a slightly higher rate of interest because they use 360 days instead of 365 in the denominator. By using 360 instead of 365, the calculation is supposedly simplified. Consumer groups, however, are questioning why banks can use 360 days, since this benefits the bank and not the customer. The use of computers and calculators no longer makes the simplified calculation necessary. For example, after a court case in Oregon, banks began calculating interest on 365 days except in mortgages.

Now let's replay the Peg Carry example we used to illustrate Method 1 to see the difference in bank interest when we use Method 2.

**EXAMPLE** On March 4, Peg Carry borrowed $40,000 at 8% interest. Interest and principal are due on July 6. What are the interest cost and the maturity value?

**Step 1.** Calculate the interest.

$$I = \$40{,}000 \times .08 \times \frac{124}{360}$$
$$= \$1{,}102.22$$

**MONEY TIPS**

Calculating the amount of interest you will pay on a loan may be a deterrent to making a purchase. Understand the terms of your loan before signing any contracts. Calculate the total out-of-pocket costs and make certain this is less than the value of what you are buying or you may be making a poor purchasing decision.

*(continued on next page)*

**Step 2.** Calculate the maturity value.

$$MV = P + I$$
$$= \$40{,}000 + \$1{,}102.22$$
$$= \$41{,}102.22$$

*Note:* By using Method 2, the bank increases its interest by $15.10.

$1,102.22 ← Method 2
− 1,087.12
$ 15.10 ← Method 1

Now you should be ready for your first Practice Quiz in this chapter.

## LU 10–1 PRACTICE QUIZ

Complete this **Practice Quiz** to see how you are doing.

Calculate simple interest (round to the nearest cent):

1. $14,000 at 4% for 9 months
2. $25,000 at 7% for 5 years
3. $40,000 at $10\frac{1}{2}$% for 19 months
4. On May 4, Dawn Kristal borrowed $15,000 at 8%. Dawn must pay the principal and interest on August 10. What are Dawn's simple interest and maturity value if you use the exact interest method?
5. What are Dawn Kristal's (Problem 4) simple interest and maturity value if you use the ordinary interest method?

*Solutions with Step-by-Step Help on DVD*

### ✓ Solutions

1. $\$14{,}000 \times .04 \times \frac{9}{12} = \$420$
2. $\$25{,}000 \times .07 \times 5 = \$8{,}750$
3. $\$40{,}000 \times .105 \times \frac{19}{12} = \$6{,}650$
4. August 10 → 222
   May 4 → − 124
   98

   $\$15{,}000 \times .08 \times \frac{98}{365} = \$322.19$

   $MV = \$15{,}000 + \$322.19 = \$15{,}322.19$
5. $\$15{,}000 \times .08 \times \frac{98}{360} = \$326.67$

   $MV = \$15{,}000 + \$326.67 = \$15{,}326.67$

## LU 10–1a EXTRA PRACTICE QUIZ WITH WORKED-OUT SOLUTIONS

Need more practice? Try this **Extra Practice Quiz** (check figures in Chapter Organizer, p. 265). Worked-out Solutions can be found in Appendix B at end of text.

Calculate simple interest (round to the nearest cent):

1. $16,000 at 3% for 8 months
2. $15,000 at 6% for 6 years
3. $50,000 at 7% for 18 months
4. On May 6, Dawn Kristal borrowed $20,000 at 7%. Dawn must pay the principal and interest on August 14. What are Dawn's simple interest and maturity value if you use the exact interest method?
5. What are Dawn Kristal's (Problem 4) simple interest and maturity value if you use the ordinary interest method?

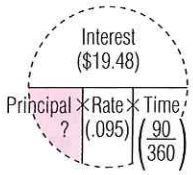
# Learning Unit 10–2: Finding Unknown in Simple Interest Formula

LO 1

This unit begins with the formula used to calculate the principal of a loan. Then it explains how to find the *principal, rate,* and *time* of a simple interest loan. In all the calculations, we use 360 days and round only final answers.

## Finding the Principal

**EXAMPLE** Tim Jarvis paid the bank $19.48 interest at 9.5% for 90 days. How much did Tim borrow using the ordinary interest method?




The following formula is used to calculate the principal of a loan:

$$\text{Principal} = \frac{\text{Interest}}{\text{Rate} \times \text{Time}}$$

Note how we illustrated this in the margin. The shaded area is what we are solving for. When solving for principal, rate, or time, you are dividing. Interest will be in the numerator, and the denominator will be the other two elements multiplied by each other.

**Step 1.** Set up the formula. $P = \dfrac{\$19.48}{.095 \times \dfrac{90}{360}}$

**Step 2.** Multiply the denominator. .095 times 90 divided by 360 (do not round)

$P = \dfrac{\$19.48}{.02375}$

**Step 3.** Divide the numerator by the result of Step 2. $P = \$820.21$

**Step 4.** Check your answer. $\underset{(I)}{\$19.48} = \underset{(P)}{\$820.21} \times \underset{(R)}{.095} \times \underset{(T)}{\dfrac{90}{360}}$

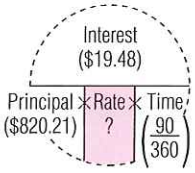
**Step 2.** When using a calculator, press
[.095] [×] [90] [÷] [360] [M+].

**Step 3.** When using a calculator, press
[19.48] [÷] [MR] [=].

## Finding the Rate

**EXAMPLE** Tim Jarvis borrowed $820.21 from a bank. Tim's interest is $19.48 for 90 days. What rate of interest did Tim pay using the ordinary interest method?

The following formula is used to calculate the rate of interest:




$$\text{Rate} = \frac{\text{Interest}}{\text{Principal} \times \text{Time}}$$

**Step 1.** Set up the formula. $R = \dfrac{\$19.48}{\$820.21 \times \dfrac{90}{360}}$

**Step 2.** Multiply the denominator. Do not round the answer. $R = \dfrac{\$19.48}{\$205.0525}$

**Step 3.** Divide the numerator by the result of Step 2. $R = 9.5\%$

**Step 4.** Check your answer. $\underset{(I)}{\$19.48} = \underset{(P)}{\$820.21} \times \underset{(R)}{.095} \times \underset{(T)}{\dfrac{90}{360}}$

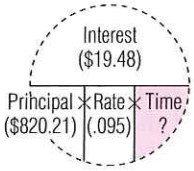
**Step 2.** When using a calculator, press
[820.21] [×] [.095] [M+].

**Step 3.** When using a calculator, press
[19.48] [÷] [MR] [=].

## Finding the Time

**EXAMPLE** Tim Jarvis borrowed $820.21 from a bank. Tim's interest is $19.48 at 9.5%. How much time does Tim have to repay the loan using the ordinary interest method?

The following formula is used to calculate time:




$$\text{Time (in years)} = \frac{\text{Interest}}{\text{Principal} \times \text{Rate}}$$

**Step 1.** Set up the formula. $T = \dfrac{\$19.48}{\$820.21 \times .095}$

**Step 2.** Multiply the denominator. Do not round the answer. $T = \dfrac{\$19.48}{\$77.91995}$

**Step 3.** Divide the numerator by the result of Step 2. $T = .25$ years

**Step 4.** Convert years to days (assume 360 days). $.25 \times 360 = 90$ days

### $ MONEY TIPS

Be wary of using payday loans. A payday loan is a small, short-term *loan* that is intended to cover a borrower's expenses until his or her next payday. These services tend to keep you upside-down with your cash flow due to high interest rate charges encouraging repeat use.

*(continued on next page)*

**Step 5.** Check your answer.

$$\underset{(I)}{\$19.48} = \underset{(P)}{\$820.21} \times \underset{(R)}{.095} \times \underset{(T)}{\frac{90}{360}}$$

Before we go on to Learning Unit 10–3, let's check your understanding of this unit.

## LU 10–2 PRACTICE QUIZ

Complete this **Practice Quiz** to see how you are doing.

Complete the following (assume 360 days):

| | Principal | Interest rate | Time (days) | Simple interest |
|---|---|---|---|---|
| **1.** | ? | 5% | 90 days | $8,000 |
| **2.** | $7,000 | ? | 220 days | 350 |
| **3.** | $1,000 | 8% | ? | 300 |

*Solutions with Step-by-Step Help on DVD*

### ✓ Solutions

**1.** $\dfrac{\$8{,}000}{.05 \times \frac{90}{360}} = \dfrac{\$8{,}000}{.0125} = \$640{,}000$ $\qquad P = \dfrac{I}{R \times T}$

**2.** $\dfrac{\$350}{\$7{,}000 \times \frac{220}{360}} = \dfrac{\$350}{\$4{,}277.7777} = 8.18\%$ $\qquad R = \dfrac{I}{P \times T}$

(do not round)

**3.** $\dfrac{\$300}{\$1{,}000 \times .08} = \dfrac{\$300}{\$80} = 3.75 \times 360 = 1{,}350$ days $\qquad T = \dfrac{I}{P \times R}$

## LU 10–2a EXTRA PRACTICE QUIZ WITH WORKED-OUT SOLUTIONS

Need more practice? Try this **Extra Practice Quiz** (check figures in Chapter Organizer, p. 265). Worked-out Solutions can be found in Appendix B at end of text.

Complete the following (assume 360 days):

| | Principal | Interest rate | Time (days) | Simple interest |
|---|---|---|---|---|
| **1.** | ? | 4% | 90 days | $9,000 |
| **2.** | $6,000 | ? | 180 days | 280 |
| **3.** | $900 | 6% | ? | 190 |

# Learning Unit 10–3: U.S. Rule—Making Partial Note Payments before Due Date

Often a person may want to pay off a debt in more than one payment before the maturity date. The **U.S. Rule** allows the borrower to receive proper interest credits. This rule states that any partial loan payment first covers any interest that has built up. The remainder of the partial payment reduces the loan principal. Courts or legal proceedings generally use the U.S. Rule. The Supreme Court originated the U.S. Rule in the case of *Story* v. *Livingston*.

**LO 1**

**EXAMPLE** Joe Mill owes $5,000 on an 11%, 90-day note. On day 50, Joe pays $600 on the note. On day 80, Joe makes an $800 additional payment. Assume a 360-day year. What is Joe's adjusted balance after day 50 and after day 80? What is the ending balance due?

*To calculate $600 payment on day 50:*

**Step 1.** Calculate interest on principal from date of loan to date of first principal payment. Round to nearest cent.

$$I = P \times R \times T$$

$$I = \$5{,}000 \times .11 \times \frac{50}{360}$$

$$I = \$76.39$$


Milos Jokic/Shutterstock

**Step 2.** Apply partial payment to interest due. Subtract remainder of payment from principal. This is the **adjusted balance** (principal).

$600.00 payment
− 76.39 interest
$523.61

$5,000.00 principal
− 523.61
$4,476.39 adjusted balance—principal

*To calculate $800 payment on day 80:*

**Step 3.** Calculate interest on adjusted balance that starts from previous payment date and goes to new payment date. Then apply Step 2.

Compute interest on $4,476.39 for 30 days (80 − 50)

$$I = \$4{,}476.39 \times .11 \times \frac{30}{360}$$

$$I = \$41.03$$

$800.00 payment
− 41.03 interest
$758.97

$4,476.39
− 758.97
$3,717.42 adjusted balance

**$ MONEY TIPS**

Make a partial payment only if the interest rate on the loan you are paying on is greater than the interest rate on your other loans or the rate you can earn on investing your money. Always use your money where it does the most for you.

**Step 4.** At maturity, calculate interest from last partial payment. *Add* this interest to adjusted balance.

Ten days are left on note since last payment.

$$I = \$3{,}717.42 \times .11 \times \frac{10}{360}$$

$$I = \$11.36$$

Balance owed = $3,728.78 ($3,717.42 + 11.36)

Note that when Joe makes two partial payments, Joe's total interest is $128.78 ($76.39 + $41.03 + $11.36). If Joe had repaid the entire loan after 90 days, his interest payment would have been $137.50—a total savings of $8.72.

Let's check your understanding of the last unit in this chapter.

## LU 10–3 PRACTICE QUIZ

Complete this **Practice Quiz** to see how you are doing.

Polly Flin borrowed $5,000 for 60 days at 8%. On day 10, Polly made a $600 partial payment. On day 40, Polly made a $1,900 partial payment. What is Polly's ending balance due under the U.S. Rule (assume a 360-day year)?

*Solutions with Step-by-Step Help on DVD*

### ✓ Solutions

$$\$5{,}000 \times .08 \times \frac{10}{360} = \$11.11$$

$600.00
− 11.11
$588.89

$5,000.00
− 588.89
$4,411.11

$$\$4{,}411.11 \times .08 \times \frac{30}{360} = \$29.41$$

$1,900.00
− 29.41
$1,870.59

$4,411.11
− 1,870.59
$2,540.52

$$\$2{,}540.52 \times .08 \times \frac{20}{360} = \$11.29$$

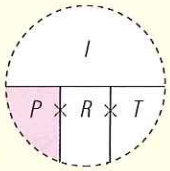
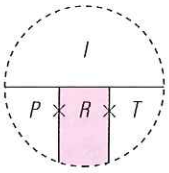
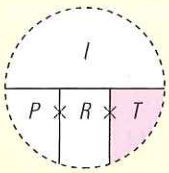
$ 11.29
+ 2,450.52
$2,551.81

## LU 10–3a EXTRA PRACTICE QUIZ WITH WORKED-OUT SOLUTIONS

Need more practice? Try this **Extra Practice Quiz** (check figures in Chapter Organizer, p. 265). Worked-out Solutions can be found in Appendix B at end of text.

Polly Flin borrowed $4,000 for 60 days at 4%. On day 15, Polly made a $700 partial payment. On day 40, Polly made a $2,000 partial payment. What is Polly's ending balance due under the U.S. Rule (assume a 360-day year)?

## CHAPTER ORGANIZER AND REFERENCE GUIDE

| Topic | Key point, procedure, formula | Example(s) to illustrate situation |
|---|---|---|
| Simple interest for months, p. 258 | Interest = Principal × Rate × Time<br>($I$) ($P$) ($R$) ($T$) | $2,000 at 9% for 17 months<br>$I = \$2{,}000 \times .09 \times \frac{17}{12}$<br>$I = \$255$ |
| Exact interest, p. 259 | $T = \frac{\text{Exact number of days}}{365}$<br>$I = P \times R \times T$ | $1,000 at 10% from January 5 to February 20<br>$I = \$1{,}000 \times .10 \times \frac{46}{365}$<br>Feb. 20: 51 days<br>Jan. 5: − 5<br>46 days<br>$I = \$12.60$ |
| Ordinary interest (Bankers Rule), p. 259 | $T = \frac{\text{Exact number of days}}{360}$<br>$I = P \times R \times T$ Higher interest costs | $I = \$1{,}000 \times .10 \times \frac{46}{360}$ (51 − 5)<br>$I = \$12.78$ |
| Finding unknown in simple interest formula (use 360 days), p. 260 | $I = P \times R \times T$ | Use this example for illustrations of simple interest formula parts:<br>$1,000 loan at 9%, 60 days<br>$I = \$1{,}000 \times .09 \times \frac{60}{360} = \$15$ |
| Finding the principal, p. 261 | $P = \frac{I}{R \times T}$<br>  | $P = \frac{\$15}{.09 \times \frac{60}{360}} = \frac{\$15}{.015} = \$1{,}000$ |
| Finding the rate, p. 261 | $R = \frac{I}{P \times T}$<br>  | $R = \frac{\$15}{\$1{,}000 \times \frac{60}{360}} = \frac{\$15}{166.66666} = .09$<br>$= 9\%$<br>*Note:* We did not round the denominator. |
| Finding the time, p. 261 | $T = \frac{I}{P \times R}$<br>(in years)<br>  <br>Multiply answer by 360 days to convert answer to days for ordinary interest. | $T = \frac{\$15}{\$1{,}000 \times .09} = \frac{\$15}{\$90} = .1666666$<br>$.1666666 \times 360 = 59.99 =$ 60 days |

(continues)

## CHAPTER ORGANIZER AND REFERENCE GUIDE

| Topic | Key point, procedure, formula | Example(s) to illustrate situation |
|---|---|---|
| **U.S. Rule (use 360 days), p. 262** | Calculate interest on principal from date of loan to date of first partial payment.<br><br>Calculate adjusted balance by subtracting from principal the partial payment less interest cost. The process continues for future partial payments with the adjusted balance used to calculate cost of interest from last payment to present payment.<br><br>Balance owed equals last adjusted balance plus interest cost from last partial payment to final due date. | 12%, 120 days, $2,000<br>*Partial payments:*<br>On day 40; $250<br>On day 60; $200<br>*First payment:*<br>$I = \$2{,}000 \times .12 \times \frac{40}{360}$<br>$I = \$26.67$<br>$250.00 payment<br>− 26.67 interest<br>$223.33<br>$2,000.00 principal<br>− 223.33<br>$1,776.67 adjusted balance<br>*Second payment:*<br>$I = \$1{,}776.67 \times .12 \times \frac{20}{360}$<br>$I = \$11.84$<br>$200.00 payment<br>− 11.84 interest<br>$188.16<br>$1,776.67<br>− 188.16<br>$1,588.51 adjusted balance<br>*60 days left:*<br>$\$1{,}588.51 \times .12 \times \frac{60}{360} = \$31.77$<br>$\$1{,}588.51 + \$31.77 =$ $1,620.28 balance due<br>Total interest = $26.67<br>11.84<br>+ 31.77<br>$70.28 |
| **KEY TERMS** | Adjusted balance, *p. 263*<br>Banker's Rule, *p. 259*<br>Exact interest, *p. 259*<br>Interest, *p. 258*<br>Maturity value, *p. 258*<br>Ordinary interest, *p. 259*<br>Principal, *p. 258*<br>Simple interest, *p. 258*<br>Simple interest formula, *p. 258*<br>Time, *p. 259*<br>U.S. Rule, *p. 262* | |
| **CHECK FIGURES FOR EXTRA PRACTICE QUIZZES WITH PAGE REFERENCES. (WORKED-OUT SOLUTIONS IN APPENDIX B.)** | LU 10–1a (p. 260)<br>1. $320<br>2. $5,400<br>3. $5,250<br>4. $20,383.56; Interest = $383.56<br>5. $20,388.89; Interest = $388.89<br><br>LU 10–2a (p. 262)<br>1. $900,000<br>2. 9.33%<br>3. 1,267 days<br><br>LU 10–3a (p. 264)<br>$1,318.78 | |

### Critical Thinking Discussion Questions

1. What is the difference between exact interest and ordinary interest? With the increase of computers in banking, do you think that the ordinary interest method is a dinosaur in business today?
2. Explain how to use the portion formula to solve the unknowns in the simple interest formula. Why would rounding the answer of the denominator result in an inaccurate final answer?
3. Explain the U.S. Rule. Why in the last step of the U.S. Rule is the interest added, not subtracted?
4. Do you believe the government bailout of banks is in the best interest of the country? Defend your position.

Solve for the missing item in the following (round to the nearest hundredth as needed):

| | Principal | Interest rate | Time (months or years) | Simple interest |
|---|---|---|---|---|
| **10–10.** | \$400 | 5% | ? | \$100 |
| **10–11.** | ? | 7% | $1\frac{1}{2}$ years | \$200 |
| **10–12.** | \$5,000 | ? | 6 months | \$300 |

**10–13.** Use the U.S. Rule to solve for total interest costs, balances, and final payments (use ordinary interest).

**Given** Principal: \$10,000, 8%, 240 days
Partial payments: On 100th day, \$4,000
On 180th day, \$2,000

## WORD PROBLEMS

**10–14.** The main concept to investing is diversify your investments. The old saying of "don't put all of your eggs in one basket" exemplifies this concept. Kerry Stutsman has saved \$500 and is wondering how to invest it. She was researching different investment options and found a June 2009 article called "What You Need to Know About CD's" in *Kiplinger's Personal Finance* magazine. She currently is investing in real estate through her home as well as contributing to the 401k she has at work and is thinking about investing in CD's as well. She has the \$500 in a savings account earning .45% interest. She is considering buying a 1-year certificate of deposit (CD) that pays 3.25% interest. What will be the annual difference in her interest earnings between the savings account and the CD?

**10–15.** Leslie Hart borrowed \$15,000 to pay for her child's education at Riverside Community College. Leslie must repay the loan at the end of 9 months in one payment with $5\frac{1}{2}$% interest. How much interest must Leslie pay? What is the maturity value?

**10–16.** On September 12, Jody Jansen went to Sunshine Bank to borrow $2,300 at 9% interest. Jody plans to repay the loan on January 27. Assume the loan is on ordinary interest. What interest will Jody owe on January 27? What is the total amount Jody must repay at maturity?

| | | |
|---|---|---|
| 10 | 78,000 | 148 |
| 10 | 48,778 | 89 |
| 10 | 76,551 | 117 |
| 10 | 33,737 | 24 |

**10–17.** Kelly O'Brien met Jody Jansen (Problem 10–16) at Sunshine Bank and suggested she consider the loan on exact interest. Recalculate the loan for Jody under this assumption. How much would she save in interest?

| | | |
|---|---|---|
| 10 | 78,000 | 148 |
| 10 | 48,778 | 89 |
| 10 | 76,551 | 117 |
| 10 | 33,737 | 24 |

**10–18.** May 3, 2010, Leven Corp. negotiated a short-term loan of $685,000. The loan is due October 1, 2010, and carries a 6.86% interest rate. Use ordinary interest to calculate the interest. What is the total amount Leven would pay on the maturity date?

**10–19.** Gordon Rosel went to his bank to find out how long it will take for $1,200 to amount to $1,650 at 8% simple interest. Please solve Gordon's problem. Round time in years to the nearest tenth.

**10–20.** Bill Moore is buying a used Winnebago. His April monthly interest at 12% was $125. What was Bill's principal balance at the beginning of April? Use 360 days.

**10–21.** On April 5, 2010, Janeen Camoct took out an $8\frac{1}{2}$% loan for $20,000. The loan is due March 9, 2011. Use ordinary interest to calculate the interest. What total amount will Janeen pay on March 9, 2011?

**10–22.** Sabrina Bowers took out the same loan as Janeen (Problem 10–21). Sabrina's terms, however, are exact interest. What is Sabrina's difference in interest? What will she pay on March 9, 2011?

**10–23.** Max Wholesaler borrowed $2,000 on a 10%, 120-day note. After 45 days, Max paid $700 on the note. Thirty days later, Max paid an additional $630. What is the final balance due? Use the U.S. Rule to determine the total interest and ending balance due. Use ordinary interest.

## ADDITIONAL SET OF WORD PROBLEMS

**10–24.** Lane French had a bad credit rating and went to a local cash center. He took out a $100 loan payable in two **weeks** at $115. What is the percent of interest paid on this loan? Do not round denominator before dividing.

**10–25.** Availability of state and federal disaster loans was the featured article in *The Enterprise Ledger* (AL) on March 14, 2007. Alabama Deputy Treasurer Anthony Leigh said the state program allows the state treasurer to place state funds in Alabama banks at 2 percent below the market interest rate. The bank then agrees to lend the funds to individuals or businesses for 2 percent below the normal charge, to help Alabama victims of disaster to secure emergency short-term loans. Laura Harden qualifies for an emergency loan. She will need $3,500 for 5 months and the local bank has an interest rate of $4\frac{3}{4}$ percent. **(a)** What would have been the maturity value of a non-emergency loan? **(b)** What will be the maturity value of the emergency loan? Round to the nearest cent.

**10–26.** On September 14, Jennifer Rick went to Park Bank to borrow $2,500 at $11\frac{3}{4}$% interest. Jennifer plans to repay the loan on January 27. Assume the loan is on ordinary interest. What interest will Jennifer owe on January 27? What is the total amount Jennifer must repay at maturity?

**10–27.** Steven Linden met Jennifer Rick (Problem 10–26) at Park Bank and suggested she consider the loan on exact interest. Recalculate the loan for Jennifer under this assumption.

**10–28.** Lance Lopes went to his bank to find out how long it will take for $1,000 to amount to $1,700 at 12% simple interest. Can you solve Lance's problem? Round time in years to the nearest tenth.

**10–29.** Margie Pagano is buying a car. Her June monthly interest at $12\frac{1}{2}$% was $195. What was Margie's principal balance at the beginning of June? Use 360 days. Do not round the denominator before dividing.

**10–30.** Shawn Bixby borrowed $17,000 on a 120-day, 12% note. After 65 days, Shawn paid $2,000 on the note. On day 89, Shawn paid an additional $4,000. What is the final balance due? Determine total interest and ending balance due by the U.S. Rule. Use ordinary interest.

**10–31.** Carol Miller went to Europe and forgot to pay her $740 mortgage payment on her New Hampshire ski house. For her 59 days overdue on her payment, the bank charged her a penalty of $15. What was the rate of interest charged by the bank? Round to the nearest hundredth percent (assume 360 days).

**10–32.** Abe Wolf bought a new kitchen set at Sears. Abe paid off the loan after 60 days with an interest charge of $9. If Sears charges 10% interest, what did Abe pay for the kitchen set (assume 360 days)?

**10–33.** Joy Kirby made a $300 loan to Robinson Landscaping at 11%. Robinson paid back the loan with interest of $6.60. How long in days was the loan outstanding (assume 360 days)? Check your answer.

**10–34.** Molly Ellen, bookkeeper for Keystone Company, forgot to send in the payroll taxes due on April 15. She sent the payment November 8. The IRS sent her a penalty charge of 8% simple interest on the unpaid taxes of $4,100. Calculate the penalty. (Remember that the government uses exact interest.)

**10–35.** Oakwood Plowing Company purchased two new plows for the upcoming winter. In 200 days, Oakwood must make a single payment of $23,200 to pay for the plows. As of today, Oakwood has $22,500. If Oakwood puts the money in a bank today, what rate of interest will it need to pay off the plows in 200 days (assume 360 days)?

## CHALLENGE PROBLEMS

**10–36.** You have the opportunity to purchase a used car in great condition for $14,500. A $2,000 down payment is required to receive 6% interest for 6 years. The car you currently own is in perfect working condition but you would like a change. Your spouse recommends using the $2,000 to remodel a bathroom in your home. The remodel is estimated to bring the value of your home up by $5,000. Determine the interest you will pay on the loan for the car. Considering the opportunity cost (value of the next best alternative forgone as the result of making a decision) for the $2,000, what should you do with the money?

**10–37.** Janet Foster bought a computer and printer at Computerland. The printer had a $600 list price with a $100 trade discount and 2/10, n/30 terms. The computer had a $1,600 list price with a 25% trade discount but no cash discount. On the computer, Computerland offered Janet the choice of (1) paying $50 per month for 17 months with the 18th payment paying the remainder of the balance or (2) paying 8% interest for 18 months in equal payments.

**a.** Assume Janet could borrow the money for the printer at 8% to take advantage of the cash discount. How much would Janet save (assume 360 days)?

**b.** On the computer, what is the difference in the final payment between choices 1 and 2?

## DVD SUMMARY PRACTICE TEST

**1.** Lorna Hall's real estate tax of $2,010.88 was due on December 14, 2009. Lorna lost her job and could not pay her tax bill until February 27, 2010. The penalty for late payment is $6\frac{1}{2}$% ordinary interest. *(p. 259)*

**a.** What is the penalty Lorna must pay?

**b.** What is the total amount Lorna must pay on February 27?

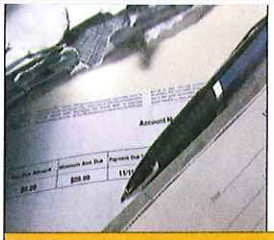
**2.** Ann Hopkins borrowed $60,000 for her child's education. She must repay the loan at the end of 8 years in one payment with $5\frac{1}{2}$% interest. What is the maturity value Ann must repay? *(p. 258)*

**3.** On May 6, Jim Ryan borrowed $14,000 from Lane Bank at $7\frac{1}{2}$% interest. Jim plans to repay the loan on March 11. Assume the loan is on ordinary interest. How much will Jim repay on March 11? *(p. 259)*

4. Gail Ross met Jim Ryan (Problem 3) at Lane Bank. After talking with Jim, Gail decided she would like to consider the same loan on exact interest. Can you recalculate the loan for Gail under this assumption? *(p. 259)*

5. Claire Russell is buying a car. Her November monthly interest was \$210 at $7\frac{3}{4}\%$ interest. What is Claire's principal balance (to the nearest dollar) at the beginning of November? Use 360 days. Do not round the denominator in your calculation. *(p. 261)*

6. Comet Lee borrowed \$16,000 on a 6%, 90-day note. After 20 days, Comet paid \$2,000 on the note. On day 50, Comet paid \$4,000 on the note. What are the total interest and ending balance due by the U.S. Rule? Use ordinary interest. *(p. 262)*





# Scams Exploit Hard Times

Prime targets are the unemployed and homeowners behind on their mortgages.

BY LAURA COHN

**WHEN NANCY DIX RECEIVED A** letter promising to help her prevent foreclosure on her home in Ansted, W.Va., she jumped at the chance. The letter, from an organization called Mortgage Rescue, said all she had to do to save her home was send the company a check for $921. So she did. Then she didn't hear anything—and got suspicious. The 67-year-old widow called the state attorney general's office, which referred her to Mountain State Justice, a nonprofit legal service. Turns out Mortgage Rescue was operating a scam, says Bren Pomponio, Dix's lawyer at Mountain State.

Fortunately, Dix hadn't signed over her deed when she sent the check—an additional layer of some similar scams. She never got her money back, but the legal service worked with her lender to keep her in her home. "Before you start sending money, talk to an attorney or a consumer group, or you'll be in the same mess I was in," Dix says.

Over the past five years, the FBI's mortgage-fraud caseload has jumped by nearly 400%, to more than 2,100. The general rule still applies: If it sounds too good to be true, it is. If, for example, you receive a call from a firm that guarantees to stop a foreclosure but asks you not to contact your lender, it's a scam: Your lender is the only route to modifying your mortgage or preventing foreclosure. If you're having trouble making your payments, find a housing counselor approved by the U.S. Department of Housing and Urban Development at www.hud.gov.

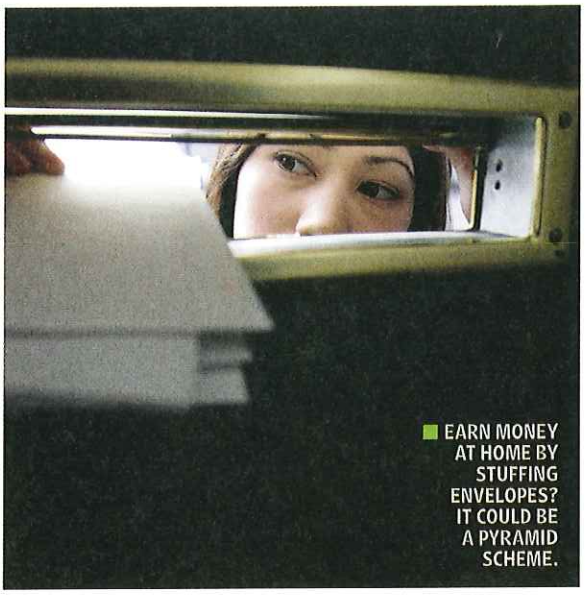
**Easy money.** The sagging economy has inspired a number of schemes to watch for, from work-at-home ploys to tax and stimulus frauds (see "Ask Kim," May). Shady operators take advantage of economic hard times, says Edward Johnson, president of the Better Business Bureau of Metro Washington and Eastern Pennsylvania. "If you don't have a job and are having trouble keeping up with your mortgage, you will let your guard down."

If you're looking for quick cash, be on the alert for job-related scams, such as an ad that promises you can earn money at home by stuffing envelopes—it's likely to be a pyramid scheme. You pay a fee upfront, and to make money you place ads and wait for people to respond and pay *you* a fee. Before you participate, ask the company to spell out, in writing, exactly what the job entails and whether you'll be on salary or commission. Also run the company's name by the BBB (www.bbb.org) and call the firm to make sure it's soliciting workers.

Another sneaky ploy involves bogus mystery-shopping firms that promise to pay shoppers to check out local stores. Scam operators may send out a letter with the company logo of an actual mystery-shopping service plus BBB certification, along with a check for several thousand dollars. The letter tells recipients to deposit the check, evaluate a money-wiring service, and then wire part of the money back to the firm to test the service—often within seven days. The check bounces after you've wired the money back.

Now that credit is harder to get, the Federal Deposit Insurance Corp. has reported a jump in "advance-fee loan" scams. Someone calls you and says that if you simply pay a fee of $500 or $1,000 upfront, you'll be guaranteed a loan. But you never get the money.

Finally, watch out for "phishing" scams. You get a phony e-mail from a trusted institution that asks for your Social Security number or other information that could be used to tap into your financial accounts (see "Lowdown," on page 79). One prevalent scheme is an e-mail promising you a tax refund from the IRS—except the IRS never e-mails taxpayers. Phony Bank of America and Citibank messages are also common. ■



■ EARN MONEY AT HOME BY STUFFING ENVELOPES? IT COULD BE A PYRAMID SCHEME.

## BUSINESS MATH ISSUE

**You should never take out a loan online.**

1. List the key points of the article and information to support your position.
2. Write a group defense of your position using math calculations to support your view.