Section 11.3 Continued

Warm up

Calculate the interest on $1500 at 4% compounded quarterly for 5 years.

$$A = 1500\left(1+\frac{.04}{4}\right)^{(4\cdot 5)} = 1830.29$$

$$1830.29 - 1500 = 330.29 \text{ Interest}$$

Calculate the interest for the problem above using the simple interest formula.

$$I = 1500(.04)(5) = 300$$

The interest rates are the same, but the compound interest pays more interest.

The *effective annual yield or annual percentage yield (APY)* is the simple interest rate that gives the same amount of interest as a compound rate over the same period of time.

To determine the actual interest rate, annual percentage yield (APY), per year, use $1 for the principal and then use the compound interest formula.

Example: Find the APY for $1 invested for 5 year at 4% compounding quarterly

$$A = 1\left(1+\frac{.04}{4}\right)^{(4\cdot 5)}$$

1.0406

.0406 = 4.06%

$1

$I = 1(.0406)(5)$

Interest Rate = Amount - Principal

Suncoast Schools Credit Union

CD Rates

Type	Rate	APY*
12 mo	4.50%	4.60%
24 mo	4.88%	5.00%
36 mo	4.97%	5.10%
48 mo	5.12%	5.25%

* Annual Percentage Yield

Example 4

Determine the annual percentage yield (APY) for $1 invested for 1 year a

a) 8% compounded daily. (360 days) $= 1\left(1+\frac{.08}{360}\right)^{(360)} = 1.0833$ 8.33%

b) 6% compounded quarterly.

$= 1\left(1+\frac{.06}{4}\right)^{4} = 6.14\%$

31. ***Determining Effective Annual Yield*** Determine the effective annual yield for \$1 invested for 1 year at 3.5% compounded semiannually.

$1\left(1+\frac{.035}{2}\right)^2 = 3.53\%$

33. ***Verifying APY*** Suppose you saw a sign at your local bank that said, "2.4% rate compounded monthly—2.6% Annual Percentage Yield (APY)." Is there anything wrong with the sign? Explain.

$1\left(1+\frac{.024}{12}\right)^{12}$ 2.43 APY

34. *Verifying APY* Suppose you saw an advertisement in the newspaper for a financial planner who was recommending a certificate of deposit that paid 4.5% interest compounded quarterly. In the fine print at the bottom of the advertisement, it stated that the APY on the CD was 4.58%. Was this advertisement accurate? Explain.

$1\left(1+\frac{.045}{4}\right)^4 = 4.58\%$ correct

36. *Comparing Loan Sources* Tom Angelo needs to borrow $1500 to expand his farm implement maintenance business. He learns that the local bank will lend him the money for 2 years at a rate of 10% compounded quarterly. After hearing of this rate, Tom's grandfather offers to lend him the money for 2 years with a simple interest rate of 7%. How much money will Tom save by borrowing the money from his grandfather?

Bank $A = 1500\left(1+\frac{.10}{4}\right)^{(4\cdot2)} = 1827.60 - 1500 = 327.60$ I

$I = 1500(.07)(2) = 210$

Save 117.60

Present Value

How much must you deposit in an account today at a given rate of interest so that it will accumulate to $25,000 to pay your child's college costs in 4 years?

The principal, p, that would have to be invested now is called the ***present value***.

PRESENT VALUE FORMULA

$$p = \frac{A}{\left(1 + \frac{r}{n}\right)^{nt}}$$

where p is the present value, or the principal to invest now, A is the amount to be accumulated in the account, r is the annual interest rate as a decimal, n is the number of compounding periods per year, and t is the time in years.

EXAMPLE 5 *Savings for College*

Will Hunting would like his daughter to attend college in 6 years when she finishes high school. Will would like to invest enough money in a certificate of deposit (CD) now to pay for his daughter's college expenses. If Will estimates that he will need $30,000 in 6 years, how much should he invest now in a CD that has a rate of 4.72% compounded quarterly?

$$P = \frac{30000}{\left(1 + \frac{.0472}{4}\right)^{(4)(6)}} = 22638.57$$

19. *Little League* Braden River Little League receives a $50,000 donation for building a new snack bar and office building. The league decides to invest this money in a money market account that pays 4% interest compounded quarterly. How much will the league have in this account after 2 years?

$A = 50000\left(1+\frac{.04}{4}\right)^{(2\cdot4)}$

$= 54142.84$

37. *A New Water Tower* The village of Kieler recently completed the construction of a new water tower. The entire cost of the water tower was $925,000, and the state paid $370,000 of the total cost through the awarding of a grant. In addition, the village can delay paying the balance of the cost for 30 years (without paying any interest during the 30 years). To finance the balance, the village board will at this time assess its 598 homeowners a one-time flat fee surcharge and then invest this money in a 30-year CD paying 7.5% interest compounded monthly.

a) What is the balance due on the water tower? $925000 - 370000 = 555000$

b) How much will the village of Kieler need to invest at this time in the CD to raise the balance due in 30 years?

c) What amount should each homeowner pay as a surcharge?

b) $P = \frac{555000}{\left(1+\frac{.075}{12}\right)^{12\cdot30}} = 58907.60$

c) $58907.60 / 598 = 98.51$

40. *Investing for Retirement* Carl and Kathy Minieri are planning to retire in 20 years and believe that they will need $200,000 in addition to income from their retirement plans. How much must they invest today at 7.5% compounded quarterly to accomplish their goal?

41. ***Investment for a Newborn*** How much money should parents invest at the birth of their child to provide their child with $50,000 at age 18? Assume that the money earns interest at 8% compounded quarterly.