

6. Melanie is planning a trip to Europe in 3 years. To save for the trip, Melanie deposits \$1500 in an investment that pays her simple interest at 2.75% per year. How much more could Melanie earn in 3 years if the investment paid 2.75% interest, compounded annually?

Simple  $P = 1500$   
 $I = Prt$   $r = 2.75\%$   
 $= 0.0275$

$$I = (1500)(0.0275)(3)$$

$$I = 123.75$$

$$A = P + I$$

$$A = 1500 + 123.75$$

$$A = 1623.75$$

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

$$A = 1500 \left(1 + \frac{0.0275}{1}\right)^{(1)(3)}$$

$P = 1500$   
 $r = 0.0275$   
 $t = 3$

$$A = 1500(1 + 0.0275)^3$$

$n = 1$

$$A = 1500(1.0275)^3$$

$$A = 1500(1.0848)$$

$$A = 1627.20$$

\$ 3.45 more

Roger invested \$20 000 in a mutual fund 7 years ago. The interest he earns is compounded monthly. He tracks his investment online. He sees that the fund has averaged an annual return of 9%.

- Determine the number of compounding periods.
- Determine the growth rate per compounding period.
- ~~Calculate the value of the investment after the first month.~~
- ~~Show the investment as a series of simple interest calculations.~~
- Write a formula for calculating the future value of a compound interest investment.
- Determine the future value of Roger's investment after 7 years.

The interest earned on mutual funds varies. It is very unlikely that a mutual fund would earn exactly 9% in each of 7 years. However, to illustrate how the compound interest formula works, assume that it did.

$$I = 37464 - 20000 = 17464$$

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

$$a) \quad n = ? \text{ monthly} \\ n = 12$$

$$b) \quad 9\% \rightarrow 0.09$$

$$P = 20000$$

$$A = 20000 \left( 1 + \frac{0.09}{12} \right)^{12 \cdot 7}$$

$$A = 20000 (1.075)^{84}$$

$$A = 20000 (1.8732)$$

$$A = \$ 37464$$

## Your Turn

Roger has another \$10 000 to invest. He researches and finds an opportunity to earn 8% for 3 years with interest compounded semi-annually.

How much will his investment be worth in 3 years?

$$P = 10\,000$$

$$r = 8\% = 0.08$$

$$t = 3 \text{ years}$$

$$n = 2$$

$$A = P \left( 1 + \frac{r}{n} \right)^{n \cdot t}$$

$$A = 10\,000 \left( 1 + \frac{0.08}{2} \right)^{(2)(3)}$$

$$A = 10\,000 (1 + 0.04)^6$$

$$A = 10\,000 (1.04)^6$$

$$A = 10\,000 (1.2653)$$

$$A = \text{\$} 12,653$$

# Comp Check

Monday Jan. 18<sup>th</sup>

→ 1 question Simple Interest

→ 2-3 Compound Interest

#6

$$P = 4000$$

$$r = 3\% = 0.03$$

$$\frac{n=1}{t=2}$$

$$A = P \left(1 + \frac{r}{n}\right)^{n \cdot t}$$

$$A = 4000 \left(1 + \frac{0.03}{1}\right)^{(1)(2)}$$

$$A = 4000 (1.03)^2$$

$$A = 4000 (1.0609)$$

$$A = 4243.26$$

$$I = 243.26$$

## Arranging a Loan

Kevin borrowed \$27 000 from his bank to buy a new car. He negotiated the interest rate of 6.5%, compounded monthly. Kevin also negotiated for a longer payback period. He will make monthly payments of \$528.29 for the next 5 years.

- a) How many payments will Kevin make?
- b) What is the total amount that Kevin will repay to the bank?
- c) How much interest will he pay?
- d) The average car retains about 80% of its value each year. Estimate the value of Kevin's car after he has finished paying for it.

