Chapter 7 Compound Interest

Prerequisite Skills

Answer these questions to check your understanding of the Prerequisite Skills concepts on pages 344–345 of the *Functions and Applications 11* textbook.

Percents

1. Convert each percent to a decimal.

   a) 4%   **b)** 7.9%   **c)** −18.2%   **d)** $-2\frac{1}{2}$ **e)** 0.3%   **f)** $-5\frac{3}{8}$%

2. Estimate.

   a) 8900 × 1.25%   **b)** 7.5% × 4000   **c)** 8.2% of 26 000   **d)** 14.5% of 7600

   e) 19 200 × 1.2%   **f)** 3.3% of $5200   **g)** $94 000 × 24.5%   **h)** 10.7% of $37 000

3. Evaluate. Express each answer as a decimal, rounded to six decimal places.

   a) $\dfrac{1.45\%}{7}$ **b)** $\dfrac{9.4\%}{52}$ **c)** $\dfrac{2.5\%}{12}$ **d)** $\dfrac{20.6\%}{4}$ **e)** $\dfrac{3.6\%}{30}$ **f)** $\dfrac{12.8\%}{365}$

Time

4. Convert each time to the unit specified.

   a) 3 years to months   **b)** 20 weeks to years   **c)** 82 days to years

   d) 15 months to weeks   **e)** 75 days to months   **f)** 39 weeks to months

5. How many intervals are in each time?

   a) weekly intervals in 2 years   **b)** annual intervals in 4 years

   c) monthly intervals in 3.5 years   **d)** quarterly intervals in 1 year

   e) semi-annual intervals in 9 months   **f)** annual intervals in 3 months

Evaluate Powers

6. Evaluate each power. Round answers to four decimal places where necessary.

   a) 6^2 **b)** 0.25^4 **c)** 2.06^{12} **d)** $(1 - 0.4)^{-6}$ **e)** $\left[1 + \dfrac{0.029}{12}\right]^{18}$

7. Without evaluating, list the following expressions in order.
   $2000(0.65)^6$, $2000(1.002)^7$, $2000(1.08)^3$, $2000(0.75)^4$, $2000(0.50)^6$

Exponential Functions

8. Complete the table of values. Then sketch a graph of the function $y = 1.3^x$.

x	0	1	2	3	4	5	6	7	8	9	10
$y = 1.3^x$											

9. Determine whether each table of values represents an exponential function. Justify your reasoning using finite differences, a graph, or common ratios.

   a)

x	0	1	2	3	4
y	10	25	63	156	391

   b)

x	0	1	2	3	4
y	5	13	24	41	62

7.1 Explore Simple Interest and Compound Interest

Textbook pp. 346–354

Prerequisite Skills

1. Convert each percent to a decimal.

a) 6.1%   **b)** 21.8%   **c)** −5.9%

d) $-1\frac{3}{4}\%$ **e)** 0.6%   **f)** $-10\frac{5}{8}\%$

2. Evaluate. Express each answer as a decimal, rounded to six decimal places.

a) $\dfrac{2.95\%}{365}$ **b)** $\dfrac{14.6\%}{7}$ **c)** $\dfrac{8.3\%}{30}$

d) $\dfrac{22.1\%}{52}$ **e)** $\dfrac{1.15\%}{4}$ **f)** $\dfrac{8.45\%}{12}$

3. Convert each time to the unit specified.

a) 26 weeks to years   **b)** 4 years to months   **c)** 300 days to years

d) 5 months to weeks   **e)** 212 days to months   **f)** 63 weeks to months

4. How many intervals are in each time?

a) weekly intervals in 3 years   **b)** annual intervals in 10 years

c) monthly intervals in 6.75 years   **d)** quarterly intervals in 6 year

e) semi-annual intervals in 12 months   **f)** annual intervals in 18 months

A

1. For each simple interest investment

- calculate the total interest earned
- determine the final amount

> Use the formulas $I = Prt$ and $A = P + I$.

a) $6000 earning 2.9% per year for 5 years

b) $3000 at 6% per year for 4 years

c) $8000 earning 1.45% per year for 6 months

d) $900 invested for 17 months a an annual interest rate of 3.25%

2. For each compound interest investment

- determine the final amount
- calculate the total interest earned

> Use a table to organise your work.

a) $38 000 earning 5.45% annual interest for 5 years with interest compounded quarterly

b) $24 000 invested at 3.7% per year for 6 years with interest compounded semi-annually

c) $7500 earning 8.4% annual interest for 3 months with interest compounded monthly

d) $4000 invested at 2.5% per year for 4 years with interest compounded annually

B

3. A Canadian bank offers a 5-year term investment paying 2.4% simple interest.

> Use a spreadsheet or a table and a graphing calculator.

 a) Determine the interest earned each year on a principal of $3500.

 b) Determine the amount of the investment at the end of each year.

 c) Use finite differences and ratios to justify whether the relation is linear, quadratic, or exponential.

 d) Graph Interest versus Time. Determine the equation of the line or curve passing through these points.

 e) Graph Amount versus Time. Determine the equation of the line or curve passing through these points.

4. Marsha buys a $2500 investment certificate that pays 3.6% simple interest per year. How much more would the investment earn in 4 years if it were invested at 3.6% annual interest compounded annually?

5. Peter invested $6000 in a mutual fund that increased in value by 8.4% in its first year. The management company charges a fee of 2.3% per year.

 a) Calculate the net percent increase in Peter's investment, after the management fee is paid.

 b) Calculate the net amount of the investment at the end of the year.

 c) Mutual funds do not always increase in value. They can even have a negative interest rate, meaning they lost money. Suppose Peter's mutual fund increased in value by –2.95%. Repeat parts a) and b) for the new interest rate.

6. Tony invests $700 in an account that earns 4.2% simple interest per year, for 4 years.

 a) Tony calculates the final amount after 4 years but realizes he needs to have double the final amount by the end of the 4 years. How much more money does Tony need to invest after the first year to have double the amount?

> How can he earn the same amount of money, but only in 3 years?

 b) Suppose Tony invested $700 at 4.2% annual interest, with interest compounded quarterly. How much will the investment be worth after 4 years?

7. Carlotta is using the Internet to explore some investment options. She wants to travel to Europe in 3 years, after finishing college. She currently has $1400 in a bank account that is earning very low interest. She sees two low risk investments on a Web site.

 Option A: a 3-year term deposit that pays 4.5% simple interest annually
 Option B: a 3-year investment paying 3.8% annually, with interest compounded semi-annually

 Determine the amount of each option and advise Suzanne as to which option would earn more money in 3 years.

C

8. Mohamed decides to purchase a $1200 GIC for 3 years with variable rates. Variable rates mean that the interest rate changes over the term of the GIC.

 • In the 1st year, the GIC pays 2.8% annual interest.
 • In the 2nd year, it pays 3.5% annual interest.
 • In the 3rd year, it pays 4.5% annual interest.

 Interest is compounded semi-annually. Display the growth of Mohamed's investment using a table of values and a graph.

7.2 The Compound Interest Formula

Textbook pp. 356–361

Prerequisite Skills

1. Evaluate. Express each answer as a decimal, rounded to six decimal places.

   a) $\dfrac{7.8\%}{52}$

   b) $\dfrac{14.75\%}{12}$

   c) $\dfrac{19.2\%}{4}$

   d) $\dfrac{2.15\%}{365}$

   e) $\dfrac{9.3\%}{7}$

   f) $\dfrac{6.9\%}{30}$

2. Evaluate each power. Round answers to four decimal places where necessary.

   a) $\left[1 + \dfrac{0.04}{6}\right]^{24}$

   b) $\left[1 + \dfrac{0.012}{18}\right]^{5}$

   c) $\left[1 + \dfrac{0.017}{20}\right]^{20}$

   d) $\left[1 + \dfrac{0.022}{17}\right]^{30}$

3. Copy and complete the table of values. Then sketch a graph of the function $y = 1.7^x$.

x	0	1	2	3	4	5	6	7	8
$y = 1.7^x$									

A

1. Copy and complete the table.

> n = number of compounding periods per year × number of years

Compounding Frequency	Number of Compounding Periods Per Year	Term of Investment or loan	Compounding Periods, n
a) annually		15 years	☐ × ☐ = ☐
b) semi-annually		30 years	
c) quarterly		18 months	
d) monthly		6.5 years	
e) daily		June 4 to July 17, inclusive	

2. Copy and complete the table.

$$i = \frac{\text{annual interest rate}}{\text{number of compounding periods per year}}$$

Annual Interest Rate	Compounding Frequency	Number of Compounding Periods Per Year, n	Interest Rate Per Compounding Period, i (expressed as a decimal)
a) 9%	annually		☐ % = ☐
b) 5.35%	semi-annually		
c) 1.7%	quarterly		
d) 10.25%	monthly		
e) 22.5%	daily		

3. For each investment
- determine i and n
- substitute the values into the compound interest formula, $A = P(1 + i)^n$
  Do not evaluate.

a) $2000 invested at 6% per year, compounded annually for 5 years

b) $90 000 invested at 4.8% per year, compounded semi-annually for 6 years

c) $45 000 invested at 7.25% per year, compounded monthly for 3 years

4. Determine the amount if $5000 is invested at 3.5% per year for 4 years at each compounding frequency.

Use a table to organise your work.

a) annually   **b)** semi-annually

c) quarterly   **d)** monthly

B

5. Martin invests $3000 in a GIC that pays 4.5% per year, compounded annually. The table shows the value of the GIC over 5 years.

Year	Value of GIC ($)
0	3000.00
1	3135.00
2	3276.08
3	3423.50
4	3577.56
5	3738.55

For help with question 5, refer to the Investigate on pages 255 to 257 of your textbook.

a) Show that an exponential relation can be used to model this investment. You may wish to use a graph, finite differences and ratios, or algebraic methods.

b) Determine the growth factor.

c) Describe the relationship between the growth factor and the interest rate.

6. Use the compound interest formula, $A = P(1 + i)^n$, to calculate each final amount.

   a) $900 invested at 2.9% per year, compounded semi-annually for 3 years

   b) $4000 loan at 12.6% per year, compounded monthly for 6.5 years

   c) $22 000 investment at 4.75% per year, compounded daily from March 24th to May 6th, inclusive

7. To purchase a motor scooter, Enrica borrows $3500 from her parents at 2.4% interest per year, compounded semi-annually. The loan must be paid in full at the end of 2 years.

   a) How much money will Enrica need to repay her parents?

   b) How much interest, in dollars, will Enrica pay?

   c) The value of the scooter depreciates by 15% each year. What will be the value of the scooter when Enrica has paid off her loan?

8. Amir has $800 in a daily interest savings account. Interest is calculated and compounded daily. The account pays an annual interest rate of 0.05%.

   a) Calculate the interest earned on Amir's money in 1 year.

   b) Explain why some people believe that a daily interest savings account is a poor place to save money.

9. Refer to question 8. Amir recently purchased a digital camera with a before-tax price of $229.00. Amir paid for the camera with a credit card. Interest is 18.50% per year and is compounded daily on an overdue balance.

   a) Calculate the after-tax cost of the camera if PST is 8% and GST is 5%.

   b) How much interest will be charged to Amir's credit card if the payment is 30 days overdue?

   c) Explain why Amir should withdraw money from his savings account and pay for the camera on or before the payment due date.

10. Clara wishes to borrow $25 000 to renovate her restaurant. She has found two options.

   A: a 2 year loan at an annual interest rate of 7.5%, compounded monthly

   B: a 2 year loan at 7.75% per year, with quarterly compounding

   The loan must be paid in full at the end of the term.

   a) Which loan should Clara accept?

   b) What is the difference in interest to be paid between the two loans?

C

11. A certain mutual fund has averaged a 9.45% annual growth rate with interest compounded monthly. The mutual fund company charges a management fee of 0.12% per month on the principal.

   > Subtract the fee from the monthly interest rate before calculating the interest.

   a) Determine the annual growth rate of the investment with the management fee included.

   b) Determine the amount of a $25 000 investment in 4 years. Assume that the growth rate remains the same.

7.3 Present Value
Textbook pp. 362–366

Prerequisite Skills

1. Evaluate. Express each answer as a decimal, rounded to six decimal places.

> Remember to convert percents into decimals. For example, $3.35\% = 0.0335$.

a) $\dfrac{3.35\%}{12}$ **b)** $\dfrac{17.4\%}{52}$ **c)** $\dfrac{1.25\%}{365}$

d) $\dfrac{8.8\%}{4}$ **e)** $\dfrac{25.6\%}{30}$ **f)** $\dfrac{5.8\%}{7}$

2. Evaluate each power. Round answers to four decimal places where necessary.

  a) 1.2^{-4} **b)** 1.085^{-10} **c)** 1.06^{-8}

  d) 1.18^{-30} **e)** 1.072^{-10} **f)** $(1 + 0.04)^{-7}$

  g) $(1 + 0.032)^{-16}$ **h)** $(1 + 0.059)^{-12}$ **i)** $(1 + 0.06)^{-5}$

  j) $(1 + 0.014)^{-6}$ **k)** 1.019^{-2} **l)** 1.05^{-8}

3. Without evaluating, list the following expressions in order.
$5000(1.025)^{-3}$, $5000(1.12)^{-6}$, $5000(1.06)^{-4}$, $5000(1.35)^{7}$, $5000(1.004)^{5}$

A

1. Evaluate. Round each answer to two decimal places.

  a) $9000(1.0645)^{-24}$

  b) $39\,500(1.012)^{-6}$

  c) $2200(1.001\,75)^{-12}$

  d) $430(1.12)^{-9}$

2. Calculate the present value, $PV = FV(1 + i)^{-n}$, of each amount.

  a) $2600 is required in 1 year. The money can be invested at 7.3% per year, compounded monthly.

  b) $1300 is required in 9 months. The money can be invested at 5.25% per year, compounded quarterly.

  c) $67 000 is required in 10 years. The money can be invested at 8.2% per year, compounded semi-annually.

  d) $3800 is required in 2 years. The money can be invested at 4.75% per year, compounded annually.

3. Georgia wants to have $4000 in 2 years to buy hockey equipment.

  a) How much must she invest now in a GIC paying 4.25% per year, compounded annually, to have the required amount?

  b) If the GIC in part a) has interest compounded monthly, how much less will Georgia need to invest now?

4. Calculate the discounted payment of each loan today.

  a) A $300 debt is due in 6 months, discounted at an interest rate of 4.5% per year, compounded monthly.

  b) A $670 debt is due in 9 months. Interest is 2.75% annually and compounded quarterly.

  c) A debt of $8500, due in 2 years is discounted at an interest rate of 5.45% per year, compounded semi-annually.

  d) A debt of $60 000, due in 5 years is discounted at 6.95% per year, compounded annually.

B

5. Ben wants to have $3000 in 6 months to go skiing. His high-interest savings account pays an annual interest rate of 4.15% compounded daily. How much money does Ben need to have in the account today?

6. Olivia needs to repay a $6500 loan in 1 year. How much might Olivia's creditor be willing to accept today at an annual interest rate of 4% compounded monthly?

7. A creditor who is owed $10 000, due in 3 years, is willing to sell the debt today at 7.4% per year, compounded semi-annually. What is the value of the debt today?

8. Wang is 21 years old and has just gotten a full-time job through his college's co-op program. He wishes to have $1 million by the time he turns 55.

    a) How much would he need to invest today if he could earn an average interest rate of 9% per year, compounded annually?

    b) How much interest would the investment from part a) earn?

9. The parents of twins want to set up an education fund so that each twin has $40 000 upon her 17th birthday. How much do the parents need to invest when the twins are born if the investment can earn 7.5% interest per year, compounded monthly?

C

10. When Alisha completes her pilot's training 4 years from now, she wants to pay for the additional fight hours she needs to earn her pilot's license. She expects she will need $10 000. Her financial institution is offering a 4-year GIC paying 6.9% interest per year, compounded annually.

    a) How much money does Alisha need to invest in the GIC today in order to have $10 000 in 4 years?

    b) Alisha only has $5000. Approximately how much will she need to save each month for the next year in order to invest in the GIC one year from today? Justify your reasoning. Assume that the annual interest rate stays the same.

11. First-time homebuyers in Canada need to make a minimum down payment of 5% of the purchase price of a house. How much would first time homebuyers need to invest today at 7.9% annual interest, compounded monthly, in order to have the minimum down payment on a $270 000 house in 4 years?

7.4 Solve Financial Problems Using Technology

Textbook pp. 367–371

Prerequisite Skills

1. Evaluate. Express each answer as a decimal, rounded to six decimal places.

   a) $\dfrac{9.5\%}{7}$

   b) $\dfrac{18.7\%}{30}$

   c) $\dfrac{2.2\%}{4}$

   d) $\dfrac{5.49\%}{365}$

   e) $\dfrac{1.1\%}{52}$

   f) $\dfrac{4.8\%}{12}$

2. Evaluate each power. Round answers to four decimal places where necessary.

   a) 1.031^5

   b) 1.091^{-4}

   c) 1.045^6

   d) 1.024^{-3}

   e) 1.008^{12}

   f) $(1 + 0.03)^{-20}$

3. Without evaluating, list the following expressions in order.
   $10\ 000(0.9)^{-5}$, $10\ 000(1.09)^2$, $10\ 000(1.08)^{10}$, $10\ 000(0.75)^3$, $10\ 000(1.065)^4$

A

> For questions 1 to 4, set FV = 0 since this is the value to be determined.

1. Calculate the future value of $6000 invested at 7% per year, compounded annually for 15 years.

2. Calculate the future value of $15 000 invested at 8% per year, compounded semi-annually for 10 years.

3. Calculate the future value of $4000 invested at 3.65% annual interest, compounded monthly for 5 years.

4. What is the future value of $900 invested at 9.9% per year, compounded quarterly for 30 years?

> For questions 5 and 6, set N = 0 since this is the value to be determined.

5. a) How long would it take $1500 to grow to at least $2000 at 2.45% annual interest, compounded annually?

   b) Determine the number of compounding periods for the investment.

6. a) How long would $10 000 need to be invested to grow to at least $13 000 at 5.5% interest per year, compounded monthly?

   b) Determine the number of compounding periods for the investment.

> For questions 7 and 8, set I% = 0 since this is the value to be determined.

7. Cameron borrows $2000 from his uncle to buy a computer. He pays his uncle $2150 in 4 months. If interest was compounded monthly, what interest rate per compounding period did Cameron pay?

8. Suk-Yee lends a friend $500 for 60 days and Suk-Yee is paid back $595. Interest is compounded daily.

   a) Calculate the annual interest rate of the loan. Express your answer as a percent.

   b) What interest rate per compounding period did Suk-Yee receive? Express your answer as a percent.

B

9. a) How long would it take $5000 to earn $250 in interest at 3.15% annual interest compounded monthly?

b) What annual interest rate would be necessary for $250 interest to be earned in 60 months?

10. a) How long would it take $4000 to grow to $6000 at 6.2% interest per year, compounded annually?

b) What annual interest rate would make the investment grow to $6000 in exactly 20 years.

11. Omar wants to have $3000 in 2 years to buy camping equipment. A credit union offers a 2-year GIC paying 4.95% per year, compounded annually. How much money would Omar need to invest today in order to afford the camping equipment?

12. Determine the annual interest rate and the interest rate per compounding period necessary for $5000 to grow to $7000 in 10 years if interest is compounded

a) annually

b) semi-annually

c) quarterly

d) monthly

13. Majida has $500 in a daily interest savings account earning 1.2% per year. If the money remains in the account for 2 years, determine the future amount in her account.

14. Ricardo needs to repay a $4500 personal loan one year from today. How much might a creditor be willing to accept today at 8.5% annual interest, compounded monthly?

15. Gwen invests $9000 in a 4-year GIC that matures with a final amount of $9745.71.

a) If interest is compounded semi-annually, determine the annual interest rate.

b) Determine the equivalent simple interest rate needed to give the same final amount.

C

16. Tamara is 21 years old and her brother Lucas is 19. They both wish to retire with $1 million when they turn 65.

> Set N to the number of years each sibling has to invest.

a) Determine the present value of $1 000 000 for each sibling assuming both investments earn 6% annual interest, compounded annually.

b) Assume that they do not have enough money to invest today. Use the TVM Solver to determine the annual payment that each sibling could make to still retire a millionaire.

c) Calculate the difference in the total amount invested in part b) by the two siblings.

Chapter 7 Review

## 7.1 Explore Simple Interest and Compound Interest
Textbook pp. 346–354

1. A financial institution offers a 6-year term deposit that pays 4.7% simple interest.

   a) Create a table of values showing the interest earned at the end of each year on a $400 initial investment.

   b) Sketch a graph of Interest versus Time.

   c) Create a table of values showing the amount of the investment at the end of each of the 6 years.

   d) Sketch a graph of Amount at the End of the Year versus Time.

2. A bank offers a 6-year term deposit that pays 4.5% annual interest, compounded annually.

   a) Determine the future value of a $400 initial investment using repeated calculations of interest.

   b) Sketch a graph of Value of the Investment at Year's End versus Time.

   c) Model this investment as an exponential function of time.

3. Does the following table of values model a simple interest or a compound interest investment? Justify your answer.

Year	Value ($)
0	600.00
1	645.00
2	693.38
3	745.38
4	801.28
5	861.38

4. The graphs show $1000 invested for 15 years at 10% per year simple interest and 10% per year, compound interest.
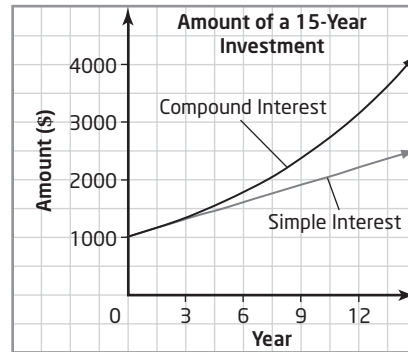
How are the graphs

   a) similar?

   b) different?

7.2 The Compound Interest Formula
Textbook pp. 355–361

5. Determine i and n for each situation involving compound interest.

   a) $5500 earning 4% annual interest, compounded annually for 10 years

   b) a GIC pays 2.85% annual interest, compounded semi-annually for 3 years on an investment of $9000

   c) $25 000 earning 7.2% annual interest, compounded monthly for 9 years

   d) a $850 credit card balance at 19.5% annual interest, compounded daily for the month of April

6. Determine the amount of each situation in question 5.

7. a) Describe an investment that could be modelled by the exponential function $f(x) = 7000(1.068)^x$.

   b) Describe another investment with a different compounding period that could be modelled using the same function.

8. Freda invests $7000 in her brother's bike repair shop interest at a rate of 3% per month, compounded monthly. At the end of 9 months she receives the statement shown.

Time (month)	Amount ($)
0	7000.00
1	7245.00
2	7498.58
3	7761.03
4	8032.66
5	8313.80
6	8604.79
7	8905.95
8	9217.66
9	9540.28

   a) Does the amount of Freda's investment grow exponentially as expected? Justify your reasoning.

   b) Is the rate of growth 3% per month, compounded monthly? Explain.

7.3 Present Value
Textbook pp. 362–366

9. Chandra and Oscar just had a baby. They want to invest in the baby's post-secondary education. Assuming an average annual rate of return of 7% with interest compounded semi-annually, how much would they need to invest when the baby was born in order to have $50 000 when the child turns 17? Round your answer to the nearest hundred dollars.

10. Suppose you lent a friend money so that the two of you could go to a concert. Your friend agrees to repay you $250 in 3 months. One month from now, your friend offers you $225 saying that you could invest the $225 at 4.5% per year, compounded monthly, which would more than make up the difference. Is your friend correct? What might you consider when deciding whether to accept this offer? Explain.

7.4 Solve Financial Problems Using Technology
Textbook pp. 367–371

11. Determine each value using a TVM Solver.

   a) the annual rate of return needed for $50 000 to triple in 20 years if interest is compounded annually

   b) the length of time required for $3000 in a daily-interest savings account to double if the annual interest rate is 1.2%

   c) the interest rate required for $18 000 invested for someone at birth, to become $600 000 by the time the person reaches age 65 with interest compounded annually

   > You can insert any value for PV and double it for the value of FV.

   d) the number of compounding periods required for an investment to double at 8% annual interest, compounded semi-annually

12. Solve question 9 using a TVM Solver.

Chapter 7 Practice Exam

For questions 1 to 5, choose the best answer.

1. Which values for i and n can be substituted into the compound interest formula to approximate the future value of an investment at 7% annual interest for 3 years, compounded monthly?

   A 0.058%, 36

   B 0.0058, 18

   C 0.0058, 36

   D 0.58, 18

2. The simple interest earned on $500 invested at 7.5% per year for 3 years is

   A $37.5

   B $75.00

   C $112.50

   D $150.00

3. If the annual interest rate is 8.25% and the interest rate per compounding period is about 0.69%, what is the compounding period?

   A weekly

   B monthly

   C quarterly

   D semi-annually

4. Which statement is false?

   A Decreasing the frequency of the compounding decreases the final amount paid on a loan.

   B Simple interest investments can be modelled with linear functions.

   C A compound interest investment always gives a greater future value than a simple interest investment for the same annual interest rate after the first year.

   D The present value of an investment is similar to the future value of a loan.

5. The length of time required for $2000 to double at 5% annual interest, compounded monthly, is approximately

   A 12 years   **B** 14 years

   C 18 years   **D** 20 years

6. A 5-year GIC from a Canadian financial institution pays 2.75% simple interest.

   a) Calculate the interest paid when a $500 certificate matures.

   b) Determine the final value of the certificate.

7. Describe a compound interest situation that could be modelled with the exponential function $f(x) = 1600(1.0525)^x$.

8. Use the compound interest formula to calculate the final amount of each investment or loan.

   a) $20 000 invested at 8% annual interest, compounded semi-annually for 9 years

   b) $1200 invested at 5.4% interest per year, compounded monthly for 3 years

   c) a $500 balance on a credit card at 22.9% annual interest, compounded daily from the April 5th due date to the arrival of the payment on May 19th

9. Compare, using tables of values and graphs, the final amount of $3000 earning 4.5% simple interest for 3 years and $3000 earning 4.5% annual interest for 3 years with interest compounded annually.

10. Effram wants to pay a $800 credit note that is due in 6 months. His creditor is willing to accept early payment of the loan by discounting it at 4.7% annual interest, compounded monthly. How much can Effram pay today to eliminate his debt?

11. For a $1000 balance on a credit card at 20.5% annual interest, compounded daily, determine the total amount of interest paid after

a) 1 month   **b)** 3 months

c) 6 months   **d)** 1 year

12. Explain the benefits of paying off a debt as quickly as possible. Use your results from question 12.

13. Nolan wants to borrow $7500. He is considering the following two loans.

A $7500 at 8.5% per year, compounded quarterly for 3 years

B $7500 at 8.2% per year, compounded bi-monthly for 3 years

    a) Draw a time line to illustrate each loan.

    b) Which loan should Nolan take? Justify your response.

14. Juzet wants to have $6000 in 3 years.

a) How much does she need to invest now at 4.3% annual interest, compounded semi-annually? Round your answer to the nearest dollar.

b) Use the Internet to research current interest rates for GICs and savings accounts offered by three Canadian financial institutions. Would you recommend that Juzet invest her money for 3 years at 4.3% annual interest, compounded semi-annually? Use your research to justify your answer.

15. Determine each value using a TVM Solver.

a) the time required for an investment to double at 7.25% annual interest, compounded annually

> You can insert any value for PV and double it for the value of FV.

b) the time required for $500 in a daily interest savings account to double if the annual interest rate is 0.08%

c) the annual interest rate required for $20 000 invested for someone at birth to become $1 000 000 by the time the person reaches age 55
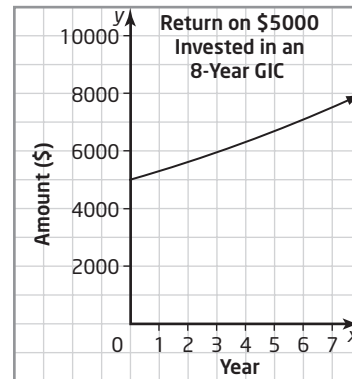
d) the interest rate per compounding period required for an investment to triple in 14 years if interest is compounded semi-annually

16. Pippa and Adrianne each have $5000 to invest for 8 years.
Pippa gets a brochure from one financial institution that shows the graph below.
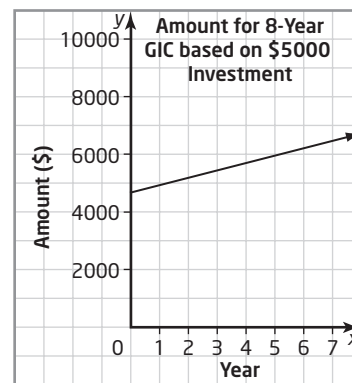
Adrianne searches the Internet and finds the following graph.

a) What type of interest rate does each graph appear to represent? Why?

b) What is the approximate future value at 4 years for each investment?

c) Use technology to estimate the interest rate offered by each institution represented by the graphs.

d) Which GIC would you invest your money in? Explain your reasoning.