

Math at Work 11: Chapter 5

February 20, 2012, 16:06

5

Banking and Budgeting



Canada is one of the most affluent countries in the world. It is always on the top ten list of best countries to live in. However, the reality is that many Canadians retire with no savings to support them. It does not have to be like this. In fact, it is quite easy to live well now and retire with enough money to live comfortably. How much do you know about saving for the future?

1. What are some possible sources of income?
2. What are some ways to put money away for savings?
3. How can someone save for a large expense?

Key Words

account
interest
service charges
incentives
bank statement
credit
debit
balance
ATM
budget
balanced budget
Guaranteed Investment Certificate (GIC)
term deposit
simple interest
future value
present value
compound interest
mutual fund

Career Link

Micki is a financial planner. She is 39 years old and has already had a few different careers. Now she helps people plan for the future by helping them set financial goals. With her help, people manage their money so that they can live comfortably now and save enough for retirement. Some of the people Micki helps are in their teens. Most are in their 40s and 50s.



Time

- Express each time period in years.
 - 24 months
 - 26 weeks
 - 6 months
 - 18 months
 - 1 day
 - April
 - from your current age until you are 60
- Express each time period in months.
 - 4 years
 - 5 years
 - $3\frac{1}{2}$ years
 - 10 years
 - 20 years
 - 25 years
 - from your current age until you are 60

Numbers

- List the six different pairs of whole numbers that multiply to 72.
- Express each percent as a decimal number.

a) 100%	b) 10%
c) 1%	d) 0.1%
e) 29.9%	f) 19.5%
g) 0.25%	h) 0%
- Determine without using a calculator.
 - 1% of \$100
 - 1% of \$300
 - 1% of \$1000
 - 1% of \$5000
 - 2% of \$100
 - 2% of \$200
 - 2% of \$2000
 - 2% of \$9000
 - 5% of \$100
 - 10% of \$700
 - 20% of \$7000
 - 50% of \$700 000
- Estimate 3% of \$817 430.
 - What sequence of keystrokes would you use on your calculator to get an exact answer to part a)?
 - Compare the keystroke sequence you used with the sequence used by some classmates. Does someone have a more efficient sequence?
 - With a partner, determine how many ways you can use a calculator to determine 3% of \$817 430.
- Calculate each power using mental math.

a) 1^{10}	b) $(0.1)^2$	c) $(0.2)^3$
-------------	--------------	--------------
- Calculate each power using a calculator.

a) 3^{10}	b) $(0.4)^{15}$	c) $(1.4)^{20}$
-------------	-----------------	-----------------

Taxes

- In Canada, most purchases are subject to the federal government's Goods and Services Tax (GST).
- Some provinces also charge a Provincial Sales Tax (PST).
- Some provinces combine the two taxes and charge a Harmonized Sales Tax (HST).

Answer the following questions using the tax that is charged where you live.

9. Calculate the amount of tax you pay on the purchase of an item that costs each amount.
- a) \$2 b) \$3
c) \$4 d) \$5
e) \$10 f) \$20
g) \$100 h) \$300
i) \$1000 j) \$4000
10. You are purchasing a new car that costs about \$30 000. Approximately how much tax will you have to pay?



11. The actual cost of the vehicle in #10 is \$29 483.09 before taxes. Calculate the exact amount of tax that you would have to pay.

Rounding

When dealing with money, either express your answer to the nearest penny (two decimal places), or to the nearest dollar (whole number).

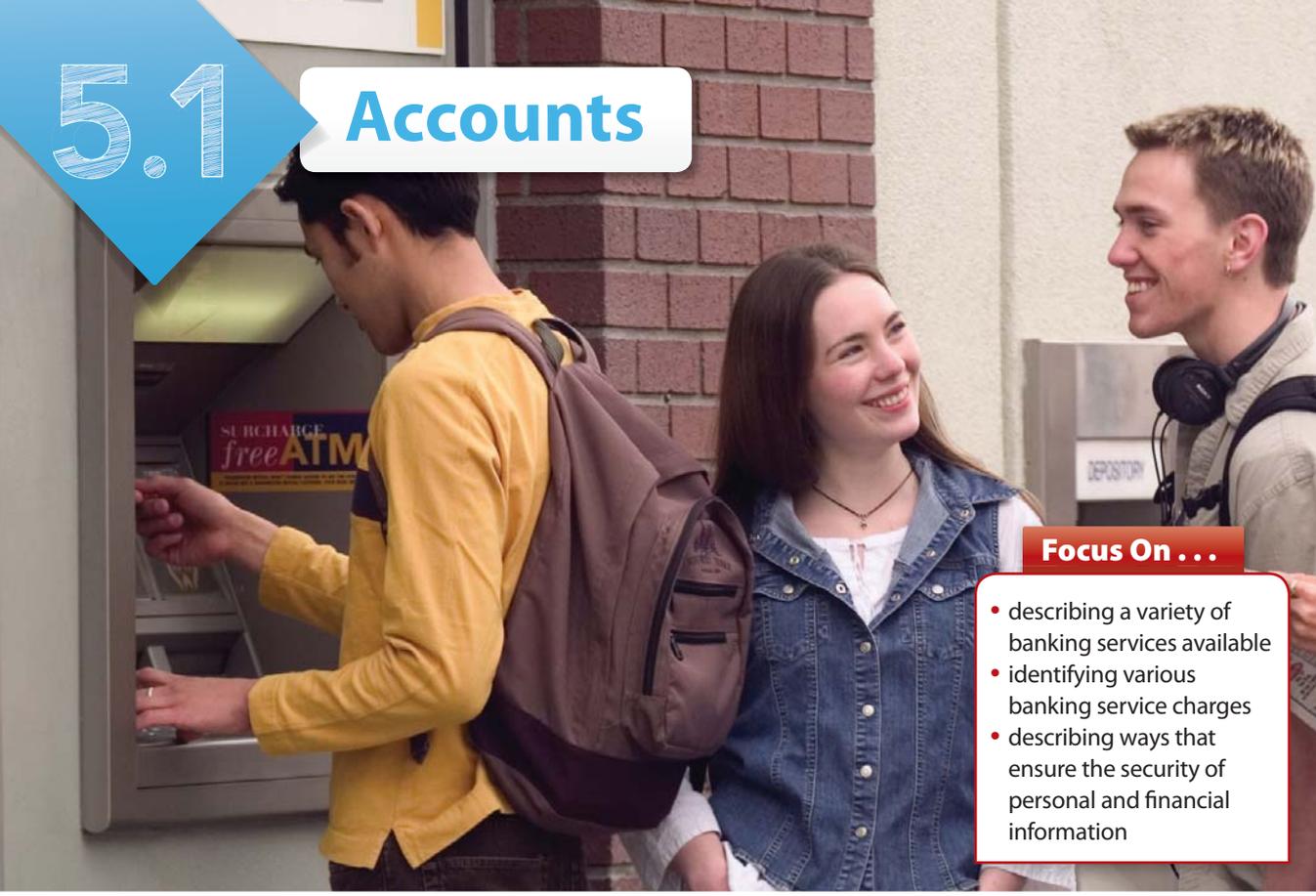
12. Express the following money values to two decimal places.
- a) \$12.1 b) \$23.375
c) \$38.8 d) \$127.4525
13. Round each value in #12 to the nearest dollar.

Rearrange Formulas

14. Rearrange the formulas as indicated.
- a) $C = \pi d$, $d = \frac{C}{\square}$
b) $A = l \times w$, $w = \frac{\square}{\square}$
c) $V = \frac{d}{t}$, $d = \square \times \square$
d) $V = lwh$, $h = \square$
e) $A = \frac{1}{2}bh$, $b = \square$

5.1

Accounts



Focus On ...

- describing a variety of banking services available
- identifying various banking service charges
- describing ways that ensure the security of personal and financial information

account

- a place at a financial institution to hold your money

interest

- a fee paid for borrowing someone else's money

*Many young people end up with an **account** at the bank that their parents or guardians use. This may or may not be the best choice for you.*

*There are the traditional “big” Canadian banks and there are credit unions, trust companies, and online banks. Some of the accounts at these institutions have fees for services, and some do not. Also, some of the accounts pay **interest**, and some do not.*

Explore Financial Institutions

1. Copy and complete the table by surveying five members of your class.

Student	Has a savings account?	Has a chequing account?	Reason for opening account(s)

service charges

- costs sometimes charged by financial institutions for providing services, such as banking by telephone, banking over the Internet, and using banking machines

incentives

- in relation to banking, anything that financial institutions offer to customers or potential customers that makes doing business with that institution seem more attractive

2. Find out what students in your class know about their bank account. Do they know the interest rate, **service charges**, and **incentives** associated with their account? Does their bank offer online and telephone banking? Copy and complete the two tables by surveying five members of your class.

a)

Student	What is the interest rate paid on your account?	What service charges are there on your account?	Are there incentives or rewards with your account?

b)

Student	Is online banking available?	Is telephone banking available?	Are there fees for these services?

3. Reflect

- If you have a bank account, add your own name to the two tables in step 2. Record what you know about your bank account.
- Research the questions in the tables in step 2 at the web site of a financial institution that you use. Confirm whether the information you recorded in part a) is correct.
- If you do not have a bank account, when do you think you will get one? Why?

4. **Extend Your Understanding** Go to the web sites of financial institutions that you or your family use, or that you are familiar with.

- Look up “Personal Banking” and/or “Accounts.”
- Recopy and complete the tables in step 2 for a savings account at a bank, a credit union, and an online bank.
- If you have a bank account, did your research make you want to open an account somewhere else? If you do not currently have a bank account, did your research help you decide where you might go when you are ready to open an account? Explain.

On the Job 1

F.Y.I.

A *transaction* is a transfer of money, such as a deposit into or a withdrawal from a bank account.

bank statement

- a record of all the transactions in an account over a period of time, usually one month

credit

- in relation to banking, an amount of money added to a bank account

debit

- in relation to banking, an amount of money subtracted from a bank account

Read Information on a Bank Statement

When Corinne got her first job, she opened a savings account at a bank close to where she lives. Corinne's pay is electronically deposited into her account every other Friday. Corinne's bank charges \$5 per month for managing her account. The account fee allows 10 transactions each month. Additional transactions are \$1.25 each. Transactions using her bank card at another institution cost \$1.50. Below is Corinne's first monthly **bank statement**.

Date	Details	Debits (–)	Credits (+)	Balance
Aug 2	Cash deposit		10.00	10.00
Aug 7	Direct deposit		146.73	156.73
Aug 8	ATM withdrawal	20.00		136.73
Aug 8	ATM charge	2.50		134.23
Aug 8	Bank machine fee	1.50		132.73
Aug 8	Cinemas	11.95		120.78
Aug 8	Joe's Subs	7.88		112.90
Aug 12	ATM withdrawal	20.00		92.90
Aug 12	ATM charge	2.50		90.40
Aug 12	Bank machine fee	1.50		88.90
Aug 15	ATM withdrawal	20.00		68.90
Aug 21	Direct deposit		171.06	239.96
Aug 21	ATM withdrawal	40.00		199.96
Aug 21	Just Jeans	67.19		132.77
Aug 22	Cinemas	11.95		120.82
Aug 28	Cell Phone Co.	87.40		33.42
Aug 28	ATM withdrawal	20.00		13.42
Aug 31	Interest		0.01	13.43
Aug 31	Account fee	8.75		4.68

- What is Corinne's opening balance?
- What is her closing balance?
- How many **credits** were made to her account?
- How many **debits** were made to her account?
- Explain how the bank determined the account fee debited from her account on Aug 31.

balance

- in relation to banking, the total amount of money in a bank account at a given point in time

ATM

- stands for *automated teller machine*
- machines people use to perform routine banking transactions

Solution

- a) Corinne's opening balance is \$10. This is the **balance** at the beginning of the month.
- b) Corinne's closing balance is \$4.68. This is the balance at the end of the month.
- c) 4 Count the entries in the Credits (+) column.
- d) 15 Count the entries in the Debits (−) column.
- e) There were 13 transactions made in Corinne's account during the month. Transactions include deposits, withdrawals, and debit card charges. On August 8 and August 12, Corinne withdrew cash from an **ATM** that does not belong to her bank. The ATM charges \$2.50, and Corinne's bank charges \$1.50 for using a machine that does not belong to the bank. These two fees do not count as transactions. The interest deposit and the account fee also do not count as transactions. Corinne is allowed to make 10 transactions for the monthly \$5 fee. Below is the calculation of the \$8.75 account fee for August.

$$\begin{aligned}\text{Account fee} &= 5 + (3 \times 1.25) \\ &= 5 + 3.75 \\ &= 8.75\end{aligned}$$

Your Turn

- a) How much extra did it cost Corinne to withdraw \$20 on August 8 from a machine that did not belong to her bank?
- b) How can you tell that the withdrawals that Corinne made on August 21 and August 28 were made from machines that belonged to her bank?
- c) What are the possible advantages of making purchases using a bank debit card?
- d) What are the possible disadvantages of making purchases using a debit card?



Check Your Understanding

Try It

1. A bank charges \$5 per month for managing an account. The account fee allows 10 transactions each month. Additional transactions are \$1.25 each. Determine the monthly account fee for the following number of transactions.
a) 11 b) 20 c) 8 d) 0
2. Another financial institution has a no-fee savings account. This means there is no monthly charge for managing the account and there are no transaction fees. Determine the monthly account fee for the following number of transactions.
a) 11 b) 20 c) 8 d) 0
3. a) Would you prefer to have the account in #1 or in #2?
b) Research where you could obtain an account like the one in #2.
4. Jack recently opened an account and received a bank card. While setting up his card with the bank's banking machine, he chose 5225 (JACK) as his pass code, or PIN (personal identification number).
a) Why do you think Jack may have chosen 5225 as his PIN?
b) Do you agree with his choice?
c) What is the risk of selecting this kind of PIN?
d) What other number combinations should not be used as a PIN?

Web Link

For more information on no-fee bank accounts, go to www.mcgrawhill.ca/school/learningcentres and follow the links.

F.Y.I.

PIN stands for personal identification number. It is a pass code selected by the user of a bank card to gain access to the user's bank accounts.

Apply It

5. Ling estimates that she uses her debit card 15 times per week.
a) In a typical month, estimate the number of banking transactions that Ling makes.
b) What type of account should Ling be using?
6. a) Select a four-digit PIN that is easy to remember and not easy to guess. **Note:** Do not use your actual PIN.
b) Find a partner. Try to guess your partner's PIN number. You get ten guesses.
c) Did you guess your partner's PIN? Did you come close?
d) There are 10 000 possible combinations for a four-digit PIN. Do you think this is sufficient to help protect a person's bank account? Explain.

7. Meg used her bank card to withdraw \$20 from a banking machine in a convenience store. The ATM in the store charged Meg a \$2.50 fee. Meg's bank charged her \$1.50 for using another institution's machine.

- a) What was the total of the fees charged?
- b) Express the total of the fees charged as a percent of the \$20 Meg withdrew.



8. Dylan works part-time after school and on weekends. His father advised him to open four bank accounts.

- Account 1 is for everyday use: this is where Dylan's pay is deposited.
 - Account 2 is for investing: Dylan puts 10% of his earnings in this account.
 - Account 3 is for gifts and charities: Dylan puts 10% of his earnings in this account.
 - Account 4 is called "saving for big things": currently, Dylan is using Account 4 to save for his driver's license and a driver training program.
- a) On March 17, the first deposit was made in Account 1: \$262.63. How much did Dylan transfer to Account 2? to Account 3?
 - b) Dylan transferred \$40 from Account 1 to Account 4. How much of his pay remains in Account 1?
 - c) Dylan gets paid every two weeks. If \$250 is the average amount of his pay, about how much will Dylan have in Account 2 a year later on March 17?

F.Y.I.

Overdraft protection is an option that financial institutions may offer to customers. If the amount of money in an account falls to \$0.00, the bank may choose to temporarily cover the customer's next few purchases. There may be a fee for overdraft protection.

9. Caitlyn has overdraft protection on her account. Caitlyn used the ATM at her bank to withdraw \$60. When she looked at the receipt, she saw the balance in her account was $-\$12.90$.

- a) What do you think a negative amount means?
- b) What amount of money was in Caitlyn's account before she withdrew the \$60?

Work With It

1. Summer works as a lifeguard. She has four bank accounts. On June 21, Summer's net pay of \$162.09 was deposited into her primary account.
 - a) Summer goes online and transfers 10% of her pay to an account for future investing. How much did Summer transfer?
 - b) Summer transfers 5% of her pay to an account for gifts and charity. Calculate this amount.
 - c) Summer is planning a trip to Cuba during the spring break. She puts 15% of her pay into her vacation account. How much did she transfer to this account?
 - d) How much of this pay does Summer have left?
2. Mara is doing some holiday shopping. In most stores, Mara uses her bank card to pay. In some places, she uses cash. Mara withdraws \$80 cash from her account. The ATM receipt says her balance is \$37.30.
 - a) What was Mara's balance before she withdrew the cash?
 - b) Mara then makes a purchase of \$18.48, using her bank card. What is her balance now?
 - c) Mara is standing in line at another store with a sweater in her hand that costs \$19.99. What is the after-tax cost of the sweater? **Note:** Use the tax rate where you live.
 - d) If Mara had overdraft protection on her account, calculate what her balance would be after the purchase of the sweater.
 - e) Mara does not have overdraft protection. After entering her PIN in the store's machine, Mara sees the following message displayed: PURCHASE DENIED. What are Mara's options right now?
 - f) How might Mara prevent this from happening in the future?
3. Create a dictionary of financial terms in your notebook or on a computer. Include the nine Key Words that you learned in this section. Also, include other terms from this section, such as *PIN*, *overdraft protection*, or any others you would like to add. Research definitions of the terms. Create a definition of each term in your own words to build your financial literacy.
4. Research and identify ways that banks ensure your personal and financial information is safe.

Discuss It

5. Do you think that “Pa55w0rd” is a good eight-character password? Explain why.
6. Ryan used his bank card to withdraw \$20 from a banking machine in a convenience store. The ATM in the store charged Ryan a \$3.00 fee. Ryan’s bank charged him \$1.25 for using another institution’s machine. Ryan’s friend said, “If it is going to cost you \$4.25 to withdraw \$20, you may as well withdraw \$100. It will still cost you \$4.25.”
 - a) Is the friend right?
 - b) Do you agree that Ryan may as well withdraw \$100?
 - c) Is there a better solution?



7. Zack intends to save money, but he always seems to spend it as fast as he makes it. From what you have learned in this section, what suggestions can you offer Zack to manage his money? Discuss your ideas with a partner.



8. A number of financial institutions offer online banking.
 - a) Research and record the various banking activities customers can perform online.
 - b) What are some advantages and disadvantages of online banking?

5.2

Budgets

Focus On ...

- identifying income and expenses that should be included in a personal budget
- creating a budget
- modifying a budget to achieve a set of personal goals

Mike's goal is to take a driving course and get his license. Everyone has goals. Everyone is motivated to do things. Some people are motivated a little, and some are motivated a lot. Even a decision to do nothing is based on some sort of motivation. Some goals involve money, and some do not. An understanding of basic financial planning can help you achieve the goals that do involve money.

Explore Financial Planning

For our purposes, assume that a short-term goal is one that can be attained within one year.

1. List all of your short-term goals.
2. Place a dollar sign beside the goals that involve money. Make sure there are at least three.

3. Estimate the amount of money that you will need to achieve each goal.

4. Rank your goals in order of importance to you. List the goal that you would most like to achieve first.

5. Now, look at just your top three goals. Design a plan so that you will achieve these goals no later than one year from today.

When you have achieved one of your goals, celebrate. Then, remake the list of your top three goals.

6. Reflect

a) Do any of your goals conflict with each other? If so, how can you resolve the conflict?

b) What events or changes in your life could affect or change the goals that you have listed? For example, if you are working, what if you lose your job next week? If a sum of money unexpectedly came your way, what would you do?

7. **Extend Your Understanding** Assume that a long-term goal is one that will probably take more than a year to accomplish.

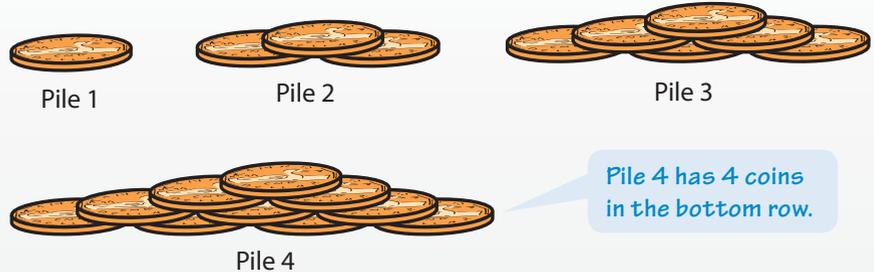
a) Repeat steps 1 to 4.

b) Review your list periodically and make changes as necessary.

This goal-setting process can be helpful throughout your life.

Puzzler

Follow the pattern shown below. How many coins would be in a pile that has 9 coins in the bottom row?



On the Job 1

Track Spending

Corinne recently started a part-time job. She lives with her parents and does not need to pay for basic living expenses. She finished the month with less money than she started it with. Corinne wants to track her expenses to figure out where she is overspending. This is Corinne's bank statement for August.

Date	Details	Debits (–)	Credits (+)	Balance
Aug 2	Cash deposit		10.00	10.00
Aug 7	Direct deposit		146.73	156.73
Aug 8	ATM withdrawal	20.00		136.73
Aug 8	ATM charge	2.50		134.23
Aug 8	Debit machine fee	1.50		132.73
Aug 8	Cinemas	11.95		120.78
Aug 8	Joe's Subs	7.88		112.90
Aug 12	ATM withdrawal	20.00		92.90
Aug 12	ATM charge	2.50		90.40
Aug 12	Debit machine fee	1.50		88.90
Aug 15	ATM withdrawal	20.00		68.90
Aug 21	Direct deposit		171.06	239.96
Aug 21	ATM withdrawal	40.00		199.96
Aug 21	Just Jeans	67.19		132.77
Aug 22	Cinemas	11.95		120.82
Aug 28	Cell Phone Co.	87.40		33.42
Aug 28	ATM withdrawal	20.00		13.42
Aug 31	Interest		0.01	13.43
Aug 31	Account fee	8.75		4.68

- If August is a typical month, what does Corinne tend to spend her money on?
- Organize Corinne's spending patterns into categories.
- What other categories might it be a good idea for Corinne to include?

Solution

- Corinne went to the movies twice, she bought clothes, and she purchased a cell phone. She frequently withdraws cash for other spending that is not identified.

- b) Entertainment: the movies, the money she withdrew the day she went to the first movie, and the fast food restaurant she went to after the first movie

Cell phone: Corinne's cell phone may be a major commitment, perhaps for the next 3 years. If so, it should have a category of its own.

Bank charges: Corinne might benefit from having a category for "Bank Charges."

Clothing: Corinne might also benefit from having this category if she regularly buys clothing.

- c) Corinne may wish to include the following categories also: long-term saving, investing, charity, transportation.

Your Turn

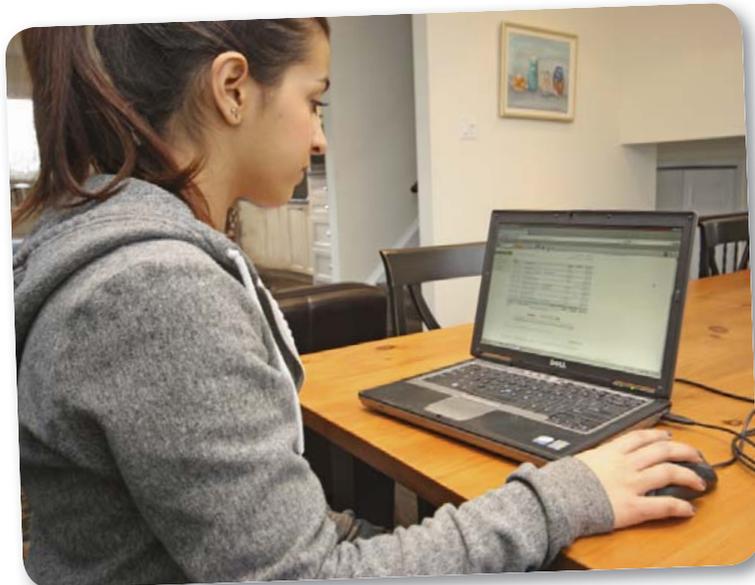
- a) Refer to the explanation of "Entertainment" in part b) above. How much did Corinne spend on entertainment in August?
- b) How much did Corinne spend on banking fees?
- c) Ignore the \$10 that Corinne deposited in order to open the account. What was her total income for the month?
- d) What was the total amount she spent?
- e) Corinne wants to create a **budget**. What are some changes she could make so that she has a **balanced budget**?

budget

- an organized plan for income and spending

balanced budget

- a budget in which the total income equals the total expenses



Check Your Understanding

Try It

F.Y.I.

Most employees do not take home every dollar that they earn. Taxes and other deductions are subtracted from their paycheque. *Gross pay* is the total amount that the employee earns. *Net pay* is the amount that the employee gets to take home.

1. One strategy for financial planning is to put away at least 10% of your net pay for investing for the future. Without using a calculator, determine 10% of the following amounts. Round your answers to the nearest cent.

- a) \$177.18 b) \$207.44
c) \$89.50 d) \$209.88

2. Some people save 20% of their net pay for investing. Without using a calculator, double your answers from #1 to determine 20% of each net income.

3. a) In order to manage your spending and meet your financial goals, you need to track your spending. Create a table like the one shown. Write down *everything* that you spend money on during one month.

Date	Amount	Spent on ...

- b) Once you have a month's worth of data, search for trends in your spending patterns. Organize the "Spent on ..." information into categories such as "transportation expenses," "living expenses," "savings," "phone expenses," "entertainment," and "investment."
- c) How much money did you set aside for long-term savings or for investing last month?
- d) Suppose your monthly income doubled. What changes would you make to your spending?
- e) Are your current spending patterns helping you to attain the goals you set in the Explore? Explain.
- f) If you said that your current spending patterns are hindering you, what changes are you willing to make?
- g) Before the next month starts, estimate your total income for the month. Then, set the maximum dollar amount to be spent for each category you listed in part b).
- h) Track your spending for a second month. Monitor the total you spend in each category as the month goes by.

Apply It

4. Ben has an after-school job, and he wants to create a budget.
- Ben's net pay averages about \$120 per week. He is paid every Friday. Calculate his total income for a month that has four Fridays.
 - Calculate Ben's total income for a month with five Fridays.
 - He tracked his spending for a month and organized the information into a table like the one shown. **Note:** His spending includes \$20 a week that he gives to his mother to help with expenses.

Item	Week of			
	October 1–7	October 8–14	October 15–21	October 22–28
	Amount(\$)			
Lunches	25.00	20.00	19.00	23.00
Clothes		32.75		45.60
Mom	20.00	20.00	20.00	20.00
Going out	18.00	12.00	35.00	32.00
Phone			44.30	
Miscellaneous	17.54	16.00	20.00	13.50
Saving	39.46	19.25	–18.30	–14.10

Calculate Ben's total expenses for each week in October.

- Calculate Ben's total expenses for each category.
 - Calculate the total expenses for all categories in October.
 - Explain the negative amounts in Ben's savings.
 - What is "Miscellaneous"?
 - Ben decides to save for a car or truck. Make three suggestions that Ben can use in November to move him toward his goal.
5. Olivia wants to save \$3000 to buy a car 1 year from now. She currently has \$1200 in her "saving for big things" account. She is paid every other week. How much will she need to save from each pay in order to achieve her goal?



6. Templates for creating a budget for yourself are available from your financial institution or from various web sites. Below is a list of expenses from a typical budget template.

Home	Daily Living	Transportation	Entertainment
Mortgage/rent	Groceries	Car payments	Cable or satellite TV
Utilities	Child care	Fuel	Movies/plays
Home/cell phone	Dry cleaning	Insurance	Concerts/clubs
Internet	Dining out	Repairs	Books
Home repairs	Housecleaning	Car wash	Music: MP3s, CDs, etc.
Home decorating	Clothing	Parking	
Home security	Gifts	Public transit	
Garden supplies	Salon/barber/stylist		
Property tax	Credit card/loan payments		
Health and Recreation	Vacations	Savings/Investing	Dues/Subscriptions
Club/team/gym memberships	Travel: bus, car, plane, train	Savings accounts	Magazines
Insurance	Accommodations	RRSP	Newspapers
Prescriptions	Food	RESP	Religious organizations
Over-the-counter drugs	Souvenirs	Stocks	Charity
Veterinarians/pet medicines	Child/pet care	Other investments	
Life insurance			
Sports equipment			
Toys/child gear			

F.Y.I.

Fixed expenses are expenses that are unlikely to change from month to month. Variable expenses are expenses that are likely to change from week to week or from month to month.

- List the items that apply to you now.
- What items might apply to you 1 or 2 years from now?
- Identify five items in the template that you think are fixed expenses.
- Identify five items in the template that you think are variable expenses.
- Identify five items in the template that you think are essential expenses. These are expenses that are not optional when it comes to day-to-day living.
- Identify five items in the template that are non-essential expenses.

7. Monica is 17 and in grade 12. She has babysat for years and has recently obtained a part-time job at a mall kiosk that sells jewellery. Below is Monica's budget for April.

Monthly Budget (April)	
Estimated Income (\$)	
Work	350
Babysitting	200
Total Income	550
Expenses (\$)	
Saving for Florida trip	50
Cell phone	60
Clothes	100
Eating out	80
Personal products	25
Entertainment	100
Insurance on family car	45
Total Expenses	460

- List the expenses that you think might be fixed expenses.
 - Calculate the difference between Monica's income and her expenses.
 - What could Monica use this extra money for?
 - Rewrite Monica's budget so that it is a balanced budget.
8. **MINI LAB** Create a personal budget.

STEP 1

- Make a list of all of the living expenses you think you will have when you live on your own. Use examples in this textbook as a guide. Also, research budget worksheets online.
- Research the cost of these expenses. Try to find information from the area where you live.

STEP 2

Research the average pay for a job that you might like in the future.

STEP 3

Determine if the pay will be enough to cover your expenses. What can you do to balance your budget?

On the Job 2

Modify a Budget

Below is a typical monthly budget for Paul and Sandra.

Monthly Budget (September)	
Income (\$)	
Paul	1950
Sandra	1500
Total Income	3450
Expenses (\$)	
Saving to buy a house	500
Rent	875
Groceries	400
Investing (RRSPs)	200
Car (insurance)	250
Car (gas, repairs)	250
Phone/cable/Internet	120
Cell phone	30
Saving for a vacation	200
Gym	120
Medical/personal items	100
Gifts and charity	100
Entertainment	200
Leftover money for a "rainy day"	105
Total Expenses	3450
Income – Expenses	0

F.Y.I.

Saving for a "rainy day" means saving for unexpected emergency expenses.

Web Link

For more information on Employment Insurance, go to www.mcgrawhill.ca/school/learningcentres and follow the links.

Sandra and Paul find out that they are going to have a baby.

- What changes might there be to the income side of their budget?
- What category will they need to add to the expenses section of their budget?
- What modifications may Sandra and Paul need to make to their existing expense estimates?

Solution

- Sandra's income will eventually change. There may, however, be no changes for the next 6 months or so. Depending on where Sandra works, she may be entitled to maternity benefits paid by her employer, or she may be able to collect Employment Insurance.

- b) They will need to add a category for “Kid things.” Friends and family have warned them that this list can be huge. They will have to buy some items before the baby is born. Some expenses related to raising a child will be ongoing until the child becomes financially independent.
- c) When Sandra’s income changes, the total amount for expenses must change. They cannot spend more than they earn. Once the baby is born, groceries will increase. Medical/personal expenses are also likely to increase. There will also be the new expenses under the “Kid things” category. Sandra and Paul may need to decrease some of their non-essential expenses, such as vacations or entertainment.

Your Turn

Sandra and Paul have identified “Kid things” as one category to be added to their list of expenses. With a partner, brainstorm a list of items that a young couple with a baby will need for their home and for their car. Research the cost of each item on your list.



Check Your Understanding

Try It

1. This is a copy of Sandra and Paul's September budget.
 - a) Explain why their current budget is balanced.
 - b) Which part of their car expenses is likely fixed? Which part is likely variable?
 - c) List the items that are likely fixed expenses.
 - d) Calculate the total of their fixed expenses.
 - e) What amount is left for their variable expenses?
 - f) Rewrite the budget by splitting the expenses into two main groupings: fixed expenses and variable expenses.

Monthly Budget (September)	
Income (\$)	
Paul	1950
Sandra	1500
Total Income	3450
Expenses (\$)	
Saving to buy a house	500
Rent	875
Groceries	400
Investing (RRSPs)	200
Car (insurance)	250
Car (gas, repairs)	250
Phone/cable/Internet	120
Cell phone	30
Saving for a vacation	200
Gym	120
Medical/personal items	100
Gifts and charity	100
Entertainment	200
Leftover money for a "rainy day"	105
Total Expenses	3450
Income – Expenses	0

2. Below is Paul and Sandra's budget for October.

Monthly Budget (October)			
Income (\$)			
Paul	1950	Sandra	1300
Total Income			3250
Expenses (\$)			
Saving for a house	300	Saving for a vacation	100
Rent	875	Gym	120
Groceries	400	Medical/personal items	100
Investing (RRSPs)	200	Gifts and charity	100
Car (insurance)	250	Entertainment	100
Car (gas, repairs)	250	Renovate second bedroom	200
Phone/cable/Internet	120	Education fund for child	50
Cell phone	30	Leftover money for a "rainy day"	55
Total Expenses			3250
Income – Expenses			0

- a) By what amount did their monthly income change?
- b) What did they do to create a balanced budget for October?
- c) What expense items were added in October?
- d) What is the budgeted cost of these items?
- e) Which expenses were eliminated?
- f) List the expenses that were changed to balance their budget.
- g) By how much was each item in part f) modified?
- h) Sandra and Paul estimate that it will take \$1000 to turn the second bedroom into a nursery. By the end of what month will they have enough money for the renovation?

Apply It

3. Janet is a college student. She also works about 20 hours per week at a restaurant. Her weekly net pay is about \$175. Janet averages about \$100 per week in tips. Below is a list of her current living expenses. Her tuition and books are paid for.

Rent: \$325/month Bus pass: \$72/month
 Health/personal: \$30/month Entertainment: \$25/week
 Loan repayment: \$212/month
 Food (groceries + eating out): \$100/week

- a) Calculate Janet's total expenses for a typical four-week month.
 - b) Which expenses do you think are fixed expenses?
 - c) Create a budget of income and expenses for Janet for this month.
 - d) Calculate total income minus total expenses.
 - e) What would you suggest that Janet do to balance her budget?
 - f) Modify Janet's budget so that it is balanced.
4. Some months have five Fridays, so Janet is paid five times.
- a) Will Janet's expenses change during these months? Explain.
 - b) One of Janet's short-term goals is to finish repaying her loan. She currently owes about \$1400. Design a balanced budget for Janet for a five-pay month, keeping her goal in mind.
5. Janet expects to pay off her loan by her final year of college. This will make \$212 per month available to her. Create a budget for Janet for a four-pay month after her loan is repaid. Add any items you wish to her expenses.



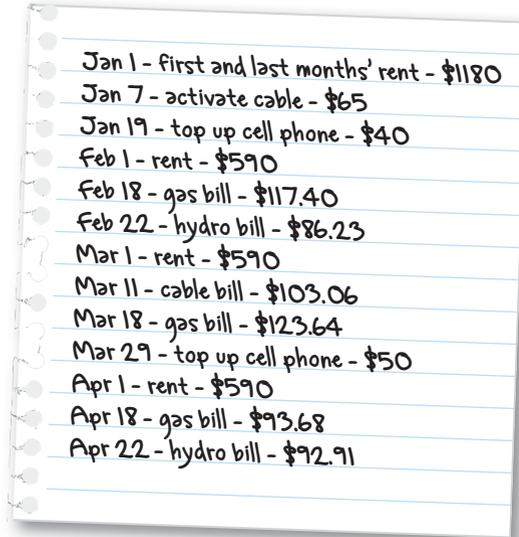
Work With It

1. Bailey and a friend share a two-bedroom apartment. Bailey has a biweekly income, which means she gets paid every 2 weeks. Her pay is about \$1025. Her budget is shown below.

Month: January			
Income: (2-pay month) $1025 + 1025 = 2050$			
Expenses:	Investments: $2 \times 87 = 174$	Savings: $2 \times 87 = 174$	Charity: $2 \times 50 = 100$
Rent: 450 (1st of month)	Internet: 20 (3rd of month)	Car ins.: 112 (16th of month)	Cell: 55 (25th of month)
Gym: 34 (28th of month)			
Groceries: 250	Gas: 150	Clothes: 75	Toiletries: 25
Other car expenses: 50	Vacation: 50	Spending money: 150	
Total expenses: 1869			

- a) How does Bailey identify her fixed expenses?
 - b) What is the total of her monthly fixed expenses?
 - c) How much remains for variable expenses?
 - d) Which expenses does she likely share with her roommate?
 - e) How much money does Bailey have left over each month? What could she do with this amount?
 - f) Twice a year, Bailey gets paid three times in a month. What is her total income during these months?
 - g) Suppose Bailey lost her job and was unemployed for two months. What adjustments could she make to her budget to get by until she got a new job?
2. In this section, two more Key Words were introduced. Other terms used in this section are *gross pay*, *net pay*, *fixed expenses*, *variable expenses*, *essential expenses*, and *non-essential expenses*. Add them to your financial dictionary. Include any other terms from this section that you wish.

3. Mario moved out of his parents' house into a two-bedroom apartment four months ago. He has recorded some of his expenses on a piece of paper.



F.Y.I.

Utilities are basic household services such as heat, electricity, and water.

- Total Mario's expenses by month.
- Organize Mario's expenses into three categories: rent, phone, and utilities. Total Mario's expenses by category.
- What categories do you think Mario left out of his notes?
- Which expense(s) do you think will decrease for Mario over the next few months? Explain your answer.

Discuss It

- Many teens do not have jobs. Many receive some form of allowance from a parent or guardian. For budgeting purposes, do you think that this money should be considered income? Explain.
- Zack intends to save money, but he still seems to make it and spend it and make it and spend it. From what you have learned in this section, what suggestions can you offer Zack to help him manage his money?



5.3

Simple and Compound Interest

Focus On . . .

- solving a problem that involves simple interest
- comparing simple and compound interest
- solving a problem that involves compound interest
- estimating the time required for a given investment to double in value

Short-Term GIC

Term/Balance	1000–4999	5000–24999	25000–99999
1–29 days	–	–	0.400
30–59 days	–	0.400	0.500
60–89 days	0.500	0.500	0.500
90–119 days	0.500	0.550	0.550
120–179 days	0.550	0.750	0.750
180–269 days	0.750	0.80	0.800
270–364 days	0.800		

Product Name	Term	Rates for Non-registered and registered (TFSA)
Term Deposit (long-term)	0–29 days	0.00%
	30–364 days	0.05%
	1–2 years less a day	0.05%
	2–3 years less a day	0.50%
	3–4 years less a day	1.00%
	4–5 years less a day	1.15%

A bank account usually gives a pretty low rate of interest. If you have some money that you will not need to use for a month or more, you can get a higher rate of interest by investing it. Some investment options are low risk, but they offer a fairly low rate of interest. Other investment options give a higher rate of interest. Some of these are risky, but others are not.

Guaranteed Investment Certificate (GIC)

- an investment that is very low risk because the investment and any interest earned are guaranteed by the bank
- tend to pay higher rates of interest than bank accounts but lower rates than some other investments

Explore GICs and Term Deposits

Part 1: GICs

1. Go to the web site of the financial institution that you use or are most familiar with. To complete the Explore, you may need to go to the web site of more than one institution.
2. Scan the home page for “Investing” or “GICs” or “GIC Rates.” All Canadian banks offer **Guaranteed Investment Certificates (GICs)**.

term deposit

- an amount of money deposited for a fixed length of time
- there may be penalties for withdrawing the money before the end of the term

3. Reflect Answer the following questions about the GICs offered by the financial institution you chose.

- a) How many types of GICs are offered?
- b) What are the shortest and the longest lengths of time your money can be invested?
- c) What range of interest rates do you see?
- d) Is there a minimum amount that must be invested?
- e) Does the interest rate change if more money is invested?
- f) Does the interest rate change if your money is invested for a longer time?

4. Extend Your Understanding

- a) A bank pays 0.95% interest per year on one of its GICs. How much interest would you earn in 1 year with a \$1000 GIC?
- b) How much would you earn in 1 year if you had a \$500 000 GIC paying at the same interest rate?

Part 2: Term Deposits

5. Scan the home page of a financial institution for “Investing” or “Term Deposits” or “Term Deposit Rates.” Some banks allow you to make a **term deposit**.

6. Reflect Answer the following questions about the term deposits offered by the financial institution you chose.

- a) How many types of term deposits are offered?
- b) What are the shortest and the longest lengths of time your money can be invested?
- c) What range of interest rates do you see?
- d) Is there a minimum amount that must be invested?
- e) Does the interest rate change if more money is invested?
- f) Does the interest rate change if your money is invested for a longer period of time?

7. Extend Your Understanding

- a) A bank pays 1% interest per year on one of its term deposits. How much interest would you earn in 2 years with a \$1000 term deposit?
- b) How much would you earn in 2 years if you had a \$100 000 term deposit paying the same interest rate?

On the Job 1

simple interest

- interest that is paid once, generally at the end of the time period of the investment
- sometimes called *regular interest*

future value

- the value of an investment at the end of a certain time period
- also called the *final amount (A)*

present value

- the amount of money that is invested
- also called *principal*

Strategy



You can also convert the percent to a decimal number and multiply.

$$I = 22\,000 \times 0.0195 \times 0.5$$

Simple Interest

Ron's business has an amount of cash available for investing. He does not want to tie up the money for a long period of time. He also does not want the money sitting in a bank account earning little interest. Ron takes \$22 000 of the cash and buys a 6-month GIC that will pay **simple interest** at 1.95%.

- What does it mean that the GIC will pay simple interest at 1.95%?
- Interest rates are quoted as a percent per year. Calculate the interest earned.
- Determine the **future value** of Ron's investment.

Solution

- A 1.95% interest rate means that Ron's financial institution will pay 1.95% of the invested amount per year.

Interest rates are always quoted per year.

- To calculate simple interest, multiply the **present value** by the interest rate by the length of time the money is invested.

Use the formula $I = P \times r \times t$, where

I is the simple interest

P is the present value

r is the interest rate

t is the length of time the money is invested

Since interest rates are quoted as a percent per year, time must also be stated in years. In this case, Ron invested for 6 months, which is $\frac{1}{2}$ year or 0.5 years.

$$\begin{aligned} I &= P \times r \times t \\ &= 22\,000 \times 1.95\% \times 0.5 \\ &= 214.5 \end{aligned}$$

C 22000 × 1.95 2nd % × 0.5 = 214.5

The interest earned is \$214.50

- c) The future value of this investment is what Ron originally invested plus the interest that it earned. Calculate the future value using the following formula:

$$\begin{aligned} FV &= P + I \\ &= 22\,000 + 214.50 \\ &= 22\,214.50 \end{aligned}$$

You may see this formula written as $A = P + I$, where A is the final amount, P is the principal, and I is the interest earned.

The future value of Ron's investment is \$22 214.50.

Your Turn

- Use the simple interest formula to determine the interest earned on a \$1000 GIC paying 2.1% interest for 3 years.
- Calculate the future value of the GIC 3 years from today.



Check Your Understanding

Try It

- Determine the simple interest earned on a \$500 investment with a 3% interest rate after the following time periods.
 - 1 year
 - 2 years
 - 3 years
 - 10 years
- Determine the simple interest earned on a \$3000 investment with a 2% interest rate after the following time periods.
 - 1 year
 - 6 months
 - 3 months
 - 1 month
- Determine the simple interest earned on a \$2000 investment with a 1% interest rate after the following time periods.
 - 1 year
 - 18 months
 - $3\frac{1}{2}$ years
 - 90 days

Apply It

- You can rearrange the simple interest formula to help you solve problems other than calculating interest.
 - Rearrange the formula $I = P \times r \times t$ to isolate P , the present value of the investment.
 - Rearrange the formula $I = P \times r \times t$ to isolate r , the percent rate of interest earned per year.
 - Rearrange the formula $I = P \times r \times t$ to isolate t , the length of time of the investment, in years.
- Rich wants to save \$1000 to put toward the purchase of a motorcycle. For his birthday, he receives \$500. He thinks that he will buy a GIC rather than leave the money in his bank account. His bank offers GICs at a simple interest rate of 2%.
 - At this interest rate, how much would Rich earn in 1 year?
 - How much would he earn in 2 years?
 - How long will it take for Rich's \$500 to double?
 - Suggest a better strategy for Rich to achieve his goal.



F.Y.I.

Sometimes, there can be a penalty for cashing in a savings bond early. For more information about Canada Savings Bonds, go to www.mcgrawhill.ca/school/learningcentres and follow the links.

6. Sometimes, the longer that your money is invested, the greater the interest rate the financial institution will pay. A Canadian bank posts this table on its web site. The term deposits pay simple interest.

Term Deposits	
Term	Interest Rate
1 year	2.95%
2 years	3.10%
3 years	3.15%
4 years	3.30%

- a) Calculate the interest earned in each case on a deposit of \$1500.
- b) Determine the future value of each term deposit.
7. Every year, the federal government sells Canada Savings Bonds (CSBs). Regular interest bonds earn simple interest. The earnings are paid when the term of the bond ends, or whenever the owner of the bond cashes it in.



- a) Kerry buys a \$2500 Canada Savings Bond on May 15. The bond pays 1.65% interest in its first year. Determine the interest that she will be paid 1 year after buying the bond.
- b) On October 15, Kerry decided to cash in the bond. For what fraction of a year did she own the bond?
- c) How much interest will she be paid when she cashes in the bond?
8. a) What amount of money, invested at 5% interest, will earn \$100 interest in 2 years?
- b) What interest rate will allow \$2000 to earn \$120 interest in 2 years?
- c) How long will it take \$1000 to earn \$100 at an interest rate of 1%?
9. a) Write three questions, similar to those in #8.
- b) Exchange problems with a partner. Solve the problems written by your partner.
- c) Discuss each other's questions and solutions.

On the Job 2

From Simple to Compound Interest

Rhonda sells clothing at markets. She plans to set up an Internet business one day. Her goal is to eventually sell her merchandise worldwide. Rhonda made a profit of \$2000 last month. Rhonda's banker offers her a savings opportunity that pays **compound interest**. Rhonda invests the \$2000 at 3.5%, with interest compounded annually for 3 years.

compound interest

- interest that is earned on the original investment plus the interest earned during the previous calculation period(s)



- What is the future value of Rhonda's \$2000?
- Compare the future value of this investment to what the future value would be if the investment earned simple interest.

Solution

- Interest is calculated at 3.5% each year. At the end of the year, the interest is reinvested to become the present value for the next year.

$$\begin{aligned}\text{Year 1: } I &= P \times r \times t \\ &= 2000 \times 3.5\% \times 1 \\ &= 70\end{aligned}$$

Rhonda's \$2000 earns \$70 in interest during the first year.

$$\begin{aligned}FV &= P + I \\ &= 2000 + 70 \\ &= 2070\end{aligned}$$

At the end of Year 1, Rhonda's investment is worth \$2070. This amount is the starting point for the calculations during Year 2.

$$\begin{aligned}\text{Year 2: } I &= P \times r \times t \\ &= 2070 \times 3.5\% \times 1 \\ &= 72.45\end{aligned}$$

Rhonda's \$2000 earns \$72.45 in interest during the second year.

$$\begin{aligned}FV &= P + I \\ &= 2070 + 72.45 \\ &= 2142.45\end{aligned}$$

At the end of Year 2, Rhonda's investment is worth \$2142.45. This amount is the starting point for the calculations during Year 3.

$$\begin{aligned}\text{Year 3: } I &= P \times r \times t \\ &= 2142.45 \times 3.5\% \times 1 \\ &= 74.98575\dots\end{aligned}$$

Rhonda's \$2000 earns \$74.99 in interest during the third year.

$$\begin{aligned}FV &= P + I \\ &= 2142.45 + 74.99 \\ &= 2217.44\end{aligned}$$

At the end of Year 3, Rhonda's investment is worth \$2217.44.

- b)** With simple interest, Rhonda would have earned interest once a year for 3 years.

$$\begin{aligned}I &= P \times r \times t \\ &= 2000 \times 3.5\% \times 3 \\ &= 210\end{aligned}$$

Rhonda's \$2000 would have earned \$210 at the end of Year 3.

$$\begin{aligned}FV &= P + I \\ &= 2000 + 210 \\ &= 2210\end{aligned}$$

With simple interest, Rhonda would have earned \$210 interest. The future value of her investment would be \$2210, which is \$7.44 less than she earned with compound interest.

Your Turn

The value of Rhonda's investment after 3 years is \$2217.44.

- a)** Continue the process of calculating compound interest for Rhonda's investment for a fourth year and a fifth year.
- b)** What is the future value of her original \$2000 investment after 5 years?

Check Your Understanding

Try It

- Determine the future value of \$1000 invested at 2%, compounded annually for 2 years.
 - What would be the future value at the end of 2 years if the investment paid simple interest annually?
 - How much more was earned by the investment in part a)?
- Determine the future value of \$4000 invested at 3%, compounded annually for 2 years.
 - What would be the future value at the end of 2 years if the investment paid simple interest annually?
 - How much more was earned by compounding the interest in part a)?

Apply It

- Tanis invested \$500 in a GIC that pays compound interest. She will be guaranteed 2.8% interest each year for 3 years with interest compounded annually. Determine the future value of Tanis's investment.



- Sometimes, investments that are fixed for a longer time period earn a higher interest rate. Ian invested \$1000 for a 5-year fixed term. The annual interest rate is 3.8%, with interest compounded annually. Calculate the future value of Ian's investment.

F.Y.I.

Fixed term investments require you to keep your money invested for a specific period of time.

5. It is now 5 years later and Ian's original \$1000 has grown to the amount you calculated in #4. Depending in part on the economy, interest rates can change dramatically over 5 years.
 - a) Round your answer to #4 to the nearest \$100.
 - b) Ian invests this amount in a fixed 2-year investment at 7.1% interest, compounded annually. Calculate the future value of this investment.
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?

Work With It

1. Each of the following investments involves simple interest.
 - a) How much interest is earned by investing \$2000 at 2.5% for 5 years?
 - b) What amount of money, invested at 4%, earns \$200 interest in 2 years?
 - c) What interest rate results in \$500 earning \$50 in interest in 10 years?
 - d) How long does it take any investment at a rate of 5% interest to double?
2. Use repeated calculations of simple interest to determine the future value of each compound interest investment.
 - a) \$10 000 invested at 5% for 3 years, with interest compounded annually
 - b) \$10 000 invested at 4% for 2 years, with interest compounded annually
 - c) \$10 000 invested at 2% for 1 year, with interest compounded annually
3. This section introduced six more Key Words. Update your financial literacy dictionary with these Key Words, plus other terms used in this section, such as *Canada Savings Bonds* and *fixed term investments*.

4. André has \$1200 in a bank account that he would like to move to an investment that pays a higher interest rate. He has researched a couple of options.
- Option 1: Canada Savings Bond paying 2.2% simple interest
 - Option 2: GIC from a local credit union paying 2.1%, compounded annually
- a) Without making any calculations, predict which option pays the most interest in 1 year.
 - b) Explain your reasoning.
 - c) Determine the future value of each investment after 1 year.
 - d) Was your prediction in part a) accurate?

Discuss It

5. Compare the effect of simple interest and compound interest on the future value of an investment.
6. How does the interest rate affect the future value of an investment?
7. Victoria thinks it is not worth putting money into the investments discussed so far in this chapter because they do not really make any money. Do you agree or disagree with her assessment? Explain why.



These investments are pointless.

5.4

Investing and Borrowing

Focus On ...

- using a formula to solve problems that involve compound interest
- comparing different types of credit options
- making decisions and plans related to the use of credit
- describing strategies to use credit effectively
- solving a problem that involves credit cards or loans
- solving a problem that involves finance charges



A simplified definition of inflation is the increase in the cost of an item over time. A cup of coffee in a restaurant or diner in the 1990s cost around \$1. Today, depending on where you live, that same size cup of coffee costs \$1.50, or \$2, or more. In the 1960s, a three-bedroom bungalow in some cities cost \$25 000. Today, again depending on where you live, that same house, now 50 years older, may sell for over \$200 000. Over the past decade, the rate of inflation in Canada has been around 1% to 2% per year. For many items, today's dollar will probably not buy as much in 5 years as it does today.

A certain GIC pays 2% interest per year. When you consider inflation and the fact that the interest earned is taxable, your "investment" may be costing you money.

mutual fund

- a collection of stocks and/or bonds
- allows investors to pool their money

*Another type of investment is a **mutual fund**. A mutual fund allows thousands, even millions, of investors to pool their money to buy shares of companies that, as individuals, they might not be able to buy. The interest earned on mutual funds is not fixed. As an investment, mutual funds can be more risky. That risk can pay off.*

Explore Mutual Funds

1. Go to the web site of the financial institution that you use or that you are most familiar with. To complete the Explore, you may need to go to the web site of more than one institution.
2.
 - a) Scan the home page for “Investing” or “Mutual Funds.” All Canadian banks offer mutual funds.
 - b) Look at the graphs or tables displaying the growth (or loss) of a number of different mutual funds.
3. **Reflect**
 - a) Over the past year, how many of the mutual funds you looked at went up in value?
 - b) How many went down in value?
 - c) What is the greatest percent increase over 1 year?
 - d) What is the greatest percent loss over 1 year?
4. Look at the 10-year average growth rates of the mutual funds. Do you see a trend over the past 10 years for the various mutual funds that you are looking at?
5. **Extend Your Understanding**
 - a) Explain what you believe the risk is, if any, in investing in mutual funds.
 - b) In what other areas of your life do you deal with risk?
 - c) What things do you perceive as risky that some other people do not? What things do some other people consider risky that you do not?
 - d) Do you consider yourself a risk taker? How willing are you to accept risk?



On the Job 1

Use the Compound Interest Formula

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%.

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.

F.Y.I.

Return is the profit on an investment.

- 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.

F.Y.I.

Financial institutions compete with one another to handle your savings. Compounding the interest more frequently makes the future value of an investment higher. This approach can be used as a way to attract customers.

Solution

- Interest is calculated and paid every month, or 12 times per year. Roger's investment began 7 years ago. The number of compounding periods is 84.
- Roger is making calculations based on a growth rate of 9% per year. The interest is paid monthly.

$$9\% \div 12 = 0.75\%$$

Roger's investment is growing by 0.75% per month for each compounding period.

$$0.75\% = 0.0075$$

Roger can multiply the value of his investment by 0.0075 to determine the interest for that month.

- After one month, Roger's investment had the following value.

$$\begin{aligned} FV_1 &= P + I \\ &= 20\,000 + (20\,000 \times 0.0075) && 20\,000 \times 0.0075 \text{ is the interest earned} \\ &= 20\,000(1) + (20\,000)(0.0075) && \text{in the first month.} \\ &= 20\,000(1 + 0.0075) && \text{Factor.} \\ &= 20\,000(1.0075) && 1.0075 \text{ is the growth factor for each} \\ &= 20\,150 && \text{calculating period.} \end{aligned}$$

The value of the investment after the first month is \$20 150.

Strategy



You could do this type of calculation mentally.

1% of \$ 20 000 = \$200

Half of that is \$100.

Half of that is \$50.

So, $\frac{3}{4}\%$ = \$150

- d) During each month, the investment grows by 0.75% or 0.0075. Take the value at the end of the first month and add the value at the end of the second month.

$$\begin{aligned} \text{After 2 months, } FV_2 &= 20\,000(1.0075) + 20\,000(1.0075)(0.0075) \\ &= 20\,000(1.0075)(1 + 0.0075) \quad \text{Simplify.} \\ &= 20\,000(1.0075)(1.0075) \end{aligned}$$

The value at the end of the first month is 20 150 or $20\,000(1.0075)$.

The growth factor is 1.0075.

For each month after that, take the value at the end of the previous month and multiply it by the growth factor for the next period. Repeat this process for the number of periods you are calculating.

$$\text{After 3 months, } FV_3 = 20\,000(1.0075)(1.0075)(1.0075)$$

$$\text{After 7 years, } FV_{84} = 20\,000(1.0075)(1.0075) \dots (1.0075) \quad 84 \text{ times}$$

Strategy



**Develop
Alternative
Approaches**

- e) A formula for calculating the future value of Roger's investment is

$$FV = 20\,000(1.0075)^{84}$$

A formula for calculating the future value of a compound interest investment is

$$FV = P(1 + i)^n, \text{ where } i \text{ is the interest rate earned per compounding period expressed as a decimal, and } n \text{ is the number of compounding periods of the investment}$$

- f) Use the compound interest formula to calculate the value of Roger's investment.

$$\begin{aligned} FV &= P(1 + i)^n \\ &= 20\,000(1 + 1.0075)^{84} \\ &= 20\,000(1.0075)^{84} \\ &= 37\,464.039\dots \end{aligned}$$

The future value of Roger's investment after 7 years is \$37 464.04.

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.

- Determine the number of compounding periods over the term of the investment.
- What is the percent interest rate earned per compounding period?
- Express your answer to part b) as a decimal number.
- Use the compound interest formula to determine the future value of Roger's investment 3 years from today.



Check Your Understanding

Try It

1. An investment earns interest compounded annually. Find the number of compounding periods over each term.
a) 1 year **b)** 2 years **c)** 3 years **d)** 5 years
2. An investment earns interest compounded semi-annually. Find the number of compounding periods over each term.
a) 1 year **b)** 2 years **c)** 3 years **d)** 7 years
3. An investment earns interest compounded monthly. Find the number of compounding periods over each term.
a) 1 year **b)** 2 years **c)** 3 years **d)** 10 years
4. A GIC offered by a Canadian bank pays 3% interest per year. What is the percent earned in each compounding period if the interest is compounded
a) semi-annually? **b)** quarterly?
c) monthly? **d)** daily?
5. Convert each answer in #4 to a decimal number.

Apply It

6. Jessie invests \$4000 at 3%, compounded annually for 2 years.
a) Determine n , the number of compounding periods.
b) Determine i , the percent interest rate earned per period, expressed as a decimal number.
c) Use the compound interest formula to determine the future value of the investment.
d) Use repeated calculations of simple interest to determine the future value.
e) Compare your answers to parts c) and d).
7. Kelly invested \$10 000 at 4% for 2 years with interest compounded semi-annually.
a) Determine n . Then, determine i .
b) Use a formula to determine the future value.
c) Use repeated calculations of simple interest to determine the future value.
d) Compare your answers to parts b) and c).

8. When their daughter was born, Bill and Shizuko invested \$1000 for her education. Kyoko is now 18 years old. The interest earned was compounded monthly and the investment averaged 4.8% interest per year.



- a) Determine the value of the \$1000 investment on Kyoko's 18th birthday.
- b) What would be the value of the investment if it had remained in a savings account that paid 0.24% per year?
- c) After high school, Kyoko gets a job and decides to leave the money her parents invested for her where it is. Assuming the investment continues to earn 4.8% interest per year, what will the \$1000 have grown to by Kyoko's 30th birthday?
- d) On her 60th birthday, do you think the future value will be double the value of the investment on her 30th birthday?
- e) Calculate the value of the \$1000 investment on Kyoko's 60th birthday, again assuming a 4.8% return each year.
- f) By how many times has the original investment grown?

9. Enter "compound interest calculator" into an Internet search engine. Use one of these calculators to solve #6 to #8.

10. Financial institutions that offer mutual funds often charge customers a percent of the investment for managing the fund. A certain institution charges 1.8% of the present value. One of their mutual funds earned 11% last year.

- a) After deducting the management fee, what percent interest did the investor really earn last year?
- b) Brooke invested \$5000 in this fund a year ago. What is the value of her investment today?
- c) Assume the growth rate is the same for each of the next 2 years. What might Brooke's original investment be worth?
- d) Do you think it is correct to assume that the growth rate from last year will continue into the next year? Explain.
- e) State three possibilities for next year's growth rate relative to the 11% it earned last year.

Web Link

For specific sites that have online compound interest calculators, go to www.mcgrawhill.ca/school/learningcentres and follow the links.

F.Y.I.

Every cell phone platform has compound interest calculator apps available. Many of them are free.

On the Job 2

F.Y.I.

The advertised interest rate for a loan that a bank charges to its customers is not necessarily fixed. Sometimes, you can negotiate the interest rate and terms of a loan. For example, perhaps you have borrowed money from your bank before and successfully paid off the loan. In this case, the next time you want to borrow money, the bank may offer you an interest rate that is a bit lower than their advertised rate.

Strategy



Note that the car loses 20% of its value each year:

$$100\% - 80\% = 20\%$$

So, you can also write the formula this way:

$$\begin{aligned}FV &= P(1 - i)^n \\ &= 27\,000(1 - 0.20)^5 \\ &= 27\,000(0.80)^5 \\ &= 8847.36\end{aligned}$$

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.

- How many payments will Kevin make?
- What is the total amount that Kevin will repay to the bank?
- How much interest will he pay?
- 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.

Solution

- Monthly payments for 5 years mean that Kevin will make 60 payments.
- The total that Kevin will repay to the bank is $\$528.29 \times 60 = \$31\,697.40$.
- The total interest that Kevin will pay on the loan is $\$31\,697.40 - \$27\,000 = \$4697.40$.
- A car keeps about 80% of its value each year. The present value goes *down* over time. So, use the compound interest formula this way:

$$\begin{aligned}FV &= P(i)^n \\ &= 27\,000(0.80)^5 \\ &= 8847.36\end{aligned}$$

80% = 0.80

Kevin's car will have a resale value of around \$9000.

Your Turn

Laura buys a new car for \$21 000. Her payments are \$493.19 per month for 4 years.

- How many payments will Laura make?
- What is the total amount that she will repay to her bank?
- How much interest will she pay?
- If Laura's car retains 80% of its value each year, approximately what will her car be worth in 4 years?



Check Your Understanding

F.Y.I.

A personal loan is a loan that is given for personal use.

Try It

1. A 3-year personal loan of \$5000 at 8% compounded semi-annually results in a monthly payment of \$156.68.
 - a) Determine the total amount to be repaid to the bank.
 - b) How much interest is paid on the loan?
2. A 2-year personal loan of \$5000 at 8% compounded semi-annually results in a monthly payment of \$226.14.
 - a) Determine the total to be repaid to the bank.
 - b) How much interest is paid on the loan?
 - c) By choosing a shorter payback period, how much less interest is paid than in #1?

Apply It

3. All major financial institutions offer credit cards. Typically, the interest rate charged on overdue amounts is quite high. The interest is usually compounded daily. Calculate the daily interest rate for each credit card annual interest rate. Express your answer as a percent, rounded to four decimal places.
 - a) 19.9%
 - b) 17.9%
 - c) 15.9%
 - d) 21.9%



4. Why do you think the interest rate charged on the credit card in #3a) is 19.9% and not simply 20%?
5. Determine the future value of an overdue credit card balance of \$1500 if interest is charged for 55 days. Use the daily interest rate of 19.9%.

6. Noelle is 17 years old. She has been approved for her first credit card. Her parents had to co-sign the application, agreeing to pay any outstanding balance if Noelle does not pay. Noelle has a \$250 spending limit. There is a 21-day “grace period.” That means that if Noelle pays the balance of her account within 21 days of the end of the monthly statement period, she will pay no interest. A portion of her first credit card statement is shown below.

Credit Card Statement		 Smith & Johns Credit Union	
STATEMENT FROM June 25 to July 26			
7/2	The Jeans Factory	48.00	
7/7	T-shirt Haus	22.75	
7/22	Soccer Unlimited	28.49	
Previous Balance:	0.00	New Balance:	
Payments:	0.00	Minimum Due:	
Overdue Balance:	0.00	Statement Date:	July 26
Interest Charged:	0.00	Annual Interest Rate:	16.9%
New Purchases:		Available Credit:	

- a) Calculate the amount of the new purchases made this month and Noelle’s new balance.
- b) The minimum payment must be \$10 or 3% of the balance, whichever is greater. Determine Noelle’s minimum payment.
- c) Determine the due date if payment is due 21 days after the statement date.
- d) Why do you think Noelle’s parents want her to have a \$250 spending limit?
- e) Calculate the daily interest rate. Express the answer as a percent and then as a decimal rounded to five decimal places.
- f) Four days after she receives the statement in the mail, Noelle goes online and pays the balance. How much interest is she charged?
7. Go to the web site of the financial institution that you use or are familiar with.
- a) How many different kinds of credit cards do they offer?
- b) Do any have an annual fee? If so, how much is it?
- c) What is the range of interest rates charged for the cards?

Web Link

To research options for borrowing money, go to www.mcgrawhill.ca/school/learningcentres and follow the links.

8. Go to the web site of a different financial institution. Repeat #7.
9. Many large retailers, such as department stores, electronics outlets, and home improvement stores, offer their own credit cards. Go to the web site of one of these retailers. Repeat #7.
10. Braden received his paycheque of \$377.08 today. If Braden deposits it into his bank account, his bank requires five business days before he can withdraw that cash. Braden is a bit short of cash right now. He is considering going to an outlet that deals with cheque cashing and payday loans. Braden looks at the web site of a local outlet and sees the following information.

The Cost of Borrowing

How much will your loan cost?

- Cost per \$100 borrowed: \$21.

Example:	Amount advanced:	\$300
For \$300 loan	Total cost of borrowing:	\$63
for 2 weeks:	Total to repay:	\$363

HOME SEARCH ABOUT US CONTACT US PRIVACY COPYRIGHT

Done

- a) Do you think Braden should use this outlet to cash his cheque? Explain your answer.
 - b) If you recommend that Braden not cash his cheque at the outlet, provide him with at least two alternatives.
11. Sam has a \$10 000 line of credit at her bank. When she borrows money, the minimum amount due each month is the interest on the amount borrowed. On November 4, Sam borrowed \$1200. Her bank charges her an annual interest rate of 8%, compounded daily.
 - a) Calculate the daily interest rate, expressed as a decimal rounded to five places.
 - b) How much interest will Sam be charged from the day she borrowed the money to the end of the month?
 - c) Sam is required to repay only the interest each month. What is one advantage of this? What is one disadvantage?

F.Y.I.

A line of credit is an arrangement between a financial institution and a customer for a maximum amount that can be borrowed. The customer may borrow any amount, up to the maximum, whenever he or she wishes. The amount borrowed can be repaid in full at any time.

Work With It

- Dana invested \$8000 at 3% interest for 4 years, compounded semi-annually.
 - Determine n , the number of compounding periods.
 - Determine i , the interest rate earned per compounding period. Express it as a decimal number.
 - Determine FV , the future value.
- Estimate the future value of \$2000 invested at 12% for 6 years with interest compounded annually.
 - Use the compound interest formula or an online calculator to determine the exact amount.
- A local truck dealership is offering a special interest rate of 2.9% for all loans for the purchase of a new vehicle. Simon wants to replace his 4-year-old pickup truck. The total cost of a new truck is about \$33 000. The dealership will give Simon \$10 000 for his old pickup as a trade-in. His payments will be \$412.26 per month for 5 years.
 - Why do you think Simon believes that a 2.9% interest rate is a good deal?
 - How many payments will Simon make before he owns the new truck?
 - What is the total amount that he will repay to the dealership?
 - What is the total amount of interest that Simon will pay?
 - If Simon's new truck retains 85% of its value each year, approximately what will the truck be worth in 5 years?
 - The truck that Simon currently owns originally cost about \$28 000. Is \$10 000 a fair price for the truck today if it retained 85% of its value each year?
 - What would you advise Simon to do?
- One new Key Word was introduced in this section. Update your financial dictionary with this term and any other financial terms that appear in this section, such as *return*, *personal loan*, and *line of credit*.



5. Janice and Dave use the profits from renting their garage apartment to pay the total cost of a 3-year-old minivan.
- a) How much did they borrow?
 - b) What is their monthly payment?
 - c) What is the total of the interest they paid?
 - d) Who really paid for their minivan?



Discuss It

6. Compare a line of credit to a personal loan.
- a) How are they similar?
 - b) How are they different?
 - c) Imagine your vehicle suddenly breaks down. You need to borrow money to buy another one. Would you prefer to buy it using a personal loan or a line of credit? Explain why.
7. Victoria says, "I don't really need to memorize the compound interest formula. I just need to understand what compound interest is and how it works." Do you agree or disagree with her assessment?
8. Explain how you can use a credit card to your advantage throughout your life.
9. Explain why an investment compounded monthly will generate a greater future value than the same investment compounded semi-annually.
10. Which type of banking would you use for each of the following situations? Explain your choice.
- a) You need cash quickly.
 - b) You are taking out a loan.
 - c) You are making a payment on a credit card.
11. Research the incentives financial institutions offer to entice customers to use their credit card.
- a) Which incentives would make you want to apply for a credit card at that financial institution. Why?
 - b) Which incentives do not appeal to you. Why?



What You Need to Know**Section** After this section, I know how to . . .

- 5.1** ■ describe a variety of banking services and service charges
■ describe ways that ensure the security of personal and financial information
- 5.2** ■ identify income and expenses that should be included in a personal budget
■ create a personal budget and modify a budget
- 5.3** ■ solve problems that involve simple and compound interest
■ estimate the time required for a given investment to double in value
- 5.4** ■ use a formula to solve a problem that involves compound interest
■ make decisions and plans related to the use of credit
■ solve problems that involve credit cards, loans, and finance charges

If you are unsure about any of these questions, review the appropriate section or sections of this chapter.

5.1 Accounts, pages 206–213

1. A bank allows customers 12 transactions per month for a \$5 monthly fee. Additional transactions are \$1.50 each. Determine the monthly fee for the following number of transactions.
a) 15 b) 8
c) 22 d) 0
2. Jamie needs to save \$3500 to buy a used motorcycle in 6 months. Her account currently has \$900 in it. How much will she need to save from each pay to achieve her goal? She is paid every Friday. Assume there are 4 weeks in each month.

5.2 Budgets, pages 214–227

3. Nick and a friend share a two-bedroom apartment. Nick has a net weekly income of about \$600. His budget is shown below.

Month: April			
Income: (5-pay month) \$3000			
Expenses:			
Rent: \$450	Car lease: \$328	Car ins.: \$230	Gas: \$200
Internet: \$45	Cell: \$75	Gym: \$65	Golf membership: \$150
Groceries: \$350	Spending money: \$500	Loan: \$210	Credit card: \$200
Total expenses: \$2803			

- Which of Nick's expenses do you think are fixed expenses?
- How much money does Nick take home in a typical four-pay month?
- What adjustments would you make to Nick's budget?

5.3 Simple and Compound Interest, pages 228–238

- Calculate the simple interest earned on \$500 invested at 4% interest for 3 years. Then, calculate the future value.
- Use repeated calculations of simple interest to determine the future value of \$500 invested at 5% for 2 years with interest compounded annually.

5.4 Investing and Borrowing, pages 239–251

- Use the compound interest formula to solve #5.
- Trevor is buying a new SUV for \$63 000. After trading in his current vehicle, he needs to borrow \$46 000. His payments are \$889.31 per month for 5 years.
 - How many payments will he make before he owns the SUV?
 - What is the total amount that he will repay to the bank?
 - If Trevor's SUV retains 80% of its value each year, approximately what will his vehicle be worth when he has made the last payment?



For #1 to #6, select the best answer.

- What is the interest rate paid on most savings accounts?
A 0%–2% **B** 6%–10%
C 15%–20% **D** 20%–30%
- What is the interest rate charged on most bank credit cards?
A 0%–2% **B** 6%–10%
C 15%–20% **D** 20%–30%
- Which budget item should be considered a variable expense?
A car insurance **B** loan payment
C rent **D** groceries
- What is the future value of \$1000 invested at 2% for 3 years with simple interest?
A \$60 **B** \$1060 **C** \$600 **D** \$1600
- Which formula is not a rearrangement of the simple interest formula?
A $t = \frac{I}{P \times r}$ **B** $r = \frac{I}{P \times t}$
C $I = \frac{P \times r}{t}$ **D** $P = \frac{I}{r \times t}$
- Ted invests \$4000 at 3% with interest compounded annually. About how long will it take for his investment to double?
A 3 years **B** 24 years
C 33 years **D** 72 years
- State the value of i (interest rate earned per compounding period) and n (number of compounding periods) for the following compound interest problems.
 - \$2000 invested at 3% for 4 years with interest compounded semi-annually
 - \$500 invested at 3% for 1 year with interest compounded monthly
- Use the compound interest formula to determine the future value of each investment in #7.

9. Stephanie works part-time after school and on weekends at a café. Her monthly budget for February is shown.

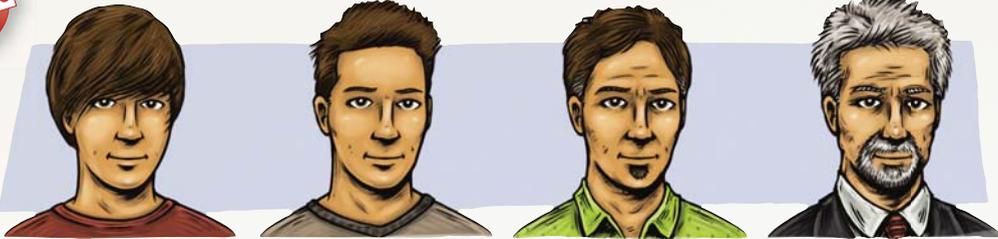
Income	
Feb 2 pay	\$312.61
Feb 16 pay	\$290.09
Expenses	
Save for college	\$200.00
Room and board	\$160.00
Spending money	\$100.00
Clothes	\$95.00
Cell phone	\$20.00

- a) What is Stephanie's total income?
- b) What are her total expenses?
- c) Stephanie will be paid three times in March. If the "extra" paycheque is \$275, suggest what she could do with the additional income.
- d) On March 1, Stephanie had \$2400 in her college account. She thinks she will need \$4000 by September. Is Stephanie on track to meet her goal? If she is, show why. If she is not, suggest what Stephanie can do to meet her goal.
10. Jeff borrows \$3500 to renovate his basement into an apartment. He agrees to a 3-year payback schedule with monthly payments of \$108.07.
- a) How much will Jeff repay to the bank?
- b) How much interest will he pay?
11. Jeff rents out his basement apartment for \$850 per month.
- a) How much income will he earn in the first year?
- b) How much income will he earn in the first 3 years, assuming the apartment is always rented?





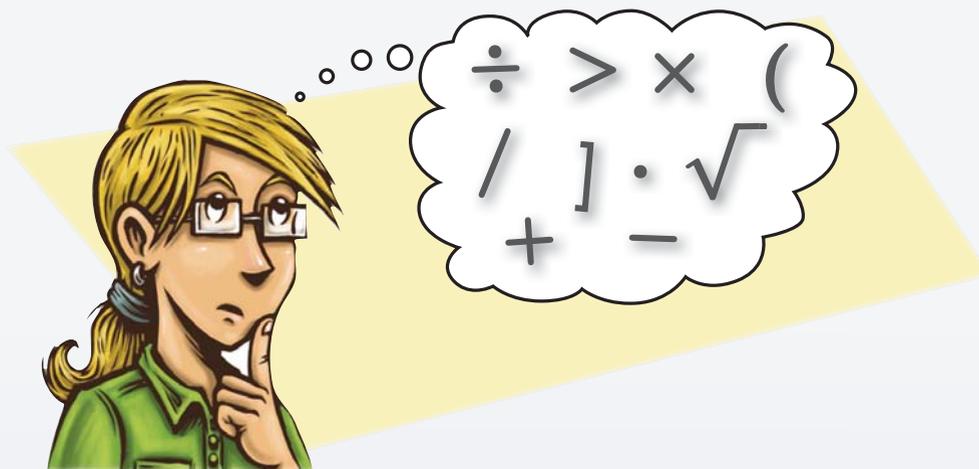
Getting Money Smart



1. You will deal with money throughout your life. It is important to become financially literate. This chapter includes a number of Key Words. You have already been putting together a financial dictionary. For this project, complete your financial dictionary. Include all of the Key Words, plus any other terms in the chapter that you think you should include. Also, add these terms: *asset*, *liability*, *financial statement*, and *balance sheet*.
 - a) Using a word processing program, create a dictionary with one word per page.
 - b) Find four definitions for each Key Word and term. Use general dictionary web sites as well as financial web sites.
 - c) Copy and paste the definitions on the appropriate page. Include the URL where you got each definition.
 - d) Read all the definitions. Consider the similarities and the differences between the various definitions, depending on the type of web site you used.
2. Set some budget goals for yourself. For each of the following times in the future, answer these questions:
 - What do you plan to be doing?
 - Where do you plan to live?
 - What material goods do you want to have?
 - How will you make all of this happen financially?
 - a) a year from now b) after high school c) in 5 years
 - d) in 20 years e) in 50 years



Math Symbols



1. What math symbol can be placed between 2 and 8 to give a number greater than 2 but less than 8?
2. Use as many math symbols between the 9s as you need to make an expression that equals 100.
9999
3. Use exactly eight 8s and as many operations (+, −, ×, ÷) as you like to make an expression that equals 1000.
4. The following equation is wrong. Change the way one digit is written to make it right. **Note:** Do not add any symbols.
 $101 - 102 = 1$
5. Use as many math symbols between the 9s as you need to make an expression that equals 100.
999999
6. a) The Internet includes lots of these kinds of number puzzles. Research one online or make one up.
b) Exchange puzzles with a partner. Solve your partner's puzzle.
c) Discuss how you solved each other's puzzles.