

4

Real-Life Decisions



Sonia wants to start her own business. She has several ideas but is not sure which one to choose.

1. How can Sonia decide which of her ideas is best?
2. How can Sonia determine how much to charge for her product or service?
3. What are some ways that Sonia can market her product or service?
4. How will Sonia know if her business is successful?

Key Words

lease
depreciation
lessee
residual value
fixed costs
extended warranty
variable costs
expenses
revenue
profit
loss
net income
break-even point

Career Link

Jordan owns a bicycle repair shop. He has always enjoyed tinkering with bikes, and he decided to open his own business two years ago. To make sure his business makes money, Jordan has to pay close attention to his expenses, sales, profits, and losses.



Rounding

- Round to the nearest dollar.
 - \$2164.76
 - \$1928.33
 - \$55 555.50
- Round to the nearest hundred dollars.
 - \$3571
 - \$6421
 - \$33 618.33
- Round to the nearest tenth of a percent. Then, write as a decimal.
 - 62.25%
 - 83.97%
 - 0.24%
 - 0.07865%

Percent

- Estimate each number as a percent. Then, calculate the percent. Round your answer to the nearest tenth of a percent.

a) $\frac{160}{280}$

*You can estimate this way:
Half of 280 is 140.
So, 160 out of 280 is more than 50%.
That means 160 out of 280 is about 60%.*

b) $\frac{169.95}{4065}$

c) $\frac{12\ 680.15}{55\ 000}$

d) 16.96 out of 34.45

- Leslie is saving for a trip to Florida. Every payday she saves 10% of her net pay. She brings home \$1153.84 every two weeks.



- Calculate how much Leslie saves each pay.
- Estimate how much she saves in one year. Then, calculate her yearly savings.

Average

- Determine the average of 65, 78, 45, 76, 65, 55, and 32. Round your answer to the nearest whole number.
- Sue's electricity bills for last year totalled \$1871.40. What was her average monthly bill?
- Last year, at the end of every day, Janie put her loose change into a jar. At the end of the year she had \$452.60.
 - On average, how much change did Janie save each month?
 - On average, how much change did Janie save each day?

Budgets

9. Paul's net pay is \$1038 every two weeks. His monthly expenses are as follows:

- \$575 rent
- \$350 groceries
- \$115 heat and electricity
- \$225 car payment
- \$85 car insurance
- \$200 savings
- \$65 cell phone
- \$55 cable

How much money does Paul have left at the end of a two-pay month?

Graphs

10. Draw the graph represented by each table of values. Is the relation linear or non-linear?

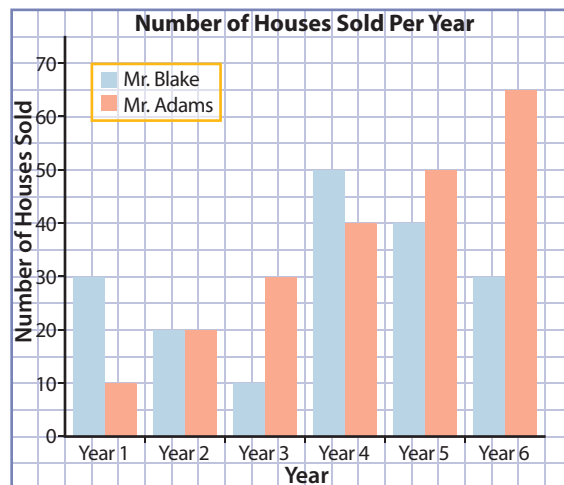
a)

Time (hours)	Distance (km)
0	0
3	1
5	2
9	3
12	4

b)

Temperature (°C)	Volume (mL)
10	849
15	864
20	879
25	894
30	909

11. The bar graph shows sales for two real estate agents.



- a) How many houses did Mr. Adams sell in year 4?
- b) How many houses did Mr. Blake sell in year 3?
- c) In what year did Mr. Blake and Mr. Adams sell the same number of houses?
- d) Which real estate agent would you hire to sell your house? Why?

Converting Units

12. Express each time period in years.

- a) 60 months
- b) 48 months
- c) 36 months

13. Express each time period in months.

- a) 2 years
- b) 3 years
- c) 4 years

4.1

Owning a Vehicle

Focus On . . .

- explaining the difference between buying, leasing, and leasing-to-own a vehicle
- calculating the costs of buying, leasing, and leasing-to-own a vehicle
- identifying situations in which leasing or buying a vehicle is the better option

lease

- a type of financing in which you pay for a vehicle for a specified amount of time
- at the end of the term you can return the vehicle to the dealer or buy the vehicle for a previously set price

Many people find it difficult to decide whether to buy, lease, or lease-to-own a car. When you buy a car, you own it. You can pay cash for it, or borrow money from the bank or dealer to pay for it. Borrowing money is called financing. When you lease a car, you pay a monthly fee to use the car, but you do not own the car. At the end of the lease you can either buy the car or give it back to the dealer. If you buy the car at the end of the lease, it is called leasing-to-own.

Explore the Costs of Buying a Used Vehicle

1. When buying a car, the first step is to consider how much you can afford to spend.
 - a) Think about how you would pay for a used car. How much would you be comfortable spending?
 - b) Will you finance your car? If so, who will you borrow the money from?

Materials

- computer with Internet access
- newspapers
- auto buy-and-sell magazines

Web Link

For more information on reliability ratings, crash-test ratings, and fuel economy, go to www.mcgrawhill.ca/books/mathatwork12 and follow the links.

F.Y.I.

In some parts of Canada, buyers pay tax when they purchase a car. For example, in Newfoundland and Labrador,

- if a dealership sells a car, the buyer pays 13% HST
- if a car is sold privately, the buyer pays 14% RST (retail sales tax)

Web Link

To get an instant car insurance quote online, go to www.mcgrawhill.ca/books/mathatwork12 and follow the links.

2. Many young drivers buy their first car from someone they know. List three other sources for finding used cars.
3. Brainstorm as many vehicle options or features as you can. For example, fuel efficiency, number of doors, side-impact air bags. Divide your list into two categories: “must have” and “nice to have.”

4. a) List three makes and models of used cars in your price range. Consider your “must have” list, availability in your area, reliability ratings, safety features, and fuel economy.

If you want to know what is available in a certain price range, search used-car web sites.

- b) Use some of the sources you listed in step 2 to find three used-car models for sale. Which model is the right choice for you?

5. Research three different used-car advertisements for the model you chose in step 4b). Copy and complete the table.

Year Made	Distance Driven (km)	Selling Price	Seller (Private or Dealer)

6. a) Which car in step 5 would you purchase? Explain why you chose this car.

- b) Calculate the cost of the car including tax.

7. **Reflect** What are some advantages and disadvantages of buying from a dealer? from a private seller?

8. When you test drive the car, what are some questions you should ask the seller? List at least three questions you would ask.

9. Extend Your Understanding

- a) Research the cost of insurance for the car you chose in step 6.
- b) Research how much it costs to license and register a used vehicle.

On the Job 1

Buy a Used Vehicle



Victoria is trying to decide which used car to buy. The table shows the details for each deal.

Details	Two-Year-Old Car	Six-Year-Old Car
Cost	\$16 000 + 13% tax	\$9000 + 13% tax
Kilometres driven	35 000	100 000
Interest rate for financing	3.9%	3.9%

- If Victoria buys the two-year-old car, calculate her monthly payment if she takes the loan out for
 - 3 years
 - 4 years
- If Victoria buys the six-year-old car, calculate her monthly payment if she takes the loan out for
 - 3 years
 - 4 years
- Victoria researches the pros and cons of buying the two-year-old car vs. the six-year-old car. The table shows the information she learns. List the advantages and disadvantages of buying each vehicle.

	Two-Year-Old Car	Six-Year-Old Car
Warranty	3 years left on the manufacturer's warranty (for 5 years or 100 000 km)	None
Safety features	<ul style="list-style-type: none"> ABS side-impact protection beams electronic stability control side air bags 	<ul style="list-style-type: none"> ABS side-impact protection beams
Depreciation	Significant in the first five years	Less depreciation because vehicle is already six years old

F.Y.I.

Manufacturers' warranties for new vehicles generally cover the engine, transmission, and other major components of the vehicle. The manufacturer's warranty is typically offered for a limited period of time or for a certain number of kilometres, whichever comes first.

depreciation

- the value that an item loses over time
- the average car depreciates about 15% to 20% per year
- car depreciation usually slows down after year five

Strategy



Develop a Strategy

You can also use a loan calculator on the Internet, or download an app to your smartphone.

Solution

- a) Find the total cost of the car including tax.

$$\begin{aligned} \text{Total cost} &= 16\,000 \times 1.13 \\ &= 18\,080.00 \end{aligned}$$

The total cost is \$18 080.

Use technology to find the monthly payment.

- i) 3 years:

```
N=36
I%=3.9
PV=18080
PMT=-532.989743
FV=0
P/Y=12
C/Y=12
PMT: [END] BEGIN
```

Victoria's monthly payment will be \$532.99.

- ii) 4 years:

```
N=48
I%=3.9
PV=18080
PMT=-407.42075...
FV=0
P/Y=12
C/Y=12
PMT: [END] BEGIN
```

Victoria's monthly payment will be \$407.42.

- b) Total cost = 9000×1.13

$$= 10\,110.00$$

The total cost is \$10 110.

- i) 3 years:

```
N=36
I%=3.9
PV=10110
PMT=-298.03795...
FV=0
P/Y=12
C/Y=12
PMT: [END] BEGIN
```

Victoria's monthly payment will be \$298.04.

- ii) 4 years:

```
N=48
I%=3.9
PV=10110
PMT=-227.82211...
FV=0
P/Y=12
C/Y=12
PMT: [END] BEGIN
```

Victoria's monthly payment will be \$227.82.

- c)

	Two-Year-Old Car	Six-Year-Old Car
Advantages	<ul style="list-style-type: none"> more safety features warranty will pay for the repairs for the next three years fewer kilometres on the car newer looking 	<ul style="list-style-type: none"> lower monthly payments since the car is already six years old it will depreciate at a slower rate; if Victoria sells the car, it will be worth closer to what she paid for it
Disadvantages	<ul style="list-style-type: none"> the car will depreciate faster than the six-year-old car higher monthly payments 	<ul style="list-style-type: none"> no warranty fewer safety features more kilometres more likely to need age-related repairs

Your Turn

Dan is buying a used car. He needs to choose between a three-year-old model from a dealership and his friend's six-year-old car. The details of the cars are shown in the table.

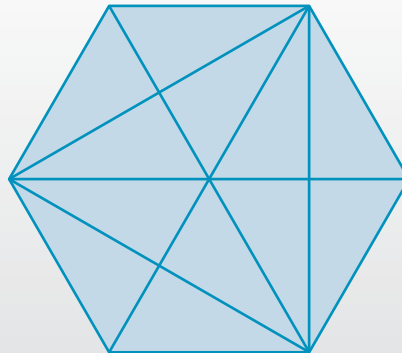
Details	Three-Year-Old Car	Six-Year-Old Car
Cost	\$15 000 + tax	\$8500 + tax
Kilometres driven	75 000	100 000
Interest rate for financing	2.9%	2.9%
Warranty	2 years left on the manufacturer's warranty (for 5 years or 100 000 km)	None

- a) Calculate the total cost of each car after tax.
- b) Use technology to determine Dan's monthly payment if he buys the three-year-old car with a
- 5-year loan
 - 6-year loan
- c) If Dan buys the six-year-old car, determine his monthly payment if he takes the loan out for
- 3 years
 - 4 years
- d) Dan is on a tight budget and does not have a lot of extra money to spend after he pays for living expenses and his car. Which car should Dan choose? Which loan period should he get? Justify your answer.

Use the sales tax for your province or territory. In Newfoundland and Labrador, if a car is sold privately, the buyer pays 14% RST (retail sales tax).

Puzzler

How many triangles of all shapes and sizes are in the figure below?



Check Your Understanding

Try It

For the following questions, use the sales tax for your province or territory, if necessary.

1. Logan has two part-time jobs and needs a car to commute between them. He has \$5000 saved and is buying a used car from his friend. The cost of the car is \$4500.
 - a) What is the total cost after tax?
 - b) Does Logan have enough money to buy the car?
2. Use technology to determine the monthly payment for each situation.

	Amount Borrowed	Interest Rate	Term
a)	\$15 000	1.9%	3 years
b)	\$15 000	1.9%	6 years
c)	\$15 000	6.9%	3 years
d)	\$15 000	6.9%	6 years

3.
 - a) For each situation in #2, calculate the total amount paid for the car.
 - b) Which interest rate and term would you choose? Why?
4. Brett borrows \$6000 from a bank to buy his first car. His monthly payment is \$197.20 for three years.
 - a) Calculate the total amount that Brett will pay to the bank.
 - b) How much interest will he pay over the life of the loan?

Apply It

5. Kylie has found two used cars for sale at a dealership.

Car 1: One-year-old, two-door coupe for \$15 000 (not including tax). Interest rate of 3.9% for 60 months.

Car 2: Three-year-old, two-door coupe for \$11 300 (not including tax). Interest rate of 3.9% for 36 months.

 - a) Use technology to calculate the monthly payment for each car.
 - b) How much will Kylie pay, in total, for car 1? car 2?
 - c) Kylie is a sales representative, and she drives a lot for work. She estimates that she will drive 40 000 km each year. Which car should Kylie buy? Justify your answer.



Tools of the Trade

An Oil and Gas Rig Technician 1 is also called a Motorhand. A rig technician is responsible for maintaining drilling rig engines, transmissions, heating systems, generators and motors, hydraulic systems, and other mechanical equipment.

6. John just got his first job as a rig technician. He needs to buy a truck to get to and from work. He saved \$8000 during his apprenticeship. John found two potential private sales on the Internet. Both trucks have had regularly scheduled maintenance and are in good condition. Which should he choose? Justify your answer.

Details	Truck 1	Truck 2
Total cost (including RST)	\$7500	\$5500
Age of truck	7 years	9 years
Kilometres driven	150 000	225 000



7. Vanessa decides to buy a used SUV. She finds two models that she likes. Which SUV is the better deal?

Details	SUV 1	SUV 2
Total cost (including taxes)	\$23 871.21	\$21 018.20
Financing option	1.9%, 24 months	4.99%, 36 months
Warranty	1 yr/20 000 km included	None

On the Job 2

Buy a New Vehicle



Erin has been working as a cabinetmaker for several years and is starting her own business. She needs a car to meet with clients, and she has decided that she can afford a new car. Details of the pricing are in the table.

Standard Vehicle Price	\$18 999
Extra Options Package	\$1 150
Freight and PDI	\$1 450
Licence (not taxable)	\$140

F.Y.I.

Freight and PDI (pre-delivery inspection) are costs that are added to all new car purchases. This charge covers the cost to ship the car to the dealership and inspect the car once it gets there.

- a) What is the total cost of the car, including taxes?
- b) Erin decides to get a car loan for 60 months. Her monthly payment will be \$439.96.
 - i) What is the total amount Erin will have paid for the car when it is paid off?
 - ii) What is Erin's cost to finance the car? That is, how much will she pay in interest?
- c) The interest rate on the loan is 2.9%. If Erin saves \$1500 for a down payment, how much money will she have to borrow? How will this affect her monthly payment?
- d) If Erin's car depreciates 15% each year, how much will her car be worth when it is paid off? Create a graph to show how much the car is worth each year after it depreciates 15%. In which year will the car depreciate the most?

A down payment on a car is applied to the total cost of the car after taxes have been calculated.

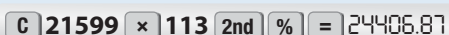
Solution

a) Taxable items = $18\,999 + 1150 + 1450$
 $= 21\,599$

HST is 13%.

$$21\,599 \times 1.13 = 24\,406.87$$

You can also use the percent key on your calculator:



C 21599 × 113 2nd % = 24406.87

Total cost of car = cost of taxable items + licence fee
 $= 24\,406.87 + 140$
 $= 24\,546.87$

The total cost of the car is \$24 546.87.

b) i) Total amount paid = monthly payment × number of months
 $= 439.96 \times 60$
 $= 26\,397.60$

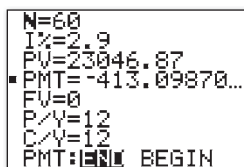
Erin will pay \$26 397.60 for the car.

ii) Cost to finance car = total amount paid – actual cost of car
 $= 26\,397.60 - 24\,546.87$
 $= 1850.73$

It will cost Erin \$1850.73 to finance the car.

c) Subtract Erin's down payment from the total cost of the car:
 $24\,546.87 - 1500 = 23\,046.87$.

Erin will have to borrow \$23 046.87.



```
N=60
I%=2.9
PV=23046.87
PMT=-413.09870...
FV=0
P/Y=12
C/Y=12
PMT: END BEGIN
```

If Erin makes a down payment of \$1500, her monthly payment will be \$413.10.

$$439.96 - 413.10 = 26.86$$

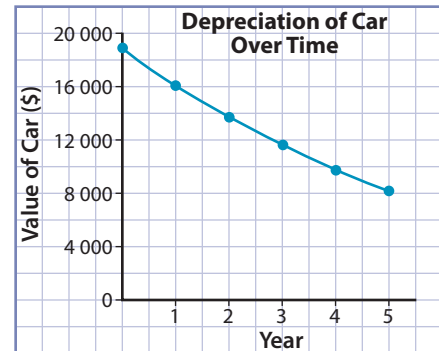
The down payment lowers Erin's monthly payment by \$26.86 per month.

F.Y.I.

The actual depreciation of a car in the first year is even steeper. When a new car is driven off the lot, its value drops from the retail price (what you paid for it) to the wholesale price (what the dealer paid for it). Some people estimate this depreciation to be 11%. That means if you buy a new car for \$20 000, it is worth \$17 800 the minute you drive it off the lot. The vehicle decreases by 15% to 20% in value each year that follows.

- d) Calculate 15% of \$18 999 to get the amount the car depreciates in one year. Next, find 15% of the new value to find the amount the car depreciates in year two. Continue the pattern.

Year	Value of Car	15% of Value
0 (now)	\$18 999.00	\$2849.85
1	\$16 149.15	\$2422.37
2	\$13 726.78	\$2059.02
3	\$11 667.76	\$1750.16
4	\$9 917.60	\$1487.64
5	\$8 429.96	



Erin's car will be worth \$8429.96 when it is paid off.

The table and the graph both show that the car depreciates the most in the first year.

Your Turn

Robert is buying a new pickup truck. Details of the pricing are in the table below.

Standard Vehicle Price	\$20 399
Extra Options Package	\$600
Freight and PDI	\$1 450

- What is the total cost of the truck, including tax?
- The dealership is offering 1.9% financing for up to 48 months. Robert decides to finance the truck for 48 months.
 - How much will Robert pay each month? Use technology to help you.
 - What is the total amount Robert will have paid for the truck when it is paid off?
 - What is Robert's cost to finance the truck?
- If Robert saves \$2000 for a down payment, how much money will he have to finance? How will this affect his monthly payment?
- If Robert's truck depreciates 15% each year, how much will it be worth when it is paid off? Create a graph to show how much the truck depreciates each year over the course of four years. In which year will it depreciate the most?

Apply It

4. a) What is the total cost of Mark's snowmobile for each loan term in #3?
- b) What are the advantages and disadvantages of each term?
5. Zach is looking for a new truck. The base price for the standard equipment on the truck he likes is \$25 615. Freight and PDI are \$1560. The table provides information about the other costs.

Optional Equipment	Cost
Rear sliding window	\$200
Spray-in bedliner	\$450
Class IV receiver hitch	\$250
Radio: media centre with CD/DVD/MP3/HDD/NAV	\$950

- a) If Zach chooses to buy the truck with all the optional equipment, what is the total cost, including taxes?
- b) The dealership is offering 0% financing. Zach plans to take the loan out for 60 months. What is his monthly payment if he buys all options?
- c) Zach decides he does not need the hitch or the spray-in bedliner. How much less will the total cost be, including taxes, by not buying these options?
- d) How much less will Zach spend each month if he buys the truck without the two options listed in part c)?
- e) If the truck depreciates at a rate of 20% per year, what will it be worth in five years? Draw a graph to show the truck's approximate value each year.
6. Sophia just bought a new hatchback. The before-tax cost was \$20 548. The dealership had 0% financing.
- a) Sophia has a 60-month loan. What is her monthly payment?
- b) After one year, how much will Sophia have paid on the car? How much will she still owe?
- c) Create a table of values to show how much Sophia owes on the car at the end of each year.



7. Greg is starting a landscaping business. He needs a pickup truck to carry his equipment. The total cost, excluding taxes, is \$26 185. The dealership is offering a deal in which the consumer gets \$3000 cash back. Greg will apply the cash back to the cost of the vehicle.
- What is the total cost of the truck, including taxes? The \$3000 will be taken off the total cost after taxes are applied.
 - The interest rate is 1.9%. Find the monthly payment if Greg takes the loan out for
 - 4 years
 - 5 years
 - 6 years
 - For each loan in part b), how much will Greg pay in total for his truck?
 - Give one reason Greg might choose a four-year loan instead of a six-year loan.
 - Give one reason he might choose a six-year loan instead of a four-year loan.
8. Derek wants to buy a new car. He goes to two dealerships and gets the following offers on the same make and model.



Dealership	Total Cost of Car (including taxes)	Financing Option
King's Autos	\$15 563.87	1.99% for four years
B&B Vehicles	\$15 018.20	2.9% for four years

- What is the monthly payment for each vehicle?
- What is the total cost of each car?
- Which car dealership made Derek the better offer? Justify your answer.

F.Y.I.

A lease agreement is a contract between the lessee and dealer. It includes information about the lease, such as

- the length of the lease
- how many kilometres the lessee is allowed to drive per year
- the monthly and total costs of the lease
- who pays for repairs and other expenses

lessee

- the customer leasing the vehicle from the car dealership

residual value

- the estimated value of the car at the end of the lease
- determined by the car dealership when the lease is signed

F.Y.I.

When you lease a car, you do not pay taxes on the cost of the car. Instead, you pay taxes on each monthly payment. However, if you buy the car at the end of the lease, you pay taxes on the residual value.

On the Job 3

Lease a Vehicle

Matt plans to lease a new car. His lease agreement allows him to drive 20 000 km per year. Matt's monthly payment will be \$246.53 for four years.



- When leasing a vehicle, there is always some money due upon delivery. Matt has to pay a delivery fee of \$156.95 plus the first month's payment. What is the total cost Matt has to pay before he can take the car home?
- If Matt drives more than 20 000 km per year, he will pay 12¢ per kilometre. Matt drives 87 248 km over the four-year lease term. How much does Matt owe when he returns the car to the dealer?
- Since he has gone over his allotted kilometres, Matt decides to buy the car at the end of the lease instead of returning it. This way, he does not have to pay for the extra kilometres. The **residual value** of the car at the end of the lease term is \$9905.70. To buy the car, the interest rate is 7%, and Matt takes the loan out for two years. How much will Matt pay in total for this car?
- If Matt had bought the car instead of leasing it, he could have had an interest rate of 1.9% over 60 months. Would it have been cheaper to lease-to-own or to buy the car? Costs to buy the car are in the table.

Standard Vehicle Price	\$18 690
Freight and PDI	\$1 395
Licence (not taxable)	\$140

- Are the monthly payments lower when Matt leases the car or buys it outright? Why?

Solution

- First, calculate the total monthly payment by including the sales tax.

$$\begin{aligned}\text{Total monthly payment} &= \text{monthly payment} \times 1.13 \\ &= 246.53 \times 1.13 \\ &= 278.58\end{aligned}$$

$$\begin{aligned}\text{Amount due upon delivery} &= \text{delivery fee} + \text{first month's payment} \\ &= 156.95 + 278.58 \\ &= 435.53\end{aligned}$$

The total amount due upon delivery is \$435.53.

- b)** Matt drives an extra 7248 km.

$$7248 \times 0.12 = 869.76$$

$$\begin{aligned}87\,248 - (4)(20\,000) \\ = 7248\end{aligned}$$

Matt has to pay \$869.76 for the extra kilometres.

- c)** $\left(\begin{array}{c} \text{Total} \\ \text{amount paid} \end{array} \right) = \left(\begin{array}{c} \text{amount paid} \\ \text{upon delivery} \end{array} \right) + \left(\begin{array}{c} \text{amount paid} \\ \text{over 48 months} \end{array} \right) + \left(\begin{array}{c} \text{residual} \\ \text{cost} \end{array} \right)$

$$\text{Amount paid over 48 months} = 47 \times \text{monthly payment}$$

$$\begin{aligned}\text{He paid the first month's} &= 47 \times 278.58 \\ \text{payment upon delivery.} &= 13\,093.26\end{aligned}$$

To find the total residual cost, first calculate the sales tax on the residual value.

$$\begin{aligned}\text{Residual cost} &= 9905.70 \times 1.13 \\ &= 11\,193.44\end{aligned}$$

Use technology to find the monthly payment for the residual cost.

```
N=24
I%=7
PV=11193.44
PMT=-501.15917...
FV=0
P/Y=12
C/Y=12
PMT: [END] BEGIN
```

The monthly payment to buy out the car is \$501.16.

$$\begin{aligned}\text{Total residual cost} &= \text{number of months} \times \text{monthly payment} \\ &= 24 \times 501.16 \\ &= \$12\,027.84\end{aligned}$$

$$\begin{aligned}\text{Total amount paid for car} &= 435.53 + 13\,093.26 + 12\,027.84 \\ &= 25\,556.63\end{aligned}$$

The total amount paid for the car is \$25 556.63.

- d)** The taxable items are the standard vehicle price plus the freight and PDI.

$$\begin{aligned}\text{Cost including taxes} &= (18\,690 + 1395) \times 1.13 \\ &= 20\,085 \times 1.13 \\ &= 22\,696.05\end{aligned}$$

$$\begin{aligned}\text{Total car cost} &= 22\,696.05 + \text{licence fee} \\ &= 22\,696.05 + 140 \\ &= 22\,836.05\end{aligned}$$

The total cost of the car is \$22 836.05.

F.Y.I.

If you buy out your lease, you do not pay for any extra kilometres.

Use technology to find the monthly payment.

```
N=60
I%=1.9
PV=22836.05
PMT=-399.26657...
FV=0
P/Y=12
C/Y=12
PMT: [ ] BEGIN
```

The monthly payment is \$399.27.

$$\begin{aligned} \text{Total cost of buying car} &= \text{number of months} \times \text{monthly payment} \\ &= 60 \times 399.27 \\ &= 23\,956.20 \end{aligned}$$

The total cost of the car is \$23 956.20.

Find the difference between buying the car up front and leasing to own.

$$25\,835.21 - 23\,956.20 = 1879.01$$

The difference is \$1879.01.

It is cheaper to buy the car up front.

- e) The monthly payments to lease the car are less than the monthly payments to finance it. When Matt leases the car, he is paying for the cost of four years of its life. When he buys it, he is paying the full cost of the car.

Your Turn

Karen wants to lease a new car. Details of the costs are in the table.

Standard Vehicle Price	\$18 526
Freight and PDI	\$1 390

- Karen's monthly payment is \$280.72. After taxes are calculated, what will be her actual monthly payment?
- Karen has to pay a licence fee of \$140 (which is non-taxable) plus the first month's payment. How much does Karen owe before she can take the car?
- Karen leases the car for 36 months. At the end of the lease, Karen decides to buy the car. The interest rate is 5.9%, and she takes the loan out for three years. How much will Karen pay in total for this car? The residual value of the car is \$11 008.10.
- If Karen had bought the car initially, she could have had an interest rate of 1.9% for five years. How much would she have paid in total?

F.Y.I.

The interest rates for loans on used cars can be much higher than those on new cars. They are also usually over a shorter term. This means that the monthly payment on a used car is usually higher.

Check Your Understanding

Try It

- Use technology to determine the monthly payment in each case.
 - 5-year loan for \$24 000 at 0.9%
 - 4-year loan for \$24 000 at 0.9%
 - 5-year loan for \$12 500 at 6.9%
 - 3-year loan for \$12 500 at 3.4%
- Calculate the total cost of each loan in #1.
- Calculate the cost for the extra kilometres.
 - 25 548 km at 8¢ each
 - 10 012 km at \$0.08 each
 - 5248 km at \$0.12 each
 - 25 370 km at 12¢ each

Apply It

- Jill plans to lease a new car. Details of the costs are in the table.

Standard Vehicle Price	\$24 390
Freight and PDI	\$1 395
Licence (not taxable)	\$140

- What is the total cost of this car, including taxes?
- Jill will lease the car for 48 months. Her monthly payment will be \$324.18 plus taxes. What is the total monthly payment?
- Before getting the car, Jill must pay delivery fees of \$156.95 plus the first month's payment. How much will she pay when she receives the car?
- How much will Jill have paid for the car at the end of 48 months, including the up-front costs?
- The residual value of the car at the end of the term will be \$12 195. If Jill buys the car, how much will the buyout actually cost? She can get a three-year loan at an interest rate of 7.4%.
- How much will Jill have paid in total over the seven years for this vehicle?



5. William just signed a three-year lease agreement for his first car. He has a down payment of \$623.47. His monthly payment is \$315.15, taxes included. How much will William have paid to lease this car at the end of the three-year term?

6. Joe is leasing a truck for four years. He expects to drive about 100 000 km in the four-year period. The lease agreement allows him to drive 24 000 km per year. The penalty for extra kilometres is \$0.12 per km. Joe's monthly payment on the lease is \$456 (including taxes). He knows it would cost him about \$550 per month for 60 months to finance the truck. Should Joe lease the truck or buy it? Justify your answer.



7. Carolyn commutes 60 km each day for work, five days a week, nine months of the year. She travels 720 km four times a year to visit family members. She also drives another 200 km/month.

- a) About how many kilometres does Carolyn drive in one year? Assume there are four weeks in each month.
- b) Do you think leasing would be a suitable option for Carolyn? Explain.

8. Lynn is leasing a car. The charges on delivery are \$604.03 and her monthly payment is \$447.08, including taxes, for 48 months. She is thinking of buying the car at the end of her lease, which is in a few months. The residual value at that time will be \$14 345.00.

- a) If she buys the car, Lynn will take the loan out for three years at an interest rate of 7%. How much will she have paid for the car in total?
- b) If Lynn had bought, rather than leased, the car, she would have financed \$33 313.57 for five years. The company was offering 1.9% interest at the time. What would her monthly payment have been if she had bought the car?
- c) How much would Lynn have paid in total if she had bought the car up front?
- d) How much extra is Lynn paying for the car by leasing to own?

Work With It

Strategy



Make a Systematic List

1. Bob and Lorne buy the same make and model of vehicle. They both take out a loan for five years. Bob pays \$318.96 biweekly. Lorne pays \$637.92 monthly. Will they have paid the same amount for their vehicles once they are paid off? Explain.

2. **MINI LAB** Anna wants to buy a car. Before she visits the dealership, she wants to know how much she can afford to spend on a car payment. Anna's net monthly income is \$2210. Her monthly expenses are shown in the table.

Expense	Cost (\$)
Rent	575
Food	250
Heat & electricity	100
Savings	100
Personal items	40
Entertainment	100
Household items	30
Cable	55
Phone	65

STEP 1

How much money does Anna have left at the end of the month after she pays her expenses?

STEP 2

What else should Anna consider when budgeting how much she can afford for a monthly car payment?

STEP 3

Anna can get a new car for \$25 314.10 (including taxes) at an interest rate of 0.9%. Calculate the monthly payment if she takes the loan out for four years, five years, or six years.

STEP 4

Anna can get a similar four-year-old car from a dealership for \$12 210 (including taxes) at an interest rate of 3.9%. Calculate the monthly payment if she takes the loan out for two years, three years, or four years.

STEP 5

Write an e-mail to Anna explaining which car she should buy and which payment option she should choose.



3. Elizabeth just bought a new car and is curious how much it will be worth when she is ready for a new model. She researched information on used-car prices and recorded her findings in the table.

Age of Car (Years)	Average Value After Depreciation
0	\$28 000
2	\$18 300
4	\$13 200
6	\$9 600
8	\$6 900
10	\$5 000

- What factors affect the amount a vehicle depreciates?
- What is the relationship between the age of a car and depreciation?
- Graph the average amount the car is worth after it depreciates each year versus the age of the car.
- Use the graph to estimate the average value of the car after three years and after seven years.

Discuss It

4. Chad wants to buy a used truck. His three options are shown in the table.

Vehicle	# of km	Cost
New pickup truck	0	\$36 995
Two-year-old pickup truck	21 000	\$26 700
Four-year-old pickup truck	55 000	\$19 300

- What are some questions Chad should ask the salesperson about each vehicle?
 - What are some pros and cons of buying each of the trucks?
 - If you were making this decision, which truck would you buy? Give at least two reasons to support your choice.
- What factors should you consider when deciding to buy or lease a vehicle?
 - Why do you think leasing is becoming more and more popular?
 - List some advantages and disadvantages of leasing a vehicle vs. buying a vehicle.
 - Tracy sees an advertisement painted on a car that says “Lease Me for \$109 Biweekly.” Should she assume that this is the amount she will pay to lease the car? What other costs might there be?



4.2

Operating a Vehicle

Focus On ...

- calculating annual fixed ownership costs of buying or leasing a vehicle
- identifying and calculating variable operating costs associated with owning a vehicle
- calculating the average monthly costs of owning and operating a vehicle



Materials

- calculator
- Internet access

When people are deciding if they can afford a vehicle, they often just look at the monthly payment. What other costs should you consider when making this decision?

Explore the Costs of Owning a Vehicle

1. Use the car you chose in Explore the Costs of Buying a Used Vehicle in section 4.1. Predict how much it will actually cost to own and operate the vehicle for one year.
2. If you decided to finance the car, research the financing terms you can get (interest rate and term of loan). Use technology to determine your monthly payment. How much will you pay in the first year?

F.Y.I.

In many regions of Canada, vehicle insurance is much more expensive for younger people, especially males. Insurance is usually paid monthly. The amount you pay is called your premium.

3. If you have not already researched the cost of insurance, do so now. What is your annual premium?
4. How much do you think you will spend on gas per month? Use the current cost of gas to calculate the cost of gas for the first year.
5. Research how much winter tires will cost for your vehicle.
6. Find the total cost of owning your vehicle for one year. Include your loan payments (if applicable), insurance, gas, winter tires, and an estimate of \$300 per year for regular maintenance.

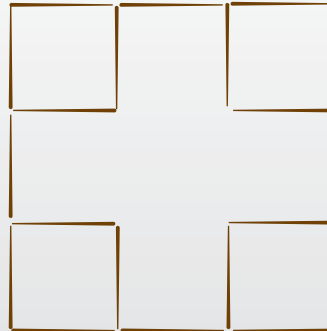
7. Reflect

- a) How accurate was your prediction in step 1 about how much it would cost to own and operate the vehicle? How far off was your prediction?
- b) What were some costs you did not consider in step 1 as part of owning a vehicle?

8. **Extend Your Understanding** How will the cost of owning and operating your vehicle change in year two? year four?

Puzzler

There are five squares (one 3×3 square and four 1×1 squares) formed with 20 toothpicks. Move two toothpicks to get seven squares. Do not overlap or break the toothpicks.



On the Job 1

Determine the Initial Costs of Owning a Vehicle



fixed costs

- costs that do not change from month to month
- have to be paid regardless of how much the vehicle is used
- examples are licence fees and insurance

extended warranty

- a service contract between the vehicle owner and warranty provider
- covers specific maintenance and repairs for the vehicle after the manufacturer's warranty expires

Aiden is buying a car and wants to know the **fixed costs** for his purchase. The details of his purchase are

- payments are \$2302.20 per year for five years
 - annual insurance premium is \$2500
 - manufacturer's warranty for four years/80 000 km is included
 - **extended warranty** for two years/120 000 km is \$1200
- a) Calculate Aiden's total monthly fixed cost.
 - b) Aiden plans to drive this car for as long as possible. What will his monthly fixed costs be after the loan is paid off?
 - c) Aiden drives about 25 000 km per year. Should he buy the extended warranty?

Solution

$$\begin{aligned}\text{a) Monthly car payment} &= 2302.20 \div 12 \\ &= 191.85\end{aligned}$$

$$\begin{aligned}\text{Monthly insurance premium} &= 2500 \div 12 \\ &= 208.33\end{aligned}$$

$$\begin{aligned}\text{Total monthly fixed cost} &= 191.85 + 208.33 \\ &= 400.18\end{aligned}$$

Aiden's monthly fixed cost will be \$400.18.

F.Y.I.

Insurance premium quotes include tax.

- b)** Aiden's monthly fixed cost after the loan is paid off will be his insurance premium, which is \$208.33.
- c)** Reason to buy the extended warranty:
Since Aiden drives 25 000 km/year, the manufacturer's warranty will expire before his car is four years old. The extended warranty will cover the car until it is almost five years old.

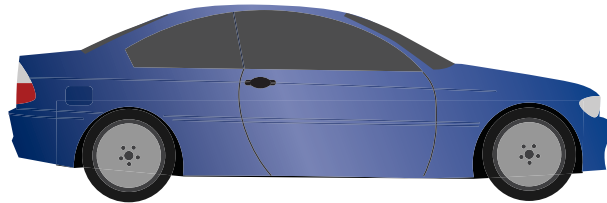
Reason not to buy the extended warranty:

The extended warranty will cover the car until it is about five years old. Cars may not need extensive repairs in the first five years. Aiden should not pay extra money for a warranty unless it will last until the car is older.

Your Turn

Eva is looking online and sees a used car that she would like to buy. She has \$2000 for a down payment. The details are

- payments are \$3815 per year for three years
- annual insurance premium is \$1970
- two year/120 000 km extended warranty is available for \$1100



- a)** Calculate Eva's monthly fixed cost.
- b)** Eva decides to buy the extended warranty. What is the initial cost to buy the car?
- c)** If Eva keeps her car for two years after it is paid off, calculate her annual fixed cost during this two-year period.
- d)** Eva decides to save the amount of her monthly payment for these last two years. How much money will she have saved by the end of the two years?

Check Your Understanding

Try It

1. Calculate the monthly fixed cost for each car.
 - a) \$286/month for financing
\$229/month for insurance
 - b) \$243/month for financing
\$2310/year for insurance
 - c) \$2220/year for financing
\$2286/year for insurance
 - d) \$1140/year for financing
\$1989/year for insurance
2. Patricia has a used car. Her monthly car payment is \$103.21. She pays \$140 to license her car each year. Her insurance premium is \$1100 annually.
 - a) Calculate Patricia's monthly fixed costs.
 - b) Calculate Patricia's annual fixed costs.
 - c) How much will Patricia pay in fixed costs over a four-year period?
 - d) Calculate Patricia's fixed costs after the car is paid off.
3. Ben is buying a new car. The details of the deal are
 - payments are \$3468.56 per year for four years
 - annual insurance premium is \$2490
 - manufacturer's warranty for four years/80 000 km is included
 - extended warranty for two years/120 000 km is \$1350
 - a) Calculate Ben's total monthly fixed cost.
 - b) Ben plans to drive this car for as long as possible. What will his monthly fixed costs be after the loan is paid off?
 - c) Ben drives about 20 000 km per year. Should he buy the extended warranty?

Apply It

4. Zoe just bought a used car for \$8502.22 including taxes, at an interest rate of 3.9% for five years. Her insurance is \$1900 annually and the yearly licence fee is \$140. Calculate Zoe's annual fixed costs.

F.Y.I.

The world's least expensive new car is manufactured in India and is called the Tata Nano. It cost less than \$ 2000 when it was released in 2009.

5. Brian's net annual salary is \$32 523. The annual fixed costs of owning his car are \$5240.55. What percent of his annual salary are his fixed car costs?

6. The table shows the annual fixed costs of various vehicles.

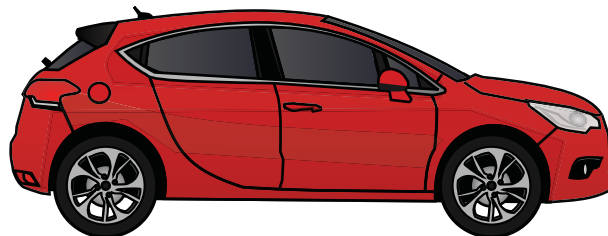
Vehicle Type	Annual Fixed Costs
Sub-compact	\$4659.36
Compact	\$5590.60
Mid-size	\$7473.32
Full-size	\$8888.56
SUV	\$9539.24
Sports car	\$13 562.76

- What is the relationship between the type of car and the fixed costs of owning the car? What accounts for this difference?
- How much less do you spend annually by owning a mid-size car instead of an SUV?
- Find the total fixed cost for each vehicle over a five-year period. Round your answer to the nearest \$1000.

7. Jason is buying a new car from a dealer. It costs \$17 512, excluding taxes. He decides to purchase an extended warranty for \$899 plus taxes. Jason plans to finance the total amount for 72 months at an interest rate of 2.8%.

- What is Jason's monthly payment?
- If the licence fee is \$140 and insurance for the car costs \$2484 annually, calculate Jason's annual fixed costs.

8. Maya is buying a new compact car. Her car comes with a five-year/100 000 km manufacturer's warranty. The dealer is offering her an extended three-year/160 000 km warranty for \$1300. If she plans to drive 35 000 km each year, should Maya buy the extended warranty? Justify your answer.



On the Job 2

Determine Ongoing Costs of Owning a Vehicle

Valerie is planning to buy a used car and wants to know some of the **variable costs**. The car is three years old and has a mileage of 60 342 km.



variable costs

- costs that change in amount or in how frequently they are paid
- examples are gas, tires, and maintenance
- the distance you drive, climate, your driving style, and maintenance affect the variable costs

F.Y.I.

Fuel consumption is the volume of fuel used by a vehicle per distance driven, usually expressed as litres per 100 km.

- Valerie wants to know how much she will spend on gas each month. She estimates that she will drive about 1700 km per month. She knows the vehicle's fuel consumption is 7.9 L/100 km. Use the current cost of gas to calculate the amount Valerie will likely spend on gas each month.
- Even though Valerie's car is still covered by a warranty, she will have to pay for regular maintenance. The table shows some common maintenance requirements, the schedule to complete them, and the cost. If Valerie does all of the maintenance according to schedule, how much will she spend on maintenance in the first year she owns the car? Assume she drives about 20 000 km per year.

Maintenance	Schedule	Estimated Cost Including Tax
Change oil and filter	Every 3 months/5000 km	\$40
Rotate tires	Every 3 months/5000 km	\$20
Replace air filter	Every 12 months	\$30
Replace windshield wipers	Every 6 months	\$25

- c) The warranty on Valerie's car expires after five years or 100 000 km. If she continues to drive the car for another three years, how much should she budget for repairs after the warranty expires? The table shows some common repairs, the schedule to complete them, and the cost.

Repair	Schedule	Estimated Cost Including Tax
Replace front brakes	Every 50 000 km	\$250
Replace back brakes	Every 100 000 km	\$250
Replace tires	Every 4 years	\$600
Replace timing belt	Every 150 000 km	\$1000

- d) What is Valerie's total ongoing variable cost to drive the car for eight years? Include gas, maintenance, and repairs.

Solution

- a) First, determine the number of litres of gas used in one month.

$$\text{Fuel consumption} = \frac{\text{litres per month}}{\text{distance per month}}$$

$$\frac{7.9 \text{ L}}{100 \text{ km}} = \frac{x}{1700 \text{ km}}$$

$$\frac{7.9 \text{ L}}{100 \text{ km}} = \frac{134.3 \text{ L}}{1700 \text{ km}}$$

Valerie uses approximately 134 L of gas per month.

Assume gas costs \$1.35/L.

$$\begin{aligned} \text{Cost of gas per month} &= 134 \times 1.35 \\ &= 180.90 \end{aligned}$$

Valerie can expect to spend about \$180.90 on gas per month.

Gas prices vary from day to day and the distance Valerie drives each month is also variable.

- b) Valerie will need four oil changes and four tire rotations. She will also need one new air filter and two new sets of windshield wipers.

$$\begin{aligned} \text{Maintenance cost for one year} &= 4(40) + 4(20) + 30 + 2(25) \\ &= 160 + 80 + 30 + 50 \\ &= 320 \end{aligned}$$

Valerie will spend \$320 on maintenance in the first year.

Strategy



Develop Alternative Approaches

You can also solve this equation using algebra.

$$\begin{aligned} \frac{7.9 \text{ L}}{100 \text{ km}} &= \frac{x}{1700 \text{ km}} \\ \frac{7.9(1700)}{100} &= \frac{x(1700)}{1700} \\ \frac{13\,430}{100} &= x \\ 134.3 &= x \end{aligned}$$

F.Y.I.
 Keep in mind that gas costs will change, and that Valerie may drive different distances in different years. This is just an estimate.

- c) After five years, Valerie will have driven 100 000 km. Over the next three years, she will drive another 60 000 km. The total distance driven will be 160 000 km. Over the next three years, Valerie's car will need
- two front brake replacements
 - one set of new tires
 - one back brake replacement
 - one new timing belt

$$\begin{aligned} \text{Repair costs} &= 2(250) + 250 + 600 + 1000 \\ &= 500 + 250 + 600 + 1000 \\ &= 2350 \end{aligned}$$

Valerie should budget \$2350 for repairs.

- d) Annual gas cost = monthly gas cost \times 12
 $= 160 \times 12$
 $= 1920$

$$\begin{aligned} \text{Cost to drive the car for eight years} &= (\text{annual gas cost} \times 8) + (\text{annual maintenance} \times 8) + \text{repairs} \\ &= (1920 \times 8) + (320 \times 8) + 2350 \\ &= 15\,360 + 2560 + 2350 \\ &= 20\,270 \end{aligned}$$

Valerie's ongoing variable costs will be \$20 270.

Your Turn

Bob has just bought his dream car. He estimates that he will drive about 2000 km per month. The car's fuel consumption is 6.2 L/100 km. The table shows common maintenance and repair costs.

Maintenance/Repair	Schedule	Estimated Cost Including Tax
Change oil and filter	Every 3 months/5000 km	\$40
Rotate tires	Every 3 months/5000 km	\$20
Replace air filter	Every 12 months	\$30
Replace windshield wipers	Every 6 months	\$25
Replace front brakes	Every 50 000 km	\$400
Replace back brakes	Every 100 000 km	\$400
Replace tires	Every 4 years	\$1100
Replace timing belt	Every 150 000 km	\$1000

- a) How much will Bob spend on gas each month? Use the current price of gas.
- b) How much will Bob spend on maintenance in the first year?
- c) After four years, Bob's warranty will expire. How much can he expect to spend over the next two years on repairs and maintenance?

Check Your Understanding

Try It

- The fuel consumption rate of a sedan is 7.2 L/100 km. How many litres of gas will be needed to travel the following distances?
 - 1000 km
 - 2000 km
 - 725 km
 - 153 km
 - 1200 km
 - 542 km
- How much does it cost to fill up vehicles with the following gas tank capacities? Use the current price of gas.
 - 60 L
 - 75 L
 - 95 L
- George decides to put winter tires on his vehicle. Each tire costs \$134.99. What is the cost, including taxes, of all four tires?
- Jake gets the oil in his car changed every 5000 km. He pays the mechanic \$59.95 for each oil change. What is the cost, including taxes, of three oil changes?



F.Y.I.

The biggest variable cost of operating a car is gas.



Tools of the Trade

A car mechanic maintains and repairs vehicles. Mechanics use both hand-held and electronic tools to diagnose and fix problems.

Apply It

- Leslie has a six-year-old SUV with 145 000 km on it. She drives about 24 000 km per year. How much should she budget to spend on repairs and maintenance over the next three years? Use the information in the table.

Maintenance/Repair	Schedule	Estimated Cost Including Tax
Change oil and filter	Every 3 months/5000 km	\$60
Rotate tires	Every 3 months/5000 km	\$20
Replace air filter	Every 12 months	\$30
Replace windshield wipers	Every 6 months	\$25
Replace front brakes	Every 50 000 km	\$400
Replace back brakes	Every 100 000 km	\$400
Replace tires	Every 4 years	\$1000
Replace timing belt	Every 150 000 km	\$1100

- Ruth drives a six-year-old car that recently needed \$1500 in repairs. She commutes 60 km for work each day. How should she decide whether she should keep this car, lease a new car, buy a newer used car, or buy a new car?

Work With It

1. List some expenses associated with buying, owning, and driving a car. Classify the expenses as fixed costs or variable operating costs.
2. Heather just bought a new car and wants to know how much it will cost her to own and operate the vehicle in the first year. She knows that
 - her monthly payment is \$521
 - her annual insurance premium is \$2164
 - she will drive about 30 000 km per year
 - the fuel consumption is 6.9 L/100 km
 - the car will depreciate 15% each year
 - a) How much will gas cost for one year? Use the current price of gas.
 - b) What will the value of the car be after one year?
 - c) How much will regular maintenance cost? The table shows common maintenance and repair costs.

Maintenance	Schedule	Estimated Cost Including Tax
Change oil and filter	Every 3 months/5000 km	\$40
Rotate tires	Every 3 months/5000 km	\$20
Replace air filter	Every 12 months	\$30
Replace windshield wipers	Every 6 months	\$25

- d) What is the total cost to own and operate the car for the first year?

3. The Sullivan family has a net annual household income (after taxes) of \$55 412. Their monthly expenses are listed in the table. The family wants to buy a new vehicle and is looking at an SUV. The monthly payment on the SUV is \$763 for five years. Insurance is \$248 per month.

Expense	Cost
Food	\$550
Shelter	\$1200
Clothing	\$250
Health/Personal care	\$100
Furnishings/ Household operations	\$650
Fitness centre	\$35
Entertainment	\$125
Insurance/Pension contributions	\$600
Savings	\$500

- a) Can they afford to buy the SUV? Consider both the fixed and ongoing costs.
- b) What recommendations would you make to the family if they decide to buy the SUV?



F.Y.I.

A hybrid vehicle uses two separate power sources: a gasoline-powered engine and an electric motor, which is powered by rechargeable batteries.

4. Joanne is trying to decide whether to buy a hybrid car. She researches a hybrid car and records her findings.

Car	Cost (excluding taxes)	Fuel Economy (City)	Fuel Economy (Highway)
Gas	\$26 729	9.4 L/100 km	6.9 L/100 km
Hybrid	\$36 329	4.6 L/100 km	5.4 L/100 km

- What are some reasons people choose to buy hybrid vehicles?
- How much more, including taxes, does the hybrid car cost?
- Joanne will finance the car at 1.9% over five years. Use technology to calculate her monthly payment for each car. How much will she pay in a year for each car?
- If Joanne drives 18 000 km in the city in the first year, how much gas will each car use?
- Using today's price for gas and assuming it will stay fairly constant for the next year, how much would Joanne save by buying the hybrid?
- What advice would you give Joanne to help her make her decision? Consider maintenance, depreciation, and driving habits.

Discuss It

- With a partner, discuss the pros and cons of owning a car versus owning a bicycle.
- How does each of the following factors affect the operating costs of a vehicle?
 - climate
 - distance driven
 - What factors affect gas consumption?
- Explain why the total annual cost for driving 28 000 km is not double the total annual cost for driving 14 000 km.



4.3

Operating a Small Business

Focus On ...

- calculating annual and average monthly revenue and expenses for a business
- determining whether a business has experienced a profit, loss, or break-even point
- identifying ways in which a business can improve its profitability
- identifying some viable small business options



John has always wanted to open his own business. He is starting a landscaping company, John's Lawn and Garden Care. He will mow lawns and maintain gardens in the summer and clear snow in the winter. What are some things you need to consider when starting a small business?

Explore Small Business Financial Operations

1. Think about a small business you would like to start, such as landscaping or hairdressing. What product(s) would you sell? What service(s) would you provide?
2. **a)** Research five possible **expenses** for your business. Do you need equipment? a car? Will you have employees?
b) List the expenses and how much each one will cost on a monthly basis.

expenses

- the money spent running a business
- examples are wages, advertising, and rent

revenue

- income from normal business activities, usually the sale of goods and/or services

profit

- when a company's revenues are more than its expenses

3. Research some possible sources of **revenue** for your business.

Research what competitors charge for similar products or services.

4. **Reflect** Imagine you want to expand your business to increase your **profit**. Copy and complete the table to show three different ways you could accomplish this goal. What are some advantages and disadvantages to each?

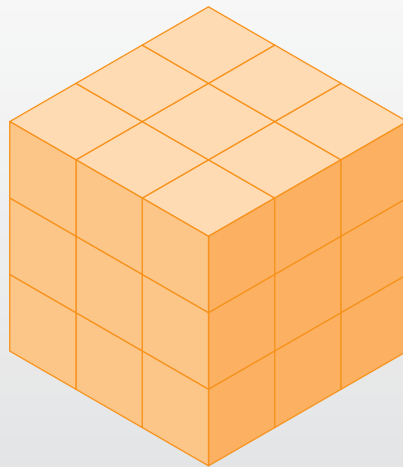
Ideas to Increase Profit	Advantages	Disadvantages

5. **Extend Your Understanding**

- a) In a business, is the month with the largest profit necessarily the month with the highest revenue? Explain.
- b) What factors might influence whether a business has a successful month?

Puzzler

What is the least number of cuts needed to divide the $3 \times 3 \times 3$ cube into 27 cubes that are each $1 \times 1 \times 1$? A cut can go through multiple pieces.

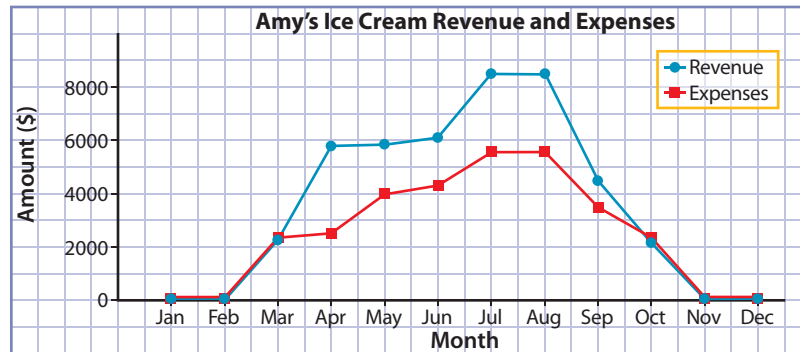
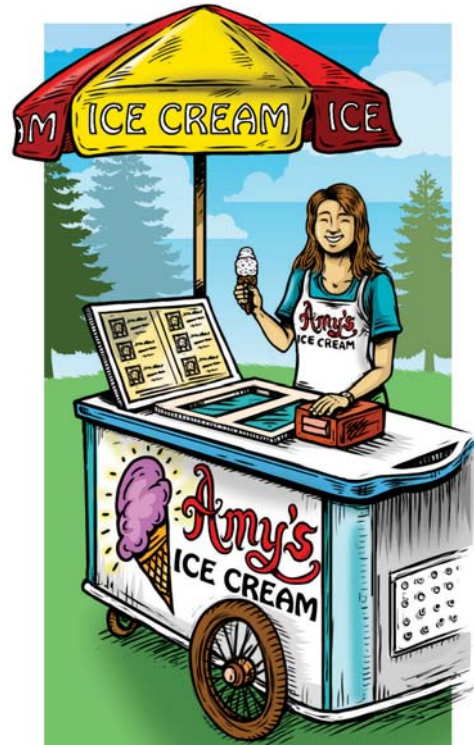


On the Job 1

Compare Revenue and Expenses

Amy opened an ice cream cart in Cavendish, PEI, three years ago. The table and graph show last year's revenue and expenses before taxes.

Month	Revenue	Expenses
Jan	\$0	\$0
Feb	\$0	\$0
Mar	\$2300	\$2375
Apr	\$5750	\$2500
May	\$5800	\$4000
Jun	\$6150	\$4300
Jul	\$8500	\$5600
Aug	\$8500	\$5600
Sep	\$4500	\$3500
Oct	\$2100	\$2375
Nov	\$0	\$0
Dec	\$0	\$0



- List some expenses for Amy's Ice Cream. Classify each expense as fixed or variable.
- Calculate the average monthly expenses and revenue for the year.
- During which month(s) did Amy's Ice Cream have the highest revenue? lowest revenue? Why do you think this was the case?

F.Y.I.

Larger companies pay wages to their employees. They also pay other expenses associated with wages, such as income taxes, Canada Pension Plan, and Employment Insurance.

Solution

a)

Fixed Expenses	Variable Expenses
Renting the ice cream cart	Ice cream, cones
Insurance	Cups, napkins
	Utilities
	Taxes

b) Annual expenses = sum of expenses for each month

$$= 2375 + 2500 + 4000 + 4300 + 5600 + 5600 + 3500 + 2375$$

$$= 30\,250$$

Average monthly expenses = annual expenses \div 12

$$= 30\,250 \div 12$$

$$= 2520.833\dots$$

The average monthly expense was \$2520.83.

Annual revenue = sum of revenue for each month

$$= 2300 + 5750 + 5800 + 6150 + 8500 + 8500 + 4500 + 2100$$

$$= 43\,600$$

Average monthly revenue = annual revenue \div 12

$$= 43\,600 \div 12$$

$$= 3633.333\dots$$

The average monthly revenue was \$3633.33.

- c) The highest revenue occurred in both July and August. The revenue for each month was \$8500.

The lowest revenue occurred in November, December, January, and February. It was \$0.

Cavendish is a beach town that is very popular with tourists. It makes sense that Amy would have the most business in the summer.

Your Turn

Melissa and her mom own a jam stand. Her mother makes different kinds of jams and Melissa sells them at the farmer's market in town. The table shows the monthly revenue and expenses last year.



Month	Revenue	Expenses
Jan	\$0	\$0
Feb	\$0	\$0
Mar	\$0	\$0
Apr	\$0	\$0
May	\$0	\$100
Jun	\$700	\$160
Jul	\$1400	\$250
Aug	\$1250	\$250
Sep	\$500	\$100
Oct	\$0	\$0
Nov	\$0	\$0
Dec	\$0	\$0

- Calculate the average monthly expenses for the months the jam stand was open.
- Calculate the average monthly revenue for the months the jam stand was open.
- During which month(s) did the jam stand have the highest revenue? highest expenses? Why do you think this was the case?
- Why do you think the stand was open for only four months of the year?
- How could Melissa and her mom expand their business? Brainstorm three ideas.

Check Your Understanding

Try It

1. List some expenses for each business. Classify each expense as fixed or variable.
 - a) sports store
 - b) landscaping company
 - c) door-to-door magazine sales
 - d) chip wagon

Strategy



Look for a
Pattern

2. The table below shows the revenue for a business over a six-year period.

Year	1	2	3	4	5	6
Revenue	\$42 000	\$40 000	\$56 000	\$84 000	\$60 000	\$100 000

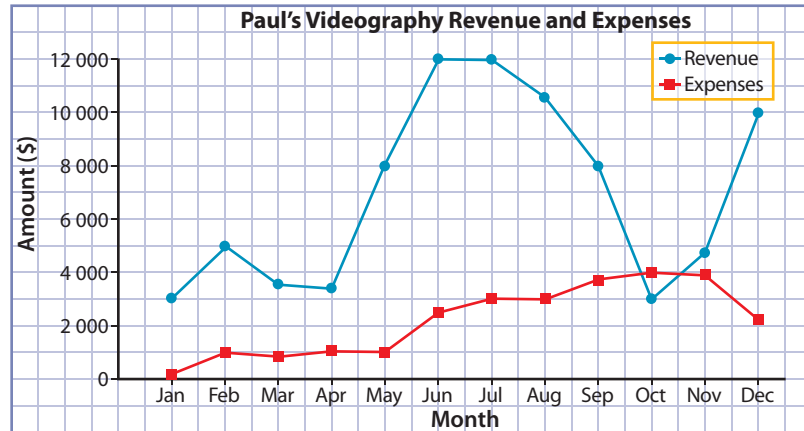
- a) Graph the revenue from year 1 to year 6.
 - b) Is this a linear relation? Why or why not?
3. The table shows the revenue and expenses for a business.

Month	Revenue	Expenses
Jan	\$2000	\$2100
Feb	\$1800	\$2150
Mar	\$1900	\$2500
Apr	\$5350	\$2175
May	\$5700	\$3800
Jun	\$5950	\$4100
Jul	\$8300	\$5400
Aug	\$8860	\$5200
Sep	\$4300	\$3300
Oct	\$4050	\$2175
Nov	\$2800	\$2800
Dec	\$2700	\$2200

- a) Graph the revenue and expenses on the same grid.
- b) Calculate the average monthly expenses.
- c) Calculate the average monthly revenue.
- d) During which month(s) did the business have the highest expenses?
- e) During which month(s) did the business have the highest revenue?

Apply It

4. Paul is a videographer who runs a business out of his home. The graph shows his revenue and expenses for the year.



- During which month(s) was Paul's revenue the highest? What might be the reason for this?
 - During which month(s) was Paul's revenue the lowest?
 - During which month(s) were Paul's expenses the highest?
 - During which month(s) were Paul's expenses the lowest?
 - Was there any month in which Paul's revenue was lower than his expenses? If so, when?
5. Chase is planning to open a hot dog stand for the summer months. List some expenses associated with operating this business. Classify each expense as fixed or variable.



6. Suzanne is starting a summer business cutting grass. She is using her parents' lawn mower. The table shows her revenue and expenses for last summer.

Month	Revenue	Expenses
May	\$400	\$200
June	\$550	\$250
July	\$1500	\$600
August	\$1550	\$600
September	\$550	\$225

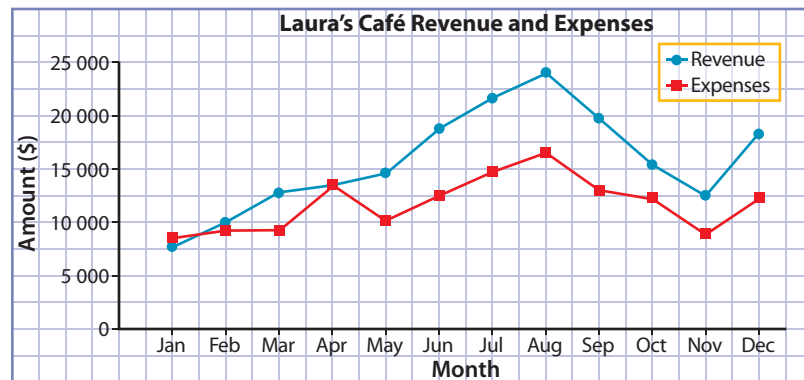
- List some possible expenses for Suzanne. Classify each expense as fixed or variable.
- Calculate her average monthly expenses.
- Calculate her average monthly revenue.
- During which month did Suzanne have the highest revenue? Why do you think this is the case?

On the Job 2

Calculate Net Income

Laura opened her own coffee shop a few years ago. The revenue and expenses for last year are shown in the table and graph below.

Month	Revenue	Expenses
Jan	\$7 600	\$8 200
Feb	\$10 000	\$8 800
Mar	\$12 750	\$9 000
Apr	\$13 250	\$13 250
May	\$14 385	\$10 200
Jun	\$18 990	\$12 400
Jul	\$22 000	\$14 800
Aug	\$24 100	\$16 800
Sep	\$19 540	\$13 000
Oct	\$15 350	\$12 100
Nov	\$12 500	\$8 900
Dec	\$18 000	\$12 100



loss

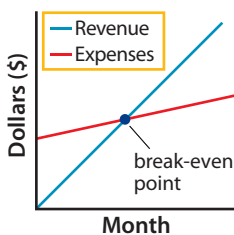
- when a company's expenses are more than its revenues

net income

- a company's total profit or loss after subtracting expenses from revenue
- Net income = revenue – expenses

break-even point

- when expenses and revenue are equal



- During which month did Laura's Café show a **loss**? Calculate the **net income** for that month.
- During which month did Laura's Café achieve a **break-even point**? How do you know?
- Did Laura's Café show an overall profit or loss for the year? How much?
- In January, Laura spent \$3875 on wages. What percent of January's expenses does this represent?
- Laura wants to make more money. What are some changes she could make to improve the profitability of her café? List advantages and disadvantages of the changes you suggest.

F.Y.I.

A loss is shown in red on an income statement. This is where the phrase *in the red* comes from.

Solution

- a) Look at the table or the graph to find the month in which the expenses are higher than the revenue.

$$\begin{aligned}\text{Net income for January} &= \text{revenue} - \text{expenses} \\ &= 7600 - 8000 \\ &= -400\end{aligned}$$

When the net income is negative, the business has lost money.

The coffee shop lost \$400 in January.

- b) Laura's Café achieved a break-even point in April.

In that month, the revenue and the expenses were both \$13 250.

- c) Net income = annual revenue – annual expenses
 $= 188\,465 - 139\,550$
 $= 48\,915$

Since the revenue was higher than the expenses, Laura's Café had a profit of \$48 915.

- d) Percent of January's expenses spent on wages = $\frac{3875}{8200} \times 100$
 $= 0.47 \times 100$
 $= 47\%$

In January, 47% of the expenses were for wages.

- e) To improve profitability, Laura needs to increase revenue, decrease expenses, or both.

Ideas to Increase Revenue	Advantage	Disadvantage
Increase prices	Laura would make more money on each sale.	People might not be willing to pay more, so Laura might lose business.
Stay open longer	The café would be able to serve more customers in a day.	If the café is not busy, Laura could lose money because she still has to pay wages and utilities while the café is open.
Run a promotion to try to get more people into the café	The café might gain more business and these people might come back after the promotion is over.	It will cost money to run the promotion, and there is no guarantee it will attract more customers.
Advertise to try to get more people into the café	The café might gain more business.	It will cost money and there is no guarantee Laura will make more money.
Open a second café	Laura could reach more customers.	It costs a lot of money up front to open a second location.

Ideas to Decrease Expenses	Advantage	Disadvantage
Find a less expensive source for coffee, tea, and food	Laura could pay less for her products but charge the same amount to customers so she would make more money.	If the products are not the same or better quality, customers may complain and Laura could lose business.
Have fewer employees	Laura would pay less for wages.	If customer service suffers, customers may complain and Laura could lose business.

Your Turn

Jennifer is a photographer. She runs a small business taking photos for special occasions and family events. Last year's revenue and expenses for Jennifer's Photography are shown in the table.

Month	Revenue	Expenses
Jan	\$300	\$25
Feb	\$525	\$100
Mar	\$125	\$75
Apr	\$325	\$85
May	\$800	\$75
Jun	\$750	\$85
Jul	\$1200	\$300
Aug	\$1200	\$300
Sep	\$200	\$75
Oct	\$0	\$0
Nov	\$0	\$0
Dec	\$1000	\$225

- During which month did Jennifer's Photography show the greatest profit? How much was the profit?
- Did Jennifer's Photography achieve a break-even point? If so, when?
- Did Jennifer's Photography show an overall profit or loss for the year? How much?
- In June, Jennifer spent \$35 on DVDs. What percent of her expenses were spent on DVDs?
- What might be a reason Jennifer's Photography had neither expenses nor revenue for the months of October and November?

Check Your Understanding

Try It



1. A business has an annual revenue of \$99 105.68. If the annual expenses are \$42 215.66, did the company experience a profit or loss for that year? How much?
2. Tammy runs a small business making costumes.

- a) During which months of the year do you think she will have the most revenue? Why?
- b) Tammy's annual revenue and expenses for the past four years are shown below. During which year did Tammy have the largest profit? How much was her profit for that year?

Year	Revenue	Expenses
1	\$68 412.87	\$55 211.77
2	\$87 465.66	\$42 776.99
3	\$92 555.99	\$49 764.34
4	\$65 764.42	\$44 657.44

- a) A business has an annual net income of \$82 615.99. If the annual expenses are \$23 983.22, what is the revenue for the year?
 - b) Last year, a business experienced a loss of \$2888.55. If the revenue was \$55 444.22, what were the expenses for the year?
4. Quinn's Pottery had the following expenses last year.

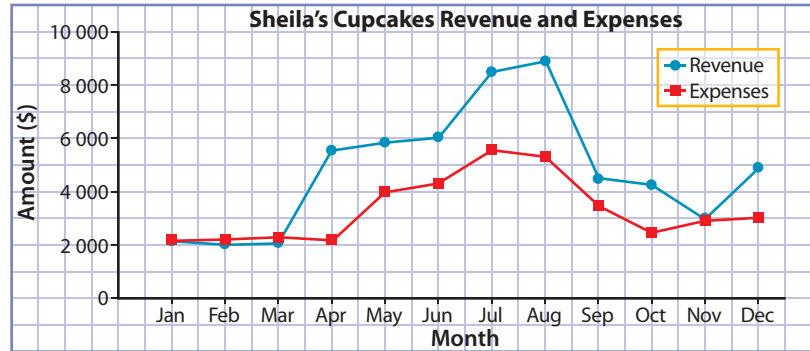
Expense	Cost
Payroll	\$75 814.77
Advertising	\$1 200.00
Materials	\$111 555.44
Telephone/Internet	\$1 356.00
Rent	\$7 200.00
Utilities	\$2 765.00
Insurance	\$3 000.00

- a) What were the total annual expenses for Quinn's Pottery?
- b) What percent of the total expenses did Quinn's Pottery spend on payroll? Round your answer to the nearest percent.
- c) What percent of the total expenses did Quinn's Pottery spend on materials? Round your answer to the nearest percent.

5. A craft shop pays \$10 260 annually for rent. If the total annual expenses for the business are \$55 615.22, what percent of the total expenses is the rent? Round your answer to the nearest percent.

Apply It

6. Sheila has her own cupcake business. The graph shows her revenue and expenses for the year.



- a) During which month(s) did Sheila's Cupcakes show the most profit?
- b) During which month(s) did Sheila's Cupcakes show a loss?
- c) During which month(s) did Sheila's Cupcakes reach a break-even point?
7. Alex started a snow removal business four years ago. He originally operated it out of his house. This year he wants to expand the business and rent office space. The rent is \$1100 a month. Alex pays the rent in advance for two months. New furniture and fixtures cost \$10 500. Alex also purchases other merchandise for \$14 266. Additional miscellaneous expenses total \$1580.
- a) What is the total cost for Alex to expand his business?
- b) Do you think it is likely that Alex's business will generate a profit this month? Explain.
8. Kent owns a skate sharpening business.
- a) During which months do you expect him to make the largest profit? Explain.
- b) How could he adjust his expenses during the other months to ensure the business does not experience a loss?

9. Last year, the total annual expenses for Karl's Christmas Tree Farm were \$70 400. In the table below, each expense is shown as a percent of Karl's total expenses. Calculate the actual cost of each type of expense.

Expense	Percent of Total Expenses
Payroll	59.0%
Advertising	0.4%
Supplies	2.1%
Insurance	9.9%
Equipment	28.4%



10. Rick owns a coin-operated carwash. Sketch a graph of probable monthly revenue for one year. Your graph does not need a scale. **Hint:** Think about the months in which the revenue would likely be the highest and the lowest.



Tools of the Trade

A general contractor oversees and coordinates building projects. A general contractor hires subcontractors, specialists who tackle certain elements of a project. A general contractor also manages all aspects of the project to ensure a successful, accurate job.

Work With It

1. Kris is a general contractor. His business has been losing money over the past few years. Last year the business lost \$1200. Kris is looking for ways to cut expenses. Examine the expenses outlined below and provide three suggestions to Kris.

Expense	Cost
Advertising	\$650
Bank charges	\$215
Dues and subscriptions	\$350
Licence and fees	\$230
Taxes	\$3100
Postage	\$135
Rent	\$4600
Telephone/Internet	\$1200
Vehicle expenses	\$1100
Insurance	\$955
Meals and entertainment	\$800

2. Emily owns a small business. Last year, she made a profit of \$24 612.55. This year, Emily hopes to increase her profit by 15%.
 - a) How much profit does Emily hope to make this year?
 - b) If Emily's projected expenses for this year are \$15 412.55, how much revenue will she need to make her target profit?

Discuss It

3. Explain the difference between revenue and expenses.
4. Explain the difference between revenue and profit.
5. For each of the following locations, list some ideas for small businesses. Explain why you think these ideas would be suitable for the location.
 - a) a big city
 - b) a small seaside town
 - c) a farming community

6. Explain how the following factors might affect the profitability of a small business.
 - a) hours of operation
 - b) seasonal variations
 - c) competition from larger companies



7. Anke thinks that the best way to measure the success of a business is to count the number of people who come through the door each day. She says that if a lot of people come to the business, then it is successful.
 - a) Do you agree with Anke's reasoning? Why or why not?
 - b) How would you measure the success of a business?
 - c) List some reasons that a business may fail.
8. Juan wants to start a small business. What are some questions he should ask himself before starting up a business?

4

Skill Check

What You Need to Know

Section After this section, I know how to . . .

- 4.1** ■ explain the difference between buying, leasing, and leasing-to-own a vehicle
 ■ calculate the costs of buying, leasing, and leasing-to-own a vehicle
 ■ identify situations in which leasing or buying a vehicle is the better option
- 4.2** ■ calculate annual fixed ownership costs of buying or leasing a vehicle
 ■ identify and calculate variable operating costs associated with owning a vehicle
 ■ calculate the average monthly costs of owning and operating a vehicle
- 4.3** ■ calculate annual and average monthly revenue and expenses for a business
 ■ determine whether a business has experienced a profit, loss, or break-even point
 ■ identify ways in which a business can improve its profitability
 ■ identify some viable small business options

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

4.1 Owning a Vehicle, pages 170–189

1. Josie is buying a new truck. Details of the pricing are in the table.
- What is the total cost of the truck, including taxes?
 - The dealership is offering 0.9% financing for up to 48 months. Josie has decided to finance the truck for 48 months. Use technology to determine Josie's monthly payment.
 - How much will Josie have paid for the truck when it is paid off?
 - What will be Josie's total cost to finance the truck?
 - If Josie had \$3000 for a down payment, how much money would she have to finance? How would this affect her monthly payment?
2. Pam is leasing a new car. The details about her lease are:
- charges on delivery are \$618.02
 - monthly payments are \$434.18, including taxes, for 48 months
- What is the total amount Pam will pay to lease the car for 48 months?

Base Price	\$35 615
Extra Options Package	\$1 525
Freight and PDI	\$1 400

4.2 Operating a Vehicle, pages 190–201

3. Ben wants to buy a used car. The payments are \$5429 per year for four years. The annual insurance premium is \$2350.
 - a) Calculate Ben's monthly fixed cost.
 - b) If Ben keeps the car for two years after it is paid off, find his annual fixed costs during this two-year period.
4. Jacob has an SUV with a 60-L gas tank.
 - a) How much will it cost Jacob to fill his vehicle? Use the current price of gas.
 - b) The highway fuel consumption rate for Jacob's SUV is 6.1 L/100 km. How many litres of gas will the SUV need to travel 660 km? How much will this cost?
5. Neve bought a sports car. How much will Neve spend on maintenance in the first year? Maintenance and repair costs are shown in the table.



Maintenance/Repair	Schedule	Estimated Cost Including Tax
Change oil and filter	Every 3 months/5000 km	\$50
Rotate tires	Every 3 months/5000 km	\$20
Replace air filter	Every 12 months	\$30
Replace windshield wipers	Every 6 months	\$25

4.3 Operating a Small Business, pages 202–215

6. Sarah opened a small sewing shop a few years ago. The table shows the revenue and expenses for last year.
 - a) List some possible expenses for the business.
 - b) Calculate the average monthly expenses.
 - c) Calculate the average monthly revenue.
 - d) Did Sarah experience a loss last year? How do you know?
 - e) How much profit did Sarah make last year?
 - f) What were Sarah's best two months of the year? What reasons can you suggest for this?

Month	Revenue	Expenses
Jan	\$1600	\$1200
Feb	\$1400	\$1220
Mar	\$2100	\$2500
Apr	\$5750	\$2375
May	\$6800	\$4000
Jun	\$6350	\$4300
Jul	\$8500	\$4200
Aug	\$9500	\$4000
Sep	\$4500	\$3500
Oct	\$3250	\$2175
Nov	\$4950	\$2300
Dec	\$3600	\$2500

4

Test Yourself

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

- Jonah bought a car that cost \$24 514.25, excluding taxes. The dealership had 0% financing and Jonah financed the car for five years. What is his monthly payment?
A \$408.57 **B** \$461.69 **C** \$510.71 **D** \$577.11
- Isabelle is buying a car that costs \$15 201.65, taxes included. Which payment plan would cost the least to finance?
A 2 years at 0.99% **B** 4 years at 2.9%
C 5 years at 0% **D** 6 years at 1.9%
- Dave is leasing a car and wants to pay for an extra 1200 km up front. If Dave has to pay 8¢/km, how much will he owe the car dealership?
A \$96 **B** \$150 **C** \$960 **D** \$1200
- Which of the following is a fixed operating cost when you own a car?
A gas **B** insurance
C maintenance **D** tires
- The fuel consumption rate of Devon's car is 7.2 L/100 km. About how many litres of gas will the car use to travel 1265 km?
A 13 L **B** 91 L **C** 176 L **D** 9108 L
- Which statement is correct?
A Profit = expenses – revenue
B Profit = revenue – expenses
C Profit = revenue – sales
D Profit = sales – revenue
- Cami is buying a new car. The cost is \$13 874, plus taxes, and the dealership offers her 0% financing.
 - What is the cost of the car, including taxes?
 - Cami takes out a loan for 60 months. What is her monthly payment?
 - After two years, how much will Cami have paid on the car? How much will she still owe?

8. Describe a scenario in which a person should
a) buy a used car **b)** buy a new car **c)** lease a car
 Give reasons for each decision.
9. Karen just bought a four-year-old hatchback with mileage of 87 000 km. She drives about 35 000 km per year. How much should she budget to spend on maintenance and repairs over the next four years? Use the information in the table.

Maintenance/Repair	Schedule	Estimated Cost Including Taxes
Change oil and filter	Every 3 months/5000 km	\$55
Rotate tires	Every 3 months/5000 km	\$20
Replace air filter	Every 12 months	\$30
Replace windshield wipers	Every 6 months	\$25
Replace front brakes	Every 50 000 km	\$300
Replace back brakes	Every 100 000 km	\$300
Replace tires	Every 4 years	\$800
Replace timing belt	Every 150 000 km	\$900

10. The table shows the annual revenue and expenses for an outdoor skating rink.
- Calculate the average monthly expenses.
 - Calculate the average monthly revenue.
 - Did the business experience a loss during any month(s) of the year? How do you know?
 - Did this business have an annual profit or an annual loss? How much?
 - List three changes the owners could make to increase their profitability.

Month	Revenue	Expenses
Jan	\$7700	\$5250
Feb	\$8160	\$5200
Mar	\$8590	\$5500
Apr	\$0	\$0
May	\$0	\$0
Jun	\$0	\$0
Jul	\$0	\$0
Aug	\$0	\$0
Sep	\$0	\$0
Oct	\$2470	\$2905
Nov	\$4000	\$2585
Dec	\$6658	\$4700





It's My Business!

Consider the business you researched in Explore Small Business Financial Operations in section 4.3.

1. Create the following for your business:
 - name
 - logo
 - web site address
2. Think about who will buy your product or service. Determine
 - if your business will be seasonal or year-round
 - the location of your work site
 - the hours of operation
 - what equipment you will need for your business
 - the materials you will need
 - if you will need storage space and, if so, how much
 - how you can use social media to promote your business
 - how your business will benefit from having a web site
3. Estimate the following:
 - start-up costs
 - ongoing costs
 - prices you will charge for the product or service
 - anticipated profit per product or service sold
 - anticipated number of products or services you expect to sell per month
 - anticipated monthly profit
4. Design a business card and create two of the following for your business:
 - 15- to 30-second radio spot
 - web site home page
 - flyer
 - 4 cm by 5 cm Internet ad to go in the sidebar of a search engine

F.Y.I.

A QR (quick response) code is a two-dimensional barcode that allows customers to use their mobile device to access a company's web site. Mobile users scan QR codes to access contests, coupons, or other promotions.




Mind Your Business

1. Play this game with a partner or in a small group. The object of the game is for your business to have a higher annual profit than your partner's business.
 - a) Remove the face cards from the deck. Separate the remaining cards into two piles: hearts and diamonds in one pile, and clubs and spades in another.
 - b) The dealer shuffles each pile of cards separately. Deal one card from each pile to each player, face up for everyone to see.
 - Hearts and diamonds represent expenses. Your annual business expenses will be \$1000 times the number on your card.
 - Clubs and spades represent revenue. Your annual business revenue will be \$1000 times the number on your card.
 - Aces have a value of 1.
 - c) Determine your business's net income. Record your answer. Indicate losses as a negative number.
 - d) Each round of play represents one month. Play 12 rounds and record your profit or loss for each month. After 12 rounds, each player determines their annual net income. The player with the highest annual net income wins the game.

2. Play a different version of Mind Your Business.
 - Keep the face cards in the deck. Jacks have a value of 11, queens have a value of 12, and kings have a value of 13.
 - The annual business expenses and revenues are \$10 000 times the value of your card.

Materials

- Chapter 4 Recording Sheet 
- deck of playing cards
- calculator

Example:**Expenses:****Revenue:****Net Income**

$$= 5000 - 9000$$

$$= -4000$$