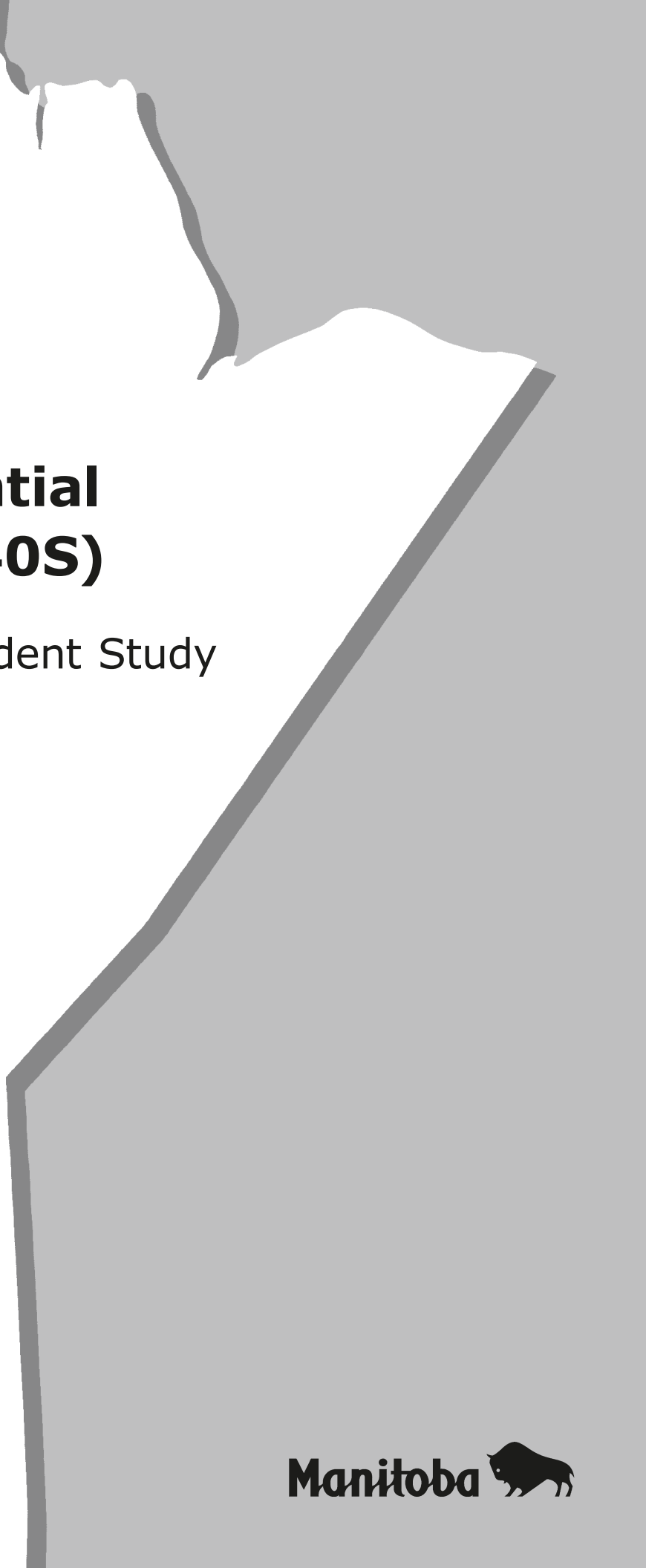
Grade 12 Essential Mathematics (40S)

A Course for Independent Study



Manitoba

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A Course for Independent Study

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GRADE 12 ESSENTIAL MATHEMATICS (40S)

Introduction

Introduction to the Course

Overview

Welcome to Grade 12 Essential Mathematics! This course is a continuation of the concepts you have been studying in previous years, as well as an introduction to new topics.

As a student enrolled in a distance learning course, you have taken on a dual role—that of a student and a teacher. As a student, you are responsible for mastering the lessons and completing the learning activities and assignments. As a teacher, you are responsible to check your work carefully, noting areas in which you need to improve and motivating yourself to succeed.

What Will You Learn in This Course?

In this course, Grade 12 Essential Mathematics, builds on the knowledge and skills students gained while studying Grade 11 Essential Mathematics. You will put to use many of the skills that you have already learned to solve problems and do basic arithmetic operations. This course helps you develop the skills, ideas, and confidence that you will need to make decisions and solve problems related to consumer applications of mathematics.

How Is This Course Organized?

The Grade 12 Essential Mathematics course consists of the following eight modules:

- Module 1: Home Finance
- Module 2: Geometry and Trigonometry
- Module 3: Business Finance
- Module 4: Probability
- Module 5: Vehicle Finance
- Module 6: Career Life
- Module 7: Statistics
- Module 8: Precision Measurement

Each module in this course consists of several lessons, which contain the following components:

Examples:

- **Lesson Focus:** The Lesson Focus at the beginning of each lesson identifies one or more specific learning outcomes (SLOs) that are addressed in the lesson. The SLOs identify the knowledge and skills you should have achieved by the end of the lesson.
- **Introduction:** Each lesson begins with an explanation of what you will be learning in that lesson.
- **Lesson:** The main body of the lesson is made up of the content that you need to learn. It contains text, explanations, images, diagrams, and completed examples.
- **Learning Activities:** Many (most) lessons include one or more learning activities that will help you learn about the lesson topics and prepare you for the assignments, the midterm examination, and the final examination. Once you complete a learning activity, check your responses against those provided in the Learning Activity Answer Key found at the end of each applicable module. You will not submit the completed learning activities to your tutor/marker.
- **Assignments:** Assignments are found at the end of each lesson that has an assignment. You will mail or electronically submit all your completed assignments to your tutor/marker for assessment at the end of each module. In total, all assignments are worth 75% of your final course mark.
- **Summary:** Each lesson ends with a brief review of what you just learned.

This course also includes the following appendix:

- **Appendix A: Glossary:** The glossary at the end of the course provides definitions for an alphabetical list of the terms identified throughout the course. You can use the glossary to review terms used in the course.

What Resources Will You Need for This Course?

You do not need a textbook for this course. All the content is provided directly within the course. You will, however, need access to a variety of resources.

The required and optional resources for this course are identified below.

Required Resources

For this course, you will need access to the following resources. If you do not have access to one or more of these resources, contact your tutor/marker.

- **A calculator:** Use a graphing or scientific calculator as you work through this course. You **will** need the calculator for the examination(s).
- **A metric ruler, an imperial ruler, and a protractor:** Use the rulers and protractor as you work through this course. You **will not** need the rulers or protractor for the examination(s).

Optional Resources

- Access to a computer with spreadsheet and graphing capabilities will be an advantage but not a requirement. Use of the Internet may be suggested as a resource in some places, but if you do not have access to an online computer you can still complete the related learning activities and assignments without it.
- Access to a photocopier would be helpful because it would let you make a copy of your assignments before you send them to your tutor/marker. That way, if you and your tutor/marker want to discuss an assignment, you would each refer to your own copy.

Who Can Help You with This Course?

Taking an independent study course is different from taking a course in a classroom. Instead of relying on the teacher to tell you to complete a learning activity or an assignment, you must tell yourself to be responsible for your learning and for meeting deadlines. There are, however, two people who can help you be successful in this course: your tutor/marker and your learning partner.

Your Tutor/Marker

Tutor/markers are experienced educators who tutor ISO students and mark assignments and examinations. When you are having difficulty with something in this course, contact your tutor/marker, who is there to help you. Your tutor/marker's name and contact information were sent to you with this course. You can also obtain this information in the Who Is My Tutor/Marker? section of the distance learning website at <www.edu.gov.mb.ca/k12/dl/iso/assistance.html>.

Your Learning Partner

Another person who can help you with your course is a learning partner. A learning partner is someone **you choose** who will help you learn. It may be someone who knows something about mathematics, but it doesn't have to be. A learning partner could be someone else who is taking this course, a teacher, a parent or guardian, a sibling, a friend, or anybody else who can help you. Most importantly, a learning partner should be someone with whom you feel comfortable and who will support you as you work through this course.

Your learning partner can help you keep on schedule with your coursework, read the course with you, check your work, look at and respond to your learning activities, or help you make sense of assignments. You may even study for your examination(s) with your learning partner. If you and your learning partner are taking the same course, however, your assignment work should not be identical.

How Will You Know How Well You Are Learning?

You will know how well you are learning in this course by how well you complete the learning activities, assignments, and examinations.

Learning Activities

Each learning activity has two parts—Part A has BrainPower questions and Part B has questions related to the content in the lesson

Part A: BrainPower

The BrainPower questions are provided as a warm-up activity for you before trying the other questions. Each question should be completed quickly and without using a calculator, and most should be completed without using pencil and paper to write out multiple steps. Some of the questions will relate directly to content of the course. Some of the questions will review content from previous courses—content that you need to be able to answer efficiently.

Being able to do these questions in a few minutes will be helpful to you as you continue with your studies in mathematics. If you are finding it is taking you longer to do the questions, you can try one of the following:

- work with your learning partner to find more efficient strategies for completing the questions
- ask your tutor/marker for help with the questions
- search online for websites that help you practice the computations so you can become more efficient at completing the questions.

None of the assignment questions or exam questions will require you to do the calculations quickly or without a calculator. However, it is for your benefit to complete the questions as they will help you in the course. Also, being able to successfully complete the BrainPower exercises will help build your confidence in mathematics. BrainPower questions are like a warm-up you would do before competing in a sporting event.

Part B: Course Content Questions

One of the easiest and fastest ways to find out how much you have learned is to complete Part B of the learning activities. These have been designed to let you assess yourself by comparing your answers with the answer keys at the end of each module. There is at least one learning activity in each lesson. You will need a notebook or loose-leaf pages to write your answers.

The learning activities in this course will help you to review and practise what you have learned in the lessons. You will not submit the completed learning activities to your tutor/marker. Instead, you will complete the learning activities and compare your responses to those provided in the Learning Activity Answer Key found at the end of each module.

Make sure you complete the learning activities. Doing so will not only help you to practise what you have learned, but will also prepare you to complete your assignments and the examination(s) successfully. Many of the questions on the examination(s) will be similar to the questions in the learning activities. Remember that you **will not submit learning activities to your tutor/marker**.

Assignments

Each module in this course contains assignments, which you will complete and submit to your tutor/marker for assessment. The assignments are worth a total of 75% of your final course mark.

There are two types of assignments that you must submit to your tutor/marker. Each module has a cover assignment, which you can complete at any time during the module. Lesson assignments are located throughout the modules, and include questions similar to the questions in the learning activities of previous lessons. The cover assignments and lesson assignments have space provided for you to write your answers on the question sheets. **You need to show all your steps as you work out your solutions, and make sure your answers are clear (include units, where appropriate).**

The tutor/marker will mark your assignments and return them to you. Remember to keep all marked assignments until you have finished the course so that you can use them to study for your examinations.

Resource Sheet

When you write your Midterm and Final Examinations, you will be allowed to take an Exam Resource Sheet with you into the exam. This sheet will be one letter-sized page, 8½ " by 11", with both sides in your handwriting or typewritten. It is to be submitted with your exam. The Exam Resource Sheet is not worth any marks.

Creating your own resource sheet is an excellent way to review. It also provides you with a convenient reference and quick summary of the important facts of each module. Each student is asked to complete a resource sheet for each module to help with studying and reviewing.

The lesson summaries are written for you to use as a guide, as are the module summaries at the end of each module. Refer to these when you create your own resource sheet. Then, go to Appendix B: Glossary (at the end of the course) to check the information on your resource sheet.

After you complete each module's resource sheet, you should summarize the sheets from all of the modules to prepare your Exam Resource Sheet. The Midterm Examination is based only on the first four modules of the course, while the Final Examination is based on Modules 5 to 8.

Midterm and Final Exams

This course contains a midterm examination and a final examination.

- The midterm examination is based on Modules 1 to 4, and is worth 12.5% of your final mark in this course. You will write the midterm examination when you have completed Module 4.

  As a student, you can use your Midterm Exam Resource Sheet to bring any formulas you have not memorized into the exam with you. You will be required to bring the following supplies to the Midterm Examination: pens and pencils (2 or 3 of each), blank paper, a scientific or graphing calculator, and your Midterm Exam Resource Sheet.

  The following tables from the course are attached to the back of the midterm examination:

  - Amortization Table
  - Manitoba Homeowner's Insurance Rates Table
  - Interest Rate Factor Table
  - Local Improvement Costs for Property Tax Credits

  Formulas are not included with the exam. Be sure to include these on the resource sheet.

- The final examination is based on Modules 5 to 8, and is worth 12.5% of your final mark in this course. You will write the final examination when you have completed Module 8.

  You can use your Final Exam Resource Sheet to bring any formulas you have not memorized into the exam with you. Formulas are not provided on the exam. You will be required to bring the following supplies to the final examination: pens and pencils (2 or 3 of each), blank paper, a scientific or graphing calculator, and your Final Exam Resource Sheet.

  The following tables from the course are attached to the back of the final examination:

  - Driver Safety Rating Chart
  - Amortization Table
  - MPI Passenger Vehicle Rate Groups Table
  - MPI Basic Rate Table

  Formulas are not included with the exam. Be sure to include these on the resource sheet.

The two examinations are worth a total of 25% of your final course mark. You will write both examinations under supervision.

To do well on each examination, you should review all the work you have completed from the modules, including all learning activities and assignments.

Practice Examinations and Answer Keys

To help you succeed in your examinations, you will have an opportunity to complete a Midterm Practice Examination and a Final Practice Examination. These examinations, along with the answer keys, are found in the Student Downloads section of the distance learning website at <www.edu.gov.mb.ca/k12/dl/downloads/index.html>. If you do not have access to the Internet, contact the Independent Study Option office at 1-800-465-9915 to obtain a copy of the practice examinations.

These practice examinations are similar to the actual examinations you will be writing. The answer keys enable you to check your answers. This will give you the confidence you need to do well on your examinations.

Requesting Your Examination(s)

You are responsible for making arrangements to have the examinations sent to your proctor from the ISO office. Please make arrangements before you finish Module 3 to write the midterm examination. Likewise, you should begin arranging for your final examination before you finish Module 7.

To write your examinations, you need to make the following arrangements:

- **If you are attending school,** ask your school's ISO school facilitator to request your examination. Do this at least **three weeks before** you are ready to write your examination. For more information on examination procedures, please contact your ISO school facilitator or visit the Grading and Evaluation section of the distance learning website at <www.edu.gov.mb.ca/k12/dl/iso/assignments.html>.

- **If you are not attending school,** check the **Examination Request Form** for options available to you. The form was mailed to you with this course. **Three weeks before** you are ready to write the examination, fill in the Examination Request Form and mail, fax, or email it to

  ISO Office
  555 Main Street
  Winkler MB R6W 1C4
  Fax: 204-325-1719
  Toll-Free Telephone: 1-800-465-9915
  Email: distance.learning@gov.mb.ca

How Much Time Will You Need to Complete This Course?

Learning through independent study has several advantages over learning in the classroom. You are in charge of how you learn and you can choose how quickly you will complete the course. You can read as many lessons as you wish in a single session. You do not have to wait for your teacher or classmates.

From the date of your registration, you have a maximum of 12 months to complete this course, but the pace at which you proceed is up to you. Read the following suggestions on how to pace yourself.

Chart A: Semester 1

If you want to start the course in September and complete it in January, you can follow the timeline suggested below.

Module	Completion Date
Module 1	Middle of September
Module 2	End of September
Module 3	Middle of October
Module 4 and Midterm Exam	Early November
Module 5	Middle of November
Module 6	End of November
Module 7	Middle of December
Module 8 and Final Exam	Middle of January

Chart B: Semester 2

If you want to start the course in January and complete it in June, you can follow the timeline suggested below.

Module	Completion Date
Module 1	Middle of February
Module 2	End of February
Module 3	Early March
Module 4 and Midterm Exam	Middle of March
Module 5	Early April
Module 6	Middle of April
Module 7	Early May
Module 8 and Final Exam	End of May

Chart C: Full School Year (Not Semestered)

If you want to start the course in September and complete it in June, you can follow the timeline suggested below.

Module	Completion Date
Module 1	End of September
Module 2	End of October
Module 3	End of November
Module 4 and Midterm Exam	Middle of January
Module 5	Middle of February
Module 6	Middle of March
Module 7	Middle of April
Module 8 and Final Exam	End of May

Timelines

Do not wait until the last minute to complete your work, since your tutor/marker may not be available to mark it immediately. It may take a few weeks for your tutor/marker to assess your work and return it to you or your school.

If you need this course to graduate this school year, remember to schedule and complete your final examination by **May 31**.

When and How Will You Submit Completed Assignments?

When to Submit Assignments

While working on this course, you will submit completed assignments to your tutor/marker eight times. Each time you submit assignments, you must include the applicable Cover Sheet, which you will find at the end of this Introduction.

The following chart shows you exactly what assignments you will be submitting at the end of each module.

Submission of Assignments

Submission	Assignments You Will Submit
1	**Module 1: Home Finance** Module 1 Cover Sheet Module 1 Cover Assignment: Investments Using Spreadsheets Assignment 1.1: Affordability, Initial Costs, and Mortgages Assignment 1.2: Insurance and Property Tax Assignment 1.3: Making Decisions
2	**Module 2: Geometry and Trigonometry** Module 2 Cover Sheet Module 2 Cover Assignment: Circle Geometry Assignment 2.1: Polygons Assignment 2.2: The Sine Law Assignment 2.3: Trigonometry
3	**Module 3: Business Finance** Module 3 Cover Sheet Module 3 Cover Assignment: Marginal Income Tax Rates Assignment 3.1: Profitability of a Small Business Assignment 3.2: Income Tax
4	**Module 4: Probability** Module 4 Cover Sheet Module 4 Cover Assignment: Applying Probability to Games Assignment 4.1: Expressing Probability and Odds Assignment 4.2: Applications of Probability
5	**Module 5: Vehicle Finance** Module 5 Cover Sheet Module 5 Cover Assignment: Vehicle Analysis Assignment 5.1: Financing a New Vehicle Assignment 5.2: Used Vehicles and Using Vehicles Assignment 5.3: Insurance Costs

continued

Submission of Assignments (continued)	
Submission	Assignments You Will Submit
6	**Module 6: Career Life** Module 6 Cover Sheet Module 6 Cover Assignment: Personal Costs and Taxes Assignment 6.1: Self-Assessment Report Assignment 6.2: Career Descriptions Assignment 6.3: Education/Training Requirements Assignment 6.4: Expected Lifestyle Report Assignment 6.5: Resumé and Reflection
7	**Module 7: Statistics** Module 7 Cover Sheet Module 7 Cover Assignment: Problem Analysis Assignment 7.1: Mean, Median, Mode, and Outliers Assignment 7.2: Five Measures of Central Tendency Assignment 7.3: Analyzing Percentiles
8	**Module 8: Precision Measurement** Module 8 Cover Sheet Module 8 Cover Assignment: Puzzles in Design Assignment 8.1: Accuracy, Precision, and Uncertainty Assignment 8.2: Measurements and Tolerances

How to Submit Assignments

In this course, you have the choice of submitting your assignments either by mail or electronically.

- **Mail:** Each time you **mail** something, you must include the print version of the applicable Cover Sheet (found at the end of this Introduction).
- **Electronic submission:** Each time you **submit** something **electronically**, you must include the electronic version of the applicable Cover Sheet (found in the Student Downloads section of the distance learning website at <www.edu.gov.mb.ca/k12/dl/downloads/index.html>) or you can scan the Cover Sheet located at the end of this Introduction.

Complete the information at the top of each Cover Sheet before submitting it along with your assignments.

Submitting Your Assignments by Mail

If you choose to mail your completed assignments, please photocopy/scan all the materials first so that you will have a copy of your work in case your package goes missing. You will need to place the applicable module Cover Sheet and assignments in an envelope, and address it to

ISO Tutor/Marker
555 Main Street
Winkler MB R6W 1C4

Your tutor/marker will mark your work and return it to you by mail.

Submitting Your Assignments Electronically

Assignment submission options vary by course. Sometimes assignments can be submitted electronically and sometimes they must be submitted by mail. Specific instructions on how to submit assignments were sent to you with this course. You can also obtain this information in the Grading and Evaluation section of the distance learning website at <www.edu.gov.mb.ca/k12/dl/iso/assignments.html>.

If you are submitting assignments electronically, make sure you have saved copies of them before you send them. That way, you can refer to your assignments when you discuss them with your tutor/marker. Also, if the original assignments are lost, you are able to resubmit them.

Your tutor/marker will mark your work and return it to you electronically.

The Independent Study Option office does not provide technical support for hardware-related issues. If troubleshooting is required, consult a professional computer technician.

What Are the Guide Graphics For?

Guide graphics are used throughout this course to identify and guide you in specific tasks. Each graphic has a specific purpose, as described below.

Lesson Introduction: The introduction sets the stage for the lesson. It may draw upon prior knowledge or briefly describe the organization of the lesson. It also lists the learning outcomes for the lesson. Learning outcomes describe what you will learn.

Learning Partner: Ask your learning partner to help you with this task.

Learning Activity: Complete a learning activity. This will help you to review or practise what you have learned and prepare you for an assignment or an examination. You will not submit learning activities to your tutor/marker. Instead, you will compare your responses to those provided in the Learning Activity Answer Key found at the end of the applicable module.

Assignment: Complete an assignment. You will submit your completed assignments to your tutor/marker for assessment at the end of a given module.

Mail or Electronic Submission: Mail or electronically submit your completed assignments to your tutor/marker for assessment.

Phone or Email: Telephone or email your tutor/marker.

Resource Sheet: Indicates material that may be valuable to include on your resource sheet.

Examination: Write your midterm or final examination at this time.

Note: Take note of and remember this important information or reminder.

Remember: If you have questions or need help at any point during this course, contact your tutor/marker or ask your learning partner for help.

Good luck with the course!

GRADE 12 ESSENTIAL MATHEMATICS (40S)

Module 1
Home Finance

Module 1:
Home Finance

Introduction

In previous mathematics courses, you explored personal finances as they apply to you now. This module focuses on financial concerns that you may have in the future. You probably don't own your own home at this point in your life, so you may not be aware of the costs of home ownership. This module will focus on costs that are associated with buying and owning a home. You will calculate the amount of money you can afford to spend on a house, how much your mortgage would cost, and the costs of home insurance, property taxes, and buying compared to renting a house. You will also become aware of the various expenses that are incurred when you buy a house.

Assignments in Module 1

To obtain credit for Module 1, you will need to send the following four assignments to your tutor/marker. Your evaluation for this module is based on these assignments.

Lesson	Assignment Number	Assignment Title
	Cover Assignment	Investments Using Spreadsheets
2	Assignment 1.1	Affordability, Initial Costs, and Mortgages
3	Assignment 1.2	Insurance and Property Tax
5	Assignment 1.3	Making Decisions

Resource Sheet

When you write your midterm exam, you are encouraged to take a Midterm Exam Resource Sheet with you into the exam. This sheet will be one letter-sized page, 8½ " by 11", with both sides in your handwriting or typewritten. You will submit it with your exam, but you do not receive any marks for it.

Many students have found that preparing a resource sheet is an excellent way to review. It provides you with a summary of the important facts of each module. You should complete a resource sheet for each module to help with your studying and reviewing. Lesson summaries and module summaries are included for you to use as a guide.

You may use the list of instructions provided below to help you with preparing your resource sheet for the material in Module 1. On this sheet, you should record math terms and definitions, formulas, sample questions, or a list of places where you often make mistakes. You should also identify special areas that require extra attention or review by writing the page numbers.

After you have completed each module's resource sheet, you may summarize the sheets from Modules 1, 2, 3, and 4 to prepare your Midterm Exam Resource Sheet. The midterm exam for this course is based on Modules 1 to 4.

Resource Sheet for Module 1

As you go through the lessons of this module, you may want to consider the following suggestions regarding the creation of a resource sheet.

1. List all the important math terms, and define them if necessary.
2. List all the formulas and perhaps a sample problem that shows how each formula is used.
3. If necessary, write the solutions to some problems, showing in detail how you did the calculations.
4. Copy any questions that represent the key points of the lesson, and perhaps include the solutions as well.
5. Identify the problems you found most difficult, and copy the page numbers onto the resource sheet so that you can review them before writing the exam. You may also copy the problems and the solutions onto your resource sheet, and later write them onto your Midterm Exam Resource Sheet.
6. Write any comments, ideas, shortcuts, or other reminders that may be helpful during an exam.

Learning Activity 1.1

Learning Activity 1.1 is the only one that does not include a BrainPower section, although it does have two parts. Be sure to complete this learning activity before you begin your first lesson.

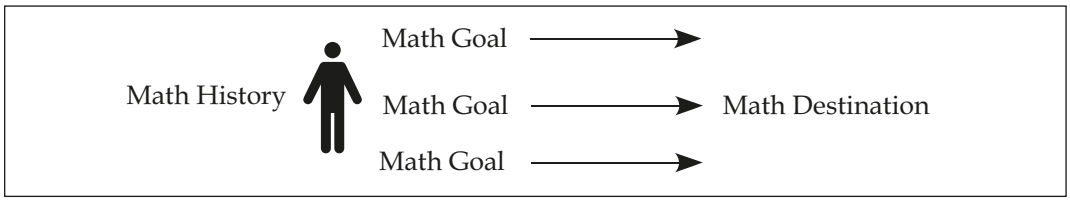
This activity involves you having a conversation with your tutor/marker. Having this conversation with your tutor/marker has two important purposes. First, it introduces you to a very valuable resource – your tutor/marker. He or she is available for you to answer questions, explain concepts, and guide you through this course. You can discuss your math learning and progress. Feel free to contact your tutor/marker by phone or email at any time during this course.

The second important purpose of this assignment is to get you thinking about your math goals. You may have a future career in mind, and this course is getting you one step closer to it by completing a prerequisite for a future required course. There may be specific skills or topics you are interested in learning about, and they are covered in this course.

If you are unsure of your math goals or why they are important, consider this:

- goals give you a sense of direction and purpose in taking this course
- goals help motivate you to learn and do your best, even when it's tough
- when you accomplish your goals, there is a great sense of achievement and success

Good goals need to be realistic and specific, and they should reflect what is important to you. They should give you direction and take you further down the path from where you have been to where you want to go.



Goals can be long term or short term, but they are the pathway that takes **you** from where you were/are, closer to where you want to go.

continued

Learning Activity 1.1 (continued)

Part A: Your Tutor/Marker

Fill in the following blanks using information provided with your course:

My tutor/marker's name is _____

I can phone my tutor/marker at 1-866-_____

My tutor/marker's email is _____

Be ready to discuss the following topics and the reasons for your answers with your tutor/marker during your phone conversation. If you'd like, make some notes below before you call in order to help you feel prepared. Feel free to add other questions or comments that you may have as well.

1. I am taking this course by distance education because…

2. What I like about math and can do mathematically is… (favourite topic, skill, where you use math, etc.).

3. What I dislike about math or have difficulty doing is…

continued

Learning Activity 1.1 (continued)

4. Previous math experiences that influence the way I feel about math are…

5. The next math course I would like to take is…

6. What I am hoping this course will help me accomplish and learn for the future…

7. What I am doing/how I will organize things to help me succeed in this course…

continued

During your phone conversation, jot down a sentence or two in the spaces above about what you and your tutor/marker talk about. For example, if you are taking this course because it doesn't fit into your schedule at school or because you travel a lot with your basketball team and this is more convenient, state that in the space below Question 1.

Part B: Your Math Pathway

Use the answers to the questions from the conversation with your tutor/marker as a starting point, and fill in the following diagram. In the Math History box, jot down point-form notes about your prior experience and knowledge about math (Questions 2, 3, and 4). In the Math Destination box, jot down what completing this course will help you accomplish in the future (Questions 5 and 6).

In the middle column, write down what you will need to do to move down the pathway from your History to your Destination.

Math History	Pathway	Math Destination

continued

Learning Activity 1.1 (continued)

For example, if your destination includes needing a 75% in this course so that you can feel confident applying to a post-secondary institution such as college or university, or so that you can learn how to make smart consumer decisions, what will help you accomplish this? It may mean figuring out how you best learn and study math. It may mean setting up a schedule so you complete the assignments on time. You may need to find your calculator manual and figure out how to use it, set up regular appointments with your learning partner, research a topic on the Internet, or read a textbook about a certain math concept or skill. Your pathway is unique to you.

As you move through this course and work on achieving your goals, self-assessment becomes important. It is the way for you to determine if you are getting closer to your destination, and if the steps along your pathway are taking you in the right direction. You will need to periodically ask yourself the following questions: Am I doing my assignments? Are my note-taking skills improving? How often have I contacted my tutor/marker or worked with my learning partner? Have I found useful homework websites? Is my schedule working? What do I need to change or adjust so I can get to my destination?

Several times during this course, you will go through this cycle of looking at where you have been, where you want to go, and where you currently are. At any time, you may want to revise your goals or set new ones, as you evaluate your own progress and learning.

- Look back/history—reflect on what you know, how far you have come
- Look around/pathway—assess if you are achieving your goals, determine if new learning or understanding has occurred, and check your progress
- Look forward/destination—determine what you want to know, set goals

Each time you go through these steps, you will become better at mathematics!

It is important that you keep the chart you created handy, as you will revisit it at other points in this course.

Notes

Lesson Focus

In this lesson, you will

- ❑ calculate the Gross Debt Service Rate
- ❑ determine the price range of houses that you can afford to buy
- ❑ explore the various costs involved in purchasing a home

Lesson Introduction

As you probably know, houses cost a lot of money. You may save for a long time in order to buy a house and still need to get a loan from a bank! The focus of this lesson is on calculating what you can afford to pay for a house, as well as some of the initial costs that you must pay when buying a house.

This lesson introduces you to some of the language used when discussing home ownership. If some of the words are new to you, write them down in your notes or on your resource sheet so that you can refer back to them later.

Affordability

In Grade 11 Essential Mathematics, you learned how to create a personal budget. Budgets are an important part of personal finance because they help you plan how much money you can spend, or indicate if you are spending too much on certain things. Calculating the amount of money you can afford to spend on a house is important when you want to buy a house. In this lesson, you will explore some formulas that are designed to help you decide how much you should spend when you decide to buy a house. As well, there are calculations that show the actual costs associated with buying a house.

Gross Debt Service Ratio

The **Gross Debt Service Ratio** is an important formula for calculating whether you can afford a house, or how much you can afford to pay for a house. It compares the total cost of your monthly mortgage payment, taxes, and heating to your gross monthly income (from all sources). A **mortgage** is a loan from a financial institution to pay for your house—we will cover mortgages in depth in the next lesson.

$$\text{Gross Debt Service Ratio (GDSR)} = \frac{\text{Monthly Mortgage Payment + Property Taxes + Heating}}{\text{Gross Monthly Income}}$$

Include this formula on your resource sheet.

The general rule is that your Gross Debt Service Ratio should not exceed 32%, but you should note that the Gross Debt Service Ratio is calculated using your gross income. Remember that gross income is the amount of money you earn *before* deductions. Your net income is the actual amount that you receive, *after* deductions. Because of this, the closer the Gross Debt Service Ratio is to 32%, the more difficult it is to budget for other expenses.

There are two ways to use the Gross Debt Service Ratio:

Number 1: Can I afford a certain house?

You can use the Gross Debt Service Ratio to calculate whether you can afford to own a house. This is done by calculating what your Gross Debt Service Ratio would be if you owned the house. If the calculated Gross Debt Service Ratio is less than 32%, then you can afford the house, but if it is greater than 32%, you should not buy the house because it will be extremely difficult to stretch your budget to cover all your expenses.

Example 1

The Menzies family is considering buying a two-storey house with a purchase price of $210,000. The family can make a down payment of $25,000. The family's gross monthly income is $4,236. The monthly mortgage payment is $925.00. The annual property taxes are $2,500 and the annual heating costs are $1,500.

a) Calculate the Gross Debt Service Ratio.

b) Can the family afford this house?

Solution

Since you are given the monthly mortgage payment, disregard the purchase price of the home and the down payment.

a) Monthly property taxes = \$2,500.00 ÷ 12 = \$208.33

Monthly heating costs = \$1,500 ÷ 12 = \$125

$$\text{Gross Debt Service Ratio (GDSR)} = \frac{\text{Monthly Mortgage Payment + Property Taxes + Heating}}{\text{Gross Monthly Income}}$$

$$= \frac{\$925.00 + \$208.33 + \$125.00}{\$4236.00} \times 100$$

$$= \frac{\$1258.33}{\$4236.00} \times 100$$

$$= 29.7\% \text{ (round to the nearest tenth)}$$

b) Since the Gross Debt Service Ratio is under 32%, the Menzies family can afford this house. However, because the Gross Debt Service Ratio is close to 32%, the family may want to reconsider buying this house, or they may prefer to reduce their monthly mortgage payment by making a larger down payment.

A **down payment** is the initial amount you pay for a house. It is a percentage of the purchase price of the home, usually around 20%. We will introduce down payments in our mortgage calculations in the next lesson.

Number 2: Determining how much money you have to spend on a home

You can use the Gross Debt Service Ratio to determine the maximum amount you can spend on housing (the affordability). In order to do this, you need to know the interest rate factor, which can be found in the table below.

Note: This chart will be made available to you for your midterm exam.

Chart 1.1
Interest Rate Factor Table
Based on 25-Year Amortization

Interest Rate	Payment Factor For Each Dollar of Loan
2.5%	0.00448
3.0%	0.00473
3.5%	0.00499
4.0%	0.00526
4.5%	0.00553
5.0%	0.00582
5.5%	0.00610
6.0%	0.00640
6.5%	0.00670
7.0%	0.00700
7.5%	0.00732
8.0%	0.00763

Note that this table is based on a 25-year amortization rate (the amount of time it will take to pay off the mortgage). If you took out a mortgage for a different time period, the factor would be different. In this course, we will only consider a 25-year amortization rate when using interest rate factors.

Example 2

A newly married couple wishes to purchase a condominium. The couple has a gross monthly income of $3,750, and is able to make a $15,000 down payment towards the purchase of a condo. The monthly mortgage the financial institution offers them is with an interest rate of 4.5%. They estimate the monthly property taxes to be about $165 and the heating costs to be about $70 per month. They anticipate that the condo fees will be $300. Calculate the maximum they can afford to pay for a condominium.

Solution

To solve this problem (and other problems like this one), you should set up the following calculation.

Maximum Affordable Home Price		
Gross monthly household income		$ 3,750.00
Multiply: (GDSR)	32%	
Total affordable household expenses		$ 1,200.00
Subtract:		
Monthly property taxes	$ 165.00	
Monthly heating costs	$ 70.00	
One-half of condo/strata fees (if applicable)	$ 150.00	
Monthly affordable mortgage payment		$ 815.00
Divide: Interest factor (from Chart 1.1)	0.00553	
Amount of affordable mortgage		$ 147,377.94
Add: Cash down payment	$ 15,000.00	
Maximum affordable home price		$ 162,377.94

The steps to complete this calculation are:

Step 1: Enter the amount of the gross monthly household income. *($3750.00)*

Step 2: Multiply the gross monthly household income by the Gross Debt Service Ratio to find the total affordable household expenses. **We always assume the Gross Debt Service Ratio is the maximum of 32%.** *(3750.00 × 0.32 = $1200.00)*

Step 3: Enter the values of the monthly property taxes, heating costs, and half of the condo/strata fees (if applicable). *($165.00, $70.00, $150.00)*

Step 4: Subtract the values of the monthly property taxes, heating costs, and half of the condo/strata fees (if applicable) from the total affordable household expenses. The money that is left can be used for a monthly mortgage payment. *(1200 – (165 + 70 + 150) = $815.00)*

Step 5: Enter the interest rate factor value for each dollar of loan at 4.5% by referring to Chart 1.1. *(0.00553)*

Step 6: Divide the value of the monthly affordable mortgage payment by the interest rate factor table value to find the amount for an affordable mortgage when monthly payments are made for 25 years. *(815 ÷ 0.00553 = $147,377.94)*

Step 7: Enter the amount of the down payment. *($15,000.00)*

Step 8: Add the amount of the down payment to the amount of the affordable mortgage to find the maximum affordable home price. *($147,377.94 + $15,000.00 = $162,377.94)*

The maximum amount that the couple can afford for a condo is $162,378.00. They are probably better off spending less than this because they may have other expenses at this time (e.g., furniture, vehicle, etc.), as well as savings. Remember that the Gross Debt Service Ratio is based on the *gross* income, so there are deductions and the couple will not receive the full amount of $3750 per month.

You can also use a spreadsheet program such as Microsoft Excel to perform the calculation. Financial institutions access spreadsheet programs in order to determine the maximum affordable home price for their clients. If you prefer to use a spreadsheet program to solve the problems in the following learning activity and in Assignment 1.1, please do so. The Interest Rate Factor Table will be available during the midterm exam. Just remember that you will not have access to a computer during your exam, so it is important that you know the steps involved for calculating the maximum affordable housing cost. Write these steps (in full or in point form) on your resource sheet.

Example 3 (Using a spreadsheet—Microsoft Excel)

Refer to Example 2 for the question.

Solution

Follow along on your computer if you have Microsoft Excel. If you are using a different spreadsheet program, the ideas should be similar but you are responsible for determining the exact steps. As you work through these steps, you may want to make an information sheet outlining how to use the program. Appendix A includes useful commands for making spreadsheets in Excel.

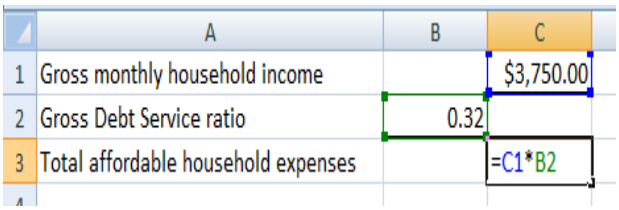
Note: If you have access to a computer, you should use a spreadsheet program such as Microsoft Excel to complete this module, including the assignments. However, you will not be given access to a spreadsheet program when you write the midterm and final examinations. You may, for example, use a spreadsheet to complete the Maximum Affordable Home Price table above, but you should also know how to complete it without using a spreadsheet.

Before starting to perform calculations, you must enter all the categories from the table in Example 2. Once you have entered the categories into your spreadsheet, you must enter the gross monthly income (3750.00) and the Gross Debt Service Ratio (0.32).

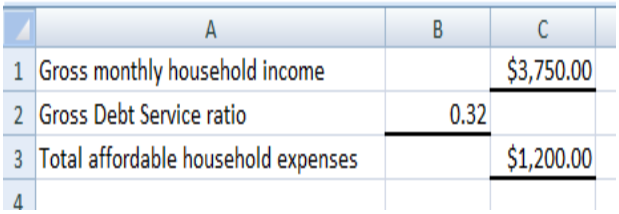
	A	B	C
1	Gross monthly household income		$3,750.00
2	Gross Debt Service ratio	0.32	
3	Total affordable household expenses		
4			
5	Monthly property taxes		
6	Monthly heating costs		
7	½ of condo/strata fees (if applicable)		
8			
9	Monthly affordable mortgage payment		
10			
11	Interest factor (from Chart 1.1)		
12			
13	Amount of affordable mortgage		
14			
15	Down payment		
16			
17	Maximum affordable home price		

In order to calculate the total affordable household expenses, you can enter a formula into cell C3. In this sample spreadsheet, our formula is **=C1*B2** because cell C1 is the value of the gross monthly household income and cell B2 is the Gross Debt Service Ratio value.

Note: In order for the calculations to work, you must include only the number. **Do not type in the dollar sign.** In order to format the cell to have a dollar sign, right-click on the cell, select **Format Cells**, and then under the **Number** tab select **Currency** from the list of options.



	A	B	C
1	Gross monthly household income		$3,750.00
2	Gross Debt Service ratio	0.32	
3	Total affordable household expenses		=C1*B2

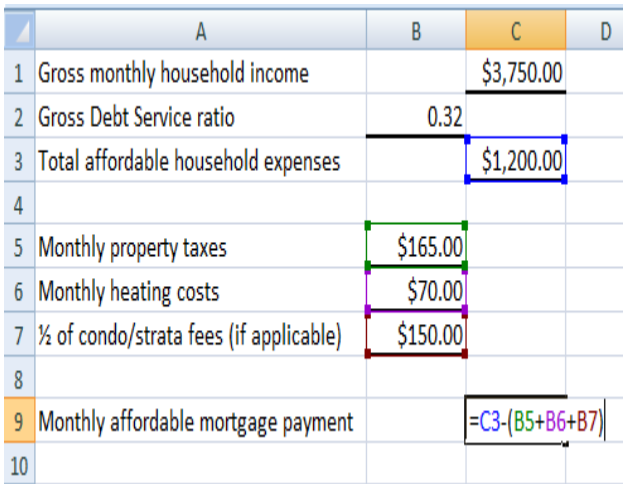


	A	B	C
1	Gross monthly household income		$3,750.00
2	Gross Debt Service ratio	0.32	
3	Total affordable household expenses		$1,200.00
4			

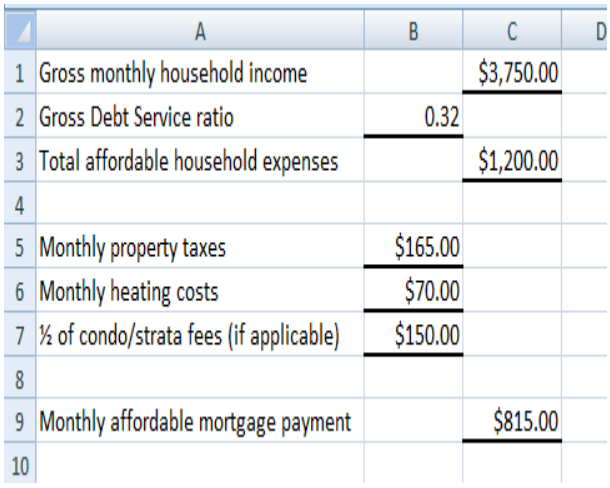
Once you have entered the formula, press Enter, and the value will appear for the **Total affordable household expenses** ($1,200.00). If you change the value for the **Gross monthly household income**, the **Total affordable household expenses** will change as well.

Next you must enter the monthly expenses (taxes = 165.00, heating = 70.00, condo fees = 150.00).

After you have done this, enter the formula to calculate the monthly affordable mortgage payment. In the cell beside **Monthly affordable mortgage payment** (cell C9), you must enter the formula **=C3-(B5+B6+B7)**. This formula subtracts the monthly costs (taxes, heating, and condo fees) from the **Total affordable household expenses**.



	A	B	C	D
1	Gross monthly household income		$3,750.00	
2	Gross Debt Service ratio	0.32		
3	Total affordable household expenses		$1,200.00	
4				
5	Monthly property taxes	$165.00		
6	Monthly heating costs	$70.00		
7	½ of condo/strata fees (if applicable)	$150.00		
8				
9	Monthly affordable mortgage payment		=C3-(B5+B6+B7)	
10				



	A	B	C	D
1	Gross monthly household income		$3,750.00	
2	Gross Debt Service ratio	0.32		
3	Total affordable household expenses		$1,200.00	
4				
5	Monthly property taxes	$165.00		
6	Monthly heating costs	$70.00		
7	½ of condo/strata fees (if applicable)	$150.00		
8				
9	Monthly affordable mortgage payment		$815.00	
10				

Now that you have calculated the **Monthly affordable mortgage payment** ($815.00), enter the **Interest rate factor** (0.00553), which gives the monthly payment amount for each $1 of loan over 25 years. If you enter the **Interest rate factor**, then click on another cell, the number may lose a decimal place or two. If this happens, right-click on the cell, select **Format Cells**, and under the **Number** tab select **Number** from the menu. Make sure that it allows for 5 decimal places.

Using the **Monthly affordable mortgage payment** (cell C9) and the **Interest rate factor** (cell B11), you can calculate the **Amount of affordable mortgage** (cell C13) using the formula **=C9/B11**.

	A	B	C
1	Gross monthly household income		$3,750.00
2	Gross Debt Service ratio	0.32	
3	Total affordable household expenses		$1,200.00
4			
5	Monthly property taxes	$165.00	
6	Monthly heating costs	$70.00	
7	½ of condo/strata fees (if applicable)	$150.00	
8			
9	Monthly affordable mortgage payment		$815.00
10			

	A	B	C
1	Gross monthly household income		$3,750.00
2	Gross Debt Service ratio	0.32	
3	Total affordable household expenses		$1,200.00
4			
5	Monthly property taxes	$165.00	
6	Monthly heating costs	$70.00	
7	½ of condo/strata fees (if applicable)	$150.00	
8			
9	Monthly affordable mortgage payment		$815.00
10			

Finally, enter the value for the **Down payment** (15000.00), then calculate the **Maximum affordable home price**. Can you think of the formula to calculate this? Because the **Maximum affordable home price** is the sum of the **Amount of affordable mortgage** (cell C13) and the **Down payment** (cell B15), the formula will be **=C13+B15**.

1	Gross monthly household income		$3,750.00
2	Gross Debt Service ratio	0.32	
3	Total affordable household expenses		$1,200.00
4			
5	Monthly property taxes	$165.00	
6	Monthly heating costs	$70.00	
7	½ of condo/strata fees (if applicable)	$150.00	
8			
9	Monthly affordable mortgage payment		$815.00
10			
11	Interest factor (from Chart 1.1)	0.00553	
12			
13	Amount of affordable mortgage		$147,377.94
14			
15	Down payment	$15,000.00	
16			
17	Maximum affordable home price		=C13+B15

1	Gross monthly household income		$3,750.00
2	Gross Debt Service ratio	0.32	
3	Total affordable household expenses		$1,200.00
4			
5	Monthly property taxes	$165.00	
6	Monthly heating costs	$70.00	
7	½ of condo/strata fees (if applicable)	$150.00	
8			
9	Monthly affordable mortgage payment		$815.00
10			
11	Interest factor (from Chart 1.1)	0.00553	
12			
13	Amount of affordable mortgage		$147,377.94
14			
15	Down payment	$15,000.00	
16			
17	Maximum affordable home price		$162,377.94

Using the spreadsheet, you got an answer of $162,377.94—the same as when you calculated the **Maximum affordable home price** using the table. What is convenient about this spreadsheet is that now all you have to do is make small changes (e.g., gross monthly household income, monthly property taxes, monthly heating costs, condo fees, interest factor, and the down payment), and the spreadsheet will make all of the calculations.

Now that you have seen how to perform affordability calculations and how to use a spreadsheet, complete the following learning activity to make sure that you understand the first part of this lesson (focusing on the Gross Debt Service Ratio). You can also use this learning activity to create a spreadsheet for solving problems involving maximum affordability. Regardless of how you solve each question, be sure to check your answers so that you are confident that you can complete these calculations successfully.

Learning Activity 1.2

Complete the following, and check your answers in the learning activity keys found at the end of this module.

Part A: BrainPower

You should be able to complete the following five questions in just a few minutes without using a calculator or paper and pencil.

1. Evaluate for $z = -1$: $3z - (-7)$
2. How much tax would you have to pay on an item that costs $49.99 (approximately) if the PST = 7% and the GST = 5%?
3. Since 10% of 440 is 44, what is 35% of 440?
4. Evaluate: $\left(\frac{8}{16}\right) \times 12$
5. You have to buy a new toaster for your house. The toaster you want to buy costs $54.45, including tax. If you give the cashier $60, how much change should you get back?

continued

Learning Activity 1.2 (continued)

Part B: Calculations Using the Gross Debt Service Ratio

Remember, these questions are similar to the ones that will be on your midterm exam. If you are able to answer them correctly, you are likely to do well on your exam. If you are not able to answer them correctly, you need to go back to the lesson to review the information you do not understand. Don't forget that you can ask your learning partner or tutor/marker for help if you are having a hard time understanding.

1. State the Gross Debt Service Ratio. How does it relate to home affordability?

2. Calculate the Gross Debt Service Ratio for the following situations. For each situation, state the likelihood of a financial institution granting a mortgage for the house.
   a) Monthly mortgage payment is $710, monthly property taxes are $118, monthly heating costs equal $96, and the gross monthly income is $3000.
   b) Monthly mortgage payment is $716, annual property taxes are $2500, the monthly heating costs are $116, and the gross monthly income is $2340.
   c) Monthly mortgage payment is $1000, annual property taxes are $2300, monthly heating costs average $105, and the gross annual income is $68,000.

3. The Cadloff family are planning to purchase a home. The family has a gross monthly income of $4400. They are able to make a down payment of $20,000 toward the purchase of their home. The bank offers the family an interest rate of 4%. They estimate their monthly property taxes to be around $230 and their heating costs to be about $120 per month. Calculate the maximum price the Cadloffs can pay for a home. (Use the chart below or create your own spreadsheet.)

Maximum Affordable Home Price		
Gross monthly household income		$ _____
Multiply: (GDSR)	_____	
Total affordable household expenses		$ _____
Subtract:		
Monthly property taxes	$ _____	
Monthly heating costs	$ _____	
One-half of condo/strata fees (if applicable)	$ _____	
Monthly affordable mortgage payment		$ _____
Divide: Interest factor (from Chart 1.1)	_____	
Amount of affordable mortgage		$ _____
Add: Cash down payment	$ _____	
Maximum affordable home price		$ _____

continued

Learning Activity 1.2 (continued)

4. Alex Gardner wants to purchase a condominium. Alex has a gross annual income of $42,600. He has saved $10,000 for a down payment. His financial institution offered him an 3.5% interest rate on a mortgage. Alex estimates his monthly property taxes will be $110 and his monthly heating costs will be $40. Condo fees are $275 per month. Calculate the maximum price Alex can pay for his condominium. (Use either the chart below or your own spreadsheet.)

Maximum Affordable Home Price		
Gross monthly household income		$ _____
Multiply: (GDSR)	_____	
Total affordable household expenses		$ _____
Subtract:		
Monthly property taxes	$ _____	
Monthly heating costs	$ _____	
One-half of condo/strata fees (if applicable)	$ _____	
Monthly affordable mortgage payment		$ _____
Divide: Interest factor (from Chart 1.1)	_____	
Amount of affordable mortgage		$ _____
Add: Cash down payment	$ _____	
Maximum affordable home price		$ _____

Additional Costs

If you have never bought a house, you might assume that it works the same way as if you were buying a chocolate bar at the grocery store (i.e., you would only expect to be charged PST and GST in addition to the cost of the chocolate bar itself). Unfortunately, buying a house is not that easy, and there are a lot of additional costs. What sounds like a low price at the beginning can grow to a much larger price with all of the additional costs.

If you are inexperienced in buying a home, read through this section with your learning partner. If you cannot read through this section with your learning partner, be sure to note any terms or statements that you do not understand so that you can ask your tutor/marker. If there are any terms that are particularly difficult for you, include them on your resource sheet.

Initial Costs

- **Inspection fee**—Before you make a decision to purchase a home, it is highly recommended you have it inspected by a professional building inspector.
- **Appraisal fee**—When borrowing money, the lender must determine the value of the property. A certified appraiser will be appointed by the lending agency (bank) to appraise the property to determine its value.
- **Mortgage application fee**—Your financial institution may charge a fee for processing your mortgage application.

Lawyers' Disbursements and Fees

When you purchase a home, you need to retain a lawyer or notary to act on your behalf. As a convenience to you, your lawyer will pay many of your purchase costs. These costs are known as **disbursements**. Your lawyer will include the costs of these disbursements with the legal fees.

Two of the largest disbursements are the land transfer tax and the survey certificate. There are additional legal costs and lawyers' fees, as well.

- **Land transfer tax**—You pay this tax to the Manitoba Land Titles Office at the time the title of your home is registered. The land transfer tax is a percentage of the purchase price as outlined below. Remember to add these dollar amounts and percentages to your resource sheet.

$0 – $30,000	nil
$30,000 – $90,000	0.5%
$90,000 – $150,000	1.0%
$150,000 – $200,000	1.5%
over $200,000	2.0%

- **Survey certificate**—You may be able to obtain this document from the seller. If you require a new survey certificate, a surveyor will charge you approximately $300 for a city or municipal property survey.

  Property survey—This will supply information on how buildings, fences, and other structures are situated on the property. If a recent survey is available to you, a property survey may not be necessary. If there are any easements or encroachments on your property, it is a good idea to know about this before making the purchase. An **easement** is the right of way by a town, city, or utility company to access your land for a specific purpose, such as repairing telephone or television cables. An **encroachment** is an intrusion on your land by a neighbour's structure, or possibly an intrusion on your neighbour's land by a structure on your property. In either case, you would want to know this prior to purchasing the property.

- **Additional legal costs**—These include disbursements such as registration costs, zoning memorandum, tax certificate, title searches, administration costs, and GST.
- **Lawyers' fees**—Real-estate lawyers will charge about $300 to $400 for the legal work involved in the purchase of your home.

Adjustments

Adjustments are not the actual costs related to the purchase of a home, they are adjustments that must be made based on the date you take possession of your new home. The **possession date**, or **closing date**, is the day the ownership of the house is officially transferred from the seller to the buyer. All the costs of home ownership before the possession date are the responsibility of the seller, and all the costs after the closing date are the responsibility of the buyer. Some of the adjustments are handled by your lawyer's office.

- **Interest adjustment**—If you require a mortgage, the processing time required by the land titles office means that your mortgage money is not released until after you take possession of your new home. During this time, you must pay interest to the seller. As a rule, you pay one month's interest to your lawyer at the time you take possession of your home. Your lawyer distributes the appropriate amount of interest to the seller, and the remaining amount either to your financial institution or back to you (as applicable).
- **Property tax adjustment**—Homeowners are required to pay property tax to the city or municipality each year. Property tax is calculated based on the calendar year (January to December), but is paid on a given due date during the year. For example, the due date in Winnipeg is June 30, the due date for Dauphin is July 31, and the due date for Brandon is September 30. In all cases, the amount paid covers January to December of that year. The City of Winnipeg has a monthly Tax Installment Payment Plan (TIPP) that allows homeowners to pay their annual tax bill in monthly installments.

  Depending on when you purchase property, you may have to reimburse the seller for property tax paid, or the seller may credit you for tax paid. If you purchase property after the due date, and the annual taxes have been paid by the seller, you will need to reimburse the seller for your share (the months during that calendar year you owned the home). If you purchase a property before the due date for annual property taxes is to be paid, the seller will have to credit you for their share of the year's taxes (the months they owned the house).

For the purposes of this course, the property tax adjustments will be made in terms of months. In reality, the property tax adjustments are made in terms of days.

- **Insurance adjustment**—You also make a property insurance payment during the calendar year. Property insurance covers you in case of loss or damage to your property due to fire, flooding, or theft. Property insurance is valid for one year from the date of renewal. If you use the same insurance company, and if the cost of insurance for your new home is not the same as the insurance of your previous home, your insurance company will make an adjustment for the time period between your possession date and the insurance renewal date. This adjustment must be paid to the insurance company by the buyer.

Other Additional Costs

- **Moving expenses**—There will be moving expenses that you will have to pay, even if it is only the price of gasoline as you move yourself.
- **Service charges**—Hookup fees may be charged for utilities, such as phone, Internet, water, and gas, and will be reflected in your first bill.
- **Immediate repairs**—Some of these may be necessary prior to your moving in. You may want to negotiate the cost of these repairs with the seller.
- **Appliances and furniture**—Sometimes the appliances are included in the purchase of the house, and sometimes you must buy appliances before you can move into your new home.
- **Decorating costs**—Sometimes a new owner may want to repaint the house or install new flooring before moving in. It is usually easier to do this before moving all your belongings into the house.

Knowing that these costs exist is the first step in being prepared for them when you are buying a house. The following examples demonstrate the calculations associated with these additional costs. You may want to make a note of the following types of problems, along with their solutions, on your resource sheet.

Example 1: Land Transfer Tax Problem

Calculate the land transfer tax on a home with a purchase price of $125,000.

Solution

To do this calculation, you need to find the percentages by referring back to the section that describes the land transfer tax. You should have written these dollar amounts and percentages on your resource sheet. Like the income tax deduction calculations you may have done in Grade 10 Essential Mathematics, different percentages for land transfer tax apply to different parts of the purchase price. This means that you have to find the amounts in each part of the purchase price, and then multiply the amount by the percentage given.

Amount under $30,000 = $30,000

Tax on this amount = $0

Amount between $30,000 and $90,000 = 90,000 – 30,000 = $60,000

Tax on this amount = 0.5% × 60,000 = $300

Amount between $90,000 and $125,000 = 125 000 – 90,000 = $35,000

Tax on this amount = 1.0% × 35 000 = $350

Land transfer tax = 0 + 300 + 350 = $650

Example 2: Home Insurance Adjustment

The Leopp family has just purchased a new home in Winnipeg. The possession date of their new home is April 15. The family's home insurance is renewed September 1 of each year. The family has to increase its home insurance from $325 to $450 per year and pay the difference for the extra months. Calculate the family's home insurance adjustment.

Solution

Step 1: Calculate how much money is owed for the yearly home insurance.

450 – 325 = $125

Step 2: How many months remain before the Leopp family will renew their home insurance?

April 15 to May 1 = 0.5 months

May 1 to September 1 = 4 months

Total = 4.5 months

Step 3: What portion of the yearly (12 months) home insurance is owed for the months (4.5 months) between when the Leopp family takes possession of the house and when they renew their insurance?

$$\frac{4.5}{12} \times 125 = \$46.88$$

Example 3: Property Tax Adjustment Problem

Lannis Jones has just purchased a new home. The possession date is September 1. Annual property taxes are $1878, and they are due on June 30. Calculate Lannis's property tax adjustment.

Solution

Step 1: Decide who owes money and who needs to be paid. Since the previous owner has already paid the property taxes for the year, Lannis has to pay the seller for the months she will own the home.

Step 2: How many months worth of tax are owed? Since Lannis takes possession of the house in September, she owes the seller property taxes for four months (September, October, November, and December).

Step 3: Calculate how much is money is owed.

Lannis owes the seller $\frac{4}{12} \times \$1878 = \$626$

The fraction $\frac{4}{12}$ comes from the 4 months that Lannis owns the house, divided by the number of months in a year. Another way to do this calculation could be

Monthly taxes: $\frac{1878}{12} = \$156.50$

Total cost: $4 \times 156.50 = \$626.00$

Note: If Lannis had taken possession of the home before June 30, the owner would have owed her money for the months *before* Lannis took possession. This amount would be credited to the purchaser of the home, so it would be *subtracted* from the total closing costs. **Total closing cost** includes the total of all additional costs that the purchaser must pay when buying the house.

Example 4: Total Closing Cost Problem

Claire Bland and Jim Gerrard are a married couple who have just purchased a house in Winnipeg. The purchase price of their new home is $114,500. Before finalizing their offer on the house, Claire and Jim have a professional building inspector inspect the house. The inspector assures the couple that the house is structurally sound. The inspection costs them $275. The couple obtains a fixed mortgage from their financial institution. They are charged $60 for a mortgage application fee and $45 for an appraisal fee.

The couple retains a lawyer to act for them in the purchase of their house. The cost of the land transfer tax is $545 (0% × 30,000 + 0.5% × 60,000 × 1.0% + 24,500). They need a property survey of their new property. The cost of this survey is $300. Their lawyer's fee is $300. Other legal disbursements are $172.

Claire and Jim's possession date for the home is August 15. The amount of interest owing to the seller on their first monthly payment is $472. Property taxes for the year are $2640. The due date for property taxes in Winnipeg is June 30. Their home insurance is renewed November 15 each year. They have to increase their home insurance from $390 to $480 per year.

The cost to hook up the phone is $65. The cost to activate the natural gas is $45. Claire and Jim hire movers to move their possessions to their new home. The mover charges them $600. Before they move in, the couple wants to install new carpeting. The cost of the new carpeting is $2085. The couple purchases a new refrigerator at $960 and a new oven at $725. They also are having interior walls painted for $514.25.

Calculate the couple's total closing costs and extras to purchase their new home.

Solution

Total Closing Costs		
Initial Fees		
Inspection Fee	$ 275.00	
Mortgage Application Fee	$ 60.00	
Appraisal Fee	$ 45.00	
Total Initial Fees		$ 380.00
Lawyer's Disbursement and Fees		
Land Transfer Tax	$ 545.00	
Property Survey	$ 300.00	
Other Legal Disbursements	$ 172.00	
Legal Fees	$ 300.00	
Total Lawyer's Disbursement and Fees		$ 1,317.00
Adjustments		
Interest Adjustment	$ 472.00	
Property Tax Adjustment ($2,640 × 4.5/12)	$ 990.00	
Home Insurance Adjustment ($480 – $390) × 3/12)	$ 22.50	
Total Adjustments		$ 1,484.50
Other Additional Costs		
Service Charges ($65 + $45)	$ 110.00	
Moving Expenses	$ 600.00	
Immediate Repairs	$ 2,085.00	
Appliances ($960 + $725)	$ 1,685.00	
Decorating Costs	$ 514.25	
Total Other Additional Costs		$ 4,994.25
Total Closing Costs and Extras		$ 8,175.75

Example 5: Closing Cost Percentage Problem

Determine the percent of Claire and Jim's total closing costs and extras compared to the purchase price of the home from the previous example.

Solution

Percent is a comparison of a quantity to 100. You can find the rate of percent by setting up a proportion between two ratios as follows. The ratio on the left is always the percent expressed as a comparison to 100. The ratio on the right consists of the total costs compared to the cost of the home.

Method 1

Let x represent the unknown rate in the following proportion.

$$\frac{x}{100} = \frac{8,175.75}{114,500}$$

$$114,500x = (100)(8,175.75) \qquad \text{(cross-multiply)}$$

$$114,500x = 817,575$$

$$\frac{114,500x}{114,500} = \frac{817,575}{114,500} \qquad \text{(divide both sides by 114,500)}$$

$$x = 7.1 \qquad \text{(rounded to the nearest tenth)}$$

The rate of percent = 7.1%

Method 2

There are other ways of finding the rate of percent. The following method indicates that you can find the rate of percent by dividing 8,175.75 by 114,500 and then multiplying by 100.

$$\text{Rate of percent} = \frac{8,175.75}{114,500} \times 100 = 7.1\%$$

Use the method you prefer to find the rate of percent.

Because of all the detail, these examples may seem scary while you're reading them, so it is important that you try to do them yourself in the following learning activity. Don't forget to check your answers after you have completed the learning activity to be absolutely sure that you understand how to complete these problems. Similar problems will appear on the midterm examination.

Learning Activity 1.3

Complete the following, and check your answers in the learning activity keys found at the end of this module.

Part A: BrainPower

You should be able to complete the following five questions in just a few minutes without using a calculator or paper and pencil.

1. Evaluate: $\left(\frac{3}{7}\right) \times \left(\frac{14}{6}\right)$

2. You are furnishing your new apartment with a budget of $2800. You have already bought a couch for $925, table and chairs for $750, and a stove for $1075. How much money do you have left in your budget to buy a refrigerator? Is this reasonable?

3. Write two equivalent fractions for $\frac{17}{34}$.

4. Josiah and his family go out for dinner and their restaurant bill is $126. If they want to leave a 15% tip, how much should they leave?

5. You are approved for a $219,000 mortgage from your bank. If you have saved up an additional $16,000 for a down payment, how much can you afford to spend on a house?

Part B: Additional Cost Calculations

Remember, these questions are similar to the ones that will be on your midterm exam. If you are able to answer them correctly, you are likely to do well on your exam. If you are not able to answer them correctly, you need to go back to the lesson to review the information you do not understand.

1. Calculate the land transfer tax on a home with a purchase price of $185,000.

continued

Learning Activity 1.3 (continued)

2. Ken Baron has just purchased a new home. The possession date of his new home is November 1. Annual property taxes on his new home are $1670. The due date for property taxes is June 30. Ken's home insurance is renewed April 1 of each year. He has to increase his home insurance from $285 to $326 per year and pay the difference for the extra months.
   a) Calculate Ken's property tax adjustment (i.e., the amount he must repay the seller).
   b) Calculate Ken's home insurance adjustment.

3. The Desrochers family has just purchased a new home in Winnipeg. The possession date of their new home is April 15.

   Annual property taxes on their new home are $2495. The due date for property taxes in Winnipeg is June 30. The family's home insurance is renewed October 1 of each year. The family has to increase its home insurance from $352 to $448 per year and pay the difference for the extra months.
   a) Calculate the family's property tax adjustment (i.e., the amount the seller owes them).
   b) Calculate the family's home insurance adjustment.

4. The Wiebe family purchases a three-bedroom bungalow for $188,500. Before finalizing their offer on the bungalow, the Wiebes have a professional building inspector inspect the house. The inspector assures the Wiebes that the house is structurally sound. The inspection costs $275. The Wiebes need to take out a mortgage at a financial institution. They are charged a mortgage application fee of $65 and an appraisal fee of $40.

   The Wiebes retain a lawyer to act for them in the purchase of their home. They do not need a property survey done of their new property. Other legal disbursements cost $124.86. Their lawyer's fee is $350.

   The Wiebes' possession date is October 1. The amount of interest owing to the seller is $322.85. Property taxes for the year are $1583. The due date for property taxes is June 30. Their home insurance is renewed May 1 of each year. The family has to increase their home insurance from $336 to $382 per year and pay the difference for the extra months.

continued

The cost to hook up the phone is $60. The cost to activate the natural gas is $45. The Wiebes hire movers to move their furniture and appliances to their new home. The movers charge $380. Before they move in, the family purchases a new dishwasher for $490.50. They have the hardwood floors refinished at a cost of $1700. They paint the bedrooms themselves. The cost of the paint and brushes is $138.70.

Use the form provided at the end of this lesson or create your own spreadsheet to calculate the Wiebe family's total closing costs and extras to purchase their new home.

5. Refer to Question 4. Determine the Wiebe family's total closing costs and extras as a percentage of the total purchase price of their new home.

6. Lauren Johansson has received a promotion from her company and is relocating in Winnipeg. She has just purchased a bungalow for $282,500. Before finalizing her offer, she has a professional building inspector inspect the house. The inspection fee costs her $300. The mortgage application fee costs $75. An appraisal fee costs $40.

   She retains a lawyer to act for her in the purchase of her home. Her lawyer's fee is $300. She needs a property survey of her new property. The cost of this survey is $325. Other legal disbursements cost her $105.20.

   The possession date of Lauren's new home is March 1. The amount of interest owing to the seller is $242.75. Property taxes for the year are $1680. The due date for property taxes in Winnipeg is June 30. (Because Lauren will be paying the taxes for the whole year, the seller must pay her for the taxes for January and February. This will be shown as a credit on the chart.) Home insurance for the year will cost her $314.

   The cost to hook up the phone is $55. The cost to activate the natural gas is $45. Lauren hires a moving company to move her possessions to her new home. Her employer pays the cost of the moving company. Before she moves in, Lauren purchases a new washing machine and dryer at a cost of $499.99 and $349.99, respectively. She has the kitchen cabinets, counters, and flooring replaced at a cost of $14,150. She also has an alarm system installed at a cost of $600. She has her new house painted at a cost of $1590.

   Use the form provided at the end of this lesson to calculate Lauren's total closing costs and extras to purchase her new home.

7. Refer to Question 6. Determine Lauren's total closing costs and extras as a percentage of the total purchase price of her new home.

Lesson Summary

In this lesson, you explored the first steps of buying a house, and the calculations that accompany these steps. You learned that Gross Debt Service Ratio formula can be used to determine the affordability of a house, and that there are many additional costs that you have to consider when you buy a house. This material is included in the assignment at the end of Lesson 2, so be sure that you understand these concepts before moving on.

The next lesson looks at mortgage calculations.

Notes

Total Closing Costs		
Initial Fees		
Inspection Fee	$	
Mortgage Application Fee	$	
Appraisal Fee	$	
Total Initial Fees		$
Lawyer's Disbursement and Fees		
Land Transfer Tax	$	
Property Survey	$	
Other Legal Disbursements	$	
Legal Fees	$	
Total Lawyer's Disbursement and Fees		$
Adjustments		
Interest Adjustment	$	
Property Tax Adjustment	$	
Home Insurance Adjustment	$	
Total Adjustments		$
Other Additional Costs		
Service Charges	$	
Moving Expenses	$	
Immediate Repairs	$	
Appliances	$	
Decorating Costs	$	
Total Other Additional Costs		$
Total Closing Costs and Extras		$

Total Closing Costs		
Initial Fees		
Inspection Fee	$	
Mortgage Application Fee	$	
Appraisal Fee	$	
Total Initial Fees		$
Lawyer's Disbursement and Fees		
Land Transfer Tax	$	
Property Survey	$	
Other Legal Disbursements	$	
Legal Fees	$	
Total Lawyer's Disbursement and Fees		$
Adjustments		
Interest Adjustment	$	
Property Tax Adjustment	$	
Home Insurance Adjustment	$	
Total Adjustments		$
Other Additional Costs		
Service Charges	$	
Moving Expenses	$	
Immediate Repairs	$	
Appliances	$	
Decorating Costs	$	
Total Other Additional Costs		$
Total Closing Costs and Extras		$

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