Adult Basic Education

Mathematics

Mathematics 2105B

Consumer Decisions
Sampling

Study Guide

Prerequisite: Mathematics 2105A

Credit Value: 1

Text: *Essentials of Mathematics 10*, Baron, Celia; Pacific Educational Press, 2003.

Mathematics Courses [General College Profile]

Mathematics 2105A
Mathematics 2105B
Mathematics 2105C
Mathematics 3107A
Mathematics 3107B
Mathematics 3107C
Mathematics 3109A
Mathematics 3109B
Mathematics 3109C

Table of Contents

To the Student

I. Introduction to Mathematics to 2105B

The goal of the first unit is to help you make informed consumer decisions. You will use mathematical skills such as calculating and comparing unit costs, calculating sales tax and finding rates and ratios to make wise purchases.

The intent of the second unit is for you to learn about sampling techniques in an experimental environment. Every day, you are faced with information that is survey-based and graphically presented. While completing this unit, you will be given opportunities to select appropriate methods of data collection and to read, interpret and analyze the validity of data presentations.

II. Resources

You will require the following:

- *Essentials of Mathematics 10*
- scientific calculator
- graph paper
- protractor

Notes concerning the textbook:

Glossary: Knowledge of mathematical terms is essential to understand concepts and correctly interpret questions. Written explanations will be part of the work you submit for evaluation, and appropriate use of vocabulary will be required.

Your text for this course includes a Glossary where definitions for mathematical terms are found. Be sure you understand such definitions and can explain them in your own words. Where appropriate, you should include examples or sketches to support your definitions.

Examples: You should carefully study the **Examples** in each section and see your instructor if you have any questions. These **Examples** have full solutions to problems that will be a great help when answering assigned questions from **Notebook Assignment**.

Chapter Project: Unless your instructor directs you differently, you should omit all **Chapter Projects** and **Project Activity**.

To the Student

Notes concerning technology:

You should have a scientific calculator (the word "scientific" should be written on it) and the instruction booklet that belongs with it. Scientific calculators are fairly inexpensive. Even though your calculator will be a useful tool, you should be able to solve most exercises by using paper and pencil.

III. Study Guide

This Study Guide is required at all times. It will lead you through the course and you should take care to complete each unit of study in the order given in this Guide.

To be successful, you should read the **References and Notes** first and then, when indicated by the ⏯⏯ symbols, complete the **Work to Submit** problems. Many times you will be directed to see your instructor, and this is vital, especially in a Mathematics course. If you have only a hazy idea about what you just completed, nothing will be gained by continuing on to the next set of problems.

To the Student

Reading for this Unit: In this box, you will find the name of the text, and the chapters, sections and pages used to cover the material for this unit. As a preliminary step, skim the referenced section, looking at the name of the section, and noting each category. Once you have completed this overview, you are ready to begin.

References and Notes

This left hand column guides you through the material to read from the text.

It will also refer to specific **Examples** found in each Exploration. You are directed to carefully study these **Examples** with solutions and see your instructor if you have any questions. The **Examples** are important in that they not only explain and demonstrate a concept, but also provide techniques or strategies that can be used in the assigned questions.

You should read and understand the **Hints** and **New Terms** that are at the bottom of selected pages in the textbook.

The symbols ▶|▶ direct you to the column on the right which contains the work to complete and submit to your instructor. You will be evaluated on this material.

This column will also contain general **Notes** which are intended to give extra information and are not usually specific to any one question.

Work to Submit

There are two basic categories included in this column that correspond to the same categories in the sections of the text. They are **Mental Math** and **Notebook Assignment**.

Mental Math: These problems should be completed using pencil and paper. If you have difficulty, you should see your instructor for extra practice problems. Usually the skills that are applied in **Mental Math** are those required to successfully complete **Notebook Assignment**.
The answers to **Mental Math** are in the *Teacher Resource Book*.

Notebook Assignment: This section provides a series of problems similar to those in the **Exploration**. You should attempt these problems only after the **Exploration** problems have been understood and all assigned **Mental Math** and practice worksheets have been completed.
The textbook contains answers to **Notebook Assignment**. Your instructor will provide more detailed solutions with workings and some explanations.

This column will also contain **Notes** which give information about specific questions.

IV. Recommended Evaluation

Written Notes	10%
Assignments	10%
Test(s)	30%
Final Exam *(entire course)*	50%
	100%

Unit 1 - Consumer Decisions

To meet the objectives of this unit, students should complete the following:

Reading for this unit:	*Essentials of Mathematics 10*		
	Chapter 4:	Exploration 1:	pages 195, 198 - 206
		Exploration 2:	pages 210 - 216
		Exploration 3:	pages 217 - 222
		Exploration 4:	pages 223 - 228
		Exploration 5:	pages 229 - 233
		Exploration 6:	pages 234 - 239
		Chapter Review:	pages 240 - 242
		Case Study:	pages 244 - 246

References and Notes

Omit all references to **Chapter Project** and **Project Activity**.

Read page 195 and **Exploration 1**.

Ask your instructor for a copy of the self-test, *What Kind of Shopper are You?* on page 199.

Answer the following questions.
▶▶

Work to Submit

1.1 Complete the self-test *What Kind of Shopper are You?*. How did you rate?

1.2 List at least 5 pieces of information that are required to be on a food label.

1.3 **Mental Math**, page 201
Answer questions 1 - 3.
Show workings.

Unit 1 - Consumer Decisions

References and Notes

Read **Exploration 2**.

This exploration deals with the cost of one unit or *unit price*.
To calculate the unit price, you must divide the price by the number of units.

Study **Example 1** on page 210.

Since unit price is often used to compare products that come in various sizes, be sure to choose a convenient unit and make sure that both sizes are in the same unit.
For example, if you are comparing a 300 mL bottle of shampoo which costs $1.79 and a 1.4 L bottle of shampoo which costs $6.99, you must ensure that you have both products in units of mL or L.

300 mL = .3L
or
1.4 L = 1400 mL

Work to Submit

1.4 **Notebook Assignment**, pages 203 - 206
Ask your instructor for a copy of Canada's Food Guide.

Answer questions 1, 2, 3 and 4.
(*See note below on question 4d.)*

Question 4d: Before you find the number of servings in 1.5 kg of peanut butter, you must change kg to g. Since 1 kg = 1000 g and .5 kg = 500 g, 1.5 kg = 1500 g.

Unit 1 - Consumer Decisions

References and Notes	Work to Submit
If we choose L, Smaller size: unit price is $\frac{\$1.79}{.3L}$ = \$5.97/L. Larger size: unit price is \$6.99 ÷ 1.4 L = \$4.99/L. Study **Example 2** on page 211. Read **Hints** on the bottom of page 211. Answer the following questions. ▶▶	1.5 **Notebook Assignment**, pages 215 and 216 Answer questions 1 - 4. (*See note below on question 4.*) Answer questions 5 - 8. (*See note below on questions 7 and 8.*) Answer question 9. **Question 4:** Assume that all cans are the same size. **Questions 7 and 8:** Make sure that all units are the same. Remember that 1000 g = 1 kg.
See your instructor for **Practice Exercise 1**, *Unit Pricing*.	1.6 **Practice Exercise 1**, *Unit Pricing* Answer questions 1 - 5.

Unit 1 - Consumer Decisions

References and Notes	Work to Submit
Read **Exploration 3**. When the textbook and Study Guide were printed, the GST rate was 7%. Your instructor will give you the current GST rate. If you use the current GST rate, some answers will differ from the given answer keys. Look at the map on page 218 and compare the taxes in Newfoundland and Labrador to the rest of Canada. The GST (Goods and Services Tax) is a federal tax and is the same for all of Canada. The PST (Provincial Sales Tax) varies. Note the areas of Canada which do not have a PST. Newfoundland and Labrador, as well as New Brunswick and Nova Scotia have a HST (Harmonized Sales Tax). The HST is just the GST and PST combined. Study **Example 1** on page 219. Note that, to find the total tax, you can find the GST and PST separately and then add, or, find 14.5% of the cost. See your instructor for information on which goods and services are taxable and which are exempt.	

Unit 1 - Consumer Decisions

References and Notes	Work to Submit
Some common examples of goods and services which are taxable at the rate of 0 % (zero rated or no tax) are: • basic groceries • agricultural products such as grain or raw wool • prescription drugs • medical devices such as hearing aids and artificial teeth.	
Answer the following questions. ▶▶	1.7 **Mental Math**, page 220 Answer questions 1 - 4. 1.8 **Notebook Assignment**, pages 221 and 222 Answer questions 2 - 8. Note which province is specified in each problem. Use the map on page 218 of *Essentials of Mathematics 10* to find the tax rates.
Read **Exploration 4**. Carefully study **Examples 1** and **2**. **Example 2** gives two methods. You can use whichever you find easier.	
Answer the following questions. ▶▶	1.9 **Mental Math**, page 225 Answer questions 1 - 4. 1.10 **Mental Math**, page 226 Answer questions 1 - 3.

Unit 1 - Consumer Decisions

References and Notes	Work to Submit
Read **Exploration 5**. Rate is always expressed using two units. (i.e. km/hr, goals per game, servings/box) *Unit price*, which you studied in **Exploration 2**, is an example of a rate. (i.e. cost per unit, $1.29 per bottle of Pepsi)	1.11 **Notebook Assignment**, pages 227 and 228 Use the map on page 218 of your textbook to answer these questions. Answer questions 1 and 2. (*See notes below on these questions.*) Answer questions 3, 4, 5 and 6. (*See note below on question 3.*) **Question 1c):** There are 2 ways to answer these questions. First, you can take 10% of the regular cost of the groceries and compare that amount to the coupon total. The second method requires you to find the total in coupons and divide it by the total regular price of the groceries. This will give the percent saved. Total coupons = $1.35 Total groceries = $11.87 1.35 ÷ 11.87 = .114 = 11.4% **Question 2b):** To find the percent that Claude saves, use the second method explained above for 1c). **Question 3:** Assume Video Village is in Manitoba.

Unit 1 - Consumer Decisions

References and Notes	Work to Submit
Study **Examples 1** and **2**. In **Example 1**, you are looking for goals per game. Therefore you can write: total goals ÷ total games. Or, $\frac{total\ goals}{total\ games}$ In **Example 2**, you should notice that you can use only <u>one</u> unit of measure. Change 15 minutes to hours. You **could** change the hours to minutes and calculate the average rate in terms of km/min. However, this rate is not the one normally used. Answer the following questions. ▶▶	1.12 **Mental Math**, page 230 Answer questions a, b and c. 1.13 **Mental Math**, page 231 Answer questions a, b and c. 1.14 **Notebook Assignment**, pages 231 - 233 Answer questions 1 - 6.
Read **Exploration 6**. Ratios are used when you are comparing two quantities which have the same unit.	

References and Notes	**Work to Submit**
For example, when comparing the number of days with sunshine to the number of days in a month, the unit for both is days. If April has 18 days with sun, the ratio of *days with sun* to *days in the month* is $\frac{18}{30}$. This ratio should be reduced to lowest terms. Divide each term by the same number. 18 and 30 can both be divided by 6. (3 and 2 also work, but you need the largest number that can evenly divide into each of the terms.) $\frac{18 \div 6}{30 \div 6} = \frac{3}{5}$ This ratio can also be written: 3 to 5 or 3:5. Study **Examples 1** and **2**. Answer the following questions. ▶▶	1.15 **Mental Math**, page 236 Answer questions a, b, c and d. 1.16 **Practice Exercise 2**, *Rate and Unit Rates* Answer questions 1 and 2.
Ask your instructor for a copy of **Practice Exercise 2**, *Rates and Unit Rates*	

Unit 1 - Consumer Decisions

References and Notes	Work to Submit
	1.17 **Notebook Assignment**, pages 237 - 239 Answer question 1. (*See note below on question 1.*) Answer questions 2 and 3. (*See note below on question 3.*) Answer questions 4 - 8. (*See note below on question 7.*) **Question 1:** If you reduce each ratio to lowest terms, you can see which pairs are equivalent. **Question 3:** You can choose your own hours for *in school*, *watching television* and *doing homework*. **Question 7:** If you have difficulty with this question, see your instructor. In 7a) the ratio of the number of waffles required to the number in the recipe is $\frac{12}{6} = \frac{2}{1}$. Therefore, you must double the recipe in order to make 12 waffles (multiply everything by 2). In 7b) the ratio is $\frac{3}{6} = \frac{1}{2}$, so you must take half of each ingredient (multiply by ½ or .5). First change the amounts from mixed fractions to improper fractions e.g. $1\frac{3}{4} = \frac{7}{4}$ Your instructor can give you some extra practice problems in changing fractions from mixed to improper and also in multiplying fractions.

Unit 1 - Consumer Decisions

References and Notes	Work to Submit
	1.18 **Chapter Review**, pages 240 - 242 Answer questions 1 - 3 and 5 - 12. 1.19 **Case Study**, pages 244 - 246 Answer questions 1 - 8.

Unit 2 - Sampling

To meet the objectives of this unit, students should complete the following:

Reading for this unit: *Essentials of Mathematics 10*

Chapter 6:	Exploration 1:	pages 335, 337 - 341, 343 and 344
	Exploration 2:	pages 345 - 349
	Exploration 3:	pages 350, 351 and 357
	Exploration 4:	pages 358 - 361
	Exploration 5:	pages 362 - 365
	Exploration 6:	pages 368 - 371
	Exploration 7:	pages 373 - 381
	Chapter Review:	pages 385 and 386
	Case Study:	pages 389 and 390

References and Notes

Omit all references to **Chapter Project** and **Project Activity**.

Read page 335.

Answer the following questions. ▶▶

The essential idea of sampling is to learn about the whole (population) by studying a part (sample).

In **Exploration 1**, you will determine the total population size by looking at a sampling.

Study **Exploration 1**.

Work through the solutions given for each of **Examples 1**, **2** and **3.**

Work to Submit

2.1 Define the following terms:
- i) data
- ii) population
- iii) probability
- iv) sample

Unit 2 - Sampling

References and Notes

In **Example 1**, you will need to know how to solve equations involving proportions.

For example: $\frac{40}{w} = \frac{13}{108}$

Solve for w. First you must cross-multiply.

$40 \times 108 = 13 \times w$
or $13w = 4320$

Divide both sides by 13

$\frac{13w}{13} = \frac{4320}{13}$

$w = 332.308$
$w \approx 332$

$\approx$ means "approximately equal to."

Ask your instructor for materials (400 white beads and 100 red beads) required to complete **Counting Sharks Activity** on pages 340 and 341.

If the materials are available, answer the following questions.
▶▶

Work to Submit

2.2 **Counting Sharks Activity**, pages 340 and 341
Answer questions 1 - 8.
This activity could be completed with one or two partners.

Unit 2 - Sampling

References and Notes	Work to Submit
	2.3 Name and briefly describe three sampling methods that can be used to estimate a total population. 2.4 **Notebook Assignment**, pages 343 and 344 Answer questions 1 - 6. (*See note below on questions 4 and 5.*) **Questions 4 and 5**: Sketch a graph to represent the data in each of these questions. Put the years on the horizontal axis (*x*-axis) and the number of elk or number of visitors per day on the *y*-axis.
Read **Exploration 2**. Carefully study **Examples 1** - **4**. Answer the following questions. ▶▶	2.5 List and briefly describe the four main ways to select samples to represent a larger population. Give an example of each type of survey. 2.6 **Notebook Assignment**, pages 348 and 349 Answer questions 1 - 8.
Read **Exploration 3**. Study **Examples 1** and **2**. (Omit **Example 3** and **Group Activity**.)	

Unit 2 - Sampling

References and Notes	Work to Submit
Answer the following questions. ▶▶	2.7 Define the term *bias*. 2.8 Explain briefly how random numbers can be useful for collecting unbiased data. 2.9 **Notebook Assignment**, page 357 Answer questions 1, 2, 5 and 6.
Read **Exploration 4**. Study **Examples 1** and **2.** Answer the following questions. ▶▶	2.10 Define the term *representative sample*. 2.11 Briefly describe how dice, a random number table, a telephone book, and a list of students could be used to find a representative sample of students for a survey. 2.12 Give an alternative solution to **Example 1** and **Example 2** on page 359. 2.13 **Notebook Assignment**, pages 360 and 361 Answer questions 1 - 5.
Read **Exploration 5**. Study **Examples 1**, **2** and **3**. Answer the following questions. ▶▶	2.14 Briefly describe three types of surveys. 2.15 **Notebook Assignment**, page 365 Answer questions 1 - 6.

Unit 2 - Sampling

References and Notes	Work to Submit
Read **Exploration 6**. Study **Examples 1**, **2** and **3**. Answer the following questions. ▶▶	2.16 List at least 4 factors that make a survey fair. 2.17 **Notebook Assignment**, pages 370 and 371 Answer questions 1 - 4.
Read **Exploration 7**. Study **Examples 1** and **2**. Work through the calculations in **Example 2**. Answer the following questions. ▶▶	2.18 Define the following terms: i) mean ii) median iii) mode 2.19 List four basic types of graphs that can be used to present data. 2.20 **Mental Math**, page 375 Answer question 1.

Unit 2 - Sampling

References and Notes	Work to Submit
	2.21 **Notebook Assignment**, pages 377 - 381 Answer questions 1 and 2. (*See note below on question 2.*) Answer questions 3, 4, 6, 7 and 8. (*See note below on question 6.*) **Question 2**: Before you can draw a pie graph (or circle graph) you must a) calculate percentages and then b) calculate the equivalent in degrees. For example, the total forest fires for all sources is 6002. The number of fires caused by human activity in 3101. The percentage of fires caused by human activity in $\frac{3101}{6002} = 0.52$ (rounded). This is made into a percentage by multiplying by 100. $0.52 \times 100 = 52\%$. To change the value of 0.52 into the equivalent of degrees, multiply = $0.52 \times 360^\circ = 187^\circ$ rounded. (You will need a protractor to read the degrees on the pie chart). Use this method for all of the causes of forest fires (include fires whose cause does not fit in the three given categories). The percentages should total 100% and the degrees should total 360°.

References and Notes

Work to Submit

Question 6: The bar graph should show the measurements on the horizontal axis and the number of students on the vertical axis. It may be easier to create the circle graph if a table similar to the following is used:

Measurement (cm)	Frequency	Percent	Degrees
53	3	20.0	72
54	2	13.3	48
55			