

Adult Basic Education

Level II Mathematics

Mathematics 2012

Fractions

Curriculum Guide

Suggested Resource: *Prism Math Blue Student Workbook (Canadian Edition).* McGraw-Hill Ryerson. 2005. ISBN 13: 978-0-07-096033-6 (10:0-07-096033-X).

Level II Mathematics Courses

Mathematics 2011: Whole Numbers

Mathematics 2012: Fractions

Mathematics 2013: Decimals

Mathematics 2014: Percents

Mathematics 2015: Interest

Mathematics 2016: Measurement

Mathematics 2017: Geometry

Mathematics 2018: Statistics and Probability

Mathematics 2019: Algebra Readiness I

Mathematics 2020: Algebra Readiness II



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To the Instructor

Introduction to Mathematics 2012: Fractions

This course is the second in a series of ten ABE Level II Mathematics courses. This course is recommended for students who have transitioned from ABE Level I into ABE Level II. Such students will likely need this course in order to develop the skills and confidence to continue in Level II and eventually progress to Level III. Likewise, students who left school without a junior high school education will benefit from this course as well. This course covers the basic mathematical operations involving fractions, including simplest form, equivalent fractions, addition, subtraction, multiplication and division of fractions.

Students may/may not have to complete all ABE Level II Mathematics courses. Students are only required to complete sufficient Level II Mathematics courses to ensure success in one of the Level III graduation profiles. For example, a Level II student intending to complete the Degree-Technical Profile (Academic) in Level III may need to complete more Level II Mathematics courses than a student intending to complete the General College Profile (General) in Level III.

Mathematics 2012: Fractions is divided into two units. The outcomes for this course are given below. By completing the **Required Work** in the Study Guide, students will fulfill the outcomes for this course.

The first unit, ***Multiplication and Division***, will cover the following course outcomes:

- 1.01 Write fractions in simplest form.
- 1.02 Simplify fractions before multiplying.
- 1.03 Rename fractions and mixed numbers.
- 1.04 Multiply mixed numbers and write products in simplest form.
- 1.05 Solve word problems involving the multiplication of fractions.
- 1.06 Understand how to write the reciprocal of a number.
- 1.07 Divide fractions and write quotients in simplest form.
- 1.08 Divide mixed numbers and write quotients in simplest form.
- 1.09 Solve word problems involving the division of fractions.

To the Instructor

The second unit, ***Addition and Subtraction***, will cover the following course outcomes:

- 2.01 Add and subtract fractions with the same denominator.
- 2.02 Write equivalent fractions.
- 2.03 Add and subtract fractions with different denominators and write the sum or difference in simplest form.
- 2.04 Add and subtract mixed numbers and write the sum or difference in simplest form.
- 2.05 Find lowest common denominators before adding and subtracting fractions, and write the sum or difference in simplest form.
- 2.06 Subtract fractions when it's necessary to rename a whole number as a mixed number first, and write the difference in simplest form.
- 2.06 Solve word problems using addition and subtraction of fractions, and write the sum or difference in simplest form.

To the Instructor

Students are required to complete one assignment and one final exam in this course. Instructors have flexibility to substitute another assignment and/or tests, or to adjust the evaluation scheme to meet the needs of individual students.

Curriculum Guide

Each new ABE Level II Mathematics course has a Curriculum Guide for the instructor and a Study Guide for the student. The Curriculum Guide includes the specific curriculum outcomes for the course. Suggestions for teaching, learning and assessment are provided to support student achievement of the outcomes. Some suggestions for teaching, learning and assessment will be repeated in the curriculum guides for the Mathematics courses when appropriate. Each Level II Mathematics course is divided into two units except **Mathematics 2019: Algebra Readiness I** and **Mathematics 2020: Algebra Readiness II**. The two pre-algebra courses are required for any Level II student, who has not successfully completed Grade 9 Mathematics, intending to do the academic mathematics stream in Level III. These two courses are more challenging and have more content than the other Level II Mathematics courses. Each unit is presented in the Curriculum Guide as a **two-page layout of four columns** as illustrated in the figure below.

Curriculum Guide Organization The Two-Page, Four-Column Spread

Unit Number – Unit Title	Unit Number – Unit Title
Outcomes Specific curriculum outcomes for the unit.	Notes for Teaching and Learning Suggested activities, elaboration of outcomes, and background information.

Suggestions for Assessment	Resources
Suggestions for assessing students' achievement of outcomes.	Recommended resources that address outcomes.

To the Instructor

Study Guide

The Study Guide provides the student with the name of the text required for the course and specifies the lessons and pages that the student will need to refer to in order to complete the **Required Work** for the course. It guides the student through the course by assigning relevant reading and exercises. Sometimes the Study Guide provides important points for students to think about, to remember or to note. The Study Guide is designed to give students some degree of independence in their work. Instructors should note, however, that there is material in the Curriculum Guide in the *Notes for Teaching and Learning* and *Suggestions for Assessment* columns that is not included in the Study Guide, and instructors will need to review this information and decide how to include it.

Resources

Recommended student resources for this course:

- *Prism Math Blue Student Workbook (Canadian Edition)*. McGraw-Hill Ryerson. 2005. ISBN 13: 978-0-07-096033-6 (10:0-07-096033-X).
<http://www.mcgrawhill.ca>

Recommended instructor resources:

- *Prism Math Blue Teacher's Edition (Canadian Edition)*. McGraw-Hill Ryerson. 2005. ISBN 007096034-8 (9-780070-960343). <http://www.mcgrawhill.ca>

The *Prism Math Blue Student Workbook* is designed to help struggling students gain a solid understanding of and confidence in numeracy fundamentals. This is a non-grade specific text that is focused on easy-to-understand instructions as well as review materials and assessment opportunities. Feedback from Newfoundland and Labrador ABE instructors in 2010 indicated a desire for one Level II Mathematics student text, and this resource meets this purpose. This resource is also used in adult learning settings in other Atlantic jurisdictions.

To the Instructor

The *Prism Math Blue Teacher's Edition* mirrors the student workbook, but contains the following helpful additions:

- All answers are conveniently provided for each assigned exercise.
- Error Analysis at the bottom of each lesson gives suggestions for responding to and assessing student performance.
- Blackline Masters (BLM's) of chapter tests are contained in this resource. These masters can be photocopied and used by instructors for chapter tests/exams/etc.

Recommended Evaluation

Assigned Exercises	20%
Assignments	30%
Final Exam (entire course)	<u>50%</u>
	100%

The overall pass mark for the course is 50%.

Note: The evaluation scheme recommended above is presented as a suggestion. Institutions may choose an alternate evaluation scheme in order to meet the individual needs of adult learners. The Department of Education has no requirement that a final exam must be given in this course. Instructors/institutions can decide if a final exam is necessary based on their own policies and procedures.

Unit 1: Multiplication and Division —Suggestions for Teaching, Learning and Assessment

Outcomes	Notes for Teaching and Learning
<p>1.01 Write fractions in simplest form.</p> <p>1.02 Simplify fractions before multiplying.</p> <p>1.03 Rename fractions and mixed numbers.</p> <p>1.04 Multiply mixed numbers and write products in simplest form.</p> <p>1.05 Solve word problems involving the multiplication of fractions.</p> <p>1.06 Understand how to write the reciprocal of a number.</p> <p>1.07 Divide fractions and write quotients in simplest form.</p> <p>1.08 Divide mixed numbers and write quotients in simplest form.</p> <p>1.09 Solve word problems involving the division of fractions.</p>	<ul style="list-style-type: none"> • Ensure that students fully understand how to write fractions in simplest form (lowest terms), as all answers throughout this course should be written in simplest form where possible. • Instructors should use models to concretely illustrate all concepts involving fractions. Many students find fractions difficult and may have a degree of anxiety associated with fractions stemming from failures in their earlier schooling. Concrete models can help students visualize fractions more effectively and will appeal to the visual learner. • Common models used in teaching fractions at any level are number lines, shaded diagrams, fractions strips, and pattern blocks. These models can be found easily online and in various teachers' resources. It is suggested that instructors keep a supply of these models in the classroom to use as appropriate. • Area models using rectangles are useful for visualizing multiplication of fractions; for example, to model $1/5 \times 1/3$, draw a 5 by 3 rectangle. The rectangle has 15 equal parts. A horizontal row of 5 squares represents $1/3$ of the rectangle. $1/5$ of this row of $1/3$ of the rectangle covers $1/15$ of the parts. • To multiply fractions without using a model, multiply the numerators and multiply the denominators; then, write the answer in simplest form. • Show students how to cancel common factors out of the numerators and denominators before multiplying. Explain that this process keeps the multiplication more simple and it reduces/eliminates the need to reduce the answer to simplest form. • Instructors should show students how to multiply and divide fractions more than one way (arithmetically and pictorially). Students can find answers using one method and verify the answer using another method.

Unit 1: Multiplication and Division —Suggestions for Teaching, Learning and Assessment

Suggestions for Assessment	Recommended resources that address outcomes.
<ul style="list-style-type: none">Instructors may ask students to complete the <i>Chapter 2 Pre-test</i> to determine their prior knowledge of mathematical operations with fractions.If a student scores an acceptable grade on the pre-test, it is unnecessary for the student to complete the course as competency will be established. The student should show all calculations on the pre-test, and complete it without using a calculator. It is recommended that this grade be 80% or above.Instructors can use the grade on the pre-test as the final grade for the course. This grade can be entered on the ABE database as part of the official ABE transcript.Instructors should follow the suggestions given in Lesson Follow-up and Error Analysis section found in the <i>Teacher's Edition</i>. This section is written in blue and is at the bottom of the page containing each lesson.Answers for all exercises and word problems are contained in the <i>Teacher's Edition</i>. Instructors can quickly assess and provide feedback on student performance.A chapter test Blackline Master (BLM) corresponding to this unit is found in the assessment section of the <i>Teacher's Edition</i> (near the end of the book). This BLM is suitable to be administered to students as part of the official evaluation for the course. Answers are also provided in the <i>Teacher's Edition</i>.Instructors can use their professional judgement to design their own assessment tools (additional exercises and word problems, assignments, tests, exams, etc) to meet the individual needs of students.	<ul style="list-style-type: none"><i>Prism Math (Blue)</i>, page 42. Answers on the same pages of the <i>Prism Math (Blue) Teacher's Edition</i>.<i>Prism Math (Blue) Teacher's Edition</i>, pages 265-277.

Unit 2: Addition and Subtraction — Suggestions for Teaching, Learning and Assessment

Outcomes	Notes for Teaching and Learning
<p>2.01 Add and subtract fractions with the same denominator.</p> <p>2.02 Write equivalent fractions.</p> <p>2.03 Add and subtract fractions with different denominators, and write the sum or difference in simplest form.</p> <p>2.04 Add and subtract mixed numbers, and write the sum or difference in simplest form.</p> <p>2.05 Find lowest common denominators before adding and subtracting fractions, and write the sum or difference in simplest form.</p> <p>2.06 Subtract fractions when it is necessary to rename a whole number as a mixed number first, and write the difference in simplest form.</p> <p>2.06 Solve word problems using addition and subtraction of fractions, and write the sum or difference in simplest form.</p>	<ul style="list-style-type: none"> • Ensure that students fully understand how to write fractions in simplest form (lowest terms), as all answers throughout this course should be written in simplest form where possible. • Instructors should use models to concretely illustrate all concepts involving fractions. Many students find fractions difficult and may have a degree of anxiety associated with fractions stemming from failures in their earlier schooling. Concrete models can help students visualize fractions more effectively and will appeal to the visual learner. • Common models used in teaching fractions at any level are number lines, shaded diagrams, fractions strips, and pattern blocks. These models can be found easily online and in various teachers' resources. It is suggested that instructors keep a supply of these models in the classroom to use as appropriate. • Shaded circle models are useful when the sum of the fractions is less than 1. Fraction strips and number lines are useful when the sum of the fractions is greater than 1. • To add fractions with the same denominator, add the numerators and write the sum over the common denominator. • To add fractions with different denominators, first write them with the same (common) denominators, then write the sum of the numerators over the common denominators. • To add mixed numbers: 1) change the fractions to equivalent fractions with common denominators, 2) add the fractions, and 3) add the whole numbers. Answers should be in simplest form. • Strategies for subtracting fractions are similar to those for adding fractions: 1) if the denominators are the same, subtract the numerators and write the difference over the common denominator, and 2) if the denominators are different, subtract equivalent fractions with the same denominator.

Unit 2: Addition and Subtraction —Suggestions for Teaching, Learning and Assessment

Outcomes	Notes for Teaching and Learning
	<ul style="list-style-type: none">• To subtract mixed numbers: 1) change the fractions to equivalent fractions with common denominators, 2) subtract the fractions, and 3) subtract the whole numbers. Answers should be in simplest form.

Unit 2: Addition and Subtraction — Suggestions for Teaching, Learning and Assessment

Suggestions for Assessment	Recommended resources that address outcomes.
<ul style="list-style-type: none">Instructors may ask students to complete the <i>Chapter 2 Pre-test</i> to determine their prior knowledge of mathematical operations with fractions.If a student scores an acceptable grade on the pre-test, it is unnecessary for the student to complete the course as competency will be established. The student should show all calculations on the pre-test, and complete it without using a calculator. It is recommended that this grade be 80% or above.Instructors can use the grade on the pre-test as the final grade for the course. This grade can be entered on the ABE database as part of the official ABE transcript.Instructors should follow the suggestions given in Lesson Follow-up and Error Analysis section found in the <i>Teacher's Edition</i>. This section is written in blue and is at the bottom of the page containing each lesson.Answers for all exercises and word problems are contained in the <i>Teacher's Edition</i>. Instructors can quickly assess and provide feedback on student performance.A chapter test Blackline Master (BLM) corresponding to this unit is found in the assessment section of the <i>Teacher's Edition</i> (near the end of the book). This BLM is suitable to be administered to students as part of the official evaluation for the course. Answers are also provided in the <i>Teacher's Edition</i>.Instructors can use their professional judgement to design their own assessment tools (additional exercises and word problems, assignments, tests, exams, etc) to meet the individual needs of students.	<ul style="list-style-type: none"><i>Prism Math (Blue)</i>, page 42. Answers on the same pages of the <i>Prism Math (Blue) Teacher's Edition</i>.<i>Prism Math (Blue) Teacher's Edition</i>, pages 265-277.