Adult Basic Education
Level II Mathematics

Mathematics 2019
Algebra Readiness I

Curriculum Guide

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

Newfoundland
Labrador

Table of Contents

Introduction to Mathematics 2019: Algebra Readiness I

This course is the ninth in series of ten ABE Level II Mathematics courses. This course, along with **Mathematics 2020: Algebra Readiness II**, is mandatory for any student who has not successfully completed Grade 9 Mathematics and who intends to complete the Academic Mathematics stream in Level III. These courses are optional for students who intend to complete the General Mathematics stream in Level III. These courses are more challenging and have more content than the other Level II Mathematics courses. This course focuses on equations, ratios, rates, proportions, similar triangles, squares and square roots.

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 2019: Algebra Readiness is divided into three 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, *Equations,* will cover the following course outcomes:

1.01	Write and simplify algebraic expressions.
1.02	Write and solve equations.
1.03	Solve equations using division.
1.04	Solve equations using multiplication.
1.05	Solve equations using subtraction.
1.06	Solve equations using addition.
1.07	Simplify expressions by combining like terms.
1.08	Solve equations involving two operations.
1.09	Solve word problems using equations.
1.10	Solve word problems using formulas.

The second unit, ***Ratio, Rate, Proportion,*** will cover the following course outcomes:

        2.01   Write ratios.
        2.02   Identify proportions.
        2.03   Solve proportions.
        2.04   Solve word problems using proportions.
        2.05   Interpret scale diagrams
        2.06   Solve word problems using proportions.

The third unit, ***Triangle Geometry and Square Roots,*** will cover the following course outcomes:

        3.01   Identify similar triangles by comparing angles.
        3.02   Identify similar triangles by comparing sides.
        3.03   Calculate a missing side in a similar triangle.
        3.04   Solve word problems using similar triangles.
        3.05   Calculate squares and square roots.
        3.06   Find squares and square roots using a table.
        3.07   Solve word problems using the Pythagorean Theorem
        3.08   Calculate the measure of missing sides of similar triangles.

Students are required to complete four assignments and three unit tests 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	**Notes for Teaching and Learning**	**Suggestions for Assessment**	**Resources**
Specific curriculum outcomes for the unit.	Suggested activities, elaboration of outcomes, and background information.	Suggestions for assessing students' achievement of outcomes.	Recommended resources that address outcomes.

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 Purple Student Workbook (Canadian Edition).* McGraw-Hill Ryerson. 2005. ISBN 13: 978-0-07-096047-3 (10:0-07-096047-X). http://www.mcgrawhill.ca

Recommended instructor resources:

- *Prism Math Purple Teacher's Edition (Canadian Edition).* McGraw-Hill Ryerson. 2005. ISBN 007096048-8. http://www.mcgrawhill.ca

The *Prism Math Purple 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.

The purple text is selected for the two Algebra Readiness courses because the content of the purple text is at a slightly higher level than the blue text.

To the Instructor

The *Prism Math Purple 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.

<u>**Recommended Evaluation**</u>

Assigned Exercises	20%
Assignments	30%
Unit Tests	<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: Equations —Suggestions for Teaching, Learning and Assessment

Outcomes	Notes for Teaching and Learning
1.01 Write and simplify algebraic expressions. 1.02 Write and solve equations. 1.03 Solve equations using division. 1.04 Solve equations using multiplication. 1.05 Solve equations using subtraction. 1.06 Solve equations using addition. 1.07 Simplify expressions by combining like terms. 1.08 Solve equations involving two operations. 1.09 Solve word problems using equations. 1.10 Solve word problems using formulas.	• Instructors should ensure that students understand the difference between an algebraic variable and algebraic expression. • Students should understand that the value of an expression changes depending on the value of each variable. To find the value of an expression, students must substitute the variables with their values. • Instructors should explain to students that it is helpful, when substituting values into their variables, to write the values inside parentheses. • An equation is a mathematical statement that says two expressions are equal. An equal sign divides the equation into two parts: the left-hand side (LHS) and the right-hand side (RHS). • To determine if a number is a solution for an equation, substitute the number in the equation and check to see if the result is true; namely, that the LHS = RHS. • Instructors should ensure that students understand the concept of preserving equality when performing operations with equations; for example, when the same operation is done to both sides of an equation, the solution does not change. • Instructors can use concrete models like a balance scale or a see-saw to illustrate the concept of preserving equality. • Instructors can use algebra tiles to concretely model equations. Students that have a more concrete learning style will benefit from such modeling. • Students can be encouraged to draw models representing each equation they are solving. • Students should be encouraged to verify all their solutions. • There are two basic concepts for students to remember when solving an equation: 1) isolate the variable on one side of the equation—LHS is the most common, and 2) do the same operations to both sides in order to keep the equation in balance (preserve equality).

Unit 1: Equations —Suggestions for Teaching, Learning and Assessment

Suggestions for Assessment	Recommended resources that address outcomes.
- Instructors may ask students to complete the *Chapters 3 and 4 Pre-tests* to determine their prior knowledge of equations. - 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 *Teacher's Edition*. 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 *Teacher's Edition*. 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 *Teacher's Edition* (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 *Teacher's Edition*. - 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.	*Prism Math (Purple)*, pages 48 and 62. Answers on the same pages of the *Prism Math (Purple) Teacher's Edition*. *Prism Math (Purple) Teacher's Edition*, pages 265-277.

Unit 2: Ratio, Rate, Proportion—Suggestions for Teaching, Learning and Assessment

	Notes for Teaching and Learning
2.01 Write ratios. 2.02 Identify proportions. 2.03 Solve proportions. 2.04 Solve word problems using proportions. 2.05 Interpret scale diagrams. 2.06 Solve word problems using proportions.	• Instructors need to ensure that students understand the terms "ratios", "rates" and "proportions". • A ratio is a comparison of two sets of like objects. A rate is a comparison of two quantities measured in different units. A proportion expresses the equality of two ratios. • Students should understand that order is important when writing a ratio. The quantity mentioned first is the numerator and the quantity mentioned second is the denominator. Also, a ratio can be written as a fraction, using ___: ___, and in words—"the ratio of girls to boys". • Equivalent ratios can be formed by multiplying each term in the ratio by the same number. Also, equivalent ratios can be formed by dividing each term in the ratio by the same number. • Ensure that students use the cross multiplication method correctly for solving proportions. • Instructors should ensure that students always include the correct units when writing a ratio. • Students should write all answers in simplest form (lowest terms) where possible. • Instructors can explain to students that unit rates and unit costs are when the denominator of a rate is 1. • The unit cost, or cost per unit, is a rate that tells how much you pay for 1 item or 1 unit. It is useful for determining the best buy on items. • Instructors can point out that supermarkets often display the unit price for items. Students can use this information to decide on better buys when grocery shopping. • Instructors should ensure that students understand you can often solve ratio problems by using proportions.

Unit 2: Ratio, Rate, Proportion—Suggestions for Teaching, Learning and Assessment

Suggestions for Assessment	Recommended resources that address outcomes.
- Instructors may ask students to complete the *Chapter 5 Pre-test* to determine their prior knowledge of ratio, rate and proportion. - If a student scores an acceptable grade on the pre-test, it is unnecessary for the student to complete the unit/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(s) 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 *Teacher's Edition*. 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 *Teacher's Edition*. 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 *Teacher's Edition* (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 *Teacher's Edition*. - 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.	*Prism Math (Purple)*, page 72. Answers on the same pages of the *Prism Math (Purple) Teacher's Edition*. *Prism Math (Purple) Teacher's Edition*, pages 265-277.

Unit 3: Triangle Geometry and Square Roots—Suggestions for Teaching, Learning and Assessment

	Notes for Teaching and Learning
3.01 Identify similar triangles by comparing angles. 3.02 Identify similar triangles by comparing sides. 3.03 Calculate a missing side in a similar triangle. 3.04 Solve word problems using similar triangles. 3.05 Calculate squares and square roots. 3.06 Find squares and square roots using a table. 3.07 Solve word problems using the Pythagorean Theorem. 3.08 Calculate the measure of missing sides of similar triangles.	• Instructors should ensure that students clearly understand similar triangles. Two triangles are similar when they have the same shape, but not the same size. Triangles are similar when: 1) corresponding angles are equal, and 2) corresponding sides are proportional. • Ensure that students can correctly identify corresponding sides in similar triangles. Students must also understand how to use a proportion to solve for unknown sides. • Instructors should encourage students to draw and correctly label/name triangles when solving problems with similar triangles. • Students should understand that the square of a number is the number multiplied by itself. • Instructors can show students how to model perfect square numbers using grid paper (graph paper). • The area found when modeling square numbers on grid paper is the square of the sides. The side length is the square root of the area. • Instructors should explain to students the terms "exponent" and "base". • Instructors can ask students to create a perfect squares table containing the squares and related square roots for the numbers 0-15. Students are encouraged to memorize these squares and square roots as they will be encountered again in Level III Mathematics. • Instructors should ensure that students properly understand the Square and Square Roots Table presented in the text. • Instructors may wish to explain to students how to calculate squares and square roots using a calculator by using the x squared and square root keys.

Unit 3: Triangle Geometry and Square Roots —Suggestions for Teaching, Learning and Assessment

Suggestions for Assessment	Recommended resources that address outcomes.
• Instructors may ask students to complete the *Chapter 10 Pre-test* to determine their prior knowledge of triangle geometry and square roots. • If a student scores an acceptable grade on the pre-test, it is unnecessary for the student to complete the unit/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(s) 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 *Teacher's Edition*. 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 *Teacher's Edition*. 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 *Teacher's Edition* (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 *Teacher's Edition*. • 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.	• *Prism Math (Purple)*, page 142. Answers on the same pages of the *Prism Math (Purple) Teacher's Edition*. • *Prism Math (Purple) Teacher's Edition*, pages 265-277.