

Adult Basic Education (ABE)

Level III Mathematics

Mathematics 1101C

Linear Functions/Systems of Linear Equations Curriculum Guide

Student Resource: *Foundations and Pre-calculus Mathematics 10. Pearson. 2010. ISBN-13-978-0-321-62684-4.*

Level III Degree and Technical/Business-Related College Profiles Mathematics Courses (Academic)

Mathematics 1101A: Measurement/Trigonometry/Factors and Products

Mathematics 1101B: Roots and Powers/Relations and Functions

Mathematics 1101C: Linear Functions/Systems of Linear Equations

Mathematics 2101A: Reasoning/Angles and Triangles/Trigonometry

Mathematics 2101B: Radicals/Statistics/Quadratic Functions

Mathematics 2101C: Quadratic Equations/Proportional Reasoning

Mathematics 3101A: Set Theory/Counting Methods/Probability

Mathematics 3101B: Rational Expressions and Equations/Polynomial Functions/Exponential Functions

Mathematics 3101C: Logarithmic Functions/Sinusoidal Functions/Borrowing Money



Contents

General Information	1
Introduction	1
Pre-requisite.....	1
Resources.....	1
Study Guide.....	1
Curriculum Guide	2
Mathematics 1101C Outcomes/Achievement Indicators.....	3
Unit 1: Linear Functions	3
Unit 2: Systems of Linear Equations	5
Recommended Evaluation	Error! Bookmark not defined.
Unit 1: Linear Functions—Suggestions for Teaching and Learning	7
Unit 1: Linear Functions—Suggestions for Teaching and Learning	8
Unit 1: Linear Functions—Suggestions for Assessment.....	9
Unit 2: Systems of Linear Equations—Suggestions for Teaching and Learning.....	10
Unit 2: Systems of Linear Equations—Suggestions for Assessment.....	11

General Information

Introduction

Mathematics 1101C when completed with **Mathematics 1101A and B** is equivalent to the Newfoundland and Labrador senior high school **Mathematics 1201 (Academic)** course.

Pre-requisite

Students must have passed **Mathematics 1101B**.

Resources

The student resource for this course is:

- *Foundations and Pre-calculus Mathematics 10. Pearson. 2010. ISBN-13-978-0-321-62684-4.*

The instructor resources for this course are:

- *Foundations and Pre-calculus Mathematics 10 Teacher Resource. 2010. ISBN-13:978-0-321-62685-1.*
- *Foundations and Pre-calculus Mathematics 10 Teacher Resource CD-ROM*

Instructors may also supplement with other resources at their discretion.

Study Guide

The Study Guide provides the student with Required Work for the course. It guides the student through the course by assigning relevant reading and exercises from the student resource. 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. There is information in the Curriculum Guide applicable to teaching, learning and assessment that is not included in the Study Guide. Instructors should review this information and decide how to use it when teaching students.

Instructors can also exercise professional judgment and make minor alterations to the Required Work in the Study Guide. For example, an instructor may decide that it is unnecessary to assign students all the exercises to complete within each lesson.

Curriculum Guide

The Curriculum Guide includes the specific curriculum outcomes and achievement indicators for the course. The specific curriculum outcomes are listed numerically, and the achievement indicators are listed alphabetically. Suggestions for teaching, learning and assessment are also provided to support student achievement of the outcomes. Some of these suggestions will also be repeated in the curriculum guides for other mathematics courses as appropriate. The curriculum guide also states the pre-requisite for each Level III mathematics course.

Mathematics 1101C Outcomes/Achievement Indicators

Unit 1: Linear Functions

1. Demonstrate an understanding of slope with respect to: rise/run, line segments and lines, rate of change, parallel lines, and perpendicular lines.
 - a) Determine the slope of a line segment by measuring or calculating the rise and run.
 - b) Classify lines in a given set as having positive or negative slopes.
 - c) Explain the meaning of the slope of a horizontal or vertical line.
 - d) Draw a line, given its slope and a point on the line.
 - e) Determine another point on the line, given the slope and a point on the line.
 - f) Explain why the slope of a line can be determined by using any two points on that line.
 - g) Explain, using examples, slope as a rate of change.
 - h) Solve a contextual problem involving slope.
 - i) Generalize and apply a rule for determining whether two lines are parallel or perpendicular.
2. Relate linear relations expressed in: slope-intercept form, general form and slope-point form.
 - a) Express a linear relation in different forms, and compare their graphs.
 - b) Generalize and explain strategies for graphing a linear relation in slope-intercept, general or slope-point form.
 - c) Graph, with and without technology, a linear relation given in slope-intercept, general or slope-point form, and explain the strategy used to create the graph.
 - d) Match a set of linear relations to their graphs.
3. Determine the equation of a linear relation given: a graph, a point and the slope, two points, a point and the equation of a parallel or perpendicular line to solve the problems.
 - a) Determine the slope and y-intercept of a given linear relation from its graph, and write the equation in the form $y = mx + b$.

- b) Write the equation of a linear relation, given its slope and the coordinates of a point on the line, and explain the reasoning.
- c) Graph linear data generated from a context, and write the equation of the resulting line.
- d) Solve a problem, using the equation of a linear relation.
- e) Write the equation of a linear relation, given the coordinates of a point on the line and the equation of a parallel or perpendicular line, and explain the reasoning.
- f) Rewrite a linear relation in either slope-intercept or general form.
- g) Identify equivalent linear relations from a set of linear relations.

Unit 2: Systems of Linear Equations

1. Solve problems that involve systems of linear equations in two variables, graphically and algebraically.
 - a) Model a situation, using a system of linear equations
 - b) Relate a system of linear equations to the context of a problem.
 - c) Explain the meaning of the point of intersection of a system of linear equations.
 - d) Determine and verify the solution of a system of linear equations graphically, with and without technology.
 - e) Solve a problem that involves a system of linear equations.
 - f) Determine and verify the solution of a system of linear equations algebraically.
 - g) Explain a strategy to solve a system of linear equations.
 - h) Explain, using examples, why a system of equations may have no solution, one solution or an infinite number of solutions.

Recommended Evaluation

Written Notes (Including all the Required Work)	10%
Assignments	20%
Tests	20%
Final Exam (entire course)	50%
Total	100%

Instructors have the discretion to make minor changes to this evaluation scheme.

Unit 1: Linear Functions—Suggestions for Teaching and Learning

- Ensure that students understand that the rate of change is the slope of a line.
- Ensure that students can relate the change in the independent variable, x (run), and the change in the dependent variable, y (rise), to the slope.
- Discuss with students real-life applications involving the slope of a line segment; e.g., steepness of a roof, incline on a treadmill, or a wheelchair ramp.
- Discuss with students the connection between the sign of the slope and the direction of the line.
- Ensure students understand why the slope of a horizontal line is 0 and the slope of a vertical line is undefined.
- Encourage students to determine the slope of a line using several pairs of non-consecutive points.
- Ensure students understand how to derive and apply the slope formula.
- Ensure students understand how to use slope to determine whether two lines are parallel, perpendicular or neither.
- Ensure students understand how to use slope to classify geometric shapes; e.g., determine if a quadrilateral is a rectangle by proving that the opposite sides are parallel and that it also contains a right angle.
- Ensure students can determine the equation of vertical, horizontal and oblique lines, and that they can express the linear relation in slope-intercept form, general form and slope-point form.
- Provide students with an opportunity to compare the graph and linear equation. Discuss questions concerning how changes in m and b affect the graph.
- Ensure students are able to graph a linear relation given its slope-intercept form and explain the strategy they used to create the graph. Encourage students to plot the y -intercept first, and then use the slope to generate additional points.
- Ensure students are able to verify that their equation is correct by selecting a point that is on the line and then check to see if it satisfies the equation.
- Ensure students are able to find the y -intercept of a linear equation graphically and algebraically.

Unit 1: Linear Functions—Suggestions for Teaching and Learning

- Ensure students understand how to write the equation of a linear relation in slope-intercept form given the coordinates of two points on a line.
- Ensure students understand how to derive and apply the slope-point form of a linear equation.
- Ensure students also understand how to use technology, such as graphing calculators, to graph a linear equation.
- Ensure that students understand the general form $Ax + By + C = 0$.

Unit 1: Linear Functions—Suggestions for Assessment

- Instructors can use the BLM's on the CD-ROM to further reinforce the unit concepts.
- The BLM's on the CD-ROM can be useful for developing unit tests and the final exam.
- Instructors have discretion to combine the last unit test with the final exam if beneficial to the student.
- Students must pass the final exam with a minimum grade of 50% to receive credit for this course.
- Instructors should encourage students to reflect on the math concepts in this unit to relate to everyday life.
- Instructors should engage students in discussions to verbalize student thinking on the math concepts.
- Instructors should require students to always show complete calculations with correct units when relevant.
- Instructors can use their own professional judgment to design assessment tools (additional exercises, word problems, assignments, reflections, math journals, etc.) to meet individual student needs.

Unit 2: Systems of Linear Equations—Suggestions for Teaching and Learning

- Ensure students understand and define the variables that are being used to represent the unknown quantity.
- Discuss with students that in order to solve a system of linear equations, the number of unknown variables must match the number of equations in the system.
- Ensure that students understand how to solve and verify solutions to systems of linear equations.
- Ensure that students understand that when two lines intersect, the coordinates of the point of intersection is the solution of the linear system.
- Ensure that students understand how to translate a word problem into a system of linear equations and solve the problem graphically or algebraically.
- Although linear systems can be solved graphically or algebraically, encourage students to think about the more efficient method to solve a specific problem.
- Discuss with students why systems of linear equations can have different numbers of solutions.
- Ensure that students understand that linear systems can also have an infinite number of solutions.

Unit 2: Systems of Linear Equations—Suggestions for Assessment

- Instructors can use the BLM's on the CD-ROM to further reinforce the unit concepts.
- The BLM's on the CD-ROM can be useful for developing unit tests and the final exam.
- Instructors have discretion to combine the last unit test with the final exam if beneficial to the student.
- Students must pass the final exam with a minimum grade of 50% to receive credit for this course.
- Instructors should encourage students to reflect on the math concepts in this unit to relate to everyday life.
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