

Atlantic Canada Elementary Mathematics Program
Correlation of the UNDERSTANDING MATH programs
by Neufeld Learning Systems
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Grade 9

I. Number Sense

A. Students will demonstrate number sense and apply number-theory concepts.

A1. Students should investigate problems involving square root and principal square root.

Understanding Exponents

Topic 5: Square Roots

- Squaring Numbers
- Square Roots
- Radical Signs
- Square Roots of Negative Numbers
- Example Questions
 1. Radicals First
 2. The 4 Equations
 3. Lawn Question
 4. Make a Square
- Practice Questions; Topic Test

A2. Students should be able to graph and write in symbols and in words the solution set for equations and inequalities involving integers and other real numbers.

Understanding Equations

Topic 7: Solving Inequalities

- Comparing Integers
- The Integer Line
- Examples 1,2
- Explanation
- Example 3, 4
- Inequalities
- What are They?
- Inequality vs Equation
- Summary of Relationships
- Inequality on the Numberline
- Examples 1 through 4
- Solving Inequalities
- Examples 1 through 6
- Solving Compound Inequalities
- Examples 1,2
- Graphing Linear Inequalities in Two Variables
- Concepts 1,2
- Examples 1,2,3
- Solving Systems of Linear Inequalities by Graphing
- Examples 1,2
- Linear Programming
- What is It?
- A fund Raising Example
- The Objective Function
- Practice Questions; Topic Test

- A3.** Students should demonstrate an understanding of the meaning and uses of irrational numbers.
- A4.** Students should be able to interrelate subsets of the set of real numbers.
- A5.** Students should be able to compare and order real numbers.
- A6.** Students should represent problem situations using matrices.

B. *Students will demonstrate operations sense and apply operation principles and procedures in both numeric and algebraic situations.*

- B1.** Students should be able to model, solve and create problems involving real numbers.
- B2.** Students should be able to add, subtract, multiply, and divide rational numbers in fractional and decimal forms using the most appropriate methods.

Understanding Fractions

Topic 7: Adding Fractions

Pattern Blocks

Hexagon 1, Hexagon 2, Hexagon3, Summary

Fraction Strips - Concepts 1,2

Percent Strips - Examples 1, 2

Decimal Strips - Examples 1, 2

The Clock - Examples 1, 2

Adding Fractions on a Number Line

Examples 1, 2, 3

The Lowest Common Denominator

Examples 1, 2

Word Problems

Alexander's Friends, Eating Candy, Goal Scoring, Walk

Fraction Card Game

Practice Questions; Topic Test

Topic 8: Subtracting Fractions

Pattern blocks

Hexagon 1, Hexagon 2, Hexagon 3, Summary

The Clock - Examples 1, 2

Fractions Strips - Concepts 1, 2

Percent Strips - Examples 1, 2

Decimal Strips - Examples 1, 2

Subtracting Fractions on a Number Line

Examples 1, 2, 3

The Lowest Common Denominator

Examples 1, 2

Word Problems

Petro and Alex Race, Wash Cars, Planting a Garden

Practice Questions; Topic Test

Topic 9: Multiplying Fractions

Pattern Blocks

Hexagon 1, Hexagon 2, Hexagon 3, Summary

Fractions Strips – Concepts 1,2

Word Problems

Boris' Money, Maria's Trip

A Summary

The Meaning of "OF"

Order in Multiplying

Examples 1,2

Multiplying Fractions with Large Numbers

Examples 1, 2
 Multiplying Many Fractions
 Examples 1, 2
 Practice Questions; Topic Test
Topic 10. Dividing Fractions
 Understanding Division
 Examples with Diagrams
 Soda Pop, Ice Cream, Shape 1, Shape 2
 Patterns from Examples
 Another Explanation
 Example 1,2
 Examples Without Diagrams
 Numerical Examples 1,2; Central High School
 Practice Questions; Topic Test

B3. Students should apply the order of operations in rational number computations.

Understanding Fractions

Topic 11. Order of Operations

Order in Addition
 Trial 1, Trial 2
 Conclusion
 Examples 1,2
 Order in Multiplication
 Trial 1, Trial 2
 Conclusion
 Examples 1,2
 Why Use Order of Operations?
 BEDMAS
 Examples Questions
 Examples 1,2,3
 Practice Questions; Topic Test

B4. Students should demonstrate an understanding of and apply the exponent laws for integral exponents.

Understanding Exponents

Topic 3. The Exponent Rules

In This Topic
 Multiplication of Powers with the Same Bases
 Expanding the Exponents – The Pattern
 In General
 Division of Powers with the Same Base
 Expanding the Exponents – The Pattern
 In General
 Raising a Power to an Exponent
 Expanding the Exponents – The Pattern
 In General
 A Power with Exponent 0
 Expanding the Exponents – The Pattern
 In General
 A Power with a NEGATIVE Exponent
 Method 1: Explanation with b
 Method 2: Explanation with k
 Method 3: Bacteria Doubling
 Summary
 Summary of Exponent Rules
 Powers with Rational Bases

Example 1; Example 2; Example 3
In General
Examples Questions
Examples 1 through 9
Practice Questions; Topic Test

B5. Students should be able to model, solve, and create problems involving numbers expressed in scientific notation.

Understanding Exponents

Topic 4. Scientific Notation

Why Use Scientific Notation?
Scientific Notation for Large Numbers
Introduction
Chart
The Rule
The Steps
Examples
1. Number Question
2. Park Question
3. Sun Question
4. Kitchen Question
Practice Questions; Topic Test

B6. Students should be able to judge the reasonableness of results in problem situations involving square roots, rational numbers, and numbers written in scientific notation.

Understanding Exponents

Topic 5. Square Roots

Example Questions
5. Radicals First
6. The 4 Equations
7. Lawn Question
8. Make a Square
Practice Questions; Topic Test

Understanding Fractions

Topic 7: Adding Fractions

Word Problems
Alexander's Friends, Eating Candy, Goal Scoring, Walk
Fraction Card Game
Practice Questions; Topic Test

Topic 8: Subtracting Fractions

Word Problems
Petro and Alex Race, Wash Cars, Planting a Garden
Practice Questions; Topic Test

Topic 9: Multiplying Fractions

Practice Questions; Topic Test

Topic 10. Dividing Fractions

Practice Questions; Topic Test

Understanding Exponents

Topic 4. Scientific Notation

Examples
5. Number Question
6. Park Question
7. Sun Question
8. Kitchen Question
Practice Questions; Topic Test

- B7.** Students should be able to model, solve, and create problems involving the matrix operations of addition, subtraction, and scalar multiplication.
- B8.** Students should be able to add and subtract polynomial expressions symbolically to solve problems.
- B9.** Students should be able to find products of two monomials, a monomial and a polynomial, and two binomials concretely, pictorially, and symbolically.
- B10.** Students should be able to find quotients of polynomials with monomial divisors.
- B11.** Students should be able to evaluate polynomial expressions.

Understanding Algebra

Topic 4: Adding Expressions

Adding Expressions with X and Y Tiles
 Examples 1, 2, 3
 Adding Expressions with X-Squared Tiles
 Examples 1, 2, 3
 Adding Expressions without Tiles
 Examples 1, 2
 Practice Questions with Tiles
 Practice Questions without Tiles
 Topic Test

Topic 5. Subtracting Expressions

Subtracting Expressions with X and Y Tiles
 Concept; Examples 1, 2
 Subtracting Expressions with X-Squared Tiles
 Examples 1, 2
 Subtracting Expressions without Tiles
 Practice Questions with Tiles
 Practice Questions without Tiles
 Topic Test

Topic 6. Multiplying Expressions

Recall Tile Concepts
 Multiplying Monomials
 Like Terms, With Tiles, Without Tiles
 Multiplying Monomials and Polynomials
 With Tiles .. Examples 1, 2, 3, 4; Without Tiles
 Pattern
 Examples – True or False: Examples 1,2,3
 Practice Questions; Topic Test

Topic 8. Dividing Expressions

Dividing a Monomial by a Monomial: Examples 1, 2, 3, 4
 Dividing a Polynomial by a Monomial: Examples 1, 2, 3; Summary
 Dividing a Polynomial by a Binomial
 Example 1 .. Method 1; Example 1 .. Method 2 .. Long Division
 Example 2
 Example 3 .. Method 1; Example 3 .. Method 2 .. Long Division
 Example 4 .. Method 1; Example 4 .. Method 2 .. Long Division
 Combination Questions; Examples 1, 2, 3, 4
 Practice Questions; Topic Test

B12. Students should be able to factor algebraic expressions with common monomial factors, concretely, pictorially, and symbolically.

Understanding Algebra

Topic 7. Factoring Expressions

Our Problem

Common Factoring

With Tiles: Examples 1,2

Without Tiles

GCF; Examples 1,2

Factoring Trinomials

With Tiles – Examples 1,2

The Pattern

Without Tiles – Examples 1,2,3,4

Difference of Squares – Examples 1,2,3,4

Factoring by Grouping – Concept – Examples 1 through 5

Summary – Examples 1,2,3,4

Practice Questions; Topic Test

B13. Students should demonstrate an understanding of the applicability of commutative, associative, distributive, identity, and inverse properties to operations involving algebraic expressions.

B14. Students should be able to select and use appropriate strategies in problem situations.

See “Practice Questions” sections under each Understanding Algebra Topic

II. Patterns and Relations

C. *Students will explore, recognize, represent, and apply patterns and relationships, both informally and formally.*

C1. Students should be able to represent patterns and relationships in a variety of formats and use these representations to predict and justify unknown values.

Understanding Graphing

Topic 5: Relations, Equations & Functions

In This Topic

Relations

What is a Relation?

Domain and Range

Examples 1 through 5

Functions

What is a Function?

Examples 1,2,3

Vertical Line Test

Examples 1,2,3

Function Notation

Examples 1,2,3

Patterns to Words to Equations

Examples 1,2,3,4

Practice Questions & Topic Test

C2. Students should be able to interpret graphs that represent linear and non-linear data.

Understanding Graphing

Topic 6. Linear Relations

In This Topic

What is a Linear Relation?

Graphs of Linear Relations
Concept; Examples
The Taxi Example – Setup Equation – Graph Equation
The Elastic Example – Setup Equation – Graph Equation
Lightning Example– Setup Equation – Graph Equation
Basketball Example– Setup Equation – Graph Equation
Line of Best Fit – Examples 1,2
Practice Questions; Topic Test

- C3.** Students should be able to construct and analyze tables and graphs to describe how changes in one quantity affect a related quantity.
- C4.** Students should be able to determine the equations of lines by obtaining their slopes and y-intercepts from graphs and sketch graphs of equations using y-intercepts and slopes.

Understanding Graphing

Topic 8: Equations of a Straight Line

Graph $y=mx+b$
Examples 1,2,3,4
Patterns to Summary
Examples 5,6,7
Slope - y- Intercept Equation
Concept
Examples 1, 2, 3, 4
Parallel and Perpendicular Lines
Concepts 1, 2
Examples 1,2,3,4
Slope - Point Form of the Equation
Examples 1, 2
Special Cases: Ex 1 – Zero Slope; Ex 2 - Undefined
Example to Summarize
Word Problems and Applications
The Taxi – Case 1 \$ 2: Find Eq, Graph Eq, Interpret Eq
Summary
The Walker; Basketball; Food
Point of Intersection of 2 Lines: Examples 1,2
Practice Questions; Topic Test

- C5.** Students should be able to explain the connections among different representations of patterns and relationships.
- C6.** Students should be able to solve single-variable equations algebraically and verify the solutions.

Understanding Equations

Topic 4. Solving Multi-Step Equations

Our Problem
Concepts – 1 Example With Tiles
Concepts – 2 Examples Without Tiles
Example 1,2,3,4,5
Summary
Practice Questions; Topic Test

- C7.** Students should be able to solve first-degree single-variable inequalities algebraically, verify the solutions, and display them on number lines.

Understanding Equations

Topic 7: Solving Inequalities

Comparing Integers

The Integer Line
 Examples 1,2
 Explanation
 Example 3, 4
 Inequalities
 What are They?
 Inequality vs Equation
 Summary of Relationships
 Inequality on the Numberline
 Examples 1through 4
 Solving Inequalities
 Examples 1 through 6
 Solving Compound Inequalities
 Examples 1,2
 Graphing Linear Inequalities in Two Variables
 Concepts 1,2
 Examples 1,2,3
 Solving Systems of Linear Inequalities by Graphing
 Examples 1,2
 Linear Programming
 What is It?
 A fund Raising Example
 The Objective Function
 Practice Questions; Topic Test

C8. Students should be able to solve and create problems involving linear equations and inequalities.

Understanding Equations

Topic 6. Solving Linear Equations

In This Topic
 The Meaning of a Linear System
 The Meaning of Solving a Linear System
 Solve a Linear System by Graphing
 Examples 1,2 – Intersecting Lines
 Examples 3,4 – Intersecting Lines involving Fractions
 Example 5 – Parallel Lines
 Example 6 – Coincidental Lines
 Solve a Linear System by Substitution
 Examples 1,2 – Intersecting Lines
 Examples 3,4 – Intersecting Lines involving Fractions
 Example 5 – Parallel Lines
 Example 6 – Coincidental Lines
 Solve a Linear System by Elimination
 Examples 1,2 – Intersecting Lines
 Examples 3,4 – Intersecting Lines involving Fractions
 Example 5 – Parallel Lines
 Example 6 – Coincidental Lines
 Solve a Linear System by Comparison
 Examples 1,2 – Intersecting Lines
 Examples 3,4 – Intersecting Lines involving Fractions
 Example 5 – Parallel Lines
 Example 6 – Coincidental Lines
 Solve Problems Using Linear Systems
 Example 1; Beginning a Question; Draw a Graph
 Example 2; Beginning a Question; Draw Graph
 Practice Questions; Topic Test

Topic 7: Solving Inequalities

Comparing Integers
The Integer Line
Examples 1,2
Explanation
Example 3, 4
Inequalities
What are They?
Inequality vs Equation
Summary of Relationships
Inequality on the Numberline
Examples 1 through 4
Solving Inequalities
Examples 1 through 6
Solving Compound Inequalities
Examples 1,2
Graphing Linear Inequalities in Two Variables
Concepts 1,2
Examples 1,2,3
Solving Systems of Linear Inequalities by Graphing
Examples 1,2
Linear Programming
What is It?
A fund Raising Example
The Objective Function
Practice Questions; Topic Test

III. Shape and Space: Measurement

D. *Students will demonstrate an understanding of and apply concepts and skills associated with measurement*

D1. **Students should be able to apply rates, other ratios, and proportions in indirect measurement problems, with particular focus on slope.**

Understanding Measurement and Geometry

Topic 9. Ratios for Areas and Volumes

Ratios for Areas and Volumes
Introduction
Area Ratios
Volume Ratios
Practice Questions; Topic Test

Understanding Graphing

Topic 7: Slope of a line

In this Topic
Introductions to Slope: When Driving; A Ski Slope; Slope of Roof
Slope: Steepness Factor; Definition
Introductory Examples 1,2,3,4
Formula
Parallel Lines: Examples 1,2,3
Perpendicular Lines: Examples 1,2,3
Positive and Negative Slopes: Examples 1,2,3,4; Pattern
Special Slopes: Examples 1,2,3,4; Pattern
Sketch Line given Point and Slope: Examples 1,2
Slopes of Parallel Lines: Examples 1,2; Summary; Examples 3,4
Slopes of Perpendicular Lines: Examples 1,2,3; Pattern
Practice Questions; Topic Test

D2. Students should be able to solve measurement problems involving conversion among SI units.

Understanding Measurement and Geometry

Topic 1. An Introduction to Measurement

Converting Between Metric Units

My Body; Rudy's Run

Practice Questions; Topic Test

D3. Students should be able to relate the volumes of pyramids and cones to the volumes of corresponding prisms and cylinders.

Understanding Measurement and Geometry

Topic 4: Solids-Volume and Surface Area

Volume of a Solid

The Concept

Volume of a Prism: Example 1, Example 2

Volume of a Cylinder

Volume of a Pyramid

Volume of a Cone

Summary

Practice Questions & Topic Test

D4. Students should be able to estimate, measure, and calculate volumes and surface areas of pyramids, cones and spheres and apply these measures.

Understanding Measurement and Geometry

Topic 4: Solids-Volume and Surface Area

Surface Area of a Solid

The Concept

Surface Area of a Pyramid

Surface Area of a Cylinder

Surface Area of a Sphere

Volume of a Solid

The Concept

Volume of a Prism: Example 1, Example 2

Volume of a Cylinder

Volume of a Pyramid

Volume of a Cone

Volume of a Sphere

Summary

Practice Questions & Topic Test

D5. Students should demonstrate an understanding of and apply ratios within similar triangles.

Understanding Measurement and Geometry

Topic 6: Angles and Polygons

Angles in Triangles

Exploration

An Explanation

Exterior Angles; Example

Practice Questions; Topic Test

IV. Shape and Space: Geometry

E. Students will demonstrate spatial sense and apply geometric concepts, properties, and relationships.

- E1.** Students should investigate and demonstrate an understanding of the minimum sufficient conditions to produce unique triangles.
- E2.** Students should investigate and demonstrate an understanding of the properties of and the minimum sufficient conditions to guarantee congruent triangles.
- E3.** Students should be able to make informal deductions using congruent triangle and angle properties.
- E4.** Students should demonstrate an understanding of and apply the properties of similar triangles.
- E5.** Students should be able to relate congruence and similarity of triangles.

Understanding Measurement and Geometry

Topic 6: Angles and Polygons

Angles in Triangles
Exploration
An Explanation
Exterior Angles; Example
Practice Questions; Topic Test

- E6.** Students should be able to use mapping notation to represent translations, reflections, rotations, and dilatations of geometric figures and interpret such notations.
- E7.** Students should be able to analyze and represent transformations and combinations of transformations using mapping notation
- E8.** Students should investigate, determine, and apply the effects of transformations of geometric figures on congruence, similarity, and orientation.

Understanding Graphing

Topic 4: Transformations

What is a Transformation?
Introduction to Common Transformations
Translations
Object to Image; We Say, We Write; Translations Mapping Rule
Examples
Reflections
Object to Image; We Say, We Write; Reflection Mapping Rule
Rotations
Object to Image; We Say, We Write; Rotation Mapping Rule
Examples
Dilatations
Object to Image; We Say, We Write; Dilatation Mapping Rule
Examples
Practice Questions; Topic Test

V. Data Management and Probability

F. Students will solve problems involving the collection, display, and analysis of data.

- F1.** Students should be able to determine the strength of the relationship in scatterplots.

Understanding Graphing

Topic 2: Understanding Statistics

Scatter Plot: Example 1,2

F2. Students should be able to sketch lines of best fit and determine their equations.

Understanding Graphing

Topic 6. Linear Relations

Line of Best Fit – Examples 1,2

F3. Students should be able to sketch curves of best fit for relationships that appear to be non-linear.

F4. Students should be able to select, defend, and use the most appropriate methods for displaying data.

F5. Students should be able to draw inferences and make predictions based on data analysis and data displays.

Understanding Graphing

Topic 2: Understanding Statistics

Data .. What is it?

An Introduction .. Examples of Data

Examples 1 through 6

A Summary: Examples

Statistics .. What is it?

Collecting Data

Presenting Data

Stem and Leaf Diagram: Example 1, 2

Bar Graph: Example 1,2

Histogram: Example 1,2

Line Graph : Example 1,2

Circle or Pie Graphs : Example 1,2

Scatter Plot: Example 1,2

Measure of Central Tendency

Introduction; The Mean Average; The Median Average; The Mode

Summary

Box and Whisker Plot

Concepts; Examples 1,2

Misleading Statistics

Examples 1,2

Practice Questions; Topic Test

F6. Students should demonstrate an understanding of the role of data management in society.

F7. Students should be able to evaluate arguments and interpretations that are based on data analysis.

VI. Data Management and Probability: Probability

G. Students will represent and solve problems involving uncertainty.

G1. Students should be able to make predictions of, and conduct experiments and simulations to determine, probabilities involving dependent and independent events.

Understanding Probability

Topic 7: Independent Events

What Are They?

Examples:

1. Toss 2 Coins

2. Replacing Marbles

Probability

1. Coin and Die

2. Replacing Marbles

3. Letter Tiles
Patterns & Summary
1. Summary
2. Spinner
3. Cards
Practice Questions; Topic Test

Topic 8. Dependent Events

What Are They?
Independent Events
Dependent Events
Examples:
1. Keep the First Marble
2. Choose the Flowers
Probability
1. Keep the First Ball
2. Keep the First Tile
3. Plant the first Flower
Patterns & Summary
1. Summary
2. Money
3. Socks
4. Names
Practice Questions; Topic Test

G2. Students should be able to determine theoretical probabilities of compound events.

G3. Students should be able to compare experimental and theoretical probabilities.

Understanding Probability

Topic 3. Dice Probabilities

Roll One Die
Your Experiment
Computer's Experiment
Theoretical Probability
Patterns
Summary
Roll Two Dice
Your Experiment
Computer's Experiment
Theoretical Probability
Patterns
Summary
Practice Questions; Topic Test

G4. Students should be able to recognize and explain why decisions based on probabilities may be combinations of theoretical calculations, experimental results, and subjective judgments.