

Developmental Math—An Open Program

Version 1.0

Developed by: Monterey Institute for Technology and Education, with generous funding from The Bill and Melinda Gates Foundation

Audience: Community College and High School

Why NROC?

NROC's high-quality courses are **media-rich**, **adaptable** and **affordable**, a combination of features not readily available from commercial providers. With rich content mapped to state and federal standards, NROC courses can be used with or without a textbook to enhance online, blended and face-to-face learning environments.

Teaching with the Power of Digital Media



Program Description

NROC's Developmental Math Program is designed to be used with students striving to meet college entrance requirements. This multi-modal program allows learners to create their own pace and path through developmental mathematics.

The program has pre- and post-assessment features that help direct students to the content needed to close their proficiency gaps, and offers video, audio, interactive simulations, puzzles, and other instructional approaches that engage a variety of learning styles and attitudes.

Typically organized, this program offers flexible modules which address concepts and skills taught in the traditional developmental math sequence of Arithmetic, Beginning and Intermediate Algebra. In keeping with AMATYC's proposal for a new developmental mathematics, basic Geometry and Statistics topics have been included.

For more details about this program, visit NROCmath.org.

Media Rich and Diverse Components Help Students Gain Mastery

- Warm-ups: a series of problems to assess prior knowledge and recommend review.
- Presentations: a rich-media presentation of the topic concept with illustrated examples.
- Worked Examples: narrated step-by-step presentations of a problem solved.
- Problems: symbolic and word, designed in adaptive sets, giving students practice and feedback.
- Text: comprehensive coverage of the topic with additional explanations and examples.
- Review: self-test understanding prior to moving to the next topic.
- Projects: collaborative assignment in the project-based learning tradition to solve real-world problems.
- Tutoring Simulation: offers students directed guidance in problem solving.
- Puzzles: give learners a chance to practice what they have learned in a no-fault, fun environment.
- Assessment: formative and summative assessment designed to guide a learner's progress.

Table of Contents

Unit 1: Whole Numbers

Introduction to Whole Numbers

Place Value and Names for Whole Numbers
Rounding Whole Numbers
Comparing Whole Numbers

Adding and Subtracting Whole Numbers

Adding Whole Numbers and Applications
Subtracting Whole Numbers and Applications
Estimation

Multiplying and Dividing Whole Numbers

Multiplying Whole Numbers and Applications
Dividing Whole Numbers and Applications

Properties of Whole Numbers

Properties of Laws and Whole Numbers
The Distributive Property

Exponents, Square Roots and Order of Operations

Understanding Exponents and Square Roots
Order of Operations

Unit 2: Fractions and Mixed Numbers

Introduction to Fractions and Mixed Numbers

Introduction to Fractions and Mixed Numbers
Proper and Improper Fractions
Factors and Primes
Simplifying Fractions
Comparing Fractions

Multiplying and Dividing Fractions and Mixed Numbers

Multiplying Fractions and Mixed Numbers
Dividing Fractions and Mixed Numbers

Adding and Subtracting Fractions and Mixed Numbers

Adding Fractions and Mixed Numbers
Subtracting Fractions and Mixed Numbers

Unit 3: Decimals

Introduction to Decimals

Decimals and Fractions
Ordering and Rounding Decimals

Decimal Operations

Adding and Subtracting Decimals
Multiplying and Dividing Decimals
Estimation with Decimals

Unit 4: Ratios, Rates and Proportions

Ratio and Rates

Simplifying Ratios and Rates

Proportions

Understanding proportions

Unit 5: Percents

Introduction to Percents

Convert Percents, Decimals and Fractions

Solving Percent Problems

Solve Percent Problems

Unit 6: Measurement

U.S. Customary Units of Measurement

Length
Weight
Capacity

Metric Units of Measurement

The Metric System
Converting within the Metric System
Using Metric Conversions to Solve Problems

Temperature

Temperature Scales

Unit 7: Geometry

Basic Geometric Concepts and Figures

Lines and Angles
Plane Figures and Solids

Perimeter, Circumference, Area, and Volume of Geometric Figures

Perimeter and Circumference
Area
Volume
Triangles
Similar Triangles

Unit 8: Statistics

Statistical Graphs and Tables

Reading, Interpreting and Constructing Graphs

Measures of Center

Mean, Median and Mode
Variation and spread

Additional Graphs

Graphical Representations
Scatter Plots

Probability

Calculating Probabilities

Unit 9: Real Numbers

Introduction to Real Numbers

The Real Number Line

Operations with Real Numbers

Addition of Real Numbers
Subtraction of Real Numbers
Multiplication and Division of Real Numbers

Properties of Real Numbers

Identity Properties
Associative, Commutative and Distributive Laws

Simplifying Expressions

Order of Operations

Unit 10: Solving Equations and Inequalities

Solving Equations

Addition and Multiplication Principle
Using the Principles Together
Special Cases and Applications
Formulas

Solving Inequalities

Addition and Multiplication Principle
Using the Principles Together

Compound Inequalities and Absolute Value

Compound Inequalities
Absolute Value Equations and Inequalities

Unit 11: Exponents and Polynomials

Integer Exponents

Exponential Notation
Simplify by using the Product, Quotient and Power Rules
Products and Quotients Raised to Powers
Scientific Notation

Polynomials with Single Variables

Introduction to Single Variable Polynomials
Adding and Subtracting Polynomials
Multiplying Polynomials
Multiplying Special Cases
Dividing by a monomial
Dividing by binomials and polynomials

Polynomials with Several Variables

Introduction
Operations with Polynomials

Unit 12: Factoring

Introduction to Factoring

Greatest Common Factor

Factoring Polynomials

Factor Trinomials
Special Cases: Squares
Special Cases: Cubes

Solving Quadratic Equations

Solve Quadratic Equations by Factoring

Unit 13: Graphing

Graphs and Applications

Introduction
Graphing Linear equations
Graphing Inequalities

Slope and Writing the Equation of a Line

Finding the slope of a line.
Writing the equation of a line

Unit 14: Systems of Equations and Inequalities

Graphing Systems of Equations and Inequalities

Graphing Systems of Equations
Graphing Systems of Inequalities

Algebraic Methods to Solve Systems of Equations

Addition/Elimination Method
Substitution Method

Systems of Equations in Three or More Variables

Addition/Elimination Method

Unit 15: Rational Expressions

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Multiplying and Dividing Rational Expressions
Adding and Subtracting Rational Expressions
Complex Rational Expressions/Complex Fractions

Rational Equations

Solving Rational Equations and Applications

Formulas and Variation

Rational Formulas
Variation

Unit 16: Radical Expressions and Quadratic Equations

Introduction to Roots and Rational Exponents

Roots
Rational Exponents

Operations with Radicals

Multiplying and Dividing Radical Expressions (single terms)
Adding and Subtracting Radicals
Multiplication of radicals (more than one term)
Rationalizing Denominators

Radical Equations

Solving Radical Equations

Complex Numbers

Introduction
Operations with Complex Numbers

Solving Quadratic Equations

Square Roots and Completing the Square
The Quadratic Formula

Unit 17: Functions

Introduction

Define key vocabulary
Identify Functions

Using Functions

Find values of a function
Domain and range

Graphing functions

Graphing types of functions

Operations with Functions

Arithmetic operations with functions

Unit 18: Exponential and Logarithmic Functions

Exponential Functions

Introduction to Exponential Functions

Logarithmic Functions

Introduction to Logarithmic Functions
Properties of Logarithmic Functions

Natural Logarithms

Introduction to Natural Logarithms

Logarithmic and Exponential Equations

Solving equations
Mathematical Modeling with Exponential and Logarithmic Functions