

Correlation of the 9 UNDERSTANDING MATH programs  
by Neufeld Learning Systems  
with  
2002 General Equivalency Diploma

Strand 1: Number, Numbers Sense and Operations

Weight: 20-30%

**Students should demonstrate the ability to represent and use numbers in a variety of equivalent forms (integer, fractions, decimal, percent, exponential, and scientific notation) in real-world and mathematical problem situations.**

**Students should demonstrate the ability to use number sense for whole numbers, fractions, decimals, integers, and rational numbers.**

**Understanding Fractions**

Topic 3. Equivalent Fractions

Introduction .. Square, Triangle  
 Pattern Blocks .. Hexagon 1, Hexagon 2  
 Fraction Strips - Concepts 1,2  
 The Clock - Introduction 1, Introduction 2, Examples  
 Equivalent Fractions on a Number Line  
 Comparison of Fractions  
 Equivalent Fractions in a Multiplication Table  
 One  
 Equivalent Fractions ... The Pattern  
 Example Questions - Examples 1,2,3  
 Greatest Common Factor - 12 and 18; 30 and 40; 70 and 42  
 Simplifying Fractions .. Method 1, Method 2  
 Memory Game  
 Practice Questions, Topic Test

Topic 4. Percent ... A Special Fraction

Percent means ...  
 Introductory Examples - School Example, Money Example  
 Percent Strips .. Concepts 1,2,3  
 Examples .. Barrel, Red Squares, Blue Squares, Green Blobs, Ruler  
 Making Sense of Percent - Weather, Squares, Election, Photocopier, Car Trip  
 Estimating Percent  
 Practice Questions, Topic Test

Topic 5. Percent .. Fraction .. Decimal

Expressing a Percent as a Fraction  
 Introduction without Graphics  
 Introduction with Graphics  
 Expressing a Fraction in Simplest Form  
 Examples 1,2,3,4  
 The Watering Can  
 Expressing a Percent as a Decimal  
 Introduction, Examples 1,2,3  
 Number Line #1  
 Decimal Strips - Concepts 1,2,3

Expressing a Decimal as a Percent

Examples 1,2,3

Summary and Patterns

% Nitrogen in the Air

Batting Averages

Expressing a Fraction as a Percent

An Example, Method 1, Method 2, Lightning Example

Number Line #2

Chart

Practice Questions, Topic Test

#### Topic 7. Adding Fractions

Pattern Blocks .. Hexagon1, Hexagon2, 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 and 2

Word Problems .. Alexander's Friends, Eating Candy, Goal Scoring, Walk

Fraction Card Game

Practice Questions, Topic Test

#### Topic 8. Subtracting Fractions

Pattern Blocks .. Hexagon1, Hexagon2, Hexagon3, Summary

The Clock .. Examples 1, 2

Fraction 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 .. Hexagon1, Hexagon2, Hexagon3

Fraction 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 .. Examples 1,2

Examples Without Diagrams .. Numerical Examples 1, 2; Central High School

Practice Questions, Topic Test

#### Topic 12. Improper Fractions and Mixed Numbers

The Concept ... Packages

Improper Fractions and Mixed Numbers .. What are they?

Introductory Problem

Mixed to Improper

Method 1 - Example 1, Example 2

Method 2 - Example 1, Example 2

Practice Questions

Improper to Mixed

Examples 1, 2

Practice Questions

Adding Mixed Numbers

Subtracting Mixed Numbers

Multiplying Mixed Numbers

Dividing Mixed Numbers

Fraction Card Game

Practice Questions, Topic Test

### Topic 13. Fractions and Decimals

Compare Fractions ... Method 1, Method 2

Fractions to Decimals

Repeating Decimals

Decimals to Fractions

Place Value, Examples 1,2,3,4,5

My Day

Fraction to Decimal .. Division Table

Practice Questions, Topic Test

### Understanding Integers

#### Topic 1. The Meaning of Integers

The Integer Line

Opposite Integers .. Examples 1,2

Absolute Value

Example Questions .. Example 1,2,3,4,5,6

Practice Questions, Topic Test

#### Topic 2. Adding Integers

Elevators .. An Introduction to Addition .. Examples 1,2,3,4 .. Summary Using Elevators

Markers .. An Introduction to Addition .. Opposites .. Examples 1,2,3,4

Going For a Walk .. An Introduction to Addition .. Examples 1,2,3

Numberline .. An Introduction to Addition .. Examples 1,2,3 .. Summary Using a Numberline

Writing Positive Integers .. Examples 1,2,3

Word Problems .. Temperature, Money, Car

Practice Questions, Topic Test

#### Topic 3. Subtracting Integers

Markers .. An Introduction to Subtraction

Markers Help Us Understand, Review Opposites, Examples 1 to 8, The Pattern

Elevators .. An Introduction to Subtraction .. Examples 1 - 4, Summary Using Elevators

Summary .. Add the Opposite

Example Questions

Example 1 .. with brackets

Example 2 .. with brackets

Example 3 .. Meaning of  $2 - 5$

Example 4 .. Meaning of  $-7 - 3$

Example 5 .. Meaning of  $-7 - 9 - 18$

Example 6 .. Meaning of  $-4 - 9 + 2 - 8$

Summary from Examples 3 to 6

Going for a Walk .. Preliminary, The Walk, David's Trip Part 1, David's Trip Part 2, Summary

Word Problems .. The Sailboat, The Bank

Practice Questions, Topic Test

#### Topic 4. Multiplying Integers

The Multiplication Table

Order in Multiplication  
 Summary #1: Signs  
 Negative X Negative ... Note Patterns  
 Summary #2: Signs  
 Example Questions  
 Word Problems  
 Practice Questions, Topic Test

**Topic 5. Dividing Integers**

Division to Multiplication  
 The Division Table  
 The Inverse of Multiplication  
 Summary #1... Signs  
 Summary #2... Signs  
 Example Questions  
 Word Problems  
 Practice Questions, Topic Test

**Topic 6. Order of Operations**

Order in Addition  
 Order in Multiplication  
 Why use Order of Operations?  
 BEDMAS  
 Example Questions  
 Word Problems  
 Practice Questions, Topic Test

**Understanding Exponents**

**Topic 1. The Meaning of Exponents**

Introduction... The Money Game  
 Introduction... Bacteria Doubling  
 Introduction... Paper Folding  
 Exponents, Powers, Bases  
 Powerful Explosions  
 Introductory Examples  
 Examples - Substitution  
 Examples - Order of Operations  
 Practice Questions, Topic Test

**Topic 2. Exponents in Formulas**

The Power Key  
 An Introduction to Formulas  
 Area Formulas Involving Exponents  
 Volume Formulas Involving Exponents  
 Examples with Area Formulas  
 Examples with Volume Formulas  
 Practice Questions, Topic Test

**Topic 3. The Exponent Rules**

Multiplication of Powers with the Same Base  
 Division of Powers with the Same Base  
 Raising a Power to an Exponent  
 Raising a Product to an Exponent  
 A Power with Exponent 0  
 A Power with a Negative Exponent  
 Summary of Exponent Rules  
 Powers with Rational Bases  
 Example Questions

Practice Questions, Topic Test

Topic 4. Scientific Notation

Why Use Scientific Notation?

Scientific Notation for Large Numbers

Scientific Notation for Small Numbers

Examples

Practice Questions, Topic Test

**Students should demonstrate the ability to analyze, explain and apply ratios, proportions, and percents in a wide variety of situations.**

Understanding Fractions

Topic 6. Ratios and Proportions

Ratios in the News

What is a Ratio?

Ex 1 - Fraction Strips, Ex 2 - Balls, Ex 3 - Students, Ex 4 - Gears

Writing Ratios

Concept, Examples 1,2,3,4

What is a Proportion?

Proportions: Ex1, Ex2..Lemonade, Ex3..Marbles, Ex4..Scale Drawing

Ratios and Your Body - Golden Ratios, Measuring Your Body

Practice Questions, Topic Test

Understanding Percent

Topic 5. Percent of a Number

The Concept

Examples - 1. Money Example, 2. Service Charge, 3. Bird Example,

4. Marathon Race, 5. Freezing, 6. Pie Chart

The Bouncing Ball

Grades... What if? Calculate. Pass or Fail?

Practice Questions, Topic Test

Topic 6. Problems Involving Percent

Steps in Solving Problems

Finding the Whole

Recall Proportions

School Population: Method 1 .. Using Proportions

School Population: Method 2 ..

Grades Problem: Method 1 .. Using Proportions

Grades Problem: Method 2

Bike Sale: Method 1 .. Using Proportions

Bike Sale: Method 2

Finding the Percent

Theatre Problem, Car Problem

Percent of a Number

Earnings Problem

Nickel Ore

Percents Greater than 100%

Number Problem; Order Problem

Percents Less than 1%

Number Problem; Pencil Problem

Mental Calculations

Number Problem; Tipping

Percent Change

Practice Questions, Topic Test

**Topic 7. Percent in Business**

Sales Tax - Bicycle Question, Coat Question, Restaurant Tipping

Discount - Football Sale, What can I afford? Which is Cheaper? Competitor's Discount

Commission - Car Salesman, Real Estate, Car Dealerships

Simple Interest - What is it? Complete the Table, Bank Interest, Credit Card Bill

Compound Interest - What is it? Complete the Table, Formula, Spreadsheet

Interest Calculator, Bank Interest, Car Depreciation, Mortgage

Practice Questions, Topic Test

**Students should demonstrate the ability to use order relations for whole numbers, fractions, decimals, integers, and rational numbers.**

**Understanding Fractions**

**Topic 1. The Meaning of Fractions**

Comparison of Fractions

**Topic 3. Equivalent Fractions**

Comparison of Fractions

**Topic 5. Percent .. Fraction .. Decimal**

Number Line #1

Decimal Strips .. Concepts 1,2,3

Number Line #2

**Understanding Integers**

**Topic 1. The Meaning of Integers**

Comparing Integers

**Students should demonstrate the ability to select the appropriate operation to represent problem situations.**

**Understanding Fractions**

**Topic 7. Adding Fractions**

Word Problems - Alexander's Friends, Eating Candy, Goal Scoring, Taking A Walk

**Topic 8. Subtracting Fractions**

Word Problems - Pedro and Alex's Race, Washing the Cars, Planting a Garden

**Topic 9. Multiplying Fractions**

Word Problems - Boris' Money, Maria's Trip

**Topic 10. Dividing Fractions**

Understanding Division

Examples with Diagrams

Patterns from Examples

Another Explanation

Examples Without Diagrams - Numerical Ex 1, Numerical Ex 2, Central High School

**Understanding Integers**

**Topic 2. Adding Integers**

Word Problems - Temperature, Money, Car

**Topic 3. Subtracting Integers**

Word Problems - The Sailboat, The Bank

**Topic 4. Multiplying Integers**

Word Problems - Washing Cars, The Helicopter, Construction

**Topic 5. Multiplying Integers**

Word Problems - Casino, Plant, Graham's Walk

**Topic 6. Order of Operations**

Word Problems - Shipping, Babysitting, Garbage

**Understanding Percent**

Topic 5. Percent of a Number

The Concept

Examples - Money, Service Charge, Marathon Race, Freezing, Pie Chart  
Grades

Topic 6. Problems Involving Percent

Finding the Whole

Finding the Percent

Percent of a Number

Percents Greater than 100%

Percents Less than 1%

Percent Change

Topic 7. Percent in Business

Sales Tax

Discount

Commission

Simple Interest

Compound Interest

**Students should demonstrate the ability to relate the basic arithmetic operations to one another.**

**Understanding Fractions**Topic 10. Dividing Fractions

Understanding Division, Examples with Diagrams, Patterns from Examples

Another Explanation, Examples Without Diagrams

**Understanding Integers**Topic 3. Subtracting Integers

Markers... An Introduction to Subtraction

Summary... Add the Opposite

Example Questions

Going for a Walk

Topic 4. Multiplying Integers

Multiplication is ... Ex 1, Ex 2

Topic 5. Dividing Integers

Division to Multiplication

The Division Table

The Inverse of Multiplicaton

Strand 2: Measurement and Geometry

Weight: 20-30%

**Students should demonstrate the ability to model and solve problems using the concepts of perpendicularity, parallelism, congruence and similarity of geometric figures.**

**Understanding Measurement and Geometry**Topic 6. Angles and Polygons

Parallel Lines

Examples with Parallel Lines

Topic 7. Constructions

Perpendicular from Point on Line

Perpendicular from Point off Line

**Understanding Graphing**Topic 7. Slope of A Line

Parallel Lines - Examples 1, 2, 3

Perpendicular Lines - Examples 1, 2, 3

Slopes of Parallel Lines - Examples 1, 2, 3  
 Slopes of Perpendicular Lines - Examples 1, 2, 3, Pattern

**Students should demonstrate the ability to use spatial visualization to describe and analyze geometric figures.**

**Understanding Measurement and Geometry**

**Topic 2. Perimeter and Area of Polygons**

Polygons ... What are They?

Concept

A Triangle is ...

A Quadrilateral is ...

A Pentagon is ...

A Hexagon is ...

An Octagon is ...

Classify Polygons

**Topic 4. Solids... Volume and Surface Area**

Classifying Solids

A Solid is ... - Recall Polygons

A Polyhedron is ...

A Prism is ... - Some Special Prisms

A Pyramid is ... - Some Special Pyramids

A Cylinder is ...

A Cone is ...

Platonic Solids

**Topic 7. Constructions**

Perpendicular Bisector, Circumcircle, Centroid, Angle Bisector, Incircle, Perpendicular from Point on Line

Perpendicular from Point Off Line, Orthocenter

**Topic 8. Projective Geometry**

Toothpicks on Isometric Dot Paper

Orthographic Projections: Introduction

The Cube Tool

Given Solid - Build it

Given Views - Build it

Given Volume - Build it

Given Area - Build it

**Students should demonstrate the ability to use the Pythagorean Theorem, similarity and right triangle trigonometry to model and solve problems.**

**Understanding Exponents**

**Topic 6. Pythagorean Theorem**

The Right Triangle

Math or Magic?

Squares on a Grid

Squares on the Sides of a Right Triangle

The Pythagorean Theorem

Example Questions

**Understanding Measurement**

**Topic 9. Ratios for Areas and Volumes**

**Students should demonstrate the ability to find, use and interpret the slope of a line, the y-intercept of a line, and the intersection of two lines.**

**Understanding Graphing**

**Topic 7. Slope of a Line**

Introduction to Slope  
Slope  
Introductory Examples  
Formula  
Parallel Lines  
Perpendicular Lines  
Positive and Negative Slope  
Special Slopes  
Sketch Line.. given Point and Slope  
Slopes of Parallel Lines  
Slopes of Perpendicular Lines

**Topic 8. Equation of a Straight Line**

Graph  $y = mx + b$   
Slope - y intercept Equations  
Parallel and Perpendicular Lines  
Slope-Point Form of the Equation  
Special Cases  
Examples to Summarize  
Word Problems / Applications  
Point of Intersection of 2 Lines

**Understanding Equations**

**Topic 6. Solving Linear Systems**

The Meaning of a Linear System  
The Meaning of Solving a Linear System  
Solve a Linear System by Graphing  
Solve a Linear System by Substitution, Elimination, Comparison  
Solve Problems Using Linear Systems

**Students should demonstrate the ability to use coordinates to design and describe geometric figures.**

**Understanding Graphing**

**Topic 3. Points of a Grid**

Ordered Pairs  
Shapes

**Students should demonstrate the ability to identify and select appropriate units of metric and customary measure.**

**Students should demonstrate the ability to convert and estimate units of metric and customary measure (all conversions within systems)**

**Understanding Measurement and Geometry**

**Topic 1. Introduction to Measurement**

Measurement in the News  
A Glimpse into the Past  
Metric and US Measurement Systems  
Searching for the Standard Unit

Related Units from Metric Prefixes  
 Metric Prefixes at Work  
 Converting Between Metric Units  
 The Ruler  
 Benchmarks  
 Establishing Benchmarks  
   Meter Benchmarks, Foot Benchmarks, Centimeter Benchmarks,  
   Inch Benchmarks, Yard Benchmarks, Our Benchmarks  
 Using Benchmarks  
 Converting Metric Units  
 My Body  
 Rudy's Run

**Students should demonstrate the ability to solve and estimate solutions to problems involving length, perimeter, area, surface area, volume, angle measurement, capacity, weight and mass.**  
**Students should demonstrate the ability to predict the impact of a change in linear dimension on the perimeter, area and volume of figures.**

**Understanding Measurement and Geometry**

**Topic 2. Perimeter and Area of Polygons**

Walk Around a Polygon  
   Joan Walks  
   Length of the Metal Strip  
   Find the Perimeter  
 Amount of Surface  
   The Driveway ... An Introduction to Area  
   Area - Estimation  
   Area of a Rectangle  
   Area of a Parallelogram  
   Area of a Triangle  
 Problems Section  
   length of Fence  
   Area of a Wall  
   The Tablecloth

**Topic 3. Circles**

Circles all Around Us!  
 Radius, Circumference and Diameter  
 PI ... A special Number  
   Introduction - How do we Measure Circumference? - Measuring Circles - Summary  
 Circumference of a Circle  
   Ex 1 - Ogg; Ex 2 - The Well; Ex 3 - The Rolling Coin; Ex 4 - The Semi-Circle  
 Area of a Circle  
   Recall Area  
   Area Exploration #1; Area Exploration #2  
   Ex 1 - Wheel; Ex 2 - Pizza; Ex 3 - The Semi-Circle; Ex 4 - The Dog's Run; Ex 5 - The Hockey Rink

**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; Volume of a Prism: Example 2

Volume of a Cylinder, Volume of a Pyramid, Volume of a Cone, Volume of a Sphere

Summary

Topic 5. Angles and Their Measure

Lines and Rays

Angles... An Introduction

The Degree

Classify Angles

Classifications; Memory Game

Measuring Angles

**Students should demonstrate the ability to use rates in problem situations.**

**Understanding Graphing**

Topic 1. Reading and Sketching Graphs

Graphs Without a Scale

Example 10 ... Bathtub #1

Example 11 ... Bathtub #2

Example 12 ... The Hot Tub

Graphs With a Scale

Concept ... Distance and Time

Example 2 ... The Cyclists

Example 3 ... Baseball

Example 4 ... The Beach

Example 5 ... Rate

Example 6 ... Villeneuve

Example 7 ... Volume and Time

Example 8 ... The River Problem

Example 9 ... Angelo's Walk

**Understanding Equations**

Topic 5. Problem Solving

Rate of Work

**Students should demonstrate the ability to read and interpret scales, meters and gauges**

**Understanding Measurement**

Topic 1. An Introduction to Measurement

Metric and US Measurement Systems

The Ruler

**Strand 3: Data, Statistics and Probability**

Weight: 20-30%

**Students should demonstrate the ability to construct, interpret and draw inferences from tables, charts and graphs.**

**Students should demonstrate the ability to make inferences and convincing arguments that are based on data analysis.**

**Students should demonstrate the ability to evaluate arguments that are based on data analysis, including distinguishing between correlation and causation.**

**Understanding Graphing**

Topic 2. Statistics

Data... What is it?

An Introduction .. Examples of Data

Ex 1 .. Fast Food Earnings; Ex 2 .. Infants Walk; Ex 3 .. Canada and USA forecast

Ex 4 .. King of the Strike Out; Ex 5 .. US Stake in India; Ex 6 .. Allergy Troubles

Statistics .. What is it?  
 Collecting Data  
 Throw a Die; Throw 2 Dice; Voting  
 Primary Data; Secondary Data .. Gathering Methods

### **Understanding Graphing**

#### **Topic 1. Reading and Sketching Graphs**

Graphs Without a Scale

Concept... Age and Weight  
 Example 1... Height and Weight  
 Example 2... Errors and Years  
 Example 3... Pushups and Situps  
 Example 4... Nelia's Bike Ride  
 Example 5... Temperature and Time  
 Example 6... Glasses of Water  
 Example 7... Bottles of Water  
 Example 8... Bottles of Water ... Matching  
 Example 9 ... Age and Weight

#### **Topic 5. Relations, Equations and Functions**

Relations

Example 1: Triangles

Displaying the Relation, Describing the Relation, Predicting New Information

Example 2: Tiles, Part 1

Example 3: Tiles, Part 2

The Problem

Patterns from Pictures #1

Patterns from Pictures #2

Patterns from Pictures #3

Patterns from Pictures #4

Summary

Example 4: Running

Displaying the Relation, Describing the Relation, Predicting New Information

Example 5: Hit the Ball

Patterns to Words to Equations

Example 1, Example 2, Example 3, Example 4

#### **Topic 6. Linear Relations**

The Taxi Example

Setup Equation

Graph Equation

The Elastic Example

Setup Equation

Graph Equation

The Lightning Example

Setup Equation

Graph

Basketball Example

Setup Equation

Graph

#### **Topic 8. Equation of a Straight Line**

Word Problems/Application

The Taxi .. Case 1 and Case 2 ..

Task 1: Find the Equation

Task 2: Graph the Equation

Task 3: Interpret the Equation

The Walker

Basketball  
Food

**Students should demonstrate the ability to represent data graphically in ways that make sense and that are appropriate to the context.**

**Understanding Graphing**

**Topic 2. Statistics**

Presenting Data

Stem-and-Leaf Diagram .. Ex1 - Ages of Fans; Ex2 - Heights of Students  
Bar Graph .. Ex1 - Energy; Ex2 - Lengths of Rivers  
Histogram .. Ex1 - Heights of Students; Ex2 - Roll a Die  
Line Graph .. Ex1 - Life Expectance; Ex2 - Software Profits  
Circle or Pie Graphs .. Ex1 - The Radio Station; Ex2 - Health Survey  
Scatter Plot .. Ex1 - T-Shirt Tailor; Ex2 - Matching

**Students should demonstrate the ability to apply measures of central tendency (mean, median, mode) and analyze the effect of changes in data on these measures.**

**Understanding Graphing**

**Topic 2. Statistics**

Introduction

The Mean Average, The Median Average, The Mode  
Summary, Another Example, Adding Data Points

**Students should demonstrate the ability to use an informal line of best fit to predict from data.**

**Understanding Graphing**

**Topic 6. Linear Relations**

Line of Best Fit

Example 1, Example 2

**Students should demonstrate the ability to apply and recognize the role of sampling and the impact of bias on statistical claims.**

**Understanding Graphing**

**Topic 2. Statistics**

Misleading Statistics

Example 1, Example 2

**Students should demonstrate the ability to make predictions that are based on experimental or theoretical probabilities including listing possible outcomes, and using and interpreting a frequency distribution of outcomes.**

**Understanding Probability**

**Topic 1. What's Possible?**

The Language of Chance

Possible Outcomes... What are They?

Possible Outcomes... Examples - Coin, Picking 1 Ball, Picking 2 Balls, Eye Test, Coin and Die, Travel  
Rabbits, Forest

**Topic 2. What's The Chance?**

Probability.. What is it? Introduction1, Introduction2

Probability Examples .. 1. Coin Toss, 2. Picking One Ball, 3. Picking 2 Balls, 4. Travel Example

5. Number Example, 6. Rabbit Example, 7. Mailing Letters, 8. Forest

The Probability Scale .. Examples, Summary, Followup, Soccer Example

Experimental Probability .. Introduction, Example 1, Example 2

**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
- Topic 4. Binomial Probabilities
  - What are They?
  - Flipping a Coin .. Once
  - Flipping a Coin .. Twice
  - Flipping a Coin .. Three Times
  - Summary
- Topic 5. Geometric Probability
  - Introduction
  - The Parachutist
  - Dartboard .. Your Experiment, Computer's Experiment, Theoretical
  - Win a Prize
  - The Fly
  - Baby Walk
- Topic 6. Pascal's Triangle
  - Pascal's Triangle .. Row 1, Row 2, Row 3, Row 4 .. all Experimental and Theoretical sections.

## Strand 4: Algebra, Functions and Patterns

Weight: 20-30%

**Students should demonstrate the ability to analyze and represent situations involving variable quantities with tables, graphs, verbal descriptions and equations.**

**Students should demonstrate the ability to convert between different representations such as tables, graphs, verbal descriptions and equations.**

**Students should demonstrate the ability to analyze tables and graphs to identify and generalize patterns and relationships.**

### Understanding Algebra

#### Topic 3. Patterns to Formulas to Substitution

- Examples .. Patterns to Formulas
  - Hockey Standings, Counting Money, Angles in a Polygon

### Understanding Graphing

#### Topic 1. Reading and Sketching Graphs

- Graphs Without a Scale
  - Concept... Age and Weight
  - Example 1... Height and Weight
  - Example 2... Errors and Years
  - Example 3... Pushups and Situps
  - Example 4... Nelia's Bike Ride
  - Example 5... Temperature and Time
  - Example 6... Glasses of Water
  - Example 7... Bottles of Water
  - Example 8... Bottles of Water ... Matching
  - Example 9 ... Age and Weight
  - Example 10 ... Bathtub #1
  - Example 11 ... Bathtub #2
  - Example 12 ... The Hot Tub
- Graphs With a Scale
  - Concept ... Distance and Time
  - Example 2 ... The Cyclists

Example 3 ... Baseball  
 Example 4 ... The Beach  
 Example 5 ... Rate  
 Example 6 ... Villeneuve  
 Example 7 ... Volume and Time  
 Example 8 ... The River Problem  
 Example 9 ... Angelo's Walk

Topic 5. Relations, Equations and Functions

Relations

Example 1: Triangles  
 Displaying the Relation, Describing the Relation, Predicting New Information  
 Example 2: Tiles, Part 1  
 Example 3: Tiles, Part 2  
 The Problem  
 Patterns from Pictures #1  
 Patterns from Pictures #2  
 Patterns from Pictures #3  
 Patterns from Pictures #4  
 Summary  
 Example 4: Running  
 Displaying the Relation, Describing the Relation, Predicting New Information  
 Example 5: Hit the Ball  
 Patterns to Words to Equations  
 Example 1, Example 2, Example 3, Example 4

Topic 6. Linear Relations

The Taxi Example  
 Setup Equation  
 Graph Equation  
 The Elastic Example  
 Setup Equation  
 Graph Equation  
 The Lightning Example  
 Setup Equation  
 Graph  
 Basketball Example  
 Setup Equation  
 Graph

Topic 8. Equation of a Straight Line

Word Problems/Application  
 The Taxi .. Case 1 and Case 2 ..  
 Task 1: Find the Equation  
 Task 2: Graph the Equation  
 Task 3: Interpret the Equation  
 The Walker  
 Basketball  
 Food

**Students should demonstrate the ability to recognize that a variety of problem situations may be modeled by the same function or type of function ( $y=mx+b$ ,  $y=ax^2$ ,  $y=a^x$ ,  $y=1/x$ )  
 Students should demonstrate the ability to recognize and use direct and indirect variation.**

**Students should demonstrate the ability to analyze and use functional relationships to explain how a change in one quantity results in a change in the other quantity, including linear, quadratic and exponential functions.**

**Understanding Graphing**

**Topic 5. Relations, Equations and Functions**

Relations

What is a Relation?

Domain and Range

Example 1 - Triangles; Example 2 - Tiles Part 1; Example 3 - Tiles Part 2; Example 4 - Running

Example 5 - Hit the Ball

Functions

What is a Function? .. Examples 1, 2, 3

Vertical Line Test .. Examples 1, 2, 3

Function Notation

Example 1

Example 2

Patterns to Words to Equations

Example 1, 2, 3, 4

**Topic 6. Linear Relations**

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

The Lightning Example - Setup Equation, Graph

Basketball Example - Setup Equation, Graph

**Topic 8. Equation of a Straight Line**

Graph  $y = mx + b$

Examples 1, 2, 3, 4, Pattern to Summary, Examples 5, 6, 7

Slope - y intercept equations

Concept, Examples 1, 2, 3, 4

Parallel and Perpendicular Lines

Concept 1, 2; Examples 1, 2, 3, 4

Slope-Point Form of the Equation

Example 1 - Solution 1, Solution 2

Example 2 - Solution 1, Solution 2, Solution 3, Solution 4

Special Cases

Example 1 .. Zero Slope

Example 2 .. Undefined Slope

Example to Summarize

Word Problems/Application

The Taxi .. Case 1 and Case 2 ..

Task 1: Find the Equation

Task 2: Graph the Equation

Task 3: Interpret the Equation

The Walker

Basketball

Food

**Topic 9. Quadratic Functions**

Introductory Examples

Example 1, 2; Summary - Example 1; Summary - Example 2

Definitions - Parabolas, Quadratic Functions

The Role of a

The Plan

a = 1, 2, 3  
 a = -1, -2, -3  
 Parabolas with the Same Width  
 Summary

The Role of c  
 The Plan  
 Increase c  
 Summary

The Role of b  
 Examples 1, 2, 3, 4  
 Summary and Pattern  
 In General

Intercepts of a Quadratic Function  
 Method 1- Graphing; Method 2 - Factoring; Method 3 - Using the Quadratic Formula  
 Examples .. Example 1, Example 2

Maximize Cage Area  
 By Trial and Error  
 Use Quadratic Functions  
 Graph  
 Conclusions  
 Summary

Maximize the Potato Income  
 By Trial and Error  
 By Quadratic Function  
 By Quadratic Function .. graph  
 By Quadratic Function .. summary

Bob's Beachball  
 Find the maximum height  
 Graph Equation  
 Summary

Hit the Brakes  
 Derive the Equation  
 Graph the Equation  
 Summary

### **Understanding Exponents**

#### **Topic 1. The Meaning of Exponents**

Introduction ... The Money Game  
 Graphs .. Game Show Results  
 Graphs .. Compare the Two Results  
 Introduction ... Bacteria Doubling  
 Introduction ... Paper Folding

**Students should demonstrate the ability to create and use algebraic expressions and equations to model situations and solve problems.**

### **Understanding Graphing**

see following Topics detailed in earlier sections in this document

Topic 5. Relations, Equations & Functions

Topic 6. Linear Relations

Topic 8. Equation of a Straight Line

Topic 9. Quadratic Functions

### **Understanding Equations**

Topic 5. Problem Solving

Words and Symbols

The Translation Machine

Area of Walls; Chemistry; Pool Puzzler, Perimeter problem; Fish problem; Money problem

Age problem; Buying CDs; Meat Mixture; Coffee Mixture; Rate of Walk

Summary: Problem Solving Using Equations

**Students should demonstrate the ability to evaluate formulas.**Understanding AlgebraTopic 3. Patterns to Formulas to Substitution

Substitution is ... Math Scrabble

Scrabble 1, Scrabble 2, Scrabble 3, Challenge

Substitution Examples

Example 1, Example 2, Example 3, Example 4

Understanding ExponentsTopic 1. The Meaning of Exponents

Examples - Substitution

Examples 1, 2, 3, 4

Topic 2. Exponents in Formulas

An Introduction to Formulas

Area Formulas Involving Exponents

Volume Formulas Involving Exponents

Examples with Area Formulas

Examples 1, 2, 3

Examples with Volume Formulas

Examples 1, 2, 3