

# 2<sup>nd</sup> Grade Math Proficiency Objectives

## Strand One: Number Sense and Operations

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-Solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

### Concept 1: Number Sense

**Understand and apply numbers, ways of representing numbers, the relationships among numbers, and different number systems.**

- Express whole numbers 0 to 1000, in groups of hundreds, tens and ones using and connecting multiple representations.
- Count forward to 1000 and backward from 1000 by 1s, 10s, and 100s using different starting points.
- \*Identify numbers which are 100 more or less than a given number to 900.\*
- Compare and order whole numbers through 1000 by applying the concept of place value.
- Count money to \$1.00.
- Sort whole numbers through 1000 into odd and even, and justify the sort.

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## Concept 2: Numerical Operations

**Understand and apply numerical operations and their relationship to one another.**

- Solve contextual problems using multiple representations involving
  - addition and subtraction with one- and/or two-digit numbers,
  - multiplication for 1s, 2s, 5s, and 10s, and
  - adding and subtracting money to \$1.00.
- Demonstrate the ability to add and subtract whole numbers (to two digits) and decimals (in the context of money)
  - with up to three addends and
  - to \$1.00.
- Demonstrate fluency of addition and subtraction facts.
- Apply and interpret the concept of addition and subtraction as inverse operations to solve problems.
- Create and solve word problems based on addition and subtraction of two-digit numbers.
- Demonstrate the concept of multiplication for 1s, 2s, 5s, and 10s.
- Describe the effect of operations (addition and subtraction) on the size of whole numbers.
- Apply properties to solve addition/subtraction problems
  - identity property of addition/ subtraction,
  - commutative property of addition, and
  - associative property of addition.

## Concept 3: Estimation

**Use estimation strategies reasonably and fluently while integrating content from each of the other strands.**

- Use estimation to determine if sums of two 2-digit numbers are more or less than 20, more or less than 50, or more or less than 100.

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## Strand Two: Data Analysis, Probability, and Discrete Math

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### Concept 1: Data Analysis (Statistics)

**Identify patterns and apply pattern recognition to reason mathematically. Students begin with simple repetitive patterns of many iterations. This is the beginning of recursive thinking. Later, students can study sequences that can best be defined using recursion.**

- Collect, record, organize, and display data using pictographs, frequency tables, or single bar graphs.
- Formulate and answer questions by interpreting displays of data, including pictographs, frequency tables, or single bar graphs.

### Concept 2: Probability

**Understand and apply the basic concepts of probability. This is the field of mathematics that deals with the likelihood that an event will occur expressed as the ratio of the number of favorable outcomes in the set of outcomes to the total number of possible outcomes.**

**No performance objectives at this grade level.**

### Concept 3: Discrete Math – Systematic Listing and Counting

**Understand and demonstrate the systematic listing and counting of possible outcomes. This field of mathematics is generally referred to as Combinatorics.**

- List all possibilities in counting situations.
- Solve a variety of problems based on the addition principle of counting.

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## Concept 4: Vertex-Edge Graphs

**Understand and apply the concepts of vertex-edge graphs and networks. This field connects graph theory with practical problems.**

- Color simple pictures or maps using the least number of colors and justify the coloring.
- Build vertex-edge graphs using concrete materials and explore properties of vertex-edge graphs
  - number of vertices and edges,
  - neighboring vertices, and
  - paths in a graph.
- Construct simple vertex-edge graphs from simple pictures or maps.

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## Strand Three: Patterns, Algebra, and Functions

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### Concept 1: Patterns

**Identify patterns and apply pattern recognition to reason mathematically. Students begin with simple repetitive patterns of many iterations. This is the beginning of recursive thinking. Later, students can study sequences that can best be defined using recursion.**

- Recognize, describe, extend, create, and find missing terms in a numerical or symbolic pattern.
- Explain the rule for a given numerical or symbolic pattern and verify that the rule works.

### Concept 2: Functions and Relationships

**Describe and model functions and their relationships. For example, distribution and communication networks, laws of physics, population models, and statistical results can all be represented in the symbolic language of algebra.**

- Describe a rule that represents a given relationship between two quantities using words or pictures.

### Concept 3: Algebraic Representations

**Represent and analyze mathematical situations and structures using algebraic representations. Algebraic representation is about abstract structures and about using the principles of those structures in solving problems expressed with symbols.**

- Record equivalent forms of whole numbers to 1000 by constructing models and using numbers.
- Compare expressions using spoken words and the symbols =,  $\neq$ ,  $<$ , and  $>$ .
- Represent a word problem requiring addition or subtraction through 100 using an equation.
- Identify the value of an unknown number in an equation involving an addition or subtraction fact.

### Concept 4: Analysis of Change

**Analyze how changing the values of one quantity corresponds to change in the values of another quantity.**

**No performance objectives at this grade level.**

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## Strand Four: Geometry and Measurement

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### Concept 1: Geometric Properties

**Analyze the attributes and properties of two- and three-dimensional figures and develop mathematical arguments about their relationships (in conjunction with strand 5, concept 2).**

- Describe and compare the attributes of polygons up to six sides using the terms side, vertex, point, and length.

### Concept 2: Transformation of Shapes

**Apply spatial reasoning to create transformations and use symmetry to analyze mathematical situations.**

- Identify, with justification, whether a 2-dimensional figure has lines of symmetry.

### Concept 3: Coordinate Geometry

**Specify and describe spatial relationships using coordinate geometry and other representational systems.**

**No performance objectives at this grade level.**

### Concept 4: Measurement

**Understand and apply appropriate units of measure, measurement techniques, and formulas to determine measurements.**

- Tell time to the nearest minute using analog and digital clocks.
- Apply measurement skills to measure the attributes of an object (length, capacity, weight).
- Read temperatures on a thermometer using Fahrenheit and Celsius.
- Demonstrate unit conversions
  - 1 foot = 12 inches,
  - 1 quart = 4 cups,
  - 1 pound = 16 ounces,
  - 1 hour = 60 minutes,
  - 1 day = 24 hours,
  - 1 week = 7 days, and
  - 1 year = 12 months.

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## Strand Five: Structure and Logic

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### Concept 1: Algorithms and Algorithmic Thinking

**Use reasoning to solve mathematical problems. Determine step-by-step series of instructions to explain mathematical processes.**

**No performance objectives at this grade level.**

### Concept 2: Logic, Reasoning, Problem Solving, and Proof

**Evaluate situations, select problem solving strategies, draw logical conclusions, develop and describe solutions, and recognize their applications. Develop mathematical arguments based on induction and deduction, and distinguish between valid and invalid arguments.**

- Identify the question(s) asked and any other questions that need to be answered in order to find a solution.
- Identify the given information that can be used to find a solution.
- Select from a variety of problem-solving strategies and use one or more strategies to arrive at a solution.
- Represent a problem situation using any combination of words, numbers, pictures, physical objects, or symbols.
- Explain and clarify mathematical thinking.
- Determine whether a solution is reasonable.