

# Elementary Mathematics

## Grade 4

Through a variety of experiences and representations, students build a true understanding of mathematical concepts, learning when and how to model them

### Learning Opportunities

Three main components of Mathland are used together. Students need the opportunity to practice skills and concepts taught in previous grades and to have an introduction to new skills and concepts.

#### **Basic skill practice and mental math**

(Daily Tune-ups and other games and resources)

#### **Mini Lesson, review of skills and concepts already taught or an introduction to new skills and concepts**

(Skill Power does a great job of keeping students working on skills taught in previous grades. Skill Power also provides new skills and concepts that can be introduced as a mini lesson. There may be times when teachers substitute for some Skill Power pages based on the needs of their students and the quality of the page.)

#### **Guided Lesson, Developing a deeper understanding of a mathematical concept through hands on exploration and problem solving**

(The Guidebook provides many rich opportunities for students to develop mathematical ideas. Some lessons may be extended or shortened, based on the needs of the students.)

## **Standards**

### Fields of Knowledge: Science, Mathematics, Technology

#### *Mathematical Understanding*

- 7.6** Arithmetic, Number and Operation Concepts: Students understand arithmetic in computation, and they select and use, in appropriate situations, mental arithmetic, pencil and paper, calculator and computer.
- 7.7** Geometric and Measurement Concepts: Students use geometric and measurement concepts.
- 7.8** Function and Algebra Concepts: Students use function and algebra concepts.
- 7.9** Statistics and Probability Concepts: Students use statistics and probability concepts.

#### *Mathematical Problem Solving and Reasoning*

- 7.10** Applications: Students use concrete, formal, and informal strategies to solve mathematical problems, apply the process of mathematical modeling, and extend and generalize mathematical concepts. Students apply mathematics as they solve scientific and technological problems or work with technological systems.

### Vital Results: Reasoning and Problem Solving

#### *Problem Solving*

- 2.5** Mathematics Dimensions: Students produce solutions to mathematical problems requiring decisions about approach and presentation, so that final drafts are appropriate in terms of these dimensions.

## **Content Knowledge and Skills**

### **7.6 Arithmetic, Number and Operation Concepts**

- Estimating to determine the reasonableness of answers
- Applying number theory concepts such as odd, even, prime and composite numbers
- Determining fraction equivalencies
- Developing operation sense for fractions and whole numbers

### **7.7 Geometric and Measurement Concepts**

- Demonstrating an understanding of the relationship between square and linear units
- Examining the relationship among the number of vertices, edges, and faces
- Using geometric arrays to explore multiples

### **7.8 Function and Algebra Concepts**

- Understanding how change in one quantity results in a change of another
- Exploring the concepts of the associative property
- Identifying multiple attributes as a way of exploring algebra
- Writing and applying a rule to explain a relationship or function

### **7.9 Statistics and Probability Concepts**

- Collecting and analyzing survey data
- Finding the average of a set of numbers
- Constructing and interpreting displays of data in graphs, charts, tables, and Venn diagrams
- Exploring probability using spinners

### **7.10 Application of Mathematical Problem Solving and Reasoning**

- Solving problems by reasoning mathematically with concepts and skills excepted in grade four
- Determining what the question, or problem is really asking
- Creating and using a variety of strategies
- Making connections between concepts in order to solve problems
- Extending concepts and generalize results to other situations
- Making sensible, reasonable estimates

## Assessment Criteria

By the end of grade four, *students will be able to...*

### **7.6 Arithmetic, Number and Operation Concepts**

- 1....add, subtract, multiply and divide whole numbers using a variety of approaches (e.g. calculators, mental math traditional and invented algorithms)
- 2....apply order of operations with and without parenthesis
- 3....know basic multiplication facts, products to 144( 12x12), and the corresponding division problems
- 4....multiply 2 digits by 2 digit without a calculator
- 5....divide 3 digits by 1 digit without a calculator
- 6....know and use patterns that are helpful for multiplying by multiples of 10, 100, and 1000's
- 7....make sense of remainders in a variety of context
- 8....count and write forward and backward by 10's, 100's and 1000's pattern starting from any given number
- 9....recognize factor pairs and use knowledge to solve for missing numbers in multiplication and division equations
- 10....find, identify and sort numbers by their properties (e.g. odd, even, multiple, square, factors, prime, composite, etc.)
- 11....estimate sums, differences, products, and quotients
- 12....read, write and compare numbers less than one million using standard and expanded notation
- 13....round numbers to a given place up to ten-thousand
- 14....compare simple fractions (e.g.  $\frac{1}{2}$ ,  $\frac{1}{4}$ ,  $\frac{3}{4}$ ,  $\frac{3}{8}$ ,  $\frac{1}{10}$  ) using models and number lines
- 15....compare decimals using models or number lines ( 100ths in context of money and 10ths in context of metric measurement)
- 16.... use different fraction combinations to make a whole
- 17....represent equivalent proper fractions with models, diagrams, explanations, or placing fractions on a number line
- 18....solve problems involving addition and subtraction of proper fractions with like denominators
- 19....add and subtract decimals within the context of money and metric measurement.
- 20....read and write decimals to the hundredth place
- 21....model understanding of division as " fair share" and the inverse of multiplication
- 22....know the total cost of a number of the same item, or a variety of different items

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- 23....give change for any amount of money (e.g. if you and your friend go to the movies, it cost \$4.25 each and you pay with \$10.00, how much change will you get back?)
- 24....use arithmetic, number and operations concepts above to represent, explain and solve problems
- 25....have a working vocabulary that consists of the following terms: equal to, greater than, less than, digit, product, sum, difference, dividend, divisor, quotient, square numbers, prime numbers, factors, multiples, common multiples, fraction, numerator, denominator, whole number, equivalent fractions, improper fraction, mixed number, divisible, composite number, equation, rounding, dollar sign, decimal point, coins and bills

### **7.7 Geometric and Measurement Concepts**

- 1....identify, classify and describe regular polygons using the following characteristics: angle size (acute, obtuse, right), parallel and perpendicular sides, congruence, similarity, symmetrical, sides, length, etc.
2. ...show relationships between figures (e.g. congruence, including flips slides and rotations)
- 3....use a compass and/ or straight edge to accurately construct regular polygons and circles
- 4....construct three-dimension structures based on two-dimensional views
- 5....identify components of 3-dimensional figures (face, edge, vertices)
- 6....identify, compare and describe 3-demensioanl figures (rectangular prisms, triangular prisms, cylinders and spheres)
- 7....identify parallel, perpendicular and intersecting lines
- 8....determine the perimeter of a variety of polygons,
- 9....determine the area of rectangles and polygons or irregular figures on a grid or using models, manipulatives or formulas
- 10....express area using the appropriate unit of measure.
- 11....determine elapsed time, forward and backward, from a given time
- 12....plot points on a coordinate graph given a set of ordered pairs
- 13....measure lengths accurately using standard or metric ruler, yardstick or meter stick
- 14....convert within customary or metric units measures (min, hour), (cm, meter), (in, ft., yd.) in problem situations
- 15....use geometry and measurement concepts above to represent, explain and solve problems
- 16....have a working vocabulary that consists of the following terms: perimeter, area, centimeter, inch, meter, foot, yard, solid, two-dimensional, three-dimensional, face, cube, rectangular prism, pyramid, cone, cylinder, sphere, model, line of symmetry, rotation, similar, congruent, polyhedron, tessellating, concave, regular polygon, convex, edge, vertex, scale drawing, parallelogram, trapezoid, square, triangle, rectangle, hexagon, rhombus,

octagon, angle, point, parallel, perpendicular, clockwise, counter-clockwise, diameter, equilateral triangle acute, obtuse, right

### 7.8 Function and Algebra Concepts

- 1....show how one quantity determines another quantity in a functional relationship based on a linear pattern ( e.g. number of eyes is determined by the number of people)
- 2....Identify and extend a variety of patterns (linear and nonlinear) represented in models, tables or sequences
- 3....know the implications of changing the value of one side of and equality relationship (e.g. $4 \times 3 = 6 + 6$ ,  $4 \times 3 - 2 = 6 + 6 - 2$ )
- 4....writes a rule for a pattern in words or symbols to find the next case
- 5.... generalize a pattern to the n'th arrangement
- 6....use the concept of variable to solve whole number equations (e.g.  $3n + 2 = 11$ )
- 7....demonstrates a conceptual understanding of equality, and solves one-step linear equations
8. ...solves problems using a two-dimensional coordinate system to locate coordinates and to represent data from tables.
- 9....create and solve function machines (e.g. solve for  $n$  and write the rule for the function machine (table) below:

In	Out
4	7
6	11
9	17
12	n

- 10....use the patterns and algebra concepts above to represent, explain and solve problems
- 11....have a working vocabulary that consist of the following terms: variable, pattern, extend, predict, rule, number sentence, equation, solution, function machine, table

### 7.9 Statistics and Probability Concepts

- 1....read, interpret and draw conclusions from a variety of representations (e.g. pictograph, bar graph, line plot, circle graph, Venn diagram, frequency tables and charts)
2. ...collect, organize and display data with appropriate representations
- 3....gather data from an entire group or by sampling a group
- 4....understand that median is one landmark of data
- 5....determine the central tendencies ( mean, median and mode )of a set of data
- 6....analyze patterns, trends, and distributions in data in a variety of contexts using measures of central tendency (median, mode), and dispersion (range

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- 7....solve problems involving combinations and simple permutations using organized lists, tables, tree diagrams or another student generated method
- 8....make a reasonable prediction about future outcomes in reference to the data collected and make generalizations based on similar situations
- 9....describe the likelihood or chance of an event as a value between 0 (for events that are impossible to occur) and 1 (for events that are certain to occur) written as either a ratio or as part to whole
- 10....use experimental probability, determine the possible outcomes, and describes the likelihood of an event
- 11....use the probability and statistics concepts above to represent, explain and solve problems
- 12....have a working vocabulary that consists of the following terms: bar graph, double bar graph, vertical bar graph, horizontal bar graph, sampling, sampling size, frequency table, pictograph, line plot, line graph, Venn diagram, data, collect, organize, sort, chart, graph, tally, survey, prediction, more likely, less likely, equally likely, outcome, predict, probability, random, fair spinner, mean, median, mode, range, chance, equal chance

## 7.10 Assessment to be integrated in the other standards

### Reasoning and Problem Solving

#### 2.5 Mathematics Dimensions

Approach and Reasoning	Level 3
Connections	Level 3 (2)
Solution	Level 3
Mathematical Language	Level 3 (2)
Mathematical Representation	Level 3
Documentation	Level 3

These levels are based the Vermont State Problem Solving Rubric and standards set by Vermont teachers. (*Some problems do not lend themselves to higher scores*)

**Assessment Portfolio Requirements** Scored using the Vermont State Scoring Guide and given a performance level for each problem

- Two Number and operation problems 7.6
- One Geometry or Measurement problem 7.7
- One Algebra problem 7.8
- One Statistics or Probability problem 7.9

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## **Resources**

Grade Four Mathland

Guidebook

Teacher's Resource manual

Daily Tune-Ups

Skill power

Arithmetwists

Smart Strands

Mathland materials kit

Calculators