Elementary Mathematics
Grade 5

By identifying equivalent and proportional relationships, students bridge the gap between simple and complex mathematical concepts.

Learning Opportunities

Three main components of the Mathland program 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 are 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

- Using multiplication strategies to solve problems
- Comparing and ordering whole numbers, fractions, decimals, integers
- Understanding and explaining the need for numbers other than whole numbers
- Creating and explaining other number systems

7.7 Geometric and Measurement Concepts

- Exploring rectangular solids to determine a method or formula to find volume
- Using a compass, ruler, and protractor to construct simple plane figures, such as angles and circles
- Classifying and drawing angles and triangles

7.8 Function and Algebra Concepts

- Recording and describing composition/ decomposition of object sets
- Solving equations using trial and error numerical analysis
- Devising formulas for solving problems
- Appling the concepts of variable, expression, and equation

7.9 Statistics and Probability Concepts

- Devising systematic processes for collecting and organizing data
- Determining the measures of central tendencies and range of given data
- Making predictions, form generalizations, hypothesis, rules, and conjectures based on data
- Analyzing graphs and writing reports about findings
- Creating an attribute set, showing all possible unique combinations
- Calculating and combining probabilities to solve real-life problems

7.10 Application of Mathematical Problem Solving and Reasoning

- Solving problems by reasoning mathematically with concepts and skills excepted in grade five
- Determining what the question, or problem is really asking

- Creating and using a variety of approaches, and understanding and evaluating the approaches that others use
- Determining how to break down a complex problem into simpler parts
- Making connections between concepts in order to solve problems
- Integrating concepts and techniques from different areas of mathematics
- Extending concepts and generalizing results to other situations
- Making sensible, reasonable estimates

Assessment Criteria

7.6 Arithmetic, Number and Operation Concepts

By the end of grade five, students will be able to…

1...round numbers to a given place up to 9,999,999
2...use place value through millions t compare and order numbers
3...estimate sums, differences and products of numbers
4...add, subtract, multiple, and divide whole numbers using a variety of strategies
5...multiply any number X 2 digits, and any number divided by 2 digits without a calculator
6...make sense of remainders on a variety of contexts
7....recognize fractions as division problems
8...use integers to express a negative relationship
9...apply order of operations with and without parenthesis
10...recall all multiplication and division facts through twelve's
11...develop mental and written strategies for finding sums, differences, products, and quotients of numbers greater than two-digit
12...know and use patterns that are useful for dividing by multiples of 10, 100, 1000
13...find, identify, and sort numbers by their properties (e.g. odd, even, multiples. Squares, prime, composite, and divisibility)
14...factor numbers less than 100 to prime numbers (e.g. factor trees)
15. understand and explain the relationship among the four basic operations and use those relationships to solve problems
16...orders and compares common fractions or fractions with common denominators, including mixed numbers (3 ½)
17...find equivalent fractions for any given fraction
18...add and subtract fractions and mixed numbers
19...read, write decimals through thousandths place
20. orders and compares decimals through thousandths
21...reasonably estimate and compute the operations of addition and subtraction of decimals
22...fluently move between equivalent representations of commonly used fractions(fourths, thirds, eighths, sixteenths, and tenths), and decimals with

models, diagrams, explanations, or placing fractions and decimals on a number line

23...orders and compares benchmark percents (10%, 25%, 50%, 75%, 100%)

24...use, number operations concepts to represent, explain, and solve problems

25...have a working vocabulary that consists of the following terms: sum, product, difference, quotient, divisor, dividend, factors, multiples, common multiples, prime number, square number, remainder, equivalent, composite, whole, fraction, numerator, denominator, mixed number, improper fraction, ones, tens, hundred, thousands, ten-thousands, hundred-thousands, millions, tenths, hundredths, thousandths

7.7 Geometric and Measurement Concepts

By the end of fifth grade, students will be able to…

1. ..identify different types of angles (acute, obtuse, right, straight) and use a protractor to measure and draw angles up to 180 degrees
2. ..construct 3-dimensioanl shapes form 2-dimensional drawings showing different perspectives of a 3-dimensional shape
3. ..identify, classify, and distinguish between different types of triangles(e.g. scalene, isosceles, right and equilateral)
4. ..identify, classify, and distinguish among different types of quadrilaterals (rectangles, squares, parallelograms, rhombi, trapezoids).
5. ..identify and use slides, flips, and turns to classify and compare plane figures
6. ..demonstrates congruency using the results of combining and subdividing shapes (rectangle into two triangles), and using transformations (flips, slides, and turns)
7. ..apply scale to determine and create similar polygons
8. ..find the volume and surface area of rectangular prisms (cubes) using manipulatives, models or formulas
9. ..classify regular and irregular 2 and 3dimensional shapes according to their properties (e.g. number of: faces, vertices, edges, angle size, lines of symmetry, etc.)
10. ..identify the ordered pair for a point and locate the point for an ordered pair in the four quadrants of a coordinate plane
11. ..find the area and perimeter of rectangles, right triangles and other polygons by subdividing or combining familiar shapes and by using manipulatives, models, or formulas
12. ..express perimeter, area, and volume using the appropriate unit of measure.
13. ..find the area of irregular polygons using a grid
14. ..identify patterns and relationships among measurements of the angles of triangles, quadrilaterals and other regular polygons
15. ..choose an appropriate measuring device and unit of measure for a
16. given situation and measure accurately
17. ..determines elapsed and accrued time to the nearest minute

18. ....use scale on a map to determine accurate distances
19. ..converts within customary or metric units measures in problem
20. situations. (sec., min, hr) (mm, cm, m) (in. ft., yd, mi), pint/quart/gallon)
21. ..use geometry and measurement concepts above to represent,
22. explain, and solve problems
23. ..have a working vocabulary that consists of the following terms:
24. acute, obtuse, right, straight, equilateral, right triangle, quadrilateral, polygon, regular polygon, pentagon, hexagon, octagon, side, face, concave, convex, parallel, perpendicular, symmetry, rotation, congruent, similar, line of reflection, angle, adjacent angles, base, reflection, tessellation, area, surface area, volume, perimeter, formula, dimensions, cylinder, rectangular prism, prisms, cube,
25. sphere, cone, pyramid, circumference, diameter

7.8 Function and Algebra Concepts

By the end of fifth grade, students will be able to…

1. ..build iterations of nonlinear patterns including multiplicative, triangular and squaring patterns
2. ...generalize and write a single variable formula for a linear pattern(constant rate of change)
3. ..describe patterns and generalize in words, and in tables
4. ..understand and use commutative, associative and distributive properties
5. ..create balanced number sentences
6. ..use a variable, or variable expression, or formula (A= LW) to solve problem
7. ..represent and investigate how a change in one variable relates to a change in a second variable (e.g. height of a plant over time)
8. ..evaluate simple variable expressions given a replacement set.
9. ..explain and extend numerical and geometric patterns including triangular numbers, square numbers, patterns formed by powers of 10 and arithmetic sequences
10. ..use order of operations to solve equations
11. ….understand that an equality relationship between two quantities remains the same as long as the same change is made to both quantities
12. ….use the pattern and algebra concepts to represent, explain, and solve problems

7.9 Statistics and Probability Concepts

By the end of fifth grade, students will be able to…

1. …collect, organize, display data in a variety of forms including bar graphs, line plots, line graphs, circle graphs, Venn diagrams, tables and charts
2. …collect, organize, display data appropriately in response to a question
3. …interpret data in a variety of forms to answer questions

4. …make a reasonable prediction about future outcomes in reference to a set of organized data and make generalizations based on similar situations
5. …determine which representation is most appropriate given a variety of situations
6. …determine the mean, median, mode, range and outliers to a set of data
7. …use mean, median, mode, range and outliers to analyze a set of data
8. …use a systematic approach to assure that all possible combinations have been found and see the relationship to multiplication
9. …understand that repeating a probability experiment can produce a variety of results
10. …conduct an experiment to find the probability of an event happening
11. …determine the theoretical probability of an event as a ratio of favorable outcomes to possible outcomes written as either a ratio or as part to whole
12. …use the probability and statistics concepts to represent, explain and solve problems

13. …have a working vocabulary that consist of the following terms: bar graph, double bar graph, vertical bar graph, horizontal bar graph, sampling, sampling size, population, 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, outliers, chance, equal chance

7.10 Application of Mathematical Problem Solving and Reasoning: (Assessment to be integrated in the other standards)

Reasoning and Problem Solving

2.5 Mathematics Dimensions

Approach and Reasoning	Level 3
Connections	Level 3
Solution	Level 3
Mathematical Language	Level 3
Mathematical Representation	Level 3
Documentation	Level 3

These levels are based the Vermont State Problem Solving Rubric and standards set by Vermont teachers.

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

Resources

Grade Five Mathland
- Guidebook
- Teacher's Resource manual
- Daily Tune-Ups
- Skill power
- Arithmetwists
- Smart Strands

Mathland materials kit
Calculators