

Grade 5

Problem Solving Strand

Students will build new mathematical knowledge through problem solving.

- information
- 5.PS.1 Know the difference between relevant and irrelevant
when solving problems
- more
- 5.PS.2 Understand that some ways of representing a problem are
efficient than others
- generate
- 5.PS.3 Interpret information correctly, identify the problem, and
possible strategies and solutions

Students will solve problems that arise in mathematics and in other contexts.

- 5.PS.4 Act out or model with manipulatives activities involving
mathematical content from literature
- situations
- 5.PS.5 Formulate problems and solutions from everyday
- 5.PS.6 Translate from a picture/diagram to a numeric expression
- 5.PS.7 Represent problem situations verbally, numerically,
algebraically,
and/or graphically
- 5.PS.8 Select an appropriate representation of a problem
- 5.PS.9 Understand the basic language of logic in mathematical
situations
(and, or, not)

Students will apply and adapt a variety of appropriate strategies to solve problems.

- 5.PS.10 Work in collaboration with others to solve problems
- 5.PS.11 Translate from a picture/diagram to a number or symbolic expression
- 5.PS.12 Use trial and error and the process of elimination to solve problems
- 5.PS.13 Model problems with pictures/diagrams or physical objects
- 5.PS.14 Analyze problems by observing patterns
- 5.PS.15 Make organized lists or charts to solve numerical problems

Students will monitor and reflect on the process of mathematical problem solving.

- 5.PS.16 Discuss with peers to understand a problem situation
- 5.PS.17 Determine what information is needed to solve problem
- 5.PS.18 Determine the efficiency of different representations of a problem
- 5.PS.19 Differentiate between valid and invalid approaches
- 5.PS.20 Understand valid counterexamples
- 5.PS.21 Explain the methods and reasoning behind the problem solving strategies used
- 5.PS.22 Discuss whether a solution is reasonable in the context of the original problem
- 5.PS.23 Verify results of a problem

Reasoning and Proof Strand

Students will recognize reasoning and proof as fundamental aspects of mathematics.

- 5.RP.1 Recognize that mathematical ideas can be supported using

a

variety of strategies

5.RP.2 Understand that mathematical statements can be supported,
using models, facts, and relationships to explain their thinking

Students will make and investigate mathematical conjectures.

5.RP.3 Investigate conjectures, using arguments and appropriate mathematical terms

5.RP.4 Make and evaluate conjectures, using a variety of strategies

Students will develop and evaluate mathematical arguments and proofs.

5.RP.5 Justify general claims or conjectures, using manipulatives, models, expressions, and mathematical relationships

5.RP.6 Develop and explain an argument verbally, numerically,
and/or graphically

5.RP.7 Verify claims other students make, using examples and counterexamples when appropriate

Students will select and use various types of reasoning and methods of proof.

5.RP.8 Support an argument through examples/counterexamples
and special cases

Communication Strand

Students will organize and consolidate their mathematical thinking through communication.

5.CM.1 Provide an organized thought process that is correct,
complete, coherent, and clear

5.CM.2 Explain a rationale for strategy selection

5.CM.3 Organize and accurately label work

Students will communicate their mathematical thinking coherently and clearly to peers, teachers, and others.

5.CM.4 Share organized mathematical ideas through the manipulation of objects, numerical tables, drawings, pictures, charts, graphs, tables, diagrams, models, and symbols in written and verbal form

5.CM.5 Answer clarifying questions from others

Students will analyze and evaluate the mathematical thinking and strategies of others.

5.CM.6 Understand mathematical solutions shared by other students

5.CM.7 Raise questions that elicit, extend, or challenge others' thinking

5.CM.8 Consider strategies used and solutions found by others in relation to their own work

Students will use the language of mathematics to express mathematical ideas precisely.

5.CM.9 Increase their use of mathematical vocabulary and language when communicating with others

5.CM.10 Use appropriate vocabulary when describing objects, relationships, mathematical solutions, and rationale

5.CM.11 Decode and comprehend mathematical visuals and symbols to construct meaning

Connections Strand

Students will recognize and use connections among mathematical ideas.

5.CN.1 Understand and make connections and conjectures in their everyday experiences to mathematical ideas

5.CN.2 Explore and explain the relationship between mathematical ideas

5.CN.3 Connect and apply mathematical information to solve problems

Students will understand how mathematical ideas interconnect and build on one another to produce a coherent whole.

5.CN.4 Understand multiple representations and how they are related

5.CN.5 Model situations with objects and representations and be able to draw conclusions

Students will recognize and apply mathematics in contexts outside of mathematics.

5.CN.6 Recognize and provide examples of the presence of mathematics in their daily lives

5.CN.7 Apply mathematics to problem situations that develop outside of mathematics

5.CN.8 Investigate the presence of mathematics in careers and areas of interest

5.CN.9 Recognize and apply mathematics to other disciplines and areas of interest

Representation Strand

Students will create and use representations to organize, record, and communicate mathematical ideas.

5.R.1 Use physical objects, drawings, charts, tables, graphs, symbols,

equations, or objects created using technology as
representations

5.R.2 Explain, describe, and defend mathematical ideas using
representations

5.R.3 Read, interpret, and extend external models

5.R.4 Use standard and nonstandard representations with accuracy
and
detail

Students will select, apply, and translate among mathematical representations to solve problems.

5.R.5 Use representations to explore problem situations

5.R.6 Investigate relationships between different representations
and
their impact on a given problem

Students will use representations to model and interpret physical, social, and mathematical phenomena.

5.R.7 Use mathematics to show and understand physical
phenomena
(e.g., determine the perimeter of a bulletin board)

5.R.8 Use mathematics to show and understand social phenomena
(e.g., construct tables to organize data showing book sales)

5.R.9 Use mathematics to show and understand mathematical
phenomena (e.g., find the missing value that makes the
equation true: $(3 + 4) + 5 = 3 + (4 + \underline{\quad})$)

Number Sense and Operations Strand

Students will understand numbers, multiple ways of representing numbers, relationships among numbers, and number systems.

Number Systems 5.N.1 Read and write whole numbers to millions

5.N.2 Compare and order numbers to millions

5.N.3 Understand the place value structure of the base ten number

system

10 ones = 1 ten

10 tens = 1 hundred

10 hundreds = 1 thousand

10 thousands = 1 ten thousand

10 ten thousands = 1 hundred thousand

10 hundred thousands = 1 million

5.N.4 Create equivalent fractions, given a fraction

5.N.5 Compare and order fractions including unlike denominators (with and without the use of a number line) *Note: Commonly used fractions such as those that might be indicated on ruler, measuring cup, etc.*

5.N.6 Understand the concept of ratio

5.N.7 Express ratios in different forms

5.N.8 Read, write, and order decimals to thousandths

5.N.9 Compare fractions using $<$, $>$, or $=$

5.N.10 Compare decimals using $<$, $>$, or $=$

5.N.11 Understand that percent means part of 100, and write percents as fractions and decimals

Number Theory

5.N.12 Recognize that some numbers are only divisible by one and themselves (prime) and others have multiple divisors (composite)

5.N.13 Calculate multiples of a whole number and the least common multiple of two numbers

5.N.14 Identify the factors of a given number

5.N.15 Find the common factors and the greatest common factor of two numbers

Students will understand meanings of operations and procedures, and how they relate to one another.

Operations

digit

5.N.16 Use a variety of strategies to multiply three-digit by three-

numbers *Note: Multiplication by anything greater than a three-digit multiplier/ multiplicand should be done using technology.*

- 5.N.17 Use a variety of strategies to divide three-digit numbers by one- and two-digit numbers *Note: Division by anything greater than a two-digit divisor should be done using technology.*
- 5.N.18 Evaluate an arithmetic expression using order of operations including multiplication, division, addition, subtraction and parentheses
- 5.N.19 Simplify fractions to lowest terms
- 5.N.20 Convert improper fractions to mixed numbers, and mixed numbers to improper fractions
- 5.N.21 Use a variety of strategies to add and subtract fractions with like denominators
- 5.N.22 Add and subtract mixed numbers with like denominators
- 5.N.23 Use a variety of strategies to add, subtract, multiply, and divide decimals to thousandths

Students will compute accurately and make reasonable estimates.

- Estimation* 5.N.24 Round numbers to the nearest hundredth and up to 10,000
- 5.N.25 Estimate sums and differences of fractions with like denominators
- 5.N.26 Estimate sums, differences, products, and quotients of decimals
- 5.N.27 Justify the reasonableness of answers using estimation

Algebra Strand

Students will represent and analyze algebraically a wide variety of problem solving situations.

Variables and Expressions 5.A.1 Define and use appropriate terminology when referring to constants, variables, and algebraic expressions

5.A.2 Translate simple verbal expressions into algebraic expressions

Students will perform algebraic procedures accurately.

Variables and evaluate Expressions 5.A.3 Substitute assigned values into variable expressions and using order of operations

Equations and facts 5.A.4 Solve simple one-step equations using basic whole-number facts

Inequalities

5.A.5 Solve and explain simple one-step equations using inverse operations involving whole numbers

5.A.6 Evaluate the perimeter formula for given input values

Students will recognize, use, and represent algebraically patterns, relations, and functions.

Patterns, Relations, and Functions 5.A.7 Create and explain patterns and algebraic relationships (e.g., 2, 4, 6, 8...) algebraically: $2n$ (doubling)

5.A.8 Create algebraic or geometric patterns using concrete objects or visual drawings (e.g., rotate and shade geometric shapes)

Geometry Strand

Students will use visualization and spatial reasoning to analyze characteristics and properties of geometric shapes.

Shapes 5.G.1 Calculate the perimeter of regular and irregular polygons

Students will identify and justify geometric relationships, formally and informally.

Geometric Relationships 5.G.2 Identify pairs of similar triangles

5.G.3 Identify the ratio of corresponding sides of similar triangles

5.G.4 Classify quadrilaterals by properties of their angles and sides

- 5.G.5 Know that the sum of the interior angles of a quadrilateral is 360 degrees
- 5.G.6 Classify triangles by properties of their angles and sides
- 5.G.7 Know that the sum of the interior angles of a triangle is 180 degrees
- 5.G.8 Find a missing angle when given two angles of a triangle
- 5.G.9 Identify pairs of congruent triangles
- 5.G.10 Identify corresponding parts of congruent triangles

Students will apply transformations and symmetry to analyze problem solving situations.

Transformational Geometry 5.G.11 Identify and draw lines of symmetry of basic geometric shapes

Students will apply coordinate geometry to analyze problem solving situations.

Coordinate Geometry 5.G.12 Identify and plot points in the first quadrant

5.G.13 Plot points to form basic geometric shapes (identify and classify)

5.G.14 Calculate perimeter of basic geometric shapes drawn on a coordinate plane (rectangles and shapes composed of rectangles having sides with integer lengths and parallel to the axes)

Measurement Strand

Students will determine what can be measured and how, using appropriate methods and formulas.

Units of Measurement 5.M.1 Use a ruler to measure to the nearest inch, $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{1}{8}$ inch

5.M.2 Identify customary equivalent units of length

5.M.3 Measure to the nearest centimeter

5.M.4 Identify equivalent metric units of length

5.M.5 Convert measurement within a given system

Tools and Methods appropriate 5.M.6 Determine the tool and technique to measure with an appropriate level of precision: lengths and angles

Students will use units to give meaning to measurements.

Units 5.M.7 Calculate elapsed time in hours and minutes

5.M.8 Measure and draw angles using a protractor

Students will develop strategies for estimating measurements.

Estimation 5.M.9 Determine personal references for customary units of length (e.g., your pace is approximately 3 feet, your height is approximately 5 feet, etc.)

5.M.10 Determine personal references for metric units of length

5.M.11 Justify the reasonableness of estimates

Statistics and Probability Strand

Students will collect, organize, display, and analyze data.

Collection of Data 5.S.1 Collect and record data from a variety of sources (e.g., newspapers, magazines, polls, charts, and surveys)

Organization and over Display of Data 5.S.2 Display data in a line graph to show an increase or decrease over time

Analysis of Data describe a set 5.S.3 Calculate the mean for a given set of data and use to describe a set of data

Students will make predictions that are based upon data analysis.

Predictions from Data 5.S.4 Formulate conclusions and make predictions from graphs

Students will understand and apply concepts of probability.

Probability

5.S.5 List the possible outcomes for a single-event experiment

5.S.6 Record experiment results using fractions/ratios

5.S.7 Create a sample space and determine the probability of a single event, given a simple experiment (e.g., rolling a number cube)