

PERFORMANCE STANDARDS FOR MATH: GRADE 5

A. Mathematical Processes

Content Standard: Students in Wisconsin will draw on a broad body of mathematical knowledge and apply a variety of mathematical skills and strategies, including reasoning, oral and written communication and the use of appropriate technology, when solving mathematical, real-world* and non-routine* problems.

Rationale: In order to participate fully as a citizen and a worker in our contemporary world, a person should be mathematically powerful. Mathematical power is the ability to explore, to conjecture, to reason logically and to apply a wide repertoire of methods to solve problems. Because no one lives and works in isolation, it is also important to have the ability to communicate mathematical ideas clearly and effectively.

Performance Standard

A.8.1 Use reasoning abilities to:

- evaluate information
- perceive patterns
- identify relationships
- formulate questions for further exploration
- evaluate strategies
- justify statements
- test reasonableness of results
- defend work

5th Grade

1. Use reasoning abilities to:
 - perceive patterns (congruent, similar, divisibility, L.C.M., G.C.F., prime factorization, comparing and ordering, sequence) _____
 - identify relationships _____
 - evaluate information (too much, not enough, what do you need to use).
2. Use reasoning abilities to:
 - design questions that will help with further research _____
 - justify a statement using logical reasoning by explaining processes used to arrive at the answer _____
 - test reasonableness of results through estimation _____
 - to defend work by using the four-step process (explore, plan, solve, examine) _____
3. Apply the following problem-solving strategies:

_____ choose an operation	_____ draw a diagram
_____ use manipulatives	_____ guess and check
_____ make a chart/table/list	_____ use estimation
_____ work backwards	_____ note important information
_____ use a calculator	_____ identify needed/extra information
_____ find a pattern	_____ use a graph
_____ Venn diagram	
4. Justify strategies and solutions through oral and written explanations. _____

A. Mathematical Processes

Performance Standard

A.8.2 Communicate logical arguments clearly to show why a result makes sense.

5th Grade

1. Communicate logical arguments clearly to show why a result makes sense using words, numbers, pictures, symbols, charts, graphs, tables, diagrams, models. _____
2. Know when to use the appropriate resource/strategy. _____
3. Justify logical arguments through oral and written explanation. _____

Performance Standard

A.8.3 Analyze non-routine* problems by modeling*, illustrating, guessing, simplifying, generalizing, shifting to another point of view, etc.

5th Grade

1. Analyze non-routine problems by illustrating, guessing, simplifying, relating to everyday life. _____
2. Use mathematics as a way to understand other areas of the curriculum (e.g. measurement in science, geography skills in social studies, and Venn diagrams in language arts). _____
3. See relationships between various kinds of problems and actual events. _____

Performance Standard

A.8.4 Develop effective oral and written presentations that include:

- appropriate use of technology
- the conventions of mathematical discourse (e.g., symbols, definitions, labeled drawings)
- mathematical language
- clear organization of ideas and procedures
- understanding of purpose and audience

5th Grade

1. Exercise and apply what they know in written form by using a journal. _____
2. Calculators – a learner will apply the following: in problem-solving; as a tool for computing; reading a display; number/operation keys; fraction calculators. _____
3. Computers – a learner will apply the following: spreadsheet tool; graphing tool; geometry tool; internet access. _____
4. The learner will determine when technology is appropriate and when other approaches are more appropriate or efficient. _____
5. Present results of a project, written and oral, to an audience. _____

A. Mathematical Processes

Performance Standard

A.8.5 Explain mathematical concepts, procedures, and ideas to others who may not be familiar with them.

5th Grade

1. Communications – The learner will explain and demonstrate mathematical concepts, procedures and ideas to others by reading, talking about it, sharing and assisting others.

* think/pair/share _____

* peer tutoring _____

* study buddies _____

* cooperative groups _____

Performance Standard

A.8.6 Read and understand mathematical texts and other instructional materials and recognize mathematical ideas as they appear in other contexts.

5th Grade

1. Curriculum connections: social studies/history/geography; health/physical education; science; music; language arts; art. _____
2. Real-world connections: the learner will use real-world connections as they apply in daily life, careers, as consumers and in multicultural situations. _____

Vocabulary

5th Grade

_____ estimation

_____ pictograph

_____ guess & check

_____ simplify

B. Number Operations and Relationships

Content Standard: Students in Wisconsin will use numbers effectively for various purposes, such as counting, measuring, estimating and problem solving.

Rationale: People use numbers to quantify, describe and label things in the world around them. It is important to know the many uses of numbers and various ways of representing them. Number sense is a matter of necessity, not only in one's occupation but also in the conduct of daily life, such as shopping, cooking, planning a budget or analyzing information reported in the media. When computing, an educated person needs to know which operations (e.g., addition, multiplication), which procedures (e.g., mental techniques, algorithms*), or which technological aids (e.g., calculator, spreadsheet) are appropriate.

Performance Standard:

B.8.1 Read, represent and interpret various rational numbers* (whole numbers*, decimals, fractions and percents) with verbal descriptions, geometric models* and mathematical notation (e.g., expanded*, scientific*, exponential*).

5th Grade

1. Read and write whole numbers to hundred billions. _____
2. Symbolically rename numbers using standard and expanded forms to millions. _____
3. Read, write and demonstrate decimals to thousandths. _____
4. Read, write and demonstrate fractions (see grade 5 B.8.3). _____
5. Read, write and demonstrate percents. _____
6. Identify and be able to place numbers on a number line. _____

Performance Standard:

B.8.2 Perform and explain operations on rational* numbers (add, subtract, multiply, divide, raise to a power, extract a root, take opposites and reciprocals, determine absolute value).

5th Grade

1. Recall multiplication and division facts 0-10. _____
2. Add and subtract whole numbers up to six digits. _____
3. Evaluate addition, subtraction, multiplication and division expressions. _____
4. Find the least common multiples of two or three numbers. _____
5. Find products of two and three digit factors. _____
6. Divide by two digit divisors. _____
7. Subtracting decimals and adding decimals. _____
8. Multiply decimals through thousandths. _____
9. Multiply money amounts. _____
10. Add and subtract fractions (like and unlike denominators). _____
11. Add and subtract mixed numbers; regroup. _____
12. Multiply and divide fractions. _____
13. Introduce numerical expressions using order of operations. _____

B. Number Operations and Relationships

Performance Standard

B.8.3 Generate and explain equivalences among fractions, decimals and percents.

5th Grade

1. Introduce zeros as place value holders in decimals (adding, subtracting, dividing). _____
2. Apply and use equivalent fractions. _____
3. Apply and use fractions in simplest form. _____
4. Apply and use mixed numbers and whole numbers as fractions. _____
5. Apply and use an equivalent decimal for a fraction. _____
6. Introduce a probability ratio. _____
7. Apply and use a percent as a fraction and vice versa. _____

Performance Standard:

B.8.4 Express order relationships among rational numbers using appropriate symbols ($>$, $<$, $<$, $>$, $=$).

5th Grade

1. Order whole numbers and decimals using $<$, $>$, $=$. _____
2. Compare and order fractions using $<$, $>$, $=$. _____

Performance Standard:

B.8.5 Apply proportional thinking in a variety of problem situations that include, but are not limited to:

- ratios and proportions (e.g., rates, scale drawings*, similarity*)
- percents including those greater than 100 and less than one (e.g., discounts, rate of increase or decrease, sales tax)

5th Grade

1. Use estimation. _____
2. Express a percent as a fraction or decimal. _____
3. Express a fraction or decimal as a percent. _____
4. Express a probability ratio for a situation involving equally likely events. _____

Performance Standard:

B.8.6 Model* and solve problems involving number-theory concepts such as:

- prime* and composite numbers
- divisibility and remainders
- greatest common factors
- least common multiples

B. Number Operations and Relationships

5th Grade

1. Construct the prime factorization of a composite number. _____
2. Use divisibility rules for 2, 3, 5, 6, 10. _____
3. Be introduced to the greatest common factor of two or more numbers. _____
4. Be introduced to the least common multiple of two or more numbers. _____
5. Be introduced to dividing by two-digit divisors. _____
6. Be introduced to dividing a whole number by a whole number with a decimal quotient. _____
7. Use equivalent fractions. _____
8. Add and subtract fractions and mixed numbers. _____

Performance Standard:

B.8.7 In problem-solving situations, select and use appropriate computational procedures with rational numbers such as:

- calculating mentally
- estimating
- using technology (e.g., scientific calculators, spreadsheets)

5th Grade

1. Use front-end estimation and rounding when appropriate. _____
2. Problem solve by making notes or using data from graphs. _____
3. Explore estimation and when to use it. _____
4. Follow order of operations. _____
5. Choose a computation method. _____
6. Estimate using compatible numbers. _____
7. Explore capabilities and terminology of a basic function calculator. _____
8. Estimate “as between” two numbers. _____
9. Express fractions as decimals by using a calculator. _____
10. Estimate to nearest whole number before adding, subtracting, multiplying or dividing. _____
11. Problem solving strategies:
Classify information, guess and check, use a graph, make a table, determine reasonable answers, use a formula, solve a simpler problem, choose the method of computation, make a list, eliminate possibilities, find a pattern, use logical reasoning, draw a diagram, make a model, work backward, use an equation and not enough information is present.

Vocabulary

B. Number Operations and Relationships

5th Grade

- | | | |
|------------------------------------|---------------------------|-----------------------|
| _____ composite numbers | _____ denominator | _____ dividend |
| _____ division | _____ divisor | _____ estimation |
| _____ equivalent fractions | _____ expanded form | _____ expressions |
| _____ factor | _____ factor tree | _____ mental math |
| _____ greatest common factor (GCF) | _____ mixed numbers | _____ multiple |
| _____ least common multiple (LCM) | _____ order of operations | _____ numerator |
| _____ percent | _____ prime factorization | _____ prime numbers |
| _____ probability | _____ proportion | _____ quotient |
| _____ ratio | _____ rational numbers | _____ reciprocals |
| _____ regrouping | _____ rounding off | _____ short word form |
| _____ simplest form | _____ standard form | _____ technology |

C. Geometry

Content Standard: Students in Wisconsin will be able to use geometric concepts, relationships and procedures to interpret, represent and solve problems.

Rationale: Geometry and its study of shapes and relationships is an effort to understand the nature and beauty of the world. While the need to understand our environment is still with us, the rapid advance of technology has created another need: to understand ideas communicated visually through electronic media. For these reasons, educated people in the 21st century need a well-developed sense of spatial order to visualize and model real world* problem situations.

Performance Standard

C.8.1 Describe special and complex two- and three-dimensional figures (e.g., rhombus, polyhedron, cylinder) and their component parts (e.g., base, altitude and slant height) by:

- naming, defining and giving examples
- comparing, sorting and classifying them
- identifying and contrasting their properties (e.g., symmetrical, isosceles, regular)
- drawing and constructing physical models to specifications
- explaining how these figures are related to objects in the environment

5th Grade

1. Identify and draw points, line segments, line rays, perpendicular lines, parallel lines, and intersecting lines. _____
2. Use a protractor to draw and measure angles (e.g., acute, obtuse and right angles). _____
3. Describe and classify angles and triangles (equilateral, isosceles, scalene, acute, obtuse and right). _____
4. Identify and classify polygons (three-sided through n-sided). _____
5. Construct polygons with a specified number of sides. _____
6. Identify and draw congruent, similar and symmetrical figures. _____
7. Construct and identify the parts of a circle including diameter and radius. _____
8. Construct three-dimensional objects and investigate by counting their faces, edges and vertices. _____
9. Analyze, select and present examples of two and three-dimensional figures in real-life settings. _____

Performance Standard:

C.8.2 Identify and use relationships among the component parts of special and complex 2- and 3-dimensional figures (e.g., parallel sides, congruent* faces).

5th Grade

1. Explain that a polygon must have congruent sides and congruent angles to be a regular polygon. _____
2. Analyze and calculate the sum of three angles of a triangle. _____
3. Construct three-dimensional objects and investigate by counting their faces, edges and vertices. _____

C. Geometry

Performance Standard:

C.8.3 Identify 3-dimensional shapes from 2-dimensional perspectives and draw 2-dimensional sketches of 3-dimensional objects preserving their significant features.

5th Grade

1. Draw and construct cubes, pyramids and prisms. _____

Performance Standard:

C.8.4 Perform transformations* on 2-dimensional figures and describe and analyze the effects of the transformations on the figures.

5th Grade

1. Transform 2-dimensional figures. _____
2. Identify how a figure was transformed (e.g., slides, flips or turns). _____
3. Investigate congruence of a figure to its slide, flip and turn images. _____
4. Explore tessellations. _____

Performance Standard:

C.8.5 Locate objects using the rectangular coordinate system*.

- Employ technology to demonstrate the rectangular coordinate system when grade appropriate.

5th Grade

1. Identify ordered pairs using the rectangular coordinate system (ordered pairs in the first quadrant). _____
2. Locate and examine points on a map using a grid system. _____

Vocabulary

5th Grade

- | | | |
|--------------------------|----------------------|------------------------|
| _____ area | _____ plane | _____ x,y axis |
| _____ circumference | _____ point | _____ coordinate plane |
| _____ protractor | _____ degree | _____ scalene triangle |
| _____ equilateral | _____ similar figure | _____ generalization |
| _____ trapezoid | _____ horizontal | _____ turn |
| _____ isosceles triangle | _____ Venn diagram | |

D. Measurement

Content Standard: Students in Wisconsin will select and use appropriate tools (including technology) and techniques to measure things to a specified degree of accuracy. They will use measurements in problem-solving situations.

Rationale: Measurement is the foundation upon which much technological, scientific, economic and social inquiry rests. Before things can be analyzed and subjected to scientific investigation, or mathematical modeling*, they must first be quantified by appropriate measurement principles. Measurable attributes* include such diverse concepts as voting preferences, consumer price indices, speed and acceleration, length, monetary value, duration of an Olympic race, or probability of contracting a fatal disease.

Performance Standard:

D.8.1 Identify and describe attributes* in situations where they are not directly* or easily measurable (e.g., distance, area of an irregular figure, likelihood of occurrence).

5th Grade

1. Find area of regular figures located in the classroom. _____
2. Estimate area of regular figures using a grid and geoboards. _____
3. Determine appropriate tools and accurately measure length and mass. _____
4. Explain the process and results in steps 2 and 3 to the class. _____

Performance Standard

D.8.2 Demonstrate understanding of basic measurement facts, principles and techniques including the following:

- approximate comparisons between metric and US customary units (e.g., a liter and a quart are about the same; a kilometer is about six-tenths of a mile.)
- knowledge that direct measurement* produces approximate, not exact, measures.
- the use of smaller units to produce more precise measures.
- employment of appropriate grade level technology.

5th Grade

1. Recognize and understand metric and customary units of measure. _____
2. Demonstrate that each unit of measurement is part of another either smaller or larger unit. _____
3. Construct a model to understand that direct measurement produces approximate, not exact, measures (i.e. construct an average fifth grader). _____

D. Measurement

Performance Standard

D.8.3 Determine measurement directly* using standard units (metric and US customary) with these suggested degrees of accuracy:

- lengths to the nearest mm or 1/16 of an inch
- weight (mass) to the nearest 0.1 g or 0.5 ounce
- liquid capacity to the nearest ml
- angles to the nearest degree
- temperature to the nearest Centigrade and Fahrenheit degree
- elapsed time to the nearest second

5th Grade

1. Determine measurements to the following degrees of accuracy:
 - length to the nearest eighth, quarter, half-inch, foot, yard, millimeter, centimeter, meter ____
 - weight to the nearest ounce, pound, gram, and kilogram _____
 - temperature to the nearest degree in Celsius and Fahrenheit _____
 - time to the nearest second _____
 - liquid capacity to the nearest ounce, cup, pint, quart, half-gallon, gallon, milliliter, liter, and fluid ounce _____
 - angles to the nearest degree. _____
2. Determine appropriate units to measure length, mass, temperature, capacity and time. ____
3. Apply measurement skills to real life problems. _____

Performance Standard

D.8.4 Determine measurements indirectly* using:

- estimation
- conversion of units within a system (e.g., quarts to cups, millimeters to centimeters)
- ratio and proportion (e.g., similarity*, scale drawings*)
- geometric formulas to derive lengths, areas, volumes of common figures (e.g., perimeter, circumference, surface area)
- the Pythagorean* relationship
- geometric relationships and properties for angle size (e.g., parallel lines and transversals; sum of angles of a triangle, vertical angles*)

5th Grade

1. Convert customary units:
 - capacity (fluid ounce, cup, pint, quart, gallon) _____
 - weight (ounce, pound, and ton) _____
 - length (inches, feet, yards and miles) _____
2. Convert metric units:
 - capacity (liters, kiloliters) _____
 - weight (grams, kilograms) _____
 - length (millimeters, centimeters, meters, kilometers) _____

D. Measurement

3. Apply measurement skills to real-life problems. _____

Vocabulary

5th Grade

_____ area	_____ feet	_____ perimeter
_____ base (of triangle)	_____ gram	_____ pound
_____ capacity	_____ height (of triangle)	_____ radius
_____ Celsius	_____ kilogram	_____ regular polygon
_____ centimeter	_____ kilometer	_____ surface area
_____ chord	_____ liter	_____ ton
_____ circumference	_____ meter	_____ volume
_____ decimeter	_____ mile	_____ yard
_____ diameter	_____ millimeter	_____ revolution
_____ Fahrenheit	_____ ounce	

E. Statistics and Probability

Content Standard: Students in Wisconsin will use data collection and analysis, statistics and probability in problem solving situations, employing technology where appropriate.

Rationale: Dramatic advances in technology have launched the world into the Information Age, when data are used to describe past events or predict future events. Whether in the business place or in the home, as producers or consumers of information, citizens need to be well versed in the concepts and procedures of data analysis in order to make informed decisions.

Performance Standard

E.8.1. Work with data in the context of real-world situations by:

- formulating questions that lead to data collection and analysis
- designing and conducting a statistical investigation
- using technology to generate displays, summary statistics* and presentations

5th Grade

1. Collect, organize and record real-world data. _____
2. Conduct surveys, experiments or simulations and display results. _____
3. Formulate questions and determine the appropriate data to collect and how to collect data. _____
4. Draw reasonable conclusions about real-world data. _____

Performance Standard

E.8.2 Organize and display data from statistical investigations using:

- appropriate tables, graphs and/or charts (e.g., circle, bar, or line, for multiple sets of data)
- appropriate plots (e.g., line*, stem-and-leaf*, box*, scatter*)

5th Grade

1. Make a simple bar graph, double bar graph, circle graph and line graph. _____
2. Construct a simple line plot. _____
3. Create story problems based on collected data for classmates to solve. _____

Performance Standard

E.8.3 Extract, interpret and analyze information from organized and displayed data by using:

- frequency and distribution, including mode* and range*
- central tendencies* of data (mean* and median*)
- indicators of dispersion (e.g., outliers*)

E. Statistics and Probability

5th Grade

1. Predict and calculate the mean, median, mode and range from a set of data. _____
2. Analyze information based on frequency and distribution. _____
3. Assess and select the appropriate scale and interval for graphs or frequency tables. _____
4. Solve data problems by extracting, interpreting, and analyzing data. _____

Performance Standard

- E.8.4 Use the results of data analysis to:
- make predictions
 - develop convincing arguments
 - draw conclusions

5th Grade

1. Predict and draw conclusions from data. _____
2. Analyze data from simple line, bar, and circle graphs. _____
3. Apply results of the data analysis to solve problems. _____
4. Construct and present arguments to support analysis and display of data. _____

Performance Standard

- E.8.5 Compare several sets of data to generate, test, and, as the data dictate, confirm or deny hypotheses.

5th Grade

1. Formulate a hypothesis from an actual set of data. _____
2. Analyze the data to determine the criteria that makes the hypothesis true or false. _____
3. Evaluate the data for accuracy. _____
4. Summarize the data on charts and graphs. _____

Performance Standard:

- E.8.6 Evaluate presentations and statistical analyses from a variety of sources for:
- credibility of the source
 - techniques of collection, organization and presentation of data
 - missing or incorrect data
 - inferences
 - possible sources of bias

5th Grade

1. Analyze techniques of organization and presentation. _____
2. Determine if any data is missing. _____

E. Statistics and Probability

Performance Standard:

E.8.7 Determine the likelihood of occurrence of simple events by:

- using a variety of strategies to identify possible outcomes (e.g., lists, tables, tree diagrams*)
- conducting an experiment
- designing and conducting simulations*
- applying theoretical notions of probability (e.g., that four equally likely events have a 25% chance of happening)
- employing appropriate grade level technology for presentations

5th Grade

1. Use a variety of strategies to identify possible outcomes (lists, tables, tree diagrams.) _____
2. Set up and conduct an experiment. _____
3. Conduct simulations (solve problems by acting them out). _____

Vocabulary

5th Grade

- | | | |
|--------------------|------------------|---------------|
| _____ credibility | _____ hypothesis | _____ mode |
| _____ data | _____ inference | _____ outcome |
| _____ distribution | _____ mean | _____ predict |
| _____ frequency | _____ median | _____ range |

F. Algebraic Relationships

Content Standard: Students in Wisconsin will discover, describe and generalize simple and complex patterns and relationships. In the context of real-world problem situations, the student will use algebraic techniques to define and describe the problem to determine and justify appropriate solutions.

Rationale: Algebra is the language of mathematics. Much of the observable world can be characterized as having patterned regularity where a change in one quantity results in changes in other quantities. Through algebra and the use of variables* and functions*, mathematical models* can be built which are essential to personal, scientific, economic, social, medical, artistic and civic fields of inquiry.

Performance Standard

F.8.1 Work with algebraic expressions in a variety of ways, including:

- using appropriate symbolism, including exponents* and variables*
- evaluating expressions through numerical substitution
- generating equivalent expressions
- adding and subtracting expressions

5th Grade

1. Use vocabulary symbols and notation of algebra correctly (n,=,≠,<,>). _____
2. Read, write and solve addition, subtraction, multiplication and division number sentences. _____
3. Provide the missing number in an addition, subtraction, multiplication and division sentence. _____
4. Evaluate expressions using order of operations. _____
5. Evaluate numerical expressions and simple algebraic expressions through numerical substitution. _____
6. Solve problems involving simple algebraic expressions. _____

Performance Standard

F.8.2 Work with linear and nonlinear patterns* and relationships in a variety of ways, including:

- representing them with tables, with graphs and with algebraic expressions, equations and inequalities
- describing and interpreting their graphical representations (e.g., slope*, rate of change, intercepts*)
- using them as models of real-world phenomena
- describing a real-world phenomenon that a given graph might represent

F. Algebraic Relationships

5th Grade

1. Identify and solve inequalities. _____
2. Complete function tables. _____

Performance Standard

F.8.3 Recognize, describe, and analyze functional relationships* by generalizing a rule that characterizes the pattern of change among variables. These functional relationships include exponential growth and decay (e.g., cell division, depreciation)

5th Grade

Performance Standard

- F.8.4 Use linear equations and inequalities in a variety of ways, including:
- writing them to represent problem situations and to express generalizations.
 - solving them by different methods (e.g., informally, graphically, with formal properties, with technology).
 - writing and evaluating formulas (including solving for a specified variable).
 - using them to record and describe solution strategies.

5th Grade

1. Solve equations using mental math and the guess and check strategy. _____
2. Solve equations involving addition, subtraction, multiplication and division of fractions/decimals. _____
3. Solve equations by using inverse operations. _____
4. Show the relationship between +/- functions by completing “fact family” equations. _____
5. Use a calculator to solve equations. _____
6. Solve problems by using a formula. _____

Performance Standard

- F.8.5 Recognize and use generalized properties and relations, including:
- additive and multiplicative property of equations and inequalities
 - commutativity* and associativity* of addition and multiplication
 - distributive* property
 - inverses* and identities* for addition and multiplication
 - transitive* property

F. Algebraic Relationships

5th Grade

1. Recognize, use, and differentiate between the basic properties of arithmetic:
 - Order/Commutative property for $+/x$. _____
 - Zero property for $+/x$. _____
 - One/Identity Property for x/\div . _____
 - Inverse property for $+/-$ and x/\div ($12-3=9/9+3=12$). _____
 - Property of one for x and \div . _____
 - Associative property for $+$ and x [$5x(3x2)=(5x3)x2$]. _____
 - Distributive property. _____

Vocabulary

5th Grade

- | | |
|----------------------------|---------------------------|
| _____ algebra | _____ order of operations |
| _____ algebraic expression | _____ solution |
| _____ equation | _____ evaluate |
| _____ inverse operations | |