

Setting the Standard

Raising Academic Achievement

Mathematics

Pre K-4 Standards Guide

for Parents and
Community Members



Child's Name



Setting the Standard, Expecting the Best

Dear Parents and Guardians,

Your child deserves the best — in education and in life. At Cincinnati Public Schools, we want to provide all our students with the best opportunities to learn. That includes giving you the tools you need to nurture your child's growth at home.

As adults, we know that we can work harder, and smarter, when we know what's expected of us. This booklet outlines our expectations for what students need to know about math from preschool through 4th grade. These are not only district but statewide standards, developed by a dedicated group of teachers, parents and school administrators from across Ohio. Together, they provide a guide for the knowledge of mathematics that all successful students need to master.

You won't find a crash course in algebra or trigonometry here, though we have included a glossary to help explain some math terms. Instead, you'll read about the many ways your child will learn to solve problems and analyze information. In addition, we've included tips on how you can support your child's learning.

We hope you'll keep this booklet handy to chart your child's progress through the end of 4th grade and that you will use it as you talk with teachers about your child's skills and knowledge.

As we work together to help your child, we encourage you to find out more about our district's academic standards, either online or at your child's school. You also can visit the CPS Web site at www.cps-k12.org to see a comprehensive explanation of all the standards (click the Standards button on the home page). The back of this booklet contains additional Internet and other resources for families.

In the end, these learning goals do more than provide expectations on important skills and strategies. They also help us communicate how much confidence we have in your child's ability to learn and grow. Through our standards, we want to make it clear that we expect great things from every CPS student in every one of our schools. And we look forward to working as a partner with you to achieve academic excellence — and a bright future — for your child.

Sincerely,

Alton Frailey
Superintendent
Cincinnati Public Schools

About Mathematics Standards

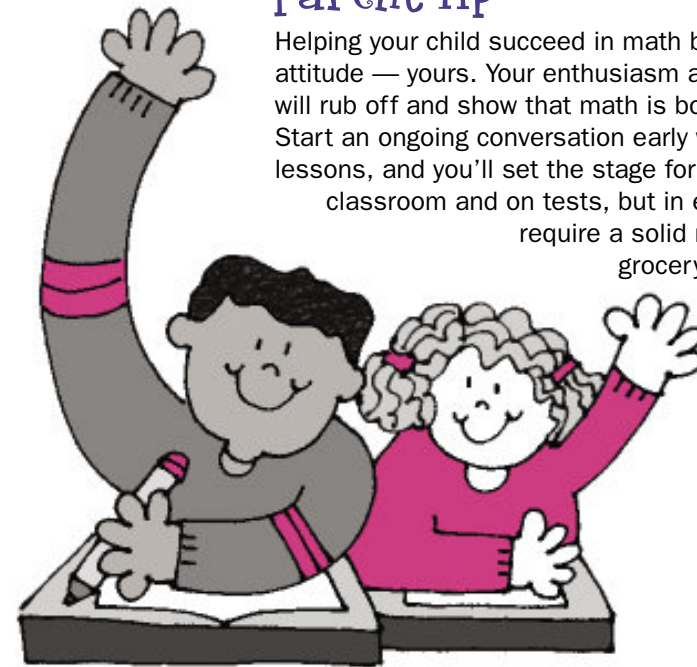
The Cincinnati Public School District's mathematics content standards are designed to prepare all students for success in school, college and the workplace. They are the same high standards adopted by the Ohio Board of Education in December 2001. The State Department of Education will use these standards in developing new statewide tests to measure student performance.

Before drafting the standards, advisory groups reviewed world-class standards from the United States and other countries. The standards-writing teams included teachers, parents, school administrators and business and college representatives. Before the standards were final, mathematics experts and the public reviewed them and added their feedback.

Described as "rigorous yet realistic," the six standards cover important math concepts and skills — and use of these concepts and skills to solve problems.

Parent Tip

Helping your child succeed in math begins with a positive attitude — yours. Your enthusiasm about your child's learning will rub off and show that math is both important and fun. Start an ongoing conversation early with your child about math lessons, and you'll set the stage for success not only in the classroom and on tests, but in everyday situations that require a solid math background, such as grocery shopping and balancing a checkbook.



How to use this Guide

Relax.

This guide covers a lot of mathematical ground, but you don't have to. You'll find general, "big picture" overviews of standards. You also will find grade-specific requirements, known as **indicators**, on pages 4-18. Work with the level and amount of information that fit your family's needs.

Get familiar.

On page 3, you'll find a list of the district's six math standards along with a non-mathematician's explanation of what each one of them means to your child.

Skim and scan.

Each grade-level summary begins with a brief overview that describes how standards fit into your child's overall learning. If you want to know more, you can then read more detailed learning goals. A glossary is included with definitions for many of the mathematics terms used in the grade-level indicators. Words defined in the glossary are written in **bold** type.

Stay involved.

Whether you're helping with homework or preparing for teacher conferences, taking an active role in your child's math education makes a difference. Use the information in this booklet to work closely with teachers and help chart your child's progress. Use pages 24-27 to jot down homework and conference notes.

Explore more.

On page 23, you'll find a list of math education resources — Web sites and books that can help solve math problems and explain complicated concepts. And at every grade level, you'll see a bit of "homework" for you — ways to help build your child's confidence, as well as math skills.



**Keep this booklet
handy until your
child completes
4th grade.**

PreK-4 Mathematics Standards

Number, Number Sense and Operations

What it means to your child: Understanding numbers, what they represent and how they are used — from basic counting to pencil-and-paper calculations to age-appropriate use of calculators and computers.

Measurement

What it means to your child: Clearly understanding and successfully using appropriate measurement tools, terms and technology.

Geometry and Spatial Sense

What it means to your child: Identifying, classifying and analyzing one-, two- and three-dimensional objects, as well as understanding their properties and using that understanding to solve problems.

Patterns, Functions and Algebra

What it means to your child: Using tables, graphs and equations to represent, analyze and solve problems based on changeable quantities.

Data Analysis and Probability

What it means to your child: Designing data collection and organizing and interpreting results to answer questions, illustrate relationships and make predictions.

Mathematical Processes

What it means to your child: Using and effectively communicating mathematics to solve practical problems and make decisions.

Pre-Kindergarten Standards

For preschoolers, learning about math comes through play. While playing “hide-and-seek,” they learn to count to ten. They recognize objects that are the same shape and use their own vocabulary to describe them. They have yet to learn precise names and rules for math, but preschoolers already are constructing the foundation for their future math knowledge. Their curiosity about time, money and how different objects are classified sets the stage for structured math lessons in later grades.

By the end of preschool, students should be able to:

Number, Number Sense and Operations

- Count to 10 in real-life and play situations. Identify and name numbers 0-9.
- Count objects one at a time while touching them and by using cards, dominoes or other dot-patterned guides.
- Say “how many” in groups of five or fewer objects.
- Create sets with more or fewer items than a given set. Sort objects into equal groups and compare groups with unequal numbers of objects using the terms “equal,” “more” and “fewer.”
- Recognize similar values of different combinations of numbers. *For example, five marbles can be three red and two green or four red and one yellow.*
- Scribble or write numbers when playing or to show “how many.”
- Compare and order whole numbers up to 5.
- Identify some coins and recognize that they have different values.
- Combine two small sets to make one big set and divide one big set into equal smaller sets. *For example, combine two bags of raisins with three pieces each, then separate them into two bags of three.*

Measurement

- Begin to use the language of time — such as days, weeks, months, years, yesterday, today and tomorrow. Recognize objects that tell time — such as clocks, timers and calendars.
- Describe everyday events in logical order. *For example, I wash my hands before and after snacks, or I can tell the teacher whose turn is next on the computer.*

Measurement Pre-Kindergarten Standards (cont.)

- Begin to compare objects using terms such as “longer,” “shorter,” “bigger,” “smaller,” “heavier,” “lighter,” “more” and “less.”
- Order objects according to their size, weight or length.
- Measure length and capacity using everyday objects. *For example, find out how many paper clips long a pencil is or how many small cans of rice it takes to fill a large can.*

Geometry and Spatial Sense

- Identify, sort and classify identical and various-sized 2- and 3-dimensional figures and objects.
- Identify, name, create and describe common 2-dimensional forms, such as circles, triangles, rectangles and squares. Describe types of 3-dimensional shapes. *For example, a sphere could be a “ball,” a cube could be a “box,” and a cylinder a “tube.”*
- Begin to be able to place objects and use “location words” to describe them in relation to each other: over, under, inside, outside, on, beside, between, above, below, on top of, upside-down, behind, in back of and in front of.

Patterns, Functions and Algebra

- Sort, classify and arrange objects by one quality, including by size, shape and number.
- Create, add on to and copy simple patterns in sounds, shapes and motions.
- Model simple problems. *For example, show how three friends can share six cookies.*

Data Analysis and Probability

- Gather, sort and compare objects that are “alike” and “different.”
- Put objects on a floor or table based on one attribute (*color, size, shape or quantity*). Select which attribute has the most objects and which has the fewest.

Parent Tip

Sing counting songs with your preschoolers and let them scribble attempts at writing numbers. Let them watch you count money, or tell time, and explain to them why these skills are important.



Kindergarten Standards

For kindergartners, math work focuses on the basics. Students keep busy learning numbers and rules about counting, and they are introduced to ways they can measure the world around them. They also learn about shapes and spaces, different kinds of patterns and how to classify objects, as well as how to gather and sort information.

By the end of kindergarten, students should be able to:

Number, Number Sense and Operations

- Compare and order whole numbers to 10, both up and down. Read and write 0 to 9.
- Sort multiple objects into equal groups and compare groups with unequal numbers of objects.
- Recognize “more than” and “less than” and similar values of different combinations of numbers. *For example, five marbles can be three red and two green or four red and one yellow.*
- “Add on” and “take away” objects from groups to represent addition and subtraction. Recognize groups with most and fewest items.
- Count to 20. Recognize “how many” in groups of up to five objects without counting.
- Recognize and know the value of pennies, nickels and dimes.

Measurement

- Identify and compare measures of time and the calendar, including days, weeks, months and years.
- Compare and order different types of objects using terms such as “longer,” “shorter,” “bigger,” “smaller,” “heavier,” “lighter,” “more” and “less.”
- Measure length and capacity using everyday objects. *For example, find how many paper clips long a pencil is or how many small cans of rice it takes to fill a large can.*
- Order events based on time, including comparing the length of time needed for different activities. Understand the concept of “yesterday,” “today” and “tomorrow.”

Kindergarten Standards (cont.)

Geometry and Spatial Sense

- Identify, sort and build using both 2- and 3-dimensional figures and objects.
- Use placement of objects to show positions including: over, under, inside, outside, on, beside, between, above, below, on top of, upside-down, behind, in back of and in front of. Use the correct terms for these positions.

Patterns, Functions and Algebra

- Sort, classify and arrange objects in more than one way, including by size, shape and number. Explain how items are “alike” and “different.”
- Create, add on to, copy and describe sequences of sounds, shapes, motions and numbers.

Data Analysis and Probability

- Solve problems by making physical models of problem situations.
- Answer questions by gathering and sorting information. *For example, tell how many brothers and sisters students have and what color shoes they’re wearing.*

Parent Tip

Read counting books with your child at home. Play finger games to help teach numbers. Encourage your child to sort toys by type or colors as a way to begin learning about different kinds of sets.



First-Grade Standards

For first-graders, math knowledge includes basic addition and subtraction facts as well as new ways to measure the world. They continue to learn more about shapes, patterns and more complex ways to classify objects, and they gather and sort information.

By the end of first grade, students should be able to:

Number, Number Sense and Operations

- Read and write numbers to 100.
- Show different representations of the same number. *For example, ten can be the written number 10, a collection of ten blocks or the sum of $5 + 5$.*
- Count forward to and backwards from 100 from any number.
- Order objects using the terms “first,” “second,” “third,” etc.
- Recognize and know the value of pennies, nickels, dimes, quarters and dollars. Tell the value of a small collection of one or two kinds of coins and organize different combinations of coins to show equal values.
- Recognize and identify fractions as part of a whole using both words and physical models.
- Count by twos, fives and tens.
- Understand values in tens and hundreds and identify groups of tens and hundreds.
- Express the concepts of addition and subtraction through drawings, sentences and verbal explanations, as well as by using plus (+) and minus (-) signs.

Measurement

- Grasp the concepts of multiplication and division in practical situations. *For example, “Twelve students need two pencils each, so how many pencils will the teacher pass out?”*
- Understand that “equal” means “the same as.”
- Use strategies for addition and subtraction. *For example, “doubles plus or minus one ($6 + 5 = 11$)” for addition and “all but one ($12 - 11 = 1$)” for subtraction.*
- Use and understand the need for standard measurement tools (*rulers, scales*).

Measurement First-Grade Standards (cont.)

- Tell time on the hour and half hour with both digital and dial clocks.
- Order events according to time, by day and season.
- Measure and estimate lengths using both standard tools, like rulers, and non-standard units, like paper clips.

Geometry and Spatial Sense

- Identify squares, circles, ellipses, triangles, rectangles, rhombi, trapezoids, parallelograms, pentagons and hexagons. Compare and sort 2-dimensional shapes by attributes like number of sides and types of angles.
- Copy 2-dimensional shapes and draw them from memory.
- Expand use of “location words” to include near, far, close to, left and right.

Patterns, Functions and Algebra

- Sort, classify and arrange objects by two or more features, including size, shape and number.
- Create, add on to, copy and describe patterned sequences of sounds, shapes, motions and numbers.
- Solve problems using **commutative property** or other number phrases, physical models and sentences.

Data Analysis and Probability

- Sort information by more than one category.
- Collect and organize data using picture graphs and bar graphs divided into units of 1.
- Read charts, picture graphs and bar graphs to identify main ideas, draw conclusions and make predictions. Identify categories with “most” and “fewest” and draw other comparisons.
- Sort five objects by a specific quality (*size, weight*) and put in order (*first, second, third, etc.*).
- Use spinners or number cubes to make predictions about whether events are possible/impossible or more or less likely.

Parent Tip

Even bath time can be math time — help your child fill a cup with water and before you know it, you’re teaching the basic concepts of volume and weight.



Second-Grade Standards

For second-graders, math knowledge includes more understanding of multiplication and division as well as an expanding list of problem-solving strategies. As students continue to learn about shapes and spatial relationships, patterns and ways to classify objects become more complex, as do the ways students are able to gather and sort information to solve problems.

By the end of second grade, students should be able to:

Number, Number Sense and Operations

- Compare and order whole numbers — in physical models, numerals and words — using place value concepts of ones, tens and hundreds. *For example, read and write 243 as 24 tens and 3 ones, or 2 hundreds and 43 ones.*
- Identify numbers as “odd” or “even.”
- Count money and make change using coins and dollar bills. Also, use symbols for dollars (\$) and cents (¢).
- Use words, numerals and physical models to show an understanding of fractions and how they relate to a whole.
- Solve problems using subtraction. *For example, answer the question: “I had six baseball cards, but my sister gave me more. Now I have ten. How many did she give me?” with the equation: “ $6 + ? = 10$.”*
- Explain multiplication as repeated addition, in **rectangular arrays** and **skip counting** (3, 6, 9, 12, etc.). Use **commutative property**.
- Explain division as repeated subtraction and equal sharing.
- Know addition and subtraction facts with numbers to 9. Add and subtract by 10s.
- Use various strategies to add and subtract 2- to 3-digit numbers, including use of **compatible numbers** and **compensatory numbers**. *For example, $473 - 40$ approximately equals 470 [compatible] $- 40 = 430 + 3$ [compensatory] $= 433$.*
- Use and judge the accuracy of **front-end estimations**.

Second-Grade Standards (cont.)

Measurement

- Use appropriate tools to measure length, volume and weight to the nearest unit, including both metric and U.S. measures. Make and test predictions about measurements using different units to measure the same thing.
- Compare relationships between like units such as *inches, feet and yards* or *cups, pints and quarts* or *ounces and pounds*.
- Create common points of reference for measurements. *For example, finger width = 1 centimeter; pop bottle = 2 liters.*
- Tell time to the nearest minute on digital clocks and the nearest five minutes on dial clocks.

Geometry and Spatial Sense

- Identify, describe, compare and sort 3-dimensional objects, such as cubes, spheres, prisms, cones, cylinders and pyramids. Also recognize them from different positions.
- Predict new shapes formed by cutting and combining existing shapes.
- Recognize 2-dimensional shapes that are **congruent** and **similar** by copying them or using **superposition**.
- Create and identify 2-dimensional figures that are **symmetrical**.

Patterns, Functions and Algebra

- Extend and explain number patterns using representative physical objects and use patterns to make generalizations and predictions.
- Create new patterns and explain their rules.
- Solve problems using representative objects, pictures, numbers and other symbols.

Parent Tip

Play board games and work puzzles with your child at home to strengthen math and problem-solving skills.



- Extend the concept of “equals” to symbols as well as numbers. *For example, $5 = 3 + 2$ and $3 + 2 = 5$ and $(\bullet) + (\blacksquare) = (\blacksquare) + (\bullet)$.*
- Use symbols to represent unknown quantities in addition and subtraction equations.
- Understand the difference between **quantitative** and **qualitative** measures.

Data Analysis and Probability

- Question, observe, interview and survey to collect data, then organize it into charts and graphs.
- Read, interpret and make predictions and simple time lines based on charts, points plotted on lines and picture and bar graphs.
- Use sentences to make statements about data, identify untrue statements about sets of data and recognize how data can vary based on one variable, such as population. *For example, expect different outcomes from a survey listing favorite TV shows of parents and one listing their children’s favorites.*
- List possible experiment outcomes and predict the likelihood of each.
- Use physical models and pictures to represent possible ways to arrange two to three objects.

Third-Grade Standards

For third-graders, math knowledge continues to grow as they learn new terms and symbols to express how numbers relate to each other and the world. They work to understand shapes and spatial relationships. They sharpen analytical skills as they work with complex patterns, rules and more ways of using data collection to solve problems.

By the end of third grade, students should be able to:

Number, Number Sense and Operations

- Know and write numbers in a variety of equivalent forms. *For example, 36 is $30 + 6$, 9×4 , $46 - 10$ and the number of inches in a yard.*
- Use place values (*ones, tens, hundreds*) to represent numbers and decimals using numerals, words and physical models such as metric pieces, base ten blocks, decimal squares or money. *For example, see 100 as “10 tens” and 1525 as “1 x 1000 plus 5 x 100 plus 2 x 10 plus 5 x 1.”*
- Order and compare numbers using correct math language and symbols, including less than (<), greater than (>), at most (\leq), equals (=) and at least (\geq).
- Count money in coins and bills and make change to \$10.
- Communicate fractions and mixed numbers with words, numerals and physical models. Compare the most commonly used fractions on number lines, with models like fraction circles or bars and through points of comparison and equivalent forms; see how they relate to a whole.
- Model, show and explain multiplication and division using appropriate symbols in equations and strategies such as **skip counting**, rows of columns and numbers and models.
- Explain relationships between addition and subtraction (**inverse**), multiplication and division (**inverse**), addition and multiplication (repeated addition) and subtraction and division (repeated subtraction).
- Use **commutative** and **associative** properties.
- Add and subtract whole numbers with and without regrouping.
- Know multiplication and division facts through 10.

Number, Number Sense and Operations
Third-Grade Standards (cont.)

- Multiply and divide 2- and 3-digit numbers by single-digit numbers (no remainders).
- Consider size, place value and estimates to evaluate computations.

Measurement

- Use appropriate tools to measure length, volume, weight and temperature to the nearest half or quarter unit, including both metric and U.S. measures. Make and test predictions about measurements using different units to measure the same thing.
- Create common points of reference for measurements. *For example, finger width = 1 centimeter or a pop bottle = 2 liters.*
- Tell time to the nearest minute. Use calendars and clocks to determine a length of time that has passed.
- Read Celsius and Fahrenheit thermometers.
- Estimate perimeter, area and volume using physical models such as links, tiles and cubes.

Geometry and Spatial Sense

- Analyze and describe properties of 2- and 3-dimensional shapes and objects with terms including “**vertex**,” “**edge**,” “**angle**,” “**side**” and “**face**.”
- Identify and describe angles, using appropriate terms and physical models. *For example, classify and draw **right**, **acute**, **obtuse** and **straight** angles.*
- Find names and locations on maps and graphs.
- Draw lines to determine **symmetry** of 2-dimensional shapes.
- Build 3-dimensional models made of cubes based on illustrations or physical objects.



Parent Tip

Fill your home with the sound of music. Encourage your child to play an instrument or listen to music at home to strengthen the natural learning connections between music and math.

Third-Grade Standards (cont.)

Patterns, Functions and Algebra

- Extend and describe rules of **multiplicative patterns** and **growing patterns**. Use patterns to make predictions, identify relationships and solve problems.
- Analyze and recreate mathematical sequences with and without calculators.
- Use objects, pictures, tables, numbers, letters and other symbols to model and solve problems.
- Express mathematical relationships in equation form. Write, solve and explain simple statements.
- Create tables to record, organize and analyze data to determine patterns and rules.
- Determine and explain **quantitative** changes in experiments. *For example, the height of water in a glass drops 1 centimeter after a week because of evaporation.*

Data Analysis and Probability

- Collect data from an experiment and organize in a table or graph, including observations and measurements. Use data results to support conclusions or predictions orally and in writing.
- Draw and interpret picture graphs in which symbols or pictures represent more than one object.
- Match a set of data with its corresponding graph or table.
- Create one type of graphic representation of data using information from another type. *For example, translate data from a bar graph onto a chart.*
- Analyze and interpret a time line.
- Identify the **mode** in a set of data and interpret its meaning.
- Conduct a simple experiment involving a single event. Record the results graphically and use them to draw conclusions about possible outcomes.
- Solve problems involving the possible combinations of two to four objects using physical models, pictures, diagrams and lists.

Fourth-Grade Standards

For fourth-graders, math knowledge includes a strong comprehension of how numbers work in both simple and more complicated ways. Problem-solving abilities continue to expand as students learn more tools they can use to make predictions, estimates and calculations, mentally and with physical models. Fourth-graders have a grasp of how experiments work and how they can be used to solve problems, as well as how to determine effective ways to collect and interpret data.

By the end of fourth grade, students should be able to:

Number, Number Sense and Operations

- Know and write fractions and decimals in a variety of equivalent forms. *For example, show that $1/2$ is also $5/10$, “five-tenths, 0.5 and a half-shaded rectangle.*
- Use place values (*ones, tens, hundreds, etc.*) to read, write, round off and compare whole numbers through millions and decimals through thousandths.
- Know and show factors and multiples of whole numbers to 100. Classify numbers as **prime** or **composite**.
- Compare common fractions using models and other points of reference. Use physical models as well as paper and pencil to add and subtract fractions with the same denominators.
- Use **commutative** and **associative** properties to find exact answers without pencil and paper. Develop and explain other “mental math” strategies.
- Use division to solve problems and interpret meaning of remainders.
- Count money and make change using both coins and bills.
- Use a variety of strategies to estimate answers to problems that include whole numbers, fractions and decimals.
- Solve multistep problems that include addition, subtraction, multiplication and division. Verify the results.
- Compute with whole numbers using pencil and paper, calculator and “mental math.”
- Add and subtract whole numbers; multiply and divide whole numbers by 1- and 2-digit numbers as well as multiples of 10.

Fourth-Grade Standards (cont.)

Measurement

- Compare the number of measurement units to their relative size. *For example, compare the number of cups and the number of quarts needed to fill the same pitcher.*
- Show and describe concepts of **perimeter** and volume.
- Develop and choose appropriate measurement units for physical model-based strategies (*string, tiles, cubes, etc.*) to determine perimeters, volumes and areas.
- Convert measurements within the same system, such as inches to feet, kilograms to grams and quarts to gallons.
- Write, solve and verify answers to multistep measurement problems.

Geometry and Spatial Sense

- Identify and model intersecting, parallel and perpendicular lines and segments using physical materials.
- Use attributes to describe, classify, compare and model 2- and 3-dimensional objects, including **quadrilaterals** (four-sided objects like squares and trapezoids) and triangles. Define triangles based on angles and side lengths.
- Locate and place ordered pairs on a plane.
- Solve geometric problems by moving two objects in a variety of ways to see if they are equal, or **congruent**. Use **reflections**, **rotations** and **translations**.
- Use geometric models to solve other types of math problems, including multiplication and measurement.

Patterns, Functions and Algebra

- Use models and words to describe, extend and generalize about patterns and mathematical relationships, including those in computations, number patterns, geometry and graphs.
- Show, analyze and solve problems relating to patterns and functions using words, tables and graphs.

- Use rules, variables and when appropriate, equations or inequalities, to describe patterns and other mathematical relationships.
- Describe how changes in variables relate to each other. *For example, tell how one variable increases as another decreases or vice versa.*

Data Analysis and Probability



Parent Tip

Ask your child to help bake a batch of cookies, then work together to double the recipe — you'll get a hands-on and tasty lesson about fractions.

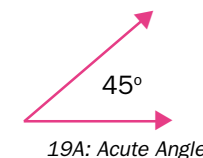
- Create a data-collecting plan for a specific purpose. Plot and interpret data with tables, bar graphs, line plots and **line graphs**.
- Use **Venn diagrams** to sort and describe data.
- Compare and evaluate validity of different types of data collection techniques. Choose the best technique on a case-by-case basis.

- Explain interpretations and predictions based on data in tables, charts and graphs.
- Identify, use and describe meaning of **range**, **median** (the middle number in an ordered set) and **mode** of data.
- Show the likelihood of possible outcomes and conduct simple experiments to verify the probability of specific outcomes in events. *For example, test probability by rolling dice or pulling colored marbles from a bag.*
- Place events in order of likelihood (impossible = 0 to certain = 1) on a diagram or by using appropriate terms (impossible, unlikely, equal, likely or certain).
- List and count all possible combinations of individual elements within multiple sets, each with two or three members. *For example, calculate the number of possible outfits from three shirts, two pairs of shorts and two pairs of shoes.*

Mathematics Glossary

Absolute value: The distance of a number from 0 (always positive) on a number line.

Acute: Angle whose measure is greater than 0 degrees and less than 90 degrees.



19A: Acute Angle

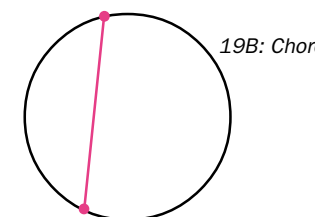
Algorithms: Steps and procedures created to solve problems.

Area: The number of unit squares that can be fit into a 2-dimensional figure.

Associative property: This property states that changes in grouping numbers do not change the end value. For example, " $a(bc) = (ab)c$."

Box-and-whisker plots: Graphs that show the range of data.

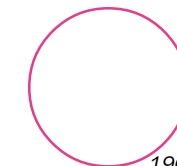
Chord: A straight line from one point in a circle to another. (19B)



19B: Chord

Circle graphs: Graphs that divide data and/or occurrences into pie slices.

Circumference: The distance around a circle. (19C)



19C: Circumference

Commutative property: This property states that when the order of numbers changes, the values do not. *For example, " $4 + 5 = 5 + 4$."*

Compatible numbers: Easy-to-use approximate values of more complicated numbers.

Compensatory numbers: Numbers needed to correct approximations made using compatible numbers.

Composite numbers: Numbers that are not prime. They can be divided by more than 2 factors with no remainders. *For example, 12 is composite because its factors are 1, 2, 3, 4, 6 and 12.*

Congruent shapes: Forms that have the same shape and size.

Continuous data: Data that can be assigned an infinite number of values between whole numbers.

Covariants: Varying with another variable quantity in a manner that leaves a specified relationship unchanged. *For example, $y = x^2 - 16$.*

Cube root: The number which, multiplied by itself twice, equals the original number. *For example, the cube root of 8 is 2 because $2 \times 2 \times 2 = 8$.*

Cubic units: These units measure volume of 3-dimensional objects.

Diameter: The distance across a circle through the center.

Dilations: These transformations maintain an object's shape, not its size.

Discrete data: Data that can be counted.

Distributive property: This property states that for any real numbers a, b and c, $a(b+c) = ab + ac$.

Edge: The intersection of two sides of a 3-dimensional object.

Face: The shape bounded by the edges on a 3-dimensional object.

Frequency tables: These tables record the numbers of occurrences of a given variable.

Front-end estimations: These estimates approximate sums by adding or subtracting with similar numerals in the hundreds and/or tens places.
For example, $468 + 365 + 234 \cong 400 + 300 + 200 = 900$.

Growing patterns: These occur when the relationship between numbers in a pattern involves a progression.

Histograms: These graphs display data frequency through equal intervals with bars. (20A)



Identity property: This property states that adding 0 or multiplying by 1 do not change the values of numbers.

Integers: Whole numbers and their opposites.

Inverse: These operations do the opposite of each other. For example, addition and subtraction are inverses, as are multiplication and division.

Irrational numbers: Numbers that cannot be divided evenly and have non-ending and non-repeating decimal values, for example, $\pi=3.1415926...$

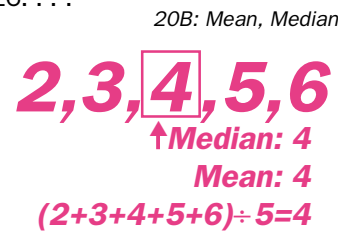
Line graphs: Graphs that plot sets of variables on a plane.

Linear units: Units that measure length.

Mean: The average of a set of numbers. (20B)

Median: The middle number of a set of data grouped in order. (20B)

Mode: The most frequently appearing number or object in a set of data.



Monomials: Numbers written as single units, with or without variables. For example, 3, $45x$ and $58xyz$.

Multiplicative patterns: These occur when the relationship between numbers in a pattern involves multiplication.

Natural numbers: Whole, positive numbers, 1, 2, 3, ...

Nets: Flat diagrams that can be folded into 3-dimensional solid shapes.

Obtuse: An angle measure greater than 90 degrees and less than 180 degrees.

Outliers: Points in a range of data that are widely separated from clusters of main data.

Parallelograms: Four-sided figures in which the opposite sides are parallel to each other.

Percent: Value that represents a part-to-whole relationship. For example, $75\% = 75/100$.

Perimeter: The total distance around the edge of a figure. (21B)

Polynomials: Monomials grouped by addition and/or subtraction.

Prime number: Number that can only be divided by 1 and itself.

Pythagorean Theorem: The formula that computes the lengths of the sides of a right triangle ($a^2 + b^2 = c^2$).

Quadrilaterals: Four-sided objects, such as squares and trapezoids.

Qualitative: Non-numerical data that can be assigned qualities or categories.

Quantitative: Numerical data.

Radicals: Signs used to show a square root, cube root, or other higher root. $\sqrt{\quad}$

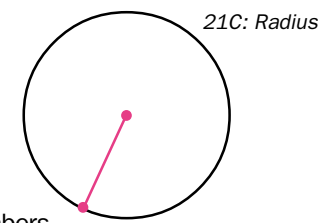
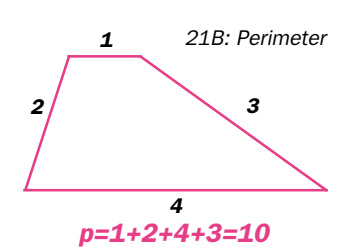
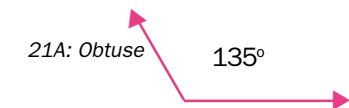
Radius: The distance from a circle's center to its edge. (21C)

Range: The highest number minus the lowest number in a set of numbers.

Ratio: This value represents part-to-part and part-to-whole relationships.

Rational numbers: Numbers that can be written as a/b , where a and b are integers and $b \neq 0$.

Rational expression: Fractions whose numerators and denominators are polynomials. For example, $\frac{n^2 - 3n}{2}$



Math Resources for Parents*

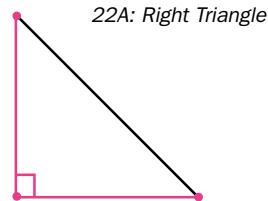
Glossary

Rectangular arrays: Numbers arranged in rows and columns to illustrate the concept of multiplication.

Reflection: A transformation that flips an object to show its mirror image.

Right: Relating to 90 degrees. For example, a right angle measures 90 degrees, and a right triangle has only one right angle.

Right triangle: Triangle with one 90-degree angle. (22A)



Rotation: A transformation that turns an object around a single fixed point.

Scatterplots: Models that represent each item in a set of data as one point that measures two of its attributes.

Scientific notation: Notation method that shows numbers as products of a power of 10 and a decimal number between one and 10. For example, 8,924,000 becomes 8.924×10^6 .

Similar shapes: Forms that have the same shape but different size.

Skip counting: Counting by skipping numbers in a pattern. For example, "3, 6, 9, 12, etc."

Square root: The number which, when multiplied by itself, equals the original number.

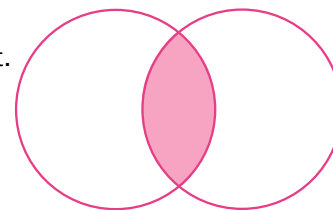
Stem-and-leaf plots: A frequency diagram that displays both the actual data and the data frequency.

Superposition: Occurs when placing one shape on top of another to compare their similarities and differences.

Symmetry: Correspondence in size, form and arrangement of parts on opposite sides of a plane, line or point.

Translations: These are changes in which every point in an object moves the same distance and direction.

Tree diagram: This type of diagram shows the number of ways an event may occur. For example, one could show the possible combinations after tossing three coins.



22B: Venn Diagram

Venn diagram: This type of diagram consists of circles that do and/or do not intersect to show relationships between more than one set. (22B)

Vertex: The point of intersection of two segments, lines, or rays.

Zero of a function: The solution to an equation which intersects the x-axis on a graph ($x = 0$).

<http://www.figurethis.org/>

A site dedicated to fun math activities for the family.

<http://sosmath.com/>

Offers more than 2,500 pages of math help, explained in easy-to-understand language.

<http://askdrmath.com/>

This resource from Drexel University provides math resources by subject and a large archive of answers to specific and general math questions.

<http://www.mathleague.com/>

A good math study resource for 4th to 8th graders.

<http://school.discovery.com/homeworkhelp/webmath/>

The Discovery School's math helper offers help with homework as well as math lessons that parents and students can work on together.

<http://www.nctm.org/corners/families/index.htm>

The National Council of Teachers of Mathematics Web site offers a family corner with tips for parents.

<http://www.ed.gov/pubs/parents/LearnPttrs/math>

This U.S. Department of Education link outlines family activities that practice math for the fun of it.

<http://www.mathgoodies.com/>

Interactive math lessons, homework help, worksheets and puzzles with a special section geared toward parents.

Math Coach: A Parent's Guide to Helping Children Succeed in Math, by Wayne A. Wickelgren and Ingrid Wickelgren (Berkley Publishing Group, 2001)

This guide translates math concepts so parents can help their students learn.

How to Help Your Child Excel in Math: An A to Z Survival Guide, by Brita Immergut (Career Press, Incorporated, 2001)

Simple, easy-to-follow explanations for math terms, from A to Z.

*Please be aware that Internet resources are subject to change.

Standards Notes for
(Child's Name)

Homework Notes

This is a good place for you to keep track of your child's homework assignments and how they connect to the standards. It's an opportunity to write down specific skills or concepts in which your child may need some extra help. Just as important, it's a place where you can note positive comments when your child does good work.

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Extra pages are available through the school office or by logging on to the CPS Web site, www.cps-k12.org, and clicking the Standards button.

conference notes

This is a good place for you to list questions that you want to make sure you ask your child's teacher during conferences at the progress-reporting periods. Consider sharing information that might be useful to your child's teacher about your child's personal strengths, challenges and most effective learning styles (coaching, small-group work, projects, individual study, etc.) Use it to take notes during teacher conferences.

Conference Questions/Comments for my Child's Teacher

Child's Grade Level _____

Date Notes

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**Setting
the
Standard**

Cincinnati Public Schools

Raising Academic Achievement

Mathematics

Pre K-4 Standards Guide

for Parents and
Community Members



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Located at 2651 Burnet Avenue

www.cps-k12.org

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Child's Name