Math

What Every Child Should Know

3rd Grade

In 3rd grade, your child will learn important new ideas and gain important new skills. One of the most important topics this year is multiplication and division. Another is fractions. Multiplication, division, and fractions are the building blocks for many life skills that students will learn in later grades, such as percentages. Students also need to master these topics to be ready for algebra and advanced math, so it is essential to get a good start with these topics in 3rd grade.

- Developing understanding of multiplication and division and strategies for multiplication and division within 100.
- Developing understanding of fractions, especially unit fractions (fractions with numerator 1).
- Developing understanding of the structure of rectangular arrays and of area;
- Describing and analyzing two-dimensional shapes.

Talking To Your Child's Teacher

When you talk to the teacher, do not worry about covering everything. Instead, keep the conversation focused on the most important topics. In 3rd grade, these include:

- Multiplication and division
- Fractions

Ask to see a sample of your child's work. Ask the teacher questions such as: Is this piece of work satisfactory? How could it be better? Is my child on track?

How can I help my child improve or excel in this area? If my child needs extra support or wants to learn more about a subject, are there resources to help his or her learning outside the classroom?

Help Your Child Learn At Home

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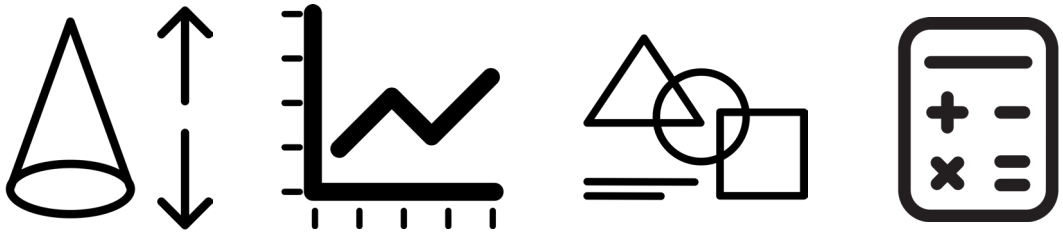
- Try to create a quiet place for your child to study, and carve out time every day when your child can concentrate on reading, writing, and math uninterrupted by friends, brothers or sisters, or other distractions.
- You should also try and sit down with your child at least once a week for 15 to 30 minutes while he or she works on homework. This will keep you informed about what your child is working on, and it will help you be the first to know if your child needs help with specific topics.

By taking these small steps, you will be helping your child become successful both in and outside the classroom. Look for "word problems" in real life. Some 3rd grade examples might include:

- Notice those everyday occasions when you find yourself using your times tables — such as to determine how many days there are in four weeks. Ask your child for the answer.
- Involve your child when you notice yourself using division to "work backward" in the times tables — such as determining how many candies each child will get if 36 candies are shared equally among nine children at a party, or determining how many six-inch lengths can be cut from a string 18 inches long.



Math

What Every Child Should Know

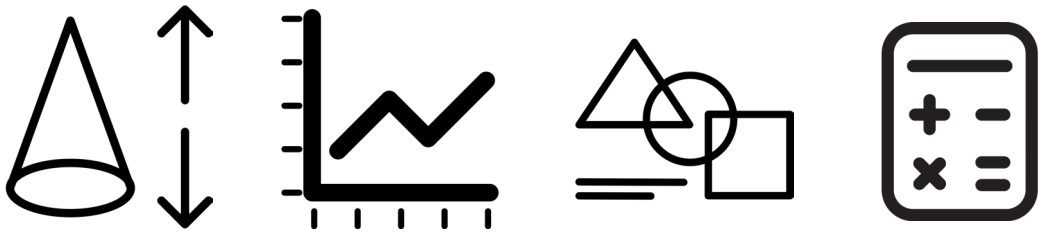
3rd Grade

Educating for citizenship in today's world

Within a society whose structures are largely mathematical it is important that citizens be educated in the methods of mathematics: first in terms of general numeracy but also in terms of understanding mathematics as a discipline which has formatting power in society. Teaching students to identify and pose problems, to explain themselves in terms others can understand and to question the invisible structures of mathematics is key to developing informed, active and critical citizens. Mathematics has a role in citizenship education because it has the potential to help us understand our society and our role in shaping it.

Skills employers look for:

- ⋆ Ability to work in a team
- ⋆ Ability to make decisions and solve problems
- ⋆ Ability to plan, organize and prioritize work
- ⋆ Ability to relate math with the real world
- ⋆ Ability to obtain and process information
- ⋆ Ability to analyze quantitative data
- ⋆ Technical knowledge related to the job
- ⋆ Proficiency with computer software programs



Math

What Every Child Should Know

4th Grade

In 4th grade, your child will gain important new skills while continuing to build on what he or she learned the previous year. One of the main areas studied in 4th grade is arithmetic and applying it to solve problems. This is an important life skill, and your child should make significant strides in this area during the year. Your child will also build knowledge and skills with fractions to prepare for mastering this topic in 5th and 6th grades. These skills will help ensure your child is ready for algebra and advanced math. In Grade 4, instructional time should focus on three critical areas:

- Developing understanding and fluency with multi-digit multiplication, and developing understanding of dividing to find quotients involving multi-digit dividends.
- Developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators and multiplication of fractions by whole numbers.
- Understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry.

Talking To Your Child's Teacher

When you talk to the teacher, do not worry about covering everything. Instead, keep the conversation focused on the most important topics. In 4th grade, these include:

- Doing arithmetic and solving word problems with multi-digit numbers
- Doing arithmetic and solving word problems with fractions

Ask to see a sample of your child's work. Ask the teacher questions such as: Is this piece of work satisfactory? How could it be better? Is my child on track? How can I help my child improve or excel in this area? If my child needs extra support or wants to learn more about a subject, are there resources to help his or her learning outside the classroom?

Help Your Child Learn At Home

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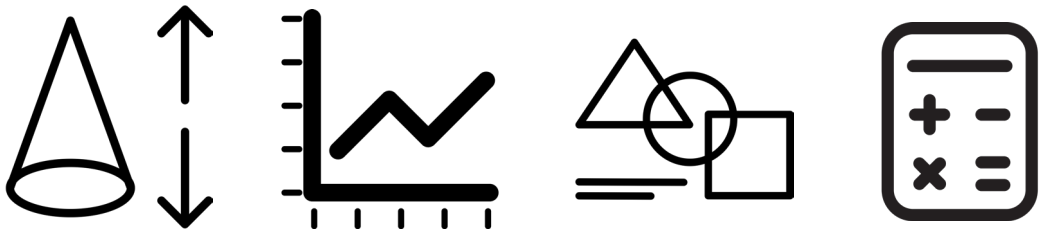
You should also try and sit down with your child at least once a week for 15 to 30 minutes while he or she works on homework. This will keep you informed about what your child is working on, and it will help you be the first to know if your child needs help with specific topics. By taking these small steps, you will be helping your child become successful both in and outside the classroom.

Look for "word problems" in real life. Some 4th grade examples might include:

- Ask your child to compare numbers using phrases like "times as much." For example, if the family cat weighs 8 lbs. and the family dog weighs 56 lbs., how many times as much does the dog weigh?
- Ask your child to help you compare fractional amounts — for example, if one recipe calls for 2⁄3 of a cup of oil, but another recipe calls for 3⁄4 of a cup of oil, which recipe calls for more oil? (In 5th grade, your child will learn ways to determine just how much more oil.



Math

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4th Grade

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Skills employers look for:

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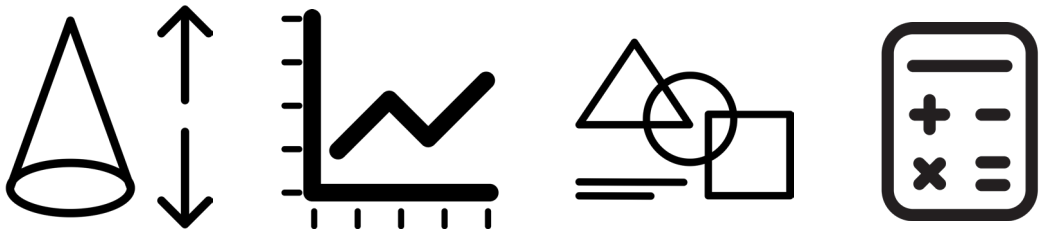
- ⋆ Ability to plan, organize and prioritize work
- ⋆ Ability to relate math with the real world
- ⋆ Ability to obtain and process information
- ⋆ Ability to analyze quantitative data
- ⋆ Technical knowledge related to the job
- ⋆ Proficiency with computer software programs



Math

What Every Child Should Know

5th Grade

Fifth grade is a milestone and a pivot point for students. The classroom focus on arithmetic during the elementary grades will develop into a more formal study of algebra in middle school. To be ready for algebra, students must have an understanding of fractional arithmetic, in part because even simple equations cannot be solved without fractions. Because of this, whole-number arithmetic comes mostly to a close in 5th grade, while multiplying and dividing fractions becomes a major focus. In Grade 5, instructional time should focus on three critical areas:

- Developing fluency with addition and subtraction of fractions, and developing understanding of the multiplication of fractions and of division of fractions in limited cases (unit fractions divided by whole numbers and whole numbers divided by unit fractions).
- Extending division to 2-digit divisors, integrating decimal fractions into the place value system and developing understanding of operations with decimals to hundredths, and developing fluency with whole number and decimal operations.
- Developing understanding of volume.

Talking To Your Child's Teacher

When you talk to the teacher, do not worry about covering everything. Instead, keep the conversation focused on the most important topics. In 5th grade, these include:

- Multiplying and dividing fractions, and solving related word problems
- Decimals (concepts and arithmetic)
- Volume (concepts and problem-solving)

Ask to see a sample of your child's work. Ask the teacher questions such as: Is this piece of work satisfactory? How could it be better? Is my child on track? How can I help my child improve or excel in this area? If my child needs extra support or wants to learn more about a subject, are there resources to help his or her learning outside the classroom?

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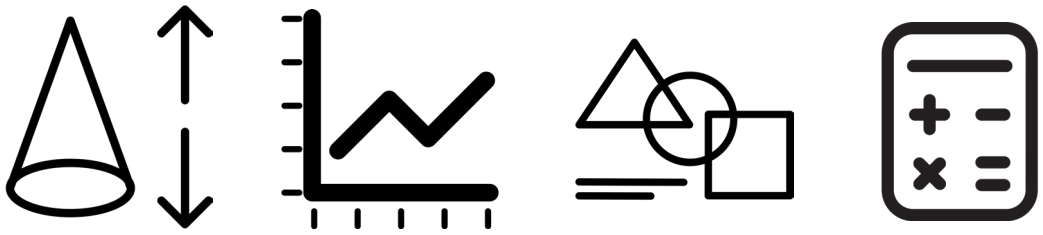
- Doing arithmetic with decimals, for example when balancing a checkbook.
- Multiplying with fractions — for example, if you used about 2⁄3 of a 3⁄4 cup measure of vegetable stock, then how much stock did you use? About how much is left?
- Using the length, width, and depth of a garden plot to determine how many bags of garden soil to buy



Math

What Every Child Should Know

5th Grade

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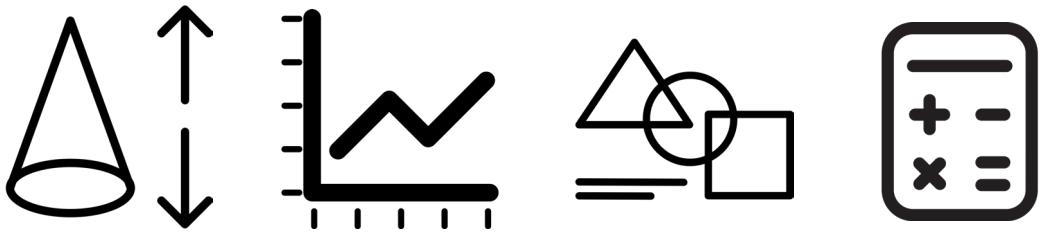

Math

What Every Child Should Know

6th Grade

The skills and understanding that your child will gain during 6th grade are among the most important foundations for college and career readiness. These include working with ratios and rates and working with variables and variable expressions — the building blocks of algebra. Many of this year's topics will remain a major emphasis throughout the middle school years and into high school.

- Connecting ratio and rate to whole number multiplication and division and using concepts of ratio and rate to solve problems
- Completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers
- Writing, interpreting, and using expressions and equations
- Developing understanding of statistical thinking.

Talking To Your Child's Teacher

When you talk to the teacher, do not worry about covering everything. Instead, keep the conversation focused on the most important topics. In 6th grade, these include:

- Analyzing and solving problems using concepts of ratio and rate
- Working with variables and expressions
- Analyzing and solving word problems using equations

Ask to see a sample of your child's work. Ask the teacher questions such as: Is this piece of work satisfactory? How could it be better? Is my child on track? How can I help my child improve or excel in this area? If my child needs extra support or wants to learn more about a subject, are there resources to help his or her learning outside the classroom?

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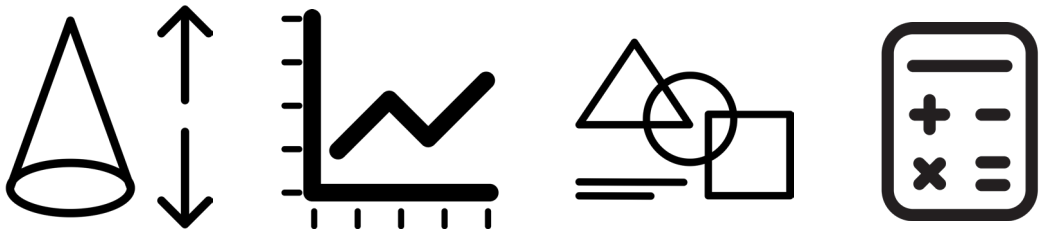

Math

What Every Child Should Know

6th Grade

Educating for citizenship in today's world

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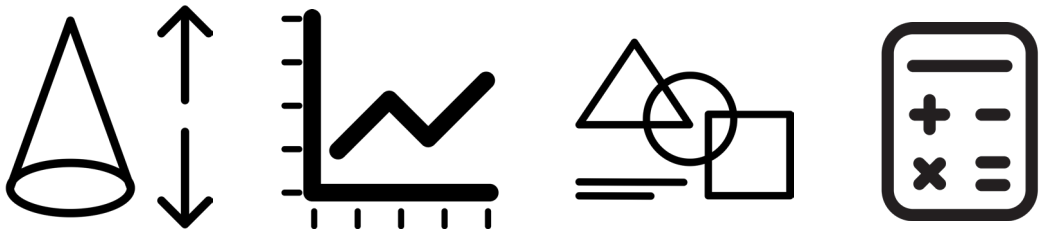

Math

What Every Child Should Know

7th Grade

In 7th grade, your child will grow in skill and understanding as he or she continues the previous grade's work in proportional relationships, equations, and positive and negative numbers. These topics will remain a major emphasis throughout the middle school years and into high school. A good command of rates and proportional relationships, including percentages, is also an important life skill.

- Developing understanding of and applying proportional relationships
- Developing understanding of operations with rational numbers and working with expressions and linear equations
- Solving problems involving scale drawings and informal geometric constructions, and working with two- and three-dimensional shapes to solve problems involving area, surface area, and volume
- Drawing inferences about populations based on samples.

Talking To Your Child's Teacher

When you talk to the teacher, do not worry about covering everything. Instead, keep the conversation focused on the most important topics. In 7th grade, these include:

- Analyzing proportional relationships
- Arithmetic with positive and negative numbers
- Solving equations quickly and accurately, and writing equations to solve word problems

Ask to see a sample of your child's work. Ask the teacher questions such as: Is this piece of work satisfactory? How could it be better? Is my child on track? How can I help my child improve or excel in this area? If my child needs extra support or wants to learn more about a subject, are there resources to help his or her learning outside the classroom?

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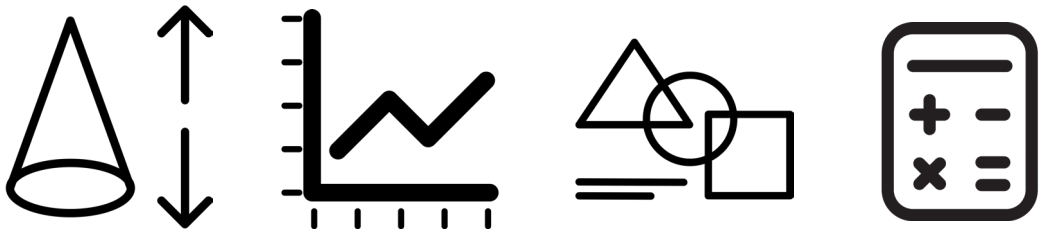

Math

What Every Child Should Know

7th Grade

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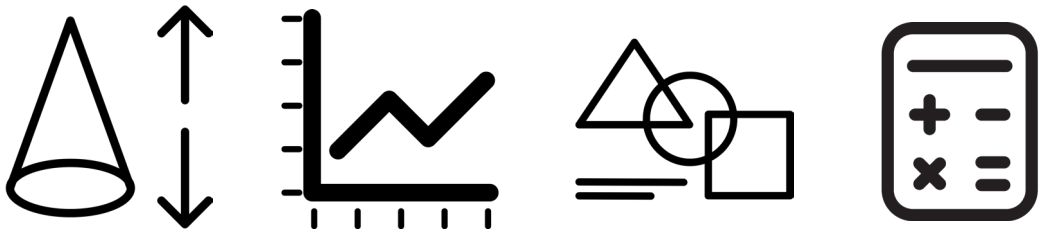

Math

What Every Child Should Know

8th Grade

In 8th grade, your child will learn a number of skills and ideas that he or she must know and understand to be ready for college and career. Your child will continue to learn how to write and reason with algebraic expressions. Your child also will make a thorough study of linear equations with one and two variables. Building on previous work with relationships between quantities, your child will be introduced to the idea of a mathematical function. And your child will prepare for high school geometry by understanding congruence (same shape and size) and similarity of geometric figures.

- Formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and solving linear equations and systems of linear equations
- Grasping the concept of a function and using functions to describe quantitative relationships
- Analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem.

Talking To Your Child's Teacher

When you talk to the teacher, do not worry about covering everything. Instead, keep the conversation focused on the most important topics. In 8th grade, these include:

- Linear equations with one and two variables
- Functions
- Congruence and similarity of geometric figures

Ask to see a sample of your child's work. Ask the teacher questions such as: Is this piece of work satisfactory? How could it be better? Is my child on track? How can I help my child improve or excel in this area? If my child needs extra support or wants to learn more about a subject, are there resources to help his or her learning outside the classroom?

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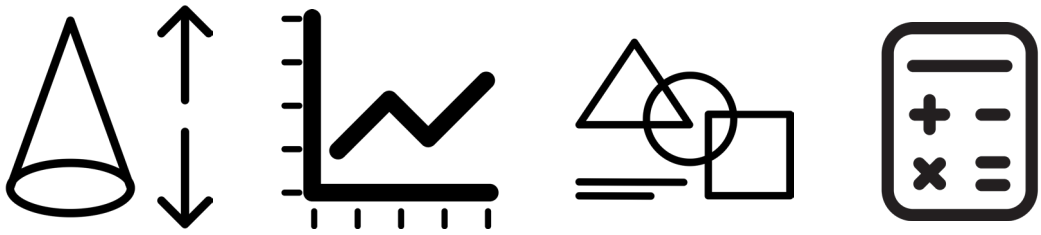

Math

What Every Child Should Know

8th Grade

Educating for citizenship in today's world

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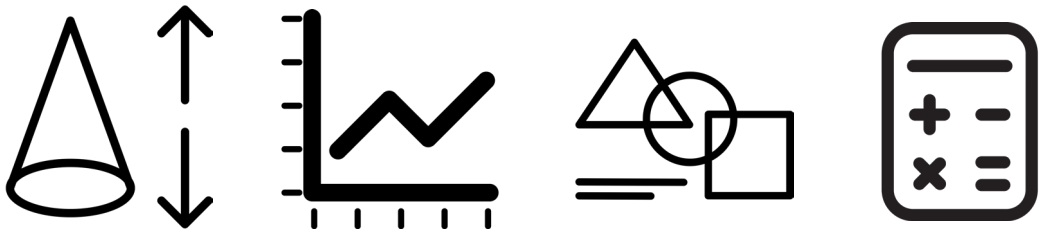


Math

What Every Child Should Know

High School

To prepare for college and career, your child will study mathematics across a broad spectrum, from pure mathematics to real-world applications. Numerical skill and quantitative reasoning remain crucial even as students move forward with algebra.
Algebra, functions, and geometry are important not only as mathematical subjects in themselves but also because they are the language of technical subjects and the sciences. And in a data-rich world, statistics and probability offer powerful ways of drawing conclusions from data and dealing with uncertainty. The high school standards also emphasize using mathematics creatively to analyze real-world situations — an activity sometimes called "mathematical modeling." For grades 9-12, the standards are grouped into grade bands of 9-10 grade standards and 11-12 grade standards.

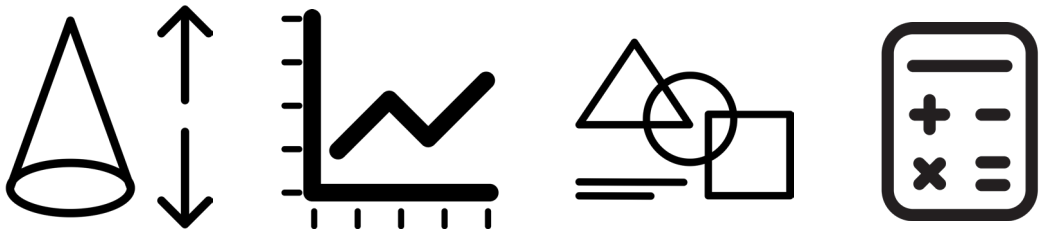
The high school standards are organized into six major content areas:

Number and Quantity

- Extend the properties of exponents to rational exponents
- Use properties of rational and irrational numbers.
- Reason quantitatively and use units to solve problems
- Perform arithmetic operations with complex numbers
- Represent complex numbers and their operations on the complex plane
- Use complex numbers in polynomial identities and equations
- Represent and model with vector quantities.
- Perform operations on vectors.
- Perform operations on matrices and use matrices in applications

Algebra

- Interpret the structure of expressions
- Write expressions in equivalent forms to solve problems
- Perform arithmetic operations on polynomials
- Understand the relationship between zeros and factors of polynomials
- Use polynomial identities to solve problems
- Rewrite rational functions
- Create equations that describe numbers or relationships
- Understand solving equations as a process of reasoning and explain the reasoning
- Solve equations and inequalities in one variable
- Solve systems of equations
- Represent and solve equations and inequalities graphically



Math

What Every Child Should Know

High School

Functions

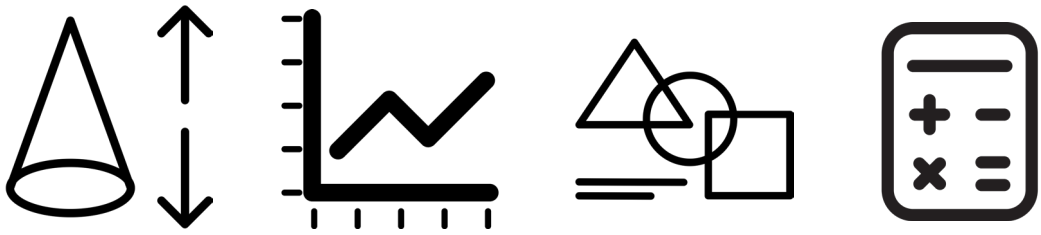
• Understand the concept of a function and use function notation
• Interpret functions that arise in applications in terms of the context
• Analyze functions using different representations
• Build a function that models a relationship between two quantities
• Build new functions from existing functions
• Construct and compare linear and exponential models and solve problems
• Interpret expressions for functions in terms of the situation they model
• Extend the domain of trigonometric functions using the unit circle
• Model periodic phenomena with trigonometric functions
• Prove and apply trigonometric identities

Modeling

• Estimating how much water and food is needed for emergency relief in a devastated city of 3 million people, and how it might be distributed.
• Planning a table tennis tournament for 7 players at a club with 4 tables, where each player plays against each other player.
• Designing the layout of the stalls in a school fair so as to raise as much money as possible.
• Analyzing stopping distance for a car.
• Modeling savings account balance, bacterial colony growth, or investment growth.
• Engaging in critical path analysis, e.g., applied to turnaround of an aircraft at an airport.
• Analyzing risk in situations such as extreme sports, pandemics, and terrorism.
• Relating population statistics to individual predictions.

Geometry

• Experiment with transformations in the plane
• Understand congruence in terms of rigid motions
• Prove geometric theorems
• Make geometric constructions
• Understand similarity in terms of similarity transformations
• Prove theorems involving similarity
• Define trigonometric ratios and solve problems involving right triangles
• Apply trigonometry to general triangles
• Understand and apply theorems about circles
• Find arc lengths and areas of sectors of circles
• Translate between the geometric description and the equation for a conic section
• Use coordinates to prove simple geometric theorems algebraically
• Explain volume formulas and use them to solve problems
• Visualize relationships between two-dimensional and three-dimensional objects
• Apply geometric concepts in modeling situations



Math

What Every Child Should Know

High School

Statistics and Probability

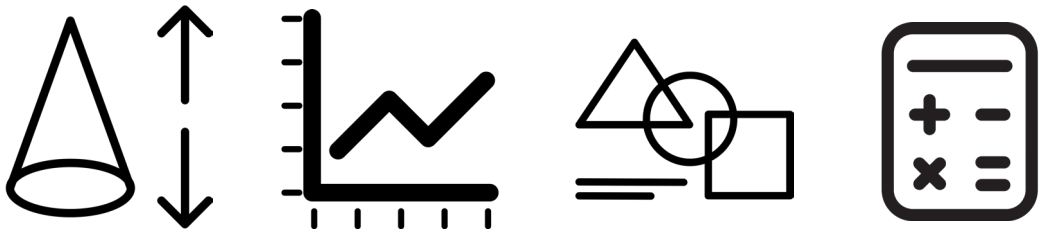
• Summarize, represent, and interpret data on a single count or measurement variable
• Summarize, represent, and interpret data on two categorical and quantitative variables
• Interpret linear models
• Understand and evaluate random processes underlying statistical experiments
• Make inferences and justify conclusions from sample surveys, experiments and observational studies
• Understand independence and conditional probability and use them to interpret data
• Use the rules of probability to compute probabilities of compound events in a uniform probability model
• Calculate expected values and use them to solve problems
• Use probability to evaluate outcomes of decisions

Talking To Your Child's Teacher

Keeping the conversation focused. When you talk to the teacher, do not worry about covering everything. Instead, keep the conversation focused on the most important topics. In high school, these include:
• Does my child have a strong grounding in arithmetic, including operations on fractions, decimals, and negative numbers?
• Does my child take a thinking approach to algebra and work with algebraic symbols fluently?
• Is my child comfortable using coordinates in algebra and geometry?
• Can my child break a complex problem down into parts and apply the math he or she knows to problems outside of mathematics?
• Does my child use terms precisely and make logical arguments?
• Does my child have the knowledge to learn advanced mathematics after high school if he or she so chooses?
Ask to see a sample of your child's work. Ask the teacher questions such as: Is this piece of work satisfactory? How could it be better? Is my child on track? How can I help my child improve or excel in this area? If my child needs extra support or wants to learn more about a subject, are there resources to help his or her learning outside the classroom?

Planning for College and Career

At the beginning of high school, sit down with your child's teachers, counselor, or other advisor to discuss what it will take for your child to graduate, your child's goals, and his or her plans after high school. Create a plan together to help your child reach these goals, and review it every year to make sure he or she is on track. This plan should include:
• An appropriate course sequence to meet your child's goals. For example, if your child wants to study biosciences in college, he or she will likely need additional or advanced math and science courses in high school to be prepared for college-level coursework.
• The most appropriate extracurricular activities for your child to participate in. For example, if your child is interested in journalism or photography, encourage him or her to sign up for the school newspaper or yearbook. These activities will help your child expand his or her learning outside of school and may help foster new hobbies or interests.



Math

What Every Child Should Know

High School

• Ways you can help your child prepare for college or career. For example, if your child is interested in a particular field, look to see if internships exist to build his or her work experience in that subject area. Look for college fairs to attend, and encourage your child to visit colleges he or she might be interested in.

• Finding ways to pay for college or advanced training. College can be expensive, but there are lots of ways to get financial help, such as scholarships, grants, work-study programs, and student loans. You just need to make the time for you and your child to do the research. You can start by helping your child fill out the FAFSA (Free Application for Federal Student Aid) during his or her senior year of high school. Visit www.fafsa.ed.gov for help and more information on FAFSA and financial aid.

Educating for citizenship in today's world

Within a society whose structures are largely mathematical it is important that citizens be educated in the methods of mathematics: first in terms of general numeracy but also in terms of understanding mathematics as a discipline which has formatting power in society. Teaching students to identify and pose problems, to explain themselves in terms others can understand and to question the invisible structures of mathematics is key to developing informed, active and critical citizens. Mathematics has a role in citizenship education because it has the potential to help us understand our society and our role in shaping it.

Skills employers look for:

- ⋆ Ability to work in a team
- ⋆ Ability to make decisions and solve problems
- ⋆ Ability to plan, organize and prioritize work
- ⋆ Ability to relate math with the real world
- ⋆ Ability to obtain and process information
- ⋆ Ability to analyze quantitative data
- ⋆ Technical knowledge related to the job
- ⋆ Proficiency with computer software programs