Family Friendly Math

GUIDE FOR MIDDLE SCHOOL

Log on to the SC Department of Education website, for the complete standards.

The move to middle school is an exciting time in your child's life. For many it means a new school and they find that subjects are a bit more challenging than they were in elementary school. In math, the South Carolina College-and-Career-Ready Standards have the middle grades take on the core of Algebra and get exposure to some of the foundational concepts in Geometry. Students use real-world applications to enhance development. If your child conquers these concepts, much of the mathematics encountered in high school will be much easier to grasp. So, hold on to your hats, parents, and brush up on your Pythagorean Theorem! Keep in mind that your attitude continues to influence your child's success with math.

LEARN ABOUT THE STANDARDS

The South Carolina College- and Career-Ready Standards for Mathematics:

- Outline the knowledge and skills students must master so that, as high-school graduates, they have the expertise needed to be successful in college or careers.
- Provide a set of grade-level standards, "stair steps," based on the previous grade's standards which serve as the foundation for the next grade.
- Ensure that no matter where a student lives in South Carolina, the expectations for learning are the same.

Human knowledge now doubles about every three years. Therefore, revision of South Carolina's standards occurs periodically to respond to this growth of knowledge and increase of needed skills so our students will be ready for college or jobs. The College-and-Career-Ready Standards prepare students for dealing with the growing mass of information by not only emphasizing content knowledge but by also stressing the skills of reasoning, analyzing data, and applying information to examine and solve situations.

South Carolinians developed these academic standards for South Carolina's children. The mathematics standards are aligned with the Profile of the South Carolina Graduate, which summarizes the knowledge, skills, and habits employers expect. Developed by business leaders, the Profile is approved by the South Carolina Chamber of Commerce and endorsed by the Superintendents' Roundtable as well as South Carolina's colleges and universities. The Profile demands world-class knowledge and skills, and emphasizes critical thinking and problem solving, communication, and interpersonal skills.

NUMBER SYSTEM

Middle-school students broaden their concept of numbers into the "system of numbers," the different types of numbers (natural, whole, integers, rational, irrational), and different representations of them. These Steps to Success include:

FIFTH GRADE

- Understand "place value" using decimals up to a thousandth
- Add, subtract, multiply, and divide decimals to hundredths using models and drawings
- Add and subtract fractions with unlike denominators (bottom number) to solve real-world problems
- Extend knowledge of multiplying fractions to include multiplying fractions by fractions
- Solve division problems using unit fractions (1 is the numerator) and whole numbers

MIDDLE SCHOOL

- Recognize rational numbers (numbers that can be written as fractions) and irrational numbers (numbers that as a decimal are infinite, such as pi, 3.14159...)
- Understand the different ways of representing rational numbers (fractions, decimals, or percentages)
- Add, subtract, multiply, and divide negative numbers in real-world situations
- Solve real-world percent problems (e.g., tax, tips, markups, and markdowns)

HIGH SCHOOL

- Understand expressions involving simple radicals (roots: square or cube, etc.) and rational exponents (fractions); convert between the two forms of expressions
- Understand imaginary numbers ($i = \sqrt{-1}$) and know that a complex number is a combination of a real and an imaginary number

THINKING AND OPERATIONS

In middle school, students move from a focus on ratios and proportions to examining functions. Your child will learn to reason using algebraic expressions and study linear equations having one and two variables. These Steps to Success include:

FIFTH GRADE

- Understand grouping of numbers using parentheses and brackets 4(3+2)=__
- Translate the groupings into verbal statements (four groups of 3+2 equal ?)
- Understand and graph ordered pairs: (14,5) means fourteen units to the right on the horizontal axis and five units up on the vertical axis of a coordinate grid
- Investigate the relationship between two numerical patterns

MIDDLE SCHOOL

- Write and solve equations and inequalities for real-world situations (e.g., the distance (D) traveled by a train in time (t) might be expressed by an equation D=85t, where D is in miles and t is in hours)
- Understand ratios and rates, and solving problems involving proportional relationships (e.g., if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?)
- Analyze relationships in tables, graphs, and equations of independent and dependent variables
- Explore positive and negative exponents, square roots, cube roots, and scientifi c notation (e.g., evaluating $\sqrt{36}$ or $\sqrt{27}$; estimating world population as 7x109)
- Add, subtract, and multiply polynomials with math expressions such as $(9r^3 + 5r^2 + 11r) + (-2r^3 + 9r - 8r^2)$

HIGH SCHOOL

- Add, subtract, and multiply polynomials (math expressions such as 5xy2-3x+4)
- Perform arithmetic with rational expressions -- the ratio of two polynomials (x3+6)/(x-2)
- Create and solve equations based on real-world problems involving formulas that have one or multiple unknowns, such as converting temperatures between Fahrenheit (f) and Celsius (c) using c=f-32/1.8
- Reason with equations and inequalities: find solution(s) to the problem, justify solution(s), and verify
- Build and solve functions (equations to which there is only one solution and in which the first variable determines the value of the second variable), including linear, quadratic, and exponential
- Interpret functions. Explain the domain and range of a function. Identify the intercepts (x and y) for the function. Be able to graph the function.

GEOMETRY

The middle grades get your child ready for high-school Geometry. Middle-school students progress from solving problems of volume and surface area to studying the relationships between geometric figures. They then move into solving problems involving cylinders, cones, and spheres. These Steps to Success include:

FIFTH GRADE

- Understand ordered pairs and their relationship to the x and y axes of a coordinate grid like longitude and latitude lines on a map
- Plot and interpret points on a coordinate grid to illustrate a real-world situation
- Classify two-dimensional shapes into a hierarchy. All rectangles are parallelograms but not all parallelograms are rectangles.

MIDDLE SCHOOL

- Reason about relationships between shapes to determine area, surface area, and volume
- Solve real-world problems involving scale drawings
- Understand congruence and similarity using physical models, transparencies, or Geometry software (e.g., given two congruent figures, show how to obtain one from the other by a sequence of rotations, translations, and/or reflections)
- Understand and apply the Pythagorean Theorem (a2+b2=c2) to solve problems

HIGH SCHOOL

- Use geometric terms and figures to describe real-world objects
- Represent rotations, reflections, translations, and dilations of objects using graphs, functions, and software to understand the effects of transformations and compositions
- Prove and apply, in mathematical and real-world contexts, theorems about:
  - lines and angles
  - relationships within and among triangles
  - parallelograms
- Explain the sources for the formulas and apply, in mathematical and real-world problems:
  - circumference and area of a circle
  - volume and surface area of a sphere, cylinder, pyramid, cone, and prism
- Construct geometric figures and use these figures to speculate about geometric relationships
- Prove simple geometric theorems with Algebra using coordinates

MEASUREMENT, DATA ANALYSIS AND PROBABILITY

Middle-school students begin to focus on ways to organize qualitative data (it describes something) and quantitative data (numbers) in order to examine information to fi nd patterns and solve problems. They are introduced to Probability. These Steps to Success include:

FIFTH GRADE

- Convert measurement into a larger or a smaller unit (for example, inches into feet or feet into inches, centimeters into meters, or meters into centimeters)
- Create a line with fraction units (such as 1/8 units.) Use the line units to solve problems.
- Understand how to measure volume using unit cubes
- Determine the difference between perimeter, area, and volume. Know which is appropriate for a given situation.

MIDDLE SCHOOL

- Create graphs (dotplots, boxplots, histograms); describe data by examining the center (averages); and spread (variability) of a distribution
- Use statistics to draw inferences and make comparisons (e.g., deciding which candidate is likely to win an election based on a survey)
- Find the probability of an event and connect probability to sampling (e.g., calculating the probability of getting a heads when flipping a coin or getting the sum of seven when tossing number cubes)
- Analyzing statistical relationships by using a line of best fit or “trend” line (a straight line that models an association between two quantities)
- Organize data using a matrix to solve real-world problems

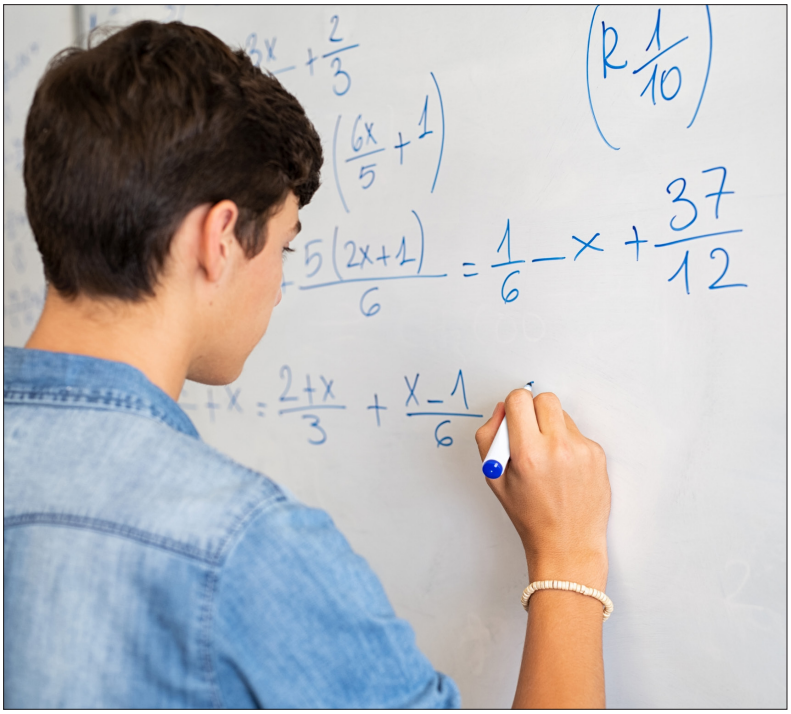
HIGH SCHOOL

- Summarize data on appropriate displays and compare the fit of linear, quadratic, or exponential models. Select the appropriate model. Fit a function to the data and use the function to solve problems in the context of the data.
- Understand each potential sample from a population gives a different estimate of a population statistic, and each estimate has error associated with it
- Understand the basics of probability: the concepts of conditional probability, dependent, and independent events. Distinguish between theoretical and experimental probabilities. Illustrate the difference with an everyday experiment.
- Analyze and evaluate outcomes of decisions using probability concepts. Determine if the decisions were fair.
- Understand mathematical modeling. Identify and select relevant features of a situation, representing those features symbolically, defining appropriate quantities, and considering the accuracy and limitations of the model.
- Recognize vector quantities as having both magnitude and direction (such as velocity) and scalar quantities that have only magnitude (volume)

LEARNING AT HOME

As your middle-school child moves more in depth into the world of algebraic expressions and works on Geometry, they still need your support to succeed. Stay informed about her work and talk to her teachers before report card time to learn whether she needs help with specific skills. Remember, a positive attitude makes a difference to him. Here are some suggestions for things to do at home to help your child learn:

- Pop some popcorn. Compare the volumes of tall and short cylinders formed with 8 x 11-inch sheets of paper by filling them with the popcorn. Which would you buy? The activity compares the volume to height in cylinders and the underlying math concept.
- Check out the NASA site http://spacemath.gsfc.nasa.gov/media.html, which uses actual NASA missions to provide situations for middle-school students to use their math. Provided by grade level and topic, the site uses press releases, videos, and three-dimensional models to keep students interested.
- Have your child draw a floor plan to scale of their dream bedroom or house. This activity will require estimation, measuring skills, proportion, and ratios. The site http://www.math-kitecture.com/floor.html will even walk your student through making a CAD from the drawing.



1205 Pendleton Street
Room 502 Brown Building
Columbia, SC 29201
www.eoc.sc.gov

SC EDUCATION OVERSIGHT COMMITTEE

Reporting facts. Measuring change. Promoting progress.

The South Carolina Education Oversight Committee (EOC) is an independent, nonpartisan group of 18 educators, business people, and elected officials appointed by the legislature and governor. The EOC enacts the South Carolina Education Accountability Act of 1998, which sets standards for improving the state's K-12 educational system. The EOC reviews the state's education improvement process, assesses how schools are doing, and evaluates the standards schools must meet to build the education system needed to compete in this century.