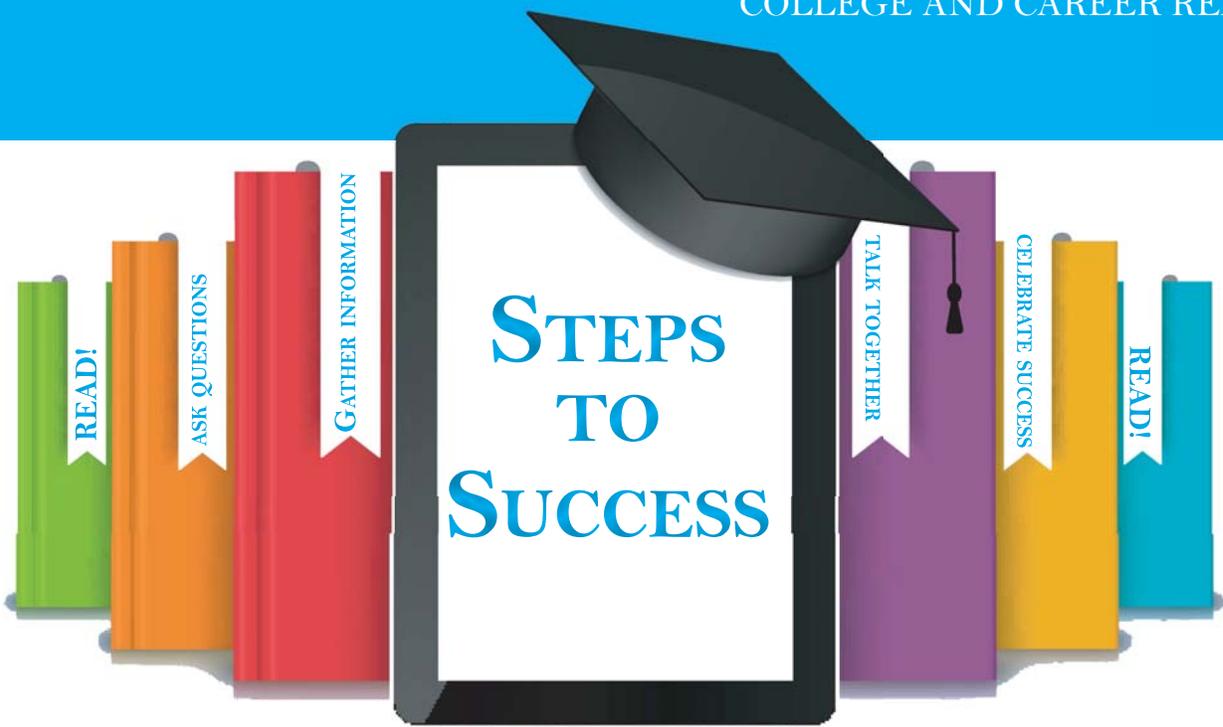
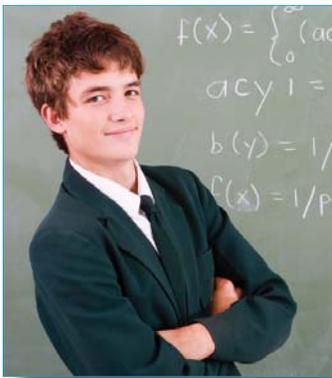


SOUTH CAROLINA STANDARDS

COLLEGE AND CAREER READY



Family-Friendly Guide for High School Mathematics

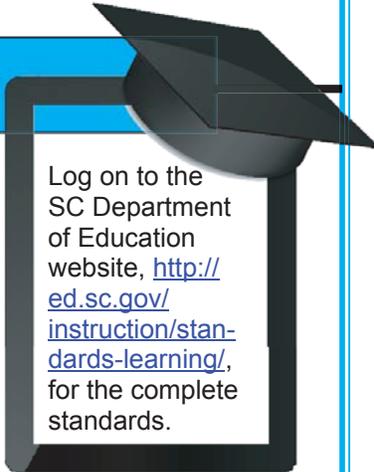


Mathematics in high school moves to a whole other level with imaginary numbers, vectors, intercepts, and polynomials—concepts many of us haven't dealt with since our high school days. However, to understand and take advantage of the technology and science changes now occurring every week, your student needs this language of mathematics and quantitative reasoning. In high school, math covers a broad spectrum, but now math objectives are organized by subject rather than grade level—including Algebra 1, Geometry, and Algebra 2. Some students will go on to study higher levels of mathematics such as Calculus. At this age, your child needs to understand the purpose and relevance of math to stay motivated. To this end, *South Carolina College- and Career-Ready Standards* emphasize the analysis of real-world problems using this more advanced math. If you, as a parent, will continue your positive outlook toward math, your child will be successful.

STEPS TO SUCCESS

This document is designed to:

- Provide examples of the standards, skills, and knowledge your child will learn in mathematics and should be able to do upon exiting high school
- Suggest activities on how you can help your child at home
- Offer additional resources for information and help



Log on to the SC Department of Education website, <http://ed.sc.gov/instruction/standards-learning/>, for the complete standards.

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 Col-*

lege- 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. (See http://sc-competes.org/wp-content/uploads/2016/01/Profile-of-the-South-Carolina-Graduate_Updated.pdf) 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.

MATHEMATICS IN HIGH SCHOOL

NUMBER SYSTEM

High-school students think and reason flexibly with numbers and they understand how numbers can be taken apart and put together in different ways. They are introduced now to imaginary numbers, how they work and are utilized. These **Steps to Success** include:

Middle School	High School
<ul style="list-style-type: none">• 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)	<ul style="list-style-type: none">• 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 high school, students delve into algebra and algebraic reasoning, working with equations with multiple unknowns. They understand more clearly the connections among operations and the applications to actual everyday situations. These **Steps to Success** include:

Middle School	High School
<ul style="list-style-type: none"> • 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 scientific notation (e.g., evaluating $\sqrt{36}$ or $\sqrt{27}$; estimating world population as 7×10^9) • Add, subtract, and multiply polynomials with math expressions such as $(9r^3 + 5r^2 + 11r) + (-2r^3 + 9r - 8r^2)$ 	<ul style="list-style-type: none"> • Add, subtract, and multiply polynomials (math expressions such as $5xy^2 - 3x + 4$) • Perform arithmetic with rational expressions -- the ratio of two polynomials $(x^3 + 6)/(x - 2)$ • 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.

MATHEMATICS IN HIGH SCHOOL

GEOMETRY

High-school Geometry builds on the concepts learned in earlier grades and expands them in complexity. Students move beyond calculations to analyze and investigate figures. Students learn how to write and justify geometric proofs. They apply Geometry in a variety of actual contexts. These **Steps to Success** include:

Middle School	High School
<ul style="list-style-type: none">• 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 ($a^2+b^2=c^2$) to solve problems	<ul style="list-style-type: none">• 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:<ul style="list-style-type: none">- lines and angles- relationships within and among triangles- parallelograms• Explain the sources for the formulas and apply, in mathematical and real-world problems:<ul style="list-style-type: none">- 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

High-school students learn sophisticated methods for organizing data for in-depth interpretations, examinations for bias, and evaluations of probability. They learn to use mathematics to model actual situations in order to define a problem, study it, and consider solutions. These **Steps to Success** include:

Middle School	High School
<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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

Your high-school child needs to assume responsibility for learning and progress. He should see your role in their education chiefly as a supportive one. However, you can make a difference. Stay informed as to what she is working on and know if she needs help with specific skills. Remember, a positive attitude toward math and its use remains important. Here are some suggestions for things to do at home to help your child learn:

- It sounds too basic--but this is crucial: make sure your child gets enough sleep. Studies show that high school students are sleep deprived and, as a result, their academics, activities, and moods suffer.
- Give your student a quiet study spot with plenty of light. Don't believe them when they say they study better with the radio, TV, or whatever he is playing.
- If there is trouble with a concept, guide your child to a specific Internet site. By providing targeted help, you show support and interest. Check out the sites listed below to see if one or more of them provides the needed help. If one site doesn't help, try another site. The explanations and examples provided differ.



ADDITIONAL INFORMATION

- For interactive help, go to <http://www.mathwarehouse.com/>. It covers Algebra, Geometry, Trigonometry, Calculus, and has calculators available.
- *Interactive Mathematics* provides clear lessons and explanations of concepts in the high-school math subjects, has interactives, and gives real-world uses for the skills at <http://www.intmath.com/>.
- This is a resource for high-school math students and for parents who want to help with math: http://www.funmaths.com/math_tutorials/.
- For help with Algebra, Trigonometry, and Calculus, try <http://www.sosmath.com/index.html>. It also has refresher pages for adults.
- The Mathematical Association of America provides links to some fun and informative sites for the mathematically fascinated: <http://www.maa.org/programs/students/fun-math>.
- For clear explanations and tons of help with Algebra concepts, go to <http://www.algebrahelp.com/>. The site includes calculators to assist the student is solving the problem in such a way to promote learning the concept.
- An interactive Algebra practice site is located at <http://www.teachingtreasures.com.au/teaching-tools/maths6-8/main-online-math6-8.htm>.
- For challenging, actual project-based, and problem-based learning experiences from NASA, go to <http://www.nasa.gov/audience/foreducators/exploringmath/home/index.html>.



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