

Chapter 18

About the SAT Math Test

Focus on Math That Matters Most

A group of select mathematics skills and abilities contributes the most to readiness for a college education and career training. These skills and abilities are used extensively in a wide range of college majors and careers. The three areas of focus for math in the redesigned SAT are:

- ▶ Heart of Algebra
- ▶ Problem Solving and Data Analysis
- ▶ Passport to Advanced Math

Heart of Algebra focuses on linear equations and systems of linear equations that are found in many fields of study. You will be asked to create equations that represent a situation and solve equations and systems of equations as well as to make connections between different representations of linear relationships.

Problem Solving and Data Analysis includes using ratios, percentages, and proportional reasoning to solve problems in real-world situations, including science, social science, and career contexts. It also includes describing relationships shown graphically and analyzing statistical data. This group of skills is really about being quantitatively literate and demonstrating a command of the math that resonates throughout college courses, career training programs, and everyday life.

These two areas of math provide a powerful foundation for the math you will do in the future.

Passport to Advanced Math is the third area of focus in the redesigned SAT Math Test, and once again, it is the math that is used in a wide variety of careers and college work. The problems in this area focus on the math you will need to pursue further study in a discipline such as science and for career opportunities in the STEM fields of science, technology, engineering, and math. The Passport to Advanced Math section requires familiarity with



REMEMBER

Questions on the SAT Math Test are distributed among these three topics with 19 Heart of Algebra questions, 17 Problem Solving and Data Analysis questions, and 16 Passport to Advanced Math questions. The remaining six questions test your understanding of additional topics in math such as area, volume, circles, triangles, and trigonometry.

REMEMBER

The SAT Math Test requires a stronger and deeper understanding of a relatively small number of math topics that are especially relevant in college and in many careers.

more-complex equations or functions, which will prepare you for calculus and advanced courses in statistics. There is also a brief section on **Additional Topics in Math**, including geometry, trigonometry, radian measure, and the arithmetic of complex numbers.

The redesigned SAT Math Test also contains questions that focus on several other areas that are important for a wide range of college courses and careers. Some of these problems focus on key concepts from geometry, including applications of volume, surface area, area, and coordinate geometry; similarity, which is another instance of proportional reasoning; and properties of lines, angles, triangles and other polygons, and circles. There are also problems that focus on the fundamental ideas of trigonometry and radian measure, which are essential for study in STEM fields. Finally, there are problems involving the arithmetic of complex numbers, another concept needed for more-advanced study in math and the STEM fields.

Rigor

Throughout the redesigned SAT Math Test, questions will require conceptual understanding, procedural skill and fluency, and application of mathematics in college and career contexts. These three aspects appear in relatively equal amounts on each SAT test.

Conceptual understanding and procedural skill and fluency are complementary skills. Together, they lead to a thorough understanding of mathematical ideas and methods for solving problems. Questions on the SAT Math portions test these skills in various ways because the ability to use mathematical ideas and methods flexibly is characteristic of an understanding of math that can be applied to a wide variety of settings.

An essential idea in the relationship between fluency and conceptual understanding is observing structure. Recognizing structure allows you to understand mathematical relationships in a coherent manner that allows you both to apply these relationships more widely and to extend these relationships in useful ways. Many of the examples and sample questions in the following chapters are more simply and deeply understood (and more quickly solved!) if you observe structure in the mathematics of the problem.

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As is mentioned throughout this guide, the best preparation for the SAT is to work hard in your high school classes. Applying your math skills in your science and social studies classes will prepare you for many of the questions you'll come across on the SAT Math Test.

Problems Grounded in Real-World Contexts

The Math Test will feature multistep problems with applications in science, social science, career scenarios, and other real-life contexts. In some cases, you will be presented with a scenario and then asked several questions about it. You learn specific math skills in your math classes, and these skills are applied in your science and social studies classes. When you use your

mathematical skills outside of the math classroom, you are preparing for the redesigned SAT.

The Makeup of the SAT Math Test

CALCULATOR AND NO-CALCULATOR PORTIONS

There will now be calculator and no-calculator portions of the redesigned SAT Math Test (as is also often true of Advanced Placement® assessments). A calculator is a tool, and the ability to determine when to use it is a skill that you are expected to have. In the calculator portion, many questions do not require a calculator and many questions can be completed faster by hand without using a calculator. In general, the questions in the calculator portion are more complex than those in the no-calculator portion. Questions in the no-calculator portion are intended to reward your ability to do problems efficiently and accurately.

You should bring a calculator to use on the math section of the SAT. A scientific or graphing calculator is recommended, and familiarity with your calculator may provide an advantage on some questions. Every question on the SAT can be solved without a calculator; however, strategically deciding when to use a calculator will reduce the time required to complete the test. Using a calculator can also help you avoid missing a question because of computation errors.

MULTIPLE-CHOICE AND GRIDDED-RESPONSE QUESTIONS

About 80% of the questions on the Math Test are multiple-choice. Each multiple-choice question consists of a question followed by four options. There is only one correct, or best, answer and there is no penalty for selecting an incorrect answer. (The pre-2016 SAT had a one-quarter-point penalty for an incorrect answer.) Therefore, you should provide an answer to every question on the test.

The other questions on the Math Test are gridded-response questions (also called student-produced response questions), and these questions make up about 20% of the test. The answer to each gridded-response question is a number (fraction, decimal, or positive integer) that you will enter on the answer sheet into a grid like the one shown on the next page. Like all questions on the redesigned SAT, there is no penalty for answering a gridded-response question incorrectly.

Examples of filled-in answer grids are shown on the next page. Note that you may also enter a fraction line or a decimal point. Further details on how to grid your answers are provided in Chapter 24.

REMEMBER

You'll be permitted to use a calculator on one portion of the SAT Math Test, so be sure to bring a calculator with you to the test. However, many questions don't require a calculator and can actually be solved more quickly without one, so use careful judgment in deciding when to use it.

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Make sure that you're very familiar with and comfortable using the calculator you bring with you on test day. Practice using the calculator you'll use on the test throughout your test preparation.

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We know we've stressed this many times already, but it's worth repeating: There is no penalty for selecting an incorrect answer on the SAT, so never leave a question blank! On questions that you're not sure how to solve, eliminate as many answer choices as you can, and then guess from among the remaining choices.

REMEMBER

On gridded-response questions, you must fill in the circles that correspond to your answer. You won't receive credit if you write your answer only in the boxes at the top of the grid.

Answer: $\frac{7}{12}$

	7	/	1	2
◦	◦	◦	◦	◦
0	0	0	0	0
①	①	①	①	①
②	②	②	②	②
③	③	③	③	③
④	④	④	④	④
⑤	⑤	⑤	⑤	⑤
⑥	⑥	⑥	⑥	⑥
⑦	⑦	⑦	⑦	⑦
⑧	⑧	⑧	⑧	⑧
⑨	⑨	⑨	⑨	⑨

← Fraction line

Answer: 2.5

	2	.	5
◦	◦	◦	◦
0	0	0	0
①	①	①	①
②	②	②	②
③	③	③	③
④	④	④	④
⑤	⑤	⑤	⑤
⑥	⑥	⑥	⑥
⑦	⑦	⑦	⑦
⑧	⑧	⑧	⑧
⑨	⑨	⑨	⑨

← Decimal point

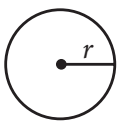
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Make sure to get lots of practice using the facts and formulas provided in the Reference section in the Math Test directions. Practicing with these facts and formulas will ensure you can use them accurately and efficiently.


MATHEMATICS REFERENCE INFORMATION

The Math Test includes the reference information shown below. You may find these facts and formulas helpful as you answer some of the test questions, but make sure you have plenty of practice with this information beforehand. To do well, you have to be comfortable working with these facts and formulas. If you have lots of practice using these facts and formulas before the test, you will be a lot more relaxed when you use them during the test.

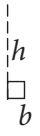
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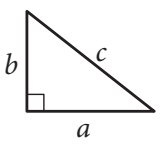
$A = \pi r^2$
 $C = 2\pi r$



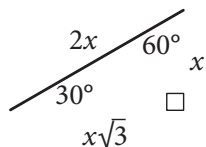
$A = \ell w$



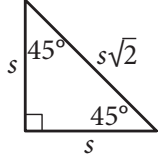
$A = \frac{1}{2}bh$

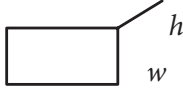


$c^2 = a^2 + b^2$

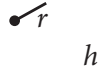


Special Right Triangles

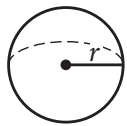





$V = \ell wh$



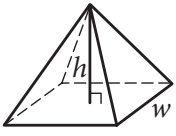
$V = \pi r^2 h$



$V = \frac{4}{3}\pi r^3$



$V = \frac{1}{3}\pi r^2 h$



$V = \frac{1}{3}\ell wh$

- The number of degrees of arc in a circle is 360.
- The number of radians of arc in a circle is 2π .
- The sum of the measures in degrees of the angles of a triangle is 180.

Test Summary

The following table summarizes the key content dimensions of the redesigned SAT Math Test.

SAT Math Test Content Specifications

Time Allotted	80 minutes	
Calculator Portion (38 questions)	55 minutes	
No-Calculator Portion (20 questions)	25 minutes	
	Number	Percentage of Test
Total Questions	58 questions	100%
Multiple-Choice (MC, 4 options)	45 questions	78%
Student-Produced Response (SPR—grid-in)	13 questions	22%
Contribution of Questions to Subscores		
Heart of Algebra	19 questions	33%
Analyzing and fluently solving linear equations and systems of linear equations		
Creating linear equations and inequalities to represent relationships between quantities and to solve problems		
Understanding and using the relationship between linear equations and inequalities and their graphs to solve problems		
Problem Solving and Data Analysis	17 questions	29%
Creating and analyzing relationships using ratios, proportional relationships, percentages, and units		
Representing and analyzing quantitative data		
Finding and applying probabilities in context		
Passport to Advanced Math	16 questions	28%
Identifying and creating equivalent algebraic expressions		
Creating, analyzing, and fluently solving quadratic and other nonlinear equations		
Creating, using, and graphing exponential, quadratic, and other nonlinear functions		

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Take plenty of time to familiarize yourself with this table. Knowing exactly what the Math Test consists of, including the number of questions and time allotted as well as the distribution of question categories, will help you to feel confident and prepared on test day.

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As you progress through your test practice, assess which math skills you're strongest in and which you have the greatest room for improvement in. Allocate your study time appropriately, and make use of the many resources available to you on the Khan Academy website (khanacademy.org/sat).

Additional Topics in Math*	6 questions	10%
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Solving problems related to area and volume

Applying definitions and theorems related to lines, angles, triangles, and circles

Working with right triangles, the unit circle, and trigonometric functions

Contribution of Questions to Cross-Test Scores

Analysis in Science	8 questions	14%
Analysis in History/Social Studies	8 questions	14%

*Questions under Additional Topics in Math contribute to the total Math Test score but do not contribute to a subscore within the Math Test.

As indicated in the content specifications previously, the Math Test has two portions. One is a 55-minute portion — 38 questions for which you are allowed to use a calculator to solve the problems. The other is a 25-minute portion — 20 questions for which you are not allowed to use a calculator. The blueprint for each portion is shown below.

Calculator Portion

	Number of Questions	% of Test
Total Questions	38	100%
Multiple-Choice (MC)	30	79%
Student-Produced Response (SPR—grid-in)	8	21%
Content Categories	38	100%
Heart of Algebra	11	29%
Problem Solving and Data Analysis	17	45%
Passport to Advanced Math	7	18%
Additional Topics in Math	3	8%
Time Allocated	55 minutes	

No-Calculator Portion

	Number of Questions	% of Test
Total Questions	20	100%
Multiple-Choice (MC)	15	75%
Student-Produced Response (SPR—grid-in)	5	25%
Content Categories	20	100%
Heart of Algebra	8	40%
Passport to Advanced Math	9	45%
Additional Topics in Math	3	15%
Time Allocated	25 minutes	

 **REMEMBER**

Don't be intimidated by the fact that you aren't permitted to use a calculator on one of the SAT Math portions. Questions in the no-calculator portion are more conceptual in nature and don't require a calculator to be solved.