marigold prep

2022 SAT

Mathematics Workbook

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Math Section Overview

The SAT Math section is made up of two separate parts that are combined to create your overall math score.

The **no-calculator** section features 20 questions and a time limit of 25 minutes, giving you just over one minute per question. The **calculator** section is longer, featuring 38 questions in 55 minutes, giving you nearly a minute and a half per question. Both sections are mostly multiple choice with a few fill-in-the-blank questions (which the SAT calls Student Generated Response Questions) at the end of each section.

Both sections feature a mix of arithmetic, algebra, geometry, and other concepts. The SAT classifies these subjects into three main categories: **Heart of Algebra**, **Problem Solving and Data Analysis**, and **Passport to Advanced Math**. We'll address each of these sections in the workbook, after we run through a refresher of basic arithmetic skills and concepts.

If you've made it through Algebra II, you should have the knowledge you need to navigate the math section successfully, though you will likely need some refreshing on the basics. If you haven't gone through Algebra II yet, you probably still know most of what you need, though you will need an introduction to higher-level concepts like conic sections and trigonometry, which are tested regularly.

The two math sections are taken together to find your math score. The SAT looks at how many questions you answered correctly out of 58 (the no-calculator and calculator combined), and then uses that raw score to give you a scale score out of 800.

Strategy Overview

Before we get into a discussion of the specific skills you need to know for SAT math, let's review the basic question answering strategies for the test.

Remember, you read, identify, anticipate, and eliminate!

READ - Make sure you read the question carefully! One of the most common reasons students miss questions in the math section is that they either thought they knew what the question was asking (and didn't!) or they never understood the question in the first place. We'll work on reading questions properly as we work through this workbook, but you should keep in mind that reading carefully is incredibly important. Let's look at an example.

If $\frac{4x+4x+4x+4x}{4}=4$, what is the value of $4x$?

A) 16

B) 4

C) 1

D) $\frac{1}{4}$

Notice the trick in this question! It begins with an algebraic equation, and your first instinct will be to look at it as a problem to be solved. So you might start working on it right away, without reading the end of the question: what is the value of 4x? If you solve the equation, you'll find x is 1. But the real task is to find 4x. And notice that there's an answer choice, C, that expects you not to read the question!

So the bottom line is that you must read questions carefully and completely!

IDENTIFY - Identifying a question type can definitely be helpful in solving that particular question. This could mean reading a question and identifying it as involving exponents—meaning you need to use your knowledge of exponent rules. Or it could mean reading a question and recognizing it as one you've seen before.

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$$0.8p = t$$

At a store, a coat originally priced at p dollars is on sale for t dollars, and the relationship between p and t is given in the equation above. What is p in terms of t ?

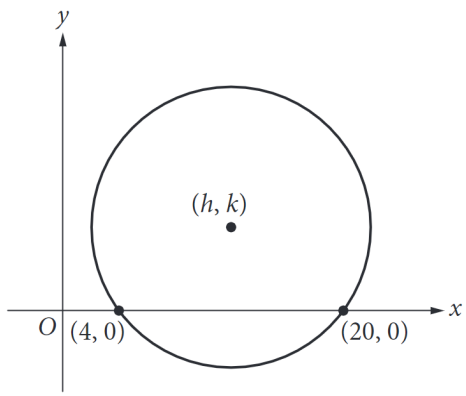
A) $p = t - 0.8$

B) $p = 0.8t$

C) $p = \frac{0.8}{t}$

D) $p = \frac{t}{0.8}$

The question above, for example, appears on nearly every SAT in different forms. It's simply asking you to rearrange the equation to isolate p. You can recognize this by the words "in terms of." Any time the SAT asks you what is ___ in terms of ___, you know you're going to be isolating a variable. Identifying this as a question type makes your job clearer, and you don't need to spend time asking yourself what the question wants!



In the xy-plane above, the circle has center (h, k) and radius 10. What is the value of k ?

Similarly, the question above looks like a circle question. The test makers even drew a circle figure for you. But to easily get to the solution, you'll need to use triangles, connecting the points along the axis with the radius. Being able to identify this as a problem requiring triangle knowledge can be incredibly powerful!

The SAT isn't terribly creative when it comes down to it. The test makers reuse similar questions on nearly every test. Being able to see those and react to them can make your life easier. It means you don't have to go through as much of a process of figuring out what the test is asking, and it can give you a nice confidence boost, since you'll have some prior experience with that question!

ANTICIPATE - Once you've read and identified the question, the work begins. For math questions, this can take the form of simply doing the math necessary to solve the problem. If the question is asking you to solve an algebraic equation and you have the skill to do so, then go ahead and solve it! However, there will be times when you can or will need to use alternate methods to solve the problem—you can substitute a number or use the answer choices to your advantage.

Substitute a number - Certain questions, especially some involving algebra, can be made easier if you pick a number for x (or whatever variable the problem uses). Take a look at this example.

If $3x - 6y = 9z$, which of the following expressions is equivalent to $x^2 - 4xy + 4y^2$?

A) $9z$

B) $3z^2$

C) $9z^2$

D) $81z^2$

In this example, the test appears to be asking an algebra-related question. If you can solve it algebraically, great! However, you could also find numbers that work for x, y, and z in the equation, then plug them in throughout to find a solution. In this case, you could use 6 for x, which would make y=0 and z=2.

Given that, the quadratic expression would be equal to

36 - 0 + 0, or 36.

So our goal then would be to find which of the answer choices would be equal to 36, given that z=2. Do you see any that work? The only possible answer is C, which we found using little to no algebra! The rule of thumb on substitution possibilities is that if you have **variables in the question AND variables in the answer choices**, there's a good chance you can substitute a number or numbers.

Use the answer choices - One the other hand, if you have **variables in the question and numbers as answer choices**, there's a great chance that you could, if necessary, substitute the answers into the question to find a solution.