4

▶ Techniques and Strategies

The next four chapters will help you review all the mathematics you need to know for the SAT. However, before you jump ahead, make sure you first read and understand this chapter thoroughly. It includes techniques and strategies that you can apply to all SAT math questions.

▶ All Tests Are Not Alike

The SAT is not like the tests you are used to taking in school. It may test the same skills and concepts that your teachers have tested you on, but it tests them in different ways. Therefore, you need to know how to approach the questions on the SAT so that they don't surprise you with their tricks.

▶ The Truth about Multiple-Choice Questions

Many students think multiple-choice questions are easier than other types of questions because, unlike other types of questions, they provide you with the correct answer. You just need to figure out which of the provided answer choices is the correct one. Seems simple, right? Not necessarily.

There are two types of multiple-choice questions. The first is the easy one. It asks a question and provides several answer choices. One of the answer choices is correct and the rest are obviously wrong. Here is an example:

Who was the fourteenth president of the United States?
a. Walt Disney
b. Tom Cruise
c. Oprah Winfrey
d. Franklin Pierce
e. Homer Simpson

Even if you don't know who was the fourteenth president, you can still answer the question correctly because the wrong answers are obviously wrong. Walt Disney founded the Walt Disney Company, Tom Cruise is an actor, Oprah Winfrey is a talk show host, and Homer Simpson is a cartoon character. Answer choice **c**, Franklin Pierce, is therefore correct.

Unfortunately, the SAT does not include this type of multiple-choice question. Instead, the SAT includes the other type of multiple-choice question. SAT questions include one or more answer choices that *seem correct* but are actually *incorrect*. The test writers include these seemingly correct answer choices to try to trick you into picking the wrong answer.

Let's look at how an SAT writer might write a question about the fourteenth president of the United States:

Who was the fourteenth president of the United States?
a. George Washington
b. James Buchanan
c. Millard Fillmore
d. Franklin Pierce
e. Abraham Lincoln

This question is much more difficult than the previous question, isn't it? Let's examine what makes it more complicated.

First, all the answer choices are actual presidents. None of the answer choices is obviously wrong. Unless you know exactly which president was the fourteenth, the answer choices don't give you any hints. As a result, you may pick George Washington or Abraham Lincoln because they are two of the best-known presidents. This is exactly what the test writers would want you to do! They included George Washington and Abraham Lincoln because they want you to see a familiar name and assume it's the correct answer.

But what if you know that George Washington was the first president and Abraham Lincoln was the sixteenth president? The question gets even trickier because the other two incorrect answer choices are James Buchanan, the thirteenth president, and Millard Fillmore, the fifteenth president. In other words, unless you happen to know that Franklin Pierce was the fourteenth president, it would be very difficult to figure out he is the correct answer based solely on the answer choices.

In fact, incorrect answer choices are often called **distracters** because they are designed to *distract* you from the correct answer choice.

This is why you should not assume that multiple-choice questions are somehow easier than other types of questions. They can be written to try to trip you up.

But don't worry. There is an important technique that you can use to help make answering multiple-choice questions easier.

▶ Finding Four Incorrect Answer Choices Is the Same as Finding One Correct Answer Choice

Think about it: A multiple-choice question on the SAT has five answer choices. Only one answer choice is correct, which means the other four must be incorrect. You can use this fact to your advantage. Sometimes it's easier to figure out which answer choices are incorrect than to figure out which answer choice is correct.

Here's an exaggerated example:

What is $9,424 \times 2,962$?
a. 0
b. 10
c. 20
d. 100
e. 27,913,888

Even without doing any calculations, you still know that answer choice **e** is correct because answer choices **a**, **b**, **c**, and **d** are obviously incorrect. Of course, questions on the SAT will not be this easy, but you can still apply this idea to every multiple-choice question on the SAT. Let's see how.

▶ Get Rid of Wrong Answer Choices and Increase Your Luck

Remember that multiple-choice questions on the SAT contain distracters: incorrect answer choices designed to distract you from the correct answer choice. Your job is to get rid of as many of those distracters as you can when answering a question. Even if you can get rid of only one of the five answer choices in a question, you have still increased your chances of answering the question correctly.

Think of it this way: Each SAT question provides five answer choices. If you guess blindly from the five choices, your chances of choosing the correct answer are 1 in 5, or 20%. If you get rid of one answer choice before guessing because you determine that it is incorrect, your chances of choosing the correct answer are 1 in 4, or 25%, because you are choosing from only the four remaining answer choices. If you get rid of two incorrect answer choices before guessing, your chances of choosing the correct answer are 1 in 3, or 33%. Get rid of three incorrect answer choices, and your chances are 1 in 2, or 50%. If you get rid of all four incorrect answer choices, your chances of guessing the correct answer choice are 1 in 1, or 100%! As you can see, each answer choice you eliminate increases your chances of guessing the correct answer.

NUMBER OF DISTRACTERS YOU ELIMINATE	ODDS YOU CAN GUESS THE CORRECT ANSWER
0	1 in 5, or 20%
1	1 in 4, or 25%
2	1 in 3, or 33%
3	1 in 2, or 50%
4	1 in 1, or 100%

Of course, on most SAT questions, you won't be guessing blindly—you'll ideally be able to use your math skills to choose the correct answer—so your chances of picking the correct answer choice are even greater than those listed above after eliminating distracters.

► How to Get Rid of Incorrect Answer Choices

Hopefully you are now convinced that getting rid of incorrect answer choices is an important technique to use when answering multiple-choice questions. So how do you do it? Let's look at an example of a question you could see on the SAT.

The statement below is true.
All integers in set *A* are odd.
Which of the following statements must also be true?
a. All even integers are in set *A*.
b. All odd integers are in set *A*.
c. Some integers in set *A* are even.
d. If an integer is even, it is not in set *A*.
e. If an integer is odd, it is not in set *A*.

First, decide what you are looking for: You need to choose which answer choice is true based on the fact that *All integers in set* A *are odd.* This means that the incorrect answer choices are *not* true.

Now follow these steps when answering the question:

1. Evaluate each answer choice one by one following these instructions:
   ■ If an answer choice is incorrect, cross it out.
   ■ If you aren't sure if an answer choice is correct or incorrect, leave it alone and go onto the next answer choice.
   ■ If you find an answer choice that seems correct, circle it and then check the remaining choices to make sure there isn't a better answer.
2. Once you look at all the answer choices, choose the best one from the remaining choices that aren't crossed out.
3. If you can't decide which is the best choice, take your best guess.

Let's try it with the previous question.

Answer choice **a** is *All even integers are in set* A. Let's decide whether this is true. We know that *all integers in set* A *are odd.* This statement means that there are not any even integers in set *A,* so *All even integers are in set* A cannot be true. Cross out answer choice **a**!

Answer choice **b** is *All odd integers are in set* A. Let's decide whether this is true. We know that *all integers in set* A *are odd,* which means that the set could be, for example, {3}, or {1, 3, 5, 7, 9, 11}, or {135, 673, 787}. It describes any set that contains only odd integers, which means that it could also describe a set that contains *all the odd integers.* Therefore, this answer choice may be correct. Let's hold onto it and see how it compares to the other answer choices.

Answer choice **c** is *Some integers in set* A *are even.* We already determined when evaluating answer choice **a** that there are not any even integers in set *A,* so answer choice **c** cannot be true. Cross out answer choice **c**!

Answer choice **d** is *If an integer is even, it is not in set* A. We already determined that there are not any even integers in set *A,* so it seems that *If an integer is even, it is not in set* A is most likely true. This is probably the correct answer. But let's evaluate the last answer choice and then choose the best answer choices from the ones we haven't eliminated.

Answer choice **e** is *If an integer is odd, it is not in set* A. Let's decide whether this is true. We know that *all integers in set* A *are odd,* which means that there is at least one odd integer in set *A* and maybe more. Therefore, answer choice **e** cannot be true. Cross out answer choice **e**!

After evaluating the five answer choices, we are left with answer choices **b** and **d** as the possible correct answer choices. Let's decide which one is better. Answer choice **b** is only possibly true. We know that *all integers in set* A *are odd,* which means that the set contains only odd integers. It could describe a set that contains *all the odd integers,* but it could also describe a set that contains only one odd integer. Answer choice **d**, on the other hand, is always true. If *all integers in set* A *are odd,* then

no matter how many integers are in the set, none of them are even. So the statement *If an integer is even, it is not in set* A must be true. It is the better answer choice. Answer choice **d** is correct!

► Guessing on Five-Choice Questions: The Long Version

Because five-choice questions provide you with the correct answer as one of their five answer choices, it's possible for you to guess the correct answer even if you don't read the question. You might just get lucky and pick the correct answer.

So should you guess on the SAT if you don't know the answer? Well, it depends. You may have heard that there's a "carelessness penalty" on the SAT. What this means is that careless or random guessing can lower your score. But that doesn't mean you shouldn't guess, because smart guessing can actually work to your advantage and help you earn more points on the exam.

Here's how smart guessing works:

- On the math questions, you get one point for each correct answer. For each question you answer incorrectly, one-fourth of a point is subtracted from your score. If you leave a question blank you are neither rewarded nor penalized.
- On the SAT, all multiple-choice questions have five answer choices. If you guess blindly from among those five choices, you have a one-in-five chance of guessing correctly. That means four times out of five you will probably guess incorrectly. In other words, if there are five questions that you have no clue how to answer, you will probably guess correctly on only one of them and receive one point. You will guess incorrectly on four of them and receive four deductions of one-fourth point each. $1 - \frac{1}{4} - \frac{1}{4} - \frac{1}{4} - \frac{1}{4} = 0$, so if you guess blindly, you will probably neither gain nor lose points in the process.

Why is this important? Well, it means that if you can rule out even one incorrect answer choice on each of the five questions, your odds of guessing correctly improve greatly. So you will receive more points than you will lose by guessing.

In fact, on many SAT questions, it's relatively easy to rule out all but two possible answers. That means you have a 50% chance of being right and receiving one whole point. Of course, you also have a 50% chance of being wrong, but if you choose the wrong answer, you lose only one-fourth point. So for every two questions where you can eliminate all but two answer choices, chances are that you will gain 1 point and lose $\frac{1}{4}$ point, for a gain of $\frac{3}{4}$ points. Therefore, it's to your advantage to guess in these situations!

It's also to your advantage to guess on questions where you can eliminate only one answer choice. If you eliminate one answer choice, you will guess from four choices, so your chances of guessing correctly are 25%. This means that for every four questions where you can eliminate an answer choice, chances are that you will gain 1 point on one of the questions and lose $\frac{1}{4}$ point on the other three questions, for a total gain of $\frac{1}{4}$ point. This may not seem like much, but a $\frac{1}{4}$ point is better than 0 points, which is what you would get if you didn't guess at all.

► Guessing on Five-Choice Questions: The Short Version

Okay, who cares about all the reasons you should guess, right? You just want to know when to do it. It's simple:

- If you can eliminate even just one answer choice, you should always guess.
- If you can't eliminate any answer choices, don't guess.

▶ Guessing on Grid-In Questions

The chances of guessing correctly on a grid-in question are so slim that it's usually not worth taking the time to fill in the ovals if you are just guessing blindly. However, you don't lose any points if you answer a grid-in question incorrectly, so if you have some kind of attempt at an answer, fill it in!

To summarize:

- If you've figured out a solution to the problem— even if you think it might be incorrect—fill in the answer.
- If you don't have a clue about how to answer the question, don't bother guessing.

▶ Other Important Strategies

Read the Questions Carefully and Know What the Question Is Asking You to Do

Many students read questions too quickly and don't understand what exactly they should answer before examining the answer choices. Questions are often written to trick students into choosing an incorrect answer choice based on misunderstanding the question. So always read questions carefully. When you finish reading the question, make a note of what you should look for in the answer choices. For example, it might be, "I need to determine the y-intercept of the line when its slope is 4" or "I need to determine the area of the unshaded region in the figure."

If You Are Stuck on a Question after 30 Seconds, Move On to the Next Question

You have 25 minutes to answer questions in each of two math sections and 20 minutes to answer questions in the third math section. In all, you must answer 65 questions in 70 minutes. That means you have about a minute per question. On many questions, less than a minute is all you will need. On others, you'll wish you had much longer than a minute. But don't worry! The SAT is designed to be too complex to finish. Therefore, do not waste time on a difficult question until you have completed the questions you know how to solve. If you can't figure out how to solve a question in 30 seconds or so and you are just staring at the page, move on to the next question. However, if you feel you are making good progress on a question, finish answering it, even if it takes you a minute or a little more.

Start with Question 1, Not Question 25

The SAT math questions can be rated from 1–5 in level of difficulty, with 1 being the easiest and 5 being the most difficult. The following is an example of how questions of varying difficulty are typically distributed in one section of a typical SAT. (**Note:** The distribution of questions on your test will vary. This is only an example.)

1. 1	**8.** 2	**15.** 3	**22.** 3
2. 1	**9.** 3	**16.** 5	**23.** 5
3. 1	**10.** 2	**17.** 4	**24.** 5
4. 1	**11.** 3	**18.** 4	**25.** 5
5. 2	**12.** 3	**19.** 4	
6. 2	**13.** 3	**20.** 4	
7. 1	**14.** 3	**21.** 4	

From this list, you can see how important it is to complete the first fifteen questions of one section before you get bogged down in the more difficult questions that follow. Because all the questions are worth the same amount, you should be sure to get the easiest questions correct. So make sure that you answer the first 15 questions well! These are typically the questions that are easiest to answer correctly. Then, after you are satisfied with the first fifteen questions, answer the rest. If you can't figure out how to solve a question after 30 seconds, move onto the next one. Spend the most time on questions that you think you can solve, not the questions that you are confused about.

Pace Yourself

We just told you that you have about a minute to answer each question. But this doesn't mean you should rush! There's a big difference between rushing and pacing yourself so you don't waste time.

Many students rush when they take the SAT. They worry they won't have time to answer all the questions. But here's some important advice: It is better to answer most questions correctly and leave some blank at the end than to answer every question but make a lot of careless mistakes.

As we said, on average you have a little over a minute to answer each math question on the SAT. Some questions will require less time than that. Others will require more. A minute may not seem like a long time to answer a question, but it usually is. As an experiment, find a clock and watch the second hand move as you sit silently for one minute. You'll see that a minute lasts longer than you think.

So how do you make sure you keep on a good pace? The best strategy is to work on one question at a time. Don't worry about any future questions or any previous questions you had trouble with. Focus all your attention on the present question. Start with Question 1. If you determine an answer in less than a minute, mark it and move to Question 2. If you can't decide on an answer in less than a minute, take your best guess from the answer choices you haven't eliminated, circle the question, and move on. If you have time at the end of the section, you can look at the question again. But in the meantime, forget about it. Concentrate on Question 2.

Follow this strategy throughout each section:

1. Focus.
2. Mark an answer.
3. Circle the question if you want to go back to it later.
4. Then, move on to the next question.

Hopefully you will be able to answer the first several easier questions in much less than a minute. This will give you extra time to spend on the more difficult questions at the end of the section. But remember: Easier questions are worth the same as the more difficult questions. It's better to get all the easier questions right and all the more difficult questions wrong than to get a lot of the easier questions wrong because you were too worried about the more difficult questions.

Don't Be Afraid to Write in Your Test Booklet

The test scorers will not evaluate your test booklet, so feel free to write in it in any way that will help you during the exam. For example, mark each question that you don't answer so that you can go back to it later. Then, if you have extra time at the end of the section, you can easily find the questions that need extra attention. It is also helpful to cross out the answer choices that you have eliminated as you answer each question.

On Some Questions, It May Be Best to Substitute in an Answer Choice

Sometimes it is quicker to pick an answer choice and check to see if it works as a solution then to try to find the solution and then choose an answer choice.

Example

The average of 8, 12, 7, and *a* is 10. What is the value of *a?*
a. 10
b. 13
c. 19
d. 20
e. 27

One way to solve this question is with algebra. Because the average of four numbers is determined by the sum of the four numbers divided by 4, you could write the following equation and solve for *a*:

$$\frac{8 + 12 + 7 + a}{4} = 10$$

$$\frac{8 + 12 + 7 + a}{4} \times 4 = 10 \times 4$$

$$8 + 12 + 7 + a = 40$$

$$27 + a = 40$$

$$27 + a - 27 = 40 - 27$$

$$a = 13$$

However, you can also solve this problem without algebra. You can write the expression $\frac{8 + 12 + 7 + a}{4}$ and just substitute each answer choice for a until you find one that makes the expression equal to 10.

Tip: When you substitute an answer choice, always start with answer choice **c**. Answer choices are ordered from least to greatest, so answer choice **c** will be the middle number. Then you can adjust the outcome to the problem as needed by choosing answer choice **b** or **d** next, depending on whether you need a larger or smaller answer.

Let's see how it works:

Answer choice **c**: $\frac{8 + 12 + 7 + 19}{4} = \frac{45}{4}$, which is greater than 10. Therefore, we need a small answer choice. Try choice **b** next:

Answer choice **b**: $\frac{8 + 12 + 7 + 13}{4} = \frac{40}{4} = 10$

There! You found the answer. The variable a must be 13. Therefore answer choice **b** is correct.

Of course, solving this problem with algebra is fine, too. But you may find that substitution is quicker and/or easier. So if a question asks you to solve for a variable, consider using substitution.

Convert All Units of Measurement to the Same Units Used in the Answer Choices before Solving the Problem

If a question involves units of measurement, be sure to convert all units in the question to the units used in the answer choices before you solve the problem. If you wait to convert units later, you may forget to do it and

will choose an incorrect answer. If you make the conversions at the start of the problem, you won't have to worry about them later. You can then focus on finding an answer instead of worrying about what units the answer should be in. For example, if the answer choices of a word problem are in *feet* but the problem includes measurements in *inches,* convert all measurements to feet before making any calculations.

Draw Pictures When Solving Word Problems if Needed

Pictures are usually helpful when a word problem doesn't have one, especially when the problem is dealing with geometry. Also, many students are better at solving problems when they see a visual representation. But don't waste time making any drawings too elaborate. A simple drawing, labeled correctly, is usually all you need.

Avoid Lengthy Calculations

It is seldom, if ever, necessary to spend a great deal of time doing calculations. The SAT is a test of mathematical concepts, not calculations. If you find yourself doing a very complex, lengthy calculation—stop! Either you are not solving the problem correctly or you are missing an easier method.

Don't Overuse Your Calculator

Because not every student will have a calculator, the SAT does not include questions that require you to use one. As a result, calculations are generally not complex. So don't make your solutions too complicated simply because you have a calculator handy. Use your calculator sparingly. It will not help you much on the SAT.

Fill in Answer Ovals Carefully and Completely

The Math sections of the SAT are scored by computer. All the computer cares about is whether the correct answer oval is filled in. So fill in your answer ovals neatly! Make sure each oval is filled in completely and

that there are no stray marks on the answer sheet. You don't want to lose any points because the computer can't understand which oval you filled in.

Mark Your Answer Sheet Carefully

This may seem obvious, but you must be careful that you fill in the correct answer oval on the answer sheet for each question. Answer sheets can be confusing—so many lines of ovals. So always double-check that you are filling in the correct oval under the correct question number. If you know the correct answer to question 12 but you fill it in under question 11 on the answer sheet, it will be marked as incorrect!

If You Have Time, Double-Check Your Answers

If you finish a section early, use the extra time to double-check your answers. It is common to make careless errors on timed tests, so even if you think you answered every question correctly, it won't hurt to check your answers again. You should also check your answer sheet and make sure that you have filled in your answers clearly and that you haven't filled in more than one oval for any question.

▶ . . . And Don't Forget to Practice!

The strategies in this chapter will definitely help you on the five-choice questions, but simply reading the strategies is not enough. For maximum benefit, you must practice, practice, and practice. So apply these strategies to all the practice questions in this book. The more comfortable you become in answering SAT questions using these strategies, the better you will perform on the test!

▶ Before the Test: Your Final Preparation

Your routine in the last week before the test should vary from your study routine of the preceding weeks.

The Final Week

Saturday morning, one week before you take the SAT, take a final practice test. Then use your next few days to wrap up any loose ends. This week is also the time to read back over your notes on test-taking tips and techniques.

However, it's a good idea to actually cut back on your study schedule in the final week. The natural tendency is to cram before a big test. Maybe this strategy has worked for you with other exams, but it's not a good idea with the SAT. Also, cramming tends to raise your anxiety level, and your brain doesn't do its best work when you're anxious. Anxiety is your enemy when it comes to test taking. It's also your enemy when it comes to restful sleep, and it's extremely important that you be well rested and relaxed on test day.

During the last week before the exam, make sure you know where you're taking the test. If it's an unfamiliar location, drive there so you will know how long it takes to get there, how long it takes to park, and how long to walk from the car to the building where you will take the SAT. This way you can avoid a last minute rush to the test.

Be sure you get adequate exercise during this last week. Exercise will help you sleep soundly and will help rid your body and mind of the effects of anxiety. Don't tackle any new physical skills, though, or overdo any old ones. You don't want to be sore and uncomfortable on test day!

Check to see that your test admission ticket and your personal identification are in order and easily located. Sharpen your pencils. Buy new batteries for your calculator and put them in.

The Day Before

It's the day before the SAT. Here are some dos and don'ts:

DOs

> Relax!
>
> Find something fun to do the night before—watch a good movie, have dinner with a friend, read a good book.
>
> Get some light exercise. Walk, dance, swim.
>
> Get together everything you need for the test: admission ticket, ID, #2 pencils, calculator, watch, bottle of water, and snacks.
>
> Go to bed early. Get a good night's sleep.

DON'Ts

> Do not study. You've prepared. Now relax.
>
> Don't party. Keep it low key.
>
> Don't eat anything unusual or adventurous—save it!
>
> Don't try any unusual or adventurous activity—save it!
>
> Don't allow yourself to get into an emotional exchange with anyone—a parent, a sibling, a friend, or a significant other. If someone starts an argument, remind him or her you have an SAT to take and need to postpone the discussion so you can focus on the exam.

Test Day

On the day of the test, get up early enough to allow yourself extra time to get ready. Set your alarm and ask a family member or friend to make sure you are up.

Eat a light, healthy breakfast, even if you usually don't eat in the morning. If you don't normally drink coffee, don't do it today. If you do normally have coffee, have only one cup. More than one cup may make you jittery. If you plan to take snacks for the break, take something healthy and easy to manage. Nuts and raisins are a great source of long-lasting energy. Stay away from cookies and candy during the exam. Remember to take water.

Give yourself plenty of time to get to the test site and avoid a last-minute rush. Plan to get to the test room ten to fifteen minutes early.

During the exam, check periodically (every five to ten questions) to make sure you are transposing your answers to the answer sheet correctly. Look at the question number, then check your answer sheet to see that you are marking the oval by that question number.

If you find yourself getting anxious during the test, remember to breathe. Remember that you have worked hard to prepare for this day. You are ready.