Lesson 1
Foundations of SAT Reasoning
FOUNDATIONS OF SAT REASONING

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Why take this course?

Let’s skip past the surface reasons: Your parents made you go to class. Your cousin took an SAT prep course and got into a good college so now it’s your turn. Your guidance counselor suggested it. And let’s skip past the even more direct reasons: You want to get into a great college. You want scholarship money. You want a high SAT score.

Why are you here? As in, what are you going to get from this class that you wouldn’t get from taking a practice test or Googling “How Do I Ace the SAT?”

Why are you here?

You’re already studying for the SAT just about every day. Your math classes in school are preparing you for some of the SAT Math content. Your language arts classes are preparing you for the SAT Reading, SAT Writing, and SAT Essay sections, as are the books and blogs you read on your free time. (The tweets and texts? Well… not so much.)

But there are several reasons to take this class, most importantly:

SAT Strategy

Even students earning straight A’s in AP courses can learn to take the SAT more efficiently. For the mere mortals who may not be giving a valedictorian speech, there are many hidden strategies for turning wrong answers into right answers. For everyone, there are ways to drastically improve pacing by shortcutting tedious work. The SAT is a different test from what you take regularly in school; learning specific strategies for this test is the greatest value in taking this course.

Content That Matters

Much of what you need to know for the SAT you’ve learned or are currently learning in school. But quite a bit of this you learned years ago and some of it hasn’t been covered (or covered well) in school yet. During this course you will review the core content for the SAT and pay special attention to the most critical rules and formulas.

Learning By Doing

Most importantly, you will learn strategy and content by doing problems and gaining experience with the format, style, and difficulty of the SAT. This course is designed to make SAT concepts stick and to help you prepare for SAT content by using it the way you will on test day.
**SAT Strategy: Pop Quiz**

How would you answer these questions if you saw them on the SAT?

1) What is the capital of the German state of Saarland?

2) What is the meaning of the word “plastic”?

3) If $2x(x - xy + 1)(3x - x^2) = 2x^4 - 8x^3 + 6x^2$ for all values of $x$, what is the value of $y$?

4) Would you change the underlined portion of this sentence?

Five fledgling sea eagles left their nests in western Scotland this summer, bringing to 34 the number of wild birds successfully raised since transplants from Norway began in 1975.

5) In the triangle below, the tangent of $a^\circ$ is $\frac{3}{4}$. What is the tangent of $b^\circ$?

![Triangle Diagram]
Pop Quiz Revisited: You Do Not Have To Take That Test!

If that quiz came easily to you, congratulations! (And say hello to your family in Saarbrücken!) But if it didn’t, you’re not alone. The good news – the SAT has very little in common with that pop quiz. The SAT is primarily a multiple-choice test that asks similar questions on the same content over and over. As a result, there are many “hidden” strategies that students can recognize and leverage on test day. In this course, you will learn all of these strategies and become experts in leveraging them. For now, let’s preview a few of them with that difficult pop quiz presented in a more user-friendly SAT format:

How would you attack the first question now? Does it still seem difficult?

1. What is the capital of the German state of Saarland?
   
   A) Wiesbaden  
   B) Tampa  
   C) Saarbrücken  
   D) Guanajuato
This question is virtually impossible without answer choices unless you just moved to the U.S. from Germany. However, with answer choices, it is relatively easy to hone in on the correct answer. If you pick Tampa or Guanajuato, you are either VERY geographically challenged or texting instead of reading. However, the choice between the two German sounding cities, Wiesbaden and Saarbrücken, is slightly more challenging. If you are going to pick between these two for the capital of SAArland, and you pick Wiesbaden instead of SAArbrücken, it would be nearly as bad as Tampa. The point here:

**Answers Are Assets: Make Sure You Leverage Them**

The vast majority of the problems you see on the SAT will appear in a multiple choice format, and the answers can give you a fighting chance you might not have had otherwise! Sometimes that means using process of elimination (as you likely did here). Other times the answer choices will teach you something about the problem and give you insight about how to solve it. Be happy that you’re taking a multiple-choice test: the answers are assets!

Since the SAT won’t test you on German geography, take a look at how you can use answer choices to your advantage on an SAT Math question:

If \(4x^3 - 3x^2 - 2x + 1 = 0\), which of the following is a possible value of \(x\)?

A) -2
B) -1
C) 1
D) 2

(Hint: you probably don’t want to factor that algebra, so try testing answer choices.)
For #2, is the answer what you thought it was in the original quiz?

2. The human brain is most **plastic** in the prenatal and early childhood time period. In this important phase, the brain is most vulnerable to harm but also most capable of recovery. As brain circuits stabilize over time, this plasticity becomes less pronounced.

As used in the first line of the above paragraph, the word “plastic” most nearly means:

A) Artificial  
B) Pliable  
C) Sculptural  
D) Material

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**Do It Yourself**

While usually answers are assets, sometimes they are traps. In many vocabulary in context questions, the answer choice that looks good at first glance is often incorrect. On these questions, the context is much more important than the answers and you should “do it yourself” – figure out what word you think works best before you look at answer choices.

If you were to do it yourself and write in a different word for plastic there, which word would you choose? Maybe something like “flexible” or “changeable”? If so, “pliable” (choice B) is the only one that can really match. Even if you didn’t have a one-word “do it yourself” replacement, but had a category like “susceptible to change,” you would likely still arrive at “pliable.”
For #3, if you had to choose between the two algebra problems below, which one would you choose?

3. If \(2x(x - yx + 1)(3x - x^2) = 2x^4 - 8x^3 + 6x^2\) for all values of \(x\), what is the value of \(y\)?

OR

If \(4(2 - y) = 0\), what is the value of \(y\)?

Turns out they are really the same problem! How?

Pick Your Own Nos.

As you will learn in detail, certain SAT Math problems lend themselves well to the strategy of “Pick Your Own Nos.” in which you can replace variables with easy-to-use numbers of your own choosing. Here, the phrase “for all values of \(x\)” should jump out at you: since that must be true for all values of \(x\), it has to be true for whatever value of \(x\) you choose. And that allows you to test what happens when \(x = 1\) and see what \(y\) becomes in that situation:

\[2x(x - yx + 1)(3x - x^2) = 2x^4 - 8x^3 + 6x^2\] then becomes:
\[2(1)(1 - 1y + 1)(3(1) - (1)^2) = 2(1)^4 - 8(1)^3 + 6(1)^2.\]

And that's pretty easy math: \[2(2 - y)(2) = 2 - 8 + 6\]
\[4(2 - y) = 0\]
\[2 - y = 0\]
\[y = 2\]

Again, because that relationship has to hold for “all values of \(x\),” proving that \(y = 2\) when \(x = 1\) means that you've actually proven that \(y = 2\) always, so you have your answer.
Does anyone really like the original sentence below?

4. Five fledgling sea eagles left their nests in western Scotland this summer, bringing to 34 the number of wild birds successfully raised since transplants from Norway began in 1975.

(A) NO CHANGE
(B) summer and it brings
(C) summer; they were bringing
(D) summer, and it brought

Process of Elimination

This SAT Writing prompt leads with a grammatical structure that, for many people, sounds very strange. “Bringing” in a past-tense sentence feels wrong, but when you compare it to the other three answer choices (once you’re on to Quiz #2) you should see that there is no good option for changing the sentence. You will learn all about participial modifiers (verbals used as adjectives) in the SAT Writing section, but perhaps even more importantly you should embrace the fact that you do not have to become a perfect grammar expert to succeed on those questions!
So who can figure out how to game this question? Leverage answer choices - there are none! (It’s a write-in question) Take a hint from the figure or question – there are none?

5. In the triangle below, the tangent of $a$ is $\frac{3}{4}$. What is the tangent of $b$?

![Right triangle diagram]

Know What You Need To Know

Were you hoping for a way to sneak around this question? There are many strategies to help you “game” questions and get the most out of your knowledge on test day, but plenty of questions are testing core knowledge. This trigonometry problem is a prime example: if you know the SOHCAHTOA acronym and relationships (below), you’ll answer this problem correctly in a relatively short time; if not, you have little choice but to guess. Fortunately the Veritas Prep course will call out all of the critical knowledge you simply must know cold.

In a right triangle:

$$\sin = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan = \frac{\text{opposite}}{\text{adjacent}}$$
Your Roadmap To SAT Success: The Veritas Prep Philosophy

As you’ve seen from the quiz, there are plenty of strategies to help you succeed on the SAT, but there’s also no substitute for strong content knowledge. The Veritas Prep course will teach you a blend of both and help you determine the circumstances under which you, personally, will want to employ them. The Veritas Prep SAT program is built upon the following philosophies:

The Toolkit Approach: Throughout the program, you will accumulate tools for your SAT Toolkit, and you’ll add them to the tools that you’ve been developing in school every day. Some tools are strategies like those you saw in the quiz. Others are pieces of content knowledge: by test day you will be an expert on algebraic factoring for the SAT Math section and on using modifiers for the SAT Writing section. The Toolkit philosophy is important: the authors of the SAT simply have too many variations of questions for you to be able to memorize an “if → then” flowchart to put into action on each problem. And you come into this program with your own strengths and weaknesses, so you don’t want a one-size-fits-all approach that “dumbs down” the things you’re already good at. This course will add new strategies to your toolkit and help you locate and organize the tools that have been there all along, as well as determine how and when to use those tools.

Learning By Doing: When there are rules you simply must memorize (like SOHCAHTOA) you will find them specifically highlighted in the books. But you likely know the vast majority of SAT concepts already, so the course will focus on reviewing those concepts through challenging problems, allowing you to rebuild your comfort with old rules and formulas while you simultaneously learn strategies for applying them in tricky situations. Your time in class will build on the time you have already spent learning content in middle school and high school; come to class prepared to actively solve problems, not to passively take notes!

Curriculum That Maximizes the Value of Your Time: Most of the Learning By Doing you perform in class will involve challenging problems, and for much of your time in class you will find that discussions start with problems first and review of the skills necessary for them second. The goal is to maximize the value of your time: if you’re shooting for an elite score, you don’t want to waste valuable time reviewing things you already know before you eventually get to a nugget of wisdom that will help you. And you certainly don’t want to be zoned out or playing on your phone when that wisdom comes! Be prepared to start with challenging problems early and often in each lesson, and to make mistakes along the way.

You won’t always leave class feeling great about your performance that day, but learning from those mistakes will help you feel fantastic about your test day performance, and that’s what matters most.
The SAT and Veritas Prep Course Structure

The Veritas Prep course contains 10 lessons to prepare you for the 5 sections of the SAT. Let’s take a quick look at what you’ll encounter on the test, and how this course will prepare you for it.

The SAT

<table>
<thead>
<tr>
<th>Section</th>
<th>Questions/Time</th>
<th>Question Format</th>
<th>Section Emphases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section 1: Reading</td>
<td>52 questions</td>
<td>Multiple choice (select 1 of 4)</td>
<td>Reading comprehension; command of evidence; vocabulary in context</td>
</tr>
<tr>
<td></td>
<td>65 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Section 2: Writing and Language</td>
<td>44 questions</td>
<td>Multiple choice (select 1 of 4)</td>
<td>Command of evidence; vocabulary in context; standard English conventions; expression of ideas</td>
</tr>
<tr>
<td></td>
<td>35 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Section 3: Math (no calculator)</td>
<td>20 questions</td>
<td>15 Multiple choice (select 1 of 4); 5 free response (grid-in)</td>
<td>The heart of algebra; problem solving and data analysis; passport to advanced math</td>
</tr>
<tr>
<td></td>
<td>25 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Section 4: Math (calculator allowed)</td>
<td>38 questions</td>
<td>30 Multiple choice (select 1 of 4); 8 free response (grid-in)</td>
<td>The heart of algebra; problem solving and data analysis; passport to advanced math</td>
</tr>
<tr>
<td></td>
<td>55 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Section 5: Essay (optional)</td>
<td>1 question</td>
<td>Handwritten essay</td>
<td>Analysis of evidence and reasoning; standard English conventions; expression of ideas</td>
</tr>
<tr>
<td></td>
<td>50 minutes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The Veritas Prep Course

Lesson 1: Foundations of SAT Logic & Graphics Interpretation
Lesson 2: Foundations of SAT Math
Lesson 3: SAT Reading
Lesson 4: SAT Algebra 1
Lesson 5: SAT Writing
Lesson 6: SAT Algebra 2
Lesson 7: SAT Essay & Writing
Lesson 8: SAT Word Problems & Translations
Lesson 9: SAT Advanced Verbal
Lesson 10: SAT Geometry & Advanced Math Topics

Throughout the Veritas Prep SAT course, you will see three recurring headlines whenever you complete an in-class problem or exercise:

Learning By Doing: Following each in-class problem, this heading will begin a discussion of how to solve the problem, calling to attention the most important takeaways that you should absorb from the experience. Remember that your primary goal is not solving that problem, but learning what tools are in your toolkit for similar questions and concepts on test day.

Skills Meet Strategy: These tags tell you how to apply your math/language knowledge strategically. Even when you know the content, often times your success on an SAT question comes down to whether you know what to do with that knowledge: where your skills combine with good strategy.

Think Like the Testmaker: These tags will provide you with insight as to how the test is written: what are the trap answers you need to look out for? What clues is the testmaker leaving in problems to help you find a shortcut? Knowing SAT content and SAT strategy is essential; knowing the SAT from the author’s perspective can elevate your score even higher.
Getting The Most Out Of This Course

The Veritas Prep course is designed to help you maximize your score on the SAT, and to build on the work that you’ve been doing every day in school. With ten sessions to review the necessary skills and master essential strategies for the SAT, you will want to maximize the value of that time. Here are some big-picture strategies for getting the most out of this program:

Learn From Mistakes…You Will Make Them

You should find these lessons challenging and you should expect to make multiple mistakes in each lesson. That is by design! You’re taking this class to increase your SAT score and probably to increase it to the 700+ range on each section. Doing so means taking problems you would ordinarily get wrong and learning how to get them right, and that means that you’ll need to get a fair number of problems wrong along the way!

So don’t get discouraged if the lessons are challenging for you. The lessons are not designed to be reflective of the difficulty of the entire SAT, but instead to review the skills necessary for the easier problems as you spend the majority of your time learning how to solve the harder ones. **Embrace the mistakes you make in class, because each one is an opportunity to get a problem correct that you otherwise would have gotten wrong on test day.**

Never Mistake Activity For Achievement

The famous John Wooden quote “Don’t mistake activity for achievement” is directly relevant to your SAT preparation. Just doing the problems and taking practice tests will help you, but only to a small degree. The greater benefits come from focusing on takeaways: why did you get problems wrong? How could you have saved valuable time by recognizing a relationship or shortcut earlier? What concepts do you need to go back and drill? What about the trap answer sucked you in?

The SAT matters to colleges because not all A’s are created equal: some students get A’s because they thoroughly know and understand the material, while others are expert at getting extra credit or just had an easy grader for a teacher. **The SAT is designed so that just “doing the assignment” isn’t enough to get everyone to the highest scores.** You’ll need to make sure you’re learning from the work you do in class and for homework, and not just “doing the activity.”

Make the SAT A Priority

When you submit your GPA to schools, it will reflect hundreds of tests you’ve taken since your freshman year. And that score will live directly beside your SAT score…which reflects exactly one test. What looks better: 3.83 and 1470, or 3.88 and 1350?

For the next ~6 weeks, you have the opportunity to maximize your SAT score and put a huge number on your “permanent record.” (And if you don’t like your score? You can always take it again. Think of this as a great opportunity, not a high-pressure situation.) So make the SAT a
priority: don’t blow off your other classes, but recognize that the SAT can have a bigger impact on your college choices than will any other test you take.

*If you don’t need crutches, walk without crutches.*

Throughout this course, you will learn strategies to make educated guesses; to regain focus when you’ve lost it; to do the problems in an order that maximizes the value of your time; to employ shortcuts and circumvent nasty algebra. And if you’ve picked up other SAT preparation books or attended information sessions, you will likely have seen many others. **But keep this in mind: the SAT is written primarily to assess your ability with the skills you’ve learned in school, so you should be able to do most of the SAT without the need for shortcuts and side doors.** More often than not, your best strategy is to “play it straight” and do the work, so take all of these tools and keep them in your toolkit for when you need them, but do not rely on gimmicks when there’s a straightforward way to solve a problem.
What Makes the SAT Difficult?

Throughout the Veritas Prep course you will learn skills and strategies to make achieving your dream SAT score easier. But before you begin finding solutions in the second half of this lesson, it’s helpful to identify the problems that you’re solving.

So let’s discuss – come up with at least 5 answers to the following question:

*What makes the SAT challenging?*

1. 
2. 
3. 
4. 
5.
You and your classmates undoubtedly have some ideas for why the test is difficult; here are a few of the most common reasons – and some reasons that you won’t have to fear as much on test day.

**The content is difficult.**

Like most tests you’ve taken since kindergarten, the SAT seeks to measure “how well you know the stuff you’re supposed to know.” The tangent/SOHCAHTOA problem in the quiz is a good example: if you knew that core tenet of trigonometry, you were destined to get that problem right. If not, there wasn’t much you could do but guess. During this course, you will review the content on the SAT with particular attention paid to the “must-know” rules and formulas that are most-directly tested.

Examples:

SOHCAHTOA and trigonometry; the Equation of a Circle; the difference between they’re/there/their. Knowing those concepts cold will give you one correct answer each; not knowing them means you have to guess.

**There is too much to read and process.**

The SAT frequently tests your knowledge and ability “in context.” Reading passages are long and dense. Ratio and percent problems often require you to find the relevant numbers in a large table or on a graph. The Veritas Prep course will provide you with skills and strategies to quickly sift through the dense context to find the important details you need. The SKIM strategy will help you process Reading passages efficiently, setting yourself up with the base understanding you need to attack the questions that follow. Later in this lesson you will break down graphs and tables so that you can quickly recognize relationships and determine where to go to find the data you need.

Example:

<table>
<thead>
<tr>
<th>Year</th>
<th>Total (thousands)</th>
<th>Male (thousands)</th>
<th>Female (thousands)</th>
<th>Population Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average annual rate of growth (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1947</td>
<td>78,101</td>
<td>38,129</td>
<td>39,972</td>
<td>5,098</td>
</tr>
<tr>
<td>1950</td>
<td>83,200</td>
<td>40,812</td>
<td>42,388</td>
<td>6,076</td>
</tr>
<tr>
<td>1955</td>
<td>89,276</td>
<td>43,861</td>
<td>45,415</td>
<td>4,143</td>
</tr>
<tr>
<td>1960</td>
<td>93,419</td>
<td>45,878</td>
<td>47,541</td>
<td>4,856</td>
</tr>
<tr>
<td>1965</td>
<td>98,275</td>
<td>48,244</td>
<td>50,031</td>
<td>3,924</td>
</tr>
<tr>
<td>1970</td>
<td>103,720</td>
<td>50,918</td>
<td>52,802</td>
<td>5,645</td>
</tr>
<tr>
<td>1975</td>
<td>111,940</td>
<td>55,091</td>
<td>56,849</td>
<td>8,220</td>
</tr>
<tr>
<td>1980</td>
<td>117,060</td>
<td>57,594</td>
<td>59,467</td>
<td>5,121</td>
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<td>1985</td>
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<td>61,574</td>
<td>63,996</td>
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<td>2000</td>
<td>126,296</td>
<td>62,111</td>
<td>64,815</td>
<td>1,356</td>
</tr>
</tbody>
</table>

For approximately what percentage of the period 1950-2000 was the population of Japan greater than 100,000?
The problem is cleverly worded to misdirect you.

As you will see later in this lesson, “precision in wording” is critical on many SAT problems, and the above problem is a prime example! **Questions are often written to reward those who read carefully and critically, and the best way for the testmaker to reward those people is to “punish” those who read too casually.** The Veritas Prep course will teach you where to look for those small-but-powerful words and phrases that can subtly change the correct answer.

For example, look at the table problem above. The parenthetical phrase “in thousands” in the “Population” cell is the key to answering that question properly. Since that tells you to multiply every number in the population columns by 1,000, the answer is 100% (and it’s not even close). You must pay critical attention to the scale in tables and graphs!

**A trap answer is too tempting not to pick.**

A multiple-choice question is too easy if there is no reason for anyone to pick any of the three wrong answers (think of the German capital question: if the three wrong answers were New York, Los Angeles, and Chicago, it certainly wouldn’t require anyone to know anything about Germany). So the testmakers have to include tempting wrong answers, and often one of those answers will jump out at you. Through the Veritas Prep course, you will learn how to sniff out those trap answers and double-check your work to make sure you’ve avoided them.

**Example:**

As you saw in the drill, the problem asking for the meaning of “plastic” in context included multiple known synonyms for plastic:

What is the meaning of the word “plastic” in the first line of the above paragraph?

A) Artificial  
B) Pliable  
C) Sculptural  
D) Material

If you hadn’t gone back to the context, “artificial” might jump out as a very tempting answer, with “pliable” seeming like more of a stretch. On vocabulary-in-context problems on the SAT Reading section, very often the trap answer is an obvious out-of-context synonym for the word in question, while the correct answer meets a lesser-used definition of the word, but one that fits in context.
I run out of time / the pressure of a timed test leads to mistakes.

The SAT requires you to answer questions efficiently: on average, you have less than 90 seconds to complete each question, and on the SAT Writing section you have less than a minute per question. This has two effects: some students won’t be able to complete each section on time, and other students will complete the section but feel rushed enough that they make mistakes they shouldn’t. Through the Veritas Prep course, you’ll master core content so that you can answer basic to moderate level problems quickly and save time for harder questions, and you’ll learn time-saving strategies so that you avoid losing valuable time on problems for which there is an easier way.

Example:

Remember that algebra problem from the quiz? \(2x(x - yx + 1)(3x - x^2) = 2x^4 - 8x^3 + 6x^2\) can be transformed algebraically to solve for \(y\), but the process is time-consuming and if you’re rushing it is very easy to make mistakes (try it: we bet you’ll make at least one mistake distributing the negatives with all that multiplication!). But as you saw, recognizing that “for all values of \(x^3\)” means that you can plug in \(x = 1\) allows you to solve directly for \(y\) with fewer steps and much fewer opportunities for error.

More than one answer looks correct.

Particularly with verbal problems, it’s common to see multiple answers and think “yeah, that can work.” But with the multiple-choice format you can only choose one answer (with the exception of the occasional “all of the above” answer choice, of course). Through the Veritas Prep course you’ll learn to read and think critically, with the “Attack!” mindset as you go through answer choices. At school and in your college application essays and interviews it pays to be friendly and open to all ideas and perspectives; on the SAT, however, you need to be aggressive and critical to make sure that the answer you choose is completely error-free.

Example:

Which of the following best describes the plot of the Disney movie “Cinderella”?

A) With the help of her fairy godmother and some local birds and mice, a poor girl gets ready to stay out all night at a royal ball, where she meets and falls in love with a prince and lives happily ever after.

B) Seemingly doomed to live out her life doing chores for her wicked stepmother and stepsisters, a girl is given a chance at the evening of a lifetime at a royal ball where she fortuitously leaves her shoe behind as she races home: this accident helps to turn her fortunes around permanently.

For most readers, it’s easy to say “yeah they both describe it pretty well,” but for those in attack mode the phrase “out all night” in choice A is a huge red flag. She left at midnight! So you must eliminate choice A and select choice B, which may not include all the language you’d prefer from choice A, but does not contain that fatal flaw!
It’s a long test and it’s difficult to stay focused on boring content.

Most test-takers will feel their attention wane as the test goes on, but through the Veritas Prep course you’ll learn what to focus on when you need to snap your attention back. When you can’t get your head in the game on an SAT Reading passage, you can scan to the italicized “where this passage comes from” portion to get some much needed context, or if that fails you can skip to the vocab-in-context problems to get a few quick wins. When you don’t know where to begin on a math problem, you’ll know that Answers Are Assets and you can start building your understanding from a quick peek at the answer choices. The SAT is a long, challenging, and stressful test for everyone, but by the end of this course you’ll have several competitive advantages that will help you get through it more confidently and efficiently.
Section 2: Using Evidence, Reading Critically, and Making Proper Inferences

In the previous section, you learned what is on the SAT, what makes the SAT so difficult, and how you will attack the test with proven Veritas Prep strategies. Now it’s time to start building your Veritas Prep SAT Toolkit with different skills and strategies.

Perhaps the most important skill on the verbal side (and an important one on the quant side) is your ability to analyze evidence, read critically, and make proper inferences from that evidence.

Consider the information below and then decide what proper inferences you can make from the given information:

A primary mission of the SAT is to test your ability to use evidence to make proper inferences.

- The SAT Reading test specifically includes “command of evidence” question pairs that ask you to draw a conclusion and then find the evidence in the text to support it
- The SAT Writing test asks you to insert or delete sentences based upon whether they fit with the author’s conclusion and logical progression of ideas
- Even the SAT Math test asks you to draw valid conclusions (and eliminate invalid ones) from statistics

So from the evidence above:

1. Can you logically conclude that every section of the SAT tests command of evidence and making proper inferences?

2. Why or why not?

How about this one:

Your instructor scored in the 99th percentile on an official SAT exam. Therefore, your instructor will be an excellent SAT instructor.

1. Is that a logical conclusion?

2. Why or why not?
As it turns out, every section of the SAT does test logical reasoning and command of evidence, and your instructor will be a great SAT teacher! But those conclusions were not guaranteed by the facts alone on the previous page. You might have been thinking about:

- What about the optional SAT essay? Does that test logic?
- Does “the SAT” include all the SAT subject tests? Do they test logic?
- Is being good at taking the SAT the same thing as being good at teaching it?

A huge part of “command of evidence” is questioning whether the facts really lead to that specific conclusion. Your mantra on these questions should always be:

Read Critically!

So let’s take a moment to discuss how evidence leads to conclusions.

**NOTE:** “inferences” and “conclusions” are interchangeable terms that you will see often on the SAT and in this course.

### Evidence and Conclusions

The Greek philosopher Aristotle (384–322 BC) first posited the notion that a tool could be used to argue convincingly. His study included grammar, rhetoric, and logic, and he built his teaching of logic upon what he calls a syllogism, a three-sentence structure in which the truth of the first two sentences guarantees the truth of the third:

**All men are mortal. ← Evidence (also called a “premise”)**
**Socrates is a man. ← Evidence (also called a “premise”)**
**Socrates is mortal. ← Conclusion**

A syllogism works if the two premises (which are always treated as facts) are related to each other logically and then prove the third statement. Here, since the second premise (Socrates is a man) directly relates to the first (all men are mortal), the two work together to produce a third statement that must be true.
The Why Test

Another way to look at this logic is to recognize that every conclusion needs to be backed up by evidence, and on the SAT that evidence needs to be clearly given. In order for a conclusion to be valid, you need to be able to ask “why?” and find that evidence in the prompt. So ask yourself:

1) Why is Socrates mortal?
2) Why is Socrates a man?
3) Why are all men mortal?

Only one of those questions has an answer “why” (Socrates is mortal because he’s a man, and because all men are mortal.), so that tells you that “Socrates is mortal” is a conclusion, and that the other two points have to be evidence. On the SAT:

- A conclusion must have a reason why (and you should find that evidence whenever you are asked to make a conclusion)
- Evidence does not have to have a reason why (and should be treated as a fact)

If you’re in doubt as to whether something is a conclusion, hold it up to “The Why Test” – if the prompt doesn’t try to explain why it’s true, it’s not a conclusion. And if it is a conclusion, you will typically be asked to find the reason.
The Why Test Drill

For each of the following paragraphs, use The Why Test to find:

Which sentence contains the author’s main conclusion?

Which sentence contains direct evidence for that conclusion?

1. [1]It is generally believed that an Indian tribe known as “The Red Paint People” first occupied the coast of Maine in approximately 3000 B.C. [2]This name was given to the Indians because their graves contained quantities of a red pigment (iron ochre) that they presumably used to decorate their faces and bodies. [3]However, recently discovered Indian grave sites on the coast of Maine that contain these same red pigments have been conclusively dated to 4000 B.C. [4]Therefore, the “Red Paint People” must have occupied the coast of Maine much earlier than archaeologists previously believed.

Which sentence contains the author’s conclusion?

Which sentence contains direct evidence for that conclusion?

2. [1]Opponents of peat harvesting in this country argue that it would alter the ecological balance of our peat-rich wetlands and that, as a direct consequence of this, much of the country’s water supply would be threatened with contamination. [2]But in Ireland, where peat has been harvested from wetlands for centuries, the water supply is not contaminated. [3]Furthermore, peat production would be a great benefit to the economies of the wetland regions in this country, where job creation is in dire need. [4]We can safely proceed with the harvesting of peat.

Which sentence contains the author’s main conclusion?

Which sentence contains direct evidence for that conclusion?
3. [1] Recently, it has become fashionable to criticize farm subsidies. [2] As the federal budget becomes more scrutinized, these payments to farmers for producing surplus corn and soy crops are an easy target for those who seek to rein in spending. [3] But these subsidies should not be repealed; instead, they should simply be reallocated. [4] Subsidies act as insurance not only for farmers, who are then protected from dramatic changes in weather, but also for the public. [5] Farm subsidies for healthier crops, primarily vegetables, could help insure affordable, healthy food options for the public at large.

Which sentence contains the author’s conclusion?

Which sentence(s) contain(s) direct evidence for that conclusion?

Solutions: 1: #4 is the conclusion and #3 is the evidence  2: #4 is the conclusion and #2 is the evidence  3: #3 is the conclusion and #4 and #5 are evidence.
Drawing Inferences: Must Be True vs. Could Be False

On both the Reading and Math sections, the SAT will ask you to draw inferences and conclusions. Examples of these question stems include:

- It can be inferred that the authors of Passage 1 believe that ___________.
- Which of the following conclusions is best supported by the information in the chart?
- According to the data, which of the following must be true?

When you see these types of questions, recognize that the correct answer “Must Be True” beyond a reasonable doubt, so your goal is to find that doubt so that you can eliminate answers.

For example, suppose you were given the chart below:

<table>
<thead>
<tr>
<th>Rank</th>
<th>Movie</th>
<th>U.S. Box Office Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Avatar</td>
<td>$760,507,625</td>
</tr>
<tr>
<td>2</td>
<td>Titanic</td>
<td>$658,672,302</td>
</tr>
<tr>
<td>3</td>
<td>Jurassic World</td>
<td>$652,270,625</td>
</tr>
<tr>
<td>4</td>
<td>The Avengers</td>
<td>$623,279,547</td>
</tr>
<tr>
<td>5</td>
<td>The Dark Knight</td>
<td>$533,345,358</td>
</tr>
<tr>
<td>6</td>
<td>Star Wars Ep. I: The Phantom Menace</td>
<td>$474,544,677</td>
</tr>
<tr>
<td>7</td>
<td>Star Wars Ep. IV: A New Hope</td>
<td>$460,935,665</td>
</tr>
<tr>
<td>8</td>
<td>The Avengers: Age of Ultron</td>
<td>$459,005,868</td>
</tr>
<tr>
<td>9</td>
<td>The Dark Knight Rises</td>
<td>$448,139,099</td>
</tr>
<tr>
<td>10</td>
<td>Shrek 2</td>
<td>$436,471,036</td>
</tr>
</tbody>
</table>

Can you conclude that “More people saw Avatar than any other movie in history”?

Why or why not?
Learning By Doing: Attack and Be Critical!

As you considered reasons that the conclusion might not be true, you may have come up with:

- These numbers only apply to the United States. What about other countries?
- The conclusion is about “number of people” but the table only shows “dollars earned.” What if Avatar tickets were just much more expensive than the others?

In doing so, you were exercising good Inference strategy. Even though an inference looks very likely, you should try to criticize it and find doubt. The two most common ways to find that doubt are:

1. **Find an exception**, a case for which the conclusion isn’t true. Since the correct answer must be true, then all you have to do is find one case in which it is not true and you’ve disproven it. Here that may be “what if there were lots of inflation and movie tickets just cost several times more when Avatar came out than when other movies did?”

2. **Notice a disconnect between the evidence and the conclusion.** Usually you’ll find that in the language, which is differs slightly from evidence to conclusion. Here that’s “U.S. box office revenue” (evidence) vs. “number of people” (conclusion).
With that in mind, take a look at the following table and answer the same question:

<table>
<thead>
<tr>
<th>Rank</th>
<th>Movie</th>
<th>Tickets Sold (in millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gone With the Wind</td>
<td>225.7</td>
</tr>
<tr>
<td>2</td>
<td>Star Wars (Ep. IV: A New Hope)</td>
<td>194.4</td>
</tr>
<tr>
<td>3</td>
<td>ET: The Extra-Terrestrial</td>
<td>161</td>
</tr>
<tr>
<td>4</td>
<td>The Sound of Music</td>
<td>156.4</td>
</tr>
<tr>
<td>5</td>
<td>The Ten Commandments</td>
<td>130</td>
</tr>
<tr>
<td>6</td>
<td>Titanic</td>
<td>128.4</td>
</tr>
<tr>
<td>7</td>
<td>Snow White and the Seven Dwarfs</td>
<td>126.3</td>
</tr>
<tr>
<td>8</td>
<td>Jaws</td>
<td>120.7</td>
</tr>
<tr>
<td>9</td>
<td>Doctor Zhivago</td>
<td>120.1</td>
</tr>
<tr>
<td>10</td>
<td>The Lion King</td>
<td>118.9</td>
</tr>
</tbody>
</table>

In the United States, more people have seen *Gone With The Wind* than have seen any other movie.

Is this a logical conclusion? Why or why not?

**Learning By Doing: Continue To Be Critical**

This conclusion is fine, right? It takes care of the problems you identified on the last example. The data is in tickets sold, not revenue. The conclusion is only referring to people in the U.S. So this must be true, right? Even if you think a conclusion is guaranteed, keep trying to identify problems with that conclusion. So what is the problem with this example? The data is about ticket sales in theatres and the conclusion is about number of people who have watched. What about repeat viewers in the theatres? What about people who have watched these movies on TV? Always search for the disconnect between the evidence and the conclusion given – there are often many hidden gaps that you will not consider or notice at first.
Two Truths And A Lie

Let’s build on your knowledge of using the “must be true” standard to eliminate inferences.
For the following problems, determine which two conclusions can logically be proven by the
prompt and which one does not have sufficient evidence.

1. If Shero wins the election, McGuinness will be appointed head of the planning
commission. But Stauning is more qualified to head it since he is an architect who has
been on the planning commission for 15 years. Unless the polls are grossly inaccurate,
Shero will win.

A) McGuinness will be appointed head of the planning commission only if the polls are a
good indication of how the election will turn out.
B) If the polls are a good indication of how the election will turn out, someone less
qualified than Stauning will be appointed head of the planning commission.
C) McGuinness is not the most qualified person to head the planning commission.

2. From 1998 to 2008, the amount of oil exported from the nation of Livonia increased by
nearly 20% as the world’s demand soared. Yet over the same period, Livonia lost over
8,000 jobs in oil drilling and refinement. Overall, there has been a 25% increase in the
nation’s unemployment rate.

A) There were fewer jobs in the oil industry in Livonia in 2008 than there were in 1998.
B) There was less world demand for oil in 1998 than there was in 2008.
C) Livonia exported more oil in 2008 than it did in 1998.

3. \( y = (x - 3)^2 \)

A) \( y \) is always positive
B) The parabola crosses the \( y \)-axis when \( x = 3 \)
C) \( y \) will never be negative
Learning By Doing: Precision In Language

The “lie” in each of these examples was extremely close to being true. And that’s how the most tempting wrong answer on SAT logic-based questions will look. The devil, as they say, is in the details: what might seem logical in a general sense is often incorrect when you dissect exactly what’s being said.

For the Shero/McGuinness election problem, answer choice A is not quite true, and it all comes down to one small but significant word: “only.” Here you know that if Shero wins the election, he will appoint McGuinness. But you do not know that that is the ONLY way that McGuinness will be appointed. What happens if Shero loses? You simply do not know what the new winner will do (maybe he too will appoint McGuiness), so you cannot draw that precise conclusion.

The Livonia/oil industry problem is similar, but in this case the “lie” answer doesn’t add a word, but instead changes a few. You do know that Livonia has lost jobs in oil drilling and refinement, but you do not know that it lost jobs in “the oil industry” as a whole. It is certainly possible that, with exports having increased substantially, there are more jobs in other areas of the oil industry, such as sales, shipping, etc. Make sure that you don’t pick answer choices simply because many of the words are similar; tempting trap answers include enough repetition to tempt you, but are off by a few key words.

The algebra/quadratic problem shows you that the same type of critical precision in language (and in symbols) is important in math, too. Of course, since \( y \) equals a squared term it can never be negative. But when \( x = 3, y = 0 \), meaning that \( y \) doesn’t have to be positive; 0 is “nonnegative” but it’s also not positive. In algebraic symbols, \( y \geq 0 \)… but answer choice A says that \( y > 0 \), another small but important distinction.

Skills Meet Strategy: Attack!

Do you know the saying “nice guys finish last”? On the SAT, you can certainly be penalized by being too “nice.” Throughout the test, and particularly when questions ask what must (or could, or cannot) be true or what can (or cannot) be logically concluded, attack the answer choices: try to poke holes in every answer choice and be aggressive in your process of elimination. There will usually be multiple answer choices that you could talk yourself into if you’re “being nice” and giving them the benefit of the doubt. You want to attack: screen the answer choices thoroughly, and if one is close but doesn’t quite fit, throw it out.
Section 3: Interpreting Graphs and Tables

In the previous section, you learned how to make proper inferences and how to analyze evidence and read critically. In today’s modern world, you are often asked to make conclusions not from writing and text, but from complicated graphs and tables. Your ability to quickly analyze graphs and tables and then make proper conclusions from that data is arguably the most important skill on the SAT. You will see tables and graphs occasionally on both verbal sections and you will see them frequently on both quant sections. The bottom line: you need to understand how to interpret graphs effectively! This section will not only serve as an introduction to interpreting tables and graphs, but will also teach you how to make proper inferences from that data.

Introduction to Common Graph Types

A picture is worth a thousand words, they say. And for those who prefer Instagram and Snapchat to Twitter and, well, books, that sentiment rings true. But that philosophy also extends to mathematicians and statisticians: information can be digested quickly and efficiently when it’s presented graphically, and for that reason the SAT tests heavily your ability to read tables and graphs.

Both the SAT Reading and SAT Math sections will feature several graphs, most notably (but not exclusively):

- Bar graphs & histograms
- Line graphs
- Scatter plots
- Pie graphs
- Data Tables

In this lesson you’ll first cover an introduction to (or review of, depending on your familiarity) the major types of graphs covered on the SAT, and then you will work through a set of practice problems that demonstrate the major ways in which graphs are tested.

Getting Your Bearings

Before you do anything with a graph or chart, think about why that particular format is being used. As you’ll see in subsequent examples, each graph has a unique purpose. Bar graphs include data points that are independent of one another (and often can be counted such as the number of cars sold last year by city). Pie graphs tend to represent data points that are free-standing, but represent a part of a whole such as a company’s operating budget. Line graphs show trends (typically over a period of time) and will often include multiple data points over the same period of time. The type of graph used will be your first clue about what is being asked in the questions.

Labels and units are your next clue. Every chart or graph will have them, but they’re going to be different and provide you with a roadmap and context for the questions. It sounds overly simplistic, but remember to read the title and blurb (if provided) first! Next, look at the units used on the graph, especially if the questions ask you to do any type of conversion. If there’s more than one graph, are the units different? Pay special attention to anything in small italicized print at the bottom; footnotes are included for a reason!
Pie Graphs

Take a look at the graph below, and be ready to discuss:
- What is the graph conveying?
- How quickly do you get the main point of the graph?
- Why is it (at least supposed to be) funny or interesting?

TIME SPENT WRITING A PAPER DUE TOMORROW

- Facebook
- Making font bigger
- Making margins bigger
- Using Thesaurus for bigger words
- Checking phone
- Bibliography
- Actually writing
Using Pie Graphs

A pie graph uses the full circle to express the entire pool of data (the total) and each individual “slice” (or section) to show that quantity’s proportion of the whole. In the previous graph, the intent is to show that “actually writing the paper” represents a really small portion of a student’s time, and that much less relevant activities (Facebook, phone) take up most of that time.

Pie graphs are useful for demonstrating how different categories relate to each other, and how different categories relate to the whole. For example, a pie graph might show you about the land mass of each continent relative to all the land on Earth:

![World Land Mass By Continent](image)

Based on that pie graph, answer the following questions:

1. Which continent is the world’s 4th largest by land mass?

2. What percentage of the world’s land mass is accounted for by the two Americas?

3. The land mass of Africa is approximately the same size as the combined land mass of which three continents?

4. Which of the following conclusions can be drawn from the graph above?

   A) Half of the earth’s surface area is covered by Asia and Africa.
   B) Asia is approximately 50% larger, based on land mass, than Africa.

Solutions: South America: 29%; Antarctica, Europe, and Australia; A is not a valid conclusion (what about the oceans?) B is a valid conclusion.
Bar Graphs

Try another graph, again asking yourself:

- What is the graph conveying?
- How quickly do you get the main point of the graph?
- Why is it (at least supposed to be) funny or interesting?

Teams Eligible to Win The World Series

<table>
<thead>
<tr>
<th></th>
<th>United States</th>
<th>Canada</th>
<th>The rest of the world</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Teams Eligible</td>
<td>30</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>
Using Bar Graphs

A bar graph compares categories while also showing the actual values for each. Here the y-(vertical) axis shows the numerical values (teams from each country) so that you can quickly gauge both the relationship between each category and the total value of each.

A useful bar graph might plot the enrollments of Ivy League schools:

![2010 Undergraduate Enrollment: Ivy League](image)

1. Which Ivy League school had the lowest undergraduate enrollment in 2010?

2. In 2010, Cornell had approximately __________ as many undergraduate students as did Harvard?
   
   A) the same  
   B) 1.5 times  
   C) twice  
   D) three times

3. In 2010, Dartmouth had approximately __________ as many undergraduate students as did Cornell?
   
   A) 30%  
   B) 40%  
   C) 50%  
   D) 60%

4. Which of the following conclusions can logically be drawn from the graph above?
   
   A) More students graduated from Cornell in 2010 than from any other Ivy League school.  
   B) The total enrollment for Ivy League schools in 2010 was greater than 40,000 students.

Solutions: Dartmouth; C, A is not a valid conclusion (the chart shows enrollment, not graduation data); B is a valid conclusion
Histogram

A histogram looks a lot like a bar graph, but has a specific purpose when it comes to statistics. Histograms are useful for displaying the frequency with which certain outcomes happen. Consider the Instagram-based histogram below:

The y-axis displays the frequency of each outcome, essentially “how many times did Ally receive a certain number of likes on a photo?” The x-axis then shows the different numbers of likes she received. So from the first column you can tell that she received two likes twice. From the second column you can tell that she received three likes nine times.

With histograms, the SAT will often ask you statistics-based questions, such as:

- What is the median number of likes that Ally received on each photo?
- What is the highest number of likes that Ally received on a photo?
- How many times did Ally receive fewer than 5 likes on a photo?

Solutions: 5; 10; 18
Line Graphs

Try another type of graph, again asking yourself:

- What is the graph conveying?
- How quickly do you get the main point of the graph?
- Why is it (at least supposed to be) funny or interesting?

![Line Graph Image]

Line graphs are most often used to show how data changes over time. In the above graph, the horizontal x-axis marks the passage of time over the course of a semester, and the y-axis shows the amount of chemistry knowledge a student has.
Using Line Graphs

Average Hours Worked Per Week

Hannah works as a lifeguard during the summer and in retail during the school year to save up for college tuition. The above graph displays the average number of hours she works per week for each month of the year. Based on the graph, answer the questions below:

1. In which month does Hannah work the most hours?

2. From October to November, Hannah’s work hours increase by:

   A) Less than 50%
   B) More than 50% but less than 100%
   C) More than 100%
   D) Hannah’s work hours decrease during this period.

3. Which of the following best describes Hannah’s annual work schedule?

   A) Her total hours worked per month increase each month from January to December.
   B) Her average hours worked per week increase each month from January to July.
   C) Her average hours worked per week decrease each month from July to December.
   D) Her total hours worked in May through August were greater than her total hours worked for the rest of the year.

Solutions: July; A, D
**Scatter Plot Graphs**

One more time, take a look at a graph and ask yourself:

- What is the graph conveying?
- How quickly do you get the main point of the graph?
- Why is it (at least supposed to be) funny or interesting?

![Nutritious vs. Delicious Graph](image)

Scatter plots are best for showing an overall trend, and do so by showing each data point as well as a trend line. In the above graph, the x-axis shows how healthy each food is, and the y-axis shows how good it tastes. The trend is that as one increases, the other decreases – an inversely proportional relationship.
Consider the following graph and the questions that go with it:

The graph above plots the SAT scores and number of hours studying for the SAT for 30 different students from a particular high school class.

1. The relationship between hours studied and overall SAT score is:
   A) Directly proportional
   B) Inversely proportional
   C) There is no relationship

2. The highest score achieved by any student who studied less than 20 hours was:
   A) 980
   B) 1090
   C) 1180
   D) 1390

3. Which of the following statements is true based on the graph?
   A) No student who studied at least 30 hours scored lower than 1300.
   B) All students who studied more than 20 hours scored above 1200.
   C) All students who studied more than 25 hours scored above 1200.
   D) No student who studied fewer than 20 hours scored above 2500.

4. According to the line of best fit, a student from the same high school class who scored a 1500 most likely studied approximately how many hours?
   A) 30
   B) 35
   C) 40
   D) 45

Solutions: A; D; C; C
Tables

The SAT will also include numerous data tables. When reading data tables, note that each column and each row will be labeled, allowing you to determine the meaning of each cell. Two major themes will help you navigate data table problems:

- **Be question driven.** Data tables contain lots of numbers but typically only a few are important, based on what the question asks for. Read the question first, then go find the data you need.

- **Precision in wording is key.** Pay particular attention to the labels in the table and the wording surrounding it. Often (as you do below) you will find language telling you to multiply the figures in the table by a larger number (1,000 or 1 million, for example). This is done to save space in the table when all figures share a similar order of magnitude.

<table>
<thead>
<tr>
<th>City</th>
<th>Spent On Sanitation</th>
<th>Total Annual Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andersonville</td>
<td>$8,225</td>
<td>$47,975</td>
</tr>
<tr>
<td>Bron xtown</td>
<td>$16,750</td>
<td>$142,950</td>
</tr>
<tr>
<td>Chadwick</td>
<td>$3,925</td>
<td>$20,325</td>
</tr>
<tr>
<td>Dodgeville</td>
<td>$3,350</td>
<td>$16,275</td>
</tr>
<tr>
<td>Edgewater</td>
<td>$13,100</td>
<td>$51,675</td>
</tr>
</tbody>
</table>

The table above shows the amount of money that each of five cities spent on sanitation in 2015 and the amount that each spent overall that year, with numbers shown in thousands of dollars. Which city spent the largest percentage of its annual budget on sanitation?

A) Andersonville  
B) Bronxtown  
C) Chadwick  
D) Edgewater

Solution: D
SAT Graphs: Common Questions

Now that you have been exposed to the major families of SAT tables and graphs, let’s take a look at how the SAT tends to test you on these graphics. The SAT tests three major themes with graphics:

- Translating Graphs to Words
- Using Graphs as Evidence
- Graphs Set Up Math Questions

Translating Graphs to Words

Throughout the SAT – on the reading, writing, and math sections – you’ll see problems that ask you to interpret in words what the graph is showing you visually. When you encounter these questions:

- You will always want to use process of elimination with the four answer choices. Read each answer choice and assess whether it fits the information displayed in the graph.
- Spend 5-10 seconds familiarizing yourself with the graph before you look at the answer choices, but do not expect to be able to predict the correct answer.
- Pay close attention to the wording that accompanies the graph. Units matter!

Graphs As Evidence

Most SAT graph problems – particularly on the Reading and Writing sections – will ask you to decide which of four conclusions is most likely based on the graph. These questions will include language such as:

“The graph offers evidence that….”
“Which of the following is most strongly supported by the graph?”
“Which of the following conclusions is best supported by the graph?”

When you see these questions, be critical! Many answer choices could be true overall, but only one will be directly supported by the graph. Make sure that your answer ties directly back to the graph – if the graph doesn’t address it, it’s not the proper conclusion!

On the following graphs, interpret them accurately and make sure you are making proper conclusions using the graphs as evidence.
The following graph displays the median weekly earnings and the unemployment rate broken down by level of education.

![Graph showing median weekly earnings and unemployment rate by level of education]

Which of the following best describes the information in the graph?

A) For every level of education, as education increases the unemployment rate decreases.
B) The average holder of any type of college degree is less than half as likely to be unemployed as is the average person who has not completed high school.
C) As level of education increases, the unemployment rate and the median weekly income are positively correlated.
D) The median holder of an associate’s degree earns more than twice as much per week as the median person who has not completed high school.
Learning By Doing: Precision In Language

When you’re selecting an answer choice that describes the graph, it’s important that the entire answer choice be true. For example, consider answer choice A: for almost every level of education, as the level of education increases the unemployment rate decreases. So choice A is almost true. But that last level—doctoral degree—has an unemployment rate just higher than the level before it (professional degree), so “every level” in choice A isn’t quite true. Choice A is therefore incorrect, even though it was quite close. Make sure you read each choice critically and are careful with words that are hard to prove (every, all, always, never, none, etc.).

Choice B is correct. The first level of college degree listed is Associate’s Degree, with an unemployment rate of 6.8%, and all other degrees listed have unemployment rates less than that. Since the unemployment rate for those without high school degrees is 14.1%, you can conclude that this rate is more than double the rate for any college degree, meaning that any college degree will have a rate less than half the rate for no high school degree.

Choice C is incorrect, again for just one word: the unemployment rate and the median weekly income are indeed correlated, but as income goes up the unemployment rate goes down. This is a negative – not positive – correlation.

And choice D is also incorrect. The Associate’s Degree median is $768 while the median for no high school degree is $451. Since $768 is not quite twice as much as $768, choice D is not correct.
The following graph plots the average wind speed by time of day for a windmill farm outside of Toronto. Time of day is given in military time (0 hours to 2400 hours).

Which of the following best summarizes the data in the graph?

A) Average wind speed increases steadily between 5:00 am and midnight.
B) Average wind speed is lowest between 3:00 and 5:00.
C) Average wind speed is highest between 20:00 and 22:00.
D) Average wind speed more than doubles from 18:00 to 22:00.
Learning By Doing: Trends In Line Graphs

Very often with line graphs, the SAT will ask you to describe a trend evident from the graph. In these cases it’s helpful to get a quick glance at the graph to notice extremes (Where is the line the highest? Where is it the lowest? Are there any places where it stays flat for multiple increments?), but ultimately you’ll need to play Process of Elimination with the answer choices.

Choice A is incorrect because the graph clearly shows periods where the line goes down after 5:00 but before 24:00. Therefore the average wind speed does not increase steadily; in some instances it decreases.

Choice B is also incorrect. Although the period between 3:00 and 5:00 marks one of the lower points on the graph, the line dips even lower below the 6.6 line at 18:00.

Choice C is correct. The highest point on the line is at 21:00, between the stated times of 20:00 and 22:00.

And choice D is incorrect. Be sure to check the scale on graph problems! The entire y-axis for this graph only spans 6.5 to 7.2 meters per second, so although the line jumps up sharply it only represents a small percentage increase.
The following scatter plot displays the world record time, in seconds, for the men’s 100 meter dash from 1910 through 2010. The line of best fit displays what the expected world record time would be at each point along the years 1900 to 2100.

Which of the following best summarizes information displayed in the scatter plot above?

A) The world records set between 1980 and 1995 were all faster than what the line of best fit predicts.
B) The world records set between 2000 and 2010 were all faster than what the line of best fit predicts.
C) Since 1900, the world record has never gone more than 15 years without being lowered.
D) The world record time in 2050, in seconds, is predicted by the line of best fit to be less than half what it was in 1910.
Learning By Doing: The Line Of Best Fit

Notice that 3 of the 4 answer choices include the term “line of best fit” with regard to a prediction. With scatter plots, the line of best fit can serve as a tool to predict where new data points will fall. In this case, the line of best fit represents where one would expect the world record to be at any given point between 1900 and 2100.

Remember that a faster time will be a lower number (running the 100 meters in 9 seconds is faster than running it in 10 seconds). So choice A is incorrect, as the data points from 1980 to 1995 are above the line of best fit, so slower than what would have been predicted.

Choice B is correct. Because the data points between 2000 and 2010 are all below the line of best fit, those times were all faster than would have been predicted.

Choice C is incorrect. Each data point represents a new world record – a point in time at which the world record was broken. So you can look at the horizontal space between each data point to see how long the duration was in between. And between approximately 1930 and just after 1950 there are no data points, so you can conclude that the world record was not broken for a period of approximately 20 years.

Choice D is also incorrect, and brings up another point critical to your work with graphs: look at the scale! Even though the line of best fit is much, much lower at 2050 than it was in 1910, the total scale goes from 9.4 seconds at the bottom to 10.8 seconds at the top. So there’s no chance for one data point to be half of another: half of 10.8 (the top data point) would be 5.4, and the graph doesn’t go that low. It’s quite common for the lines or bars on a graph to appear to have a much greater difference in size than is actually true, so always check the scale when answering questions dealing with percent change.
The following scatter plot displays the world record time, in seconds, for the men's 100 meter dash from 1910 through 2010. The line of best fit displays what the expected world record time would be at each point along the years 1900 to 2100.

Which of the following best summarizes information displayed in the scatter plot above?

A) The world record was broken more frequently between 1910 and 1960 than between 1960 and 2010.
B) On average, the world record experienced greater percentage decreases between 1910 and 1960 than between 1960 and 2010.
C) The world record was broken fewer than 15 times between 1910 and 2010.
D) The world record was broken at least once in every decade between 1910 and 2010.
Learning By Doing: Using The Axes In Scatter Plots

In this scatter plot, the distances between the data points tell you two things: the horizontal distance tells you how long each record lasted before it was broken, and the vertical distance tells you how much lower the new record was than the previous one. Based on that, you can make quick visual assessments as you use Process of Elimination with the four answer choices.

Choice A is incorrect, because there are more data points clustered closer together horizontally in the 1960-2010 timeframe than in the 1910-1960 timeframe. Therefore, you can conclude that the record was broken more frequently in the 1960-2010 time period.

Choice B is correct. Look at the vertical distances between the points on the left-hand side of the graph versus those on the right-hand side. On the left the horizontal differences are much larger, so you can see that the average percent decrease was much bigger.

Choice C is incorrect, as you can see by counting data points. Once you get to 15, you know that the record has been broken at least 15 times.

And choice D is also incorrect. There is no data point between 1940 and 1950, so that represents a decade in which the record was not broken.
The following graph displays, for several major categories of public transportation, the share of total trips taken via public transportation in the United States over a year.

What statement is best supported by the data in the figure above?

A) Over half of all users of public transportation are bus riders.
B) 45% of all miles traveled on public transportation are traveled by rail of some kind.
C) More people travel via paratransit than via ferry.
D) Over 40% of all public transportation trips are taken by rail of some kind.
**Learning By Doing: Precision In Language**

Perhaps the easiest way to miss a graph-based question is to answer based only on the image without consideration of the words that accompany it. So make sure you always take note of what, specifically, the graph is displaying. Here it’s the percentages OF TRIPS TAKEN, which is critical. Answer choice A might look correct (“more than half” certainly applies to “bus”), but the units matter! You can’t conclude that more than half of all USERS are bus riders, just that more than half of all TRIPS TAKEN were by bus. Suppose, for example, that people who take the bus take it twice per day, but people who use heavy rail only use it once per week. Each user of the bus would then take 10 trips for every one that a heavy rail user takes, and in that case you’d need a lot more heavy rail users than bus users to have 35% of all trips be taken by heavy rail.

Choice B is also incorrect, because again you’re facing a units problem. You don’t know about the percentage of MILES TRAVELED via each public transportation service; you only know about the percentage of TRIPS TAKEN.

Choice C makes the same mistake that choice A makes: it draws a conclusion about the percentage OF PEOPLE, when the information you have is about percentage of TRIPS TAKEN.

Which leaves correct choice D: choice D correctly makes an inference about the percentage of TRIPS TAKEN, and then if you check the actual numbers you’ll see that the three categories of rail add up to 45% of all trips taken. Therefore it is true that rail accounts for more than 40% of all trips taken.
The scatter plot below displays the daily sales figures for a beachfront ice cream shop for the month of June, with each data point representing the sales totals and the high temperature for the day.

The scatter plot above offers evidence that the ice cream store will:

A) not sell any ice cream on a day for which the high temperature is below 55 degrees.
B) sell over $2,100 in ice cream on a day for which the high temperature is over 90 degrees.
C) usually sell less ice cream on days with lower temperatures than on days with higher temperatures.
D) typically sell more ice cream on weekends than on weekdays.
Learning By Doing: Graphs As Prediction Tools

Sometimes the SAT will ask you a question about what the graph suggests will happen in the future. Here you won’t always be able to find the exact answer simply by looking at the graph, but will instead have to pay attention – as always – to trends in the graph and to precision in wording in the answer choices.

Choice A is a good example of precision in wording. “Not sell any” is a very strong statement, particularly when the bottom of the graph shows $700 worth of ice cream and you have data points near 55 degrees that are well above that line. It’s not likely (even though it’s technically possible) that sales would fall off the graph entirely with just a slight move leftward on the x-axis (temperature axis), so answer choice A is incorrect.

Choice B is similarly incorrect. Over $2,100 in sales would jump above the highest gridline on the graph, and the trend shows that the two closest data points to 90 degrees retreat slightly toward lower sales. Such a jump to over $2,100 is possible, but not entirely likely.

Choice C uses softer language than the previous two choices, something you should notice given that precision in wording matters quite a bit on graph problems. “Usually” is a bit easier to prove than “will,” and the general trend in the data supports this – the trend in the data points is from lower left (lower temperature, less sales revenue) to upper right (higher temperature, more sales revenue), so choice C is correct.

Choice D is incorrect. The graph only shows information regarding temperature and sales, not about day of week and sales, so even though this might very well be true, the graph gives no evidence to make this prediction.
Do the Math

Graphs are generally visual representations of numbers, so many SAT graph questions – even those on the Reading and Writing sections – will require you to do at least a little bit of math.

Which age group saw the greatest percent increase in number of emails sent per week from 2005 to 2015?

A) 19-35
B) 36-55
C) 56-65
D) 66+
Learning By Doing: Percent Increase

With math-based graph questions, be careful not to become too enamored with the visual aspects of the graph. Precision in language matters, and so does precision in numbers! Here, of course the 19-35 and 36-55 groups have the largest bars, but if you check their relative percent increases you’ll see that 19-35 doesn’t quite double (115 isn’t quite double what 62 is) but that 36-55 does (45x2 is 90, and 102 is above that). 66+ also more than doubles from 6 to 15, so you’ll want to do the math to see which one has a higher growth rate.

Answer choice B: \[
\left(\frac{\text{New} - \text{Original}}{\text{Original}}\right) \times 100\% = \frac{102 - 45}{45} \times 100\% = \frac{57}{45} \times 100\% = 127\%
\]

Answer choice D: \[
\left(\frac{\text{New} - \text{Original}}{\text{Original}}\right) \times 100\% = \frac{15 - 6}{6} \times 100\% = \frac{9}{6} \times 100\% = 150\%
\]

Therefore choice D is correct.
By approximately what percent did the average number of emails sent increase in the 19-35 age group from 2005 to 2015?

A) 70%
B) 75%
C) 80%
D) 85%

**Learning By Doing: More With Percent Change**

The percent change equation is $\frac{\text{New} - \text{Original}}{\text{Original}} \times 100\%$. For the 19-35 age group that calculation becomes $\frac{115 - 62}{62} \times 100\% = \frac{53}{62} = \text{approximately 85\%. Therefore answer choice D is correct.}$
**Section 4: More on SAT Structure and Scoring**

As you have seen earlier in the lesson, your SAT test day experience will look like the following:

<table>
<thead>
<tr>
<th>Section</th>
<th>Questions/Time</th>
<th>Question Format</th>
<th>Section Emphases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section 1: Reading</td>
<td>52 questions</td>
<td>Multiple choice (select 1 of 4)</td>
<td>Reading comprehension; command of evidence; vocabulary in context</td>
</tr>
<tr>
<td></td>
<td>65 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Section 2: Writing and Language</td>
<td>44 questions</td>
<td>Multiple choice (select 1 of 4)</td>
<td>Command of evidence; vocabulary in context; standard English conventions; expression of ideas</td>
</tr>
<tr>
<td></td>
<td>35 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Section 3: Math (no calculator)</td>
<td>20 questions</td>
<td>15 Multiple choice (select 1 of 4); 5</td>
<td>The heart of algebra; problem solving and data analysis; passport to advanced math</td>
</tr>
<tr>
<td></td>
<td>25 minutes</td>
<td>free response (grid-in)</td>
<td></td>
</tr>
<tr>
<td>Section 4: Math (calculator allowed)</td>
<td>38 questions</td>
<td>30 Multiple choice (select 1 of 4); 8</td>
<td>The heart of algebra; problem solving and data analysis; passport to advanced math</td>
</tr>
<tr>
<td></td>
<td>55 minutes</td>
<td>free response (grid-in)</td>
<td></td>
</tr>
<tr>
<td>Section 5: Essay (optional)</td>
<td>1 question</td>
<td>Handwritten essay</td>
<td>Analysis of evidence and reasoning; standard English conventions; expression of ideas</td>
</tr>
<tr>
<td></td>
<td>50 minutes</td>
<td></td>
<td></td>
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</tbody>
</table>

Let’s take a quick look at each section in more detail, and at how these sections will contribute to your SAT score report.
About Each Section

The Reading test includes five passages, two of which contain graphs, charts or tables. Passages will range in length from 500 – 750 words on average and come from a variety of different sources:

- (1) One passage from a classic or contemporary work of U.S. or world literature
- (1) One passage or a pair of passages from either a U.S. founding document or a “great global conversation”
- (1) One passage from economics, psychology, sociology, or some other social science
- (2) Science passages that examine foundational concepts and developments in Earth science, biology, chemistry, or physics

All questions are presented as multiple choice, and students must answer questions based only on information that is provided in the passages. Students will be asked to analyze referenced lines within text and find support within the passage (“Command of Evidence”). Vocabulary will be tested through “Words in Context” and focus less on difficult and obscure vocabulary, but words that can have multiple meanings.

The Writing and Language test has students improve passages by reading, identifying mistakes and weaknesses and editing them. Students will only be able to use information provided in the question, and all questions are multiple choice. All passages will be original texts so errors will be “intentional” and there may be multiple paragraph passages so that students can leverage real-life editing tasks. There will be considerable focus on punctuation, such as transitions, semicolons, and colons, as well as relevance (e.g. do certain questions and sentences belong in context or is the passage better off without them)?

The Math test consists of two sections, calculator and non-calculator, and asks students to answer via multiple choice as well as grid-ins (coming up with an answer as opposed to selecting an answer). Questions focus on real world problems and leverage skills developed throughout middle and high school math courses. Fluency in algebra will be crucial to success as students are asked to solve equations, interpret formulas and create expressions. Geometry, trigonometry, volumes and surface area will also be tested as will quadratics, exponents and other non-linear equations.

You will need to bring your own calculator in order to use one on the second of the math sections.

The Essay is optional, but will provide students with a source document and ask them to analyze the author’s argument and support their position using evidence from the passage. Unlike the previous SAT essay, students will not be asked to agree or disagree with a topic or write from personal experience.
**Scoring**

Each section of the SAT is scored individually, and when you first look at your score report, it might be overwhelming to see so many numbers. In the end, the Total Score and Section Scores are the numbers that most students and school administrators tend to focus on. After all, those scores have over 100 years of history: pretty much anyone who has been to college knows what those scores mean (and likely remembers their score from high school).

Let’s break down what the numbers mean and which ones you should focus on.

**Total Score:** 400 – 1600

This score is the composite (or sum) of your scores on the Evidence-Based Reading and Writing and Math sections.

**Section Scores:** 200 – 800

These scores represent your performance on the two sub-sections, Evidence-Based Reading and Writing and Math.

**Test Scores (3):** 10 – 40

These scores will represent your abilities and performance on the reading, writing and language and math sections.

**Essay Scores (3):** 2 – 8

Reminder: The SAT essay is optional, but should you choose to complete it, you’ll receive three scores in reading, analysis and writing.

**Cross-Test Scores (2):** 10 – 40

These scores will represent your ability to analyze and solve questions posed in history/social studies and science. They’ll be based upon selected questions from the Reading, Writing and Language, and Math tests.

**Subscores (7):** 1 – 15

- Relevant Words In Context
- Command of Evidence
- Expression of Ideas
- Standard English Conventions
- Heart of Algebra
- Problem Solving and Data Analysis
- Passport to Advanced Math
Important Scoring Items:

- **There is no penalty for guessing on the SAT.** Prior versions of the SAT – those your parents, siblings, or cousins, may have taken – deducted fractional points for incorrect answers. Your SAT will not penalize you, so you are free to guess when you do not know the answer!

- **If you do not like your score, you can retake the test.** You choose which tests get reported to schools, so a bad test day will not hurt you!