THE GMAT MENTOR

QUANT & DATA INSIGHTS STUDY RESET

This Study Reset is designed to help you do two things: first, rethink how you prepare for GMAT Quant and Data Insights; second, experience the strategy-first approach used throughout *The GMAT Mentor*.

It includes Chapters 1–6: the opening study framework plus the first strategy chapter for Problem Solving, Data Insights, and Data Sufficiency. The full book continues through 27 chapters, building the pattern-based reasoning and decision-making skills needed for GMAT Quant and DI.

The Complete Quant and DI Roadmap

You Can Do This

You can succeed on the GMAT, no matter your innate ability. How? By working smart—and working hard.

I've personally taught over 1,000 GMAT students, and thousands more have used the study program I co-authored at Veritas Prep. Among the most successful were those who struggled the most to begin with. Some started with a shaky grasp on core math and logic concepts. Others were solid at math but were unable to translate that skill to the test and thought they were "bad" test-takers. Still others suffered from severe test anxiety.

But all these obstacles can be overcome. My students gained confidence and poise, learned the material, got the scores they wanted, and attended select MBA and other master's programs. Not all of my students, to be sure—but everyone who worked smart and worked hard reached their greatest potential on the test.

Working smart is on me. I've developed a unique program that builds all the GMAT skills from foundation to mastery, with a focus on developing strong habits and mental flexibility. With *The GMAT Mentor* program, you'll avoid the common pitfalls that sink many candidates' chances.

Working hard is on you. You must put in the hours to learn concepts and processes and repeat them until they come naturally. You must take your studying seriously if you want to see serious results.

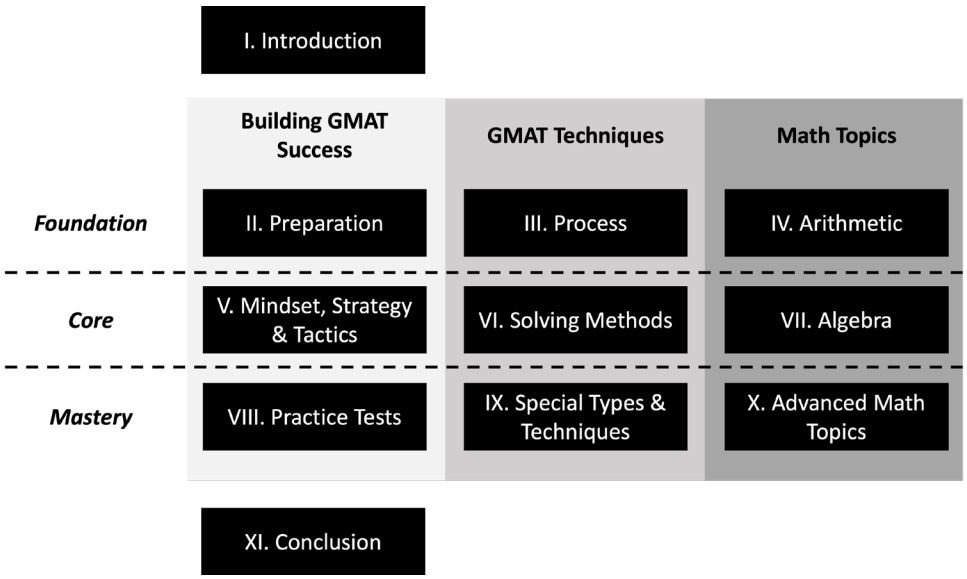
You'll also be learning a way to think about math and logic that is inherently valuable, that will serve you well in your business school classes and beyond. And just maybe you can have a little fun along the way, too.

If you do your part, I'll do mine. Let's dive in!

1

How *The GMAT Mentor* Is Structured

As shown below, this book is structured to be flexible and easy to use:



Aside from the Introduction and Conclusion, the book is divided into three main sections:

1. **Foundation:** The first third of the book is about understanding the key habits, processes, and mathematical properties you need to do well on the GMAT Quantitative (Quant) and Data Insights sections.

2. **Core:** The middle third of the book builds on the Foundation and goes in depth on mindset, strategy, and tactics; GMAT solving techniques; and algebraic and logical operations.

3. **Mastery:** The final third of the book applies the Foundation and Core lessons to test pacing and strategy, special problem types, and advanced topics, preparing you to reach your full potential on the GMAT.

Each chapter in this book, aside from the Introduction and Conclusion, falls under one of three themes:

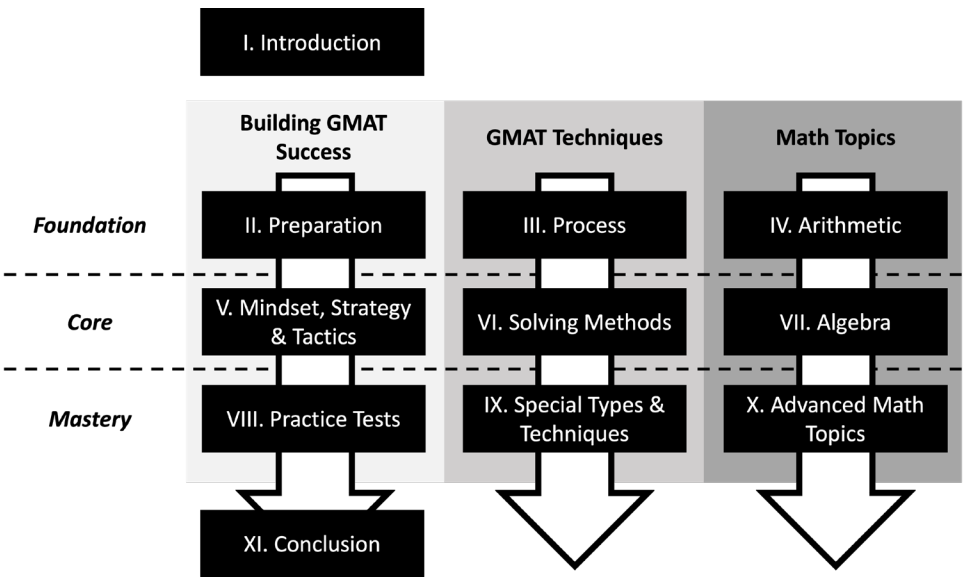
1. **Building GMAT Success:** Here you'll learn the key elements that all successful test-takers bring to the test, as well as specific pacing and guessing strategies. These chapters contain critical insights for your study program—not just in Quant and Data Insights, but across the whole GMAT.

2. **GMAT Techniques:** Here you'll learn the processes and methods you need to solve Quant and Data Insights problems using the test logic unique to the GMAT.

3. **Math Topics:** Here you'll learn all the math you need to know—exponents, statistics, probability, etc.—and how to apply it to the GMAT. These chapters include numerous drills to build your math "muscle memory."

If you need a full program of Quant and Data Insights prep, you'll go sequentially through the book from Foundation through Core to Mastery. That is, after the Introduction, you'll go *horizontally* in the diagram, completing Parts II–IV in Foundation, then Parts V–VII in Core, and then Parts VIII–X in Mastery before wrapping up with the Conclusion.

But if you need specific help in certain areas (or simply want to review), you can instead work *vertically* in one of the themes:



For example, if your math is strong but you struggle with how it applies to the GMAT, you can work through the GMAT Techniques chapters (found in Parts III, VI, and IX). See the black tabs at the edge of the right-hand pages? They reflect the diagram above and can be used to help with vertical navigation.

One other thing: depending on your current math knowledge (e.g., if you haven't actually used any math since Ms. Frumkin's high school algebra class), you may want to download the free Math Fundamentals Supplement from thegmatmentor.com and work through that first. To help you decide if you need the Supplement, I'll give you a diagnostic quiz in a moment.

2 Getting Started

As you get started, there are some things you need to get squared away. In this chapter, I'll first give you the basics on the current GMAT test. Then I'll give you a quiz to test your math fundamentals knowledge and discuss taking your first practice test. (If you're already familiar with the new test and what you need to improve, you can skip through these sections.) Finally, we'll discuss study planning and other resources that will be helpful to you in your studying.

Introduction to the Current GMAT

The Graduate Management Admissions Council (GMAC) introduced the GMAT Focus Edition in November 2023. Shortly thereafter, the older version of the GMAT (the "GMAT Classic") was phased out.

Like the GMAT Classic, the GMAT Focus Edition is taken on the computer. It consists of three separately timed sections, listed below:

Section	Question Types	What It Measures, According to GMAC	No. of Questions	Time	Onscreen Calculator?
Quantitative Reasoning	• Problem Solving	Your algebraic and arithmetic foundational knowledge and how you apply this knowledge to solve problems.	21	45 min.	
Data Insights	• Graphics Interpretation • Table Analysis • Two-Part Analysis • Multi-Source Reasoning • Data Sufficiency	Your ability to analyze and interpret data and apply it to real-world business scenarios.	20	45 min.	
Verbal Reasoning	• Critical Reasoning • Reading Comprehension	Your ability to read and comprehend written material and to reason and evaluate arguments.	23	45 min.	

You can take the three sections in *any order.* You may take one optional 10-minute break after either the first or second section. (You should always take the break!)

Calculator Use: *You get an onscreen calculator for the Data Insights section, but not for the Quant or Verbal sections. Using the calculator in Data Insights is sometimes helpful, but it can also be a distraction if overused.*

With 45 minutes to answer 20 to 23 questions (depending on the section), you have about 2 minutes per question. However, this is only an average. Some questions you'll be able to solve in as quickly as 30 seconds, while others may take 3–4 minutes. Every so often, you'll want to check the timer to make sure that you aren't falling off the pace. We'll get into more specific timing strategies later.

You must answer each question before proceeding, but you can bookmark questions you want to review. At the end of each section, you can review questions from the section (whether or not you bookmarked them) and change your answers on up to three of them. This ability to review questions and change answers is new to the GMAT Focus Edition (and very welcome!).

Because the GMAT is taken on the computer, it offers some benefits over traditional standardized tests:

- You can self-schedule the test for a time that works for you.
- You have the option to take it at home or at a test center.
- You get your score right away after you finish.

In addition, the test is *adaptive,* meaning that it adapts its questions to the test-taker. I'll go deeper into this aspect of the test in a moment.

Scores

As shown in the table below, the individual sections are scored from 60 to 90 in 1-point increments. Each section has an equal weight in calculating your Total GMAT Score, which ranges from 205 to 805 in 10-point increments.

Score	Scale	Increments
Quantitative Reasoning	60–90	1 point
Data Insights	60–90	1 point
Verbal Reasoning	60–90	1 point
Total	205–805	10 points

For example, if you scored 81 in Quant, 74 in Data Insights, and 79 in Verbal, your Total GMAT Score would be 565.

How Are the Scores Used?

The Total GMAT Score is the most important of the four scores. Schools weigh the Total GMAT Score most heavily in their admissions decisions, and it is the measure that various media use to evaluate and rank the competitiveness of MBA programs.

However, the other scores are still significant. For example, some schools, especially those with a more quantitative focus, want high enough Quant scores to be comfortable that you can handle the curriculum. And if any one score is too low, this may raise a red flag to the admissions committee.

GMAT Focus vs. GMAT Classic Scoring

The GMAT Classic was scored from 200–800 in 10-point increments, making it easy to match a score to its test version: any GMAT score that ends in a 0 is from the GMAT Classic; any GMAT score that ends in a 5 is from the GMAT Focus.

The two scores are *not* directly comparable. Generally speaking, you can add about 35–55 points to a GMAT Focus score to get the equivalent GMAT Classic score. (Full conversion tables are available at mba.com.) MBA admissions committees are fully aware of this discrepancy and will use the conversion tables to get an apples to apples comparison.

In the end, then, the difference in the two scores won't have any impact on your studying. But it's important to be aware of this difference so that you can properly compare scores between the two tests during the application process—for example, when comparing your score to the average scores of students admitted to particular MBA programs.

Adaptive Scoring: A Different Kind of Test

The GMAT is a computer-adaptive test (CAT). On each section, the test *adapts* its questions depending on how well you are answering them. Though the scoring algorithm is complex, broadly speaking this is how it works: As you answer questions correctly, the test raises its estimate of your score and gives you harder questions. As you answer questions incorrectly, the test lowers its estimate of your score and gives you easier questions.

Knowing that better performance on the GMAT leads to generally more difficult questions, test-takers sometimes freak out when they get easy questions on the test. However, in reality, the correlation between the score estimate and question difficulty level is far from perfect. You can answer a question correctly and see an easier question next, or answer a question incorrectly and see a harder question next. Besides, when a question seems easy, be suspicious! It may contain a trap to snare the unwary.

Similarly, the first few questions of a section won't necessarily be of moderate difficulty; they can sometimes be quite difficult. Don't be thrown if you struggle at the beginning of a section. Stick to your strategy and the question difficulty levels will work themselves out.

For more details on the CAT and how adaptive scoring works, see Chapter 19: The Arena (Practice Tests).

Stay Focused:
Don't think about question difficulty level or how well you're doing on the test. Such thoughts will only distract you from the task at hand.

Diagnostics

As you begin studying, you need to answer two questions:

1. **How much review of math fundamentals do you need?**

2. **What is taking the test actually like?**

To answer the first question, you'll take the following diagnostic quiz. To answer the second question, you'll take your first practice test (more on this after the quiz).

Math Fundamentals Diagnostic Quiz

All the math-focused chapters in the book thoroughly review math concepts before you apply them to GMAT problems. But because everything in math is interconnected, every math concept relies on other concepts, and if math was never your thing (or you've forgotten it all), you may need a refresher before you can begin.

Even if you're fairly comfortable with math concepts, I'd recommend taking the quiz to see if you have any gaps that can be addressed by the Math Fundamentals Supplement. The quiz itself also appears in the supplement.

Give yourself up to twenty minutes to take this diagnostic quiz. Don't use a calculator.

Numbers and Digits

1. In the set of numbers $\left\{-2, 0, \frac{3}{4}, \sqrt{2}, 7, 10.5\right\}$, how many are integers?

2. In the number 8,192.635, what is the value of the digit in the hundredths place?

Calculations

3. Calculate $13.7 - 35.6$

4. Calculate -3.2×-7

5. What is the quotient and remainder of $116 \div 9$?

6. Calculate $50.56 \div 0.8$

Arithmetic Shortcuts

7. Calculate 69×6 without doing any written work.

8. Find a rough estimate for 39.1×52.36 without doing any written work.

Fractions and Percents

9. Put $\frac{24}{27}$ in lowest terms.

10. What is 0.3% of 1400?

Expressions

11. What is 3^4?

12. Calculate $|3(2^2 - 5)|$

13. Calculate $\frac{3^2 - 1}{\sqrt{16}}$

14. Simplify $3x^2 + 2x^2 + 2x^2y$

15. Simplify $2x(y + 2z)$

Equations and Inequalities

16. If $2x - 2 = 4$, what is the value of $x^2 + 4x + 6$?

17. Isolate x in the following inequality: $-3x < 9$

18. If John is 3 years older than twice Mary's age, and John is 25 years old, how old is Mary?

19. If Ray has half as many books as Jose, and Jose has 3 times as many books as Gary, Ray has how many times the number of books as Gary?

20. What is the average of 9, 10, and 12?

Math Fundamentals Diagnostic Quiz Solutions

Numbers and Digits

1. In the set of numbers $\left\{-2, 0, \frac{3}{4}, \sqrt{2}, 7, 10.5\right\}$, how many are integers?

Integers are whole numbers (including zero) and negative whole numbers. The integers are –2, 0, and 7 $\Longrightarrow$ 3 integers

2. In the number 8,192.635, what is the value of the digit in the hundredths place?

The hundredths place is two to the right of the decimal point. Here, its value is $3 \times 0.01 \implies 0.03$ (or alternatively, $\frac{3}{100}$)

Calculations

3. Calculate 13.7 – 35.6

Here, you're subtracting a larger positive number from a smaller positive number. The result will be negative. To calculate, flip the numbers, line up the decimals, and perform the subtraction, borrowing as needed:

$$\begin{array}{r} {}^{4}\cancel{35.6}^{16} \\ -13.7 \\ \hline 21.9 \end{array}$$

Remember to make the result negative $\Longrightarrow$ –21.9

4. Calculate -3.2×-7

Since you're multiplying two negatives, the product will be positive. Set up the problem and multiply, carrying as needed:

$$\begin{array}{r} {}^{1} \\ -3.2 \\ \times -7 \\ \hline 224 \end{array}$$

Since there is one decimal place, move the decimal point over one place to $\Longrightarrow$ 22.4

5. What is the quotient and remainder of 116 ÷ 9?

Use long division to solve:

$$\begin{array}{r} 12 \\ 9\overline{)116} \\ -9 \\ \hline 26 \\ -18 \\ \hline 8 \end{array}$$

The quotient is $\Longrightarrow$ 12 with a remainder of 8

6. Calculate 50.56 ÷ 0.8

First, move the decimal point one place to the right in both numbers so that you're dividing by an integer: 505.6 ÷ 8

To calculate, perform the long division:

$$\begin{array}{r} 63.2 \\ 8\overline{)505.6} \\ -48 \\ \hline 25 \\ -24 \\ \hline 16 \\ -16 \\ \hline 0 \end{array}$$

The result is $\Longrightarrow$ 63.2

Arithmetic Shortcuts

7. Calculate 69 × 6 without doing any written work.

Since 69 is close to 70, calculate 70 × 6 = 420 and subtract one 6 → 420 – 6 $\Longrightarrow$ 414

8. Find a rough estimate for 39.1 × 52.36 without doing any written work.

Round 39.1 to 40 and round 52.36 to 50.

Then, 40 × 50 $\Longrightarrow$ 2,000

Fractions and Percents

9. Put $\frac{24}{27}$ in lowest terms.

3 divides evenly into both numerator (24 ÷ 3 = 8) and denominator (27 ÷ 3 = 9), so you can rewrite the fraction as $\Longrightarrow \frac{8}{9}$

10. What is 0.3% of 1400?

0.3% is equivalent to 0.003. Then multiply, carrying as needed:

$$\begin{array}{r} {}^{1} \\ 1400 \\ \times 0.003 \\ \hline 4200 \end{array}$$

Then, move the decimal point over three places to give you 4.200 or simply $\Longrightarrow$ 4.2

Math Fundamentals Diagnostic Quiz Solutions (continued)

Expressions

11. What is 3^4?

This is equal to $3 \times 3 \times 3 \times 3 \implies 81$

12. Calculate $|3(2^2 - 5)|$

First, convert 2^2 to 4, giving you: $|3(4 - 5)|$

Then, calculate within the parentheses: $|3(-1)|$

Multiply 3×-1 to get: $|-3|$

The absolute value makes the result positive $\implies 3$

13. Calculate $\frac{3^2 - 1}{\sqrt{16}}$

In the numerator, convert 3^2 to 9, then subtract 1: $\frac{8}{\sqrt{16}}$

In the denominator, take the square root of 16: $\frac{8}{4}$

Divide 8 by 4 $\implies 2$

14. Simplify $3x^2 + 2x^2 + 2x^2y$

Since $3x^2$ and $2x^2$ are like terms, they can be added: $3x^2 + 2x^2 = 5x^2$. But $5x^2$ and $2x^2y$ are not like terms and can't be added $\implies 5x^2 + 2x^2y$

15. Simplify $2x(y + 2z)$

Distribute the $2x$ to both terms in the parentheses: $2x \cdot y + 2x \cdot 2z \implies 2xy + 4xz$

Equations and Inequalities

16. If $2x - 2 = 4$, what is the value of $x^2 + 4x + 6$?

First, solve for x: $2x - 2 = 4 \rightarrow 2x = 6 \rightarrow x = 3$

Then, substitute 3 for x: $(3)^2 + 4(3) + 6 \rightarrow 9 + 12 + 6 \implies 27$

17. Isolate x in the following inequality: $-3x < 9$

Divide both sides by -3 and flip the inequality sign: $\frac{-3x}{-3} > \frac{9}{-3}$ $\implies x > -3$

18. If John is 3 years older than twice Mary's age, and John is 25 years old, how old is Mary?

Translate this as: $j = 2m + 3$ and $j = 25$. Then, substitute 25 for j: $25 = 2m + 3$

Subtract 3 from both sides: $22 = 2m$. Divide both sides by 2, resulting in $\implies m = 11$

19. If Ray has half as many books as Jose, and Jose has 3 times as many books as Gary, Ray has how many times the number of books as Gary?

Translate this as $r = \frac{1}{2}j$ and $j = 3g$. Then substitute $3g$ for j in the first equation: $r = \frac{1}{2}(3g) \rightarrow r = \frac{3}{2}g$ or $r = 1.5g$ $\implies \frac{3}{2}$ or 1.5 times

20. What is the average of 9, 10, and 12?

Calculate $\frac{\textit{sum of terms}}{\textit{number of terms}}$ to get: $\frac{9+10+12}{3} \implies \frac{31}{3}$ or $10\frac{1}{3}$

How Did You Do?

The sections of the diagnostic (Numbers and Digits, Calculations, Arithmetic Shortcuts, Fractions and Percents, Expressions, and Equations and Inequalities) correspond to sections of the Math Fundamentals Supplement (available for free download from thegmatmentor.com). Depending on how you did, you may need to review some or all sections of the supplement. If you need to review the supplement, make sure you do so before starting Chapter 4:

Number Incorrect	Recommendation
0	If you got every question correct, nicely done! You probably don't need to review the supplement.
1–3	Review the sections in which you missed questions.
4–6	Review the whole supplement. You can skim through sections in which you missed no questions.
7 or more	Review every section of the supplement in detail.

First Practice Test

If you haven't already taken a practice GMAT, you should take a free one from mba.com within the first week or two of studying.

You may not feel ready to take a practice test. That's okay—you still need to do it. Why?

- You need to get a sense of what the actual test is like, including the format and the timing. Since performance on the actual test is the goal, this will help you understand what it takes to improve.
- The practice test will reveal (at a high level) your areas of strength and weakness. This will help guide your studying and where to put your focus.
- The score you receive on your first test will act as a baseline from which you can measure your improvement.

Remember that the test takes about two and a half hours, so try to set aside enough time to complete it in one sitting. While you can pause the practice test if you need to, you should try to make your practice tests as realistic as possible (you can't pause the real test!).

Whatever score you receive, remember that it's no indication of your potential, only where you're at right now. Dramatic score improvements are very achievable—I've witnessed them firsthand with many, many students. By following the principles in *The GMAT Mentor*, you'll be able to reach that potential.

After you take the test, take note of any patterns in terms of areas to improve. As you study those concepts later in the program, make sure you thoroughly understand them so that you'd be able to answer these questions if you got them a second time.

After you take your first practice test, hold off on taking any more until you're further along in your studying. Then you can apply what you've learned.

Organizing for Success

All good study courses put lessons, drills, practice problems, and practice tests together to steadily improve your skills. But no one study course is right for everyone. Some students have limited time before they take the test. Others know that certain sections will give them particular trouble. And still others have already done significant studying and want to focus on certain areas.

That said, this book will reference two main types of programs: the **Full Program** and **Targeted Study**.

1. Full Program

Do the Full Program if you're new to the GMAT or still early in your preparation, or if you've previously tried a more "surface-level" study approach and now realize that you need a comprehensive approach (at least for the Quant and Data Insights sections).

On thegmatmentor.com, you can choose from a range of Full Program options that vary based on how much time you have to study. Each of these study courses goes through

The GMAT Mentor program and is supplemented by the *Official Guide* (published by the makers of the GMAT).

2. Targeted Study of Particular GMAT Topics

Alternatively, you can target your study if you need a refresher or a deep dive on specific Quant or Data Insights topics, or if you need to improve your question-solving processes and strategies.

You may already know which areas you want to focus on, but if you don't:

1. **Look for patterns:** From your practice problems / tests, note any patterns of questions you missed or struggled with—whether by question type, concept, or technique.

2. **Compare your list of patterns with the Table of Contents:** Match the patterns with chapters in the book.

3. **Make a study course:** Adapt one of the study courses from thegmatmentor.com to your needs.

Adjust as Needed

Whichever course you use, remember to be flexible. You can (and probably should) mix things up when needed. When one lesson is particularly difficult, spend extra time on it. When burnout is preventing you from absorbing the material, take a break. Remember that the goal is *learning the material,* not mindlessly doing practice problems. As you study, revisit your overall plan on occasion and make adjustments as circumstances change. But having the plan will give you something to aim for and naturally prime your brain for learning material on a regular basis.

Other Resources

Register Early: *Register for a test date sooner rather than later. Schedule slots fill up quickly, and having a test date will motivate you to put in the work.*

There are a number of physical and online resources to support you in your studying and test-taking, including:

- thegmatmentor.com**:** Source for downloadable study courses, information on upcoming releases, and other resources.

- mba.com**:** The testmaker's official website. You should sign up for a free account and explore, even if you're not yet ready to register for the test. (Don't wait too long—the schedule slots do fill up.) With your account, you have access to a starter kit and two free practice exams, with four more available for purchase.

- gmatclub.com**:** Discussion board for all things GMAT, with threads on many official practice problems.

- ***Official Guide*:** A book of official practice problems published by the testmaker, available from mba.com or online booksellers. While *The GMAT Mentor* contains a comprehensive review of every type of problem that appears on the Quant and Data Insights sections, you'll benefit from additional practice. With purchase of the *Official Guide*, you get a physical book or e-book as well as an online question bank. The questions are organized by type, making them good sources for practice sets. (My sample study courses reference the *Official Guide* for additional problems.)

- **Noteboard booklet:** A dry-erase, spiral-bound notepad with laminated sheets. If you plan to take your test in the testing center, you'll be provided with a noteboard booklet. It's important to take some practice tests with a booklet to get used to it, so you should purchase your own at some point (booklets are available from Amazon, for example).

- **Whiteboard:** If you plan to take your test remotely, you'll need to provide your own dry-erase whiteboard. It's good to take some practice tests with the whiteboard to get used to it, though you don't have to take *every* practice test with it. (If you're not sure whether you'll take the test remotely, you don't need to make this decision just yet.) Here are the official requirements:

  » 1 erasable whiteboard no larger than 12 inches x 20 inches (30 centimeters x 50 centimeters)

  » Up to 2 dry erase markers

  » 1 dry erase whiteboard eraser

Next Steps

I've just given you a lot of information, but don't worry—as you go through the book everything will become clear.

If you haven't done so already, perform the following key steps before moving on:

- Take the Math Fundamentals Diagnostic Quiz to identify areas for review.
- Go to thegmatmentor.com and decide on a study course (or adapt one to your needs).

That's it. Now, get ready to put in the work. Keep at it and you will succeed!

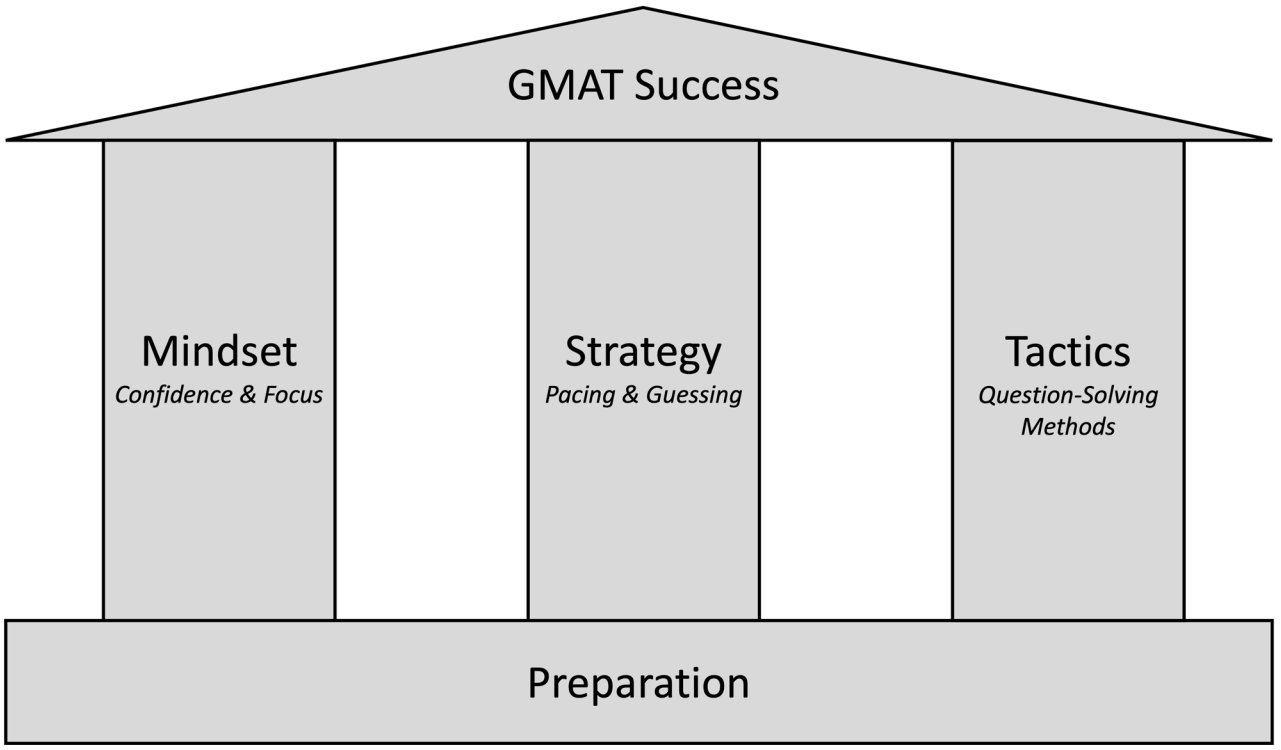
3

Preparation: The Base

In this chapter I'll introduce you to an overall framework for success that I'll continue to reference throughout *The GMAT Mentor* program.

Your goal is to get a great GMAT score—and achieving that goal is completely within your reach. But great scores reflect more than simply your natural ability. You must *prepare* by developing mental habits that will allow you to succeed.

As shown in the graphic, your **GMAT Success** rests on three broad components, or pillars: **Mindset**, **Strategy**, and **Tactics**. The three pillars in turn are built from a base of diligent **Preparation**.



Let's focus first on three principles for Preparation—the foundation that underpins your success:

- **The Test is Learnable**
- **Don't Just Check the Box**
- **Muscle Memory, not Memorization**

The Test is Learnable

To some degree, you must already believe that the test is learnable—otherwise you wouldn't have purchased this book. But there's a deeper layer to this theme. Sometimes people equate the GMAT and other standardized tests to an IQ test, a measurement of an immutable human characteristic. Nothing could be further from the truth (besides, even IQ tests are learnable).

Learn Success to Earn Success: *Success comes to those who put time and effort into studying the right way.*

Sure—some students, for whatever reason, have a higher starting point than others. Like most things in life, some people find the GMAT way of solving logical puzzles more natural than others do. But ultimately what matters is the finish, not the starting point. I've seen students progress from the low 400s to 700+ through hard work on their mental habits.

Take it from an athlete who represents perhaps the most stunning example ever of exceeding expectations: Tom Brady. Entering the 2000 NFL draft, Brady's first "test" was the NFL Combine, where players' physical attributes are measured. He recorded one of the slowest sprint times in combine history and was infamously scrawny. Most scouts had no interest in him, and the New England Patriots chose him with the 199th pick in the sixth round.

Brady never became particularly fast or strong. But he had an *immense willingness to learn and train*. The rest, of course, is history: with a record 7 NFL championships, practically every conceivable NFL passing record, and a slew of regular season and Super Bowl MVPs, Brady is now considered by many to be the greatest NFL quarterback of all time.

Don't be afraid to "fail" at the "GMAT Combine"—fear of feeling or looking stupid will hold back your growth. This is the exploration phase and the training phase—your opportunity to get absorbed in the learning. The competition phase will come in due time.

When you're studying, go easy on yourself. Laugh at your mistakes, don't be afraid to try out new techniques, and don't judge yourself against the standards of those who have already learned. You'll get there, with steady practice and patience with yourself.

Don't Just Check the Box

Students sometimes approach GMAT topics as they would a series of routine tasks, like doing the laundry or deleting spam. And because of the volume of material, it's tempting to rush through it all, get the answer (or at least *some* answer), and quickly move on. Doing so can provide a superficial sense of accomplishment and progress towards your goals.

However, while you must do the work, improving on the test isn't about finishing a certain number of problems. You need to focus on the *learning process*. And while the ultimate goal is a great score and acceptance to business school, in the moment, as you're building your knowledge, your goal is *understanding.* The testmakers are experts at creating tricky problems to expose those who lack a full understanding.

Did You Get It?: *Focus on understanding first, outcomes later.*

To gain understanding, it's critical for you to spend time reviewing problems. Whenever you complete a problem (or problem set), think about what gave you trouble, and ask yourself some questions. What are the patterns you notice in the problems you're missing? Are they careless errors, or did you not understand the concept? Why did the wrong answers tempt you? Did you fall into traps?

Take ownership of your studying, with the goal of a solid (if not complete) understanding of each topic. I've included in-depth problem explanations for a reason; really dig in and study them as needed until you understand. Reread the lessons, if necessary. Take note of problems that gave you trouble and return to them in a few weeks to test yourself. Do what you need to do to understand the test at a deep level.

Though repetition is important (as I'll soon discuss), make sure you avoid mindlessly chugging through problems. Put it this way: I'd rather you do half the problems and fully understand them vs. do all the problems and only half-understand them. (Best of all, of course, is gaining a full understanding of all problems.) The testmakers often put concepts together in unexpected ways, and a surface-level understanding isn't enough to tackle the moderate to difficult questions.

By keeping the focus on exploring, asking yourself questions, and learning, you'll feel the improvement—and ultimately *see* the improvement on Test Day.

Muscle Memory, not Memorization

When you tie your shoelaces, do you explicitly recall the steps involved and then follow them? Of course not—you just do it. And yet, tying your shoelaces involves multiple steps and complex hand and finger movements. Through multiple repetitions, the procedure has become second nature, even if you would struggle to accurately describe that process in words.

Similarly, on the GMAT, you'll want to focus on developing your "mental muscle memory" rather than on memorization. Yes, there are some math concepts you need to memorize, but, for the most part, these are just table stakes. It's your ability to apply these concepts using muscle memory—recognizing patterns, making quick but careful calculations, avoiding unwarranted assumptions, etc.—that will make the difference.

Skills > Facts:
While you must develop and practice skills, knowledge of facts is a secondary concern.

How do you form good habits? Not only do you need to learn concepts, you need to *practice* their application enough for them to begin to feel natural for you. It's not enough to simply have a concept explained to you. To make it stick in a way that it can be repeated on the test, you need to practice it until it becomes second nature. (Just make sure that your practice comes with understanding—i.e., Don't Just Check the Box.)

The GMAT Mentor contains numerous drills to develop your core math and reasoning skills into solid, reliable habits of mind. Likewise, the program provides the right mix of test questions to build a resilient solving process across all question types and potential traps. This is not to say that you can mindlessly plow through any problem because you've seen it all before. Rather, you'll have the confidence to know how, where, and in what way to focus your energy to solve the problem—and if your first method fails, you'll have the confidence and GMAT familiarity to tackle it another way.

Because the test mostly rewards good habits rather than memorization, cramming is not a particularly effective study strategy. Think of yourself as developing skills rather than knowledge. Skills take time and practice to reliably improve. Like muscle memory, GMAT memory is strengthened through repetition over time.

A Look Ahead: The Three Pillars

You must be strong in all three pillars (Mindset, Strategy, and Tactics) to achieve GMAT success. We'll go into depth on the pillars in Chapter 11, but I'll introduce them briefly now.

Mindset (Confidence & Focus): You must have the right mindset on test day to maximize your potential. I've seen too many brilliant students miss their full GMAT potential because of mindset issues, while seemingly less talented peers exceed what they thought were their limits. Key Mindset themes include:

- **Take Care of Yourself:** Like an athlete during the playoffs, take care of yourself and your mind so that you peak on test day. Get enough rest and exercise, and study when you're able to truly focus and absorb new information.

- **Don't Stress the Stress:** Test anxiety is perfectly normal and is a sign that you're taking your practice seriously. Allow it to energize you. Let go of thoughts about your level of stress, about question difficulty level, or about how well you're doing.

- **Stay Motivated:** Studying for the GMAT is an important part of achieving your dreams. Accept (and even try to enjoy) the learning process so that you can reach your full potential.

Strategy (Pacing & Guessing): Although you won't spend as much time prepping it, big-picture strategy (as opposed to question-specific tactics) is just as important to test day success. The test has a high level of time pressure, meaning that you will likely need to strategically guess at points throughout the test. Key Strategy themes include:

- **Learning First, Pacing Second:** Since good pacing is critical on Test Day, it's tempting to time yourself on practice questions immediately. But first you need to learn how to solve questions. Start slow and don't worry about speed until later in your studying (I'll let you know when).

- **Don't Be a Perfectionist:** The test is meant to challenge you at the limit of your ability. You'll most likely miss numerous problems; even if you start poorly or hit a bad streak, recovery is possible. Just get the problems right that you can, and don't overinvest on the ones you can't.

- **Proactive vs. Reactive Guessing:** Be ready to guess early on a few questions per section. You may need to guess on other questions, too, after giving them a try, but more proactive vs. reactive guessing will give you additional time back for later use.

Tactics (Question-Solving Methods): When you think of what being "good" at the GMAT entails, you probably picture a high level of question-solving ability. Efficiently and accurately working out the correct solution to a GMAT problem—using math, logic, and solving techniques—is, of course, absolutely critical. Most of your prep time, and most of this book, will be oriented to improving your question-solving ability. Key Tactics themes include:

- **Be Disciplined:** Stick to your question-solving processes, follow the rules of math and logic, and avoid assumptions.

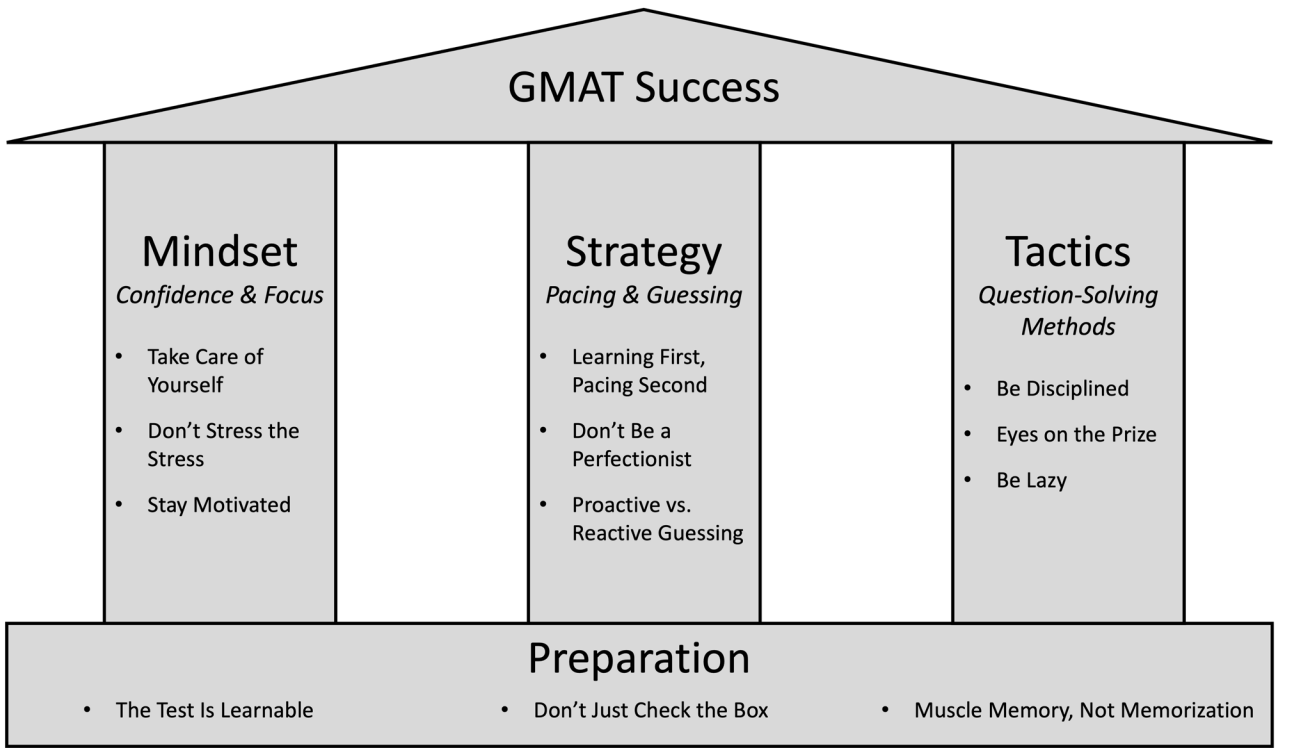
- **Eyes on the Prize:** Focus on the goal—getting the answer. There are often many ways to solve a question, and you can go whichever way seems doable for *you*.

- **Be Lazy:** Be flexible and follow the path of least resistance. Make things easy on yourself by avoiding rabbit holes and unnecessary calculations.

All three pillars are important. If any one of the three is shaky, a great GMAT score is highly unlikely. But don't worry—you're going to learn everything you ever wanted to know about developing the right Mindset, Strategy, and Tactics for GMAT mastery.

Building GMAT Success

I'll refer frequently back to the themes encapsulated in the GMAT Success graphic, and I encourage you to come back as needed and re-read the Building GMAT Success chapters (Chapters 3, 11, and 19). Some points that may seem abstract to you now will become much more concrete as you get into the thick of studying. I'll also expand on these themes as you take practice tests, troubleshoot, and prepare for your official exam.



4

Problem Solving 1: Four Steps

The Quant section is composed entirely of Problem Solving (PS) questions. You have 45 minutes to solve 21 PS questions, giving you a little over 2 minutes per question. Remember, though, that this is just an average. More importantly, I don't want you to worry too much about timing right now. Your focus at this stage should be on learning, not speed.

The PS question format will likely be familiar to you from previous tests: essentially it's a math problem with five multiple-choice answers. You don't get a calculator on PS questions. (Throughout the book, I'll remind you of this with a  icon.)

Remember, the GMAT is designed to test your higher-order thinking skills, not rote mathematical processes. Since you don't get a calculator for PS, you should try to *avoid tedious calculations* whenever possible.

I'll show you a four-step process for solving any PS question in a moment. First, though, let's just take a look at a couple of PS questions. Try to solve the following question before reading the solution below:

---

1. Of the following, which is least?

(A) $\frac{0.1}{4.9}$

(B) $\frac{0.1}{0.49}$

(C) $\frac{0.1}{0.049}$

(D) $\frac{0.1}{0.0049}$

(E) $\frac{0.1}{0.00049}$

---

1. In this question you need to compare the five fractions in the answer choices—which is the same as comparing the result of five division operations. Is the test expecting you to calculate all five results? To do so would be very tedious, so there must be a simpler way.

All five fractions have the same numerator (number on top), but the numbers in the denominator (bottom) vary. Using this observation, you can solve with *reasoning* as follows:

When all numbers are positive, if you divide something by a larger number the result gets smaller. For example, dividing 12 by 6 gives you a smaller result than if you divide 12 by 2.

In this problem, what choice divides 0.1 by the largest number? This happens in choice A, which has the largest denominator, 4.9. The other answer choices will all have a larger result than A will. Therefore, answer choice A must be correct.

Unlike questions on math tests you may have taken in high school or college, PS questions often have two (or more) ways to solve: an inefficient, calculation-heavy, "textbook-style" method, and one (or more) faster strategic method(s). Before you dive into a textbook approach for solving, it's worthwhile to understand how the problem is set up, including any information given in the prompt, as well as the answer choices. The answer choices are very deliberately designed, and you should see them as an integral part of the question itself. Frequently these strategic methods involve making use of the answer choices in a *process of elimination*.

---

2. Which of the following is equivalent to 93^3?

(A) 749,089
(B) 804,357
(C) 857,522
(D) 887,781
(E) 1,023,437

---

2. With a calculator, solving this question would be trivial. But you don't get one on the Quant section, so it's important to be strategic. You could, for example, multiply 93×93, and then multiply that result by 93 once more. This will give you the answer, but is it the best way to solve the problem?

You might note that choice C is the only choice that's an even number. But 93^3 involves multiplying three odd numbers together. An odd times an odd is *always* an odd, so there's no way your result will be even. You can eliminate choice C.

But you can go further than that. Because of the *units digit* principle (which I'll explain in depth in Chapter 7: Number Properties), the units digit of $93 \times 93 \times 93$ is the same as the units digit of $3 \times 3 \times 3$. Since $3 \times 3 \times 3 = 27$, the units digit of $93 \times 93 \times 93$ is 7; in other words, the answer ends in 7. You can eliminate choices A and D, since their units digits are 9 and 1, respectively.

Choices B and E both have a 7 in the units digit. How can you choose between them? You could estimate using *landmark values*. Note that 93 is close to but less than 100. And since it's a power of ten, 100^3 is easy to calculate: just add up the zeroes in $100 \times 100 \times 100 \rightarrow 1{,}000{,}000$. Since 93 is less than 100, 93^3 must be less than 1,000,000. You can eliminate choice E; choice B is the correct answer.

After a quick check to make sure you didn't miss anything, you can select B as your answer.

If these techniques and math principles seem like a lot to you right now, don't worry: I'll go over each of them in depth, and you'll have the opportunity to practice them until they're second nature. Once you're comfortable, you can deploy these techniques very quickly, saving yourself time that would be wasted by (for example) multiplying $93 \times 93 \times 93$. Think of it like learning to type: while, at first, it's slower than writing by hand, once you're comfortable, typing is a much quicker and easier method of expression.

Problem Solving Process

Now I'll introduce a more formal, four-step process for answering PS questions. Having a solid process is critical for success on the GMAT—it allows you to solve efficiently and avoid trap answers and wasted time.

1. UNDERSTAND the setup:

First make sure you thoroughly understand how the problem is set up. The *problem setup* includes both the *question prompt* and the *answer choices*. Read carefully, noting any restrictions (for example, whether certain variables must be positive or integers). If you can make any immediate deductions from the prompt, note them down. If you can restate the question into a simpler form, do so. Note what the answer choices look like. Think about what methods you could use to solve the problem.

2. SOLVE using a quick, feasible method:

Based on your understanding of the setup, begin to solve using a method that seems both reasonably fast and capable of solving the problem. Though you should always look for strategic, efficient solving methods, the method you choose doesn't have to be an amazing shortcut. As long as you see a method that is *reasonably fast*, better to get started than to get stuck in "analysis paralysis."

Your solving method will likely involve one, or some combination, of the following: reasoning, picking numbers, backsolving, using the answer choices, or straight math. I'll cover all of these methods in depth. If you don't see how to get started, you can always guess and move on, banking the time for later questions.

3. ADJUST solving method (as needed):

If your chosen method isn't working or turns out to be unreasonably tedious—or even if you just see a better way to do things—you should adjust your solving method. Expert test takers do this frequently, sometimes more than once for the same problem.

You should look for the path of least resistance and do your best to be flexible as you solve. Ultimately, your goal isn't to solve questions in some ideal way, but to get as high a score as possible. That usually requires the ability to change course as needed.

4. CONFIRM your answer:

Once you get an answer, it's important to confirm it before finalizing your selection onscreen. The time pressure of the test means that students sometimes skip over this step, but it's time well spent. For example, if the question asks for the value of $x + y$, the value of x and the value of y could both be trap answers, and it's too easy to rush and pick the wrong thing after your calculations are done.

Always look back at the question, making sure that you've answered the right question. Also, ensure that you carried your calculations all the way through, since another common mistake is neglecting the last math operation in the solution. Depending on your confidence level, you can also double-check your calculations from the beginning—though you won't have enough time to do this on all questions.

Now try using the process on the problem on the next page. Note that the solution references techniques I haven't yet covered, so don't be concerned if you find it hard.

Follow the Process:
Be intentional and consciously follow this process as you are starting out. Soon it will become second nature to you.

Always Confirm:
The worst way to get a question wrong is to spend a bunch of time on it, understand the math and the solution strategy, and then answer the wrong question. I'll remind you to confirm your answer throughout the book.

3.

$$\begin{array}{r} XY \\ +8Y \\ \hline XZZ \end{array}$$

In the correctly worked addition problem shown above, where the sum of the two-digit positive integers XY and $8Y$ is the three-digit integer XZZ, and X, Y, and Z are different digits, what is the units digit of the integer XY?

(A) 0
(B) 1
(C) 2
(D) 5
(E) 9

3. Follow the process:

(1) UNDERSTAND the setup:
Before trying to solve, note a couple of things. While the two numbers being added are both two-digit integers, the result is a three-digit integer. Each of the digits X, Y, and Z shows up twice in the addition problem.

The question asks for the units digit of the XY. Since the units digit is simply Y, you can *restate* the question as "What is Y?"

(2) SOLVE using a quick, feasible method:
There are several options to solve, but two that may come to mind are *algebra* (straight math) and *backsolving* (working backwards from the answer choices to the problem).

Backsolving can be tedious, since you might have to solve for multiple answer choices, so let's try the algebraic approach. You might try to create one equation for the rightmost or units column, $Y + Y = Z$, and another for the tens column, $X + 8 = Z$. However, while these equations might be true, they don't have to be, since X, Y, and Z represent digits rather than numbers. If Y is 5 or greater, for example, then $Y + Y$ will be 10 or greater—in this case you would need to write $Y + Y = 1Z$. Similarly, in the tens column, it's possible that $X + 8 = 1Z$. Solving algebraically seems very complicated.

(3) ADJUST solving method (as needed):
If your chosen method is giving you trouble, it's completely acceptable (and common) to switch it up. But even when a particular method doesn't work out, you can often use what you've learned by having tried it.

You may have noticed while trying the algebraic approach that there was no equation created for the hundreds column, because XY and $8Y$ don't have a hundreds digit. So then what kind of three-digit integer could result from adding two two-digit numbers together? Perhaps you can use a *reasoning* approach to deduce the answer.

Since even the largest two-digit numbers added together, 99 + 99, will only result in 198, the three-digit result must be in the 100s. Thus, X must be 1. Now the problem looks like:

$$\begin{array}{r} 1Y \\ +8Y \\ \hline 1ZZ \end{array}$$

Now you might notice something strange: the tens column adds only 1 + 8 together, yet the result has a hundreds digit of 1. This tells you that a 1 *must* be carried from the ones column to the tens column so that the tens column is $1 + 1 + 8 = 10$. Thus, Z must be 0. Now you have:

$$\begin{array}{r} {\scriptstyle 1} \\ 1Y \\ +8Y \\ \hline 100 \end{array}$$

If Z is 0 and you are carrying a 1 from the ones column to the tens column, then $Y + Y = 10$. Thus, Y must equal 5.

(4) CONFIRM your answer:
Since Y is 5, the answer is D. Before selecting your answer, however, it's always a good idea to confirm it. Here, it's easy enough to look again at the addition problem with all of the digits replaced: 1 for X, 5 for Y, and 0 for Z:

$$\begin{array}{r} {\scriptstyle 1} \\ 15 \\ +85 \\ \hline 100 \end{array}$$

This works out, so your reasoning is correct. Checking your calculations won't always be so easy, so it's sometimes a judgment call whether to double-check your math.

However, **what you should always do is make sure that you answered the right question**. Note here that all three of the unknown digits are represented in the answer choices: 5 as well as the trap answers 0 and 1. It's easy to make the mistake of answering for X or Z instead of Y. To confirm your answer, look back at the question, verify that you're solving for Y, and then make your selection.

In this problem, it's ideal if you can employ reasoning to solve right off the bat without wasting time trying the algebraic approach. As you learn and gain familiarity with the questions, you'll become more and more adept at choosing an effective method quickly. But remember that even the best test-takers won't always know the "best" solution method right away, so it's important to be flexible.

Note also that despite the lengthy problem explanation, the *thought process* of the advanced test taker is quick and efficient, while still being mathematically rigorous. The steps I outlined above could all be performed in 90 seconds or less, without cutting unnecessary corners. By *being methodical, but choosing the quick methods*, the advanced test taker does only the math that is necessary to quickly determine the correct answer.

What should you write down?

Throughout this book, I provide a lot of details in the problem solutions. This is to make sure that everyone understands each step, since different students will have trouble with different aspects of each problem. Should you do the same when you're actually calculating?

I generally recommend writing more rather than less. It may surprise you how much clearer problems (especially word problems) can be when you simply write out every step. However, your time is precious, and as you gain comfort with the format, it is okay to be somewhat less explicit in your calculations, as long as you are still *clear*:

- Keep your scratchwork organized and legible.
- Use a dot (e.g., $2 \cdot 3 = 6$) or parentheses (e.g., $2(3) = 6$) rather than $\times$ for multiplication, to avoid confusion with the variable x.
- Similarly, write variables so that they are clear:
  - » Put a curl at the bottom of t's to avoid confusion with +: t
  - » Write l's as a capital or in cursive to avoid confusion with the number 1: L or ℓ
  - » Put a dash through z's to avoid confusion with the number 2: $\bar{z}$

When in Doubt, Write it Out:
Err on the side of writing more rather than less.

Now let's look more closely at each of the four steps of the PS framework.

Spend Time to Save Time:
Often a little more time invested up front—including reading the problem two or three times as needed—will save you time later as you avoid assumptions and inefficient solving methods.

Step 1: UNDERSTAND the Setup

As discussed, before diving into solving, and definitely before doing any calculations, it's critical to understand the problem setup. You'll be well-served by spending some time up front ensuring that you understand each question. This involves *reading carefully*, particularly if the question prompt has convoluted language. **You should read the prompt twice or even three times if necessary.**

---

4. A subscription to a newspaper was purchased for w weeks with a discount of 60 percent off the regular weekly price of the newspaper. If the total value of the discount was equivalent to buying the newspaper at its regular weekly price for 24 weeks, what was the value of w?

(A) 18
(B) 20
(C) 32
(D) 40
(E) 60

---

4. This problem isn't mathematically complex but is still difficult for most who are new to the GMAT. Always read carefully—and literally. The prompt is *not* saying that the value of the discounted purchase is equal to 24 weeks at the regular price. Rather, *the discount itself* is worth 24 weeks of subscription. Notice that the word "equivalent" is mathematically synonymous with an equals sign (=).

Make sure to *write down the question* ("What is w?" or simply "w?") so that you'll keep your focus on what you're solving for. It's also worthwhile to glance at the answer choices, where you note that choices A and B are below 24, while C through E are above 24. It wouldn't make sense for a discount to be greater than the value of the purchase itself, so choices A and B can be eliminated.

Now you can solve. The straight math works well here, so let's translate to algebra and make our calculations:

$$\text{discount} = 24 \text{ weeks} \times \text{price}$$

The discount equals 60% of the regular price for w weeks:

$$60\% \times \text{price} \times w \text{ weeks} = 24 \text{ weeks} \times \text{price}$$

$0.6w = 24$ Divide out price.

$w = \frac{24}{0.6} = \frac{240}{6} = 40$ Solve for w.

Finally, let's confirm our answer. Does 40 make sense as an answer? This would mean that the subscription was purchased for 40 weeks. When the 60% discount was applied, the discount was equivalent to 24 weeks at the regular price. 24 is 60% of 40, so the answer checks out. Choice D is correct.

Alternately, you might use reasoning to note that if the value of the discount is worth 24 weeks, then 24 weeks is 60% of the total weeks purchased; i.e., $0.6w = 24$. Then, you could calculate as above.

Note that if you'd misread the setup and set the value of the discounted purchase equal to 24 weeks—i.e., $0.4w = 24$—you would have come up with $w = 60$, which is answer choice E. The testmaker is aware of common mistakes and often includes them as wrong answer choices.

Step 2: SOLVE Using a Quick, Feasible Method

How do you determine a "quick, feasible method" of solving a particular problem? Many, if not most, PS questions can be solved in more than one way. The most common methods of solving are:

- **Reasoning:** With a reasoning approach, you make logical deductions based on given information. If the problem tells you something is a fact, what else must be true based on that fact? Can you make an additional deduction from that deduction? Using reasoning, some problems can be solved very quickly, occasionally without any traditional math whatsoever.

- **Picking numbers:** When a problem contains a variable or unknown (or multiple variables / unknowns), you can often assign a number to represent this unknown and then make your calculations. This has the benefit of making an abstraction like a variable into something concrete and easier to work with.

- **Backsolving:** In this approach, you work the problem backwards, starting with an answer choice and working it through the problem. If everything works out (no contradiction is created), you've found the correct answer choice. In a way, this is like picking numbers, except instead of assigning a number of your own choosing for the unknown, you are using one of the options provided in the answer choices.

- **Using the answer choices:** Whether or not you backsolve, you can often leverage the answer choices to help you solve. For example, you can eliminate answer choices that don't make sense or that have the wrong units digit. If the answer choices are relatively far apart, you can also use estimation to eliminate answer choices.

- **Straight math:** A "textbook-math" style approach is an option on most PS questions. Even within straight math, there may be multiple possible approaches. You'll want to look for an approach that minimizes difficult calculations, whether through arithmetic shortcuts or algebraic manipulation.

Often the quickest way to solve will involve some combination of the above techniques. Despite your best efforts, you won't always start with the quickest way—but when you find that a particular method is unworkable, you can always change methods.

If you simply don't see how to solve, you have two options:

- **Try something** and see what you learn. Often this can spark an understanding of how to solve.

- **Guess** and move on. Most test-takers will need to guess on a few problems in each of the Quant and Data Insights sections, and it's best to guess before investing a lot of time in a problem you aren't going to get.

Assuming you don't guess, how do you decide which approach, or combination of approaches, to use? Let your understanding of the setup (prompt and answer choices) guide you. Does the prompt, for example, provide information from which you can make deductions? If the answer choices are numbers, are they far enough apart where estimation can be a useful strategy? If there are variables in the answer choices, is picking numbers a potential approach?

You've already briefly seen a few of these approaches, but I'll go over each of them in detail in Chapter 12: Problem Solving 2. For now, it's enough to know that they exist. While taking the test, on any given problem, you'll want to use the quickest feasible method *for you*. That said, you should get comfortable with all possible approaches, since, on many problems, a particular approach may be prohibitively time-consuming or impossible.

---

5. Two numbers differ by 4 and their sum is equal to x. Which of the following is the smaller of the numbers in terms of x?

(A) $\frac{x}{2} + 2$

(B) $\frac{x}{2}$

(C) $\frac{x}{2} - 1$

(D) $\frac{x}{2} - 2$

(E) $\frac{x}{2} - 4$

---

5. As always, let's first make sure to understand the setup. You have two numbers that put together equal x—though no variables are assigned to these two numbers—and you want the *smaller* of the two numbers in terms of x. The answer choices share one remarkable similarity—they all contain an $\frac{x}{2}$ term, which would represent the *average* of the two numbers.

There are a few possible ways to tackle this problem. Knowing that $\frac{x}{2}$ represents the average of the numbers, you could solve using reasoning. If the two numbers are separated by 4, one of them must be 2 higher than the average ($\frac{x}{2} + 2$) and the other must be 2 lower than the average ($\frac{x}{2} - 2$). The latter expression ($\frac{x}{2} - 2$) represents the smaller number and is the correct answer (choice D). This is an excellent example of how using reasoning can, on certain problems, make solving remarkably quick.

However, if this wasn't apparent to you, other potential approaches are still reasonably fast. You could also solve using straight math. In this method, you would turn the prompt into math using algebraic translation. Since no variables are assigned to the numbers, let's call the smaller number n and the larger number $n + 4$. Now let's build our equation and solve for n:

$n + (n + 4) = x$

$2n + 4 = x$ Combine like terms.

$n + 2 = \frac{x}{2}$ Divide both sides by 2.

$n = \frac{x}{2} - 2$ Subtract 2 from both sides.

Picking numbers also works well here, particularly if the algebraic approach proves troublesome. Here you could, for example, pick 2 and 6 as your two numbers. This would mean that $x = 8$. Since the question is asking for the smaller number, here you would plug 8 in for x in each of the answer choices and see what results in a value of 2:

(A) $\frac{8}{2} + 2 = 6$

(B) $\frac{8}{2} = 4$

(C) $\frac{8}{2} - 1 = 3$

(D) $\frac{8}{2} - 2 = 2$

(E) $\frac{8}{2} - 4 = 0$

The smaller number was 2, and since only choice D results in 2, it is the correct answer. (Sometimes picking numbers results in more than one answer choice "matching." This is a drawback of picking numbers that I'll cover how to handle in Chapter 12: Problem Solving 2.)

Step 3: ADJUST Solving Method (as Needed)

No matter your chosen solving method, sometimes it simply won't work as you'd hoped. You need to be light on your feet and willing to adjust your strategy.

This applies in multiple contexts. For example, on the previous problem, if you'd gotten stuck trying to solve algebraically, you could have shifted to a reasoning or picking numbers strategy. On that problem, each method is reasonable when followed correctly, but, on other problems, one particular method may be practically unworkable even for an expert test taker—and it may be impossible to know this before attempting it.

Keep in mind also that your strategic adjustment can be large (e.g., shifting from algebra to picking numbers) or small (e.g., making an estimate rather than a full calculation). Frequently your chosen method will only be a way to get started, and you won't know in advance all the steps to the right answer—you are instead probing for next steps as you work the problem. In all cases you will look for the quickest feasible method and adjust as needed to continue making progress.

Flex Mode:
Be flexible as you solve, and be prepared to change your solving method to take the path of least resistance.

---

6. The first number in a certain sequence is 3 and the second number in the sequence is 19. Each subsequent number in the sequence is 16 greater than the immediately previous number. What is the value of the 26th number in the sequence?

(A) 371
(B) 387
(C) 403
(D) 419
(E) 435

---

6. Ensure that you understand the setup. After the first number, the sequence increases by 16 each time. You need to find the 26^{th} number.

To find this number, you can keep going with the sequence by continuing to add 16's:

1^{st}	2^{nd}	3^{rd}	4^{th}	5^{th}	…
3	19	35	51	67	…

While you could do this all the way to the 26^{th} number, doing so isn't an efficient way of solving the problem. Can you adjust your solving method to be less tedious?

From the first number to the 26^{th} number, you're adding 16 a total of 25 times. Therefore, to find the 26^{th} number, multiply 16×25 and add the first number, 3.

Even with the arithmetic, however, try to find the best way to solve. Here, you could note that:

$$16 \times 25 = 8 \times 50 = 4 \times 100$$

Thus, the value of the 26^{th} number is:

$$3 + 4 \times 100 = 403$$

The correct answer is C. Confirm that you've answered the right question, and you are finished.

This problem is an example of the need to stay light on your feet. If you stuck with the original solving method of adding 16's, not only would you suck up a lot of time, but you'd also be much more likely to make a calculation mistake. Whenever a solving method seems impossibly tedious or difficult, be ready to make an adjustment.

Step 4: CONFIRM Your Answer

Once you finish the calculations on any particular problem, it's natural to want to click an answer as quickly as possible and move on. It's true that you shouldn't waste time, but you must also take care not to rush your exit. Make sure you've answered the right question, that your answer makes sense, and that you haven't fallen prey to any traps.

In a sense, this step is simply coming full circle to where you began: when you Understood the Setup. Here, you're making sure that, whatever path you took to get to the answer, it wasn't a path that led you astray. For example, you may have solved for x, while the question was asking for y. Don't leave easy points on the table! Only when you've confirmed your answer are you ready to move on.

7. Joe rented an electric bike from a boardwalk rental shop. The rent for the bike was \$18 for the first hour and \$6 for each additional half-hour. If Joe paid a total of \$60 to rent the bike, for how many hours did he rent it?

(A) 3
(B) 3½
(C) 4
(D) 4½
(E) 5

---

7. Looking at the setup, you see that the \$60 total consists of \$18 for the first hour and a number of \$6 half-hours for the remainder. Likely trap answers would be answers that use the same rate for the whole time, or answers that confuse hours for half-hours.

If Joe spent \$18 for the first hour, that leaves \$60 − \$18 = \$42 for the rest of the rental period. At \$6 per half-hour, the \$42 represents:

$\frac{\$42}{\$6} = 7$ half-hours

$7(\frac{1}{2}\text{ hour}) = \frac{7}{2}\text{ hours} = 3\frac{1}{2}\text{ hours}$

So the answer is B, right?

Nope! Hopefully you weren't fooled—looking back at the question, it's asking for the total number of hours the bike was rented, and that includes the first hour. Adding one hour to $3\frac{1}{2}$ hours results in $4\frac{1}{2}$ hours. The correct answer is D.

Though the math here is fairly simple, far too many test-takers miss this question by rushing the final step, failing to account for the initial hour, and selecting choice B. Make sure to confirm your answer—even if you're initially tempted by the wrong answer choice, you can often save yourself from disaster with a final confirmation.

Summary Problem

Let's now apply the PS framework to a more difficult problem.

8. What values of a have a corresponding value of b that satisfies both $ab < 0$ and $ab = a - b$?

(A) $a \geq 1$
(B) $0 \leq a < 1$
(C) $-1 \leq a < 0$
(D) $a < -1$
(E) All real numbers

---

8. Follow the process:

(1) UNDERSTAND the Setup:
In the prompt, you're given an equation and an inequality and told that you're looking for values of *a*. Which values? Any that give a value of *b* that makes it all "work out."

If *a* is positive, for example, *b must* be negative to satisfy the inequality, and if *a* is negative, *b must* be positive to satisfy the inequality. Glancing at the answer choices, you can see that the first four choices restrict *a* to a certain range on the number line and that choice E tells you that *any* value of *a* will work.

(2) SOLVE Using a Quick Feasible Method:
Noticing that the *ab* term is in both the inequality and the equation, you might do a quick substitution, yielding:

$$a - b < 0$$

What values of *a* give a value of *b* that satisfies the inequality? No matter how high a value you assign to *a* (say 1,000), there will be a value of *b* that satisfies the inequality (say 1,001):

$$1{,}000 - 1{,}001 < 0$$

Is the answer E then? This feels a little too easy—it may be a trap answer. Checking with the original equation $ab = a - b$ gives you:

$$(1{,}000)(1{,}001) = 1{,}000 - 1{,}001$$

Clearly this isn't true; the equation is a contradiction. There's more going on with this problem than first appears.

(3) ADJUST Solving Method (As Needed):
You need to try something else. What if you *pick numbers* for *a* to see what works? In effect, you tried that on the previous step when you chose 1,000 for *a*. But perhaps you can be smarter about it by *using the answer choices*. Let's first try $a = 1$ to align with choice A. If $a = 1$, then *b* must be negative to fit $ab < 0$. And if $a = 1$, then you can substitute 1 for *a*:

$$ab = a - b \rightarrow (1)b = (1) - b \rightarrow b = 1 - b$$

But since *b* is negative, on the right side you are *subtracting a negative*, which is the same as adding a positive. So this equation is telling you that a negative equals a positive, which is impossible. Eliminate choice A. Eliminate choice E too, since *not all* real numbers will work.

You could also have seen this by solving the equation for *b*:

$$b = 1 - b \rightarrow 2b = 1 \rightarrow b = \frac{1}{2}$$

You already determined that *b* must be negative, so $b = \frac{1}{2}$ creates a contradiction, eliminating choice A (and E).

Next, try $a = 0$ to align with choice B. But if $a = 0$, there is no value of *b* that satisfies $ab < 0$, since anything times zero is zero. You can eliminate choice B.

Then, try $a = -1$ to align with choice C. If $a = -1$, then *b* must be positive to fit $ab < 0$. And if $a = -1$, then you can substitute –1 for *a*:

$$ab = a - b \rightarrow (-1)b = (-1) - b \rightarrow -b = -1 - b$$

When you add *b* to both sides, you get:

$$0 = -1$$

This is another contradiction. You can eliminate choice C. Choice D, $a < -1$, is the only choice remaining and must be your answer.

(4) CONFIRM Your Answer:
It's always a good idea to look back to make sure you're answering the right question. Here, you want values of *a* with corresponding values of *b* that satisfy both $ab < 0$ and $ab = a - b$ (i.e., that don't cause a contradiction). You eliminated all the choices with values of *a* that didn't work, so you're answering the right question. However, you never tested one that did work. It's worth testing a value in $a < -1$ to confirm that Choice D is correct.

If $a = -2$, *b* must be positive to fit $ab < 0$. And if $a = -2$ then:

$$ab = a - b \rightarrow -2b = -2 - b \rightarrow -b = -2 \rightarrow b = 2$$

Since *b* must be positive, $b = 2$ fits $ab < 0$:

$$(-2)(2) < 0$$

There is no contradiction, so choice D must be correct.

This is a hard question, so don't be discouraged if it gave you trouble—you're just getting started. If you were able to solve, nice job!

Making Adjustments

The best way to solve a problem often isn't immediately apparent. This isn't something to worry about, because you can learn something about the problem even while using the "wrong" method. So, after making sure you understand the setup, make a judgment on how to solve and get started. In the last problem, the first solving method eliminated critical restrictions on the variables. However, it gave us the insight to use a *picking numbers* strategy on our next, more successful attempt. (And because we *maintained disciplined thinking*, we were able to avoid the trap answer.)

On some problems, the first solving method you attempt may be too difficult. It may involve convoluted calculations or leave you without a definitive answer. You want to *take the path of least resistance*, being flexible as you work through your solving methods. As you gain knowledge and develop your problem solving abilities, your instincts in choosing solving methods will improve. But even the best test takers will often switch course mid-stream—whether because they're forced to, or because they realize in the middle of a problem that there is a better way to solve.

How Did It Go?

How did this chapter feel to you? If it felt difficult, don't be too hard on yourself—remember that you're just beginning. If the math gave you a lot of trouble, you may want to check out (or revisit) the Math Fundamentals Supplement and review the relevant math concepts. Take comfort in the fact that no matter your ability level *right now*, you'll learn all you need to know by going through this program.

If this chapter felt easy, remember that the focus of these early chapters is not on the math, but rather on absorbing the problem-solving *process* so that you can seamlessly replicate it on test questions. All the math knowledge in the world won't help you if your process is sloppy or too rigid. I've taught brilliant math majors who struggled on the Quant section due to a poor process.

Fortunately, a good process is very learnable. Remember that you don't need to solve problems quickly at this stage. Yes, you should always try to find the most efficient ways to solve, but I don't want you to *rush*. Take your time to do things the right way, building good habits that will stick with you as you learn. You can then pick up speed as you approach GMAT mastery.

Chapter Answer Key

1. A
2. B
3. D
4. D
5. D
6. C
7. D
8. D

5 Data Insights 1: Five Steps

As its name suggests, the Data Insights (DI) section is all about interpreting, working with, and making inferences based on data. The DI section is the only part of the test that allows you to use an onscreen calculator. (Throughout the book, I'll remind you of this with a  icon.)

You'll see 20 DI questions in the 45 minute section, giving you an average of 2 minutes and 15 seconds per question—though you'll want to shoot for closer to 2 minutes per question to give yourself time to check any flagged questions at the end. As with Problem Solving (PS) questions, however, don't worry about timing just yet. Let's focus first on learning.

In contrast to the Quant section, which has only one question type (PS), the DI section has *five* different question types. And unlike the PS question type, the five question types won't be familiar to you from previous tests:

- Graphics Interpretation
- Table Analysis
- Two-Part Analysis
- Multi-Source Reasoning
- Data Sufficiency

The good news is that, while the problems may *look* quite different, the *solution process* for the first four of these types is fairly close to the process for PS. The fifth type, Data Sufficiency, is so unusual that I'll discuss it in a separate chapter following this one.

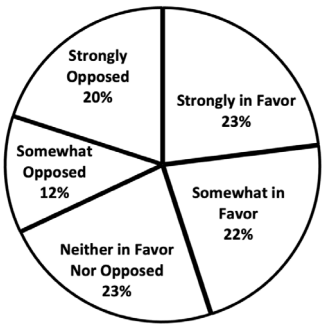
Graphics Interpretation

Graphics Interpretation (GI) problems are designed to test your understanding of data in visual form—charts, graphs, or diagrams. Each GI problem presents its graphical data and then asks two fill-in-the-blank sub-questions about that data. You can expect 3–4 GI problems on a DI section.

For example, take a look at the GI problem on the next page.

1.

SURVEY RESULTS



A poll of eligible Green County voters was conducted to ascertain voter attitudes toward Measure T. The results of the poll are displayed in the graph.

Based on the given information, use the drop-down menus to accurately complete the following statements.

The poll results indicate that ____ times as many poll respondents were somewhat in favor or strongly in favor of Measure T as were strongly opposed to Measure T.

(A) 1.10
(B) 2.00
(C) 2.25
(D) 2.50

If 184 poll respondents indicated that they were strongly in favor of Measure T, the total number of survey respondents was ____.

(A) 500
(B) 800
(C) 2,000
(D) 4,200

1. While this question looks more involved than a PS question, note that the setup still includes a prompt and multiple answer choices. But GI problems always have two sub-questions. Miss either one and your answer is incorrect.

The number of answer choices in the sub-questions is not fixed; you may see anywhere from 3 to 6 choices per question. In addition, on the actual computer test, the answer choices are not displayed until you click the drop-down menus.

Always click the drop-down menus before doing any work. Just like with PS questions, you can often solve GI questions more efficiently by using the answer choices.

Make sure you understand what the pie graph represents: a straightforward segmentation of five different answers to a survey.

Here, the first sub-question directs you to compare one value to another. Look back at the graph to gather the values. Totaling the "Strongly in Favor" and "Somewhat in Favor" results yields 23% + 22% = 45%. The figure for "Strongly Opposed" is 20%. It may be tempting to go to the calculator at this point, but, by looking at the answer choices, you can see that it's easy to solve quickly without a calculator.

45% is more than twice 20%, so you can eliminate choices A and B. But $2\frac{1}{2}$ times 20% would be 50%, so you can eliminate choice D. Choice C is correct. Confirm that you've answered the right question, and then move on.

The second sub-question can be approached in a similar fashion. If 184 respondents are strongly in favor, then they represent 23% of the total. So 184 represents slightly less than $\frac{1}{4}$ of the entire group of respondents. Looking at the answer choices, $\frac{1}{4}$ of 800 would be 200, which checks out (it's slightly more than 184). The other choices are way off—either way too small or way too big. Answer choice B, 800, must be correct. Confirm your answer once again, and you're finished.

Using the calculator on this problem isn't necessarily wrong, but it is more time-consuming and prone to error. When the answer choices are fairly well spread apart, you're usually better off estimating and eliminating.

Know Your Choices:
Always click the drop-down menus before doing any work.

Brain > Calculator:
Don't over-rely on your calculator in the Data Insights section. Sometimes you do need it, but other times you can estimate and use the answer choices to solve quickly.

Data Insights Process

The overall process for GI questions—and for all DI questions except for Data Sufficiency—is similar to the Problem Solving process, with one additional step:

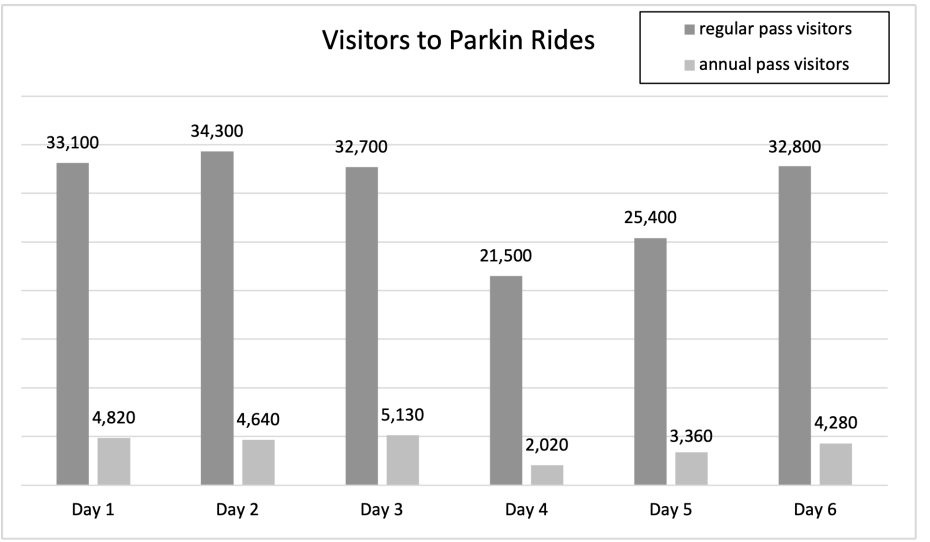
1. **UNDERSTAND the setup.**
2. **SOLVE using a quick, feasible method.**
3. **ADJUST solving method (as needed).**
4. **CONFIRM your answer.**
5. **REPEAT steps 1-4 (as needed).**

On the last problem, after going through the first four steps on the first sub-question, you *repeated* the first four steps on the second sub-question. For the second sub-question, you didn't need to re-read everything to understand the setup, but you did need to grasp the new information in the sub-question.

Most DI problems (aside from Data Sufficiency) will require repeating the process on two or three sub-questions. However, some DI problems require you to answer both sub-questions at once. (You'll see some examples in Chapter 13: Data Insights 2.)

Let's see the process in action with another GI question on the next page.

2.



Visitors to Parkin Rides, an amusement park, can enter either with a regular pass or an annual pass. The graph shows estimates of the number of visitors using either pass each day over a six-day period. Use the drop-down menus to create the most accurate statements based on the estimates provided.

The day with the greatest number of regular pass visitors per annual pass visitor was ____ .

(A) Day 1
(B) Day 2
(C) Day 3
(D) Day 4
(E) Day 5
(F) Day 6

The day with the greatest number of total visitors was ____ .

(A) Day 1
(B) Day 2
(C) Day 3
(D) Day 4
(E) Day 5
(F) Day 6

2. Follow the process:

(1) UNDERSTAND the setup:
Make sure you understand the description and the bar graph, reading twice or even three times, if necessary. In particular, note that each bar represents a distinct kind of visitor to the park. Since visitors can enter either with a regular pass or an annual pass, the two bars put together would represent the total visitors for any particular day.

The first sub-question asks you to find the day with the greatest number of regular pass visitors per annual pass visitor. In other words, you're looking for the day with the highest fraction (or ratio) of:

$$\frac{\textit{regular pass visitors}}{\textit{annual pass visitors}}$$

(2) SOLVE using a quick, feasible method:
It isn't immediately obvious which day has the highest fraction. One way to solve would be to calculate the value for each day, starting with Day 1:

$$\frac{\textit{regular pass visitors}}{\textit{annual pass visitors}} = \frac{33{,}100}{4{,}820}$$

But doing this 6 times would be tedious, even with a calculator. Let's look for a more efficient approach.

If you look at Day 1 vs. Day 2, you'll note that the number of regular pass visitors goes up (from 33,100 to 34,300) while the number of annual pass visitors goes down (from 4,820 to 4,640). You'll have a higher number on top (the numerator) and a lower number on bottom (the denominator): this must result in a higher fraction. Without calculating, you can eliminate choice A, Day 1.

Similarly, Day 3, as compared to Day 2, has a lower number on top and a higher number on bottom: this must result in a lower fraction. You can eliminate choice C, Day 3.

On Day 4, however, both numbers are lower. You'll need to adjust your solving method.

(solution continued on the next page)

(3) ADJUST solving method (as needed):
Let's try an estimation approach. For Day 4, since 21,500 is more than 10 times 2,020, $\frac{21,500}{2,020}$ must be greater than 10. But for Day 2, the previous leader, 34,300 is clearly *less than* 10 times 4,640. So you can eliminate choice B, Day 2.

Similarly, looking at Days 5 and 6, both fractions must be less than $\frac{10}{1}$, meaning that you can eliminate choices E and F. The correct answer is D, Day 4.

Note that, even if E or F did have a fraction over $\frac{10}{1}$, you would have saved yourself some time by only needing to calculate a couple of values rather than all 6.

(4) CONFIRM your answer:
As always, double-check that you answered the right question: yes, you're looking for the *highest* fraction of regular pass visitors to annual pass visitors. Quickly check as well whether your answer makes sense. Looking quickly at Days 1 and 3, you can confirm that the fractions for those days must also be less than $\frac{10}{1}$. Day 4 must have the highest fraction.

(5) REPEAT steps 1-4 (as needed):

(1) UNDERSTAND the setup:
The second sub-question asks for the day with the highest *total* number of visitors. In other words, you want to find the day with the highest sum of regular pass and annual pass visitors.

(2) SOLVE using a quick, feasible method:
Once again, you can solve more efficiently without a calculator here. By simply eyeballing the graph, it's clear that Days 4 and 5 don't have the highest total, so you can eliminate them.

The remaining days' totals are closer, but still far enough apart that you can use estimation rather than calculating exact numbers. Comparing Day 1 and Day 2, you note that Day 2's regular pass visitors are over 1,000 greater than Day 1's (34,300 vs. 33,100). Day 1 has more annual pass visitors, but only by about 200. Day 2 clearly has the higher total, so you can eliminate Day 1.

Similar logic can be applied comparing Day 2 to Day 3. Day 2 has over 1,000 more regular pass visitors and about 500 fewer annual pass visitors than Day 3, so Day 3 can be eliminated.

The final day, Day 6, has fewer regular pass visitors *and* regular pass visitors than Day 2, so Day 6 can also be eliminated. Day 2 has the highest number of total visitors; the answer to the second sub-question is B.

(3) ADJUST solving method (as needed):
No adjustments needed here, so you can go to the last step.

(4) CONFIRM your answer:
Again, double-check that you answered the right question and that your answer makes sense. Day 2 has the highest number of regular pass visitors by over 1,000; none of the other days have annual pass visitors that exceed Day 2's annual pass visitors by anything close to 1,000. Day 2 must be the correct answer.

The previous problem is a great example of a type of estimation that works very well on the DI section: *comparative math*. Rather than calculating exact amounts, or even estimating approximate amounts, comparative math seeks only to say whether one value is greater than another. You'll see additional examples later in the book.

As I did with the PS process, here I went into exhaustive detail on the DI process. I won't always do this going forward. Similarly, as you're getting started, it's helpful to go slow, be explicit with each step, and get used to how the process works. You must learn to walk before you learn to run, and, as with any learning process, it's important to get it right early.

Of course, ultimately speed is critical, since the time pressure on the test can be intense. But by focusing on getting the process right early, you'll develop good habits that will stick with you on test day. As you gain comfort with the questions, you can allow the process to become more of an unconscious habit, enabling you to move quickly through the test.

Compare, Don't Calculate:
When you only need to know whether one value is greater than another, use comparative math to cut down on calculations and save time.

Table Analysis

Like GI questions, Table Analysis (TA) questions provide you a set of data, but here the information comes in the form of a sortable table rather than a graph. You're then given three either/or sub-questions to answer on the basis of the information in the table. You can expect 2–3 TA questions on a DI section.

The solving process is similar to GI, but with three sub-questions per problem, you'll have to cycle through the process relatively quickly for each sub-question.

One key process *difference* is the ability to sort the table by each of its columns, which is similar to sorting tables in Microsoft Excel or Google Sheets. Often, smart use of the sorting capability can enable you to quickly find the information you need to solve.

---

3. *(Note: The table is shown initially sorted by its leftmost column, just like you'll see on the computer test. The other relevant column sortings are shown at the end of the problem.)*

Title	Revenue (millions)	Director(s)	Year
Avatar	$2,924	James Cameron	2009
Avatar: The Way of Water	$2,320	James Cameron	2022
Avengers: Endgame	$2,799	Joe and Anthony Russo	2019
Avengers: Infinity War	$2,052	Joe and Anthony Russo	2018
Jurassic World	$1,672	Colin Trevorrow	2015
Spider-Man: No Way Home	$1,922	Jon Watts	2021
Star Wars: The Force Awakens	$2,071	J.J. Abrams	2015
The Avengers	$1,521	Joss Whedon	2012
The Lion King	$1,663	Jon Favreau	2019
Titanic	$2,265	James Cameron	1997

The table shows a list of the top 10 highest-grossing movies of all time (by worldwide gross box-office revenue) as of July 2023, along with their respective directors and years of release.

For each of the following statements, select *Yes* if the statement is true based on the data provided. Otherwise select *No*.

The most recent movie listed also grossed the highest worldwide box office revenue.

(A) Yes (B) No

At least half the movies listed that were released in the 2010s grossed more than $2,000,000,000 in worldwide box office revenue.

(A) Yes (B) No

Most of the movies listed that grossed over $2,300,000,000 in worldwide box office revenue were released earlier than most of the movies listed that grossed under $1,700,000,000 in worldwide box office revenue.

(A) Yes (B) No

Table sorted by **Revenue***, ascending order:*

Title	Revenue (millions)	Director(s)	Year
The Avengers	$1,521	Joss Whedon	2012
The Lion King	$1,663	Jon Favreau	2019
Jurassic World	$1,672	Colin Trevorrow	2015
Spider-Man: No Way Home	$1,922	Jon Watts	2021
Avengers: Infinity War	$2,052	Joe and Anthony Russo	2018
Star Wars: The Force Awakens	$2,071	J.J. Abrams	2015
Titanic	$2,265	James Cameron	1997
Avatar: The Way of Water	$2,320	James Cameron	2022
Avengers: Endgame	$2,799	Joe and Anthony Russo	2019
Avatar	$2,924	James Cameron	2009

Table sorted by **Year***, ascending order:*

Title	Revenue (millions)	Director(s)	Year
Titanic	$2,265	James Cameron	1997
Avatar	$2,924	James Cameron	2009
The Avengers	$1,521	Joss Whedon	2012
Jurassic World	$1,672	Colin Trevorrow	2015
Star Wars: The Force Awakens	$2,071	J.J. Abrams	2015
Avengers: Infinity War	$2,052	Joe and Anthony Russo	2018
The Lion King	$1,663	Jon Favreau	2019
Avengers: Endgame	$2,799	Joe and Anthony Russo	2019
Spider-Man: No Way Home	$1,922	Jon Watts	2021
Avatar: The Way of Water	$2,320	James Cameron	2022

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3. Start by understanding the setup, and in particular the table, which provides data on the top 10 grossing movies. It's sorted by Title to start, but is also sortable by Revenue, Director(s), and Year.

The question instructions tell you simply to select *Yes* if the statement is true and *No* if it isn't. This is the most common set of question instructions.

For the first sub-question, you need to determine whether the most recent movie listed is also the highest-grossing movie. In other words, you need to cross-reference two columns (Year and Revenue). While you could accomplish this without sorting, doing so will be more time-consuming and prone to error.

You could start by sorting either by Year or by Revenue; in either case, sorting will "rank" the movies from lowest to highest in that category. If you sort by Year, you'll see that the most recent movie (at the bottom of the list) is *Avatar: The Way of Water*, released in 2022. Then when you sort by Revenue, you'll see that the highest-grossing movie (at the bottom of the list) is a different film: the original *Avatar*, released in 2009, with over $2.9 billion in revenue. The answer is B, *No*. Confirm that you've answered the right question, and select *No* as your answer.

In the second sub-question, again, you need to cross-reference the Revenue and Year columns. In this case, however, since you are trying to find a proportion *of the movies released in the 2010s*, you should definitely sort by Year. Doing so gives you a "chunk" of six movies in the middle of the list:

The Avengers	$1,521	Joss Whedon	2012
Jurassic World	$1,672	Colin Trevorrow	2015
Star Wars: The Force Awakens	$2,071	J.J. Abrams	2015
Avengers: Infinity War	$2,052	Joe and Anthony Russo	2018
The Lion King	$1,663	Jon Favreau	2019
Avengers: Endgame	$2,799	Joe and Anthony Russo	2019

Of these six movies, three of them grossed more than $2 billion. Since three is half of six, the answer is A, *Yes*, at least half grossed more than $2 billion. Confirm that you've answered the right question, and select *Yes* as your answer.

In the third sub-question, you must, yet again, cross-reference Revenue and Year, but note the tricky wording. Be careful as you go through the process. Here, since you're looking for *most* of the movies *that grossed over or under a certain dollar amount*, you should sort by Revenue. This gives you the "chunk" of movies that grossed over $2.3 billion:

Avatar: The Way of Water	$2,320	James Cameron	2022
Avengers: Endgame	$2,799	Joe and Anthony Russo	2019
Avatar	$2,924	James Cameron	2009

It also gives you the "chunk" of movies that grossed under $1.7 billion:

The Avengers	$1,521	Joss Whedon	2012
The Lion King	$1,663	Jon Favreau	2019
Jurassic World	$1,672	Colin Trevorrow	2015

Each chunk has three movies, so *most* refers to two movies in each chunk. By 2015, two movies in the under-$1.7 billion chunk had been released—thus *most* of the under-$1.7 billion movies had been released. But in 2015, only one of the over-$2.3 billion movies had been released—so *most* of the over-$2.3 billion movies had *not* been released. The answer to the third sub-question is B, *No*. Confirm that you've answered the right question, and select your answer.

Note that sorting by Director(s) wouldn't be useful for any of the sub-questions. But sorting by Revenue and by Year was critical. Always look to sort when it makes sense.

In the first sub-question you sorted in order to "rank", and in the second and third sub-questions you sorted in order to "chunk". Sorting to rank tends to be fairly intuitive. Sorting to chunk takes more practice, but will allow you to solve more difficult questions.

Chunk it Up:
Sorting tables will often allow you to organize the data into easy-to-manage "chunks." You can then scan quickly for the info you need.

Only Sort When It's Helpful

While sorting is a go-to strategy on many TA questions, the caveat is that there are also many questions where it will not help. On such questions, there are no rankings or "chunks" that can help you solve, so there's no reason to change the table by sorting. Instead, you should simply reference the table for information "as-is."

Often, what makes such problems difficult is something you'll see a lot in DI: the need to manipulate the data so that it matches what the question is asking. The problem below illustrates this well.

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4. A clothing retailer with multiple locations tracks its sales for each month. The table shows, for each of the first six months of 2023, the number of locations that had greater sales (by dollar amount) in that month as compared to the previous month, the average increase in sales per location, and similar data for decreases in sales.

Month	Locations with higher sales	Average monthly sales increase	Locations with lower sales	Average monthly sales decrease
January	10	$6,890.03	17	$8,546.12
February	11	$7,442.83	16	$7,158.48
March	13	$7,564.31	14	$7,856.29
April	12	$8,914.45	15	$8,936.15
May	9	$7,562.04	18	$9,465.89
June	14	$9,078.41	13	$9,005.61

Based on the above information, for each of the following months, select *Increased from March* if the total value of sales from all locations was greater than it was in March. Otherwise, select *Did not increase from March*.

April

(A) Increased from March (B) Did not increase from March

May

(A) Increased from March (B) Did not increase from March

June

(A) Increased from March (B) Did not increase from March

---

4. Make sure you read carefully and understand the table. Note that the question asks only about the months from March onward; the data given for January and February is irrelevant.

The first sub-question asks you whether total sales increased from March to April. Note that the table gives you only increases and decreases, with nothing about the actual amounts of sales (in fact, there's no way to calculate actual amounts). Thus, you don't need the data from March either. Furthermore, sorting the table won't help you organize the information into useful chunks. The "April" row by itself will tell you all you need to know.

For the 12 locations that had higher sales in April vs. March, you can find the total sales increase by multiplying 12 by the average increase of $8,914.45. Similarly, for the 15 locations that had lower sales, you can find the total sales decrease by multiplying 15 by the average decrease of $8,936.15. So the total change in sales from March to April is:

12($8,914.45) – 15($8,936.15)

You could use the calculator to solve, but this isn't necessary. Since *more* locations decreased than increased, and the average decrease was *greater* than the average increase, the total decrease must be greater than the total increase. Overall, sales must have gone down in April; the answer to the first sub-question is B, *Did not increase from March*. Confirm your answer, and move to the second sub-question.

You can use similar reasoning when you look at May. The total change in sales from April to May is:

9($7,562.04) – 18($9,465.89)

Again, since *more* locations decreased than increased, and the average decrease was *greater* than the average increase (significantly greater in this case), sales must have gone down from April to May. And since you have two decreases in a row (from March to April and from April to May), sales must be down since March. The answer to the second sub-question is B, *Did not increase from March*. Confirm your answer, and move to the third sub-question.

Go through the process one more time with June. The total change in sales from May to June is:

14($9,078.41) – 13($9,005.61)

In this case, *more* locations increased than decreased, and the average increase was *greater* than the average decrease. So sales must have increased from May to June. But have sales increased since March? Let's see if we can answer this without resorting to the calculator, which, in this case, would be tedious and time-consuming.

One way to do this is to compare the increase in June with the decrease you found in May. In May, 9 more locations decreased vs. increased (18 vs. 9), a significant disparity, while in June, only 1 more location increased vs. decreased (14 vs.13). In May, the average decrease was ~$1,800 more than the average increase ($9,465.89 vs. $7,562.04), while in June, the average increase was only ~$70 more than the average decrease ($9,078.41 vs. $9,005.61).

Thus, the overall decrease in May was *much greater* than the overall increase in June. Despite the uptick in June, from March to June, sales have decreased. The answer to the third sub-question is once again B, *Did not increase from March*. Confirm your answer before moving on. The trap here is to forget what you're solving for and, because of the increase in June, select *Increased from March*.

This problem shows that sometimes there is no reason to sort in Table Analysis; in fact, sorting the table here would only lead to confusion.

It's also a good example of how crucial it is on DI questions to properly interpret data and match it to what's being asked. Often the data provided will not fit what you expect. While you'd likely expect a table like this to show sales *amounts*, instead it shows only *increases* from the previous month. Once you're clear on that, you must then match it to the sub-questions by estimating the *cumulative* increase / decrease. It's very common to miss DI questions due to misinterpretation (as opposed to miscalculation). We'll do a deeper dive on interpreting and matching data in Chapter 13: Data Insights 2.

Interpret & Match:
It's critical to correctly interpret data and match it to the question.

Two-Part Analysis

No Math = Logic: *Use logical reasoning, not prior knowledge, to solve non-math based Data Insights questions.*

Two-Part Analysis (TPA) questions give you a prompt and then ask you to consider two sub-questions based on that prompt. The two sub-questions each have the same five or six answer choices, and occasionally the same answer will be correct for both sub-questions. You can expect 4–5 TPA questions on a DI section.

Though most DI questions reference mathematical concepts, others don't. Instead, they're based purely on logic. (This is true whether the subject matter relates to business, the sciences, or the humanities.) In particular, TPA questions are often logic-based rather than math-based. Sometimes they may even appear closer to Verbal question types (Critical Reasoning or Reading Comprehension) than they do to Problem Solving questions. For example, take a look at the following TPA question:

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5. Classics Professor A: Two monumental figures in ancient Western literature are the poets Homer and Virgil. Homer's epics, the "Iliad" and the "Odyssey," portray the heroes and gods of ancient Greece in a grand and morally complex world. Virgil's epic, the "Aeneid," blends elements of Roman political ideology with themes of heroism and destiny. Some modern readers prefer Homer's works, citing his vivid characters and insights on the human condition.

Classics Professor B: The "Aeneid" cannot be objectively evaluated without considering the context in which it was written. Virgil wrote the "Aeneid" with an overtly propagandistic and nation-building purpose, a purpose that is fulfilled as the hero Aeneas escapes the burning Troy and embarks on a journey to found Rome.

Based on the commentary above, in the first column of the table, select the statement that Classics Professor B would most likely agree with. In the second column of the table, select the statement that Classics Professor B would most likely disagree with. Make only two selections, one in each column.

Agrees	Disagrees	
(A)	(A)	Virgil's epic, the "Aeneid," is superior to Homer's epics, the "Iliad" and the "Odyssey."
(B)	(B)	The purpose of Homer's poetry is not to nation-build.
(C)	(C)	In the "Aeneid," the journey to found Rome contributes to fulfilling Virgil's purpose.
(D)	(D)	Moral complexity is part of the appeal of Homer's works for modern readers.
(E)	(E)	An objective evaluation of an epic poem should be based only on its intrinsic qualities.

---

5. This question has no quantitative component—it is logic-based. You're asked to infer what Classics Professor B would agree or disagree with. While this may sound "softer" or more debatable than a math-based question, make no mistake: the logic must be airtight.

As with inference questions in the Verbal section, in the DI section you can only make inferences that *must be true* (or are *necessarily true*). Yes, the question uses the phrases "*most likely* agree" and "*most likely* disagree," but, in fact, there will be only one answer choice that Professor B *must* agree with and one answer choice that Professor B *must* disagree with.

Since the question asks only about Professor B, focus most of your attention on her. Professor A's commentary contains useful context, but it won't give you the data you need. In general, on DI questions (as opposed to Problem Solving), there will often be extraneous data provided, and it's your job to focus on what you need to answer the question.

Professor A compares the poets Homer and Virgil, and then notes that some modern readers prefer Homer. Professor B raises a counterpoint, saying that Virgil must be understood in the context of his nation-building purpose.

Let's look at the answers for the "Agree" column. Choice A seems to be in the vein of Professor B's emphasis on Virgil. However, it goes too far. Nowhere does Professor B actually say that she believes Virgil's poetry is superior to Homer's. It *could* be true, but isn't *necessarily true*.

Similarly for choice B, while Professor B discusses Virgil's nation-building purpose, she doesn't say that Homer did *not* have a nation-building purpose. Again, while she *might* agree with this, it doesn't fit the *must be true* standard.

Choice C is very close to what Professor B actually says: that Virgil wrote the "Aeneid" with an explicit nation-building purpose, and that purpose is fulfilled as Aeneas journeys to found Rome. If what Professor B says is true, it would be completely contradictory to argue that the journey to found Rome *did not* contribute to fulfilling Aeneas's purpose. She *must* agree with choice C.

You might object that choice C says little that Professor B hasn't already said. But on an inference question, this is a *good* thing. If a statement stays close to the facts you're given, it's naturally more likely to fit the "must be true" standard.

Confirm your answer by checking the other two answer choices. Choice D is also close to what is stated in the commentary—however, it's Professor A who discusses why modern readers might enjoy Homer. Professor B *might* agree with him—but you just don't know.

Choice E references objective evaluation of epic poetry—something that Professor B definitely discusses. Professor B says that such an evaluation must take the context in which it was written into account. Virgil's nation-building purpose in writing the Aeneid is thus an example of such context. But this context is *not* intrinsic. So choice E doesn't fit the bill for something Professor B must agree with.

In fact, Professor B must *disagree* with choice E, because she believes that factors *other* than intrinsic qualities (like context) must be taken into account for an objective evaluation. Choice E is correct for the second column.

To confirm, glance again at choices A, B, and D. You knocked each answer choice out of contention for the first column because she wouldn't *necessarily agree*. But Professor B *might* or *could* agree with each of them, which is the same as saying that she wouldn't *necessarily disagree*, either. You only know for sure that she agrees with choice C and disagrees with choice E, and that is enough.

Must Be True:
On the GMAT, any inferences you make must be true.

Focus on Your Needs:
Use the question to target your attention on the pieces of data that can give you answers.

Two Problem Solving Questions in One

You can expect to see at least one "Verbal-style" TPA question (like the previous question) per DI section. Often, however, TPA problems are nothing more than two PS questions in one, as in the following example. Solve such questions just like you would solve regular PS questions.

---

6. A car traveled 240 miles, rounded to the nearest 10 miles. The driving time for the trip was 4 hours, rounded to the nearest hour. Given these estimates, the average speed of the car was between __*m*__ and __*n*__ miles per hour, inclusive, where *n* is greater than *m*.

Select for *m* and *n* the values that complete the statement such that all possible average speeds for the trip are included and the difference between *m* and *n* is minimal. Make only two selections, one in each column.

m	***n***	
(A)	(A)	49
(B)	(B)	52
(C)	(C)	54
(D)	(D)	68
(E)	(E)	70

---

6. First, understand the setup. Note that the trip data has been rounded. You're asked to find the range of possible average speeds for the trip. In other words, you're looking for a value *m* that is the lower bound of that range and a value *n* that is the upper bound of that range.

To calculate these values, you need to find the ranges for the distance and time of the trip. Remember rounding rules? If the distance rounded to the nearest 10 miles is 240 miles, the actual distance could be anywhere from 235 miles to just under 245 miles. If the time rounded to the nearest hour is 4 hours, the actual time could be anywhere from $3\frac{1}{2}$ hours to just under $4\frac{1}{2}$ hours.

Note that $speed = \frac{distance}{time}$ (or just $\frac{miles}{hour}$).

Thus, to find the lower bound *m* you'll want to use the minimum possible distance and the maximum possible time. The minimum distance is 235 miles and the maximum time is just under $4\frac{1}{2}$ hours (or 4.5 hours). How should you represent "just under 4.5 hours"? You could use a value like 4.49999, but for the purpose of your calculations here, 4.5 is good enough. Since the answer choices are fairly close together, it's probably easiest to use the calculator here:

$$\frac{235\ miles}{4.5\ hours} \approx 52.22\frac{miles}{hour}$$

This is closest to choice B, 52. Make sure to confirm your answer by rechecking the question. Choice B includes the lowest possible speed (about 52.22 miles per hour), but so does choice A, 48. However, choice B helps *minimize* the difference between *m* and *n*, so it is correct.

To find the upper bound *n*, you'll use the maximum possible distance and the minimum possible time—just under 245 miles and $3\frac{1}{2}$ hours (or 3.5 hours). Then calculate:

$$\frac{245\ miles}{3.5\ hours} = 70\frac{miles}{hour}$$

This matches choice E exactly. Since the average speed of the car is between *m* and *n* "inclusive," if *n* is 70, then 70 is included. Choice E is correct for the second column. Confirm that you've answered the right question, and make your selection.

Note that, although the two parts of this question are related, it operates essentially as two PS questions in one. Usually this is the case, though TPA problems often have longer prompts with more information than PS questions. There are also some TPA problems where you need to answer both sub-questions at once; we'll look at some examples in Chapter 13: Data Insights 2.

Multi-Source Reasoning

Of all the question types on the GMAT, Multi-Source Reasoning (MSR) most closely approximates what you'll do during case studies in business school. You're given a bunch of information, some of which won't be particularly relevant, and must piece together the information to answer the questions asked.

The information is given to you in the form of two or three clickable tabs, each of which may contain tables, charts, and/or narratives. Similar to Reading Comprehension in the Verbal section, multiple questions accompany each set of tabs in MSR. On the actual test, you can expect one set of tabs with exactly three questions (that number varies from two to five questions on the official practice question sets).

The questions come in two formats: five answer choices (similar to Problem Solving) or three either/or sub-questions (similar to Table Analysis).

It's a good idea to read everything, taking brief notes as needed, before you answer the first question. Information may be buried in one of the tabs that will affect your answer. Naturally, this means that you will spend a disproportionately long time on the first question. This is fine—if you've read properly, you can make up that time on the following questions.

When you get to the questions, use your understanding of the tabs to locate the relevant data for each question. Sometimes you'll need to bring together data from multiple tabs to solve.

Otherwise, the overall solving process is similar to the process you've seen already for PS and other DI questions. Remember to *adjust your method* as needed and *confirm your answer* before selecting it. Try it in practice with the following set of tabs and two questions that accompany it:

Shift Gears:
When you see a set of tabs for Multi-Source Reasoning, get ready to absorb a lot of information. Read for key points / insights and take notes as needed.

HR Professional | Researcher | Firms

Job candidates in competitive fields strongly consider benefits other than salary before accepting a job offer. Management consulting as a career is challenging and rewarding as well as competitive. Large management consulting firms are able to offer employees many tangible benefits that smaller firms can't match, but the unique positives of working for a smaller firm shouldn't be overlooked.

HR Professional | Researcher | Firms

My research shows that management consulting firms that offer relatively greater health benefits, travel opportunities, or skill development are more likely to be large firms (firms with over $1 billion in annual revenue). However, firms that offer relatively greater promotion opportunities or responsibilities upon starting are less likely to be large firms, while firms that offer relatively greater work-life balance are neither more nor less likely to be large firms.

HR Professional | Researcher | Firms

100 management consulting firms were examined by the researcher. Each firm was given a rating of 1-10 in each of six categories. Higher numbers represent relatively greater health benefits, promotion opportunities, travel opportunities, work-life balance, skill development, and responsibilities upon starting. Of the 100 firms, five were randomly selected for the table below.

Firm	Health benefits	Promotion opportunities	Travel opportunities	Work-life balance	Skill development	Responsibilities upon starting
V	8	2	4	6	9	5
W	6	6	2	2	5	4
X	9	3	8	4	10	2
Y	3	4	5	8	5	8
Z	7	8	9	2	6	10

7. For each of the following statements, select *Yes* if it is strongly supported by the given information. Otherwise, select *No*.

Of the five firms listed, the same firm offers both the greatest promotion opportunities and the greatest responsibilities upon starting.

(A) Yes (B) No

Job candidates in non-competitive fields do not consider perks and benefits other than salary before accepting a job offer.

(A) Yes (B) No

The researcher considered factors that are correlated with the size of management consulting firms.

(A) Yes (B) No

8. Assume that each category rated by the researcher has an equal impact on the probability that a firm is a large firm. Of the five firms, ____ is most likely to be a large firm.

(A) V
(B) W
(C) X
(D) Y
(E) Z

7. The first tab, "HR Professional," provides context for the situation in the form of someone knowledgeable about non-salary job benefits for management consulting firms.

In the second tab, "Researcher," the researcher summarizes her research on six benefits associated with large vs. small management consulting firms. For some of the benefits, a firm offering a greater benefit is *more* likely to be a large firm, while for other benefits, a firm offering a greater benefit is *less* likely to be a large firm.

The third tab, "Firms," provides some of the data from which the researcher drew her conclusions. Five firms have a numerical rating in each of the six benefit categories, with higher numbers indicating greater benefits.

Now you can look at the directions for the first question. If a statement is strongly supported by the given information, it *must be true*. In other words, you're looking for *inferences*. Pick *Yes* if a statement is inferable.

The first sub-question references the 5 firms rated in the table in the "Firms" tab. The firm with the greatest promotion opportunities is firm Z, since its rating of 8 is highest. Firm Z also has the greatest responsibilities upon starting, since its rating of 10 is highest. So the answer to the first sub-question is A, *Yes*. Confirm your answer, and move on.

The second sub-question references job candidates. The "HR Professional" tab does say that job candidates in competitive fields strongly consider non-salary benefits before accepting a job offer. But nothing here tells you that the inverse is true; you're told *nothing* about candidates in non-competitive fields, so you can't assume that they don't consider non-salary benefits. And the other tabs don't say anything at all about job candidates. While the statement *could be true*, it doesn't *have to be true*, and thus isn't strongly supported. The answer to the second sub-question is B, *No*. Confirm your answer before moving on.

The third sub-question references the researcher and her research, discussed in the second and third tabs. The "Researcher" tab tells you that a greater degree of certain benefits means a greater likelihood that a firm is large. This is just another way of saying that the researcher considered factors that are correlated with the size of firms. Since the statement is a paraphrase of given information, it is strongly supported. The answer to the third sub-question is A, *Yes*. After confirming, you can move to the next question.

8. This question asks you to assess the five firms listed in the "Firms" tab and decide which is most likely to be a large firm, based on the numeric values given by the researcher.

Do you need to perform some sort of numerical correlation analysis? No—the GMAT will not expect anything so complex. However, it is critical to reference the "Researcher" tab also, since that tab lays out what kind of impact a high or low score has on the likelihood a firm is large.

You'll want to look for firms with high scores in health benefits, travel opportunities, and skill development, since those scores are correlated with large firms. Since firms with greater promotion opportunities or responsibilities upon starting are *less* likely to be large firms, you'll want to look for firms with low scores in those categories. And since work-life balance doesn't push the likelihood in either direction, this category can be safely ignored.

Of the five firms, W and Y can be quickly eliminated, since they have low to medium scores in health benefits, travel opportunities, and skill development. Of the remaining firms, firm Z can be eliminated because it has very high scores in promotion opportunities and responsibilities upon starting (8 and 10, respectively).

The last two firms are V and X. Firm X scores higher than V in health benefits (9 vs. 8), travel opportunities (8 vs. 4), and skill development (10 vs. 9). Firm X scores significantly lower than V in responsibilities upon starting (2 vs. 5) and just barely higher than V in promotion opportunities (3 vs. 2). On balance, X clearly fits what you are looking for most closely. The correct answer is choice C. Confirm that you've solved for the right question before moving on.

The second question illustrates the importance of using all the relevant information in MSR problems. You could have gotten in serious trouble if you neglected to reference the "Researcher" tab in addition to the "Firms" tab. For instance, if you'd solved for the firm with the greatest total scores (by summing the six scores for each firm), you would have chosen firm Z as your answer.

Don't Assume:
You can't assume anything unless it's stated—this is particularly important on Multi-Source Reasoning, but applies throughout the test.

The Whole Truth:
On Multi-Source Reasoning, always make sure you're incorporating all the relevant information for each question.

Tracking Your Work

As you work though the chapters in this book, you should keep track of any problems that you missed (or that you had to guess on). Then, you can circle back to them later to make sure you're improving.

For each question, note the question type and math concepts involved. Also take note of why you missed the question. Did you not understand the concept? Was it an issue with your logic? Was it a careless error? Try to address the underlying issue through your studying.

Periodically, give the problems you missed another try. (You should wait at least a couple of weeks so that you forget the question particulars.) By giving extra attention to questions you previously missed, you can iron out mistakes and turn problem areas into strengths.

Chapter Answer Key

1. C, B
2. D, B
3. B, A, B
4. B, B, B
5. C, E
6. B, E
7. A, B, A
8. C

6 Data Sufficiency 1: Four More

The Data Sufficiency (DS) question type is unique to the GMAT: you won't find it on any other test. DS questions appear in the Data Insights section, but because the logic and solution process on DS questions is so unusual, I've given them their own chapters (Chapters 6, 14, and 22).

Most DS questions are closely tied to math concepts; in fact, until 2024, DS questions were part of the Quant section. DS is the most common question type on the DI section, and you can expect to see 6–8 DS questions on your test. Like the other DI question types, DS allows a calculator (though it usually isn't very useful on DS).

Rather than asking you to solve for a particular answer, DS problems ask whether you *could solve* the question given certain information. Your job is to figure out if the information you're given is *sufficient* for you to solve the question.

Example: Is $x > 0$?

(1) $10x = 20$

From the information in Statement 1, you can calculate that $x = 2$. Therefore the answer to the question "Is $x > 0$?" is definitely YES. Because the answer is definite (there's no way the answer is NO), you can say that the statement "$10x = 20$" is *sufficient* to answer the question.

In real DS questions, you're given *two* statements containing information that could potentially be sufficient to answer the question definitively. Sometimes one or both statements will be sufficient by themselves. Sometimes you need the information in both statements, working together, to answer the question definitively. Finally, sometimes even with both statements together you don't have sufficient information to find a definite answer.

Let's see how this works in practice with a test-like problem on the next page.

Get Your Facts Straight:
When you work with a statement, it is a true fact; your goal is determining if this fact gives you enough to answer the question definitively.

1. Does Company X have more than 5 employees?

(1) If Company X had 3 times as many employees, it would have more than 15 employees.

(2) If Company X lost 4 employees, it would have less than 3 employees.

(A) Statement (1) ALONE is sufficient, but statement (2) alone is not sufficient.
(B) Statement (2) ALONE is sufficient, but statement (1) alone is not sufficient.
(C) BOTH statements TOGETHER are sufficient, but NEITHER statement ALONE is sufficient.
(D) EACH statement ALONE is sufficient.
(E) Statements (1) and (2) TOGETHER are NOT sufficient.

1. The question asks if Company X has more than 5 employees. Another way to say this is, "Is $x > 5$?"

Let's first look at the statements individually to see if they are sufficient:

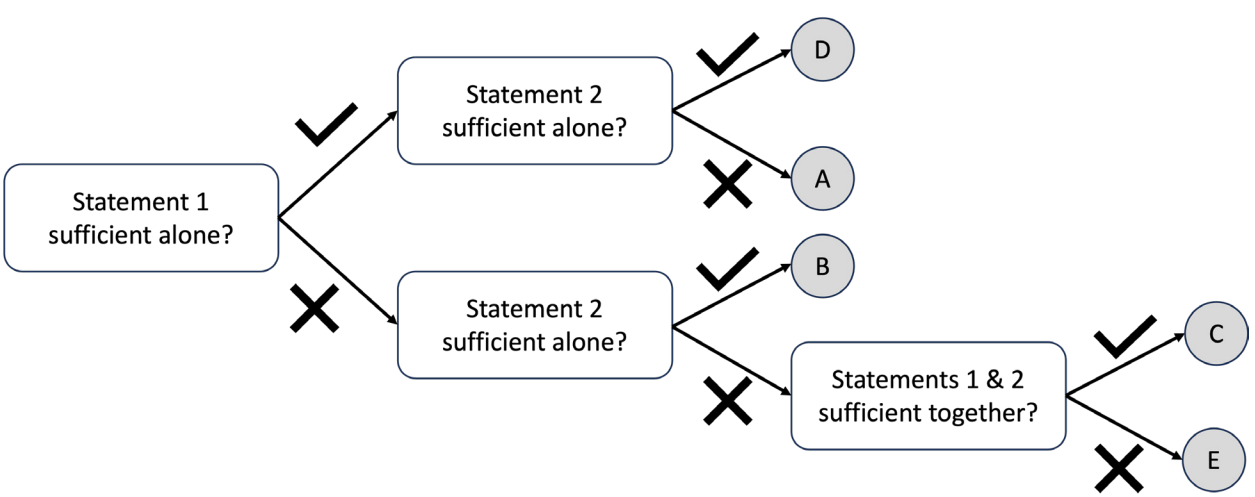
Statement 1: You can translate this statement into an inequality: $3x > 15$. Dividing both sides by 5 yields $x > 5$. This answers the question exactly: YES, Company X has more than 5 employees. *Sufficient*. Looking at the answer choices, you can eliminate choices B, C, and E. Only choices A and D indicate that Statement 1 alone is sufficient; the only remaining question is whether Statement 2 alone is sufficient.

Statement 2: When you look at Statement 2 individually, you must disregard what you learned in Statement 1 and start with a clean slate. You can translate this statement as follows: $x - 4 < 3$. Adding 4 to both sides yields $x < 7$. This isn't enough information to answer the question definitively: there could be 6 employees, giving an answer of YES to the question, or there could be 5 (or fewer) employees, giving an answer of NO to the question. Because you don't have a definitive answer, Statement 2 is *insufficient*.

Because Statement 2 is insufficient, you can eliminate choice D; the correct choice is A. Note that there is no reason to try the statements together. As long as at least one statement alone is sufficient, you won't be able to eliminate any more answer choices by trying the statements together.

Note that even though Statement 1 was sufficient, it wasn't enough to tell you how many employees Company X has. It could have 6 employees, 7 employees, or any number of employees over 5. But it was still sufficient because it answered the Yes/No question with a definite YES.

As you saw in this problem, you want to try the statements individually first. Then, *only if neither statement was sufficient alone,* try the statements together. This is illustrated in the following flowchart:



From looking at the flowchart, note that after evaluating the first statement alone, you can eliminate two or three answer choices. If Statement 1 is sufficient, then you can eliminate B, C, and E—the answer must be A or D. If Statement 1 is insufficient, then the reverse holds: you can eliminate A and D, and the answer must be B, C, or E. As long as you understand Statement 1, even if Statement 2 gives you trouble, you'll have a 1 in 2 or 1 in 3 chance of guessing the correct answer.

Now let's look at a variation on the previous problem:

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2. How many employees does Company X have?

(1) If Company X had 3 times as many employees, it would have more than 15 employees.

(2) If Company X lost 4 employees, it would have less than 3 employees.

(A) Statement (1) ALONE is sufficient, but statement (2) alone is not sufficient.
(B) Statement (2) ALONE is sufficient, but statement (1) alone is not sufficient.
(C) BOTH statements TOGETHER are sufficient, but NEITHER statement ALONE is sufficient.
(D) EACH statement ALONE is sufficient.
(E) Statements (1) and (2) TOGETHER are NOT sufficient.

---

2. Often, rather than asking a Yes / No question as in the first example, a DS question will ask for a *specific value*. The same fundamental logic applies: to be sufficient, the information must answer the question *definitively*. In a "What is the value?" question, this means your answer needs to be *one and only one value*. If more than one value is possible, the information is insufficient. (I'll talk more about Yes / No questions vs. Value questions later in the chapter.)

The statements are the same as in the previous example. Let's see how the statements apply to the new question:

Statement 1: This tells you that Company X has more than 5 employees ($x > 5$), but x could be *any* value over 5: 6, 24, 1000, etc. Because more than one value is possible, there is more than one answer to the question and the statement is *insufficient*. Eliminate choices A and D.

Statement 2: This tells you that Company X has less than 7 employees ($x < 7$), but that still leaves multiple possibilities: x could be 5 or 6, for example. Again, because more than one value is possible, the statement is *insufficient*. Eliminate choice B. The only remaining possibilities are choices C and E.

Only now that you've tried each statement individually, and discovered that neither is sufficient alone, should you try the statements together.

The Two Statements Together: If both statements are true, there's only one possible value for x: there must be 6 employees at Company X. This signals *sufficiency*. The answer is C: BOTH statements TOGETHER are sufficient, but NEITHER statement ALONE is sufficient.

Because it's so unusual, it can take a little time to "warm up" to the DS format. At first you will likely have trouble answering these questions accurately and within a reasonable time frame. Remember, go easy on yourself—you're just starting your GMAT journey.

The good news is that the DS format is very learnable and rewards consistent study. Because you only need to determine sufficiency (as opposed to solving), you can make up time on many of these problems, even when using a rigorous approach. Ultimately, the best thing about DS questions is that they provide your best opportunity to distinguish yourself on the GMAT, since many test takers won't put in the time, effort, and presence of mind to thoroughly learn DS skills. But you will.

Sufficiently Rewarding: *Data Sufficiency questions are tough at first, but they provide an opportunity for you to excel.*

Data Sufficiency Process

Next I'll go over a more formal process for answering DS questions. As with all GMAT questions, with DS questions it's critical to follow the right process. With the added "weirdness" of DS questions, it's especially easy to get lost or make mistakes if your process isn't solid.

1. UNDERSTAND the Setup:

As with Problem Solving questions, with DS questions, make sure you understand the question prompt before trying to solve. Don't work with the statements yet (though you should glance at them to get a sense of what they say). Read the prompt carefully, noting any restrictions (for example, whether certain variables must be positive or integers). If you can make any immediate deductions from the prompt, note them down. If you can restate the question into a simpler form, do so.

2. TRY Statements ALONE:

Look at each statement individually to determine if it is sufficient to answer the question definitively. As you work with each statement, treat it as a true fact. Then, given that the fact is true, is there one and only one answer to the question?

Follow the Process:
A consistent Data Sufficiency process is the key to solving efficiently and avoiding traps and careless errors.

If the question is a Yes / No question and the answer is always YES or always NO, then the statement is sufficient. If the question is a Value question and the answer is only one numeric value, then the statement is sufficient. In either case, you don't necessarily need to know what the values are, only that they answer the question definitively—so you can often avoid unnecessary calculations on DS.

3. TRY Statements TOGETHER (as needed):

If—and only if—neither statement is sufficient on its own, look at them together to see if they are sufficient. (About 60% of the time, you will not need to try the statements together.) When you try them together, treat them both as true facts. If there is one and only one answer to the question that is consistent with *both* statements, then they are sufficient together. The criteria for sufficiency is the same as when you looked at the statements separately—a definite YES or definite NO for Yes / No questions, and only one value for Value questions.

4. CONFIRM Your Answer:

It's crucial to confirm your answer before making your selection onscreen. As you did with PS and other DI problems, look back at the question to make sure that you've answered the right question. It's also worthwhile to check that you didn't fall into any traps or make any unwarranted assumptions that led you down the wrong path. For example, unless the problem specifically states that a number is positive, or you can deduce that a number must be positive, you cannot assume it is so.

Let's see the process in action on the next problem:

3. If a bag of marbles contains only red marbles and blue marbles, how many blue marbles are in the bag?

(1) The number of red marbles in the bag is 3 times the number of blue marbles in the bag.

(2) There is a total of 12 marbles in the bag.

(A) Statement (1) ALONE is sufficient, but statement (2) alone is not sufficient.
(B) Statement (2) ALONE is sufficient, but statement (1) alone is not sufficient.
(C) BOTH statements TOGETHER are sufficient, but NEITHER statement ALONE is sufficient.
(D) EACH statement ALONE is sufficient.
(E) Statements (1) and (2) TOGETHER are NOT sufficient.

3. Follow the process:

(1) UNDERSTAND the Setup:
In the prompt, you're given information as well as the question you're trying to answer. The information you're given (that the bag contains only red marbles and blue marbles) is a fact that will remain true for the duration of your work on the problem—it isn't conditional on which statement or statements you are evaluating. The question is asking for the number of blue marbles in the bag; therefore for information to be sufficient it must generate *only one* possible number of blue marbles.

(2) TRY Statements ALONE:
The first statement gives you a ratio or proportion, but no solid numbers. There could be 3 red marbles and 1 blue marble, or 6 red marbles and 2 blue marbles, etc. Two or more possible answers to the question ("How many blue marbles are in the bag?") means that the statement is *insufficient*. You can perform the algebraic translation ($r = 3b$), but you cannot solve for this equation by itself. You can eliminate answer choices A and D.

The second statement gives you a total, and, from the setup, you know that this total consists only of red marbles and blue marbles. However, there's no way of knowing the split between red and blue. There could be 10 red marbles and 2 blue marbles, 6 of each, or any other combination that adds up to 12. *Insufficient.* Again, you can translate into algebra if you wish ($r + b = 12$), but you cannot solve for the equation. You can eliminate answer choice B.

(3) TRY Statements TOGETHER (as needed):
Because (and only because) neither statement was sufficient by itself, next look at both statements together to see if they're sufficient to answer the question. To see how the statements could work together, it's easiest to use their algebraic forms ($r = 3b$ and $r + b = 12$). It's hopefully clear that with these two 2-variable, linear equations, you can solve for the number of blue marbles. Thus the statements are *sufficient* together and the answer is C.

You can actually solve if you want. Substitute $3b$ for r in the second equation to get:

$$3b + b = 12 \rightarrow 4b = 12 \rightarrow b = 3$$

Though it's not terribly complicated, there's no reason to do the calculation here because you know you'll get *one value* for b, and no matter what that value is, it will answer the question definitively. Avoiding unnecessary calculations will help you complete the GMAT in the limited time allowed.

(4) CONFIRM Your Answer:
Before you click your answer, quickly confirm it. Make sure you've determined sufficiency for the right question, and confirm that you haven't made any assumptions. This can happen in one of two ways: either you assumed something that wasn't necessarily true, making statements seem more sufficient than they really were, or you neglected to account for something that was in fact true, making statements seem less sufficient than they really were. With the double-checking complete, you can click answer choice C.

I won't always reference the process explicitly as I did on this question, but it applies to *all* DS problems. Through practice and repetition as you develop your skills, it will become a habit that you naturally engage.

In the rest of the chapter, we'll look more closely at each of the steps of the DS solving process.

Scratchwork for Data Sufficiency

It's important to keep your scratchwork organized. This is essential for all question types, but doubly so for DS questions. If you're not careful, you might confuse the information from one statement with information from another, or with information given in the prompt.

To organize problem #3, you could write it down as follows for the steps of the DS process:

1. UNDERSTAND the Setup
Write down key information from the prompt as well as the question itself, just like you would for Problem Solving.

Only r and b. What is b?

2. TRY Statements ALONE
Write "(1)", then note the information given in Statement 1. The statement is insufficient, which you can indicate with an "x" to the left of (1).

X (1) r = 3b

Likewise for Statement 2, write "(2)" followed by the given information. Statement 2 is also insufficient.

X (2) r + b = 12

3. TRY Statements TOGETHER (as needed)
When you try the statements together, you can indicate this with "(3)" (or, alternately, with "T"). Substituting the equation from (1) into (2) yields an equation with only one variable, which is sufficient (indicated by the check mark).

√ (3) 3b + b = 12

4. CONFIRM Your Answer
Double-check: yes, you answered the right question by determining that you can solve for *b*. You are finished.

1. UNDERSTAND the Setup

DS setups can be wordy and complicated. Misunderstanding the setup can lead to wasted time and effort solving for the wrong thing, or making unwarranted assumptions that result in wrong answers. It's critical to make sure you understand what the question prompt is saying.

Don't Jump the Gun:
Time spent understanding the prompt will save you even more time when working with the statements.

You should read the prompt twice, or even three times, if necessary. In addition, it can be helpful to draw insights from the prompt, including factual deductions and framings of the missing information needed to answer the question definitively. Again, getting in this habit will save you time once you start working on the statements.

Let's try this by looking at an example DS prompt without statements. What can you deduce from the following prompt?

Example: In a certain country, hours worked by nonexempt employees in excess of 40 hours per week are overtime hours and are paid at 1½ times the employee's regular pay rate. If a nonexempt employee worked a total of 55 hours last week, how much was the employee's total gross pay for the hours worked last week?

You can deduce that the employee worked 40 regular hours and 15 overtime hours. Since you know that the overtime rate is 1½ times the regular rate, knowing either rate will give you the other, and you'll be able to solve. This is a key deduction that will help as you go through the two statements.

In the next problem, make sure you understand the setup, noting any deductions you can make from the prompt, before working with the statements.

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4. At Javier's Paperback Bookstore, customers who buy 3 books pay the regular price for the first 2 books and a discounted price for the third book. The bookstore makes the same profit from the sale of 3 books that it makes from the sale of 2 books at the regular price. If a customer buys 3 books, what is the discounted price of the third book?

(1) The regular price of each of the 3 books the customer buys at the bookstore is $10.

(2) The cost to the bookstore of each of the 3 books the customer buys is $7.

(A) Statement (1) ALONE is sufficient, but statement (2) alone is not sufficient.
(B) Statement (2) ALONE is sufficient, but statement (1) alone is not sufficient.
(C) BOTH statements TOGETHER are sufficient, but NEITHER statement ALONE is sufficient.
(D) EACH statement ALONE is sufficient.
(E) Statements (1) and (2) TOGETHER are NOT sufficient.

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4. This is a good example of a DS setup that, while not mathematically complex, can still trip up the unwary. Read the prompt carefully at least twice. Give the statements a quick glance, but don't work on them until you're clear on the prompt.

The first sentence of the prompt is fairly straightforward—buy 2 books at regular price and you get a third book at a discount.

But what's going on in the second sentence? How can a store make the same profit from 3 books as it does from 2? If the profit doesn't increase (or decrease) with the addition of the third book, the store must be selling that book *at cost*. This is a key deduction that will help as you go through the two statements.

Also pay close attention to the last sentence of the prompt, which contains the question. You need to find the discounted price of the third book, and that's it—nothing about the regular price.

Only after being clear on the above should you work with the statements:

Statement 1 gives you the regular price, but no way to get to the discounted price. Thus, there are multiple possibilities for the discounted price. *Insufficient*.

Statement 2 tells you the cost of each of the three books. Since you know that the discounted price is equal to the cost, you have what you need to answer the question. *Sufficient*. The answer is B.

Given the time pressures during the GMAT, it may be tempting to move quickly through the prompt, brushing past confusing sentences in the hope that working with the statements will clarify things.

However, in this problem, that strategy could result in picking C or E, since the statements separately give you nothing explicit to help you calculate the discounted price. Or you might waste valuable time trying to work with the statements, setting up profit equations and so forth, only to realize that you need to go back and understand the prompt. While it's good to take a quick glance at the statements, avoid actively working with them until you understand the prompt and the question you are being asked.

Take note of one other thing about this problem: with the understanding that the prompt tells you that the discounted price is equivalent to the cost, the question "What is the discounted price of the third book?" can be restated as "What is the cost of the third book?" This restatement of the question makes it even more clear that the second statement is sufficient (once you reach it). We'll dig further into this strategy in Chapter 14: Data Sufficiency 2.

2. TRY Statements ALONE

After understanding the overall setup and making any deductions / restatements from the question prompt, the next step is looking at the statements individually to determine whether they are sufficient.

As I mentioned, there are two broad types of DS questions: Value questions and Yes / No questions. Each of these question types has a very specific bar that must be met for sufficiency.

Remember that for a statement to be considered *sufficient*, it must provide information that allows for only one definitive answer to the question. For a Value question, this means that the statement allows for *only one numeric value* as an answer—if more than one value is possible, the statement is not sufficient. For a Yes/No question, this means that the statement allows for only a YES *or* only a NO—if both a YES and a NO are possible, the statement is not sufficient.

Let's drive home the concept of sufficiency with a drill. In this drill, you won't solve test-like questions, but rather look at a collection of statements matched to a Value question and to a Yes / No question.

Drill

For questions 1 and 2, look at each of the five statements individually to determine whether they are sufficient to answer the question. (Do not try the statements together.)

1. If *gross profit* = *revenue* − *cost*, what is a hot dog stand's gross profit from selling hot dogs?

   (1) The stand sold 25 hot dogs at a price of $5 per hot dog.

   (2) The stand made $125 in revenue from selling hot dogs, which cost the stand $25.

   (3) The stand earned $45 in gross profit on the sale of hamburgers.

   (4) The stand sold 25 hot dogs for a gross profit of $4 per hot dog.

   (5) The stand earned at least $75 in gross profit from selling hot dogs.

2. If *gross profit* = *revenue* − *cost*, is a hot dog stand's revenue from selling hot dogs at least $100?

   (1) The stand sold 25 hot dogs at a price of $5 per hot dog.

   (2) The stand made $125 in revenue from selling hot dogs, which cost the stand $25.

   (3) The stand earned $45 in gross profit on the sale of hamburgers.

   (4) The stand sold 25 hot dogs for a gross profit of $4 per hot dog.

   (5) The stand earned at least $75 in gross profit from selling hot dogs.

Drill Solutions

1. If *gross profit* = *revenue* – *cost*, what is a hot dog stand's gross profit from selling hot dogs?

(1) The stand sold 25 hot dogs at a price of $5 per hot dog.

Find gross profit using the given formula: *gross profit* = *revenue* – *cost*, or more simply, *profit* = *revenue* – *cost*. (The test will not expect you differentiate *gross profit* vs. *net profit*.) If the revenue per hot dog is $5, then the revenue for 25 hot dogs is 25 · $5 = $125. However, you know nothing about cost. If costs are high, say $100, then profit would be $125 – $100 = $25. If costs are low, say $10, then profit would be $125 – $10 = $115. With multiple possible answers to the question, this statement is ⟹ *Insufficient*

(2) The stand made $125 in revenue from selling hot dogs, which cost the stand $25.

You're given revenue and cost; therefore, you can calculate *profit* = $125 – $25 = $100. With one definite answer to the question, this statement is ⟹ *Sufficient*

(3) The stand earned $45 in gross profit on the sale of hamburgers.

Knowing the profit on hamburger sales tells you nothing about the profit on hot dog sales, which could be anything. ⟹ *Insufficient*

(4) The stand sold 25 hot dogs for a gross profit of $4 per hot dog.

If the profit per hot dog is $4, then the profit for 25 hot dogs must be 25 · $4 = $100. This statement is ⟹ *Sufficient*

(5) The stand earned at least $75 in gross profit from selling hot dogs.

If the stand earned *at least* $75 in profit from hot dogs, then it could have earned $75 or $1000, or any other value over $75 ⟹ *Insufficient*

2. If *gross profit* = *revenue* – *cost*, is a hot dog stand's revenue from selling hot dogs at least $100?

(1) The stand sold 25 hot dogs at a price of $5 per hot dog.

If the revenue per hot dog is $5, then the revenue for 25 hot dogs is 25 · $5 = $125. This is greater than $100, giving a definite YES answer to the question ⟹ *Sufficient*

(2) The stand made $125 in revenue from selling hot dogs, which cost the stand $25.

$125 is greater than $100 in revenue, so this again gives a definite YES answer to the question ⟹ *Sufficient*

(3) The stand earned $45 in gross profit on the sale of hamburgers.

Knowing the profit on hamburger sales tells you nothing about the revenue on hot dog sales, which could be at least $100 (an answer of YES) or less than $100 (an answer of NO) ⟹ *Insufficient*

(4) The stand sold 25 hot dogs for a gross profit of $4 per hot dog.

If the profit per hot dog is $4, then the profit for 25 hot dogs must be 25 · $4 = $100. So, even if there were no cost at all ($0), the revenue would be $100. But the cost could also be higher—for example, if the cost were $10, the revenue would have to be $110 to get a profit of $100. Though you don't have one single answer for the *value* of the revenue, you have only one possible answer to the Yes/No question: YES, the revenue is at least $100 ⟹ *Sufficient*

(5) The stand earned at least $75 in gross profit from selling hot dogs.

As with the last statement, this statement tells you about profit, not revenue. But because it gives you a range, you must think about the possible scenarios that could fit with earning $75 in profit. For example, if revenue were $1000 and cost was $200, profit would be $800, fitting the statement. Since $1000 in revenue is greater than $100, the answer to the question here is YES. But could it also be NO? Revenue could be $80, let's say, and the cost $5, making the profit $75 (and thus fitting the statement). In this case, since $80 in revenue is less than $100, the answer to the question is NO. With a YES and a NO as possible answers, the statement is ⟹ *Insufficient*

Value Question

5. Every employee at a manufacturing plant is either a manager or a line worker. The plant currently has a ratio of 4 managers to 9 line workers. How many line workers does the plant currently have?

(1) The plant currently has between 40 and 60 employees.

(2) If the plant added 4 more managers, the plant would have 20 managers.

(A) Statement (1) ALONE is sufficient, but statement (2) alone is not sufficient.
(B) Statement (2) ALONE is sufficient, but statement (1) alone is not sufficient.
(C) BOTH statements TOGETHER are sufficient, but NEITHER statement ALONE is sufficient.
(D) EACH statement ALONE is sufficient.
(E) Statements (1) and (2) TOGETHER are NOT sufficient.

5. The question is asking for the number of line workers; therefore for statement(s) to be sufficient you must get *only one* value for the number of line workers. You're given a ratio but no "solid" numbers in the prompt itself.

Statement 1 also has no solid numbers, so it may at first appear insufficient. But before dismissing it, you want to make sure that more than one answer to the question is possible. The easiest way to do this is to think of the "ratio whole"—the value of the ratio parts added together, which here is $4 + 9 = 13$. So there could be 13 total employees, or there could be $13 \times 2 = 26$ employees, or the employees could be any other multiple of 13. But per Statement 1, the total must fall within the 40–60 range, so 13 and 26 don't work. The next multiple is $13 \times 3 = 39$, which is also too low.

But the next multiple, $13 \times 4 = 52$, does work. And it's the only one that does, because the following multiple, $13 \times 5 = 65$, is too high. If there are 52 employees, there must be $9 \times 4 = 36$ line workers. This is the only possible answer to the question, so Statement 1 is actually *sufficient*.

Note that you can eliminate choices B, C, and E. The answer must be A or D.

Statement 2 gives you some solid numbers to work with. If adding 4 managers would result in 20 total managers, there must currently be 16 managers. If there are 16 managers, the ratio multiplier must be 4 (since $4 \times 4 = 16$). This means that there must be $9 \times 4 = 36$ line workers. Statement 2 is also *sufficient*. The correct answer is D. Confirm your answer and you can move on.

The danger with this question comes from assuming that because it only gives you a range, Statement 1 is insufficient. On a "What is the value?" question, to be insufficient, a statement must give you *more than one possible value*. Conversely, for sufficiency you need to make sure that there is *only one possible value*.

Don't worry if you weren't sure how to work with the ratio. We'll cover ratios in depth in Chapter 9: Fractions & Friends.

Value Sufficiency:
On a Value question, data is sufficient if it results in one and only one value for an answer; insufficient if it results in more than one possible value.

Yes / No Question

6. A sales team has n account managers, each of whom can manage a maximum of q accounts at once, where q is a positive integer less than 5. If there are 200 current and 200 potential accounts, can the sales team manage all the current and potential accounts at once?

(1) $n = 99$

(2) $q > 2$

(A) Statement (1) ALONE is sufficient, but statement (2) alone is not sufficient.
(B) Statement (2) ALONE is sufficient, but statement (1) alone is not sufficient.
(C) BOTH statements TOGETHER are sufficient, but NEITHER statement ALONE is sufficient.
(D) EACH statement ALONE is sufficient.
(E) Statements (1) and (2) TOGETHER are NOT sufficient.

6. The question prompt introduces a couple of variables along with a scenario. The statements each provide more information about those variables, but, before diving into the statements, take a moment to reflect on the setup. If the sales team is n members large, and each team member (account manager) can manage up to q accounts, the total capacity must be nq accounts. You want to know if that capacity is greater than or equal to the current accounts *and* the potential accounts. So the question can be restated as: "Is $nq \geq 200 + 200$?" Or more simply:

Is $nq \geq 400$?

This restated question will be easier to address while working through the statements. (We'll go further into the strategy of Restating the Question in Chapter 14: Data Sufficiency 2.) Note also the specification that q is an integer less than 5.

Let's look at the first statement. If there are 99 account managers ($n = 99$), nq could be less than 400—if q were equal to 1, for example. Then nq would equal 99, giving an answer of NO to the question "Is $nq \geq 400$?"

Is an answer of YES also possible? To see, let's make q as large as possible given that $q < 5$. If $q = 4$, then $nq = 99 \cdot 4$, which is still less than 400 since 99 is less than 100. So you again have an answer of NO—in fact, there's no way to get YES as an answer, so the answer is a *definite* NO. Remember, a NO is *sufficient* as long as it's a definite NO. Since Statement 1 is sufficient, you can eliminate choices B, C, and E; the answer must be A or D.

Looking at the second statement, you can note that q must be either 3 or 4. (Could q be a number like 2.5? No, because q was defined as an integer in the prompt.) But without Statement 1, you don't know how many account managers n there are. If n is a small number (say 1), then nq will be less than 400—an answer of NO to the question. But if n is large (say 1000), then clearly nq will be greater than 400—an answer of YES to the question. Since it yields both a YES and a NO, Statement 2 is *insufficient*. You can eliminate choice D; the correct answer is A. Confirm your answer before moving on.

In the majority of Yes / No problems, sufficient answers are YES answers, but as in this case, the testmaker can make a problem more difficult with a sufficient answer of NO, tripping up unwary test-takers. Always make sure you distinguish between the question in the problem ("Can the sales team manage all the accounts?") and the question of sufficiency ("Are the statement(s) sufficient?").

On questions like this, students sometimes confuse the question and the statements. For example, you might have taken $nq \geq 400$ as a fact and then tried to reconcile it with the first statement, which tells you that $n = 99$. Then, because n can't be 99 when $nq \geq 400$, you might have thought the statement was insufficient. But this reverses the DS logic. Remember, when you work with a statement, it is a *fact*, and your task is to see if you can use that fact to answer the question.

Yes / No Sufficiency:
On a Yes / No question, data is sufficient if it results in a definite YES or a definite NO; insufficient if it results in both YES and NO.

No Is as Good as Yes:
Be clear on the question in the problem vs. the question of sufficiency: a solid NO to the problem's question is sufficient just like a solid YES is.

3. TRY Statements TOGETHER (As Needed)

If either or both of the statements are sufficient individually, there's no need to perform this step. (In fact, it would be counterproductive.) Since in 3 of the 5 answer choices (A, B, and D) at least one statement is sufficient individually, and, since each answer choice appears with approximately the same frequency, on 60% of problems you will not try the statements together. About 40% of the time, neither statement is sufficient individually, and, in this case, you will try the statements together.

The bar for sufficiency when trying the statements together is exactly the same as it was when you tried the statements individually. For Value questions, the statements must allow for only one value in order to be sufficient. For Yes/No questions, the statements must allow for only a definite YES or a definite NO answer. Because the bar for sufficiency is the same, trying the two statements together is logically equivalent to evaluating a single "super-statement" that contains all the information from both statements in one. So, everything in the previous section on trying the statements individually applies also to trying the statements together.

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7. Nation X consists of a certain number of states, which are in turn subdivided into counties. What is the number of counties in Nation X?

(1) The land area of each county is between 100 and 120 square miles.

(2) The average number of counties per state is 20.

(A) Statement (1) ALONE is sufficient, but statement (2) alone is not sufficient.
(B) Statement (2) ALONE is sufficient, but statement (1) alone is not sufficient.
(C) BOTH statements TOGETHER are sufficient, but NEITHER statement ALONE is sufficient.
(D) EACH statement ALONE is sufficient.
(E) Statements (1) and (2) TOGETHER are NOT sufficient.

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7. The problem is asking for the number of counties in Nation X, which is just another way of asking for a value, so you need to have one and only one number for the statement(s) to be sufficient. Let's follow the process:

The first statement gives you a limited range for the land area of each county but nothing that could give you the total number of counties. There could be 100 counties or 1000 counties, for example. So Statement 1 is *insufficient*.

Statement 2 gives an average number of counties per state. Remembering how averages work, you know that:

$$\textit{average counties per state} = \frac{\textit{total number of counties}}{\textit{total number of states}}$$

Knowing only the average, you have two unknowns in the equation and can't find the total number of counties. Again, there could be 100 counties or 1000 counties. *Insufficient*.

The real question is whether the two statements together are sufficient. Can you put them together somehow? There doesn't seem to be any way to insert the land area information into the average equation you've come up with. The two statements together *seem* insufficient, which would result in answer choice E. But how can you be sure?

The failsafe test for insufficiency is once again to find two (or more) possible answers to the question. In fact, you can again say that 100 counties or 1000 counties are both possible with the two statements. Therefore you know with certainty that the two statements together are insufficient and the answer is E.

8. The Jones Organization spent *y* percent of its annual profits on research & development in each of the last four years. Did the Jones Organization spend more than $1 million on research & development last year?

(1) Three years ago, the Jones Organization had annual profits of $5 million and spent $1.5 million on research & development.

(2) Last year, the Jones Organization had annual profits of $4 million.

(A) Statement (1) ALONE is sufficient, but statement (2) alone is not sufficient.
(B) Statement (2) ALONE is sufficient, but statement (1) alone is not sufficient.
(C) BOTH statements TOGETHER are sufficient, but NEITHER statement ALONE is sufficient.
(D) EACH statement ALONE is sufficient.
(E) Statements (1) and (2) TOGETHER are NOT sufficient.

8. This is a Yes / No question; therefore, for information to be sufficient, you must get a definite YES or a definite NO as an answer.

Looking at the prompt, you can see that if you get the annual profit from last year and the % spend on R&D (the value of *y*), you can find the value of the R&D spend last year by multiplying *y*% times those profits.

Statement 1 gives you information from three years ago. You know that the % spend on R&D has stayed constant, so you could calculate *y*, if you wanted to:

$$\frac{y}{100} = \frac{\$1.5\ million}{\$5\ million}$$

However, you still don't know last year's profits, so knowing *y* won't help you calculate the R&D spend last year. It could be more than or less than $1 million. By itself this statement is *insufficient*.

Statement 2 gives you the profits from last year. But in isolation, this doesn't tell you how much of it was spent on research. It could be more than or less than $1 million. *Insufficient*.

Together, the statements give you both components needed to calculate R&D spend last year. Thus, together the statements are *sufficient* without even needing to calculate (whether by hand or with a calculator). Or are they?

It isn't immediately clear whether the R&D spend last year will be over $1 million; in other words, whether you will get a YES or NO answer to the question. What if, after calculating, you discover that the spend is below $1 million? In that case, the answer to the question would be NO. However, it would be a *definite* NO, and remember, a definite no is as good as a definite yes in terms of sufficiency.

Likewise, if you calculate and find that the R&D spend is over $1 million, the answer to the question is a definite YES. So either way, together the statements will be sufficient. The answer is C. Confirm your answer before moving on.

For completeness, I'll do the calculation, but to be clear, **you should not calculate on the test in this situation, since you already know you'll get a definite answer**.

First find *y*: $\frac{y}{100} = \frac{\$1.5\ million}{\$5\ million}$

Simplify the right side to find that $y = 30$:

$$\frac{y}{100} = \frac{1.5}{5} \rightarrow \frac{y}{100} = \frac{3}{10} \rightarrow \frac{y}{100} = \frac{30}{100} \rightarrow y = 30$$

Then calculate R&D spend last year:

$$30\,\% \cdot \$4\ million = \$1.2\ million$$

As it turns out, the answer to the question is YES, the Jones Organization spent more than $1 million on R&D last year. If the calculation had resulted in a value equal to or less than $1 million, the answer to the question would be NO. Either way, you'd have a definite answer using both statements together.

Don't Calculate:
When possible, avoid unnecessary calculations on Data Sufficiency.

4. CONFIRM Your Answer

By its nature, the DS question type provides many opportunities for the unwary to fall into traps. This is why it's important to confirm your answer before selecting it. Make sure that you've answered the right question and haven't gone astray during your calculations.

In a way, this is the mirror image of the first step, "Understand the Setup." Just as you started the problem by understanding the big picture, here you're taking a step back and making sure that the answer you've come up with fits into that big picture. For example, try the following problem:

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9. An electronics dealer's gross profit on the sale of a certain television was what percent of the cost of the television? (Gross profit is equal to selling price minus cost.)

(1) The cost of the television was $900.

(2) The selling price of the television was $\frac{6}{5}$ of the cost of the television.

(A) Statement (1) ALONE is sufficient, but statement (2) alone is not sufficient.
(B) Statement (2) ALONE is sufficient, but statement (1) alone is not sufficient.
(C) BOTH statements TOGETHER are sufficient, but NEITHER statement ALONE is sufficient.
(D) EACH statement ALONE is sufficient.
(E) Statements (1) and (2) TOGETHER are NOT sufficient.

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9. The question prompt tells you only what you're looking for: gross profit as a percentage of cost.

Looking at the first statement, you're given only one of the two values you need (gross profit and cost), so you won't be able to calculate. Multiple answers are possible. *Insufficient*.

The second statement gives you no solid numbers, so it may appear insufficient on its own. But it gives you a way to calculate the selling price if you know the cost, and you would then be able to calculate the gross profit. Since you were just given the cost in the first statement, it appears that you need both statements, giving an answer of C.

Confirm your answer first. Looking back at the question reminds you that it's asking for the gross profit *percentage*, not the absolute number. Do you actually need to know the gross profit and cost to know the gross profit percentage? Not necessarily—you only need to know their *relative sizes*. In fact, statement 2 alone gives you these relative sizes, and is enough to give you the percentage. Another way of writing $\frac{6}{5}$ is 120%, which tells you that the gross profit is 20% of the cost. *Sufficient*. The correct answer is B, not C.

To be more explicit, you could calculate as follows:

$$\textit{selling price} = \frac{6}{5}\textit{cost} \qquad \text{From Statement 2.}$$

$$\textit{gross profit} = \textit{selling price} - \textit{cost} \qquad \text{Profit equation.}$$

Substitute $\frac{6}{5}\textit{cost}$ for *selling price*:

$$\textit{gross profit} = \frac{6}{5}\textit{cost} - \textit{cost}$$

Subtract and convert to percentage:

$$\textit{gross profit} = \frac{1}{5}\textit{cost} = 20\%\ \textit{of cost}$$

Note that the question is designed to make it all too easy for you to select C. Make sure that you confirm your answer!

Begin and End the Right Way:
Don't ignore the first step (UNDERSTAND) or the last step (CONFIRM)—if you do, you'll lose points to careless errors.

A Look Behind—and Ahead

You've now learned the basics of all the Quant and DI question types, with a focus on the *solution process* for each type. A strong process is the foundation for success on the GMAT.

What's a strong process? It's one that's disciplined in following the key steps, while at the same time allowing for flexible thinking when a particular method isn't working. I'll talk more about the balance between discipline and flexibility in Chapter 11: The Three Pillars (Mindset, Strategy, and Tactics).

Part IV will teach you the foundational math and statistics concepts tested across the Quant and DI sections. But it's just as important, as you solve the associated GMAT questions, to make sure to apply the processes you've learned. (I'll reinforce the process in the problem explanations.) Nice work completing Part III!

Chapter Answer Key

1. A
2. C
3. C
4. B
5. D
6. A
7. E
8. C
9. B