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Princeton
Review®**

Math Workout for the New **GRE®**

2nd Edition

REVISED
& UPDATED
FOR THE
NEW TEST

**Proven techniques
from the test-prep experts**

- More than 200 practice questions included
- Complete coverage of the changes to the Quantitative Reasoning section
- Strategies to master every math question on the new GRE
- Glossary of common terms to help you brush up on your math vocabulary
- Detailed, comprehensive explanations for every question

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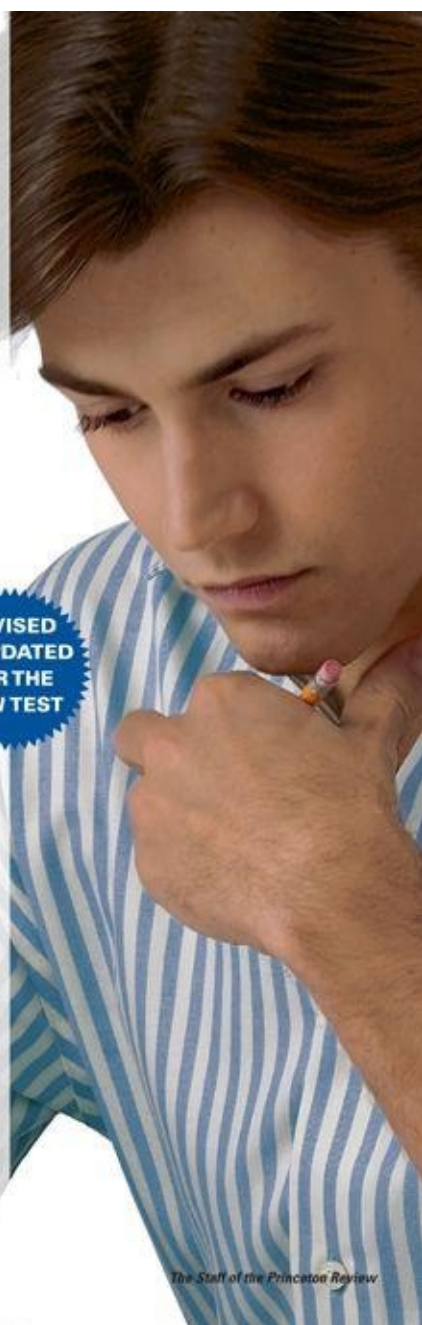
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Revised and Updated for the New GRE

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Chapter 1 Introduction

ADVICE FOR THE FAINT OF HEART

Welcome to The Princeton Review's *Math Workout for the New GRE*, the one-stop shop for all of the mathematical knowledge and practice you'll need to tackle the Math section of the GRE effectively.

You've bought this book, which means you may be one of many grad-school candidates who are approaching the math, or "quantitative," portion of the GRE with a little bit of trepidation. This might be for any of several reasons, including the following:

- You come in contact with the word "variable" only when it's used to describe the weather.
- Your first thought about Pythagoras is that he might have been a character in *The Lord of the Rings*.
- You regard "standard deviation" as more of a psychological problem than a mathematical one.

If any of the above pertain to you, you're definitely not alone.

But don't worry, that's what this book is all about. Its two main objectives are (1) to give you an overview of all of the math concepts you could see on the GRE, and (2) to give you simple strategies for handling even the most complex math you could encounter on test day.

WHAT KIND OF MATH DOES THE GRE ROUTINELY TEST?

The good news is that the GRE's math sections don't test anything that you learned after your sophomore year of high school, so the concepts aren't extremely advanced.

The bad news is that the GRE's math sections don't test anything that you learned after your sophomore year of high school, so it may have been a long time since you studied them.

That's largely why this book was written: to help you build up an impressive canon of math knowledge that will (1) help you score your best on the quantitative portion of the GRE, and (2) send you up to knock 'em dead at your next cocktail party.

The GRE supposedly was written so that graduate schools might get a better sense of an applicant's ability to work in a post-graduate setting—a goal that is lofty and unrealistic at best. The test doesn't even measure how intelligent you are; if you take a test-prep course and your score improves, does that mean you're any smarter? Nope. Yet you can improve your score just by learning about what to expect on the GRE.

All the GRE really tests is how well you take the GRE.

Succeeding on the quantitative portion of the GRE—or any standardized test, for that matter—is much more about relearning math concepts as it is about modifying the way you think. There are several very important skills to cultivate when you're preparing to take the GRE, and each of them is attainable with the right guidance, a strong work ethic, and a healthy dose of optimism.

We'll discuss the math basics you'll need for the GRE, but if you need a quick reference, consult the glossary at the back of the book.

The Layout of the Test

Let's talk about the different sections of the GRE. The GRE contains five scored sections:

- One 60-minute Analytical Writing section, which contains two essay questions
- Two 30-minute Verbal sections, which contain approximately 20 questions each
- Two 30-minute Math sections, which contain approximately 20 questions each

The first section will always be the Analytical Writing section, followed by the Math and Verbal sections, which can appear in any order. All of the Verbal questions are multiple choice. The Math questions are mostly multiple choice with some numeric entry questions, which require typing in an answer.

You will be able to see your Verbal and Math scores immediately upon completion of the test, but you will have to wait about two weeks before your Analytical Writing section is scored.

Scores are given on a scale from 130 to 170, in 1-point increments. The questions within each section are always worth the same amount of points. So the easy questions in a section are just as important to get right as the hard questions in a section.

Once you've completed one Math section, the GRE will use your score on that section to determine which questions to give you in the next Math section. The same applies for the two Verbal sections. (This doesn't really affect how you will approach the test, so don't worry about it too much.)

You will get a 1-minute break—enough time to close your eyes and catch a breath—between each section. You will also get a full 10-minute break after the third section. Be sure to use it to visit the bathroom, take a drink of water, refresh your mind, and get ready for the rest of the exam.

Experimental Section

Here's where ETS, the makers of the test, start to get mean. In addition to the five scored sections listed above (one Analytical Writing, two Math, two Verbal), you may also have an unscored experimental section. This section is almost always a Math or Verbal section. It will look exactly like the other Math or Verbal sections, but it won't count at all toward your score. ETS administers the experimental section to gather data on questions before they appear on real GREs.

Thus, after your Analytical Writing section you will probably see five—not four—multiple-choice sections: either three Verbal and two Math, or two Verbal and three Math, depending on whether you get a Verbal or Math experimental section. These sections can come in any order. You will have no way of knowing which section is experimental, so you need to do your best on all of them. Don't waste time worrying about which sections count and which section does not.

Here is how a typical GRE might look:

Analytical Writing – 60 minutes
Verbal – 30 minutes
<i>10-minute break</i>
Math – 30 minutes
Math – 30 minutes
Verbal – 30 minutes
Math – 30 minutes

Remember, the Analytical Writing section will always be first, and it will never be experimental. In the above example, the two Verbal sections will be scored, but out of the three Math sections only two will be scored. One of the three is an experimental section, but we don't know which one. Of course on your GRE you might see three Verbal sections instead, meaning one of your Verbal sections is experimental, and they may come in any order. Be flexible, and you'll be ready for the test no matter what order the sections come in. In fact, the test makers may not even include an experimental section! If so, count your lucky stars that you didn't have to waste your time on a meaningless section.

Research Section

At the end of the test, you may also have an unscored Research section. At the beginning of the section, you will be told that it is an unscored Research section, used only to help develop and test new questions for the GRE. If you want to skip it, you have the option of skipping it. They normally offer some sort of prize to induce people to take it, but by that point in the test you will probably be exhausted. If they offer you a Research section, just go ahead and decline, get your scores, and go home.

MATH OVERVIEW

There are three main skills that we will emphasize throughout this book: *keep your hand moving*, *take the easy test first*, and *be prepared to walk away*. These are not necessarily what you would naturally do while taking a test, so you'll have to force yourself to apply these skills as you work through the problems in this book and as you take practice tests. If you do, you'll find that once you get to the real test your body and brain already know how to tackle each question, and you'll be able to breathe a bit easier.

Most people assume that the Math section is about thinking. It's not. It's about *doing*. When you get stuck, resist the urge to sit and stare. Instead, get your hand moving.

Keep Your Hand Moving

You'll get about six pieces of scratch paper to use for the test. Use them. Use all of them, and then get more. Don't just use scratch paper for multiplying or doing long division. Use your scratch paper for every single part of the problem, from beginning to end.

You will not solve the problems in your head, and you will not solve them on the screen. You will solve them on the scratch paper. As soon as you click Next, and see a question, start writing.

We'll go into exactly what to write for each question later in the book. For now, you should get into the habit of writing the following:

- **Question Number:** You may need to leave a question and come back to it. If so, you may have some calculations that you can reuse. If you've got the question number written down, you can easily see what work goes with which question.
- **Answer Choices:** For most questions, this will mean simply writing A B C D E vertically on the left side of your scratch paper. As you work each question, you may realize that certain answer choices are definitely wrong. In that case, cross them off on your scratch paper.
- **Problem Set Up:** On the left side of your paper, next to the answer choices, write down information as you read the problem. If it's a geometry question, redraw the figure. If the question says that Bob has 142 oranges in his grove, and Sue has 219 oranges in her grove, then immediately write down "Bob = 142 oranges" and "Sue = 219 oranges." Don't keep anything in your head.
- **Calculations:** As you work through the problem, you will probably need to use the onscreen calculator. As you do so, write down every single calculation on your piece of paper, off to the right side. Don't enter in $216 \times 3 \div 4$ all at once. First, do 216×3 on the calculator, and write down the result, 648. Then, do $648 \div 4$, and write down the result, 162. It's easy to make small mistakes with the calculator if you're not careful.
- **A Horizontal Line:** After each problem, draw a line to separate it from the next problem. This will keep your work organized, and prevent you from accidentally using numbers or information for one problem while solving another.

Your scratch paper may end up looking something like this:

12)

$$2 \cdot 2 \cdot 2 \cdot 2 = 4 \cdot 4 = 16$$

A

$$2^x > 10000$$

B

$$x = 4 \quad 2^4 = 16$$

C

$$x = 12 \quad 2^{12} = 2^4 \cdot 2^4 \cdot 2^4$$

D

$$= 16 \cdot 16 \cdot 16 = 256 \cdot 16 = 4096$$

E

13)

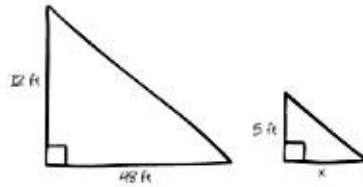
A

B

C

D

E



$$\frac{12}{48} = \frac{5}{x}$$

$$48 \cdot 5 = 12x$$

$$240 = 12x$$

$$\frac{240}{12} = \frac{12x}{12}$$

$$20 = x$$

$$20 = x$$

Click [here](#) to view a larger image.

Take the Easy Test First

All questions within a given section are worth the same amount of points. Many people rush through the easy questions so they can spend more time on the hard questions. However, if easy questions are worth just as much as hard questions, why not focus just as much on them?

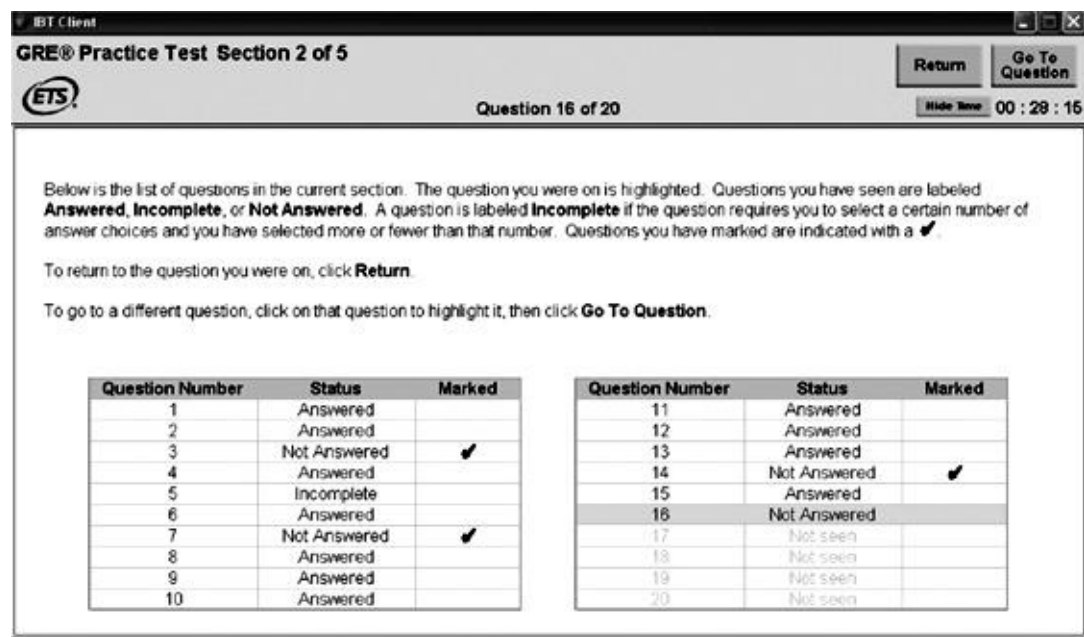
There are a certain number of questions on the GRE that you can easily answer correctly. As soon as you read through them, you know what they're asking and how to get to the answer. Your job is to answer all of those questions first. Don't rush through them, because you can't afford to get the questions wrong. These are practically free points, as long as you're paying attention. Use your scratch paper and read carefully.

Save the hard questions for later. You can always return to them, even if it's just for a last-second guess. The goal with your first pass through any section is to get as many points as you can, without any mistakes. Once you've done that, you can use the time remaining to return to the other, harder questions. You'll find that after a second look, some of the hard questions are easier than you initially thought. Go ahead and do those questions now. Some of the questions you thought were going to be hard are, in fact, hard questions. Leave those. You'll come back with any time remaining and either work through them or eliminate answers and guess.

Easy questions are worth the same as hard questions. Work easy questions carefully, so you don't get any wrong.

Be Prepared to Walk Away

At the top of the screen are buttons labeled Mark, Review, and Next. Any question you're not sure about, click Mark, then click Next and move on. If you click on Review, you'll see a screen like this:



Click [here](#) to view a larger image.

Here you can see every question you haven't answered, and every question you marked to come back to later. If you need to return to any question, you can click on that question on the review screen and you'll be brought right to it.

Why is all this so important? Because you can always move on. If you read a question and you don't immediately know what to do, move on. If a question seems particularly difficult, move on. If you start working through a question and realize you aren't getting any closer to the answer, move on. If you work through a question and the answer you got isn't among the answer choices, move on.

Your first pass is all of the easy questions. Your second pass is the harder questions, and these are the questions you're most likely to misread. Once you've read a question one way, it's hard to get your brain to read that question any other way. So if you're not sure what the question is asking, if you realize you're doing a lot more math than you normally do for GRE questions, or if you get an answer that isn't one of the answer choices, then move on. Do a couple other questions, give your brain a chance to shift gears, and then come back to it. Don't look back at your old scratch paper yet. Reread the question and take notes on your scratch paper as if it's the first time you've seen this question.

Any time you stall while working on a question, move on. Do not let yourself get stuck. Sitting and staring blankly at the computer screen does not help. Move to another question, and keep your hands moving.

QUESTION TYPES

There are four types of math questions on the GRE. Once you know how these questions work, you'll save yourself the time of rereading the instructions each time they appear. We're going to show you a sample problem for each question type. Don't worry if you don't know how to solve these yet; they are here mostly for you to see the format for each question type.

Multiple Choice

You've seen these questions before. You've probably answered them for most of your life. Multiple choice questions are questions which have five answer choices. You have to select one answer choice and then click Next.

The answer bubbles for these questions will always be round. Whenever a question has circular answer bubbles, you must select one and only one answer and then click Next to continue.

Get used to thinking of each answer choice as (A), (B), (C), (D), or (E). As soon as you see a multiple choice question, write down A B C D E vertically on the left side of your scratch paper.

Question 1 of 4

If c is the largest prime number smaller than 22, and d is the smallest prime number larger than 35, then $c + d =$

- 33
- 41
- 50
- 56
- 58

Here's How to Crack It

Since this is a multiple-choice question, write down the question number and A B C D E on your scratch paper. The question says that c is the largest prime number smaller than 22. Check each number smaller than 22, starting with 21. Is 21 prime? Nope. Neither is 20. 19 is prime, so 19 is the largest prime number that is still smaller than 22. Write down $c = 19$. Now try to find d . It must be larger than 35, and prime, so it can't be 36. The next number, 37, is prime, because the only numbers we can divide 37 by are 37 and 1, so write down $d = 37$. The question asks for $c + d$, which is $19 + 37 = 56$, answer (D).

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