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Study Guide for the *Mathematics: Proofs, Models, and Problems, Part I, Test*
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Chapter 1

Background Information on The Praxis Series™ Assessments
What Are The Praxis Series Subject Assessments?

The Praxis Series™ Subject Assessments are designed by Educational Testing Service (ETS) to assess your knowledge of specific subject areas. They are a part of the licensing procedure in many states. This study guide covers an assessment that tests your knowledge of the actual content you will be expected to teach once you are licensed. Your state has adopted The Praxis Series tests because it wants to confirm that you have achieved a specified level of mastery in your subject area before it grants you a license to teach in a classroom.

The Praxis Series tests are part of a national testing program, meaning that the test covered in this study guide is required in more than one state for licensure. The advantage of a national program is that if you want to move to another state, you can transfer your scores from one state to another. However, each state has specific test requirements and passing scores. If you are applying for a license in another state, you will want to verify the appropriate test and passing score requirements. This information is available online at www.ets.org/praxis/prxstate.html or by calling ETS at 800-772-9476 or 609-771-7395.

What Is Licensure?

Licensure in any area—medicine, law, architecture, accounting, cosmetology—is an assurance to the public that the person holding the license possesses sufficient knowledge and skills to perform important occupational activities safely and effectively. In the case of teacher licensing, a license tells the public that the individual has met predefined competency standards for beginning teaching practice.

Because a license makes such a serious claim about its holder, licensure tests are usually quite demanding. In some fields, licensure tests have more than one part and last for more than one day. Candidates for licensure in all fields plan intensive study as part of their professional preparation: some join study groups; others study alone. But preparing to take a licensure test is, in all cases, a professional activity. Because it assesses the entire body of knowledge for the field you are entering, preparing for a licensure exam takes planning, discipline, and sustained effort.

Why Does My State Require The Praxis Series Assessments?

Your state chose The Praxis Series Assessments because the tests assess the breadth and depth of content—called the “domain”—that your state wants its teachers to possess before they begin to teach. The level of content knowledge, reflected in the passing score, is based on recommendations of panels of teachers and teacher educators in each subject area. The state licensing agency and, in some states, the state legislature ratify the passing scores that have been recommended by panels of teachers.
What Do the Tests Measure?

The Praxis Series Subject Assessments are tests of content knowledge. They measure your understanding and skills in a particular subject area. Multiple-choice tests measure a broad range of knowledge across your content area. Constructed-response tests measure your ability to provide in-depth explanations of a few essential topics in a given subject area. Content-specific pedagogy tests, most of which are constructed-response, measure your understanding of how to teach certain fundamental concepts in a subject area. The tests do not measure your actual teaching ability, however. They measure your knowledge of a subject and of how to teach it. The teachers in your field who help us design and write these tests, and the states that require them, do so in the belief that knowledge of your subject area is the first requirement for licensing. Teaching combines many complex skills, only some of which can be measured by a single test. While the tests covered in this study guide measure content knowledge, your teaching ability is a skill that is typically measured in other ways; for example, through observation, videotaped practice, or portfolios.

How Were These Tests Developed?

ETS began the development of The Praxis Series Subject Assessments with a survey. For each subject, teachers around the country in various teaching situations were asked to judge which knowledge and skills a beginning teacher in that subject needs to possess. Professors in schools of education who prepare teachers were asked the same questions. These responses were ranked in order of importance and sent out to hundreds of teachers for review. All of the responses to these surveys (called “job analysis surveys”) were analyzed to summarize the judgments of these professionals. From their consensus, we developed guidelines, or specifications, for the multiple-choice and constructed-response tests. Each subject area had a committee of practicing teachers and teacher educators who wrote the specifications, which were reviewed and eventually approved by teachers. From the test specifications, groups of teachers and professional test developers created test questions that met content requirements and satisfied the ETS Standards for Quality and Fairness.

When your state adopted The Praxis Series Subject Assessments, local panels of practicing teachers and teacher educators in each subject area met to examine the tests and to evaluate each question for its relevance to beginning teachers in your state. This is called a “validity study” because local practicing teachers validate that the test content is relevant to the job. For the test to be adopted in your state, teachers in your state must judge that it is valid. During the validity study, the panel also provides a passing-score recommendation. This process includes a rigorous review to determine how many of the test questions a beginning teacher in that state would be able to answer correctly. Your state's licensing agency then reviewed the panel's recommendations and made a final determination of the passing-score requirement.

Throughout the development process, practitioners in the teaching field—teachers and teacher educators—participated in defining what The Praxis Series Subject Assessments would cover, which test would be used for licensure in your subject area, and what score would be needed to achieve licensure. This practice is consistent with how professional licensure works in most fields: those who are already licensed oversee the licensing of new practitioners. When you pass The Praxis Series Subject Assessments, you and the practitioners in your state will have evidence that you have the knowledge and skills required for beginning teaching practice.
Chapter 2

Introduction to the Mathematics: Proofs, Models, and Problems, Part 1, test

The Mathematics: Proofs, Models, and Problems, Part 1, test is designed for prospective secondary-school mathematics teachers. The test is designed to reflect current standards for knowledge, skills, and abilities in mathematics. Educational Testing Service (ETS) works in collaboration with teacher educators, higher education content specialists, and accomplished practicing teachers in the field of mathematics to keep the tests updated and representative of current standards.

This guide covers the Mathematics: Proofs, Models, and Problems, Part 1, test. This test is composed of four constructed-response questions; that is, you are asked to answer a question or group of questions by writing out your response. It is not accurate to call constructed-response tests essay tests, since your response will not be graded on the basis of how it succeeds as an essay. Instead, your constructed response will be graded on the basis of how well it demonstrates an understanding of the principles of mathematics and their appropriate application.

The Mathematics: Proofs, Models, and Problems, Part 1, test (0063) consists of four constructed-response questions that cover one or more of the ten content categories, grouped into five reporting categories, in the following proportions:

<table>
<thead>
<tr>
<th>Number and Format of Questions</th>
<th>Content Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 constructed-response questions:</td>
<td>I. Algebra and Number Theory</td>
</tr>
<tr>
<td>I. 2 problems (each 20% of total score)</td>
<td>II. Measurement, Geometry, and Trigonometry</td>
</tr>
<tr>
<td>II. 1 model (30% of total score)</td>
<td>III. Functions</td>
</tr>
<tr>
<td>III. 1 proof (30% of total score)</td>
<td>IV. Data Analysis, Statistics (without Calculus), and Probability</td>
</tr>
<tr>
<td>Note: Graphing calculator is required.</td>
<td>V. Matrix Algebra and Discrete Mathematics</td>
</tr>
</tbody>
</table>

Process Categories

Mathematical Problem Solving
Mathematical Reasoning and Proof
Mathematical Connections
Mathematical Representations
Use of Technology

Test takers have one hour to complete the test.

Please note that a graphing calculator is required for the test.

The test is not intended to assess your teaching skills but rather your knowledge in the major areas of mathematics.
How to Use This Study Guide

This study guide gives you instruction, practice, and test-taking tips to help you prepare for taking the Mathematics: Proofs, Models, and Problems, Part 1, test.

If you plan to take the Mathematics: Proofs, Models, and Problems, Part 1, test, you should turn to chapters 3, 4, 5, and 6 to

• review the topics likely to be covered on the test
• get tips on succeeding at constructed-response tests
• answer practice questions
• see the answers to the practice questions, along with explanations of those answers

So where should you start? All users of this study guide will probably want to begin with the following two steps:

Become familiar with the test content. Chapter 4 provides information on the study topics covered in the Mathematics: Proofs, Models, and Problems, Part 1, test.

Consider how well you know the content in each subject area. Perhaps you already know that you need to build up your skills in a particular area. If you’re not sure, skim over the chapter that covers test content, chapter 4, to see what topics it covers. If you encounter material that feels unfamiliar or difficult, mark the pages to remind yourself to spend extra time in these sections.

Also, all users of this study guide will probably want to end with these two steps:

Familiarize yourself with test taking. Chapter 3 answers frequently asked questions about constructed-response tests and how they are scored, with valuable tips on how to succeed on a test in this format. You can simulate the experience of the test by answering practice questions within the specified time limits. Choose a time and place where you will not be interrupted or distracted. For a constructed-response test, you can see sample responses that scored well, scored poorly, or scored in-between. By examining these sample responses, you can focus on the aspects of your own practice response that were successful and those that were unsuccessful. This knowledge will help you plan any additional studying you might need.

Register for the test and consider last-minute tips. Consult http://www.ets.org/praxis/index.html to learn how to register for the test, and review the checklist in chapter 7 to make sure you are ready for the test.

What you do between these first steps and these last steps depends on whether you intend to use this study guide to prepare on your own or as part of a class or study group.
Using this study guide to prepare on your own

If you are working by yourself to prepare for this test, you may find it helpful to fill out the Study Plan Sheet in appendix A. This worksheet will help you to focus on what topics you need to study most, identify materials that will help you study, and set a schedule for doing the studying.

Using this study guide as part of a study group

People who have a lot of studying to do sometimes find it helpful to form a study group with others who are preparing toward the same goal. Study groups give members opportunities to ask questions and get detailed answers. In a group, some members usually have a better understanding of certain topics, while others in the group may be better at other topics. As members take turns explaining concepts to each other, everyone builds self-confidence. If the group encounters a question that none of the members can answer well, the members can go as a group to a teacher or other expert and get answers efficiently. Because study groups schedule regular meetings, group members study in a more disciplined fashion. They also gain emotional support. The group should be large enough so that various people can contribute various kinds of knowledge, but small enough so that it stays focused. Often, three to six people is a good size.

Here are some ways to use this study guide as part of a study group:

**Plan the group’s study program.** Parts of the Study Plan Sheet in appendix A can help to structure your group’s study program. By filling out the first five columns and sharing the worksheets, everyone will learn more about your group’s mix of abilities and about the resources (such as textbooks) that members can share with the group. In the sixth column (“Dates planned for study of content”), you can create an overall schedule for your group’s study program.

**Plan individual group sessions.** At the end of each session, the group should decide what specific topics will be covered at the next meeting and who will present each topic. Use the topic headings and subheadings in the chapter that covers the topics for the test you will take.

**Prepare your presentation for the group.** When it’s your turn to be presenter, prepare something that’s more than a lecture. Write five to ten original questions to pose to the group. Practicing writing actual questions can help you better understand the topics covered on the test as well as the types of questions you will encounter on the test. It will also give other members of the group extra practice at answering questions.

**Take the practice test questions together.** The idea of the practice test is to simulate an actual administration of the test, so scheduling a test session with the group will add to the realism and will also help boost everyone’s confidence.
**Learn from the results of the practice test questions.** For each test, use chapter 6 as a guide to score each other’s responses. Then plan one or more study sessions based on the questions that group members got wrong. For example, each group member might be responsible for a question that he or she got wrong and could use it as a model to create an original question to pose to the group, together with an explanation of the correct answer modeled after the explanations in this study guide.

Whether you decide to study alone or with a group, remember that the best way to prepare is to have an organized plan. The plan should set goals based on specific topics and skills that you need to learn, and it should commit you to a realistic set of deadlines for meeting these goals. Then you need to discipline yourself to stick with your plan and accomplish your goals on schedule.