

Introduction

General Description

The Praxis Middle School Mathematics test (0069) is designed to assess the mathematical knowledge and skills that an entry-level teacher of middle school mathematics needs to possess. As listed in the *Middle School Mathematics (0069) Test at a Glance* (www.ets.org/Media/Tests/PRAXIS/taag/0069/glance.htm), the test addresses five content categories:

- I. Arithmetic and Basic Algebra
- II. Geometry and Measurement
- III. Functions and Their Graphs
- IV. Probability, Data Analysis and Statistics, and Discrete Mathematics
- V. Problem Solving Exercises

The test consists of two parts: Part A (67 percent of total score) and Part B (33 percent of total score). Part A consists of 40 multiple-choice questions. Each multiple-choice question contains four response options. You record your answer choice in the separate answer booklet by filling in the space corresponding to **A**, **B**, **C**, or **D**. No penalty is imposed for wrong answers (you merely score a zero for that test question). Part B consists of three short constructed-response questions. You are given 2 hours to complete the test. The individual parts of the test are not timed, so you may allot your time between Parts A and B as you choose.

Allocation of the Test Content

According to the *Middle School Mathematics (0069) Test at a Glance*, the content categories for the test and approximate number of questions and percentage of the test for each content category are as follows:

Allocation of the Test Content		
<i>Content Category</i>	<i>Approximate Number of Questions</i>	<i>Approximate Percent of Test</i>
Arithmetic and Basic Algebra	12	20%
Geometry and Measurement	10	17%
Functions and Their Graphs	8	13%
Data, Probability, and Statistical Concepts; Discrete Mathematics	10	17%
Problem Solving Exercises	3	33%

In addition to mathematical knowledge and skills, the Praxis Middle School Mathematics test assesses five process categories: Mathematical Problem Solving, Mathematical Reasoning and Proof, Mathematical Connections, Mathematical Representation, and Use of Technology. These process categories refer to the ways through which mathematical knowledge is acquired and used. The first four process categories are adopted from the National Council of Teachers of Mathematics (NCTM) *Principles and Standards for School Mathematics* (2000–2004) process standards and are as described here:

Problem Solving (<http://standards.nctm.org/document/chapter3/prob.htm>)

- Build new mathematical knowledge through problem solving.
- Solve problems that arise in mathematics and in other contexts.
- Apply and adapt a variety of appropriate strategies to solve problems.
- Monitor and reflect on the process of mathematical problem solving.

Reasoning and Proof (<http://standards.nctm.org/document/chapter3/reas.htm>)

- Recognize reasoning and proof as fundamental aspects of mathematics.
- Make and investigate mathematical conjectures.
- Develop and evaluate mathematical arguments and proofs.
- Select and use various types of reasoning and methods of proof.

Connections (<http://standards.nctm.org/document/chapter3/conn.htm>)

- Recognize and use connections among mathematical ideas.
- Understand how mathematical ideas interconnect and build on one another.
- Recognize and apply mathematics in contexts outside of mathematics.

Representation (<http://standards.nctm.org/document/chapter3/rep.htm>)

- Create and use representations to organize, record, and communicate mathematical ideas.
- Select, apply, and translate among mathematical representations to solve problems.
- Use representations to model and interpret physical, social, and mathematical phenomena.

The description of the fifth process category as given in the *Middle School Mathematics (0069) Test at a Glance* is as follows:

Use of Technology

- Use technology appropriately as a tool for problem solving.
- Use technology as an aid to understanding mathematical ideas.

The process categories are integrated into the content questions. This circumstance means that you will not be asked explicit questions about the process categories, but rather you will be expected to use one or more of the processes in answering questions on the test.

Scoring of the Test

Educational Testing Service (ETS) does not release the exact details of the way the Praxis Middle School Mathematics test is scored. According to the *Middle School Mathematics (0069) Test at a Glance*, the multiple-choice part of the test is weighted 67 percent of the total score, and the short constructed-response part of the test is weighted 33 percent of the total score. Each short constructed response receives a score of 0 to 3 based on the following criteria:

- Correctly answered all parts of the question
- Gave a complete and full explanation for answers
- Demonstrated a strong understanding of the mathematical content relevant to the question
- Demonstrated a complete understanding of the most important aspects of any stimulus material provided

Your raw point score is obtained using a weighted formula, and then it is converted to a scaled score that adjusts for the difficulty level of the particular edition of the test that you took. Your score report for the test will show a scaled score ranging from 100 to 200. Read *Understanding Your Praxis Scores* (www.ets.org) for more information about the scoring of the test.

Calculators

You are allowed to bring a graphing calculator or a four-function scientific calculator to use while taking the Praxis Middle School Mathematics test. The testing company suggests that a graphing calculator could provide an advantage over a scientific calculator on certain questions, so you should plan to bring a graphing calculator to the test. *Note:* You must bring your own calculator because none will be provided at the test center.

You are *not* allowed to bring calculators with QWERTY keyboards (for example, TI-92 PLUS, Voyage 200); cell-phone calculators; minicomputers including powerbooks and portable/handheld computers; electronic writing pads or other pen-input/stylus-driven devices; or models that print, make noise, or require an electrical outlet.

Currently (in 2008) test administrators do not clear the memory of test takers' calculators before the test starts. You can find more information on the testing company's calculator use policy for Praxis tests at www.ets.org/praxis/prxcalc.html.

The Role of the Praxis Middle School Mathematics Test in Teacher Certification/Licensure

The Praxis Middle School Mathematics test is one of the Praxis II Series subject assessment tests designed by ETS. The Praxis II tests are part of a national teacher assessment program and are used as part of the certification or licensing requirements in about 80 percent of the states. This means that you can transfer your score on the Praxis Middle School Mathematics test from state to state for those states that use it as a subject area assessment test.

If your state has selected the Praxis Middle School Mathematics test to assess middle school teacher candidates' mathematical knowledge and skills, then this *CliffsNotes* book will be invaluable in helping you achieve the passing score for your state. Test scores needed to obtain certification vary from state to state because each state sets its own passing score. ETS maintains a listing by state of links to test requirements for those states that require the Praxis II subject assessment tests for certification at www.ets.org/praxis/prxstate.html. ETS also publishes the most recent information it has regarding passing score requirements in a pamphlet titled *Understanding Your Praxis Scores* (www.ets.org/Media/Tests/PRAXIS/pdf/09706PRAXIS.pdf) and in a summary document *The Praxis Series Passing Scores* (www.ets.org). The following is a list of states that require the Praxis Middle School Mathematics test along with the current score (in 2008) as given in *The Praxis Series Passing Scores* that is needed to obtain certification in each state:

Alabama—149	Maryland—152	Pennsylvania—151
Alaska—145	Minnesota—152	Rhode Island—158
Connecticut—158	Mississippi—140	South Carolina—149
Delaware—148	Missouri—158	South Dakota—140
Hawaii—143	Nevada—139	Tennessee—143
Idaho—145	New Hampshire—151	Vermont—161
Indiana—156	New Jersey—152	Virginia—163
Kansas—158	North Carolina—141	Washington—152
Kentucky—148	North Dakota—148	West Virginia—148
Louisiana—148	Ohio—143	Wyoming—152
Maine—148	Oregon—156	

Questions Commonly Asked About the Praxis Middle School Mathematics Test

Q. What is the Praxis Middle School Mathematics test?

A. The Praxis Middle School Mathematics test is a Praxis II Series subject assessment test. Currently, it is used by 32 states as part of their teacher certification/licensure requirements.

Q. Who administers the Praxis Middle School Mathematics test?

A. The Praxis Middle School Mathematics test is administered by Educational Testing Service (ETS).

Q. When and where is the Praxis Middle School Mathematics test given?

A. Currently, Praxis II Series tests, including the Praxis Middle School Mathematics test, are administered seven times a year (usually in September, November, January, March, April, June, and July or August) at locations throughout the United States. You can find information on test dates, site locations, fees, registration procedures, and policies in the current *The Praxis Series Information and Registration Bulletin (Registration Bulletin)*, which you can download at www.ets.org/Media/Tests/PRAXIS/pdf/01361.pdf.

Q. How do I register to take to the test?

A. You can register online using a credit/debit card at the Praxis Website (www.ets.org/praxis) from 7 A.M. to 10 P.M. (EST), Monday through Friday; or Saturday, 7 A.M. through Sunday, 8 P.M. (EST).

You can register by mail by downloading the registration form available on the Praxis Website and then mailing the completed form to ETS-The Praxis Series, Box 382065, Pittsburgh, PA 15251–8065.

Q. Are special testing arrangements available?

A. If you have a disabling condition (visual, physical, hearing, or so on), special testing arrangements and test materials can be made available for you. Complete the registration form and follow the instructions at www.ets.org/praxis/prxdsabl.html.

If you are unable to take the test on Saturdays because of your religious convictions or because of duties as a member of the U.S. armed forces, you can request a Monday testing day by following the instructions in the *Registration Bulletin*. A copy of your military duties or a letter from your clergy on the clergy's letterhead, verifying the religious basis for your request, must be included with your registration application.

If your primary language is not English, you can request extended testing time by following the instructions in the *Registration Bulletin*.

You should write your name and contact information on all correspondence to ensure proper handling of your documentation. Don't forget to make copies of everything before you mail it.

Q. May I change my registration if I need to?

A. Yes, you may change tests, test sites, or transfer registration to a later test date by completing the appropriate forms, which you can download from the Praxis Website (www.ets.org/praxis). For test and test center changes, the form must be received by the late registration deadline. For test date changes, the form must be received within two weeks after your original test date. The current fee (in 2008) for this service is \$45.

Q. What is the fee for the test?

A. The current fee (in 2008) for regular registration is \$90. The fee for late registration is an additional \$45 charge.

Q. What should I bring to the test site?

A. After you mail in your registration form, you should receive an admission ticket by one week before your scheduled test date. If you have not received your admission ticket by this time or if you have lost your admission ticket, contact Praxis Customer Service at 1-800-772-9476 or through email on its Website. If you register online, you must print your admission ticket. Your admission ticket will include your name, the tests you are registered to take, the test date, the test site address, and the reporting time. Check the information on your admission ticket to make sure that it is correct. You will not be allowed to make changes at the test site.

The day of the test, you should bring your admission ticket, a valid form of photo and signature identification (for example, driver's license or military identification), your graphing calculator, several sharpened, Number 2, soft lead pencils, a good eraser, a blue or black ink pen, and a watch to help pace yourself during the exam. Mechanical pencils cannot be used. No personal items such as handbags, cell phones, or study materials or other aids will be permitted in the testing room.

Q. Is the Praxis Middle School Mathematics test divided into timed sections?

A. No, you have two hours to complete both parts of the test: the 40 multiple-choice test items and the three short constructed-response questions. The testing company recommends that you plan to spend about 80 minutes on the 40 multiple-choice questions and about 40 minutes on the constructed response questions. Nonetheless, you may allot your time between the two parts as you choose as long as you stay within the two-hour timeframe.

Q. What is the passing score?

A. The passing score varies from state to state. Check the list of states and their passing score requirements given earlier in this chapter. You also should check with your preparation institution regarding the passing score in your state.

Q. When will I get my score report?

A. Your score report will be mailed approximately four weeks after the test administration date.

Q. How should I prepare?

A. If you have reached the point at which you need to test for certification/licensure, using this test prep book is your best preparation. This study guide gives you insights, reviews, and strategies for the question types. Some universities offer preparation programs to assist you in attaining a passing score. Check with them for further information.

Q. How do I get more information about the Praxis Middle School Mathematics test?

A. Check the Praxis Website (www.ets.org/praxis). If new information on the Praxis Middle School Mathematics test becomes available, it will be posted on this site.

How to Use This *CliffsNotes* Book

The review for the Praxis II Middle School Mathematics test in this CliffsNotes book is designed around the five content categories that are assessed on the test: Arithmetic and Basic Algebra, Geometry and Measurement, Functions and Their Graphs, Probability, Data Analysis and Statistics, Discrete Mathematics, and Problem Solving Exercises.

Three full-length practice tests follow the review chapters. Complete answer explanations are provided after each of the practice tests.

When you read through the list of content categories that are assessed on the Praxis Middle School Mathematics test, you may feel overwhelmed by the task of preparing for the test. Here are some suggestions for developing an effective study program using this book.

1. Set up a regular schedule of study sessions. Try to set aside approximately two hours for each session. If you complete one session per day (including weekends), it should take you about 4 to 6 weeks to work your way through the review and practice material provided in this book. Of course, if your test date is coming up soon, you might need to lengthen your study time per day.
2. Reserve a place for studying where you will have few distractions, so that you can concentrate. Make sure that you have adequate lighting and a room temperature that is comfortable—not too warm or too cold. Be sure that you have an ample supply of water to keep your brain hydrated, and you might also want to have some light snacks available. To improve mental alertness, choose snacks that are high in protein and low in carbohydrates (for example, nuts). Gather all the necessary study aids (paper, pencils, note cards, and so on) beforehand. Let your voicemail answer your phone during your study time.
3. Take Practice Test 1 before you begin reading the review material to help you discover your strengths and weaknesses. Read the answer explanations for all the questions, not just the ones you missed, because you might have gotten some of your correct answers by guessing. Make a list of the content categories with which you had the

most problems. Plan your study program so that you can spend more time on content categories that your Practice Test 1 results indicate are weak areas for you. For instance, if you did very well in arithmetic and basic algebra, but poorly in geometry and measurement, then you should plan to spend more time studying the review material on geometry and measurement.

- Carefully study the review of the test areas in Part II of this book to refresh your memory about the key ideas for each of the content categories, being sure to concentrate as you go through the material. Work through the examples and exercises and make sure you understand them thoroughly.
- Make flashcards to aid you in memorizing key definitions and formulas and keep them with you at all times. When you have spare moments of time, take out the flash cards and go over the information you've recorded on them. This is a particularly important strategy for the Praxis II Middle School Mathematics test because *no notation, definitions, and formulas sheet is provided for your reference during the test.*
- Take several brief 2- to 3-minute breaks during your study sessions to give your mind time to absorb the review material you just read. According to brain research, you remember the first part and last part of something you've read more easily than you remember the middle part. Taking several breaks will allow you to create more beginnings and endings to maximize the amount of material you remember. It's best not to leave your study area during a break. Try stretching, closing your eyes for a few minutes, or getting a quick drink or snack.
- Periodically review material you have already studied to reinforce what you have learned and to help you identify topics you might need to restudy.
- When you complete your first review, take Practice Test 2. Use a timer and take the test under the same conditions you expect for the actual test, being sure to adhere to the 2-hour time limit for the test. When you finish taking the test, as you did for Practice Test 1, carefully study the answer explanations for *all* the questions. Then, go back and review again any topics in which you performed unsatisfactorily.
- When you complete your second review, take Practice Test 3 under the same conditions you expect for the actual test, adhering to the 2-hour time limit. When you finish taking the test, carefully study the answer explanations for *all* the questions and do additional study, if needed.
- Organize a study group, if possible. A good way of learning and reinforcing the material is to discuss it with others. If feasible, set up a regular time to study with one or more classmates or friends. Take turns explaining how to work problems to each other. This strategy will help you to clarify your own understanding of the problems and, at the same time, help you discover new insights into how to approach various problems.

After completing your study program, you should find yourself prepared and confident to achieve a passing score on the Praxis Middle School Mathematics test.

How to Prepare for the Day of the Test

There are several things you can do to prepare yourself for the day of the test.

- Know how to get to the test center and how to get into the room where you will be testing at the test center.
- Make sure you have dependable transportation that will get you to the test center and that you know where you should park (if you plan to go by car).
- Keep all the materials you will need to bring to the test center—especially, your admission ticket and identification—in a secure place, so that you easily can find them on the day of the test.
- The night before the test, try to get a good night's rest. Avoid taking nonprescription drugs or consuming alcohol as the use of these products might impair your mental faculties on test day.
- On the day of the test, get to the testing center early—at least 30 minutes before your test is scheduled to begin.
- Dress in comfortable clothing and wear comfortable shoes. Even if it is warm outside, wear layers of clothing that can be removed or put on, depending on the temperature in the test center.
- Eat a light meal. Select foods that you have found usually give you the most energy and stamina.
- Drink plenty of water to make sure that your brain remains hydrated during the test for optimal thinking.
- Put fresh batteries in your calculator just before you leave to go to the testing center.
- Make a copy of this list and post it in a strategic location. Check over it before you leave for the testing center.

Test Taking Strategies for the Praxis Middle School Mathematics Test

Here are some general test-taking strategies to help maximize your score on the test:

1. When you receive the test, briefly close your eyes, breathe in and out slowly, and mentally visualize yourself working through the test successfully.
2. During the test, read and follow all the directions. If you do not understand something in the directions, ask the test administrator for clarification.
3. Work through the test at a steady pace. Part I of the test consists of 40 multiple-choice items. As you begin the test, skim through the booklet to find multiple-choice question 20, mark this question as an approximate one-third-of-the-way point. When you get to question 20, check your watch to see how much time has passed. If more than 40 minutes have gone by, you will need to pick up the pace. Otherwise, continue to work as rapidly as you can without being careless, *but do not rush*.
4. Try to work the problems in order. Skipping around can waste time and might cause mistakes on your answer sheet. However, if a question is taking too much of your time, place a large check mark next to it in the test booklet (*not* on the answer booklet), mark your best guess in the answer booklet, and move on.
5. Read each question entirely. Skimming to save time can cause you to misread a question or miss important information.
6. Write in the test booklet. Mark on diagrams, draw figures, underline or circle key words or phrases, and do scratch work in the test booklet. Remember, however, to mark your answer choice in the separate answer booklet. Answers marked only in the test booklet are not scored.
7. Don't read too much into a question. For instance, don't presume a geometric figure is drawn accurately or to scale.
8. Use your calculator, but use it wisely. Keep in mind that graphing calculators are powerful tools, but they can make errors. See the discussion about graphing calculators that follows this section.
9. Be sure you are answering the question asked. Circle or underline what you are being asked to find, to help you stay focused on it.
10. Read all the answer choices before you select an answer. You might find an answer that immediately strikes you as correct, but this determination might have occurred because you jumped to a false conclusion or made an incorrect assumption.
11. Eliminate as many wrong choices as you can. Estimate the answer to help you decide which answers are unreasonable.
12. Change an answer only if you have a good reason to do so. Be sure to completely erase the old answer choice before marking the new one.
13. If you are trying to recall information during the test, close your eyes and try to visualize yourself in your study place. This might trigger your memory.
14. Remain calm during the test. If you start to feel anxious, briefly close your eyes, breathe in and out slowly, and mentally visualize yourself in a peaceful place, to help you relax.
15. Record your answers to the multiple-choice items in the answer booklet carefully. This part of the test is scored electronically, so it is critical that you mark your answer booklet accurately. As you go through the test questions, circle the letters of your answer choice in the test booklet. Then mark those answers in the answer booklet in bunches of 5 to 10 (unless time is running out, at which point you should start marking answers one by one).
16. Even though the testing company recommends that you spend only 40 minutes working the constructed-response questions, try to save at least 45 minutes for this part of the test—because it counts 33 percent of your test score.
17. Be sure you answer all parts of each constructed-response question and that you give complete and full explanations for your answers.
18. Before turning in your answer booklet, check that you have marked an answer for every multiple-choice test question. You are not penalized for a wrong answer (you merely score a zero for that test question), so even if you have no clue about how to work the problem, make a guess.

19. Before turning in your answer booklet, erase any stray marks in the answer booklet and brush off any loose eraser dust.
20. As you work through the practice tests provided in this book, consciously use the strategies suggested in this section as preparation for the actual Praxis Middle School Mathematics test. Try to reach the point where the strategies are automatic for you.

Graphing Calculators and the Praxis Middle School Mathematics Test

Because you likely will be bringing a graphing calculator to use when you take the Praxis Middle School Mathematics test, you should have your calculator on hand and use it, when needed, to work problems in the review material and practice tests in this book. Select a calculator that you will feel comfortable using. Don't purchase a high-powered calculator that will require an investment of your time to learn while you are preparing for the test. In this book, we use the TI-83 calculator to show special features of graphing calculators.

A word of caution: Graphing calculators are very powerful tools, but you should be aware that they can make errors!

One situation in which errors might occur is when the calculator is finding the roots or zeros of a high-degree polynomial (for example, a polynomial of degree eight). The algorithm that the calculator uses to find the roots of the polynomial forces the calculator to round numbers to a certain number of decimal places before the final result is obtained, thus yielding inaccurate answers.

Another situation in which errors commonly occur is when the calculator is drawing the graph of a function. Your choice of viewing window dimensions can give results that are visually very misleading. For instance, you can be led to believe that a function has only two zeros when, in fact, it has three zeros. Changing the dimensions for the viewing window can clear up the problem in most cases; however, not every time.

The point of this discussion is to make you aware that such mistakes can happen. Therefore, you should use your mathematical expertise to evaluate all your calculator's answers for reliability and accuracy.

You will benefit greatly from this *CliffsNotes* book. By using the recommendations in this chapter as you complete your study program, you will be prepared to walk into the testing room with confidence. Good luck on the test and on your new career as a middle school mathematics teacher!