
Introduction

ABOUT THE SAMPLE EXAM

The sample examination contained in this book is designed to be representative of the NCEES PS examination in subject matter, level of difficulty, length, and question type. The realistic review it provides will allow you to evaluate your level of preparedness, and will make you familiar with the examination process. If you can comfortably pass this sample exam, you should be able to pass the actual exam.

Solutions for each sample problem are also provided to help you evaluate your approach.

ABOUT THE ACTUAL EXAM

In most of the United States, requirements for registration as a surveyor include passage of two written exams. The exams are administered twice a year (usually in mid-April and late October) over the same two days in all states. The FS exam, a standardized test prepared by the NCEES, is typically a requirement for the Surveyor-In-Training or Surveying Intern registration. For those who have passed the FS exam and are ready to fulfill the requirements for full registration as a surveyor, the NCEES also offers an exam on the principles and practice of surveying. The PS exam is a portion of the first exam day in many states, with the remainder of the day devoted to surveying practice and regulations specific to the state. Some states elect to have a third day for local exams. To ensure their reliability and validity, the NCEES exams are based on input from committees of professional surveyors throughout the United States.

Although prepared by the NCEES, the exams are administered by the various state licensing boards. The boards typically require of exam candidates a certain level of education and experience. For information regarding requirements or to apply for licensure, contact the appropriate board. Current addresses and phone numbers for each state board may be obtained at the Professional Publications website (www.ppi2pass.com).

Exam Format

The NCEES PS exam consists of 100 problems split into a four-hour section containing 67 questions, followed by a two-hour section containing 33 questions

after a one-hour break. This open-book exam tests a candidate's ability to apply the principles of surveying to analysis of typical problems from surveying practice. Machine scored sheets are provided for recording answers.

The exam content is subject to change. Consult the Professional Publications website (www.ppi2pass.com) for the most current exam specifications.

Exam Content

Reflecting the changing requirements of professional practice, the NCEES made significant changes in the PS examination. The examination now covers five major knowledge areas instead of seven and places greater emphasis than previous examinations on legal principles, business practices including ethics, and survey standards. The specific subjects within each knowledge area and the approximate percentage of the exam from each area are as follows.

I. standards and specifications (15%)

1. federal statutes, laws, rules, and regulations
2. U.S. Public Land Survey System
3. U.S. National Map Accuracy Standards
4. ALTA/ACSM surveys
5. geodetic control network and mapping accuracy standards
6. FEMA

II. legal principles (25%)

1. common/case law boundary principles
2. sequential and simultaneous conveyances
3. U.S. Public Land System
4. controlling elements in legal descriptions
5. riparian and littoral rights
6. property title issues (e.g., encumbrances, interpretation, deficiencies)
7. sovereign land rights (e.g., navigable waters, eminent domain)
8. prescriptive rights/adverse possession
9. easement rights
10. parol evidence

III. professional survey practices (30%)

1. research (8%)
 - (a) public/private record sources
 - (b) project planning (e.g., photogrammetric, geodetic, boundary)
 - (c) control datums and easement rights
 - (d) control network accuracy standards
2. field procedures (8%)
 - (a) instrument operations and usage
 - (b) monumentation (e.g., identification, classification, perpetuation)
 - (c) survey control (e.g., boundary, topographic, photogrammetric)
 - (d) GPS operations
 - (e) construction staking
3. calculations and compilations (7%)
 - (a) mapping methods and/or projections
 - (b) graphic terrain representations
 - (c) geoid, ellipsoid, and orthometric heights
 - (d) state plane coordinate systems
 - (e) GPS data reduction and analysis
 - (f) control network calculations, analysis, and adjustments
 - (g) determination of bearings/azimuths
 - (h) area/volume calculations
 - (i) horizontal and vertical alignment calculations
 - (j) construction staking calculations (e.g., plan interpretation)
4. documentation (7%)
 - (1) survey maps/plats
 - (2) survey reports
 - (3) descriptions

IV. business/professional practices (15%)

1. project planning (e.g., parameters, costs)
2. contracts
3. risk management (e.g., liability, safety procedures, insurance)
4. ethics
5. communications (oral, written, graphical)
6. quality assurance procedures

V. types of surveys (15%)

1. ALTA/ACSM surveys
2. control and geodetic surveys
3. construction surveys (e.g., construction calculations and staking)
4. boundary surveys

5. route and right-of-way surveys
6. topographic surveys by field methods
7. topographic surveys by photogrammetry

The exam content is subject to change. Consult the Professional Publications website (www.ppi2pass.com) for the most current specifications.

Typical Question Format

The PS exam tests your ability to apply the fundamentals in typical problems encountered in surveying practice. For example, a series of land descriptions from deeds might be provided, followed by a multiple-choice question that would require you to analyze the descriptions and indicate how you would establish certain boundaries or corner positions, or how you would treat encroachments.

Exam Scoring

The PS exam is not graded on a curve, since a certain minimum competency must be demonstrated to safeguard the public welfare. Nevertheless, it is recognized that the tests may vary slightly in difficulty, depending upon the questions selected for a particular exam. Therefore, questions are reviewed by committees of practicing surveyors before the examinations take place. These committees evaluate the difficulty of each question in order to develop a “standard of minimum competency,” or recommended passing score for each exam. However, the individual state boards have the authority to determine the passing score in their respective states.

In the grading process, credit is given for each correct answer, with no points deducted for incorrect answers. The sum of the correct answers is scaled so that the grade of 70 reflects the standard minimum competency.

Use of Calculators and Computers in the Exam

The exam requires use of a scientific calculator. NCEES has banned communicating and text-editing calculators from the exam site. Only select types of calculators are permitted. Check the current list of permissible devices at the Professional Publications website (www.ppi2pass.com). Nomographs and specialty slide rules are permitted. Laptop and palmtop computers are generally not permitted. Communication devices such as cell phones are not permitted. Contact your state board for rules specific to your state.

For most problems, a basic scientific calculator will suffice as long as it has trigonometric functions, pi, square root, square, logarithms, and standard deviation. In addition, it is helpful to have functions for converting degrees, minutes, and seconds to decimal degrees, and for performing economic analysis.

Permitted Reference Material

The PS examination is “open book.” Therefore, you may use textbooks, handbooks, and bound reference materials, although you may not share books with other examinees in the room. Generally, you can use personal notes bound in a three-ring notebook. However, loose paper and scratch pads are not permitted. Since specific requirements may vary with individual state boards, you should contact your state board for rules specific to your state. A few states prohibit the use of published collections of solved problems. Those states typically maintain a list of such banned books.

Cheating and Exam Subversion

The proctors for this exam are well trained in enforcing the regulations regarding misuse of reference materials and other types of cheating. Obviously, you should not talk to other examinees in the room during the examination, nor should you pass notes back and forth. Typically, the number of people released to use the rest rooms at any given time during the exam may be restricted, to prevent discussions.

The NCEES regularly reuses good problems that have appeared on previous exams. Therefore, security is a serious issue for the NCEES, which goes to great lengths to prevent problem copying. You may not keep your exam booklet at the end of the day, enter text of problems into your calculator, or copy problems onto your own materials.

The proctors are especially concerned about exam subversion, which generally means any activity that might invalidate the exam or the examination process. The most common form of exam subversion involves attempts at copying exam problems for future use.

PREPARATION FOR THE EXAM

Plan Your Attack

Preparation for the licensure exam should be considered a long-term project, worthy of careful planning. As currently structured, the exam is comprehensive and fast paced. Rapid recall, discipline, stamina, and mastery of all areas to be covered are essential elements for success on the exam. Development of these may require months of preparation in addition to the years of academic study and work practice necessary to qualify for the exam. Therefore, it is important to plan and prepare for the exam as you would for a large surveying and mapping project. A rigid review schedule should be established and followed. Use the following preparation steps as a guide.

1. Review the listing of exam subject areas, given in the Exam Content section of this preface, to gain insight into the nature and content of the exam.
2. Review a good reference book or two on each major subject area. It's a good idea to prepare a concise outline as you work through each area, for future reference. Consider adhering to a rigorous review schedule. This will help you develop the discipline and stamina necessary to do well on the exam.
3. For any areas in which you are not comfortable with your knowledge level, read additional reference materials as you work through each chapter. Tabbing pages that contain frequently used or hard-to-find information will give you quick access to such information when you need it during the exam or during the review process. For problem areas, you may consider taking continuing education courses in those topics.
4. Take the sample exam contained in this book.
5. Work on any weak areas detected by the sample exam.
6. Conduct a final review of your notes.

Learning to use your time wisely is one of the most important things you can do during your review. You will undoubtedly encounter review problems that end up taking much longer to solve than you expected. In some instances, you may cause your own delays by spending too much time looking through books for things you need. At other times, the problems will just entail too much work. Learning to recognize such situations will help you make intelligent decisions about problems during the exam.

Additional Reference Materials

Numerous texts are available that cover various aspects of the principles and practice of surveying. The following are several of the author's personal favorites, which offer coverage of the areas to be tested on the exam.

Legal Principles

Brown, Curtis A., Walter G. Robillard, and Donald A. Wilson. *Brown's Boundary Control and Legal Principles*. John Wiley & Sons.

Bureau of Land Management. *Manual of Instruction for Surveys of Public Lands*. Government Printing Office.

Cole, George M. *Water Boundaries*. John Wiley & Sons.

Robillard, Walter G., Donald A. Wilson, and Curtis M. Brown. *Evidence and Procedures for Boundary Location*. John Wiley & Sons.

Wattles, William C., and Gurdon Wattles. *Survey Descriptions*. Wattles Publications.

Measurement and Computation Theory and Practice

Anderson, James M., et al. *Surveying Theory and Practice*. McGraw-Hill.

Bureau of Land Management. *Manual of Instruction for Surveys of Public Lands*. Government Printing Office.

Cole, George M. *Water Boundaries*. John Wiley & Sons.

Harbin, Andrew L., and George M. Cole. *Surveyor Reference Manual*. Professional Publications.

Hickerson, Thomas Felix. *Route Location and Design*. McGraw-Hill.

Stem, James E. *State Plane Coordinate System of 1983*. NOAA Manual NOS, NGS.

Wolf, Paul R., and Charles D. Ghilani. *Adjustment Computations*. John Wiley & Sons.

Geodesy (including GPS) and Survey Astronomy

Buckner, R. B. *A Manual on Astronomic and Grid Azimuth*. Landmark Enterprises.

Smith, James R. *Introduction to Geodesy*. John Wiley & Sons.

Van Sickle, Jan. *GPS for Land Surveyors*. Ann Arbor Press.

Geographic Information Systems and Photogrammetry

Clarke, Keith C. *Getting Started with Geographic Information Systems*. Prentice Hall.

Wolf, Paul R., and Bon A. Dewitt. *Elements of Photogrammetry*. McGraw-Hill.

Land Development

Colley, Barbara C. *Practical Manual of Land Development*. McGraw-Hill.

The Dewberry Companies. *Land Development Handbook*. McGraw-Hill.

Business Law, Management, Economics, and Finance

Denny, Milton E. *Surveyors and Engineers Small Business Handbook*. CED Technical Services.

Lindeburg, Michael R. *Engineering Economic Analysis*. Professional Publications.

Last-Minute Preparation

A week or so before the exam, you should conduct an intensive review of the outlines prepared during your review. However, do not attempt to cram during the last night before the exam.

During the last week or so before the exam, make arrangements for child care and transportation. Since the exam does not always start or end at the designated time, make sure such arrangements are flexible. If it is convenient, visit the examination site to locate the building, parking areas, examination rooms, and rest rooms.

You should always take a backup calculator to the exam. If your spare calculator is not the same type as your primary one, spend some time familiarizing yourself with its functioning. Make sure that you have correct-sized replacement batteries for both calculators. In addition, you should prepare a kit of items and reference materials to be taken to the examination.

Schedule a vacation from your job on the day before the exam so you can relax. A day off and a good night's sleep is the best way to start the exam. If you live a considerable distance from the examination site, consider getting a hotel room nearby in which to spend the night. Calculate your wake-up time and set two alarms. Select and lay out your clothing and breakfast items, and make sure you have gas in your car and money in your wallet.

TAKING THE EXAM

What to Take to the Exam

In addition to your review, another important aspect of exam preparation is the selection of materials to be taken to the exam. There are a number of documents, tools, and personal comfort items you should pack in your exam kit. The following is a list of suggestions.

- letter admitting you to the exam
- photo identification (such as driver's license)
- eyeglasses
- primary calculator
- spare calculator
- spare batteries for calculators
- ruler and protractor
- unobtrusive snacks or candies
- travel pack of tissues
- handkerchief
- headache remedy
- several dollars in change
- light jacket or sweater
- wristwatch with alarm

For the PS exam, which is open book, you will also need to take reference materials and books. You actually won't use many books during the exam; however, you won't know in advance which ones you'll need. That's why many examinees show up with boxes and boxes of books. But in this very fast-paced exam, you won't have time to use books with which you are not thoroughly familiar, so bring only books with which you are intimately familiar. Typically, five or six reference books such as those previously listed will be sufficient for most of the problems you'll encounter.

As a final touch, take along the morning newspaper to read while waiting for the exam to begin. You should not take your cell phone to the examination. At the very least, be sure to turn it off before the exam begins.

What to Do During the Exam

Arrive at least 30 minutes before the exam is scheduled to start. This will allow time for finding a convenient parking place, getting your materials into the examination room, finding a good seat, and calming down. Be prepared, though, to find that the exam room is not open or ready at the designated time. Once you have arranged your materials on your table, take out your morning newspaper and look cool.

All of the procedures typically associated with timed, proctored, computer-graded assessment tests will be in effect when you take your licensure examination. The proctors will distribute the examination booklets and answer sheets. However, you should not open the booklets until instructed to do so.

Listen carefully to everything the proctors say. Do not ask the proctors any surveying questions. Even if knowledgeable in surveying, they are not permitted to answer your questions. They will guide you through the process of writing your name and other biographical information on the material. Time allotted for instructions and for initializing the answer sheets is not part of the timed exam period.

The common instructions to completely fill the bubbles and erase completely apply here. The NCEES provides each examinee with a mechanical pencil with an eraser. To ensure that you receive proper credit, fill in all your responses on the answer sheet with a dark pencil mark.

All the questions on the exam are worth the same number of points, so it's a good idea to answer every question you can within a reasonable time before attempting to solve problems that will take a disproportionate amount of time. If time allows, you can go back to those difficult problems after you have answered all of the "easy" questions.

Many points are lost due to carelessness. Therefore, it is a good idea to read each question twice before solving.

Check to make sure that you've used all of the given data and made the appropriate unit conversions. While the exam questions are not tricky, you may find that answers using commonly made mistakes are represented among the available answer choices. Thus, just because there is an answer choice that matches your result, it does not mean that you have obtained the correct result.

The PS exam is multiple choice with credit given for correct answers. No credit is deducted for wrong answers. Therefore, it is in your best interest to answer each question. It is a good idea to set your wristwatch alarm for five minutes before the end of each session and use that time to guess at all of the remaining unsolved multiple-choice problems. You will be successful with about 25% of your guesses, and those points will more than make up for the few points you might earn by working during the last five minutes.

If you finish the exam early and there are still more than 30 minutes remaining, you will be permitted to leave the room. If you finish less than 30 minutes before the end of the exam, you may be required to remain until the end in consideration of the people who are still working. You will not be permitted to keep your examination booklet for later review. When you leave, you must return it to the proctors.

After the Exam

People react quite differently to the examination experience. Some are energized and need to unwind by talking with other examinees, describing every detail of their experience, and dissecting every examination question. However, most are completely exhausted and need a lot of quiet space and a hot tub in which to soak and sulk. Since everyone who took the exam has seen it, you will not be violating your "oath of silence" if you talk about the details with other examinees. It is difficult not to ask how someone else approached a problem that had you completely stumped. However, it is also very disquieting to think you did well on a problem, only to have someone else tell you where you went wrong.

Waiting for your exam results is its own form of mental torture. There is no predictable pattern to the release of the results. They are not released by NCEES to all states simultaneously. They are not released alphabetically by state or examinee name. The people who failed are not notified first or last. Your coworker might receive his or her notification today, and you might have to wait another three weeks. It all depends on when the entire process is completed. Some states are required to have the results approved at a board meeting. Some prepare certificates before sending out notifications. Some states are more highly automated than others. The number of examinees also varies from state

to state, and so do numerous other factors. Therefore, you'll just have to wait patiently.

You will typically receive your results within 12 weeks of the exam. Your licensing board will contact you with your results. If you passed the exam, you will receive a letter that states you passed. If you failed, you will receive notice of this and get a diagnostic report that shows your strengths and weaknesses.

Now that you know all there is to know about the examinations and about how to prepare for them, the rest is up to you. Plan your attack, and get to work. The very best of luck to you!