

Preparing for and Taking Licensing Exams: Part I—Introduction to Taking Exams

Dr. Ben Buckner, LS, PE

Editor's note: The following is the first of a four-part series. The material is adapted from Appendix B of the author's book, Land Survey Review Manual.

Preparing for and taking exams involves more than simply acquiring knowledge, although knowledge of the exam material is the most important variable. Most of us could pass most multiple-choice or true-false exams with very little knowledge of the subject, depending on the standard set for the passing score. This series of articles is not on how to study, but rather on how to focus on the examination itself, including consideration of prior preparation. To ensure a passing score, you must become an astute exam-taker. This series will explain attitudes you can take toward an exam and techniques to apply that will improve scores over simply sitting and racking your brain trying to recall basic knowledge.

Analyze the Questions

One technique, which permeates all aspects of exam-taking, is analyzing the questions, rather than simply perusing or reading them. Without a certain level of reading and analytical ability and willingness to concentrate, it is difficult to pass any exam. This is true even if you have acquired basic knowledge and gained appropriate experience. Do not expect miracles in the exam room. An exam is the proof of the knowledge. This must be communicated to the grader. You must be fully involved with the exam to do this. Knowing the anatomy of exam questions will help you analyze them. Because most licensing exams are now in the multiple-choice format, most of the discussion in this series

will focus on this style, although some points will be made concerning discussion questions or problems requiring solutions.

Multiple-Choice Format

The statement of the question is called the "stem." The stem can be written as a question, a statement to be completed or a presentation of a problem. Within these formats, the level of the questions varies. Some questions simply test knowledge of facts, some test ability to recognize or associate concepts, and others test ability to analyze and solve problems. In land surveying licensing exams, the subject matter can be anything related to the fundamentals or the principles and practices of land surveying as embraced by the National Council of Examiners for Engineers and Surveyors (NCEES) "content areas" or as decided by individual state licensing boards.

The responses provide alternative answers to questions, completions of statements or answers to numerical problems. There are usually either four or five answer choices. One of these will be correct or best. Sometimes there is only one true answer in the choices, and the others are false. At other times there may be elements of truth in all responses, but one has more truth than the others. The incorrect choices are called *logical distractors*, or *decoys*.

The reasons boards and other groups use this format are related to grading and objectivity. First, multiple choice exam grading is easy, with no need for examiners to plod through examinees' answers and render judgments. Also, the objective, rather than subjective, nature of the grading is more "defensible"—when questions are multiple choice, an examinee can-

not easily argue or bring suit against a board for showing arbitrariness or favoritism.

The advantage to the examinee is that all of the correct answers are provided. They are surrounded by some distractions, but a skilled examinee views these distractors as minor annoyances or clutter. The responses serve as prompts to "jog" your memory or as clues leading to the best answer. You do not have to recall information—as you would for a short-answer or essay question—and compose an original answer. This makes it easier.

Multiple Choice Is a Game of Probability

Most exams today have four choices for the answer to each question. Because all questions are worth the same point value, if you randomly guessed on the entire exam, the score would theoretically be 25 percent. However, if you could eliminate one response from consideration on each question and guess from among the remaining three choices, the score would increase to about 33 percent. Eliminating two responses from consideration would raise the score to about 50 percent, and so on. Much of the discussion in this series will be on developing ways to throw out choices, leaving a shorter list from which to choose. There are many ways to do this. Combining the methods can significantly increase exam scores and even result in passing scores when your knowledge of the subjects may be somewhat lacking, simply based on the laws of probability in selecting from a shorter list of choices.

To become an astute exam-taker, you must learn how to recognize whether a question has been carefully or poorly written. The first of sev-

eral exam-taking tips is how to spot strengths and weaknesses in individual exam questions. It probably is not literally true that the examiner is out to get you. However, if you begin to view the exam and its authors as adversaries, identifying their strengths and weaknesses can give you a better chance of winning, or passing, perhaps with points to spare.

Finding weaknesses in the questions and their responses can increase your exam score because it can help you eliminate some responses from consideration and sometimes lead you directly to the correct answer. Even minor flaws in questions lead a good exam-taker to either the right answer or a wrong answer, either of which serves to increase your exam score on the basis of the laws of probability alone.

Good Questions versus Poor Questions

Good questions contain complete and unambiguous statements in the stem, so that a knowledgeable reader will not be confused merely by the way the question is presented. However, it is the quality of the distractors that determines the overall quality of a question. Good questions have distractors that are as attractive as the correct answer to an uninformed reader and are worded so well that even an informed reader must read all of the choices carefully before deciding which is best.

Well-prepared distractors contain common misconceptions, statements that are true in themselves but do not answer the specific question, statements that are either too broad or too narrow for the requirements of the problem or other statements related to the subject that might appear plausible to a person who is unfamiliar with the subject addressed in the stem. In contrast, a poor question contains illogical or nonsense responses that are unrelated to the subject or responses that have clear disqualifiers or clues that render them incorrect to anyone applying logic and common sense.

Good questions have responses that are all similar in style and level of technical vocabulary, approximately the same length or the same num-

ber of digits and arranged in alphabetical or numerical order. In contrast, a set of responses that lacks these qualities sometimes contains subtle clues that can be used as an aid to select the correct answer. For example, a very lengthy response or a very short one is often the correct answer. The writer probably copied the correct answer from a book or dictionary, and it is longer or shorter than the distractors, which he devised quickly. Similarly, a response with a rather technical tone can be selected as the correct answer if the others are in everyday language.

Suppose the question writer asked for a definition of the term "extrinsic evidence" and gave the following four choices: a) proportionate measurement, b) least squares fit, c) alluvial fan, d) evidence outside the writings. This is not a good question because three of the choices have little to do with the subject, and, furthermore, the correct answer d) has the key word (evidence) in it. The correct answer is easy to find in such a question even if you did not know the meaning of the term. In contrast, had the three wrong answers been a) conclusive evidence, b) controlling evidence, c) judicial notice, it would have been a little more difficult for an uninformed examinee to select the correct answer. These latter wrong answers are much better logical distractors. Poorly written responses give you a means to improve your odds when you have to guess. You eliminate the clearly wrong answers and guess from among fewer choices.

Numerical Problems

For numerical problems, a good set of logical distractors contains numbers that have been determined using the most probable or common mistakes in analysis or computation. Poor distractors for numerical problems are simply random numbers not based on any type of solution. Good responses should be reasonably close in value. Often, when some are ridiculously large or small, a quick estimate of the answer can eliminate the extreme values. Always take a close look at the choices with approximation in mind.

For example, if a circular curve had a radius of 200 feet and a central angle of 30 degrees, and you had choices for the arc length of a) 40 feet, b) 100 feet, c) 200 feet, and d) 500 feet, the closest answer can be spotted as 100 feet rather quickly by making a sketch, roughly to scale, in about 5 to 10 seconds. A better choice of responses in this question would be a) 53.59, b) 103.53, c) 104.71, d) 107.18. The first answer represents the tangent length, the second answer is the chord length. The fourth answer is calculated by using the tangent function instead of the sine function in calculating the chord. The correct answer couldn't be as easily spotted, and, furthermore, if you misread the question and calculated the tangent distance or the chord length instead of the arc distance, this is just one of the traps that the question writer set for you.

Good Questions Are Difficult to Write

Good multiple-choice questions are difficult to write. The distractors present the greatest challenge. Even experienced question writers who understand the above principles generally have difficulty preparing some of the distractors. When a writer cannot think of enough incorrect but logical choices or problem solutions, one or more of the distractors may not be well prepared, making it easier for an astute examinee to eliminate them from consideration.

Finding strengths and weaknesses in questions, particularly the weaknesses, is a first step in learning to read and analyze questions. The next part of this series will continue with a more complete discussion of analyzing the questions, including how to read the question to discern what is being asked, how to approach the responses, looking for key words and clues and some other mental skills that can be applied to improve scores. Also, questions requiring written answers and displayed problem solutions will be discussed. ▼

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Preparing for and Taking Licensing Exams, Part 2 Analysis of Multiple Choice Questions

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(Editor's note: This is the second of a four-part series. The material is adapted from Appendix B of the author's book titled Land Survey Review Manual.)

It is surprising that many multiple-choice questions are answered incorrectly, not because of lack of knowledge, but because of failure to read and understand the question. Years of college teaching has shown me that respondents to exam questions are often poor readers.

Inability to understand the question could be influenced by the question writer. Perhaps the grammar or choice of words is unclear or unfamiliar. Le-

gal and technical descriptions are often unclear to many people because the language is not what they are accustomed to hearing. The problem is more often in the receiver than the sender. If you have not studied the subject, clearly presented statements will be confusing.

Let's assume that an examinee has the knowledge and the writer prepared a good question. The problem then reduces to a basic inability to read, an unwillingness to read carefully, lack of analytical skills or adverse conditions affecting your ability to read and concentrate. Understanding what is being asked requires sufficient time, concentration and attention to

detail. Too often, most people just half-listen to others, even when the information or instruction being communicated is important. Distractions, including immediate physical problems (hunger, thirst, illness, pain, fatigue, sleepiness and so forth), emotions (fear, anxiety and similar feelings), or an adverse physical environment (noise, room too cold or hot and so on) can hamper a person's ability to focus on something being read or heard.

I think much of the problem is some combination of mental laziness, bad listening and concentration habits, and failing to see the importance of reading the complete statement and consider-

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ing each element in light of all others. These problems can be corrected, but it requires conscious effort and practice to do so. An examinee must go into the exam with the right attitude and determination to overcome the laziness factor. He or she must make a conscious effort to concentrate on each question and consider every word, phrase, and piece of given data. These points will be amplified in Part 3 of this series. Dealing with adverse exam conditions will be covered in Part 4.

If the stem of a multiple-choice question seems ambiguous after careful reading, its meaning and intent might be clarified by reading the responses. Reading the responses with the stem, and not as isolated statements, is important. Assuming that the question can be understood either through carefully reading the stem alone or in conjunction with the responses, focus next shifts to evaluation of the responses in terms of what is being asked.

Approaching the Responses

Two responses. I have found that there are two basic approaches to finding the best answer to a multiple choice question. I call them the *positive* and the *negative* approaches. The positive approach is to search for the correct answer. The negative approach involves eliminating all of the perceived wrong answers and either guessing from the remaining choices or selecting the one remaining, if only one remains.

The positive approach. The positive approach is natural for numerical problems because the distractors usually contain little information to use for comparing the choices. If the problem was solved correctly, the appearance of the answer in the list of choices provides confidence in its correctness, and thus the distractors are not so important. If a correct solution cannot be reasoned, the numerical distractors serve a purpose for the negative approach, their relative numerical values giving clues as to which might be most or least logical, considering the information given.

A pure positive approach should never be used for non-numerical questions. Each response should be tested for its truth (or the extent it satisfies the

question), based on knowledge of the concepts. The responses should then be arranged in order of apparent correctness. Selecting one response without carefully considering the others is jumping to conclusions. An examinee can be led to a good distractor this way. Even when an examinee is fairly certain of a best answer, it should be compared with each of the other responses to be even more confident that it is best.

The negative approach. The negative approach uses most of the skills being explained in this series. Many of the points are tips on how to find weaknesses in responses, thus eliminating them. The process is much like eliminating items on a menu, based on your experience or instincts as to what "sounds good." You narrow your choices in this way to gain a higher probability of being satisfied. The negative approach in answering a multiple choice question uses the same principles.

Looking for Clues

An examinee should not become intimidated by questions on unfamiliar subjects. Often, a question can be answered by logical association, even with little knowledge of the subject. There are usually clues of some kind, either in the responses or in some connection between the stem and the responses. Reading both the stem and the responses properly includes looking for key words that associate the stem with the responses. An example of this type of clue was given in Part 1, with the use of the word "evidence" in the stem and only one of the responses, giving a clue to the answer.

Besides key words, other clues often exist. For example, one response may be much longer or shorter than the others, one may be written in a different style than the others or some may contain qualifying statements. Such responses stand out from the others and thus offer clues to either lead to the correct answer or eliminate responses, depending on each clue and other factors. As mentioned in Part 1, wrong answers are often significantly longer or shorter than the correct one, and the wording could be less formal than that of the correct answer.

Recognition of clues requires understanding the anatomy of a question. It

also helps to realize that the motivation of the question writer is to write a good question having one best answer, and the concern of the exam administrators is to ensure that one answer is indubitably correct to avoid complaints from examinees. These concerns often contribute to a list of responses that appear to be a little inconsistent or out of balance. An astute exam-taker can use this to advantage when it is recognized.

A question writer will think of the correct answer first, the best distractors next and the poorest ones last. An editing refinement sometimes overlooked is to rearrange them by alphabetizing or random reordering. If it is observed that the quality of the responses seems to deteriorate from a) to d), answer a) is a good bet as the correct one.

Numerical Responses

For numerical responses, the wrong solutions often tend to yield answers both larger and smaller than the correct one. Thus, whether they have been arranged according to magnitude or not, your best chance, assuming you need to guess, is to go with one of the middle answers, not the largest or smallest.

The response "all of the above" is often the correct answer. This answer is the logical one if it is fairly certain that two or more of the choices are correct. The "none of the above" response is usually an incorrect answer. It is often used when a writer simply cannot think of a good distractor. Thus, it is more of a filler than a legitimate distractor or correct answer. To select this answer, an examinee must be pretty sure none of the responses have much merit.

None of these rules are absolute. It is best to read and analyze each question on its merits. However, analyzing the overall "flow" of the responses is part of exam-taking skill. If you are following the logic here, you are learning to "know the enemy" and are thus in a better position to win.

A Step Beyond Analysis

Other Senses. I maintain that a lot of people simply give up too easily out of lack of confidence, mental laziness or failure to recognize the powers that exist

in the human mind and spirit. The essence of this section is to emphasize that, aside from looking for clues and applying other such skills, there is something lying between actual conscious knowledge and random guessing.

Even without background on the subject, correct answers can often be selected. This process combines careful reading, good concentration and analytical ability, simple logic and confidence. It is more than being observant or astute and more than just looking for clues and weaknesses in questions. It has to do with use of the mind in a way other than just recalling knowledge or seeing the obvious. If a careful reading, analysis and search for key words and clues does not lead to a correct answer by either the positive or the negative approach, the examinee should use intuition, or what we commonly call "gut-feelings" or "hunches" to select an answer. Even when you do not see it clearly in the conscious mind, something is often happening in the subconscious to give you some hint as to the best answer. Whatever you might call the mental process, an examinee should pause long enough to allow the mind to lead to an answer before admitting defeat and resorting to guessing. The human mind is capable of doing better than what is achieved by pure guessing. What is stored in the mind can be recalled!

Meditation (to the extent possible during an exam) and prayer add more possibilities to reach deeper for answers. Quitting prematurely is a common reason for failure on exams, when there are perhaps resources available that might spell success. Recognizing and using the power of the mind and other dimensions of the inner self can make the difference between success and failure.

You may know more about the subject than you thought, but conscious awareness of this may not give you immediate reassurance. Dig a little deeper. The knowledge may find its way into your #2 pencil and point it to the best answer.

Other Advice

Most of the exam-taking skills explained herein are just good communication skills sprinkled with some ele-

mentary laws of probability and principles of logic. Any person having learned these skills and possessing a reasonable level of intelligence, confidence, analytical ability and knowledge can succeed in passing licensing or other exams. All of this gives you the power you need to succeed at exam-taking and most other things.

In your preparations for your next

exam, try to approach practice questions by applying the tips given here and in Part 1. In the next part of this series, we will discuss how to prepare for exams. ▼

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Preparing for and Taking Licensing Exams

Part 3—Preparation for an Exam

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(Editor's note: This is the third of a four-part series. The material is adapted from Appendix B of the author's book titled Land Survey Review Manual.)

Long-Term Preparation

Formal education. College courses help prepare a person for licensing exams in three ways: 1) The knowledge acquired should improve an examinee's ability to select correct answers. 2) Exams are a routine part of college courses, and the experience of taking such exams develops exam-taking skill. Anyone who has passed into the senior year of a 4-year college program has usually learned how to read and analyze exam questions, as well as how to prepare for the exams and perform under pressure. This skill is nearly as important as knowledge itself. 3) A rigorous, professional-level college education broadens the mind, develops strong analytical ability and enhances communication skills. These strengths may be the most important aspect of success in exam-taking and most other areas requiring decision making. It has been said that knowledge is power. I believe that being able to read and comprehend something is power, as are good analytical skills and communication ability.

If you have not allowed yourself the advantage of a college education, just taking a few courses will better prepare you for licensing exams. Seminars are not a substitute for formal education. Seminars may contain much information, but they do not constitute a complete curriculum, and they lack the qualities deriving from the pressure of exams and other tests of performance that are fundamental to earning a college degree.

Experience. The quality, quantity and nature of a person's professional and practical experience will directly affect exam scores. If someone has not had ex-

perience, both in the field and in the office, with much of it in "responsible charge," he or she will lack the development needed to understand many exam questions. Anyone aspiring to be licensed should try to gain a breadth and depth of experience of the nature that teaches theory, techniques, analytical thinking and judgment. Merely holding a prism pole or working at a computer or drafting table for several years does not prepare a person properly to become a professional surveyor, so it is understandable that a person who prepares this way cannot easily pass a licensing exam. Anyone aspiring to be licensed should seek the type of employment that will offer the necessary experience.

Try to gain quality employment. Quality employment means that you work for honest, ethical and knowledgeable professionals. If your employer is not willing or able to mentor you toward becoming a good professional surveyor, seek other employment. Work only for mature people who are not afraid or intimidated by you if you offer suggestions and want to learn. You can easily stunt your professional development and acquire bad attitudes about surveying and public service by working for and associating with negative, fearful, immature people or those who simply lack knowledge and the right attitudes toward people (including you as a growing and learning surveying intern).

Personal attitudes. A person's attitude and general goals determine success to a large extent. Positive attitudes toward learning and responsibility are important for preparing to become a licensed surveyor. If a person has a desire to learn and is curious enough to inquire, read, study, and keep seeking, the back-

ground and knowledge to pass a licensing exam will be gained slowly and methodically, so that the person is essentially prepared when exam time arrives. In contrast, one who tends to let others do the thinking, does not want or accept responsibility, and does not have an interest in learning will have a difficult time preparing for a licensing exam.

To expect that only last-minute study ("cramming") will succeed in gaining knowledge is unrealistic. There are no shortcuts to learning complex principles and concepts. No review manual, review seminar or set of study questions can prepare you. These things only help you to focus and find out primarily what you don't know. A few hours or even several days of a seminar are no substitute for good experience, college education and a good attitude. There is no such thing as an "instant" professional.

Collect a library of references. Part of the result of the positive attitude described above will be the accumulation and study of references. Familiarity with references over a period of years is far better than purchasing a few books shortly before an exam. References are of little use if they are not studied well in advance. Besides instruments, books may well be the most important possession of a surveyor. Surveying is an art, a science and a technology, much of which is well explained in the many available books. Despite what some people might lead aspiring young surveyors to believe, experience cannot teach everything. Surveying is a profession, not a trade, and it is said that achieving professionalism requires long and intensive study. Theories and applications—the primary subject matter of written exams—are almost all covered in books on the various subjects that comprise the specialized body of knowledge called surveying.

Short-Term Preparation

Applications and advice. Final preparations should begin no less than six months before the exam. Application must be made, fees must be paid and so forth. At the same time, the applicant should begin to make inquiries as to exam content, scope and expectations. Some licensing boards offer very little advice and no syllabi of exam content, whereas others publish outlines of content and sample questions. Laws generally do not allow examinees to disclose past exam content, but discussions with individuals who have recently taken the exam can nevertheless provide some insights and guidance in preparing for it. Exams change, and any advice offered by others—even licensing boards—must be used only as a guide, not a promise of specific exam content. The information available from NCEES should be absorbed well in advance of the exam.

An understanding of rules on the use of calculators and references should be gained well in advance because these rules affect study and preparation methods. State licensing board rules on the use of calculators vary, and individual boards vary in their interpretation of the NCEES rules. An applicant accustomed to using calculator programs may have to work all problems, even those on multiple-choice exams, without using the programs. Also, only certain references (or no references) may be permitted on some portions of the exam. It is best to know these details well in advance.

Study habits. You should form good study habits. You should study regularly and in an environment conducive to concentration. You may need to set aside some favorite habits and pastimes for a few months to allow for study time. You should attend review and other seminars during this final preparation stage. You may need to purchase a few additional references. A certain amount of sacrifice by the examinee and family members is to be expected during this period, both in time and in possible costs for additional references and seminars. Presumably, the time, expense and sacrifices will be repaid with higher income, a feeling of achievement and higher job satisfaction in the future after the exam is passed (the process of "delayed gratification" being one of the realities of life).

Practice problems and sample questions are a good form of final preparation, but they should not take the place of quality study. The questions on the exam day will not be the same as those practiced. Conscientious study of review manuals (such as my *Land Survey Review Manual*) should provide not

only background, coverage of the scope of land survey practice and ample practice with typical questions, but also the development of skills in analyzing questions.

Final preparations. The final preparations include arriving at the exam site ready to take the exam. You should be calm, rested, comfortably dressed and fed and have a positive and confident attitude. Your brain does not function well without sleep, so get to bed early for at least two nights before the exam. The night before the night before the exam is actually the most important. (That is, it is important to get a good night's sleep on Wednesday if your exam is on Friday.) Many people seem to think it is a mark of strength and wisdom to attempt difficult tasks on little sleep. You hear college students bragging sometimes on how little sleep they had the night before a final exam, but such practices are unwise.

Leave responsibilities and concerns not related to the exam in the hands of

others for the day. Arrive early to locate the building and room where the exam will be held. It is wise to have at least two calculators and extra batteries. You should have your favorite references, carefully chosen on the basis of expected exam content. Naturally, pencils, paper and erasers are also needed. It is advisable to have a watch to check pacing.

Go into the exam with a positive attitude and take it seriously. You should be a little nervous. That is normal. However, panic is inappropriate. It isn't a life-and-death situation. Try to recall the techniques and advice given in the earlier parts of this series. Read those articles just before taking the exam.

The last installment in this series will offer advice on actually taking the exam. ▼

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