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# College Algebra

## EXAM GUIDE



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# Introduction

This is the only *official* guide to the College-Level Examination Program® (CLEP®) exams. CLEP exams are administered on computers at test centers across the country.

This guide has been written for adults making plans to enroll in college, and it contains information of interest to others as well. College-bound high school students, current college students, military personnel, professionals seeking certification, and persons of all ages who have learned or wish to learn college-level material outside the college classroom will find the guide helpful as they strive to accomplish their goals.

CLEP is based on the premise that some individuals enrolling in college have already learned part of what is taught in college courses through job training, independent reading and study, noncredit adult courses, and advanced high school courses. Often, their jobs and life experiences have enhanced and reinforced their learning. CLEP gives these individuals a chance to show their mastery of college-level material by taking exams that assess knowledge and skills taught in college courses.

The first few sections of this guide explain how CLEP can earn you credit for the college-level learning you have acquired and provide suggestions for preparing for the exams. The individual exam section includes test descriptions, sample questions, and study tips.

The guide also has an answer key for each exam, as well as in-depth information about how to interpret your scores.

## CLEP Study Materials: A Word of Warning

There are many free or inexpensive sources for CLEP preparation materials, including public or college libraries, bookstores, and educational websites. CLEP exams reflect the material taught in introductory college courses. Check with local colleges to see what texts are being used in the subject you hope to study for a CLEP exam.

The College Board provides the *CLEP Official Study Guide* and individual exam guides so you get to know the types of questions on the exams. You also get

important tips to get ready for the tests. The guides are not meant to help you learn all the subject matter CLEP exams cover. We suggest you study a textbook for the relevant course at your college or access one of the suggested resources listed on the CLEP website to learn or review the content of the exam in which you're interested.

Many private companies offer preparation services for CLEP exams. Some companies are legitimate, but others make promises they can't keep and sell services and products you don't need.

We've received complaints from CLEP candidates regarding the following practices (practices we consider unfair or inappropriate).

- Attempts to sell preparation services for many CLEP exams at once, with sizable payment up front or on credit
- Credit agreements with companies other than the one selling the preparation material
- Contacts from salespeople to you or your family at home
- Promises that you can get college credit without enrolling in college
- Efforts to sell dictionaries or encyclopedias as part of a test preparation package

If you feel you have been cheated, we recommend you seek the assistance of an organization such as the Better Business Bureau ([www.bbb.org](http://www.bbb.org)) or the Federal Trade Commission ([www.ftc.gov](http://www.ftc.gov)).

## American Council on Education (ACE)

If you still have general questions about continuing or adult education after reading this book, ACE can provide advice and information:

### American Council on Education

One Dupont Circle, NW  
Washington, DC 20036  
202-939-9300

[www.acenet.edu](http://www.acenet.edu)



# I. The College-Level Examination Program

## How the Program Works

CLEP exams are administered at over 2,000 test centers nationwide, and 2,900 colleges and universities award college credit to those who do well on the tests.

This rigorous program lets self-directed students of a wide range of ages and backgrounds show their mastery of introductory college-level material and pursue academic success. Students earn credit for what they already know by getting qualifying scores on any of the 34 examinations.

CLEP exams cover material taught in introductory-level courses at many colleges and universities. Faculty at individual colleges review the exams to ensure that they cover the important material currently taught in their courses.

Although CLEP is sponsored by the College Board, only colleges may grant credit toward a degree. To learn about a particular college's CLEP policy, contact the college directly. When you take a CLEP exam, request that a copy of your score report be sent to the college you're attending or planning to attend. After evaluating your score, the college will decide whether or not to award you credit for, or to exempt you from, one or more courses.

If the college decides to give you credit, it records the number of credits on your permanent record, indicating that you completed work equivalent to a course in that subject. If the college decides to grant exemption without giving you credit for a course, you'll be permitted to omit a course that would normally be required of you and to take a course of your choice instead.

The CLEP program has a long-standing policy that an exam can't be retaken within the specified wait period. This waiting period gives you a chance to spend more time preparing for the exam or the option of taking a classroom course. If you violate the CLEP retest policy, the administration will be considered invalid, the score canceled, and any test fees forfeited. If you're a military service member, note that DANTES (Defense Activity for Non-Traditional Education Support) won't fund

retesting on a previously funded CLEP exam. However, you may personally fund a retest after the specified wait period.

## The CLEP Examinations

CLEP exams cover material directly related to specific undergraduate courses taught during a student's first two years in college. The courses may be offered for three or more semester hours in general areas such as mathematics, history, social sciences, English composition, natural sciences, and humanities. Institutions will either grant credit for a specific course based on a satisfactory score on the related exam, or in the general area in which a satisfactory score is earned. The credit is equal to the credit awarded to students who successfully complete the course.

## What the Examinations Are Like

CLEP exams are administered on computer and are approximately 90 minutes long, with the exception of College Composition, which is approximately 120 minutes long, and Spanish with Writing, which is 110 minutes long. Most questions are multiple choice; other types of questions require you to fill in a numeric answer, to shade areas of an object, or to put items in the correct order. Questions using these kinds of skills are called zone, shade, grid, scale, fraction, numeric entry, histogram, and order match questions.

CLEP College Composition includes a mandatory essay section, responses to which must be typed into the computer. CLEP Spanish with Writing contains two writing tasks that measure interpersonal and presentational communication.

Some examinations have optional essays. You should check with the individual college or university where you're sending your score to see whether an optional essay is required for those exams. These essays are administered on paper and are scored by faculty at the institution that receives your score.

## Where to Take the Examinations and How to Register

CLEP exams are administered throughout the year at over 2,000 test centers in the United States and select international sites. Once you have decided to take a CLEP exam, log into My Account at [clepportal.collegeboard.org/myaccount](https://clepportal.collegeboard.org/myaccount) to create and manage your own personal accounts, pay for CLEP exams, and purchase study materials. You can self-register at any time by completing the online registration form.

Through My Account, you can access a list of institutions that administer CLEP, and you can locate a test center in your area. **After paying for your exam through My Account, you must still contact the test center to schedule your CLEP exam.**

If you're unable to locate a test center near you, call 800-257-9558 for help.

## College Credit Recommendations of the American Council on Education (ACE)

For many years, the American Council on Education's College Credit Recommendation Service (ACE CREDIT) has periodically evaluated CLEP processes and procedures for developing, administering, and scoring the exams. ACE recommends a uniform credit-granting score of 50 across all subjects (with additional Level-2 recommendations for the world language examinations), representing the performance of students who earn a grade of C in the corresponding course. The score scale for each CLEP exam is decided by a panel of experts (college faculty teaching the course) who provide information on the level of student performance that would be necessary to receive college credit in the course.

The American Council on Education, the major coordinating body for all the nation's higher education institutions, seeks to provide leadership and a unifying voice on key higher education issues and to influence public policy through advocacy, research, and program initiatives. For more information, visit ACE CREDIT at [acenet.edu/higher-education/topics/Pages/Credit-Evaluations.aspx](https://acenet.edu/higher-education/topics/Pages/Credit-Evaluations.aspx).

## How Your Score Is Reported

You have the option of seeing your CLEP score immediately after you complete the exam, except for College Composition and Spanish with Writing; scores for these exams are available online one to two weeks after the exam date. Once you choose to see your score, it will be sent automatically to the institution you designated as a score recipient. It can't be canceled. You'll receive a candidate copy of your score before you leave the test center. If you tested at the institution that you designated as a score recipient, it will have immediate access to your test results. Additionally, you'll be able to view your CLEP exam scores by logging into My Account and clicking on "View My CLEP Exam Scores." Scores are available online one business day after taking an exam with the exception of College Composition and Spanish with Writing.

If you don't want your score reported, you may select that as an option at the end of the examination *before the exam is scored*. Once you have selected the option to *not* view your score, the score is canceled. The score won't be reported to the institution you designated, and you won't receive a candidate copy of your score report. In addition, scores of canceled exams can't be viewed on My Account. You'll have to wait the specified wait period before you can take the exam again.

CLEP scores are kept on file for 20 years. During this period, for a small fee, you may have your transcript sent to another college or to anyone else you specify. Your score(s) will never be sent to anyone without your approval.

## II. Approaching a College About CLEP

The following sections provide a step-by-step guide to learning about the CLEP policy at a particular college or university. The person or office that can best assist you may have a different title at each institution, but the following guidelines will point you to information about CLEP at any institution.

Adults and other nontraditional students returning to college often benefit from special assistance when they approach a college. Opportunities for adults to return to formal learning in the classroom are widespread, and colleges and universities have worked hard to make this a smooth process for older students. Many colleges have established special offices staffed with trained professionals who understand the problems facing adults returning to college. If you think you might benefit from such assistance, be sure to find out whether these services are available at your college.

### How to Apply for College Credit

**Step 1.** *Obtain, or access online, the general information catalog and a copy of the CLEP policy from each college you're considering.*

Learn about admission and CLEP policies on the college's website at [clep.collegeboard.org/school-policy-search](http://clep.collegeboard.org/school-policy-search), or by contacting or visiting the admission office. Ask for a copy of the publication that explains the college's complete CLEP policy. Also, get the name and the telephone number of the person to contact in case you have further questions about CLEP.

**Step 2.** *If you haven't already been admitted to a college that you're considering, look at its admission requirements for undergraduate students to see whether you qualify.*

Whether you're applying for college admission as a high school student or transfer student, or as an adult resuming a college career or going to college for the first time, you should be familiar with the requirements for admission at the schools you're

considering. If you're a nontraditional student, be sure to check whether the school has separate admission requirements that apply to you. Some schools are selective, while others are "open admission."

Contact the admission office for an interview with a counselor. State why you want the interview, and ask what documents you should bring with you or send in advance. (These materials may include a high school transcript, transcript of previous college work, or completed application for admission.) Make an extra effort to get all the information requested in time for the interview.

During the interview, relax and be yourself. Be prepared to state honestly why you think you're ready and able to do college work. If you have already taken CLEP exams and scored high enough to earn credit, you have shown you're able to do college work. Mention this achievement to the admission counselor because it may increase your chances of being accepted. If you haven't taken a CLEP exam, you can still improve your chances of being accepted by describing how your job training or independent study prepared you for college-level work. Discuss with the counselor what you learned from your work and personal experiences.

**Step 3.** *Evaluate the college's CLEP policy.*

Typically, a college lists all its academic policies, including CLEP policies, in its general catalog or on its website. You'll probably find the CLEP policy statement under a heading such as Credit-by-Examination, Advanced Standing, Advanced Placement, or External Degree Program. These sections can usually be found in the front of the catalog. Check out the institution's CLEP Policy on [clep.collegeboard.org/school-policy-search](http://clep.collegeboard.org/school-policy-search).

Many colleges publish their credit-by-examination policies in separate brochures distributed through the campus testing office, counseling center, admission office, or registrar's office. If you find an overly general policy statement in the college catalog, seek clarification from one of these offices.



Review the material in the section of this chapter entitled “Questions to Ask About a College’s CLEP Policy.” Use these guidelines to evaluate the college’s CLEP policy. If you haven’t taken a CLEP exam, this evaluation helps you decide which exams to take. Because individual colleges have different CLEP policies, reviewing several policies helps you decide which college to attend.

**Step 4.** *If you haven’t yet applied for admission, do so as early as possible.*

Most colleges expect you to apply for admission several months before you enroll, and it’s essential that you meet the published application deadlines. It takes time to process your application for admission. If you have yet to take a CLEP exam, you can take one or more CLEP exams while you’re waiting for your application to be processed. Be sure to check the college’s CLEP policy beforehand so that you’re taking exams your college will accept for credit. You should find out from the college when to submit your CLEP score(s).

Complete all forms and include all documents requested with your application(s) for admission. Normally, an admission decision can’t be reached until all documents have been submitted and evaluated. Unless told to do so, don’t send your CLEP score(s) until you’ve been officially admitted.

**Step 5.** *Arrange to take CLEP exam(s) or to submit your CLEP score(s).*

CLEP exams can be taken at any of the 2,000 test centers worldwide. To locate a test center near you, visit [clep.collegeboard.org/search/test-centers](http://clep.collegeboard.org/search/test-centers).

If you have already taken a CLEP exam, but didn’t have your score sent to your college, you can have an official transcript sent at any time for a small fee. Prior to sending a transcript to an institution, please ensure that you have verified the institution’s CLEP credit-granting policy. Order your transcript online by logging in to My Account ([clepportal.collegeboard.org/myaccount](http://clepportal.collegeboard.org/myaccount)) using the same account you used to register.

Please note there are some instances in which CLEP exam scores cannot be ordered. If you have a score on hold, took an exam that was DANTES-funded or retaken a CLEP exam within the 3-month waiting period, those exam scores are considered non-orderable. In addition, CLEP Transcript Requests are nonrefundable. Once ordered, a request cannot be canceled, changed or re-routed.

Transcripts only include CLEP scores for the past 20 years; scores more than 20 years old are not kept on file.

Your CLEP scores will be evaluated, probably by someone in the admission office, and sent to the registrar’s office to be posted on your permanent record once you are enrolled. Procedures vary from college to college, but the process usually begins in the admission office.

**Step 6.** *Ask to receive a written notice of the credit you receive for your CLEP score(s).*

A written notice may save you problems later when you submit your degree plan or file for graduation. In the event that there’s a question about whether or not you earned CLEP credit, you’ll have an official record of what credit was awarded. You may also need this verification of course credit if you meet with an academic adviser before the credit is posted on your permanent record.

**Step 7.** *Before you register for courses, seek academic advising.*

Talking with your academic adviser helps you avoid taking unnecessary courses and lets you know exactly what your CLEP credit will mean to you. This discussion may take place at the time you enroll. Most colleges have orientation sessions for new students prior to each enrollment period. During orientation, students are assigned academic advisers who give them individual guidance in developing long-range plans and course schedules for the next semester. In conjunction with this counseling, you may be asked to take some additional tests so you can be placed at the proper course level.

## Questions to Ask About a College’s CLEP Policy

Before taking CLEP exams for the purpose of earning college credit, try to find the answers to these questions:

### 1. Which CLEP exams are accepted by the college?

A college may accept some CLEP exams for credit and not others—possibly not the exams you’re considering. For this reason, it’s important you know the specific CLEP exams you can receive credit for.



**2. Does the college require the optional free-response (essay) section for exams in composition and literature, as well as the multiple-choice portion of the CLEP exam you're considering? Do you need to pass a departmental test such as an essay, laboratory, or oral exam in addition to the CLEP multiple-choice exam?**

Knowing the answers to these questions ahead of time will enable you to schedule the optional free-response or departmental exam when you register to take your CLEP exam.

**3. Is CLEP credit granted for specific courses at the college? If so, which ones?**

You're likely to find that credit is granted for specific courses and that the course titles are designated in the college's CLEP policy. It's not necessary, however, that credit be granted for a specific course for you to benefit from your CLEP credit. For instance, at many liberal arts colleges, all students must take certain types of courses. These courses may be labeled the core curriculum, general education requirements, distribution requirements, or liberal arts requirements. The requirements, are often expressed in terms of credit hours. For example, all students may be required to take at least six hours of humanities, six hours of English, three hours of mathematics, six hours of natural

science, and six hours of social science, with no particular courses in these disciplines specified. In these instances, CLEP credit may be given as "6 hrs. English Credit" or "3 hrs. Math Credit" without specifying for which English or mathematics courses credit has been awarded. To avoid possible disappointment, you should know before taking a CLEP exam what type of credit you can receive or whether you'll be exempted from a required course but receive no credit.

**4. How much credit is granted for each exam you're considering, and does the college place a limit on the total amount of CLEP credit you can earn toward your degree?**

Not all colleges that grant CLEP credit award the same amount for individual exams. Furthermore, some colleges place a limit on the total amount of credit you can earn through CLEP or other exams. Other colleges may grant you exemption but no credit toward your degree. Knowing several colleges' policies concerning these issues may help you decide which college to attend. If you think you're capable of passing a number of CLEP exams, you may want to attend a college that allows you to earn credit for all or most of the exams. Find your institution's CLEP policy by visiting [clep.collegeboard.org/school-policy-search](http://clep.collegeboard.org/school-policy-search).



# III. Deciding Which Examinations to Take

## If You're Taking the Examinations for College Credit or Career Advancement...

Most people who take CLEP exams want to earn credit for college courses. Others take the exams to qualify for job promotions, professional certification, or licensing. Whatever the reason, it's vital for most test takers to be well prepared so they can advance as fast as possible toward their educational or career goals.

Those with limited knowledge in the subjects covered by the exams they're considering are advised to enroll in the college courses in which that material is taught. Although there's no way to predict whether you'll pass a particular CLEP exam, you may find the following guidelines helpful.

### 1. Test Descriptions

For each exam, read the test description and the outline set forth in the "Knowledge and Skills Required" section provided in this guide. Are you familiar with most of the topics and terminology in the outline?

### 2. Textbooks

Review the textbook and other resource materials used for the corresponding course at your college. You can find a list of suggested textbooks and free online resources for each exam at [clep.collegeboard.org/exams](http://clep.collegeboard.org/exams). Are you familiar with most of the topics and terminology used in college textbooks on this subject?

### 3. Sample Questions

The sample questions included in this guide are representative of the content and difficulty of the exam questions. None of the sample questions appear on any CLEP examination. Use them to get

an understanding of the content and difficulty level of the questions on an actual exam. Knowing the correct answers to all of the sample questions is not a substitute for college-level study or a guarantee of satisfactory performance on the exam.

Following the instructions and suggestions in Chapter V, answer as many of the sample questions for the exam as you can. Check your answers against the answer key at the end of each section.

- Were you able to answer almost all of the questions correctly? You may not need to study the subject extensively.
- Did you have difficulty answering the questions? You'll probably benefit from more extensive study of the subject.

### 4. Previous Study

Have you taken noncredit courses in this subject offered by an adult school or a private school, through correspondence, or in connection with your job? Did you do exceptionally well in this subject in high school, or did you take an honors course in this subject?

### 5. Experience

Have you learned or used the knowledge or skills included in this exam in your job or life experience? For example, if you lived in a Spanish-speaking country and spoke the language for a year or more, you might consider taking the Spanish Language or Spanish with Writing exams. Or, if you have worked at a job in which you used accounting and finance skills, Financial Accounting would be an exam to consider taking. Or if you have read a considerable amount of literature and attended art exhibits, concerts, and plays, you might expect to do well on the Humanities exam.

**6. Other Exams**

Have you done well on other standardized tests in subjects related to the one you want to take? For example, did you score well above average on a portion of a college entrance exam covering similar skills, or did you get an exceptionally high score on a licensing exam in this subject? Although such tests don't cover exactly the same material as the CLEP exams and may be easier, people who do well on these tests often do well on CLEP exams too.

**7. Advice**

Has a college counselor, professor, or some other professional person familiar with your ability advised you to take a CLEP exam?

If you answered yes to several of the above questions, you have a good chance of passing the CLEP exam you're considering. It's unlikely you would have acquired sufficient background from experience alone. Learning gained through reading and study is essential, and you'll likely find additional study helpful before taking a CLEP exam. Information on how to review for CLEP exams can be found in Chapter IV and in Chapter VII.

# IV. Preparing to Take CLEP Examinations

Having made the decision to take one or more CLEP exams, most people then want to know how to prepare for them—how much, how long, when, and how should they go about it? The precise answers to these questions vary greatly from individual to individual. However, most test takers find that some type of test preparation is beneficial.

Most people who take CLEP exams do so to show that they already learned the key material taught in a college course. Many need only a quick review to assure themselves that they haven't forgotten what they once studied, and to fill in the gaps in their knowledge of the subject. Others feel that they need a thorough review and spend several weeks studying for an exam. Some people take a CLEP exam as a kind of "final exam" for independent study of a subject. This last group requires significantly more study than do those who only need to review, and they may need some guidance from professors of the subjects they're studying.

The key to how you prepare for CLEP exams often lies in locating those skills and areas of prior learning in which you are strongest and deciding where to focus your energy. Some people may know a considerable amount about a subject area but may not test well. These individuals would probably be just as concerned about strengthening their test-taking skills as they would about studying for a specific test. Many mental and physical skills are required in preparing for a test. It's important not only to review or study for the exams but also to make certain that you are alert, relatively free of anxiety, and aware of how to approach standardized tests. Suggestions about developing test-taking skills and preparing psychologically and physically for a test are given in this chapter. The following section suggests ways of assessing your knowledge of the content of an exam and then reviewing and studying the material.

## Using the Examination Guides

The individual exam guides contain the same information you will find in the *CLEP Official Study Guide*. Each exam guide includes an outline of the knowledge and skills covered by the test, sample questions similar to those that appear on the exam, and tips to get ready for the exam.

You may also choose to contact a college in your area that offers a course with content comparable to that on the CLEP exam you want to take, or read the suggested resources for each exam on [clep.collegeboard.org/exams](http://clep.collegeboard.org/exams). If possible, use the textbook and other materials required for that course to help you prepare. To get this information, check the college's catalog for a list of courses offered. Then call the admission office, explain what subject you're interested in, and ask who in that academic department you can contact for specific information on textbooks and other study resources to use. You might also be able to find the course syllabus, which will list course materials and assignments, on the college's website. Be sure the college you're interested in gives credit for the CLEP exam you're preparing for.

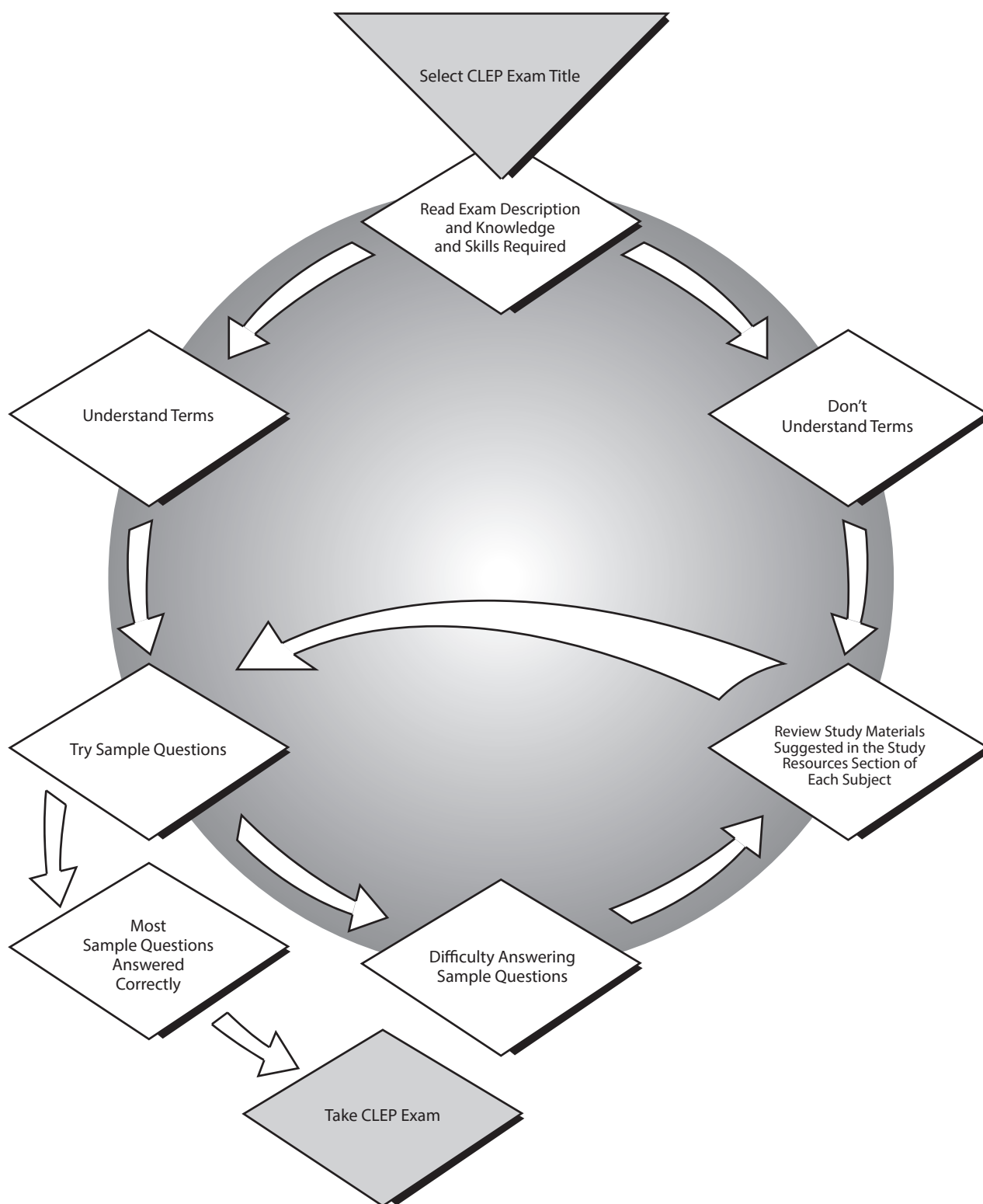
Begin by carefully reading the test description and outline of knowledge and skills required for the exam in the exam guide. As you read through the topics listed, ask yourself how much you know about each one. Also note the terms, names, and symbols mentioned, and ask yourself whether you're familiar with them. This will give you a quick overview of how much you know about the subject. If you're familiar with nearly all the material, you'll likely need a minimum of review. If topics and terms are unfamiliar, you'll probably require substantial study to do well on the exam.

If, after reviewing the test description provided in the exam guide, you find that you need extensive review, put off answering the sample questions until you have done some reading in the subject. If you complete them before reviewing the material, you'll probably

look for the answers as you study, and this will not be a good assessment of your ability at a later date. Don't refer to the sample questions as you prepare for the exam. The sample questions are representative of the types of questions you'll find on a CLEP exam, but none of the questions will actually appear on an exam. Concentrating on them without broader study of the subject won't help you.

If you think you're familiar with most of the test material, try to answer the sample questions, checking your responses against the answer key. Use the test-taking strategies described in the next chapter.

## Assessing Your Readiness for a CLEP Exam





## Suggestions for Studying

The following suggestions have been gathered from people who have prepared for CLEP exams or other college-level tests.

### 1. Review CLEP exam content.

**Remember, if you want to review exam content, Chapter VII of this study guide contains a complete exam description—including a content outline, a description of the knowledge and skills required to do well, and sample questions. An answer key is also included. However, the study guide is not intended to replace a textbook. Additional study may be required.**

### 2. Define your goals and locate study materials.

Once you have determined how much preparation you'll need to do, you'll need to define your study goals. Set aside a block of time to review the exam content provided in this book. Using the guidelines for knowledge and skills required, locate suitable resource materials. If a preparation course is offered by an adult school or college in your area, you might find it helpful to enroll. (You should be aware, however, that such courses are not authorized or sponsored by the College Board. The College Board has no responsibility for the content of these courses, nor are they responsible for books on preparing for CLEP exams published by other organizations.) If you know others who have taken CLEP exams, ask them how they prepared.

You may want to get a copy of a syllabus for the college course that is comparable to the CLEP exam(s) you plan to take. You can also ask the appropriate professor at the school you'll be attending, or check his or her website, for a reading list. Use the syllabus, course materials, and/or reading list as a guide for selecting textbooks and study materials. You may purchase these or check them out of your local library. Some websites offer excellent course materials and lectures. Examples include:

- MIT OpenCourseWare ([ocw.mit.edu](http://ocw.mit.edu))
- Carnegie Mellon's Open Learning Initiative ([cmu.edu/oli/](http://cmu.edu/oli/))
- National Repository of Online Courses ([thenrocpj.org](http://thenrocpj.org))

Most of this material is free. Educational websites, like those offered by PBS ([pbs.org](http://pbs.org)) or the National Geographic Society ([nationalgeographic.com](http://nationalgeographic.com)), can help. Find a list of suggested textbooks and online resources for each CLEP exam at [clep.collegeboard.org/exams](http://clep.collegeboard.org/exams).

Check with your librarian about study aids relevant to the exams you plan to take. These supplementary materials may include videos or DVDs made by education-oriented companies and organizations, language tapes, and computer software. And don't forget that what you do with your leisure time can be very educational, whether it's surfing current-events websites, watching a PBS series, reading a financial newsletter, or attending a play.

### 3. Find a good place to study.

To determine what kind of place you need for studying, ask yourself the following questions: Do I need a quiet place? Does the telephone distract me? Do objects I see in this place remind me of things I should do? Is it too warm? Is it well lit? Am I too comfortable here? Do I have space to spread out my materials? You may find the library more conducive to studying than your home. If you decide to study at home or in your dorm, prevent interruptions by household members by putting a sign on the door of your study room to indicate when you're available.

### 4. Schedule time to study.

To help you determine where studying best fits into your schedule, try this exercise: Make a list of your daily activities (for example, sleeping, working, eating, attending class, sports, or exercise), and estimate how many hours a day you spend on each activity. Rate activities on your list in order of importance, and evaluate your use of time. Often people are astonished at how an average day looks from this perspective. You may discover that your time can be scheduled in alternative ways. For example, you could remove the least important activities from your day, and devote that time to studying or to another important activity.

### 5. Establish a study routine and a set of goals.

To study effectively, establish specific goals and a schedule for accomplishing them. Some people find it helpful to write out a weekly schedule and cross out each study period when it's completed.

Others maintain concentration by writing down the time when they expect to complete a study task. Most people find short periods of intense study more productive than long stretches of time. For example, they may follow a regular schedule of several 20- or 30-minute study periods with short breaks between them. Some people allow themselves rewards as they complete each study goal. It doesn't matter whether you accomplish every goal on schedule. The point is to be committed to your task.

**6. Learn how to take an active role in studying.**

If you haven't done much studying lately, you may find it difficult to concentrate. Try a method of studying, such as the one outlined below, that gets you to concentrate on and remember what you read.

- a. First, read the chapter summary and the introduction so you'll know what to look for in your reading.
- b. Next, convert the section or paragraph headlines into questions. For example, if you're reading a section entitled "The Causes of the American Revolution," ask yourself, "What were the causes of the American Revolution?" Compose the answer as you read the paragraph. Reading and answering questions aloud let you grasp and retain the material.
- c. Take notes on key ideas or concepts as you read. Writing fixes concepts more firmly in your mind. Underlining key ideas or writing notes in your book may work for you and is useful for review. Underline only important points. If you underline more than a third of each paragraph, you're underlining too much.
- d. If there are questions or problems at the end of a chapter, answer or solve them on paper as if you were asked to do them for homework. Mathematics textbooks (and some other books) sometimes include answers to exercises. If you have such a book, write your answers before looking at the ones given. When problem solving is involved, work enough problems to master the required methods and concepts. If you have difficulty with problems, review any sample problems or explanations in the chapter.
- e. To retain knowledge, most people have to review the material periodically. If you're preparing for an exam over an extended period of time, review key concepts and notes each week or so. Don't wait weeks to review the material or you'll need to relearn much of it.

## Test Preparation Tips

1. Familiarize yourself as much as possible with the test and the test situation before the day of the exam. It helps to know ahead of time:
  - a. how much time is allowed for the test and whether there are timed subsections. (See Chapter VII.)
  - b. what types of questions and directions appear on the exam. (See Chapter VII.)
  - c. how your test score is computed.
  - d. in which building and room the exam is administered.
  - e. the time of the test administration.
  - f. directions, transportation, and parking information for the test center.
2. Register and pay your exam fee through My Account at [cleportal.collegeboard.org/myaccount](https://cleportal.collegeboard.org/myaccount) and print your registration ticket. Contact your preferred test center to schedule your appointment to test. Your test center may require an additional administration fee. Check with your test center to confirm the amount required and acceptable method of payment.

3. On the day of the exam, remember to do the following:

- a. Arrive early enough so you can find a parking place, locate the test center, and get settled comfortably before testing begins.
- b. Bring the following with you:
  - completed registration ticket.
  - any registration forms or printouts required by the test center. Make sure you have filled out all necessary paperwork before your testing date.
  - a form of valid and acceptable identification. Acceptable identification must:
    - Be government-issued.
    - Be an original document—photocopied documents aren't acceptable.
    - Be valid and current—expired documents (bearing expiration dates that have passed) aren't acceptable, no matter how recently they expired.
    - Bear the test taker's full name, in English language characters, exactly as it appears on the Registration Ticket, including the order of the names.
    - Include middle initials only if preferred to be included by test taker. They're optional and only need to match the first letter of the middle name when present on both the ticket and the identification.
    - Bear a recent recognizable photograph that clearly matches the test taker.
    - Include the test taker's signature.
    - Be in good condition, with clearly legible text and a clearly visible photograph.

**Refer to the Exam Day Info page on the CLEP website ([clep.collegeboard.org/earn-college-credit/taking-the-test](https://clep.collegeboard.org/earn-college-credit/taking-the-test)) for more details on acceptable and unacceptable forms of identification.**

- military test takers, bring your Geneva Convention Identification Card. Refer to [clep.collegeboard.org/military](https://clep.collegeboard.org/military) for additional information on IDs for active duty members, spouses, and civil service civilian employees.

- two number 2 pencils with good erasers. Mechanical pencils are prohibited in the testing room.

- c. Don't bring a cell phone or other electronic devices into the testing room.
- d. Leave all books, papers, and notes outside the test center. You aren't permitted to use your own scratch paper. It's provided by the test center.
- e. Don't take a calculator to the exam. If a calculator is required, it will be built into the testing software and available to you on the computer. The CLEP website has a link to a demonstration on how to use online calculators.

4. When you enter the test room:

- a. You'll be assigned to a computer testing station. If you have special needs, be sure to communicate them to the test center administrator *before* your test date.
- b. Be relaxed while taking the exam. Read directions carefully, and listen to instructions given by the test administrator. If you don't understand the directions, ask for help before the test begins. If you must ask a question not related to the exam after testing has begun, raise your hand, and a proctor will assist you. The proctor can't answer questions related to the exam.
- c. Know your rights as a test taker. You can expect to be given the full working time allowed for taking the exam and a reasonably quiet and comfortable place in which to work. If a poor testing situation prevents you from doing your best, ask whether the situation can be remedied. If it can't, ask the test administrator to report the problem on a Center Problem Report that will be submitted with your test results. You may also wish to immediately write a letter to CLEP, P.O. Box 6656, Princeton, NJ 08541-6656. Describe the exact circumstances as completely as you can. Be sure to include the name of the test center, the test date, and the name(s) of the exam(s) you took.

## Accommodations for Students with Disabilities

If you have a disability, such as a learning or physical disability, that would prevent you from taking a CLEP exam under standard conditions, you may request accommodations at your preferred test center. Contact your preferred test center well in advance of the test date to make the necessary arrangements and to find out its deadline for submission of documentation and approval of accommodations. Each test center sets its own guidelines in terms of deadlines for submission of documentation and approval of accommodations.

Accommodations that can be arranged directly with test centers include:

- ZoomText (screen magnification)
- Modifiable screen colors
- Use of a human reader, a scribe/writer, or sign language interpreter
- Extended time
- Untimed rest breaks

If the above accommodations don't meet your needs, contact CLEP Services at [clep@info.collegeboard.org](mailto:clep@info.collegeboard.org) for information about other accommodations.



# V. Taking the Examinations

Test-taking skills enable a person to use all available information to earn a score that truly reflects their ability. There are different strategies for approaching different kinds of exam questions. For example, free-response and multiple-choice questions require very different approaches. Other factors, such as how the exam will be scored, may influence your approach to the exam and your use of test time. Consequently, your preparation for an exam should include finding out all you can about the exam so you can use the most effective test-taking strategies.

## Test-Taking Strategies for Multiple-Choice Questions

1. Listen carefully to any instructions given by the test administrator, and read the on-screen instructions before you begin to answer the questions.
2. Keep an eye on the clock and the timing that's built into the testing software. You have the option of turning the clock on or off at any time. As you proceed, make sure that you're not working too slowly. You should have answered at least half the questions in a section when half the time for that section has passed.
3. Before answering a question, read the entire question, including all the answer choices. Instructions usually tell you to select the "best" answer. Sometimes one answer choice is partially correct, but another option is better. It's a good idea to read all the answers even if the first or second choice looks correct to you.
4. Read and consider every question. Questions that look complicated at first glance may not actually be so difficult once you have read them carefully.
5. Don't spend too much time on any one question. If you don't know the answer after you've considered it briefly, go on to the next question. Mark that question using the mark tool at the bottom of the screen, and go back to review the question later if you have time.

6. Watch for the following key words in test questions:

all	may	only
always	must	perhaps
but	necessary	rarely
except	never	seldom
every	none	sometimes
generally	not	usually
however	often	

When a question or answer option contains words such as "always," "every," "only," "never," and "none," there can be no exceptions to the answer you choose. Use of words such as "often," "rarely," "sometimes," and "generally" indicates that there may be some exceptions to the answer.

7. Make educated guesses. There's no penalty for incorrect answers. Therefore, guess even if you don't know an answer. If you have some knowledge of the question and can eliminate one or more of the answer choices as wrong, your chance of getting the right answer improves.
8. Don't waste your time looking for clues to right answers based on flaws in question wording or patterns in correct answers. CLEP puts a great deal of effort into developing valid, reliable, and fair exams. CLEP test development committees are composed of college faculty who are experts in the subjects covered by the exams and are appointed by the College Board to write test questions and to scrutinize each question on a CLEP exam. They ensure that questions aren't ambiguous, have only one correct answer, and cover college-level topics. These committees don't intentionally include "trick" questions. If you think a question is flawed, ask the test administrator to report it, or write immediately to CLEP Test Development, P.O. Box 6600, Princeton, NJ 08541-6600. Include the name of the exam and test center, the exam date, and the number of the exam question. All such inquiries are investigated by test development professionals.

## Answering Essay Questions

The College Composition and Spanish with Writing exams are the only CLEP exams that include mandatory writing sections. Both the multiple-choice and writing sections of the exams are administered on the computer. You're required to type your written responses using a format similar to word processing.

The essays for the College Composition exam are scored by English professors from various colleges and universities who are trained by CLEP. A process called holistic scoring is used to rate your writing abilities. This process is explained in the examination guide for College Composition, which also includes scored sample essays and essay questions.

The Spanish with Writing responses are scored twice monthly by college Spanish faculty from throughout the country via an online scoring system. Each of the two writing tasks is scored independently by at least two different readers, and the scores are then combined. Additional scoring details can be found in the Spanish Language examination guide along with sample writing tasks.

Four other CLEP exams have optional essays. Some colleges or universities may require you to take one of these optional essays as part of the American Literature, Analyzing and Interpreting Literature, English Literature, or College Composition Modular exam. There's an additional fee for each of the optional essays, payable to the institution that administers the exam. These essays are scored by the faculty of the institution that grants the credit. Therefore, you may find it helpful to talk with someone at your college to find out what criteria are used to determine whether you'll get credit. Ask how much emphasis is placed on your writing ability and your ability to organize your thoughts, as opposed to your knowledge of the subject matter. Find out how much weight is given to your multiple-choice test score, compared to your free-response score, in determining whether you'll get credit. This gives you an idea of what to work hardest on in preparing for and taking the exam.

## Test-Taking Strategies for Essay Writing

1. Before you begin to respond, read the questions carefully, and take a few minutes to jot down some ideas or create an outline. Scratch paper is provided at the test center.
2. If you're given a choice of questions to answer, choose the questions that you think you can answer most clearly and knowledgeably.
3. Determine the order in which you'll answer the questions. First, answer those you find the easiest so you can spend any extra time on the questions you find more difficult.
4. When you know which questions you'll answer and in what order, determine how much testing time remains, and estimate how many minutes you'll devote to each question. Unless suggested times are given for the questions, try to allot an equal amount of time for each question.
5. Before answering each question, read it again carefully to make sure you're interpreting it correctly. Pay attention to key words, such as those listed below, that appear in free-response questions. Be sure you know the exact meaning of these words before taking the exam.

analyze	describe	interpret
apply	determine	justify
assess	discuss	list
compare	distinguish	outline
contrast	enumerate	prove
define	explain	rank
demonstrate	generalize	show
derive	illustrate	summarize

If a question asks you to "outline," "define," or "summarize," don't write a detailed explanation; if a question asks you to "analyze," "explain," "illustrate," "interpret," or "show," you must do more than briefly describe the topic.



# VI. Interpreting Your Scores

CLEP score requirements for awarding credit vary from institution to institution. The College Board, however, recommends that colleges refer to the standards set by the American Council on Education (ACE). All ACE recommendations are the result of careful and periodic review by evaluation teams made up of faculty who are subject-matter experts and technical experts in testing and measurement. To determine whether you are eligible for credit for your CLEP scores, refer to the policy of the college you'll be attending. The policy states the score that's required to earn credit at that institution. Many colleges award credit at the score levels recommended by ACE. However, some require scores higher or lower than these.

Your exam score is printed for you at the test center immediately upon completion of the examination, unless you took College Composition or Spanish with Writing. For these exams, you'll receive your score online one to two weeks after the exam date. You can also view your scores for other exams online one business day after taking the test by logging into My Account ([cleportal.collegeboard.org/myaccount](https://cleportal.collegeboard.org/myaccount)). Your scores are kept on file for 20 years. Your CLEP exam scores are reported only to you, unless you ask to have them sent elsewhere. If you want your scores sent to a college, employer, or certifying agency, you must select this option through My Account. This service is free only if you select your score recipient when you register. For a fee, you can request an official transcript at a later date by logging in to My Account ([cleportal.collegeboard.org/myaccount](https://cleportal.collegeboard.org/myaccount)).

The pamphlet, *What Your CLEP Score Means*, gives detailed information about interpreting your scores and is available at [clep.collegeboard.org](https://clep.collegeboard.org). A copy of the pamphlet is also in the appendix of this guide. A brief explanation appears below.

## How CLEP Scores Are Computed

In order to reach a total score on your exam, two calculations are performed.

1. Your "raw score" is the number of questions you answered correctly. Your raw score increases by one point for each question answered correctly.
2. Your raw score is then converted to a scaled score that ranges from 20 to 80, and this is the score

that appears on your score report. The American Council on Education (ACE) recommends that colleges grant credit for a score of 50 or higher, but individual institutions can set their own CLEP credit policies.

## How Essays Are Scored

The College Board arranges for college English professors to score the essays written for the College Composition exam. These carefully selected college faculty members teach at two- and four-year institutions nationwide. The faculty members receive extensive training and thoroughly review the College Board scoring policies and procedures before grading the essays. Each essay is read and scored by two professors, the sum of the two scores for each essay is combined with the multiple-choice score, and the result is reported as a scaled score between 20 and 80. Although the format of the two sections is very different, both measure skills required for expository writing. Knowledge of formal grammar, sentence structure, and organizational skills is necessary for the multiple-choice section, but the emphasis in the free-response section is on writing skills rather than grammar.

Spanish with Writing compositions are scored twice monthly by college Spanish faculty from throughout the country via an online scoring system. Each of the two writing tasks is scored independently by two different readers, and the scores are then combined. The multiple-choice section score (75%) and writing score (25%) are then combined to yield the candidate's exam score. The resulting combined score is reported as a single scaled score between 20 and 80. Separate scores are not reported for the multiple-choice and writing sections.

Optional essays for CLEP Composition Modular and the literature examinations are evaluated and scored by the colleges that require them, rather than by the College Board. If you take an optional essay, it's sent to the institution you designate when you take the test. If you didn't designate a score recipient institution when you took an optional essay, you may still select one as long as you notify CLEP within 18 months of taking the exam. Copies of essays aren't held beyond 18 months or after they have been sent to an institution.



# VII. Examination Guide

## College Algebra

### Description of the Examination

The College Algebra examination covers material that is usually taught in a one-semester college course in algebra. Nearly half of the test is made up of routine problems requiring basic algebraic skills; the remainder involves solving nonroutine problems in which candidates must demonstrate their understanding of concepts. The test includes questions on basic algebraic operations; linear and quadratic equations, inequalities and graphs; algebraic, exponential and logarithmic functions; and miscellaneous other topics. It is assumed that candidates are familiar with currently taught algebraic vocabulary, symbols and notation. The test places little emphasis on arithmetic calculations. However, an online scientific calculator (nongraphing) will be available during the examination.

The examination contains approximately 60 questions to be answered in approximately 90 minutes. Some of these are pretest questions that will not be scored.

### Knowledge and Skills Required

Questions on the College Algebra examination require candidates to demonstrate the following abilities in the approximate proportions indicated.

- Solving routine, straightforward problems (about 50 percent of the examination)
- Solving nonroutine problems requiring an understanding of concepts and the application of skills and concepts (about 50 percent of the examination)

The subject matter of the College Algebra examination is drawn from the following topics. The percentages next to the main topics indicate the approximate percentage of exam questions on that topic.

### 25% Algebraic Operations

Operations with exponents  
Factoring and expanding polynomials  
Operations with algebraic expressions  
Absolute value  
Properties of logarithms

### 25% Equations and Inequalities

Linear equations and inequalities  
Quadratic equations and inequalities  
Absolute value equations and inequalities  
Systems of equations and inequalities  
Exponential and logarithmic equations

### 30% Functions and Their Properties\*

Definition, interpretation and representation/  
modeling (graphical, numerical,  
symbolic, verbal)  
Domain and range  
Evaluation of functions  
Algebra of functions  
Graphs and their properties (including  
intercepts, symmetry, transformations)  
Inverse functions

### 20% Number Systems and Operations

Real numbers  
Complex numbers  
Sequences and series  
Factorials and Binomial Theorem

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\*Each test may contain a variety of functions, including linear, polynomial (degree  $\leq 5$ ), rational, absolute value, power, exponential, logarithmic and piecewise-defined.

## Sample Test Questions

The following sample questions do not appear on an actual CLEP examination. They are intended to give potential test takers an indication of the format and difficulty level of the examination and to provide content for practice and review. Knowing the correct answers to all of the sample questions is not a guarantee of satisfactory performance on the exam.

**Directions:** An online scientific calculator will be available for the questions in this test.

Some questions will require you to select from among five choices. For these questions, select the BEST of the choices given.

Some questions will require you to type a numerical answer in the box provided.

**Notes:** (1) Unless otherwise specified, the domain of any function  $f$  is assumed to be the set of all real numbers  $x$  for which  $f(x)$  is a real number.

(2)  $i$  will be used to denote  $\sqrt{-1}$ .

(3) Figures that accompany questions are intended to provide information useful in answering the questions. All figures lie in a plane unless otherwise indicated. The figures are drawn as accurately as possible EXCEPT when it is stated in a specific question that the figure is not drawn to scale. Straight lines and smooth curves may appear slightly jagged on the screen.

1. Which of the following expressions is equivalent to  $(3 - 5b)^2$ ?

- (A)  $9 - 25b^2$
- (B)  $9 + 25b^2$
- (C)  $9 - 15b - 25b^2$
- (D)  $9 + 30b - 25b^2$
- (E)  $9 - 30b + 25b^2$

2. Which of the following is a factor of  $4 - (x + y)^2$ ?

- (A)  $-(x + y)^2$
- (B)  $x + y$
- (C)  $2 - x + y$
- (D)  $2 + x + y$
- (E)  $4 + x + y$

3.  $2v(3v^2 - 1) - (6 - 8v^3 + 14v) + 3 =$

- (A)  $-2v^3 + 12v - 3$
- (B)  $14v^3 + 12v - 3$
- (C)  $14v^3 - 14v - 4$
- (D)  $14v^3 - 16v - 3$
- (E)  $14v^3 - 16v - 6$

4. The radius of the Sun is approximately  $10^9$  meters, and the radius of an oxygen atom is approximately  $10^{-12}$  meter. The radius of the Sun is approximately how many times the radius of an oxygen atom?

- (A)  $10^{-21}$
- (B)  $10^{-3}$
- (C)  $10^3$
- (D)  $10^9$
- (E)  $10^{21}$

5. Where defined  $\frac{\frac{x^2 - 9}{x + 2}}{\frac{x - 3}{x - 2}} =$

- (A)  $\frac{x - 2}{x + 2}$
- (B)  $\frac{(x - 2)(x + 3)}{x + 2}$
- (C)  $\frac{x^2 - x + 6}{x + 2}$
- (D)  $\frac{1}{(x - 2)(x + 2)}$
- (E)  $\frac{x + 3}{(x - 2)(x + 2)}$

6. Which of the following are solutions of the equation  $(2x - 3)(3x + 5) = -14$  ?

- (A)  $x = \frac{1}{3}$  and  $x = -\frac{1}{2}$   
 (B)  $x = -\frac{1}{3}$  and  $x = \frac{1}{2}$   
 (C)  $x = \frac{3}{2}$  and  $x = -\frac{5}{3}$   
 (D)  $x = -\frac{3}{2}$  and  $x = \frac{5}{3}$   
 (E)  $x = 2$  and  $x = -7$

7. Of the following, which is the greatest?

- (A)  $2^{(3^5)}$   
 (B)  $(2^3)^5$   
 (C)  $3^{(2^5)}$   
 (D)  $(3^2)^5$   
 (E)  $5^{(3^2)}$

8. For any positive integer  $n$ ,  $\frac{(n+1)!}{n!} - n =$

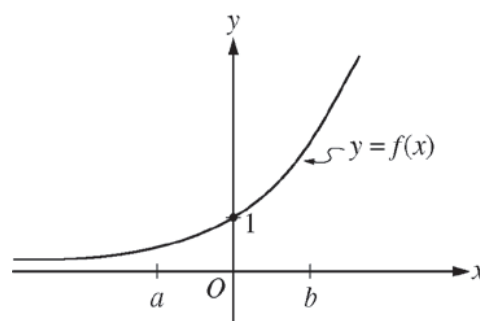
- (A) 0 (B) 1 (C)  $n$  (D)  $n+1$  (E)  $n!$

9. Which of the following is equal to  $r^2 t^{1/2} r^{2/3} t^{-3/2}$  ?

- (A)  $-r^{8/3} t$   
 (B)  $\frac{r^{4/3}}{t^{3/4}}$   
 (C)  $\frac{r^{4/3}}{t}$   
 (D)  $\frac{r^{5/2}}{t^{5/6}}$   
 (E)  $\frac{r^{8/3}}{t}$

10. A ball is dropped from a height of  $h$  feet and repeatedly bounces off the floor. After each bounce, the ball reaches a height that is  $\frac{2}{3}$  of the height from which it previously fell. For example, after the first bounce, the ball reaches a height of  $\frac{2}{3}h$  feet. Which of the following represents the total number of feet the ball travels between the first and the sixth bounce?

- (A)  $\sum_{i=1}^5 (2h) \left(\frac{2}{3}\right)^i$   
 (B)  $\sum_{i=1}^5 h \left(\frac{2}{3}\right)^i$   
 (C)  $\sum_{i=1}^5 \left(\frac{2}{3}h\right)^i$   
 (D)  $\sum_{i=1}^6 (2h) \left(\frac{2}{3}\right)^{i-1}$   
 (E)  $\sum_{i=1}^{\infty} h \left(\frac{2}{3}\right)^i$



11. The graph shows an exponential function  $f$  in the  $xy$ -plane. The function  $g$  is defined by  $g(x) = 2^{-x}$ . Complete each sentence in the table by indicating the correct relationship between the two values.

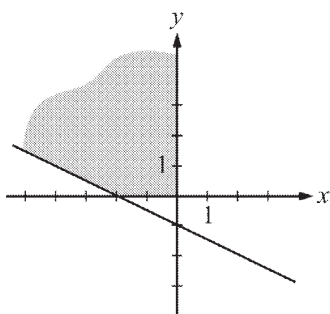
	less than	greater than	equal to	
$f(a)$ is				$g(a)$ .
$f(b)$ is				$g(b)$ .
$f(0)$ is				$g(0)$ .

12. Which of the following defines the interval of real numbers  $[-4, 2]$ ?

(A)  $|x - 0| \leq 2$   
 (B)  $|x + 1| \leq 3$   
 (C)  $|x + 1| \geq 3$   
 (D)  $|x - 4| \leq 2$   
 (E)  $|x - 4| \geq 2$

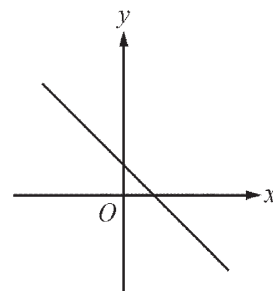
13. Which of the following are the solutions of the equation  $2x^2 + 2x = 4 - x$ ?

(A)  $x = 4$  and  $x = 1$   
 (B)  $x = 4$  and  $x = -\frac{1}{2}$   
 (C)  $x = \frac{3 + \sqrt{35}}{4}$  and  $x = \frac{3 - \sqrt{35}}{4}$   
 (D)  $x = \frac{-3 + \sqrt{41}}{4}$  and  $x = \frac{-3 - \sqrt{41}}{4}$   
 (E)  $x = \frac{-3 + i\sqrt{23}}{2}$  and  $x = \frac{-3 - i\sqrt{23}}{2}$



14. The shaded region in the figure above represents the intersection of the graphs of  $x \leq 0$ ,  $y \geq 0$ , and which of the following inequalities?

(A)  $y \leq -2x - 1$   
 (B)  $y \leq -\frac{1}{2}x + 1$   
 (C)  $y \geq -2x - 1$   
 (D)  $y \geq -\frac{1}{2}x - 1$   
 (E)  $y \geq \frac{1}{2}x - 1$



15. The graph of the line with equation  $ax + by = 1$  is shown above. Which of the following must be true?

(A)  $a > 0$  and  $b < 0$   
 (B)  $a > 0$  and  $b > 0$   
 (C)  $a < 0$  and  $b < 0$   
 (D)  $a < 0$  and  $b > 0$   
 (E)  $a = 0$  and  $b > 0$

16. What are all the values of  $b$  for which the equation  $9x^2 + bx + 1 = 0$  has no real solutions?

(A)  $b = -6$  or  $b = 6$   
 (B)  $b < -6$  or  $b > 6$   
 (C)  $b \leq -6$  or  $b \geq 6$   
 (D)  $-6 < b < 6$   
 (E)  $-6 \leq b \leq 6$

17. Which quadrants of the  $xy$ -plane contain points of the graph of  $2x - y > 4$ ?

(A) I, II, and III only  
 (B) I, II, and IV only  
 (C) I, III, and IV only  
 (D) II, III, and IV only  
 (E) I, II, III, and IV

18. Joe invests \$40,000 and, at the same time, Tom invests \$10,000. The value of Joe's investment decreases by \$4,000 per year, while the value of Tom's investment increases by \$1,000 per year. Which of the following systems of equations could be used to find the numbers of years,  $t$ , that it will take for the values,  $v$ , of the two investments to be equal?
- (A)  $v = 40,000 - t$  and  $v = 10,000 + t$   
 (B)  $v = 40,000 - 4t$  and  $v = 10,000 + t$   
 (C)  $v = 40,000 + 1,000t$  and  $v = 10,000 - 4,000t$   
 (D)  $v = 40,000 + 4,000t$  and  $v = 10,000 - 1,000t$   
 (E)  $v = 40,000 - 4,000t$  and  $v = 10,000 + 1,000t$
19. Which of the following is an equation of the line that passes through the points  $(-2, 1)$  and  $(1, 2)$  in the  $xy$ -plane?
- (A)  $x + 3y = 1$   
 (B)  $x + 3y = 5$   
 (C)  $x + 3y = -5$   
 (D)  $x - 3y = -5$   
 (E)  $x - 3y = -1$
20. If  $x$  is an irrational number, which of the following statements must be true?
- (A)  $x^3$  is an irrational number.  
 (B)  $x^2$  is an irrational number.  
 (C)  $x + x$  is an irrational number.  
 (D)  $x^2$  is a rational number.  
 (E)  $x + x$  is a rational number.
21. When  $\frac{3+4i}{2+i}$  is expressed in the form  $a + bi$ , what is the value of  $a$ ?
- 
22. If  $a < 0 < b < c$ , then each of the following must be true EXCEPT
- (A)  $ac < ab$   
 (B)  $a^2 < b^2 < c^2$   
 (C)  $a^3 < b^3 < c^3$   
 (D)  $ab < b^2 < bc$   
 (E)  $a^2b < a^2c$
23. The illuminance of a surface varies inversely with the square of its distance from the light source. If the illuminance of a surface is 120 lumens per square meter when its distance from a certain light source is 6 meters, by how many meters should the distance of the surface from the source be increased to reduce its illuminance to 30 lumens per square meter?
- (A) 3  
 (B) 6  
 (C) 12  
 (D) 15  
 (E) 18
24. What are all real values of  $x$  for which  $\frac{2}{3-x} = \frac{1}{3} - \frac{1}{x}$ ?
- (A)  $x = -3$  only  
 (B)  $x = 3$  only  
 (C)  $x = -3$  and  $x = 0$   
 (D)  $x = -3$  and  $x = 3$   
 (E) There are no real solutions.
25. Indicate whether each statement is always true, never true, or sometimes true for the real numbers  $a$  and  $b$ .

Statement	Always True	Never True	Sometimes True
$ a + b  =  a  +  b $			
$ a + b  <  a  +  b $			
$ a + b  \leq  a  +  b $			
$ a + b  >  a  +  b $			



$x$	0	1	2	3	4	5	6	7
$p(x)$	-30	22	110	150	34	-130	222	2,350

26. The table above gives some of the values of a 5th degree polynomial  $p(x)$ . Based on the values shown, what is the minimum number of real roots of the equation  $p(x) = 0$ ?

(A) One  
(B) Two  
(C) Three  
(D) Four  
(E) Five

27. The number of bricks in the bottom row of a brick wall is 49. The next row up from the bottom contains 47 bricks, and each subsequent row contains 2 fewer bricks than the row immediately below it. The number of bricks in the top row is 3. If the wall is one brick thick, what is the total number of bricks in the wall?

28. Which of the following is the expansion of  $(2x + 3)^3$ ?

(A)  $2x^3 + 3(2x^2) + 3(2x) + 1$   
(B)  $2x^3 + 3(2x^2) + 3^2(2x) + 3$   
(C)  $2x^3 + 3(2x^2) + 3^2(2x) + 3^3$   
(D)  $(2x)^3 + 3(2x)^2 + 3^2(2x) + 3^3$   
(E)  $(2x)^3 + 3^2(2x)^2 + 3^3(2x) + 3^3$

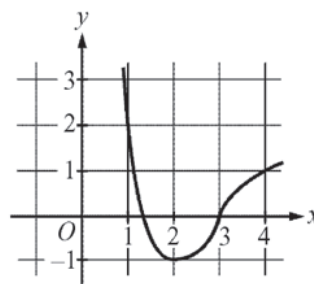
29. If  $x = -3$  is a root of the equation  $x^3 + 3x^2 - ax - 12 = 0$ , what is the value of  $a$ ?

30. If the first term of a geometric sequence is  $\frac{3}{2}$  and the second and third terms are  $-\frac{3}{4}$  and  $\frac{3}{8}$ , respectively, which of the following represents the  $n$ th term of the sequence?

(A)  $\frac{3(-1)^{n-1}}{2n}$   
(B)  $\frac{3(-1)^n}{2n}$   
(C)  $\frac{3(-1)^{n-1}}{2^n}$   
(D)  $\frac{3(-1)^n}{2^n}$   
(E)  $\frac{3(-1)^{n-1}}{2^{n+1}}$

31. A clothing company has budgeted \$58,000 for the purchase of 7 sewing machines. The 7 sewing machines are to be chosen from two models, model X and model Y. If a model X sewing machine costs \$8,000 and a model Y sewing machine costs \$9,000, how many model X sewing machines should the company purchase to use exactly the budgeted money?

(A) 2    (B) 3    (C) 4    (D) 5    (E) 6



32. The graph of the function  $f$  is shown above. What is the value of  $f(f(1))$ ?

(A) -1    (B) 0    (C) 1    (D) 2    (E) 4

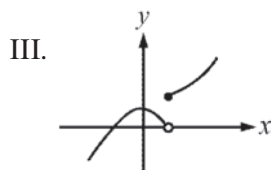
33. In the  $xy$ -plane, what is the  $x$ -intercept of the graph of  $y = -\frac{2}{3}x - 4$ ?

34. Which of the following define  $y$  as a function of  $x$ ?

I.  $2x^2 + y = 7$

II.

$x$	1	2	3	4
$y$	2	5	-1	2



- (A) None  
 (B) I and II only  
 (C) I and III only  
 (D) II and III only  
 (E) I, II, and III

35. If  $3^{x+1} = 9^{2x-1}$ , then  $x =$

36. Select two of the following choices and place them in the blanks below so that the resulting statements are true.

$$M(t) = 210(0.89)^t \quad 155$$

$$M(t) = 210(0.11)^t \quad 117$$

$$M(t) = 11(210)^t \quad 28$$

A patient takes a 210-milligram dose of medicine. The amount of medicine present in the body decreases by 11 percent each hour after it is taken. The amount of medicine  $M$  present in the body  $t$  hours after the medicine is taken can be modeled by the function \_\_\_\_\_. According to the model, \_\_\_\_\_ milligrams of the medicine are present in the body 5 hours after the medicine is taken.

37. Let  $f$  be a linear function. When  $f(x)$  is divided by  $x - 3$ , the remainder is 5. When  $f(x)$  is divided by  $x - 4$ , the remainder is 3. What is the value of  $f(0)$ ?

- (A) 2  
 (B) 5  
 (C) 8  
 (D) 11  
 (E) 15

38. If  $\log_4(y + 2) = 3$ , what is the value of  $y$ ?

- (A) 10 (B) 62 (C) 64 (D) 79 (E) 83

39. A colony of bacteria starts with 2 bacteria at noon. If the colony of bacteria triples every 30 minutes, how many bacteria will be present at 3:00 P.M. on the same day?

- (A) 486  
 (B) 729  
 (C) 1,458  
 (D) 46,656  
 (E) 118,098

40. Which of the following must be true?

- I.  $\log_3 3^t = t$   
 II.  $\ln 10^{4.3} = 4.3 \ln 10$   
 III.  $\log_{10}(xy^n) = \log_{10} x + n \log_{10} y$  for all positive numbers  $x$  and  $y$
- (A) I only  
 (B) II only  
 (C) I and II only  
 (D) II and III only  
 (E) I, II, and III

41. If  $f(x) = 5 - 2x^3$  and  $f^{-1}$  denotes the inverse function of  $f$ , then  $f^{-1}(x) =$

(A)  $\sqrt[3]{\frac{5-x}{2}}$   
 (B)  $\frac{\sqrt[3]{5-x}}{2}$   
 (C)  $\sqrt[3]{\frac{x-5}{2}}$   
 (D)  $\frac{1}{5-2x^3}$   
 (E)  $5x^3 + 2$

42.  $\frac{2x-1}{x+3} - \frac{x-2}{2x+1} =$

(A)  $\frac{x+1}{3x+4}$   
 (B)  $\frac{x-3}{(x+3)(2x+1)}$   
 (C)  $\frac{3x-3}{(x+3)(2x+1)}$   
 (D)  $\frac{3x^2-x+5}{(x+3)(2x+1)}$   
 (E)  $\frac{3x^2+x-7}{(x+3)(2x+1)}$

43. In the  $xy$ -plane, the point  $(8, 10)$  lies on the graph of the function  $y = f(x)$ . Which of the following points must lie on the graph of the function  $y = 2f(x-3) + 5$ ?

(A)  $(5, 10)$   
 (B)  $(5, 15)$   
 (C)  $(5, 25)$   
 (D)  $(11, 15)$   
 (E)  $(11, 25)$

44.  $(i+1)(3-i) + (2i-1) =$

(A)  $-6$   
 (B)  $1+4i$   
 (C)  $2+4i$   
 (D)  $3+4i$   
 (E)  $4+2i$

45. The population of a small town is modeled by an exponential function of the form  $p(t) = ab^t$ , where  $t$  represents the number of years since 2010. The population of the town was recorded as 425 in 2010 and 612 in 2012. Based on the data for the years 2010 and 2012, what is the value of  $b$  in the model?

46. Which of the following, when added to  $4a^2 + 9$ , will result in a perfect square for all integer values of  $a$ ?

(A) 0 (B)  $3a$  (C)  $6a$  (D)  $9a$  (E)  $12a$

$$\begin{aligned}x^2 + y^2 &= 25 \\x + y &= 1\end{aligned}$$

47. For what values of  $x$  will  $(x, y)$  be a solution of the system of equations above?

(A)  $x = -4$  and  $x = 3$   
 (B)  $x = -4$  and  $x = 5$   
 (C)  $x = -3$  and  $x = 4$   
 (D)  $x = 1$  and  $x = 5$   
 (E) The system has no solutions.

48. A company's daily cost  $c$ , in hundreds of dollars, to manufacture  $n$  items of a certain product can be modeled by the function  $c(n)$ . According to the model, which of the following is the best interpretation of  $c^{-1}(5) = 80$ , where  $c^{-1}$  is the inverse function of  $c$ ?

(A) The company's daily cost to manufacture 5 items of the product is \$80.  
 (B) The company's daily cost to manufacture 5 items of the product is \$8,000.  
 (C) The company's daily cost to manufacture 500 items of the product is \$80.  
 (D) The company's daily cost to manufacture 80 items of the product is \$5.  
 (E) The company's daily cost to manufacture 80 items of the product is \$500.

$$f(x) = \begin{cases} x^2 & \text{for } x \leq 0 \\ ax + b & \text{for } x > 0 \end{cases}$$

49. The function  $f$  above has an inverse function for which of the following values of  $a$  and  $b$ ?

(A)  $a = -1$ ,  $b = -2$   
 (B)  $a = -1$ ,  $b = 2$   
 (C)  $a = 0$ ,  $b = -1$   
 (D)  $a = 1$ ,  $b = -2$   
 (E)  $a = 1$ ,  $b = 2$

50. For the function  $g(x) = \log_2 x$ , which of the following must be true?

I. The domain is  $[0, \infty)$ .  
 II. The range is  $(-\infty, \infty)$ .  
 III.  $g(x)$  increases with increasing values of  $x$ .

(A) III only  
 (B) I and II only  
 (C) I and III only  
 (D) II and III only  
 (E) I, II, and III

51. A rectangular box has volume  $x^3 - 8$  cubic inches. If the height of the box is  $x - 2$  inches, what is the area of the base of the box, in square inches? (The volume of a box equals the area of the base times the height.)

(A)  $x^2 + 4$   
 (B)  $x^2 - 2x - 4$   
 (C)  $x^2 - 2x + 4$   
 (D)  $x^2 + 2x + 4$   
 (E)  $x^2 + 4x + 4$

52. If  $y = 8x^2 + 4x - 1$  is expressed in the form  $y = a(x - h)^2 + k$ , where  $a$ ,  $h$ , and  $k$  are constants, what is the value of  $k$ ?

(A)  $-3$   
 (B)  $-2$   
 (C)  $-\frac{3}{2}$   
 (D)  $-\frac{17}{16}$   
 (E)  $-\frac{1}{2}$

53. If  $b$  and  $c$  are integers such that the equation  $3x^2 + bx + c = 0$  has only one real root, which of the following statements must be true?

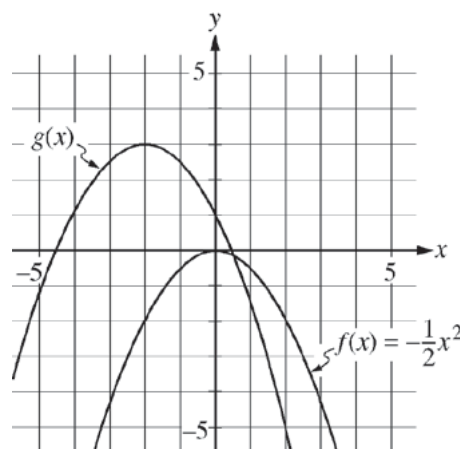
I.  $b$  is even.  
 II.  $c$  is odd.  
 III.  $b^2$  is a multiple of 3.

(A) I only  
 (B) III only  
 (C) I and II only  
 (D) I and III only  
 (E) I, II, and III

54. A rock is thrown straight up into the air from a height of 4 feet. The height of the rock above the ground, in feet,  $t$  seconds after it is thrown is given by  $-16t^2 + 56t + 4$ . For how many seconds will the height of the rock be at least 28 feet above the ground?

(A) 0.5  
 (B) 1.5  
 (C) 2.5  
 (D) 3.0  
 (E) 3.5

55.  $\log_5 \sqrt{125} - \log_2 \sqrt{2} =$



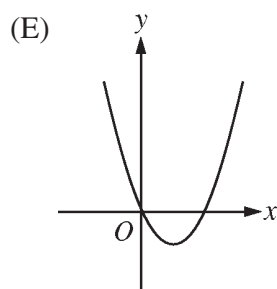
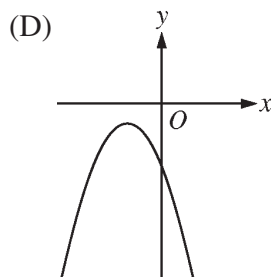
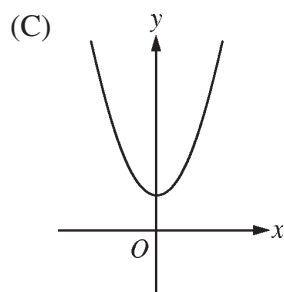
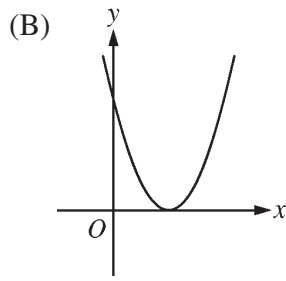
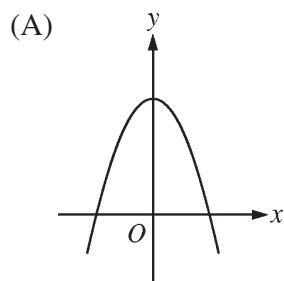
56. In the figure shown above, the graph of the function  $g$  is a transformation of the graph of the function  $f$ . Which of the following is the equation of  $g$ ?

(A)  $g(x) = -\frac{1}{2}x^2 + 3$   
 (B)  $g(x) = -\frac{1}{2}(x - 2)^2 + 3$   
 (C)  $g(x) = -\frac{1}{2}(x - 2)^2 - 3$   
 (D)  $g(x) = -\frac{1}{2}(x + 2)^2 + 3$   
 (E)  $g(x) = -\frac{1}{2}(x + 2)^2 - 3$

57. The polynomial  $p(x) = x^3 + 2x - 11$  has a real zero between which two consecutive integers?

(A) 0 and 1  
 (B) 1 and 2  
 (C) 2 and 3  
 (D) 3 and 4  
 (E) 4 and 5

58. Which of the following could be the graph of  $y = ax^2 + bx + c$ , where  $b^2 - 4ac = 0$ ?



59. Consider each function below. Is the domain of the function the set of all real numbers?

Function	Yes	No
$f(x) = \frac{x-1}{x^2+2}$		
$g(x) = \frac{x^2}{x+1}$		
$h(x) = \frac{\sqrt{x}}{x^2+3}$		

60. The sum of the first  $n$  terms of an arithmetic sequence  $a_1, a_2, a_3, \dots, a_n$  is  $\frac{1}{2}n(a_1 + a_n)$ , where  $a_1$  and  $a_n$  are the first and the  $n$ th terms of the sequence, respectively. What is the sum of the odd integers from 1 to 99, inclusive?

- (A) 2,400  
(B) 2,450  
(C) 2,475  
(D) 2,500  
(E) 2,550

61. The function  $f$  is defined for all real numbers  $x$  by  $f(x) = ax^2 + bx + c$ , where  $a$ ,  $b$ , and  $c$  are constants and  $a$  is negative. In the  $xy$ -plane, the  $x$ -coordinate of the vertex of the parabola  $y = f(x)$  is  $-1$ . If  $t$  is a number for which  $f(t) > f(0)$ , which of the following must be true?

- I.  $-2 < t < 0$   
II.  $f(t) < f(-2)$   
III.  $f(t) > f(1)$
- (A) I only  
(B) II only  
(C) I and III only  
(D) II and III only  
(E) I, II, and III

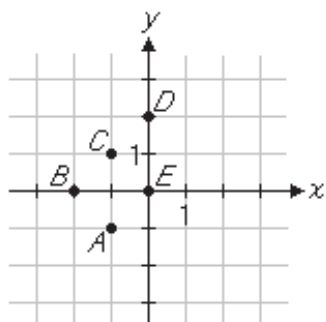
$x$	$h(x)$
-3	5
-2	-4
2	$c$

62. The table above shows some values of the function  $h$ , which is defined for all real numbers  $x$ . If  $h$  is an odd function, what is the value of  $c$ ?

(A) -5  
(B) -4  
(C) -2  
(D) 2  
(E) 4

63. If  $\sum_{n=1}^{10} a_n = 50$ , what is the value of  $\sum_{n=1}^{10} (4a_n + 3)$ ?

(A) 53  
(B) 80  
(C) 203  
(D) 223  
(E) 230



64. If  $z = -1 + i$  and  $\bar{z}$  denotes the complex conjugate of  $z$ , which of the following points in the complex plane above represents  $z + \bar{z}$ ?

(A) A  
(B) B  
(C) C  
(D) D  
(E) E

65. What is the remainder when the polynomial  $9x^{23} - 7x^{12} - 2x^5 + 1$  is divided by  $x + 1$ ?

(A) -19  
(B) -13  
(C) -7  
(D) 1  
(E) 11

66. 
$$f(x) = \sqrt{x+1}$$
$$g(x) = \sqrt{2-x}$$

Functions  $f$  and  $g$  are defined as shown above. What is the domain of the function  $f + g$ ?

(A)  $x \geq 0$   
(B)  $x \geq 1$   
(C)  $x \geq 2$   
(D)  $-1 \leq x \leq 2$   
(E)  $-2 \leq x \leq 1$

67. In the  $xy$ -plane, the line given by which of the following is perpendicular to the line  $5x - 2y = 7$ ?

(A)  $2x + 5y = 7$   
(B)  $2x - 5y = 7$   
(C)  $5x + 2y = 7$   
(D)  $5x - 2y = 10$   
(E)  $5x - 5y = 10$



68. Which of the following statements about the polynomial  $p(x) = (x - 4)^2(x^2 + 4)$  are true?

- I. The polynomial has two imaginary roots.
- II. The polynomial has no real roots.
- III. The polynomial has four complex roots, counting multiplicities.

- (A) I only
- (B) II only
- (C) III only
- (D) I and III only
- (E) I, II, and III

69. 
$$C(x) = 1200 + 1000x$$
$$R(x) = 1200x - x^2$$

For a certain company, the functions shown above model the cost  $C$  of producing  $x$  units of a product and the revenue  $R$  from selling  $x$  units of the same product. The profit function  $P$  is equal to  $R - C$ . Which of the following defines the function  $P$ ?

- (A)  $P(x) = x^2 - 200x + 1200$
- (B)  $P(x) = x^2 + 200x - 1200$
- (C)  $P(x) = -x^2 + 200x - 1200$
- (D)  $P(x) = -x^2 + 2200x - 1200$
- (E)  $P(x) = -x^2 + 2200x + 1200$

70. Which of the following is equivalent to  $\frac{\sqrt[4]{36}}{\sqrt{6}}$ ?

- (A)  $6\sqrt[4]{6}$
- (B)  $\sqrt[4]{6}$
- (C)  $\sqrt{6}$
- (D) 6
- (E) 1

71. If  $\log_x 5 = 2$ , what is the value of  $x$ ?

- (A)  $\sqrt{5}$
- (B)  $\sqrt{2}$
- (C)  $\sqrt[5]{2}$
- (D)  $2^5$
- (E)  $5^2$

72. What is the solution of the equation  $4^{2x} = 64$ ?

- (A)  $\frac{2}{3}$
- (B)  $\frac{3}{2}$
- (C) 2
- (D) 3
- (E) 8

73. The function  $f$  is defined by  $f(x) = x^2 + 3$ . Which of the following is equal to  $f(x + 5)$ ?

- (A)  $x^2 + 8$
- (B)  $x^2 + 28$
- (C)  $x^2 + 5x + 8$
- (D)  $x^2 + 10x + 8$
- (E)  $x^2 + 10x + 28$

74. The population of a certain city was 10,200 on January 1, 2013. If the population increases by 8 percent per year for the next 3 years, which of the following best approximates the population of the city on January 1, 2016?

- (A)  $10,200(0.8)^3$
- (B)  $10,200(0.08)^3$
- (C)  $10,200(1.08)^3$
- (D)  $10,200 + (0.8)(3)$
- (E)  $10,200 + (1.08)(3)$

75. What is the value of  $f(0)$  for the function  $f(x) = \log_{10} 10 + 9^x + (x-2)(x-1)$ ?

76. If  $20 = 3^x$ , which of the following expresses  $x$  as a base ten logarithm?
- (A)  $\log_{10} 60$   
 (B)  $(\log_{10} 20) + (\log_{10} 3)$   
 (C)  $(\log_{10} 20) - (\log_{10} 3)$   
 (D)  $(\log_{10} 20)(\log_{10} 3)$   
 (E)  $\frac{\log_{10} 20}{\log_{10} 3}$
77. The owner of a small restaurant earned a profit of \$300 during the first month of operation. According to the business model for the next 12 months, it is projected that the profit for each month after the first will be \$50 more than the profit for the preceding month. If  $p(m)$  represents the profit for each month  $m$  and  $m = 1$  represents the first month, which of the following functions describes the business model?
- (A)  $p(m) = m + 50$   
 (B)  $p(m) = m + 300$   
 (C)  $p(m) = 50m + 250$   
 (D)  $p(m) = 50m + 300$   
 (E)  $p(m) = 300m + 50$

78. When the quadratic functions below are graphed in the  $xy$ -plane, is the vertex for each function above the  $x$ -axis, below the  $x$ -axis, or on the  $x$ -axis?

Function	Above	Below	On
$f(x) = x^2 + 3$			
$f(x) = (x + 3)^2$			
$f(x) = -x^2 + 3$			
$f(x) = x^2 - 3$			

79. A circular cylindrical water tank is filled with water to 75 percent of its total volume of  $V$  cubic inches. The radius of the tank is 6 inches, and the height of the tank is  $h$  inches. Which of the following represents the height, in inches, of the water in the tank? (Note: The volume of a cylinder with radius  $r$  and height  $h$  is given by  $\pi r^2 h$ .)

- (A)  $\frac{V}{6\pi}$   
 (B)  $\frac{V}{8\pi}$   
 (C)  $\frac{V}{27\pi}$   
 (D)  $\frac{V}{36\pi}$   
 (E)  $\frac{V}{48\pi}$

80. Select two of the following choices and place them in the blanks below so that the resulting statement is true.

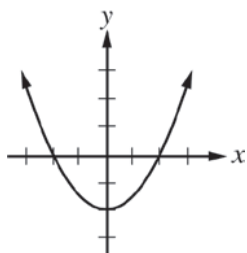
$f(x) =  x  + 8$	$f(x) = x^2 - 4$	$f(x) = \ln x$
increasing	decreasing	constant

The function \_\_\_\_\_ is  
 \_\_\_\_\_ on its domain.

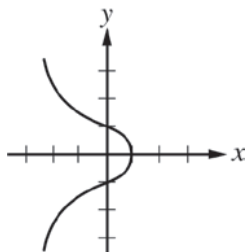
81. Which of the following graphs in the  $xy$ -plane represent  $y$  as a function of  $x$  ?

Indicate all such graphs.

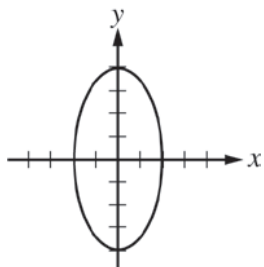
(A)



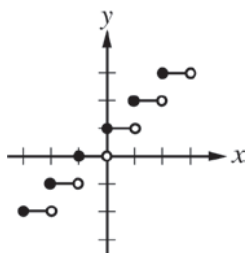
(B)



(C)



(D)



82. Select two of the following choices and place them in the blanks below so that the resulting statements are true.

$$A(t) = 100(0.83)^{\frac{t}{20}} \quad 14$$

$$A(t) = 100(0.17)^{\frac{t}{20}} \quad 23$$

$$A(t) = 0.83(100)^{\frac{t}{20}} \quad 76$$

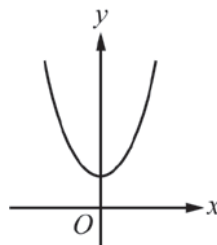
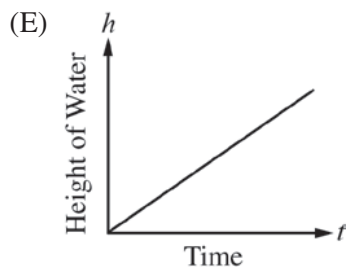
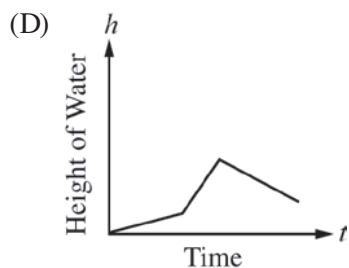
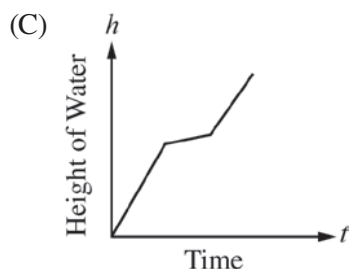
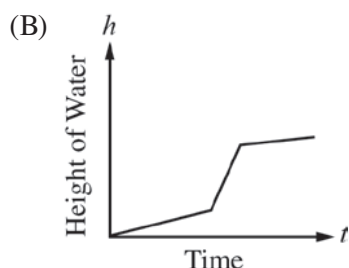
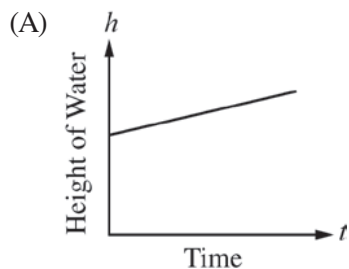
$$A(t) = 0.17(100)^{\frac{t}{20}} \quad 130$$

The amount of a certain radioactive substance decreases by 17 percent every 20 years. If the initial amount of the substance is 100 grams, then the amount  $A$ , in grams, of the substance remaining after  $t$  years can be modeled by the function \_\_\_\_\_. According to the model, 30 grams of the substance will remain after approximately \_\_\_\_\_ years.

83. The predicted price  $P$ , in dollars, of an item can be modeled by the function  $P(t) = P_0(1.035)^t$ , where  $P_0$  is the initial price of the item and  $t$  is the amount of time, in years, after the initial price was established. Based on the model, if the price of one gallon of milk is expected to be \$4.69 in the year 2020, in which of the following years will the price of one gallon of milk be closest to \$3.95 ?

- (A) 2009
- (B) 2010
- (C) 2014
- (D) 2015
- (E) 2025

84. During a certain rainstorm, an empty rain barrel became filled with water. During this storm, the rain fell lightly at first, followed by a heavy downpour, followed by a lighter rain. Which of the following graphs could be a model for the height of the water  $h$  in the rain barrel at time  $t$ , where  $t$  is the amount of time that has passed since the storm began.



85. The graph of a quadratic function  $y = f(x)$  is shown in the  $xy$ -plane. Which of the following statements about  $f$  must be true?

Indicate all such statements.

- (A)  $f$  has no real roots.  
 (B)  $f$  has a positive leading coefficient.  
 (C) The domain and range of  $f$  are all real numbers.
86. In the  $xy$ -plane, the graphs of which of the following functions are symmetric about the  $y$ -axis?
- Indicate all such functions.

- (A)  $f(x) = x^2 + 2$   
 (B)  $f(x) = x^3 + x^2 - 1$   
 (C)  $f(x) = x^4 - 2x^2 + 3$

87. Which of the following is equivalent to  $\sqrt{32} + \sqrt{200}$ ?

- (A)  $8\sqrt{2}$   
 (B)  $14\sqrt{2}$   
 (C)  $116\sqrt{2}$   
 (D)  $2\sqrt{58}$   
 (E)  $4\sqrt{58}$

88. What is the coefficient of the term  $r^3s$  in the expansion of  $(2r + 3s)^4$ ?

89. Which of the following is equivalent to  $3y - 6xy - 12x^2y$ ?

- (A)  $-3y(4x^2 + 2x - 1)$
- (B)  $-3y(4x^2 - 2x - 1)$
- (C)  $-3y(4x^2 + 2x + 1)$
- (D)  $3y(-4x^2 - 2x)$
- (E)  $3y(4x^2 + 2x)$

## Study Resources

Most textbooks used in college-level algebra courses cover the topics in the outline given earlier, but the approaches to certain topics and the emphases given to them may differ. To prepare for the College Algebra exam, it is advisable to study one or more college textbooks, which can be found in most college bookstores. When selecting a textbook, check the table of contents against the knowledge and skills required for this test.

Visit [clep.collegeboard.org/earn-college-credit/practice](https://clep.collegeboard.org/earn-college-credit/practice) for additional college algebra resources. You can also find suggestions for exam preparation in Chapter IV. In addition, many college faculty post their course materials on their schools' websites.

## Answer Key

1.	E	46.	E
2.	D	47.	C
3.	D	48.	E
4.	E	49.	A
5.	B	50.	D
6.	A	51.	D
7.	A	52.	C
8.	B	53.	D
9.	E	54.	C
10.	A	55.	1
11.	See next page.	56.	D
12.	B	57.	B
13.	D	58.	B
14.	D	59.	See next page.
15.	B	60.	D
16.	D	61.	C
17.	C	62.	E
18.	E	63.	E
19.	D	64.	B
20.	C	65.	B
21.	2	66.	D
22.	B	67.	A
23.	B	68.	D
24.	E	69.	C
25.	See next page.	70.	E
26.	C	71.	A
27.	624	72.	B
28.	E	73.	E
29.	4	74.	C
30.	C	75.	4
31.	D	76.	E
32.	A	77.	C
33.	-6	78.	See next page.
34.	E	79.	E
35.	1	80.	See next page.
36.	See next page.	81.	A, D
37.	D	82.	See next page.
38.	B	83.	D
39.	C	84.	B
40.	E	85.	A, B
41.	A	86.	A, C
42.	D	87.	B
43.	E	88.	96
44.	D	89.	A
45.	1.2		

11.

	less than	greater than	equal to	
$f(a)$ is	✓			$g(a)$ .
$f(b)$ is		✓		$g(b)$ .
$f(0)$ is			✓	$g(0)$ .

25.

Statement	Always True	Never True	Sometimes True
$ a + b  =  a  +  b $			✓
$ a + b  <  a  +  b $			✓
$ a + b  \leq  a  +  b $	✓		
$ a + b  >  a  +  b $		✓	

36.

The amount of medicine  $M$  present in the body at  $t$  hours after the medicine is taken can be modeled by the function  $M(t) = 210(0.89)^t$ . According to the model, 117 mg of the medicine is present in the body at 5 hours after the medicine is taken.

59.

Function	Yes	No
$f(x) = \frac{x-1}{x^2+2}$	✓	
$g(x) = \frac{x^2}{x+1}$		✓
$h(x) = \frac{\sqrt{x}}{x^2+3}$		✓

78.

Function	Above	Below	On
$f(x) = x^2 + 3$	✓		
$f(x) = (x + 3)^2$			✓
$f(x) = -x^2 + 3$	✓		
$f(x) = x^2 - 3$		✓	

80.

The function  $f(x) = \ln x$  is increasing on its domain.

82.

The amount of a certain radioactive substance decreases by 17 percent every 20 years. If the initial amount of the substance is 100 grams, then the amount  $A$ , in grams, of the substance remaining after  $t$  years can be modeled by the function  $A(t) = 100(0.83)^{\frac{t}{20}}$ . According to the model, 30 grams of the substance will remain after approximately 130 years.





# Appendix

## What Your CLEP Score Means

In order to reach the total score you see on your score report, two calculations are performed.

**1. Your “raw score” is the number of questions you answered correctly.** Your raw score increases by one point for each question answered correctly.

**2. Your raw score is then converted into a “scaled score”** that ranges from 20, the lowest, to 80, the highest. This scaled score is the score that appears on your score report.

The scores that appear in the table shown are the credit-granting scores recommended by the American Council on Education (ACE). **Each college, however, can set its own credit-granting policy, which may differ from that of ACE.** If you haven’t already done so, contact your college as soon as possible to find out the score it requires to grant credit, the number of credit hours granted, and the course(s) that can be bypassed with a satisfactory score.

Please note that College-Level Examination Program® (CLEP®) exams are developed and evaluated independently and aren’t linked to one another except by the program’s common purpose, format, and method of reporting results. For this reason, direct comparisons shouldn’t be made between CLEP exams in different subjects. CLEP scores aren’t comparable to SAT® scores or other test scores.

**Scores are kept on file for 20 years.** During this period, score reports may be sent to an institution, but only at the request of the candidate. Students can order official transcripts through the CLEP My Account portal ([cleportal.collegeboard.org](https://cleportal.collegeboard.org)) and pay a fee. CLEP Transcript Requests are nonrefundable. Once ordered, a request cannot be canceled, changed, or rerouted. To order official transcripts for DANTES-funded exams, candidates need to place an order online using the Parchment Transcript Ordering Service ([https://exchange.parchment.com/send/adds/index.php?main\\_page=login&s\\_id=3q7ey35yiWKgVEiC](https://exchange.parchment.com/send/adds/index.php?main_page=login&s_id=3q7ey35yiWKgVEiC)).

**Test takers may not repeat an exam of the same title within the specified wait period of the initial testing date.** If a test taker retakes the exam within the specified wait period, the administration will be considered invalid, the score will be canceled, and any test fees will be forfeited. **For military service members: DANTES doesn’t fund retesting on a previously funded CLEP exam.** However, service members may personally fund a retest after the specified wait period.

If you have questions about your score report, a test question, or any other aspect of a CLEP exam that your test center cannot answer, write to CLEP, P.O. Box 6600, Princeton, NJ 08541-6600 or email [clep@info.collegeboard.org](mailto:clep@info.collegeboard.org).

# CLEP® Credit-Granting Recommendations (Effective June 2019)

	ACE Recommended Score*	Semester Hours*
<b>Business</b>		
Financial Accounting	50	3
Information Systems	50	3
Introductory Business Law	50	3
Principles of Management	50	3
Principles of Marketing	50	3
<b>Composition and Literature</b>		
American Literature	50	3
Analyzing and Interpreting Literature	50	3
College Composition	50	6
College Composition Modular	50	3
English Literature	50	3
Humanities	50	3
<b>World Languages**</b>		
French Language, Level 1 Proficiency	50	6
Level 2 Proficiency	59	9
German Language, Level 1 Proficiency	50	6
Level 2 Proficiency	60	9
Spanish Language, Level 1 Proficiency	50	6
Level 2 Proficiency	63	9
Spanish with Writing, Level 1 Proficiency	50	6
Level 2 Proficiency	65	12
<b>History and Social Sciences</b>		
American Government	50	3
History of the United States I: Early Colonization to 1877	50	3
History of the United States II: 1865 to the Present	50	3
Human Growth and Development	50	3
Introduction to Educational Psychology	50	3
Introductory Psychology	50	3
Introductory Sociology	50	3
Principles of Macroeconomics	50	3
Principles of Microeconomics	50	3
Social Sciences and History	50	6
Western Civilization I: Ancient Near East to 1648	50	3
Western Civilization II: 1648 to the Present	50	3
<b>Science and Mathematics</b>		
Biology	50	6
Calculus	50	4
Chemistry	50	6
College Algebra	50	3
College Mathematics	50	6
Natural Sciences	50	6
Precalculus	50	3

\*\* A test taker's proficiency level on the CLEP World Language exams is dependent on the test score; American Council on Education (ACE) recommends different credit-granting scores and amounts of credits at Level 1 and Level 2 for each of the exam subjects.

\* The American Council on Education's College Credit Recommendation Service (ACE CREDIT®) has evaluated CLEP processes and procedures for developing, administering, and scoring the exams. The scores listed above are equivalent to a grade of C in the corresponding course. The American Council on Education, the major coordinating body for all the nation's higher education institutions, seeks to provide leadership and a unifying voice on key higher education issues and to influence public policy through advocacy, research, and program initiatives. For more information, visit the ACE CREDIT website at [acenet.edu/acecredit](https://www.acenet.edu/acecredit).