



CLEP[®]

Official Study Guide

18th Edition

Calculus

College-Level Examination Program[®]

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<http://www.xtremepapers.net>

Calculus

Description of the Examination

The Calculus examination covers skills and concepts that are usually taught in a one-semester college course in calculus. The content of each examination is approximately 60% limits and differential calculus and 40% integral calculus. Algebraic, trigonometric, exponential, logarithmic, and general functions are included. The exam is primarily concerned with an intuitive understanding of calculus and experience with its methods and applications. Knowledge of preparatory mathematics, including algebra, plane and solid geometry, trigonometry, and analytic geometry is assumed.

Students are not permitted to use a calculator during the CLEP Calculus exam.

The examination contains 45 questions to be answered in 90 minutes. Any time candidates spend on tutorials and providing personal information is in addition to the actual testing time.

Knowledge and Skills Required

Questions on the exam require candidates to demonstrate the following abilities:

- Solving routine problems involving the techniques of calculus (about 50% of the examination)
- Solving nonroutine problems involving an understanding of the concepts and applications of calculus (about 50% of the examination)

The subject matter of the calculus examination is drawn from the following topics. The percentages next to the main topics indicate the approximate percentages of exam questions on those topics.

5% Limits

- Statement of properties, e.g., limit of a constant, sum, product, or quotient
- Limits that involve infinity, e.g., $\lim_{x \rightarrow 0} \frac{1}{x}$ is nonexistent and $\lim_{x \rightarrow \infty} \frac{\sin x}{x} = 0$
- Continuity

55% Differential Calculus

The Derivative

- Definitions of the derivative,

$$\text{e.g., } f'(a) = \lim_{x \rightarrow a} \frac{f(x) - f(a)}{x - a} \text{ and}$$

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

- Derivatives of elementary functions
- Derivatives of sum, product, and quotient (including $\tan x$ and $\cot x$)
- Derivative of a composite function (chain rule), e.g., $\sin(ax+b)$, ae^{kx} , $\ln(kx)$
- Derivative of an implicitly defined function
- Derivative of the inverse of a function (including $\text{Arcsin } x$ and $\text{Arctan } x$)
- Derivatives of higher order
- Corresponding characteristics of graphs of f , f' , and f''
- Statement (without proof) of the Mean Value Theorem; applications and graphical illustrations
- Relation between differentiability and continuity
- Use of L'Hôpital's rule (quotient and indeterminate forms)

Applications of the Derivative

- Slope at a point
- Tangent lines and linear approximation
- Curve sketching: increasing and decreasing functions; relative and absolute maximum and minimum points; concavity; points of inflection
- Extreme value problems
- Velocity and acceleration of a particle moving along a line
- Average and instantaneous rates of change
- Related rates of change

40% Integral Calculus

Antiderivatives and Techniques of Integration

- Concept of antiderivatives
- Basic integration formulas
- Integration by substitution (use of identities, change of variable)

Applications of Antiderivatives

- Distance and velocity from acceleration with initial conditions
- Solutions of $y' = ky$ and applications to growth and decay

The Definite Integral

- Definition of the definite integral as the limit of a sequence of Riemann sums and approximations of the definite integral using rectangles and trapezoids
- Properties of the definite integral
- The Fundamental Theorem:

$$\frac{d}{dx} \int_a^x f(t) dt = f(x)$$

$$\int_a^b F'(x) dx = F(b) - F(a)$$

Applications of the Definite Integral

- Average value of a function on an interval
- Area

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.

A calculator may not be used on this examination.

Directions: Solve each of the following problems. After examining the form of the choices, decide which is the best of the choices given. Do not spend too much time on any one problem.

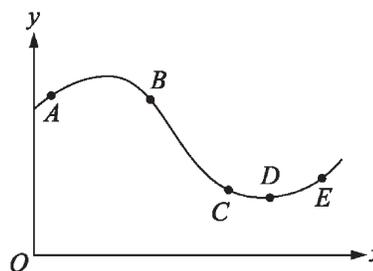
- Notes:**
- (1) In this examination, $\ln x$ denotes the natural logarithm of x (that is, the logarithm to the base e).
 - (2) Unless otherwise specified, the domain of a function f is assumed to be the set of all real numbers x for which $f(x)$ is a real number.

1. If $f(x) = -2x^{-3}$, then $f'(x) =$

- (A) $6x^2$
- (B) $6x^{-2}$
- (C) $6x^{-4}$
- (D) $-6x^{-2}$
- (E) $-6x^{-4}$

2. $\lim_{x \rightarrow 3} \frac{1}{x-3}$ is

- (A) -3 (B) 0 (C) 1 (D) 3 (E) nonexistent



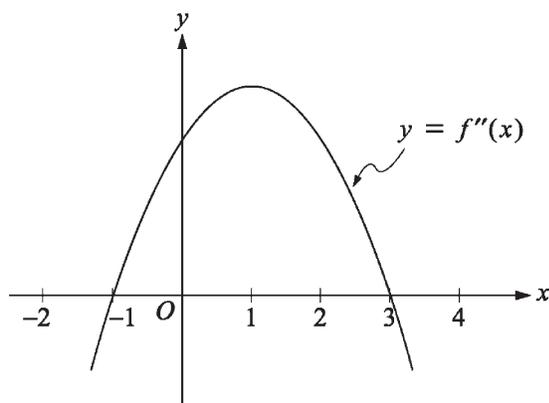
3. At which of the five points on the graph in the figure above are $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ both negative?

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

4. Which of the following is an equation of the line tangent to the graph of $f(x) = x^3 - x$ at the point where $x = 2$?

- (A) $y - 6 = 4(x - 2)$
- (B) $y - 6 = 5(x - 2)$
- (C) $y - 6 = 6(x - 2)$
- (D) $y - 6 = 11(x - 2)$
- (E) $y - 6 = 12(x - 2)$

5. $\int(e^x + e)dx =$
- (A) $e^x + C$
 (B) $e^x + e + C$
 (C) $e^x + ex + C$
 (D) $\frac{e^{x+1}}{x+1} + ex + C$
 (E) $\frac{e^{x+1}}{x+1} + \frac{e^2}{2} + C$



6. The graph of f'' , the second derivative of the function f , is shown in the figure above. On what intervals is f concave up?
- (A) $(-\infty, \infty)$
 (B) $(-\infty, -1)$ and $(3, \infty)$
 (C) $(-\infty, 1)$
 (D) $(-1, 3)$
 (E) $(1, \infty)$

7. $\int(x-1)\sqrt{x} dx =$
- (A) $\frac{2}{5}x^{\frac{5}{2}} - \frac{2}{3}x^{\frac{3}{2}} + C$
 (B) $\frac{1}{2}x^2 + 2x^{\frac{2}{3}} - x + C$
 (C) $\frac{1}{2}x^2 - x + C$
 (D) $\frac{2}{3}x^{\frac{3}{2}} + 2x^{\frac{1}{2}} + C$
 (E) $\frac{3}{2}x^{\frac{1}{2}} - x^{-\frac{1}{2}} + C$

8. The acceleration, at time t , of a particle moving along the x -axis is given by $a(t) = 20t^3 + 6$. At time $t = 0$, the velocity of the particle is 0 and the position of the particle is 7. What is the position of the particle at time t ?

- (A) $120t + 7$
 (B) $60t^2 + 7t$
 (C) $5t^4 + 6t + 7$
 (D) $t^5 + 3t^2 + 7$
 (E) $t^5 + 3t^2 + 7t$

9. What is $\lim_{x \rightarrow \infty} \frac{x^2 - 4}{2 + x - 4x^2}$?

- (A) -2
 (B) $-\frac{1}{4}$
 (C) $\frac{1}{2}$
 (D) 1
 (E) The limit does not exist.

10. $\int_{-3}^3 |x+2| dx =$

- (A) 0 (B) 9 (C) 12 (D) 13 (E) 14

11. Let f and g be the functions defined by $f(x) = \sin x$ and $g(x) = \cos x$. For which of the following values of a is the tangent line to f at $x = a$ parallel to the tangent line to g at $x = a$?

- (A) 0 (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{2}$ (D) $\frac{3\pi}{4}$ (E) π

12. The function f is given by $f(x) = 3x^2 + 1$. What is the average value of f over the closed interval $[1, 3]$?

- (A) $\frac{28}{3}$ (B) 8 (C) 12 (D) 14 (E) 28

13. If $f(x) = \frac{\sin x}{2x}$, then $f'(x) =$

- (A) $\frac{\cos x}{2}$
- (B) $\frac{x \cos x - \sin x}{2x^2}$
- (C) $\frac{x \cos x - \sin x}{4x^2}$
- (D) $\frac{\sin x - x \cos x}{2x^2}$
- (E) $\frac{\sin x - x \cos x}{4x^2}$

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
10	35	15	6	4
20	8	5	12	10
30	24	25	20	10

14. Selected values of the functions f and g and their derivatives, f' and g' , are given in the table above. If $h(x) = f(g(x))$, what is $h'(30)$?

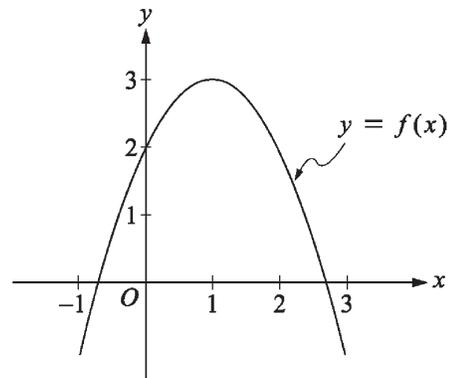
- (A) 5 (B) 15 (C) 35 (D) 50 (E) 250

15. $\int_2^5 \frac{1}{x} dx =$

- (A) $-\frac{3}{10}$
- (B) $\frac{21}{100}$
- (C) $-\ln 10$
- (D) $\ln \frac{5}{2}$
- (E) $\ln 3$

16. What is $\lim_{h \rightarrow 0} \frac{\cos\left(\frac{\pi}{2} + h\right) - \cos\frac{\pi}{2}}{h}$?

- (A) $-\infty$ (B) -1 (C) 0 (D) 1 (E) ∞



17. The function f has a relative maximum value of 3 at $x = 1$, as shown in the figure above. If $h(x) = x^2 f(x)$, then $h'(1) =$

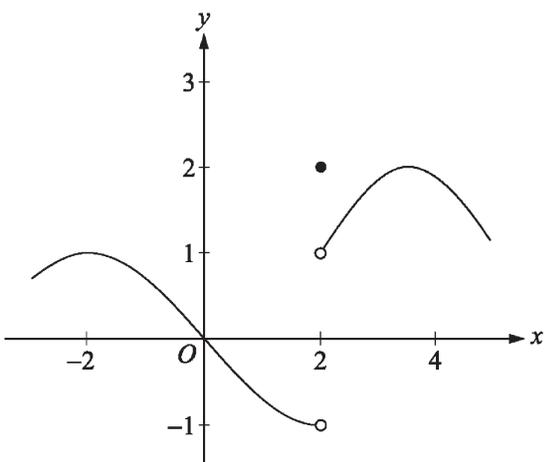
- (A) -6 (B) -3 (C) 0 (D) 3 (E) 6

18. The area of the region in the first quadrant between the graph of $y = x\sqrt{4 - x^2}$ and the x -axis is

- (A) $\frac{2}{3}\sqrt{2}$
- (B) $\frac{8}{3}$
- (C) $2\sqrt{2}$
- (D) $2\sqrt{3}$
- (E) $\frac{16}{3}$

19. If $x^2 + y^3 = x^3 y^2$, then $\frac{dy}{dx} =$

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



20. The graph of the function f is shown in the figure above. What is $\lim_{x \rightarrow 2} f(x)$?

- (A) -1
- (B) 0
- (C) 1
- (D) 2
- (E) The limit does not exist.

21. $\lim_{x \rightarrow \infty} \frac{x^2}{x \ln x} =$

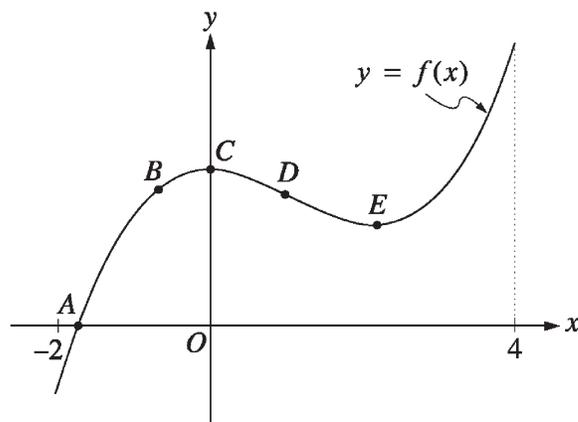
- (A) 0 (B) 1 (C) 2 (D) e (E) ∞

22. The function f is differentiable on $[a, b]$ and $a < c < b$. Which of the following is NOT necessarily true?

- (A) $\int_a^b f(x) dx = \int_a^c f(x) dx + \int_c^b f(x) dx$
- (B) There exists a point d in the open interval (a, b) such that $f'(d) = \frac{f(b) - f(a)}{b - a}$.
- (C) $\int_a^b f(x) dx \geq 0$
- (D) $\lim_{x \rightarrow c} f(x) = f(c)$
- (E) If k is a real number, then $\int_a^b kf(x) dx = k \int_a^b f(x) dx$.

23. $\int \frac{\ln x}{x} dx =$

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



24. The function f is shown in the figure above. At which of the following points could the derivative of f be equal to the average rate of change of f over the closed interval $[-2, 4]$?

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

25. For which of the following functions does

$$\frac{d^3 y}{dx^3} = \frac{dy}{dx} ?$$

- I. $y = e^x$
- II. $y = e^{-x}$
- III. $y = \sin x$

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

26. The vertical height, in feet, of a ball thrown upward from a cliff is given by $s(t) = -16t^2 + 64t + 200$, where t is measured in seconds. What is the height of the ball, in feet, when its velocity is zero?

- (A) 2 (B) 8 (C) 64 (D) 200 (E) 264

27. If the function f is continuous for all real numbers and $\lim_{h \rightarrow 0} \frac{f(a+h) - f(a)}{h} = 7$, then which of the following statements must be true?

- (A) $f(a) = 7$
- (B) f is differentiable at $x = a$.
- (C) f is differentiable for all real numbers.
- (D) f is increasing for $x > 0$.
- (E) f is increasing for all real numbers.

28. $\frac{d}{dx}(\sin(\cos x)) =$

- (A) $\cos(\cos x)$
- (B) $\sin(-\sin x)$
- (C) $(\sin(-\sin x))\cos x$
- (D) $-(\cos(\cos x))\sin x$
- (E) $-(\sin(\cos x))\sin x$

29. Which of the following statements about the curve $y = x^4 - 2x^3$ is true?

- (A) The curve has no relative extremum.
- (B) The curve has one point of inflection and two relative extrema.
- (C) The curve has two points of inflection and one relative extremum.
- (D) The curve has two points of inflection and two relative extrema.
- (E) The curve has two points of inflection and three relative extrema.

30. $\int \cos^2 x \sin x \, dx =$

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

31. Let $r(t)$ be a differentiable function that is positive and increasing. The rate of increase of r^3 is equal to 12 times the rate of increase of r when $r(t) =$

- (A) $\sqrt[3]{4}$ (B) 2 (C) $\sqrt[3]{12}$ (D) $2\sqrt{3}$ (E) 6

32. $\frac{d}{dx} \int_1^x t^2 \, dt =$

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

33. Let f be the function defined by

$$f(x) = \begin{cases} \frac{x^2 - 25}{x - 5} & \text{for } x \neq 5 \\ 0 & \text{for } x = 5. \end{cases}$$

Which of the following statements about f are true?

- I. $\lim_{x \rightarrow 5} f(x)$ exists.
- II. $f(5)$ exists.
- III. $f(x)$ is continuous at $x = 5$.

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

x	1	2	3	4	5
$f(x)$	15	10	9	6	5

34. The function f is continuous on the closed interval $[1, 5]$ and has values that are given in the table above. If two subintervals of equal length are used, what is the midpoint Riemann sum approximation of $\int_1^5 f(x) dx$?

- (A) -3 (B) 9 (C) 14 (D) 32 (E) 35

35. What is the average rate of change of the function f defined by $f(x) = 100 \cdot 2^x$ on the interval $[0, 4]$?

- (A) 100
- (B) 375
- (C) 400
- (D) 1,500
- (E) 1,600

36. If the functions f and g are defined for all real numbers and f is an antiderivative of g , which of the following statements is NOT necessarily true?

- (A) If $g(x) > 0$ for all x , then f is increasing.
- (B) If $g(a) = 0$, then $f(x)$ has a horizontal tangent at $x = a$.
- (C) If $f(x) = 0$ for all x , then $g(x) = 0$ for all x .
- (D) If $g(x) = 0$ for all x , then $f(x) = 0$ for all x .
- (E) f is continuous for all x .

37. A college is planning to construct a new parking lot. The parking lot must be rectangular and enclose 6,000 square meters of land. A fence will surround the parking lot, and another fence parallel to one of the sides will divide the parking lot into two sections. What are the dimensions, in meters, of the rectangular lot that will use the least amount of fencing?

- (A) 1,000 by 1,500
- (B) $20\sqrt{5}$ by $60\sqrt{5}$
- (C) $20\sqrt{10}$ by $30\sqrt{10}$
- (D) $20\sqrt{15}$ by $20\sqrt{15}$
- (E) $20\sqrt{15}$ by $40\sqrt{15}$

38. If $f(x) = \ln(\sin(x^2))$, then $f'(x) =$

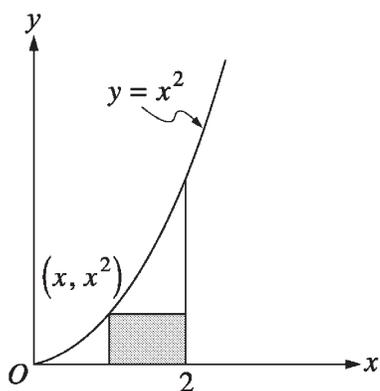
- (A) $\frac{1}{\cos(x^2)}$
- (B) $\frac{1}{\sin(x^2)}$
- (C) $\frac{\cos(x^2)}{\sin(x^2)}$
- (D) $\frac{2x \cos(x^2)}{\sin(x^2)}$
- (E) $\frac{2x}{\cos(x^2)}$

39. Let f be a differentiable function defined on the closed interval $[a, b]$ and let c be a point in the open interval (a, b) such that

- I. $f'(c) = 0$,
- II. $f'(x) > 0$ when $a \leq x < c$, and
- III. $f'(x) < 0$ when $c < x \leq b$.

Which of the following statements must be true?

- (A) $f(c) = 0$
- (B) $f''(c) = 0$
- (C) $f(c)$ is an absolute maximum value of f on $[a, b]$.
- (D) $f(c)$ is an absolute minimum value of f on $[a, b]$.
- (E) $f(x)$ has a point of inflection at $x = c$.



40. A rectangle with one side on the x -axis and one side on the line $x = 2$ has its upper left vertex on the graph of $y = x^2$, as indicated in the figure above. For what value of x does the area of the rectangle attain its maximum value?

- (A) 2 (B) $\frac{4}{3}$ (C) 1 (D) $\frac{3}{4}$ (E) $\frac{2}{3}$

41. Let $f(x) = x^3 + x$. If h is the inverse function of f , then $h'(2) =$

- (A) $\frac{1}{13}$ (B) $\frac{1}{4}$ (C) 1 (D) 4 (E) 13

42. If f is continuous for all x , which of the following integrals necessarily have the same value?

- I. $\int_a^b f(x) dx$
- II. $\int_0^{b-a} f(x+a) dx$
- III. $\int_{a+c}^{b+c} f(x+c) dx$

- (A) I and II only
- (B) I and III only
- (C) II and III only
- (D) I, II, and III
- (E) No two necessarily have the same value.

43. Let F be the number of trees in a forest at time t , in years. If F is decreasing at a rate given by the equation $\frac{dF}{dt} = -2F$ and if $F(0) = 5000$, then $F(t) =$

- (A) $5000t^{-2}$
- (B) $5000e^{-2t}$
- (C) $5000 - 2t$
- (D) $5000 + t^{-2}$
- (E) $5000 + e^{-2t}$

44. A spherical balloon is being inflated at a constant rate of $25 \text{ cm}^3/\text{sec}$. At what rate, in cm/sec , is the radius of the balloon changing when the radius is 2 cm ? (The volume of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.)

- (A) $\frac{25}{16\pi}$
- (B) $\frac{25}{8\pi}$
- (C) $\frac{75}{16\pi}$
- (D) $\frac{32\pi}{25}$
- (E) $\frac{32\pi}{3}$

45. The Riemann sum $\sum_{i=1}^{50} \left(\frac{i}{50}\right)^2 \frac{1}{50}$ on the closed interval $[0,1]$ is an approximation for which of the following definite integrals?

(A) $\int_0^1 x^2 dx$

(B) $\int_0^{50} x^2 dx$

(C) $\int_0^1 \left(\frac{x}{50}\right)^2 dx$

(D) $\int_0^{50} \left(\frac{x}{50}\right)^2 dx$

(E) $\int_0^1 \frac{x^2}{50^3} dx$

Study Resources

To prepare for the Calculus exam, you should study the contents of at least one introductory college-level calculus textbook, which you can find in most college bookstores. You would do well to consult several textbooks, because the approaches to certain topics may vary. When selecting a textbook, check the table of contents against the “Knowledge and Skills Required” for this exam.

Additional suggestions for preparing for CLEP exams are given in “Preparing to Take CLEP Examinations.”

Answer Key

- | | |
|-------|-------|
| 1. C | 24. B |
| 2. E | 25. D |
| 3. B | 26. E |
| 4. D | 27. B |
| 5. C | 28. D |
| 6. D | 29. C |
| 7. A | 30. A |
| 8. D | 31. B |
| 9. B | 32. C |
| 10. D | 33. D |
| 11. D | 34. D |
| 12. D | 35. B |
| 13. B | 36. D |
| 14. D | 37. C |
| 15. D | 38. D |
| 16. B | 39. C |
| 17. E | 40. B |
| 18. B | 41. B |
| 19. C | 42. A |
| 20. E | 43. B |
| 21. E | 44. A |
| 22. C | 45. A |
| 23. C | |

I. 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 candidates find that some type of test preparation is helpful.

Most people who take CLEP exams do so to show that they have already learned the key material taught in a college course. Many of them need only a quick review to assure themselves that they have not forgotten what they once studied, and to fill in some of 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 are 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 strong and deciding where to focus your energies. Some people may know a great deal about a certain 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 used in preparing for a test. It is 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

Whether you are using the latest edition of this *Study Guide*, or you have downloaded an individual examination guide from the CLEP Web site, you will find the same information. 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 for preparing to take 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. If possible, use the textbook 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 admissions 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. Be sure that the college you’re interested in gives credit for the CLEP exam for which you’re preparing.

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 that are mentioned, and ask yourself whether you are familiar with them. This will give you a quick overview of how much you know about the subject. If you are

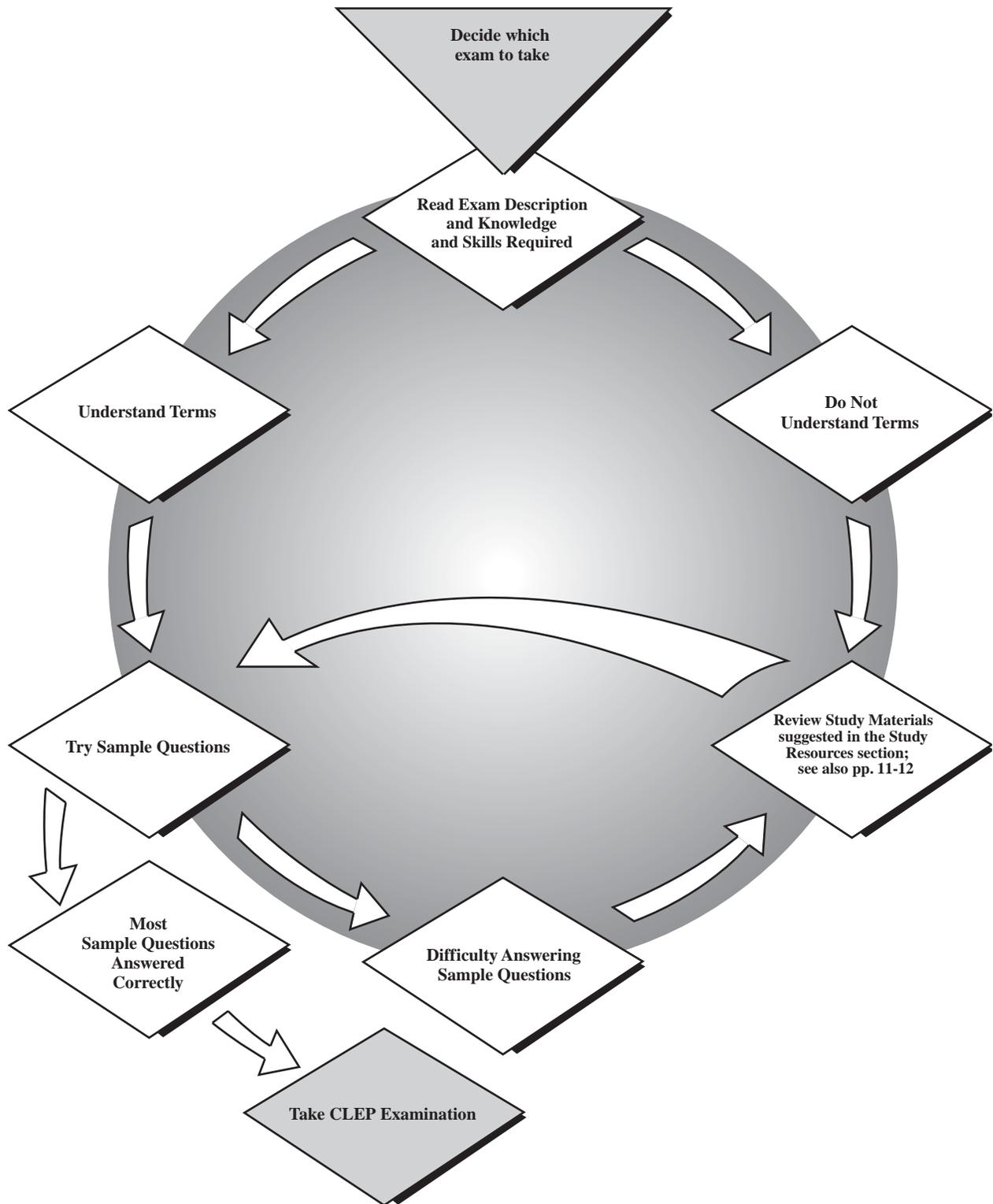
I. PREPARING TO TAKE CLEP EXAMINATIONS

familiar with nearly all the material, you will probably need a minimum of review; however, if topics and terms are unfamiliar, you will 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 will probably look for the answers as you study, and they will not be a good assessment of your ability at a later date. Do not refer to the sample questions as you prepare for the exam. None of the sample questions appear on the CLEP exam, so concentrating on them without broader study of the subject won't help you.

If you think you are 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 Examination



Suggestions for Studying

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

1. Use CLEP tutorials.

Make sure you are familiar with the computer-based format of the CLEP exams. Use the *CLEP Sampler*, which can be downloaded from the CLEP Web site, to familiarize yourself with CLEP CBT exams before taking the test; it's also the only *official* CLEP tutorial program for computer-based testing. You can find the *Sampler* on the Web at www.collegeboard.com/clep. If you are not comfortable using a computer, you can practice the necessary pointing, clicking, and scrolling skills by working with the *Sampler*. You'll also be able to practice using the testing tools that will help you navigate throughout the test, and you'll see the types of questions you'll be required to answer.

If you don't have access to a computer, check with the library or test center at the school where you'll be testing. Many CLEP test centers and college libraries will have the *Sampler* installed on computers in public areas, so you'll be able to practice and review before your test date. The tutorials are also part of the testing software, and you'll be able to work through them before you begin your test. Check with the test center to see how much time will be allotted for your testing appointment; then you can determine how much time you might need to spend on the tutorials.

Remember, if you want to review *content* covered by each examination, the exam description includes a content outline, a description of the knowledge and skills required to do well, and sample questions. An answer key is also included. However, this exam guide is not intended to replace a textbook. Additional study may be required.

2. Define your goals and locate study materials.

First, determine your study goals. Set aside a block of time to review the exam guide and then decide which exam(s) you will take. 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 that have been 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. Some colleges, like MIT and Carnegie Mellon, offer their course materials for free online; these can be an excellent resource. You can also ask the appropriate professor at the school you'll be attending, or check his or her Web site, for a reading list. Use the syllabus, course materials and/or reading list as your guide for selecting textbooks and study materials. You may purchase these or check them out of your local library. Educational Web sites, like those offered by PBS or the National Geographic Society, can be helpful as well.

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Check with your librarian about locating study aids relevant to the exams you plan to take. These supplementary materials may include, for example, 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 Web sites, 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 these 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, you might prevent interruptions by other household members by putting a sign on the door of your study room to indicate when you will be 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. Now, rate all the activities on your list in order of their importance and evaluate your use of time. Often people are astonished at how an average day appears 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, you should 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 is completed. Others maintain their concentration better 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 like to allow themselves rewards as they complete each study goal. It is not essential that you accomplish every goal exactly within your schedule; the point is to be committed to your task.

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

If you have not done much studying for some time, you may find it difficult to concentrate at first. Try a method of studying, such as the one outlined below, that will help you concentrate on and remember what you read.

- a. First, read the chapter summary and the introduction so you will know what to look for in your reading.

- b. Next, convert the section or paragraph headlines into questions. For example, if you are 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 will help you understand and remember the material.
- c. Take notes on key ideas or concepts as you read. Writing will also help you fix concepts more firmly in your mind. Underlining key ideas or writing notes in your book can be helpful and will be useful for review. Underline only important points. If you underline more than a third of each paragraph, you are probably 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 some or all of the 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 are preparing for an exam over an extended period of time, review key concepts and notes each week or so. Do not wait for weeks to review the material or you will need to relearn much of it.

Psychological and Physical Preparation

Most people feel at least some nervousness before taking a test. Adults who are returning to college may not have taken tests in many years, or they may have had little experience with standardized tests. Some younger students, as well, are uncomfortable with testing situations. People who received their education in countries outside the United States may find that many tests given in this country are quite different from the ones they are accustomed to taking.

Not only might candidates find the types of tests and questions unfamiliar, but other aspects of the testing environment may be strange as well. The physical and mental stress that results from meeting this new experience can hinder a candidate’s ability to demonstrate his or her true degree of knowledge in the subject area being tested. For this reason, it is important to go to the test center well prepared, both mentally and physically, for taking the test. You may find the following suggestions helpful.

1. Familiarize yourself as much as possible with the test and the test situation before the day of the exam. It will be helpful for you to know ahead of time:
 - a. How much time will be allowed for the test and whether there are timed subsections. (This information is included in the examination guides and in the *CLEP Sampler*.)
 - b. What types of questions and directions appear on the exam. (See the examination guides and the *CLEP Sampler*.)
 - c. How your test score will be computed.
 - d. In which building and room the exam will be administered. If you don’t know where the building is, get directions ahead of time.

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- e. The time of the test administration. You may wish to confirm this information a day or two before the exam and find out what time the building and room will be open so that you can plan to arrive early.
 - f. Where to park your car and whether you will need a parking permit or, if you will be taking public transportation, which bus or train to take and the location of the nearest stop.
 - g. Whether there will be a break between exams (if you will be taking more than one on the same day), and whether there is a place nearby where you can get something to eat or drink.
2. Be relaxed and alert while you are taking the exam:
- a. Get a good night's sleep. Last-minute cramming, particularly late the night before, is usually counterproductive.
 - b. Eat normally. It is usually not wise to skip breakfast or lunch on the day you take the exam or to eat a big meal just before testing.
 - c. Avoid tranquilizers and stimulants. If you follow the other directions in this book, you won't need artificial aids. It's better to be a little tense than to be drowsy, but stimulants such as coffee and cola can make you nervous and interfere with your concentration.
 - d. Don't drink a lot of liquids before taking the exam. Leaving to use the restroom during testing will disturb your concentration and reduce the time you have to complete the exam.
 - e. If you are inclined to be nervous or tense, learn some relaxation exercises and use them to prepare for the exam.
3. Be sure to:
- a. Arrive early enough so that you can find a parking place, locate the test center, and get settled comfortably before testing begins. Allow some extra time in case you are delayed unexpectedly.
 - b. Take the following with you:
 - Any registration forms or printouts required by the test center. Make sure you have filled out all necessary paperwork in advance of your testing date.
 - Your driver's license, passport, or other government-issued identification that includes your photograph and signature, as well as a secondary form of ID that includes a photo and/or your signature, such as a student ID, military ID, social security card, or credit card. You will be asked to show this identification to be admitted to the testing area.
 - A valid credit card to pay the \$60 examination fee. (This fee is subject to change.) Although a credit card is the preferred method of payment, you can also pay by check or money order (payable to the College-Level Examination Program). Your test center may require an additional administration fee. Contact the test center to determine the amount and the method of payment.
 - Two pencils with good erasers. You may need a pencil for writing an outline or figuring out math problems. Mechanical pencils are prohibited in the testing room.
 - Your glasses if you need them for reading or seeing the chalkboard or wall clock.
 - c. Leave all books, papers, and notes outside the test center. You will not be permitted to use your own scratch paper; it will be provided by the test center.

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- d. Do not 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 Sampler* and the pretest tutorials will show you how to use that feature.
 - e. Do not bring a cell phone or other electronic devices into the testing room.
 - f. Be prepared to adjust to an uncomfortable temperature in the testing room. Wear layers of clothing that can be removed if the room is too hot but that will keep you warm if it is too cold.
4. When you enter the test room:
- a. Although you will be assigned to a computer testing station, the test center administrator can usually accommodate special needs. Be sure to communicate your needs *before* the day you test.
 - b. Read directions carefully and listen to all instructions given by the test administrator. If you don't understand the directions, ask for help before test timing begins. If you must ask a question after testing has begun, raise your hand and a proctor will assist you. The proctor can answer certain kinds of questions but cannot help you with 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 is preventing you from doing your best, ask whether the situation can be remedied. If bad testing conditions cannot be remedied, ask the person in charge to report the problem on an Electronic Irregularity 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. The problem will be investigated to make sure it does not happen again, and, if the problem is serious enough, arrangements will be made for you to retake the exam without charge.

Arrangements for Students with Disabilities

CLEP is committed to working with test-takers with disabilities. If you have a learning or physical disability that would prevent you from taking a CLEP exam under standard conditions, you may request special accommodations and arrangements to take it on a regularly scheduled test date or at a special administration. Contact a CLEP test center prior to registration about testing accommodations and to ensure the accommodation you are requesting is available. Each test center sets its own guidelines in terms of deadlines for submission of documentation and approval of accommodations. Only students with documented hearing, learning, physical, or visual disabilities are eligible to receive testing accommodations. Also, it is important to ensure that you are taking the exam(s) with accommodations that are approved by your score recipient institution.

Testing accommodations that may be provided with appropriate disability documentation include:

- ZoomText (screen magnification)
- Modifiable screen colors
- Use of a reader or amanuensis or sign language interpreter
- Extended time
- Untimed rest breaks

II. Taking the Examinations

A person may know a great deal about the subject being tested but not be able to demonstrate it on the exam. Knowing how to approach an exam is an important part of the testing process. While a command of test-taking skills cannot substitute for knowledge of the subject matter, it can be a significant factor in successful testing.

Test-taking skills enable a person to use all available information to earn a score that truly reflects her or his 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 graded, may also influence your approach to the exam and your use of test time. Thus, 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.

Taking CLEP Exams

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 is 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 are 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. If you have not reached that point in the section, speed up your pace on the remaining questions.
3. Before answering a question, read the entire question, including all the answer choices. Don't think that because the first or second answer choice looks good to you, it isn't necessary to read the remaining options. Instructions usually tell you to select the "best" answer. Sometimes one answer choice is partially correct but another option is better; therefore, it's usually a good idea to read all the answers before you choose one.
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. Do not puzzle too long over 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	generally	never	perhaps
always	however	none	rarely
but	may	not	seldom
except	must	often	sometimes
every	necessary	only	usually

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 is no penalty for incorrect answers. It is to your benefit to guess if you do not know an answer since CLEP CBT uses “rights-only” scoring. (An explanation of the procedures used for scoring CLEP exams is given in the next chapter.) If you are not sure of the correct answer but have some knowledge of the question and are able to eliminate one or more of the answer choices as wrong, your chance of getting the right answer is improved.

8. Do not 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 that is included on a CLEP exam. Faculty committee members make every effort to ensure that the questions are not ambiguous, that they have only one correct answer, and that they cover college-level topics. These committees do not 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 English Composition with Essay exam is the only CLEP exam that includes a mandatory essay. Both the multiple-choice section and the essay section of the exam are administered on computer. You are required to type your essay using a format similar to word processing. If you are not at ease using a keyboard, you can prepare by practicing with the tutorial on the *CLEP Sampler*.

The essay for the English Composition with Essay exam will be graded by English professors from a variety of 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 English Composition with Essay, which also includes graded sample essays and essay questions.

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 Freshman College Composition exam. There is an additional fee of \$10 for each of the optional essays payable to the institution that administers the exam. These essays are administered on paper and are graded 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 will be used to determine whether you will get credit. Ask how much emphasis will be 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 will be given to your multiple-choice test score in comparison with your free-response grade in determining whether you will get credit. This will give you an idea of where you should expend the greatest effort in preparing for and taking the exam.

Here are some strategies you will find useful in taking any essay exam:

1. Before you begin to respond, read all the questions carefully and take a few minutes to jot down some ideas or create an outline. Scratch paper will be provided at the test center.
2. If you are 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 will answer the questions. First, answer those you find the easiest so you can spend any extra time on the more difficult questions.
4. When you know which questions you will answer and in what order, determine how much testing time remains and estimate how many minutes you will devote to each question. Unless suggested times are given for the questions, try to allot an equal amount of time for each question.

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5. Before answering each question, read it again carefully to make sure you are interpreting it correctly. Pay attention to key words, such as those listed below, that often appear in free-response questions. Be sure you know the exact meaning of these words before taking the exam.

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

If a question asks you to “outline,” “define,” or “summarize,” do not 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.

III. 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. 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, you should refer to the policy of the college you will be attending. The policy will state the score that is required to earn credit at that institution. Many colleges award credit at the score levels recommended by ACE. Some require scores that are higher or lower than these.

Your exam score will be printed for you at the test center immediately upon completion of the examination, unless you took English Composition with Essay. For this exam, your score will be mailed to you two to three weeks after the exam date. 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 the examination software. This service is free only if you select your score recipient at the time you test. A fee will be charged for each score recipient you select at a later date. Your scores are kept on file for 20 years. For a fee, you can request a transcript at a later date.

The pamphlet *What Your CLEP Score Means*, which you will receive with your exam score, gives detailed information about interpreting your scores. A copy of the pamphlet is available at www.collegeboard.com/clep. A brief explanation appears below.

How CLEP Scores Are Computed

Your exam score, which reflects the total score for your CLEP exam, will be between 20 and 80. When your raw score is computed, you receive one point for each correct answer. (There is no deduction for a question you do not answer.) This “rights-only” score is converted to the scaled score between 20 and 80. This conversion ensures that scores earned on different forms and editions of the same CLEP examination are comparable to one another.

How Essays Are Graded

The College Board arranges for college English professors to grade the essays written for the English Composition exam. These carefully selected college faculty consultants represent the current curriculums being taught at two- and four-year institutions nationwide. The faculty consultants receive extensive training and thoroughly review the College Board scoring policies and procedures before grading the essays. Each essay is read and graded by two professors, the sum of the two grades is combined with the multiple-choice score, and the result is reported as a scaled score between 20 and 80. Although the format

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of the two sections is very different, both measure skills required for expository writing. Knowledge of formal grammar is necessary for the multiple-choice section, but the emphasis in the free-response section is on writing skills rather than grammar.

Optional essays for CLEP composition and literature examinations are evaluated and graded by the colleges that require them, rather than by the College Board. If you take an optional essay, it will be sent with a copy of your score report (which includes only the results of your multiple-choice test) to the institution you designate when you take the test.

You may opt not to have your score sent to a college until after you have seen it. In this case, your essay can still be sent to the college of your choice as long as you request a transcript within 90 days after you take the exam. Copies of essays are not held beyond 90 days or after they have been sent to an institution.