

## Test Content

This section provides detailed descriptions of the subject areas and the reasoning competencies assessed by *College BASE*, as well as selected sample questions. Each of the four subjects—English, mathematics, science, and social studies—is organized into levels of increasing specificity. Each subject is divided into two or more clusters; each cluster is made up of several closely related skills; and each skill is defined by two to six highly specific subskills.

### English

*College BASE* divides English into two clusters: reading and literature, and writing. The reading and literature cluster evaluates students' reading comprehension skills and students' knowledge of major literary terms, genres, figures, and works, with emphasis on British and American literature. The writing cluster evaluates students' pre-writing, composing, and revising skills through a combination of multiple-choice questions and an essay.

#### Cluster: Reading and Literature

The reading and literature cluster consists of three skills: reading critically, reading analytically, and understanding literature.

#### Skill 101

**Read accurately and critically by asking pertinent questions about a text, by recognizing assumptions and implications, and by evaluating ideas.**

##### Enabling Subskills

Ascertain the meaning of a passage, identifying main ideas, supporting details, and logical or narrative sequences.

Recognize the implicit assumptions and values underlying a written work.

Evaluate the ideas presented in a text by determining their logical validity, their implications, and their relationships to ideas beyond the text.

This skill focuses on interpretation and evaluation of relatively short reading passages selected from many fields of study and from many forms and styles of writing typical of that required in college courses. To demonstrate mastery of this skill, students must be able to identify main ideas and distinguish them from subordinate ideas and supporting details, to recognize assumptions and values that are unstated but

clearly implied, and to evaluate the logic or the underlying meaning of a passage. The following sample question illustrates one type of question that may be used to assess the first enabling subskill (i.e., identify main ideas).

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#### Sample Question

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Our crew employed themselves catching cod and hauled up a great number. Till then I had stuck to my resolution to eat nothing that had had life; and on this occasion I considered . . . the taking of every fish as a kind of unprovoked murder, since none of them had or ever could do us any injury that might justify this massacre. All this seemed very reasonable. But I had formerly been a great lover of fish, and when this came hot out of the frying pan, it smelled so admirably well. I balanced some time between principle and inclination till I recollected that when the fish were opened, I saw smaller fish taken out of their stomachs. "Then," thought I, "if you eat one another, I don't see why I mayn't eat you." So I dined upon cod very heartily. . . . So convenient a thing it is to be a reasonable creature, since it enables one to find or make a reason for everything one has a mind to do.

What is the main idea of this passage?

- A. Humans possess a limited capacity for compassion.
  - \* B. Humans possess an enormous capacity for self-justification.
  - C. Because fish are carnivorous, humans are justified in eating them.
  - D. Reason is the intellectual power separating humans from animals.
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Like other questions assessing this skill, questions asking students to identify the main idea require them to go beyond information directly stated in the passage. In order to identify the main idea, for example, students must separate other, less important ideas and supporting details. The correct answer will be the sentence that accurately describes the most important idea expressed by the author, regardless of whether that sentence appears in the passage itself. It will be neither too general nor too specific, and will not introduce ideas that have not been discussed by the author.

For example, in the above passage, the narrator describes how he used his reasoning abilities in order to justify eating fish, although he originally determined not to eat any living thing. The main idea, then, is best expressed in option B. Although the other options also present plausible statements, they do not accurately describe the most important idea of this passage. Option A brings to the passage something

## Appendix A

not discussed by the author (i.e., that taking life is a sign of a lack of compassion). Option C gives too much emphasis to a subordinate idea (i.e., that fish are carnivorous). Option D is too general, since the passage is not about the characteristics that distinguish humans from animals.

### **Skill 102**

**Read a literary text analytically, seeing relationships between form and content.**

#### *Enabling Subskills*

Identify and analyze common semantic features such as connotation and figures of speech.

Identify conventional literary genres, elements, and devices and relate such formal elements to the content of the passage in which they are found.

Identify the tone, mood, and voice of a literary text through an analysis of its linguistic features and literary devices.

Identify the theme of a literary text and the ways it is embodied by formal elements.

This skill focuses on students' ability to analyze relatively short literary passages, including poetry, short stories, and essays typical of required reading in college literature courses. To demonstrate mastery of this skill, students must recognize relationships between what is said (content) and how it is expressed (form). They should be familiar with the basic language of literary study and recognize certain formal elements used in various types of literature. Questions may take a number of different forms. For example, students may be asked to find an example of a metaphor or pun in a given passage, to identify the connotation of a word or phrase, or to select the literary term that best describes a given example. The sample question below illustrates one type of question that may be used to assess the third enabling subskill (i.e., identify the tone of a literary passage).

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#### *Sample Question*

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Our crew employed themselves catching cod and hauled up a great number. Till then I had stuck to my resolution to eat nothing that had had life; and on this occasion I considered . . . the taking of every fish as a kind of unprovoked murder, since none of them had or ever could do us any injury that might justify this massacre. All this seemed very reasonable. But I had formerly been a great lover of fish, and when this came hot out of the frying pan, it smelled so admirably well. I balanced some time between principle and inclination

## *ENGLISH: Reading and Literature*

till I recollected that when the fish were opened, I saw smaller fish taken out of their stomachs. "Then," thought I, "if you eat one another, I don't see why I mayn't eat you." So I dined upon cod very heartily. . . . So convenient a thing it is to be a reasonable creature, since it enables one to find or make a reason for every-thing one has a mind to do.

What is the tone of the last sentence?

- A. bitter
- B. proud
- \* C. ironic
- D. hopeful

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Notice that this question is based on the same reading passage as the first sample question. Frequently, two or more questions are based on a single passage.

Like other questions assessing this skill, questions asking students to identify tone require that they analyze how the author's choice of words and their arrangement into sentences determines the meaning or effect of a passage. For example, to identify the author's attitude toward the subject (i.e., tone), one could compare the author's choice of words to the subject as a whole. In this passage, students should notice that the words in the last sentence are impersonal and abstract, and that the passage contains few contractions or concrete nouns. This rather dramatic contrast between the formal level of diction and the subject of the passage (i.e., eating fish) indicates an ironic tone. Thus, C is the correct answer. Although the other options also describe possible attitudes toward the subject, they do not describe attitudes supported by this particular passage.

### **Skill 103**

**Understand a range of literature, rich in quality and representative of different literary forms and historical contexts.**

#### *Enabling Subskills*

Identify major authors of British and American literature and describe distinctive features of their works.

Recognize the historical sequence of major literary figures, works, movements, and periods of world literature (including British and American) and relate them to their literary and cultural contexts.

This skill covers the major figures and concepts of literary history. The questions presume a level of

knowledge generally achieved through a combination of high school English courses and a college-level survey of literature. Examples of British and American authors with whom undergraduates should be familiar include: Geoffrey Chaucer, William Shakespeare, Francis Bacon, John Milton, Jonathan Swift, William Wordsworth, Lord Byron, Samuel Taylor Coleridge, Percy Bysshe Shelley, Mary Wollstonecraft Shelley, Jane Austen, Charlotte Bronte, Emily Bronte, Charles Dickens, Thomas Hardy, Joseph Conrad, James Joyce, Virginia Woolf, Washington Irving, Edgar Allan Poe, Nathaniel Hawthorne, Ralph Waldo Emerson, Henry David Thoreau, Walt Whitman, Mark Twain, Emily Dickinson, Henry James, Stephen Crane, T. S. Eliot, William Faulkner, Robert Frost, Flannery O'Connor, Tennessee Williams, Richard Wright, Sylvia Plath, and Toni Morrison.

Examples of world authors may include but are not limited to: Homer, Confucius, Aristotle, Plato, Sophocles, Horace, Virgil, Augustine, Dante Alighieri, Miguel de Cervantes, Jean-Baptiste Molière, Jean-Jacques Rousseau, Johann von Goethe, Gustave Flaubert, Fyodor Dostoevsky, Henrik Ibsen, Marcel Proust, Thomas Mann, Franz Kafka, Bertolt Brecht, and Jorge Luis Borges. In addition, students should be familiar with major literary periods, such as Classical, Medieval, Renaissance, Neo-Classical, Romantic, Realistic, Naturalistic, Modern, and Contemporary.

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### Sample Question

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Which literary movement most frequently produced works that “objectively” examined the psychology and conduct of middle-class society?

- A. Classical
  - B. Medieval
  - C. Romantic
  - \* D. Realistic
- 

This question assesses students’ ability to identify a particular literary period, given a brief description of the subject matter and style generally associated with works of that period. Other questions assessing this skill may ask them to identify the author who wrote a particular title, or to identify a work based on information about its authorship, plot, theme, style, or characters. They might also be asked to identify the correct sequence of major literary figures, or to place a literary work into historical context.

### Cluster: Writing

The writing cluster includes three skills. Two of these skills are assessed through multiple-choice questions covering the writing process and conventions of standard written English. The other skill is assessed through a written essay.

#### Skill 104

**Understand the various elements of the writing process, including collecting information and formulating ideas, determining relationships, arranging sentences and paragraphs, establishing transitions, and revising what has been written.**

#### Enabling Subskills

Identify and apply appropriate prewriting strategies, organizational methods, and research techniques.

Improve the clarity, coherence, organization, and style of a text through revision.

This skill involves the various stages of the writing process, from gathering and organizing information to revising the rough draft. Typical questions may require students to identify an appropriate strategy for prewriting, to analyze an outline for flaws in organization, to select the best source of information for a particular purpose, or to revise an awkward sentence. The sample question below illustrates a type of question that might be used to assess the second enabling subskill (i.e., revision).

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### Sample Question

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Which is the best revision of this sentence?

Bubonic plague has threatened the population of the whole, entire world for millennia.

- \* A. Bubonic plague has threatened the world’s population for millennia.
- B. Bubonic plague has threatened the world for millennia.
- C. Bubonic plague has threatened worldwide population and the safety of the world for millennia.
- D. Bubonic plague has threatened the population and safety of the world for millennia.

Questions assessing skill 104 do not require corrections of errors in grammar, punctuation, capitalization, or spelling. Rather, they ask which revision improves the organization, clarity, or conciseness of the original sentence. Although the original sentence contains no errors, the wordiness reduces its effectiveness. For example, “whole” and “entire” mean nearly the same thing in the phrase “population of the whole, entire world.” Options C and D introduce further problems of wordiness. Option B, although shorter, leaves out important information from the original sentence. Thus, A is the correct answer to this question.

### Skill 105

**Use the conventions of standard written English.**

#### Enabling Subskills

Identify the parts of speech and grammatical elements of a sentence.

Recognize and correct common flaws in diction, grammar, mechanics, and punctuation.

This skill involves the correction of nonstandard diction, grammar, mechanics, and punctuation. Although students are not asked to define grammatical terms, they should be familiar with such terms as subject, verb, object, noun, pronoun, adjective, misplaced modifier, tense, agreement, and parallelism. Typical questions assessing this skill might present a sentence or a paragraph containing errors or examples of nonstandard English and direct students either to identify the flaws or to identify a corrected version. Other questions might ask students to identify the term that best describes a given error. The sample question below illustrates one type of question that could be used to assess the second enabling subskill.

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#### Sample Question

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What correction, if any, should be made in this sentence?

As an educator, good writing is important to me.

- \* A. As an educator, I know that good writing is important.
- B. As an educator, the importance of good writing is obvious to me.
- C. As an educator, which I am, good writing is important.
- D. No correction is required.

This question assesses the ability to identify a correction of a common grammatical error. Of course, in order to identify the correction, one must first identify the error. In this case, the original sentence contains a dangling modifier. In English, when modifiers occur at the beginning of a sentence, they usually describe the subject. “Writing” is the subject of the sentence, “As an educator, good writing is important to me.” Since the modifier, “As an educator,” does not describe the subject, “writing,” the modifier is said to be dangling. Option A, which introduces a person (“I”) into the subject position, corrects the problem.

### Skill 106

**Write an organized, coherent, and effective essay.**

#### Enabling Subskills

Formulate a central idea suitable to the occasion for writing, focusing it as required by the work’s format and the expectations of the audience.

Select a rhetorical strategy and pattern of development that effectively organize ideas.

Develop ideas logically and coherently with adequate supporting detail.

Employ unified paragraphs, varied syntax, and precise diction to present ideas clearly and efficiently.

Create a voice and tone appropriate to the audience and purpose.

Observe the conventions of standard written English.

This is the only skill in *College BASE* that is not evaluated through multiple-choice questions. Instead, students are asked to write an essay in response to a specific prompt. They are only required to write one essay during any given administration of *College BASE*. There is no choice among prompts. *College BASE* essay prompts focus on issues and concerns common to college campuses rather than on course-specific knowledge or current events. The prompt provides a specific situation and an equally specific audience to which the essay should be directed.

In order to demonstrate mastery of this skill, students must analyze a specific situation and compose a thoughtful, well-supported essay directed to the particular audience specified in the prompt. *College BASE* allows forty minutes for composition of the essay. Students should use a portion of that time to make notes or to do any other prewriting activities that they find helpful. However, they should not plan to revise extensively or to recopy their essays.

The sample writing prompt below is typical of the kind of question that may be encountered in the essay portion of *College BASE*. Following the sample question is a competently written student essay. With the exception of being typed, the essay is reproduced

just as the student wrote it. Beginning on page 6 is a description of the scoring procedure used to evaluate the *College BASE* writing exercise, detailed commentary on this particular essay, and the score it received.

### Sample Prompt

Imagine that you are attending a college that is contemplating a change in its curriculum. The current curriculum is called a “core curriculum.” All students who attend the school are required to take the same set of courses during the freshman and sophomore years. This requirement, supporters argue, assures that students have many experiences in common, and it gives them the information they need to select a major during their junior year. The proposed curriculum, called an “open curriculum,” would not go into effect for at least three years and thus would not affect you. It would, though, completely do away with requirements for all students entering after it is adopted. Supporters of the open curriculum argue that it will encourage students to make their own choices and thus better prepare them for life after college.

The College Policy Committee, composed of faculty members and administrators, has asked students to submit statements expressing their attitudes toward the current and proposed curricula, and you have decided to submit such a statement.

In an organized, coherent, and supported essay directed to the Committee, explain what you believe the Committee should do and why it should do so, as well as your general attitudes toward the priorities your school must set.

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**I realize that the decision about whether to retain the core curriculum or to adopt an open curriculum is very difficult. Nonetheless, I urge the Committee to adopt the open curriculum because this enables students to make their own choices as to what curriculum they want to follow.**

**Many Freshmen and Sophomores are undecided about what area to follow because they haven't experienced a varied high school curriculum. A big part of figuring out what interests one is by taking a lot of different courses which are varied. But some students have a general idea about their interests. Thus it would be a waste to take Art classes if one was interested in the sciences.**

**Generally every major requires classes that pertain to different subject matters. This will certainly guarantee the student a well rounded education. But with a declared major students are also able to concentrate on their area of interests. With the closed core system many students are stuck in classes with which they have no interest. But an open system would allow them to take their preferred classes along with the required classes.**

**Forcing students to stick to a closed core system may also be detrimental to the students study habits as well as grades. If students are forced to take classes they don't like then they are less likely to work for the top grade. When students are forced into a curriculum a negative feedback is likely to occur. But if students are able to chose their own set of classes then they obviously know what is required. When entering a class that's interesting to a student, he/she is much more likely to put time and energy into it.**

**A closed core curriculum also puts limits on the students variety of friends. If Freshmen and Sophomores are all thrown into the curriculum then obviously these will be the majority of the people they meet. It is important to become acquainted with students the same age, older, and younger. Older students have gone through a lot and have much good advice to offer younger students. It would be unfortunate to put limits on the age of ones friends.**

**I've argued strongly against the closed core curriculum mainly because I enjoy the freedom of choosing my own classes. I would strongly oppose being forced into certain classes with which I have no interest. True the closed curriculum exposes a student to a variety of subjects. But I feel that the requirements of one's major does a good enough job of giving a student a well rounded education.**

## Scoring Procedures

Each essay is read by at least two professional evaluators familiar with college-level writing. *College BASE* essay readers are trained to evaluate the work as a whole. While the mechanics of composition (e.g., punctuation, spelling, grammar) certainly affect their

reading, they understand the time constraints students are under. They score each essay based on its overall success in satisfying the demands of the question and in meeting the standards described below. Each essay is evaluated on the following 6-point scale, with 6 being the highest score possible.

### Score Points

**Score of 6:** Essays assigned a “6” will be excellent in nearly all respects, although the circumstances under which the essays were written allow for some imperfections. The “6” essay should employ a sound organizational strategy with clearly developed paragraphs proceeding from a sharply focused and clearly identifiable main idea or thesis. Assertions should be sufficiently developed and directed to engage the specified audience and should be supported through appropriate examples, details, and/or other fully integrated rhetorical techniques (e.g., analogy, narration). Again, considering the writing situation, there should be few, if any, distracting grammatical and mechanical errors.

**Score of 5:** Essays assigned a “5” will be good, but not excellent, in almost all respects. Specifically, look for a thesis or main idea that is clearly discernible and for sophisticated reasoning and/or support, going well beyond the information provided by the prompt. The writer will engage the opposition, beyond a passing reference, and may even redefine the problem while not evading it. A “5” may be marred by some stylistic and/or organizational problems, or it may be well-organized and fairly sophisticated at the sentence level but fail to use or fully integrate a variety of rhetorical devices. There should be few distracting grammatical and mechanical errors.

**Score of 4:** Essays assigned a “4” will present a competent thesis and adequate organization and will acknowledge the opposition, even if that acknowledgment takes the form of an indictment. A “4” may rely heavily on the prompt for ideas but supply sophisticated examples, or it may present ideas beyond the prompt but offer scant or predictable support. An essay which shows some insights but fails to unite them may also receive a “4.” Generally, a “4” may contain a few distracting grammatical and mechanical errors, although essays appreciably damaged by major errors should not receive a “4.”

**Score of 3:** Essays assigned a “3” will contain some virtues, although they may contain an unengaging or poorly focused main idea or thesis or be marred by inadequate development. A “3” might, for example, express some ideas that reflect a thoughtful consideration of the problem, but at the same time be obscured by unclear or “incorrect” writing. On the other hand, it might represent clear and competent writing but convey superficial ideas, or ideas which fail to account for information provided in the prompt. A “3” may be primarily a list of responses to the prompt, but with some development of the listed ideas, or it may show an organizational strategy which goes beyond listing, but offers support only in list form. As an argumentative essay, it may exhibit specious or circular reasoning or lack the coherence necessary to foster a complete understanding of the writer’s meaning. A number of major and distracting grammatical and mechanical errors may place an otherwise thoughtful and well-written essay in this category.

**Score of 2:** Essays assigned a “2” are weak because they are poorly written throughout (with consistent errors in grammar or mechanics), or because they fail to support major points, or because they are exceedingly superficial. A “2” may be flawed by a lack of unity or discernible organizational pattern, or it may rely upon a clearly organized list with little or no development or simple development which presents personal examples as proof.

**Score of 1:** Essays assigned a “1” will be clearly unacceptable as college-level writing or will demonstrate an only momentary engagement with the topic, concentrating instead upon some tangential concern(s). A “1” will be riddled with major grammatical and mechanical errors and/or will consist of a collection of random thoughts or undeveloped ideas. In short, essays that appear to have been written in careless haste or without effort should receive a “1.”

**Score of 0:** Essays that for any reason cannot be read should be assigned this score.

**Discussion of Sample Essay**

The preceding sample essay opens with a clearly stated thesis, and the writer acknowledges, although sparingly, that the opposing view has its merits. In addition, the writer provides basic support for the thesis with ideas and examples.

Some of the examples tend toward generalities rather than specifics, however, and their relevance is not always readily apparent. In fact, without a great deal of support, an overtly opinionated generalization—such as the statement that concludes the second paragraph—could easily alienate a reader. Many scientists deeply appreciate the arts, and members of the committee debating the curriculum probably include faculty from the arts and humanities—faculty who may be so put off by the comment as to dismiss the writer’s arguments altogether.

Nonetheless, the writer demonstrates basic competence in organization and development as well as grammar and mechanics. While the essay has a few errors in grammar and mechanics, none is so distracting or confusing as to prevent the reader from understanding the writer’s intended meaning. Taking all aspects of the discussion into consideration, readers determined that the essay should receive a score of “4,” in accordance with the scoring criteria.

**Mathematics**

College BASE divides mathematics into three clusters: general mathematics, algebra, and geometry. The general mathematics cluster assesses computational skills, knowledge of basic mathematical concepts and notational systems, and the ability to use techniques of statistical reasoning. The algebra cluster assesses ability to solve linear equations, inequalities, and quadratic equations and to reduce numerical expressions to their lowest terms. The geometry cluster assesses knowledge of basic geometrical concepts and ability to use those concepts in calculations. Students may bring their own handheld, non-printing calculator and use it for any of the mathematics problems, but they may not share calculators or use any instructional material.

**Cluster: General Mathematics Proficiency**

The general mathematics cluster consists of three skills: practical applications, properties and notations, and using statistics.

**Skill 201**

**Use mathematical techniques in the solution of real-life problems.**

*Enabling Subskills*

Solve word problems requiring computation of base, rate, or percentage, including problems related to interest, discount, taxes, and paycheck deductions.

Solve word problems involving time, distance, and velocity.

Solve word problems involving ratio and proportion.

This skill involves the solution of realistic word problems. In order to demonstrate mastery of this skill, students must be able to screen out irrelevant data, apply correct formulas, and perform calculations or determine ratios. Formulas are not provided for problems assessing this skill. The sample question below illustrates one type of word problem that could be used to assess the second enabling subskill.

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*Sample Question*

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Susan left Georgetown for Mt. Vernon at 1:00 in the afternoon. She traveled at 50 miles per hour for the first 62.5 miles. She stopped for 20 minutes and then drove at 60 miles per hour for 150 miles. At what time in the afternoon did Susan arrive in Mt. Vernon?

- A. 2:32
  - B. 4:05
  - \* C. 5:05
  - D. 5:35
- 

This question asks for a solution to a problem using the formula: time = distance ÷ rate. However, like other questions assessing this skill, this problem requires a number of steps in order to arrive at the correct solution. Susan’s trip involves three stages: the first 62.5 miles, traveled at 50 mph; the 20-minute stop; and the last 150 miles, traveled at 60 mph. Susan’s arrival time is determined by first calculating the time required for each part of Susan’s journey. Substituting the distance and the rate into the formula  $t = d \div r$  reveals that one portion of the journey required 1 hour and 15 minutes ( $62.50 \div 50$ ) and the other portion of the journey took 2 hours and 30 minutes ( $150 \div 60$ ). After dividing the distance by the rate, the resulting decimal must be converted into hours and minutes (e.g., 1.25 hours equals 1:15). Finally, to determine Susan’s arrival time students must add the times required for each stage of Susan’s trip (1:15 + 2:30 + 0:20) to her departure time of 1:00 p.m. The correct answer is 5:05 p.m.

**Skill 202**

**Use the language, notation, and deductive nature of mathematics to express quantitative ideas with precision.**

*Enabling Subskills*

Use and interpret such set concepts as union and intersection, and identify finite, infinite, and empty sets.

Convert a verbal description of a mathematical relationship to a symbolic mathematical statement.

Identify integers, real numbers, rational numbers, and irrational numbers.

Identify applications of the identity, inverse, associative, commutative, distributive, and transitive properties of real numbers.

Identify patterns in numerical progressions and predict further sequential elements.

This skill covers the basic concepts and vocabulary of mathematics. In order to demonstrate mastery of this skill, students must be able to identify and define mathematical terms and to apply fundamental concepts. Typical questions assessing this skill may require identification of unions and intersections of sets, selection of a specified set, translation of verbal descriptions into mathematical symbols, identification of valid mathematical statements, or prediction of elements in a sequence. Some questions are expressed using appropriate mathematical symbols, while others rely on verbal descriptions of mathematical concepts. The sample question below illustrates a type of question that may be used to assess the first enabling subskill.

*Sample Question*

Which set is infinite?

- \* A. the set of all integers
- B. the set of positive whole numbers less than 10
- C.  $\{0\}$
- D.  $\{2, 4, 6, 8\}$

This question requires students to select which of the four options represents an infinite set. In order to correctly answer this question, they must first recall and comprehend the definition of an infinite set, and then analyze the four options to determine which set fits that definition. The correct answer is A.

**Skill 203**

**Use the techniques of statistical reasoning and recognize common misuses of statistics.**

*Enabling Subskills*

Calculate and interpret probability, including that of independent and mutually exclusive events.

Recognize inappropriate statistical reasoning and incorrect or misleading displays of statistical data.

Calculate and interpret mean, median, mode, and range.

This skill covers fundamental statistical concepts and terminology, and common applications of statistical reasoning in daily life. Typical questions assessing this skill call for computing probability; identifying accurate interpretations of statistical information; recognizing flaws in statistical reasoning; or calculating the mean, median, mode, or range of a specified set of values. The sample question below illustrates one type of question that could be used to assess the first enabling subskill (i.e., probability).

*Sample Question*

The probability of having a male child is 50 percent. A couple now has two children, both of whom are male. What is the probability that the couple's third child will be male?

- A. 0.125
- \* B. 0.50
- C. 1.00
- D. 1.25

This question assesses an understanding of fundamentals of probability theory. The question focuses on determining the likelihood that a specified event will occur and the dependence or independence of probability on other events or circumstances. In the situation described above, each time a couple has a child, the probability of its being male is 50 percent (0.50), regardless of the number of children the couple has. Thus, the correct answer is B.

**Cluster: Algebra**

The algebra cluster consists of two skills: evaluating expressions, and equations and inequalities.

**Skill 204**

**Evaluate algebraic and numerical expressions.**

*Enabling Subskills*

Simplify algebraic expressions by substituting given values.

Simplify numerical and algebraic expressions, using the hierarchy of operations and grouping symbols.

This skill encompasses the fundamentals of algebraic and numerical expressions. In order to demonstrate mastery of this skill, students must be able to identify numerical equivalents of algebraic expressions and to reduce numerical expressions to their simplest terms. They should be familiar with symbols used in this branch of mathematics as well as with conventions governing the manipulation of signs and the hierarchy of operations. The sample question below illustrates a type of question that may be used to assess the second enabling subskill.

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*Sample Question*

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Simplify:

$$3 - [4 - (3^2 - 2 \cdot 5)]$$

- A. 0
  - \* B. -2
  - C. 18
  - D. 34
- 

This question assesses the ability to simplify a numerical expression. In order to arrive at the correct answer, the operations must be performed in the proper order and follow rules governing the manipulation of positive and negative signs. In order to reduce the above numerical expression, students should begin with the operations within the parentheses. First, determine the square of 3; then multiply 2 times 5. The expression at this point will be:  $3 - [4 - (9 - 10)]$ . Continuing with the expression within the parentheses, subtract 10 from 9. The expression has now been reduced to  $3 - [4 - (-1)]$ . The next step is to subtract -1 from 4, resulting in 5. Finally, subtract 5 from 3, and the expression has been reduced to -2.

**Skill 205**

**Solve equations and inequalities.**

*Enabling Subskills*

Solve linear equations.

Solve linear inequalities.

Use the quadratic formula to solve quadratic equations.

This skill covers linear equations and linear inequalities that have one variable. In order to demonstrate mastery of this skill, students must be able to solve linear equations and inequalities involving at least two operations. Questions for this skill may require applying the quadratic formula to identify possible values of the variable in a quadratic equation. The sample question below illustrates a type of question that may be used to assess the second enabling subskill (i.e., linear inequalities).

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*Sample Question*

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Solve for  $x$ :

$$2x - 8 \geq 5x - 2$$

- \* A.  $x \leq -2$
  - B.  $x \geq -2$
  - C.  $x \geq 2$
  - D.  $x \geq \frac{10}{7}$
- 

This question assesses the ability to solve linear inequalities that have one variable. In order to solve the above inequality, begin by adding 8 to each side of the inequality sign ( $2x \geq 5x + 6$ ). Next, subtract  $5x$  from each side ( $-3x \geq 6$ ). Finally, divide each side by  $-3$ , remembering that division by a negative number reverses the inequality sign. The correct answer to the above question is A,  $x \leq -2$ .

**Cluster: Geometry**

The geometry cluster consists of two skills, knowledge of two- and three-dimensional figures, and geometrical calculations.

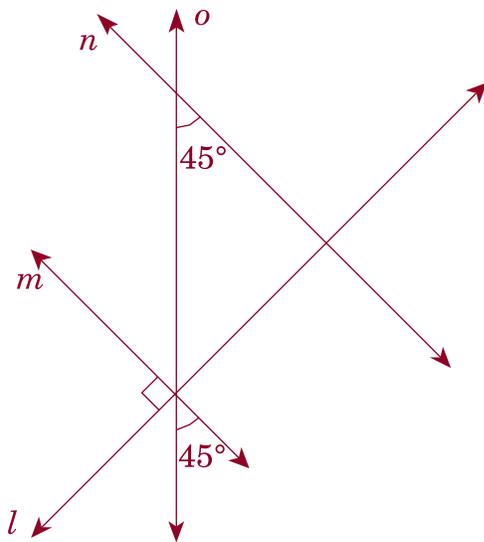
**Skill 206****Recognize two- and three-dimensional figures and their properties.***Enabling Subskills*

Identify parallel, perpendicular, and intersecting lines and determine the angle relationships they create by recognizing acute, obtuse, vertical, right, adjacent, supplementary, and complementary angles.

Identify two- and three-dimensional geometrical figures.

Identify similar and congruent polygons.

This skill involves understanding the basic terminology, concepts, and symbols of geometry. To demonstrate mastery of this skill, one must identify the relationships among lines and angles depicted on diagrams, provide the names for diagrams of basic two- and three-dimensional figures, and recognize similar and congruent figures. The sample question below illustrates one type of question that may be used to assess the first enabling subskill.

*Sample Question*

Which lines are perpendicular?

- \* A.  $l$  and  $n$
- B.  $l$  and  $o$
- C.  $m$  and  $n$
- D.  $m$  and  $o$

This question assesses the ability to identify which of several lines depicted in a diagram are perpendicular. Diagrams often will include angle measures or relationships that provide evidence of the relationship among the lines. Questions themselves may occasionally use symbols for relationships such as parallel and perpendicular lines and right angles. Often, however, students need to go beyond information presented in the diagram and apply basic theorems of geometry. For example, to determine whether the intersection of lines  $l$  and  $n$  forms a right angle, knowledge of vertical and supplementary angles must be applied.

**Skill 207****Use the properties of two- and three-dimensional figures to perform geometrical calculations.***Enabling Subskills*

Calculate the perimeter and area of two-dimensional geometrical figures.

Calculate the area and volume of three-dimensional geometrical figures.

Use the Pythagorean Theorem to solve problems involving right triangles.

This skill covers calculations and practical applications of geometry. Questions assessing this skill present situations that require exercising knowledge of geometry in the solution of everyday problems. Students will also confront straightforward problems which require computing the perimeter, area, or volume of a variety of geometrical figures. Formulas are provided for all three-dimensional figures except rectangular solids. Formulas are not provided for two-dimensional figures. The sample question below illustrates one type of question that may be used to assess the second enabling subskill.

*Sample Question*

What is the surface area in square centimeters of a cube with edges measuring 3 centimeters?

- A. 9
- B. 27
- C. 36
- \* D. 54

This question assesses the ability to calculate the surface area of a cube based on a verbal description of the measurements of the figure. Other questions assessing this skill may use a diagram to depict the figure. Calculating the surface area in square centimeters of this cube requires determining the area of one of the six sides of the cube and then multiplying that area by the total number of sides. The formula for the area of a square is length  $\times$  width. Thus, each side of the cube has an area of 9 square centimeters, and the surface area of the cube is 9 times 6 sides, or 54 square centimeters.

## Science

*College BASE* divides science into two clusters of skills: laboratory/field work and fundamental concepts. The laboratory/field work cluster assesses knowledge and understanding of scientific methodology, including design and implementation of experiments and interpretation of results. The fundamental concepts cluster assesses knowledge of the basic principles of the life, earth, and physical sciences.

### Cluster: Laboratory and Field Work

This cluster consists of three skills: observation/experimental design, laboratory/field work techniques, and interpreting results.

#### Skill 301

**Recognize the role of observation and experimentation in the development of scientific theories.**

#### Enabling Subskills

Isolate and define a scientific problem or area for scientific study.

Recognize the principal elements in an experimental design, including the hypothesis, independent and dependent variables, and controls.

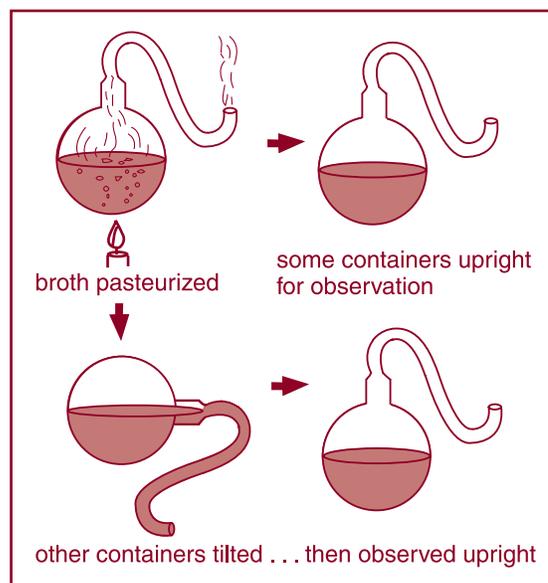
Evaluate an experimental design by analyzing its ability to test the hypothesis, identifying weaknesses and improvements, and discerning inherent limitations and assumptions.

This skill covers scientific methods of observation and experimentation. To demonstrate mastery of this skill, students must have a working knowledge of basic scientific vocabulary. In addition, they must analyze experimental designs in order to identify the particular problem under investigation, the principle elements of the experiment, and any flaws or limita-

tions in experimental design. The sample question below illustrates one type of question that may be used to assess the second enabling subskill (i.e., recognize hypothesis).

#### Sample Question

In the nineteenth century, Louis Pasteur performed an experiment in which he bent the necks of flasks into “S” shapes, leaving their ends opened. Then he boiled broth in the flasks to force air out and kill any microbes inside. After the flasks cooled, he left some of them upright for observation. Before setting aside others to observe, he tilted them so that the broth moved up into the bent necks and then back into the flasks. After the flasks had been prepared, he watched them for signs of microbial growth.



Which hypothesis was Pasteur testing in this experiment?

- Flasks with bent necks would cause microbes to grow in the broth.
- Cooling broth in the flasks would cause microbes to grow in the broth.
- Heating broth in the flasks and then cooling it would cause microbes to grow in the broth.
- \* Contact of the broth with something in the necks of the flasks would cause microbes to grow in the broth.

This question requires recognizing the principal elements in an experimental design. To deduce the hypothesis, one must also identify the independent variable. In this case, the independent variable (the vari-

## Appendix A

able the experimenter manipulates) is the tilting of some of the flasks and the subsequent contact of the broth with the necks of the flasks. Option D is the only one that includes the independent variable in its description and is thus the correct answer.

### **Skill 302**

**Recognize appropriate procedures for gathering scientific information through laboratory and field work.**

#### *Enabling Subskills*

Identify effective laboratory and field techniques for observation, measurement, and other information-gathering procedures.

Select the scientific apparatus or instrument appropriate to a specified laboratory or field task and identify proper operation of such equipment.

Use the metric system of measurement, recognizing equivalents within that system and selecting units appropriate to a given laboratory or field task.

Convert between scientific notation and conventional numerals and use scientific notation to perform calculations.

Questions for this skill assess an understanding of data gathering. To demonstrate mastery of this skill, one must identify accurate and effective methods or equipment most appropriate to particular scientific investigations, as well as convert measurement from one metric unit to another and perform calculations in scientific notation. The sample question below illustrates one type of question that may be used to assess the first enabling subskill.

---

#### *Sample Question*

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Which method might be used to determine the relative depths of two wells without using a tape measure?

- A. Drop a pebble down each well and measure the time it takes the pebbles to strike bottom. The deeper well will have the shorter elapsed time.
- \* B. Drop a pebble down each well and measure the time it takes the pebbles to strike bottom. The deeper well will have the longer elapsed time.
- C. Drop one large rock and one pebble down each well. The deeper well will have a greater elapsed time for the large rock than for the pebble.
- D. It is not possible to find out which well is deeper without using a tape measure.

## *SCIENCE: Laboratory and Field Work*

This question assesses the ability to identify a practical method of gathering data in the field. Option C is incorrect because the pebble and rock would fall at the same rate. Option D is also incorrect because it is possible to measure relative depth without a tape measure. Options A and B both present the same plausible method of measurement, except that A states an incorrect conclusion. Option B is thus correct.

### **Skill 303**

**Interpret and express the results of observation and experimentation.**

#### *Enabling Subskills*

Identify accurate verbal, graphic, and tabular expressions of data derived from observation and experimentation.

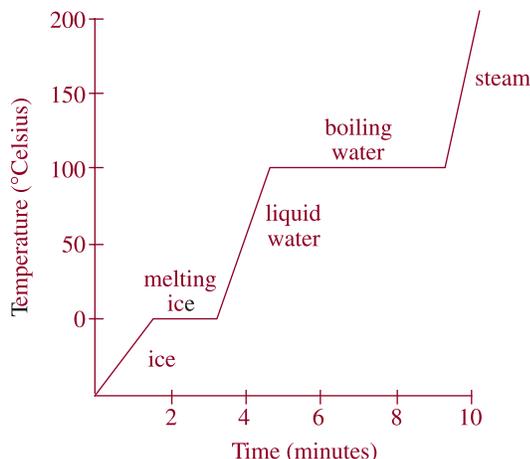
Draw conclusions and make inferences from observations or experimental results presented in verbal, graphic, or tabular form.

Describe a scientific relationship in symbolic mathematical terms.

This skill encompasses graphic, tabular, and pictorial presentations of data. Some questions ask for a translation of information from one form of expression to another; for example, a question might provide a verbal expression and ask students to select the best graphic presentation of the information, or the question might ask students to translate the verbal expression into a mathematical expression or formula. Other questions ask for interpretation of graphs, tables, or figures. Still other questions present a graph, table, or figure and ask for a description of a flaw in the presentation of the data. Finally, some questions ask students to extrapolate information from a graph, table, or figure. The sample question below illustrates one type of question that may be used to assess the second enabling subskill.

Sample Question

The graph below shows the relationship of temperature and time as constant heat is applied to an ice cube.



Which statement is consistent with the graph?

- \* A. The temperature of melting ice remains constant until all of the ice is melted.
- B. The rate of water boiling equals the rate of ice melting.
- C. The same amount of heat is required to melt ice as to boil water.
- D. More heat is required to melt ice than is required to boil water.

This question assesses the ability to identify a reasonable conclusion based upon experimental results presented in graphical form. Since the amount of heat applied to the ice cube is constant, C and D cannot be true since it takes an appreciably longer time to change all the water into steam than to melt the ice cube. B is also incorrect because the time required to boil all the water is longer than the time needed to melt the ice cube. According to the graph, A is the correct answer because the water stays at a constant temperature while undergoing a change of state.

Cluster: Fundamental Concepts

The fundamental concepts cluster consists of two skills that assess knowledge of scientific content. One skill encompasses the life sciences, while the other skill covers the physical sciences.

Skill 304

Understand the fundamental concepts, principles, and theories of the life sciences.

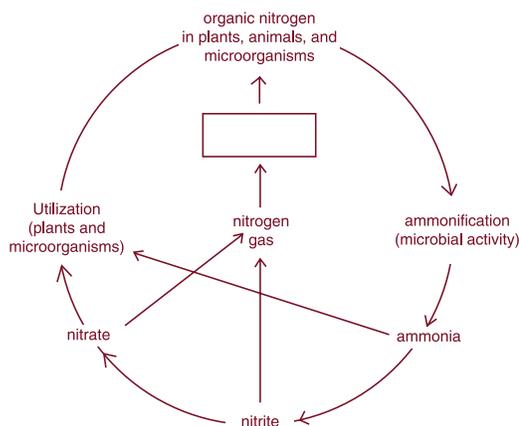
Enabling Subskills

- Describe the elements of fundamental concepts in the life sciences.
- Describe the basic processes of matter, energy, and information in the life sciences.
- Describe significant relationships among natural phenomena in the life sciences.
- Describe the products or effects of fundamental processes in the life sciences.

This skill includes biology, botany, zoology, and ecology. To demonstrate mastery of this skill, students must be familiar with basic scientific terminology and concepts of the life sciences. Typical questions may ask for identification of a particular unit (e.g., cell) based on a verbal description of its components. Other questions may ask students to identify the effects of a basic process (e.g., photosynthesis) or to identify the relationships among participants in a given system (e.g., food chain). The sample question below illustrates one type of question that may be used to assess the second enabling subskill.

Sample Question

Which process must be inserted in the box to complete the important steps in the nitrogen cycle?



- A. nitrogen irradiation
- \* B. nitrogen fixation
- C. nitrogen fusion
- D. nitrogen induction

This question is designed to test knowledge of the nitrogen cycle. All the options, with the exception of B, are invented processes. It is not necessary to be able to diagram the nitrogen cycle to know that nitrogen fixation is the process by which nitrogen gas is converted to a form usable by plants and animals.

### Skill 305

#### Understand the fundamental concepts, principles, and theories of the physical sciences.

##### Enabling Subskills

Describe the elements of fundamental concepts in the physical sciences.

Describe the basic processes of matter, energy, and information in the physical sciences.

Describe significant relationships among natural phenomena in the physical sciences.

Describe the products or effects of fundamental processes in the physical sciences.

This skill includes chemistry, physics, astronomy, geology, and meteorology. To demonstrate mastery of this skill, students must be familiar with basic scientific terminology and concepts of the physical sciences. Typical questions may ask them to identify a particular unit (e.g., atom) or structure (e.g., molecule) based on a verbal description of its components. Other questions may ask them to identify the operation or effects of a given process (e.g., chemical bonding). The sample question below illustrates one type of question that may be used to assess the first enabling subskill.

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#### Sample Question

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Which statement describes covalent bonding?

- \* A. Electrons are shared by atoms.
  - B. Electrons are transferred between atoms.
  - C. The nucleus of one atom is split, and energy is released.
  - D. The nuclei of the atoms are fused together.
- 

This question asks students to identify a fundamental concept in the physical sciences, covalent bonding. The correct answer to the above question is A. Option B describes ionic bonding. Option C describes nuclear fission, and option D describes nuclear fusion.

## Social Studies

College *BASE* divides social studies into two areas of study: history and the social sciences. The history cluster assesses knowledge of chronology, historical movements, significant figures and institutions, and the causal relationships that connect events in United States and world history. The social science cluster assesses knowledge of the principles and concepts of geography, economics, and political science, as well as the research tools and methodologies available to the social scientist.

### Cluster: History

The history cluster consists of two skills: significance of world events and significance of United States events.

### Skill 401

#### Recognize the chronology and significance of major events and movements in world history.

##### Enabling Subskills

Identify and compare key institutions or participants in major events and movements of world history.

Identify the sequence of major events and movements in world history.

Describe the significance of major events and movements in world history, including their causes and effects as well as their relationships to broader historical trends.

This skill encompasses the key events, movements, institutions, and figures that compose humanity's collective past. Questions will be drawn from all world history, not just European history. America's involvement is also considered a component of world history.

Major historical institutions and individuals may include but are not limited to the following: Roman Catholic Church, Russian Orthodox Church, Sorbonne, Oxford, British Parliament, League of Nations, United Nations, European Economic Community; Lao Tsu, Joan of Arc, Martin Luther, Henry VIII, Peter the Great, Vladimir Lenin, Josef Stalin, Winston Churchill, and Chiang Kai-shek. In addition, students should be familiar with such major events and movements as the Norman Conquest, feudalism, Great Schism, Reformation, rationalism, empiricism, French Revolution, Darwinism, Marxism, World War I, Russian Revolution, and World War II.

Questions assessing this skill may take several forms. Some questions may call for identifying institutions or individuals associated with specified historical events or historical events associated with a specific person or institution. Other questions may ask one to identify the correct order for a series of major events or the relationships among specified historical events or movements. The sample question below illustrates one type that may be used to assess the second enabling subskill (i.e., chronology).

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### Sample Question

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Which list is in chronological order?

- \* A. Roman Empire, Byzantine Empire, Ottoman Empire
  - B. Roman Empire, Ottoman Empire, Byzantine Empire
  - C. Byzantine Empire, Ottoman Empire, Roman Empire
  - D. Ottoman Empire, Roman Empire, Byzantine Empire
- 

This question assesses the ability to identify the sequence of major events. Because questions assessing this skill focus on major events, often separated by a century or more, it is not necessary to know the exact dates of the events listed in order to answer correctly. The correct answer to this question is A, which places the three given empires in chronological order: the Roman, from classical times; the Byzantine, following Rome during the Middle Ages; and the Ottoman, which flourished during the European Renaissance and early Modern era.

### Skill 402

**Recognize the chronology and significance of major events and movements in United States history.**

#### Enabling Subskills

Identify and compare key institutions or participants in major events and movements in United States history.

Identify the sequence and the significance of major events and movements in United States history, including their causes and effects as well as their relationships to broader historical trends.

Identify technological developments and environmental changes in United States history and relate them to historical events and movements.

Describe the principles and development of American Constitutional democracy and the significance of major Supreme Court decisions.

Describe the interaction among peoples of different national origins, races, and cultures and how such interaction has shaped American history.

This skill assesses knowledge of major institutions, events, movements, and figures in United States history, as well as knowledge of the principles and development of American Constitutional democracy. On the rationale that students know their own country's history more comprehensively than they know the history of other countries, this skill is more detailed than the world history skill. This skill includes the contributions of the many racial and cultural groups that compose the American people—their origins, their contributions to the culture, and their interactions with the dominant culture. Students should also be able to identify technological and environmental developments, such as the telephone, automobile, airplane, satellite communications, and acid rain and their relationships to the development of the United States.

Major historical events and movements may include but are not limited to the following: Revolutionary War, Louisiana Purchase, Lincoln-Douglas debates, Civil War, populist movement, woman suffrage, Prohibition, Great Depression, civil rights movement, first moon landing. In addition, students should be familiar with the significance of such institutions and individuals as the public school systems, day-care industry, New York Stock Exchange, Congress; Thomas Jefferson, Susan B. Anthony, Carrie Nation, Franklin Roosevelt, and Martin Luther King, Jr.

Questions assessing knowledge of United States history may take a number of different forms. For example, some questions may ask for a key person or institution associated with a specified historical event. Other questions may ask for a chronological list of events, movements, or individuals. Still others may require identifying causes or effects of specified events or technological developments. In addition, one can expect some questions about the operation of American government and about the significance of key decisions of the Supreme Court. The sample question below illustrates one type of question that may be used to assess the second enabling subskill.

## Appendix A

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### Sample Question

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What prevented Texas from becoming a state immediately after winning its independence from Mexico?

- A. Texas had amassed huge war debts.
  - \* B. The balance of slave and free states would have been upset.
  - C. Mexico threatened to retake southern California and Arizona.
  - D. Most Texans were actually of Mexican descent.
- 

This question assesses ability to identify relationships among specified events or movements in United States history. While students do not need to know specific dates of events or movements to answer questions on *College BASE*, they will need to place events within their historical context. To answer this question, for example, events in Texas during the 1830s must be linked with what may at first appear to be disconnected events—such as the Missouri Compromise—in the United States. An understanding of the politics of slavery, then, proves to be instrumental in arriving at the correct conclusion, B.

### Cluster: Social Sciences

The social sciences cluster consists of three skills: geography; political/economic structures; and social science procedures.

### Skill 403

#### Recognize basic features and concepts of world geography.

##### Enabling Subskills

Identify the location and explain the geographical significance of cultural regions, political units, and physical features of the world, including nations, cities, land masses, bodies of water and waterways, mountain ranges, deserts, and climatic zones.

Describe central features of the cultural and social life within nations, including aspects of daily life, customs, religious belief, and the arts.

Analyze geographical relationships, including the effects of geographical factors upon human life.

This skill assesses knowledge of the topography of the world. Places may include but are not limited to

## SOCIAL STUDIES: Social Sciences

Argentina, Brazil, Cuba, Egypt, France, India, Iran, Israel, Mexico, Poland, South Africa, the former Soviet Union, Vietnam; Berlin, Chicago, Detroit, Hong Kong, London, Mecca, Miami, Nairobi, New York, Rome; the continents; Arctic, Atlantic, Indian, Pacific oceans; Caribbean, Mediterranean, Red seas; Great Lakes; Amazon, Congo, Mississippi, Ohio, Rhine, St. Lawrence rivers; Panama, Suez canals; Alps, Andes, Himalayan, Rocky mountains; Gobi, Sahara deserts; and arctic, temperate, and tropical zones.

Questions assessing this skill may take one of several forms. Some questions ask students to identify regions, climate zones, topographic features, countries, or cities on a map. Other questions may ask them to identify a geographic element or a specified aspect of a culture based on a verbal description of its characteristics. They may also be asked to identify ways in which geography can affect or be affected by inhabitants of a specified region. The sample question below illustrates one type of question that may be used to assess the first enabling subskill.

---

### Sample Question

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Which body of water lies between Africa and Australia?

- A. Atlantic Ocean
  - B. Pacific Ocean
  - C. Coral Sea
  - \* D. Indian Ocean
- 

This question assesses the ability to identify a geographic feature specified by a verbal description of its location. In order to answer this question—or others of its type—one must possess a comprehensive “mental map” of the world. This “map” should allow location of specified places or show understanding of basic geographic relationships, including the positions of bodies of water in relation to land masses. Those that have this understanding will know that the correct response is D.

### Skill 404

#### Recognize basic features and concepts of the world’s political and economic structures.

##### Enabling Subskills

Identify and apply basic principles of economics and international trade, as well as describing their operation between and within the economic systems of particular countries.

Identify and apply basic principles of political science, as well as describing their operation between and within the governments of particular countries.

Questions for this skill assess the ability to recognize major economic and political systems and to apply the concepts defined or implied by those systems to real or hypothetical situations. The sample question below illustrates one type of question that students may encounter.

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### Sample Question

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Which economic/political system is in theory characterized by a classless society, government control of wages and prices, and national resources owned collectively by the people?

- A. anarchism
  - B. fascism
  - C. capitalism
  - \* D. communism
- 

This question requires identifying an economic/political system based on a description of its basic principles. Governmental controls eliminate anarchism and capitalism as possibilities, leaving fascism and communism. In practice, fascism and communism may appear to be quite similar. A basic theoretical distinction, however, is that fascism exalts the state above the individual, while communism emphasizes an equitable sharing of resources among the people. Thus, the correct response is D.

### Skill 405

#### Recognize appropriate investigative and interpretive procedures in the social sciences.

##### Enabling Subskills

Identify appropriate sources and methods for the investigation of a social problem or institution.

Interpret and express the results of social science research in verbal, tabular, and graphic form.

This skill differs from others in social studies in that it addresses research skills and methods rather than particular content. The questions are designed to assess knowledge of the research tools available to social scientists and the ability to analyze the kinds of data presentations found most frequently in social science research literature.

Students can expect to encounter two types of questions designed to assess this skill. One type poses hypothetical research scenarios and asks for an evaluation which of the options is most likely to yield the best data. The other type asks for an identification of correct or faulty interpretations or conclusions based on verbal, tabular, or graphic presentations of data. The sample question below illustrates one type of question that may be used to assess the first enabling subskill.

---

### Sample Question

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A graduate student wants to collect data for his study on divorce. He has hypothesized that divorce is less likely to occur among families with over three children than among families with one or two children. Which method would be most helpful in the study?

- \* A. conducting a mail survey in several counties about divorce
  - B. attending several meetings of the local Divorced Parent's Club
  - C. talking with single parents in his neighborhood
  - D. reading a library book on coping with divorce
- 

This question assesses the ability to identify an appropriate source of information for a specified research project. Although all of the options would theoretically yield information, only one of them qualifies as the “best” source. The task, then, is to evaluate each of the options, keeping in mind what the graduate student is studying and what method best meets the study’s goals and the restrictions of scientific investigation.

Option A, “conducting a mail survey in several counties,” is the best method of those listed. A questionnaire affords the researcher more direct control over the information. Moreover, this option should provide a sufficiently broad sampling to allow the researcher to make the generalizations demanded by the study, whereas the other options would be too narrow in scope.

## Appendix B

### Competencies

In addition to assessing subject area knowledge, *College BASE* assesses three reasoning competencies applied to all subjects. These competencies (i.e., interpretive, strategic, and adaptive reasoning) represent levels of cognitive skills developed as a result of education and practice, beyond mere observation or recall of facts. They indicate an understanding of the significance of and the ability to manipulate information, as evidenced by formulating hypotheses or evaluating the logical validity of an argument. This model of intellectual processing assumes that a basic core of factual information is a fundamental step that must precede any higher-level processing skills.

Approximately three-fourths of *College BASE* test questions represent the three levels of reasoning skills—interpretive, strategic, and adaptive. Because *College BASE* is designed as a sophomore-level examination, it assumes a level of recall knowledge reflecting what students have likely acquired through secondary school and early college experience. Consequently, approximately one-fourth of the questions on the exam are designed to assess mastery of a representative sampling of recall knowledge. These recall questions contribute to subject, cluster, and skill scores, but they do not contribute to competency scores. The figure below illustrates the relationship among the levels of reasoning assessed by *College BASE*.



The basic distinctions among the three types of reasoning and their relationship to factual recall or observation can be seen in the following simplified summary of the development of penicillin as the first antibiotic drug:

**Observation:** In 1928, a British scientist saw mold growing in a laboratory dish that contained bacteria and noticed that there were no bacteria growing near the mold clusters.

**Interpretive reasoning:** He concluded that the mold had the capacity to kill bacteria.

**Strategic reasoning:** He devised an experiment to test his interpretation. He grew the mold in a

### COMPETENCIES: Strategic Reasoning

broth but discovered that bacteria would not grow in the broth.

**Adaptive reasoning:** Someone conceived a plan for treating human bacterial infections with the penicillin mold.

### Interpretive Reasoning

Interpretive reasoning is the first level of cognitive processing beyond mere recall of facts. It is the cognitive process by which we begin to understand information that has been remembered or observed. As such, it is primarily a translating activity; that is, in order to make knowledge our own, we first translate information into personally meaningful terms through such activities as paraphrasing, summarizing, or explaining particular information. We also reason interpretively when we translate information from one form to another.

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#### Sample Question

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What is the surface area in square centimeters of a cube with edges measuring 3 centimeters?

- A. 9
- B. 27
- C. 36
- \* D. 54

---

This question from the geometry cluster of mathematics illustrates one type of question that could be used to assess the ability to apply interpretive reasoning skills. The first step in solving this problem is to translate the words into numbers that can be manipulated (e.g., compared or analyzed) to arrive at a solution. To identify the correct response, one must go beyond merely recalling the formula for calculating the area of a square; one must use interpretive reasoning skills to apply those concepts to a new situation, calculating the surface area of a cube.

### Strategic Reasoning

Strategic reasoning is the second level of cognitive processing. At this intermediate stage, we establish boundaries for information through definition, comparison, classification, and analysis that lead to inferences or deductions. Questions designed to assess strategic reasoning abilities typically require students to compare, categorize, or analyze information.

*Sample Question*

All animals which man has reason to believe are more than usually intelligent . . . the great apes, the elephant, the raccoon, the wolverine . . . are problem solvers, and in at least a small way manipulators of their environment. Save for the instinctive calls of their species, however, they cannot communicate except by direct imitation. They cannot invent words for new situations nor get their fellows to use such words. No matter how high the individual intelligence, its private world remains a private possession locked forever within a single, perishable brain. It is this fact that finally balks our hunger to communicate even with the sensitive dog who shares our fireside.

(Loren Eiseley, "The Long Loneliness,"  
in *The Star Thrower*. © 1978, Random House.)

Which is an implication of this passage?

- A. Animals are inferior to human beings because they do not solve problems or manipulate their environment.
- \* B. Language gives human beings the advantages of a stable, collective consciousness.
- C. Dogs are only capable of communicating that they are hungry or need warmth.
- D. Individual intelligence is exclusively the product of instinct and direct imitation.

This question from the reading and literature cluster assesses the ability to apply strategic reasoning. The correct answer, B, is not directly stated in the passage but is a logical extension of it. In order to arrive at option B, one must infer from the passage that language is necessary for the establishment of a collective consciousness. Since individual animals cannot communicate their thoughts to others through language, animals are incapable of creating a collective consciousness. Therefore, human beings, who can invent words to describe new situations and who can get other human beings to use those words, have an advantage over other intelligent animals.

**Adaptive Reasoning**

Adaptive reasoning is the cognitive process by which we extend our knowledge beyond the boundaries established by strategic reasoning. This highest level of cognitive processing is revealed in the ability to synthesize new rules or theories, to hypothesize a means of testing a proposition, to predict causal relationships, or to express judgments

of value, merit, or worth. Consequently, questions designed to assess adaptive reasoning skills may require expression of a synthesis of opposing positions, prediction or projection of a new hypothesis based on the experiences of a prior experiment, or evaluation of the effectiveness or applicability of a situation.

*Sample Question*

A nutritionist is studying the use of radiation to slow down the spoilage of fruits and vegetables. In one experiment, she harvested four dozen tomatoes of a variety that had been grown under identical conditions and were approximately the same size and weight. After randomly selecting them for placement in sterile racks containing a dozen each, she subjected two racks to a fixed amount of radiation. Then she placed one irradiated rack and one that had not been irradiated in refrigerators which maintained the same temperature. She stored the other two racks, one of which had been irradiated, at room temperature. She checked all four racks every six hours for signs of spoilage. When she found signs of spoilage in at least three of the tomatoes in a rack, she recorded the time and disposed of that rack of tomatoes. The research found that the irradiated tomatoes spoiled at the same rate as those that were not irradiated. Repetition of the experiment gave the same results.

Which variable would it be best for the researcher to alter in her next experiment?

- \* A. amount of radiation
- B. storage temperature
- C. number of tomatoes
- D. size of tomatoes

This question from the laboratory and field work cluster of science assesses adaptive reasoning skills. In order to arrive at the correct answer, one must go beyond identifying a hypothesis or interpreting results. To predict a new hypothesis, one must first perceive a "problem." Based on the results of the original experiment, one must determine the problem to be investigated—and then design an appropriate experiment to test the hypothesis. The correct option is A.