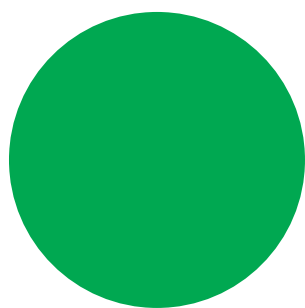


2013 | 2014

# PREPARING FOR THE ACT



## What's Inside

- Full-Length Practice Tests, including a Writing Test
- Information about the Optional Writing Test
- Strategies to Prepare for the Tests
- What to Expect on Test Day

Esta publicación también se puede ver o descargar en español en [www.actstudent.org/testprep/index.html](http://www.actstudent.org/testprep/index.html).

This booklet is provided free of charge.

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## A Message to Students

This booklet, which is provided **free of charge**, is intended to help you do your best on the ACT® college readiness assessment. Included in this booklet are **complete practice tests**—“retired” ACT questions that were administered to students on a national test date, including a writing prompt—a sample answer document, answer keys, and self-scoring instructions.

Read this booklet carefully and take the practice tests well before test day so you will be familiar with the tests, what they measure, and the strategies you can use to do your best on test day.

Go to **[www.actstudent.org/testprep](http://www.actstudent.org/testprep)** for additional ACT test preparation materials, including ACT Online Prep™, the Real ACT Prep Guide, sample questions, and Question of the Day.

ACT is committed to representing the diversity of our society in all its aspects, including race, ethnicity, and gender. Thus, test passages, questions, and writing prompts are deliberately chosen to reflect the range of cultures in our population.

We also are committed to ensuring that test questions and writing prompts are fair—that they do not disadvantage any particular group of examinees. Extensive reviews of the fairness of test materials are rigorously conducted by both ACT staff and external consultants. We also employ statistical procedures to help ensure that our test materials do not unfairly affect the performance of any group.

ACT endorses the *Code of Fair Testing Practices in Education* and the *Code of Professional Responsibilities in Educational Measurement*, guides to the conduct of those involved in educational testing. ACT is committed to ensuring that each of its testing programs upholds the guidelines in each *Code*. A copy of each *Code* may be obtained free of charge from ACT Customer Services (68), P.O. Box 1008, Iowa City, IA 52243-1008, 319.337.1429.

# 1 General Preparation for the ACT Tests

## General Test-Taking Strategies for the ACT

The ACT contains multiple-choice tests in four areas: English, Mathematics, Reading, and Science. Each of these tests contains questions that offer either four or five answer choices from which you are to choose the correct, or best, answer. The following suggestions apply to all four tests:

### ***Pace yourself.***

The time limits set for each test give nearly everyone enough time to finish all the questions. However, because the English, Reading, and Science Tests contain a considerable amount of text, it is important to pace yourself so you will not spend too much time on one passage. Similarly, try not to spend too much time puzzling over an answer to a specific problem in the Mathematics Test. Go on to the other questions and come back if there is time. Your supervisor will announce when you have five minutes remaining on each test.

### ***Read the directions for each test carefully.***

Before you begin taking one of the tests, read the directions carefully. The English, Reading, and Science Tests ask for the “best” answer. Do not respond as soon as you identify a correct answer. Read and consider all of the answer choices and choose the answer that *best* responds to the question.

The Mathematics Test asks for the “correct” answer. Read each question carefully to make sure you understand the type of answer required. Then, you may want to work out the answer you feel is correct and look for it among the choices given. If your answer is not among the choices provided, reread the question and consider all of the answer choices.

### ***Read each question carefully.***

It is important that you understand what each question asks. Some questions will require you to go through several steps to find the correct or best answer, while others can be answered more quickly.

### ***Answer the easy questions first.***

The best strategy for taking the tests is to answer the easy questions and skip the questions you find difficult. After answering all of the easy questions, go back and answer the more difficult questions if you have time.

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**Use logic on more difficult questions.**

When you return to the more difficult questions, try to use logic to eliminate incorrect answers to a question. Compare the answer choices to each other and note how they differ. Such differences may provide clues as to what the question requires. Eliminate as many incorrect answers as you can, then make an educated guess from the remaining answers.

**Answer every question.**

Your score on the tests will be based only on the number of questions that you answer correctly; **there is no penalty for guessing**. Thus, you should answer every question within the time allowed for each test.

**Review your work.**

If there is time left after you have answered every question in a test, go back and check your work on that test. You will not be allowed to go back to any other test or mark responses to a test after time has been called on that test.

**Be precise in marking your answer document.**

Be sure that you properly fill in the correct ovals on your answer document. Check to be sure that the number of the line of ovals on your answer document is the same as the number of the question you are answering and that you mark only one response for each question.

**Erase completely.**

If you want to change a multiple-choice answer, be sure to use a soft eraser that will not leave smudges and erase the unintended mark completely. Do not cross out answers or use correction fluid or tape; you must erase. Correction fluid/tape, smudges, or unintended marks may cause errors in scoring.

**To students approved to test at national test centers with extended time:**

You will be allowed up to 5 hours total to work on the multiple-choice tests at your own pace, including breaks between tests. If you are taking the ACT Plus Writing, you will be allowed up to 5 hours and 45 minutes total to work on all five tests.

## General Test-Taking Strategies for the ACT Writing Test

The ACT Writing Test lets you show your skill in planning and composing an essay. It measures writing proficiencies that are taught in high school and are important for readiness to succeed in entry-level college composition courses.

The following general strategies will help if you take the ACT Writing Test.

**Pace yourself.**

You will have 30 minutes to write your essay. It is important to pace yourself in the way that best suits your personal writing strategy. Many writers do best when they spend part of their time planning the essay, most of their time writing the essay, and the last part of their time reviewing the essay to make corrections and small revisions. You are unlikely to have time to draft, revise, and recopy your essay.

Budget your time based on your experience in taking essay tests in school and in other circumstances when you've done writing within a time limit. Your supervisor will announce when you have five minutes remaining on the Writing Test.

**Read the directions carefully.**

Before you begin the Writing Test, read the directions carefully. They tell you the aspects of writing on which your essay will be evaluated and give instructions on how to write your essay in the answer folder.

**Read the writing prompt carefully.**

It is important that you understand exactly what the writing prompt asks you to do. Be sure you have a clear understanding of the issue in the writing prompt and of the question you must respond to before you start to plan and write your essay.

**Write (or print) legibly in the answer folder.**

If your readers cannot read what you have written, they will not be able to score your essay. You must write your essay using a **soft lead No. 2 pencil** (not a mechanical pencil or ink pen) on the lined pages in the answer folder. You may not need all the lined pages, but to ensure you have enough room to finish, do not skip lines.

**Make corrections clear.**

If you make corrections, do so thoroughly and legibly. You may write corrections or additions neatly between the lines of your essay, but do not write in the margins.

## Preparing for Test Day

- Prepare well in advance for the tests.
- Know what to expect on test day. Familiarize yourself with the information in this booklet, and at **www.actstudent.org**.
- Most procedures in this booklet refer to testing on a National or International Test Date at an ACT test center. Procedures may differ slightly if you test at another location.
- Take the practice tests in order and review your responses.
- Get plenty of rest the night before the tests.
- Carefully review the "Test Day Checklist" at **www.actstudent.org**.
- **Bring the following items with you to the test center:**
  1. Your ticket (if you test on a National or International ACT Test Date). You will **not** be admitted to test without it.
  2. Acceptable photo identification. See details on your ticket or at **www.actstudent.org**. If you do not present acceptable photo identification with your ticket at check-in, you will **not** be admitted to test.
  3. Sharpened soft lead No. 2 pencils with good erasers (no mechanical pencils or ink pens). Do **not** bring any other writing instruments; you will not be allowed to use them.

4. A watch to pace yourself. Do **not** bring a watch with an alarm, because it will disturb other students. If your alarm sounds during testing, you will be dismissed and your answer document will not be scored. Your supervisor will announce when you have five minutes remaining on each test.
5. A permitted calculator for the Mathematics Test, if you choose to use one. (See details about **prohibited** models and features at [www.actstudent.org](http://www.actstudent.org).)

## 2 Strategies for Taking the ACT Tests

The ACT measures the knowledge, understanding, and skills that you have acquired throughout your education. Although the sum total of what a person has learned cannot be changed, your performance in a specific area can be affected by adequate preparation, especially if it has been some time since you have taken a course in that area.

There are three strategies that can help you to prepare yourself for the content included in the ACT:

### ***Familiarize yourself with the content of the ACT tests.***

Review the information about the tests that is provided on the following pages. Note which content areas make up a large proportion of the tests and which do not. The specific topics included in each content area are examples of possible topics; they do not include all of the possibilities.

### ***Refresh your knowledge and skills in the content areas.***

Review those content areas you have studied but are not fresh in your mind. Spend your time refreshing your knowledge and skills in the content areas that make up large portions of the tests.

### ***Identify the content areas you have not studied.***

If unfamiliar content areas make up major portions of the tests, consider taking coursework to help you gain knowledge and skills in these areas before you take the ACT. Because the ACT measures knowledge and skills acquired over a period of time, it is unlikely that a “cram” course covering material that is unfamiliar to you will help you improve your scores. Longer-term survey courses will be most helpful to you, because they aim to improve your knowledge through sustained learning and practice.

## **ACT English Test**

The ACT English Test is a 75-question, 45-minute test that measures your understanding of the conventions of standard written English (punctuation, grammar and usage, and sentence structure) and of rhetorical skills (strategy, organization, and style). Spelling, vocabulary, and rote recall of rules of grammar are not tested. The test consists of five essays, or passages, each of which is accompanied by a sequence of multiple-choice test questions. Different passage types are employed to provide a variety of rhetorical situations. Passages are chosen not only for their appropriateness in assessing writing skills but also to reflect students' interests and experiences.

Some questions refer to underlined portions of the passage and offer several alternatives to the underlined portion. You

must decide which choice is most appropriate in the context of the passage. Some questions ask about an underlined portion, a section of the passage, or the passage as a whole. You must decide which choice best answers the question posed. Many questions offer “NO CHANGE” to the passage as one of the choices. The questions are numbered consecutively. Each question number refers to a correspondingly numbered portion underlined in the passage or to a corresponding numeral in a box located at the appropriate point in the passage.

Three scores are reported for the ACT English Test: a total test score based on all 75 questions, a subscore in Usage/Mechanics based on 40 questions, and a subscore in Rhetorical Skills based on 35 questions.

### **Tips for Taking the ACT English Test**

#### ***Pace yourself.***

The ACT English Test contains 75 questions to be completed in 45 minutes. If you spend 1½ minutes skimming through each passage before responding to the questions, then you will have 30 seconds to answer each question. If possible, spend less time on each question and use the remaining time allowed for this test to review your work and return to the questions on this test that were most difficult for you.

#### ***Be aware of the writing style used in each passage.***

The five passages cover a variety of topics and are written in a variety of styles. It is important that you take into account the writing style used in each passage when you respond to the questions. In responding to a question, be sure to understand the context of the question. Consider how the sentence containing an underlined portion fits in with the surrounding sentences and into the passage as a whole.

#### ***Examine the underlined portions of the passage.***

Before responding to a question with an underlined portion, carefully examine what is underlined in the text. Consider the elements of writing that are included in each underlined portion. Some questions will ask you to base your decision on some specific element of writing, such as the tone or emphasis the text should convey. Some questions will ask you to choose the alternative to the underlined portion that is NOT or LEAST acceptable. The answer choices for each question will contain changes in one or more of those elements of writing.

#### ***Be aware of questions with no underlined portions.***

You will be asked some questions about a section of the passage or about the passage as a whole, in light of a given rhetorical situation. Questions of this type are often identified by a question number in a box located at the appropriate point in the passage. Questions about the entire passage are placed at the end of the passage and introduced by a horizontal box enclosing the following instruction: “Questions \_\_\_ and \_\_\_ ask about the preceding passage as a whole.”

#### ***Note the differences in the answer choices.***

Many of the questions in the test will involve more than one aspect of writing. Examine each answer choice and how it differs from the others. Be careful not to select an answer that corrects one error but causes a different error.

**Determine the best answer.**

Two approaches can be taken to determine the best answer to a question in which you are to choose the best alternative to an underlined portion. In the first approach, you can reread the sentence or sentences, substituting each of the possible answer choices for the underlined portion to determine the best choice. In the second approach, you can decide how the underlined portion might best be phrased in standard written English or in terms of the particular question posed. If you think the underlined portion is the best answer, you should select "NO CHANGE." If not, you should check to see whether your phrasing is one of the other answer choices. If you do not find your phrasing, you should choose the best of the answers presented. For questions cued by a number in a box, you must decide which choice is most appropriate in terms of the question posed or the stated rhetorical situation.

**Reread the sentence, using your selected answer.**

Once you have selected the answer you feel is best, reread the corresponding sentence(s) of the passage, inserting your selected answer at the appropriate place in the text to make sure it is the best answer within the context of the passage.

**Content Covered by the ACT English Test**

Six elements of effective writing are included in the English Test: punctuation, grammar and usage, sentence structure, strategy, organization, and style. The questions covering punctuation, grammar and usage, and sentence structure make up the Usage/Mechanics subscore. The questions covering strategy, organization, and style make up the Rhetorical Skills subscore. A brief description and the approximate percentage of the test devoted to each element of effective writing are given on the next page.

**USAGE/MECHANICS**

*Punctuation (13%).* Questions in this category test your knowledge of the conventions of internal and end-of-sentence punctuation, with emphasis on the relationship of punctuation to meaning (for example, avoiding ambiguity, indicating appositives).

*Grammar and Usage (16%).* Questions in this category test your understanding of agreement between subject and verb, between pronoun and antecedent, and between modifiers and the word modified; verb formation; pronoun case; formation of comparative and superlative adjectives and adverbs; and idiomatic usage.

*Sentence Structure (24%).* Questions in this category test your understanding of relationships between and among clauses, placement of modifiers, and shifts in construction.

**RHETORICAL SKILLS**

*Strategy (16%).* Questions in this category test how well you develop a given topic by choosing expressions appropriate to an essay's audience and purpose; judging the effect of adding, revising, or deleting supporting material; and judging the relevancy of statements in context.

*Organization (15%).* Questions in this category test how well you organize ideas and choose effective opening, transitional, and closing sentences.

*Style (16%).* Questions in this category test how well you choose precise and appropriate words and images, maintain the level of style and tone in an essay, manage sentence elements for rhetorical effectiveness, and avoid ambiguous pronoun references, wordiness, and redundancy.

**ACT Mathematics Test**

**You may use a calculator on the Mathematics Test. See [www.actstudent.org](http://www.actstudent.org) for details about prohibited models and features.**

The ACT Mathematics Test is a 60-question, 60-minute test designed to assess the mathematical skills students have typically acquired in courses taken up to the beginning of grade 12. The test presents multiple-choice questions that require you to use reasoning skills to solve practical problems in mathematics. Most questions are discrete, but on occasion some may belong to sets of several questions (e.g., several questions based on the same graph or chart). Knowledge of basic formulas and computational skills are assumed as background for the problems, but recall of complex formulas and extensive computation is not required. The material covered on the test emphasizes the major content areas that are prerequisites to successful performance in entry-level courses in college mathematics.

Four scores are reported for the ACT Mathematics Test: a total test score based on all 60 questions, a subscore in Pre-Algebra/Elementary Algebra based on 24 questions, a subscore in Intermediate Algebra/Coordinate Geometry based on 18 questions, and a subscore in Plane Geometry/Trigonometry based on 18 questions.

**Tips for Taking the ACT Mathematics Test****Pace yourself.**

The ACT Mathematics Test contains 60 questions to be completed in 60 minutes. You have an average of 1 minute per question. If possible, spend less time on each question and use the remaining time allowed for this test to review your work and return to the questions on this test that were most difficult for you.

**If you use a calculator, use it wisely.**

Remember, all of the mathematics problems can be solved without using a calculator. In fact, some of the problems are best done without a calculator. Use good judgment in deciding when, and when not, to use a calculator. For example, for some problems you may wish to do scratch work to clarify your thoughts on the question before you begin using a calculator to do computations. For many problems, you may not want to use a calculator.

**Solve the problem.**

For working out the solutions to the problems, you will usually do scratch work in the space provided in the test booklet. You may wish to glance over the answer choices after reading the questions. However, working backwards from the answer choices provided can take a lot of time and may not be effective.



**Locate your solution among the answer choices.**

Once you have solved the problem, look for your answer among the choices. If your answer is not included among the choices, carefully reread the problem to see whether you missed important information. Pay careful attention to the question being asked. If an equation is to be selected, check to see whether the equation you think is best can be transformed into one of the answer choices provided.

**Make sure you answer the question.**

The solutions to many questions in the test will involve several steps. Make sure your answer includes all of the necessary steps. Frequently, questions include answer choices that are based on incomplete solutions.

**Make sure your answer is reasonable.**

Sometimes an error in computation will result in an answer that is not practically possible for the situation described. Always think about your answer to determine whether it is reasonable.

**Check your work.**

You may arrive at an incorrect solution by making common errors in the problem-solving process. Thus, if there is time remaining before the end of the Mathematics Test, it is important that you reread the questions and check your answers to make sure they are correct.

**Content Covered by the ACT Mathematics Test**

Six content areas are included in the Mathematics Test: pre-algebra, elementary algebra, intermediate algebra, coordinate geometry, plane geometry, and trigonometry. The questions covering pre-algebra and elementary algebra make up the Pre-Algebra/Elementary Algebra subscore. The questions covering intermediate algebra and coordinate geometry make up the Intermediate Algebra/Coordinate Geometry subscore. The questions covering plane geometry and trigonometry make up the Plane Geometry/Trigonometry subscore. A brief description and the approximate percentage of the test devoted to each content area are given below.

**PRE-ALGEBRA/ELEMENTARY ALGEBRA**

*Pre-Algebra (23%).* Questions in this content area are based on basic operations using whole numbers, decimals, fractions, and integers; place value; square roots and approximations; the concept of exponents; scientific notation; factors; ratio, proportion, and percent; linear equations in one variable; absolute value and ordering numbers by value; elementary counting techniques and simple probability; data collection, representation, and interpretation; and understanding simple descriptive statistics.

*Elementary Algebra (17%).* Questions in this content area are based on properties of exponents and square roots, evaluation of algebraic expressions through substitution, using variables to express functional relationships, understanding algebraic operations, and the solution of quadratic equations by factoring.

**INTERMEDIATE ALGEBRA/COORDINATE GEOMETRY**

*Intermediate Algebra (15%).* Questions in this content area are based on an understanding of the quadratic formula, rational and radical expressions, absolute value equations and inequalities, sequences and patterns, systems of equations, quadratic inequalities, functions, modeling, matrices, roots of polynomials, and complex numbers.

*Coordinate Geometry (15%).* Questions in this content area are based on graphing and the relations between equations and graphs, including points, lines, polynomials, circles, and other curves; graphing inequalities; slope; parallel and perpendicular lines; distance; midpoints; and conics.

**PLANE GEOMETRY/TRIGONOMETRY**

*Plane Geometry (23%).* Questions in this content area are based on the properties and relations of plane figures, including angles and relations among perpendicular and parallel lines; properties of circles, triangles, rectangles, parallelograms, and trapezoids; transformations; the concept of proof and proof techniques; volume; and applications of geometry to three dimensions.

*Trigonometry (7%).* Questions in this content area are based on understanding trigonometric relations in right triangles; values and properties of trigonometric functions; graphing trigonometric functions; modeling using trigonometric functions; use of trigonometric identities; and solving trigonometric equations.

**ACT Reading Test**

The ACT Reading Test is a 40-question, 35-minute test that measures your reading comprehension. The test questions ask you to derive meaning from several texts by (1) referring to what is explicitly stated and (2) reasoning to determine implicit meanings. Specifically, questions will ask you to use referring and reasoning skills to determine main ideas; locate and interpret significant details; understand sequences of events; make comparisons; comprehend cause-effect relationships; determine the meaning of context-dependent words, phrases, and statements; draw generalizations; and analyze the author's or narrator's voice and method. The test comprises four sections, each containing one long or two shorter prose passages that are representative of the level and kinds of text commonly encountered in first-year college curricula. Each passage is preceded by a heading that identifies what type of passage it is (for example, "Literary Narrative"), names the author, and may include a brief note that helps in understanding the passage. Each section contains a set of multiple-choice test questions. These questions do not test the rote recall of facts from outside the passage, isolated vocabulary items, or rules of formal logic. In sections that contain two short passages, some of the questions are about both of the passages in the section.

Three scores are reported for the ACT Reading Test: a total test score based on all 40 questions, a subscore in Social Studies/Sciences reading skills (based on the 20 questions on the social studies and natural sciences passages), and a subscore in Arts/Literature reading skills (based on the 20 questions on the literary narrative and humanities passages).

### **Tips for Taking the ACT Reading Test**

#### ***Pace yourself.***

The ACT Reading Test contains 40 questions to be completed in 35 minutes. If you spend 2–3 minutes reading the passage(s) in each section, then you will have about 35 seconds to answer each question. If possible, spend less time on the passages and the questions and use the remaining time allowed for this test to review your work and return to the questions on this test that were most difficult for you.

#### ***Read each passage carefully.***

Before you begin answering a question, read the entire passage (or two short passages) carefully. Be conscious of relationships between or among ideas. You may make notes in the test booklet about important ideas in the passages.

#### ***Refer to the passages when answering the questions.***

Answers to some of the questions will be found by referring to what is explicitly stated in the text. Other questions will require you to determine implicit meanings and to draw conclusions, comparisons, and generalizations. Consider the text before you answer any question.

### **Content Covered by the ACT Reading Test**

The Reading Test is based on four types of reading selections: the social studies, the natural sciences, literary narrative, and the humanities. A subscore in Social Studies/Sciences reading skills is based on the questions on the social studies and the natural sciences passages, and a subscore in Arts/Literature reading skills is based on the questions on the literary narrative and humanities passages. A brief description and the approximate percentage of the test devoted to each type of reading selection are given on the next page.

*Social Studies (25%).* Questions in this category are based on passages in the content areas of anthropology, archaeology, biography, business, economics, education, geography, history, political science, psychology, and sociology.

*Natural Sciences (25%).* Questions in this category are based on passages in the content areas of anatomy, astronomy, biology, botany, chemistry, ecology, geology, medicine, meteorology, microbiology, natural history, physiology, physics, technology, and zoology.

*Literary Narrative (25%).* Questions in this category are based on passages from short stories, novels, memoirs, and personal essays.

*Humanities (25%).* Questions in this category are based on passages in the content areas of architecture, art, dance, ethics, film, language, literary criticism, music, philosophy, radio, television, and theater.

## **ACT Science Test**

The ACT Science Test is a 40-question, 35-minute test that measures the interpretation, analysis, evaluation, reasoning, and problem-solving skills required in the natural sciences.

The test presents several sets of scientific information, each followed by a number of multiple-choice test questions. The scientific information is conveyed in one of three different formats: data representation (graphs, tables, and other schematic forms), research summaries (descriptions of several related experiments), or conflicting viewpoints (expressions of several related hypotheses or views that are inconsistent with one another). The questions require you to recognize and understand the basic features of, and concepts related to, the provided information; to examine critically the relationship between the information provided and the conclusions drawn or hypotheses developed; and to generalize from given information to gain new information, draw conclusions, or make predictions.

You are **not permitted** to use a calculator on the ACT Science Test.

One score is reported for the ACT Science Test: a total test score based on all 40 questions.

### **Tips for Taking the ACT Science Test**

#### ***Pace yourself.***

The ACT Science Test contains 40 questions to be completed in 35 minutes. If you spend about 2 minutes reading each passage, then you will have about 30 seconds to answer each question. If possible, spend less time on the passages and the questions and use the remaining time allowed for this test to review your work and return to the questions on this test that were most difficult for you.

#### ***Read the passage carefully.***

Before you begin answering a question, read the scientific material provided. It is important that you read the entire text and examine any tables, graphs, or figures. You may want to make notes about important ideas in the information provided in the test booklet. Some of the information sets will describe experiments. You should consider the experimental design, including the controls and variables, because questions are likely to address this component of scientific research.

#### ***Note different viewpoints in passages.***

Some material will present conflicting points of view, and the questions will ask you to distinguish among the various viewpoints. It may be helpful for you to make notes summarizing each viewpoint next to that section in the test booklet.

### **Content Covered by the ACT Science Test**

The content of the Science Test includes biology, chemistry, physics, and the Earth/space sciences (for example, geology, astronomy, and meteorology). Advanced knowledge in these subjects is not required, but knowledge acquired in general, introductory science courses is needed to answer some of the questions. The test emphasizes scientific reasoning skills over recall of scientific content, skill in mathematics, or reading ability. The scientific information is conveyed in one of three different formats.

*Data Representation (38%).* This format presents graphic and tabular material similar to that found in science journals and texts. The questions associated with this format measure skills such as graph reading, interpretation of scatterplots, and interpretation of information presented in tables.

*Research Summaries (45%).* This format provides descriptions of one or more related experiments. The questions focus upon the design of experiments and the interpretation of experimental results.

*Conflicting Viewpoints (17%).* This format presents expressions of several hypotheses or views that, being based on differing premises or on incomplete data, are inconsistent with one another. The questions focus upon the understanding, analysis, and comparison of alternative viewpoints or hypotheses.

## ACT Writing Test (Optional)

If you register for the ACT Plus Writing, you will take the ACT Writing Test (which must be completed in English) **after** you complete the four multiple-choice tests. Taking the Writing Test will **not** affect your scores on the multiple-choice tests or your Composite score. Rather, you will receive two *additional* scores: a Combined English/Writing score on a scale of 1 through 36 and a Writing subscore on a scale of 2 through 12. You will also receive some comments on your essay.

The ACT Writing Test is a 30-minute essay test that measures your writing skills—specifically those writing skills emphasized in high school English classes and in entry-level college composition courses. The test consists of one writing prompt that will define an issue and describe two points of view on that issue. You are asked to write in response to a question about your position on the issue described in the writing prompt. You may adopt either of the perspectives described in the prompt, or present your own point of view on the issue. Your score will not be affected by the point of view you take on the issue.

Your essay will be evaluated on the evidence it gives of your ability to do the following:

- express judgments by taking a position on the issue in the writing prompt;
- maintain a focus on the topic throughout the essay;
- develop a position by using logical reasoning and by supporting your ideas;
- organize ideas in a logical way; and
- use language clearly and effectively according to the conventions of standard written English.

Your essay will be scored holistically—that is, on the basis of the overall impression created by all the elements of the writing. Two trained readers will score your essay, each giving it a rating from 1 (low) to 6 (high). The sum of those ratings is your Writing subscore. If the readers' ratings disagree by more than one point, a third reader will evaluate your essay and resolve the discrepancy.

## Tips for Taking the ACT Writing Test

### ***Pace yourself.***

The ACT Writing Test gives you 30 minutes to read and think about the issue in the prompt, and to plan and write your essay. When asked to write a timed essay, most writers find it useful to do some planning before they write the essay, and to do a final check of the essay when it is finished. It is unlikely that you will have time to draft, revise, and recopy your essay.

### ***Prewrite.***

Before writing, carefully consider the prompt and make sure you understand it—reread it if you aren't sure. Decide how you want to answer the question in the prompt. Then jot down your ideas on the topic and how you will explain your point of view on the issue. Write down what you think others might say in opposition to your point of view and what you would say in reply. Think of how to organize your essay. Do your prewriting in your Writing Test booklet.

### ***Write.***

At the beginning of your essay, make sure readers will see that you understand the issue. Explain your point of view in a clear and logical way. Discuss the issue in a broader context or evaluate the implications of the issue. Address what others might say in opposition and present a counterargument. Use specific examples. Vary the structure of your sentences, and use interesting and precise word choices. Stay on topic and end with a strong conclusion.

### ***Review your essay.***

Take a few minutes before time is called to read over your essay. Correct any mistakes. If you find any words that are hard to read, recopy them. Make corrections and revisions neatly, between the lines. Do not write in the margins. Your readers know you had only 30 minutes to compose and write your essay. Within that time limit, try to make your essay as polished as you can.

### ***Practice.***

There are many ways to prepare for the ACT Writing Test. These include reading newspapers and magazines, listening to news analyses on television or radio, and participating in discussions and debates.

One of the best ways to prepare for the ACT Writing Test is to practice writing with different purposes for different audiences. The writing you do in your classes will help you. So will writing essays, stories, editorials, a personal journal, or other writing you do on your own.

It is also a good idea to practice writing within a time limit. Taking the practice ACT Writing Test will give you a sense of how much additional practice you may need. You might want to take the practice ACT Writing Test even if you do not plan to take the ACT Plus Writing, because this will help build skills that are important in college-level learning and in the world of work.



# 3 What to Expect on Test Day

## Reporting Time

For National and International Test Dates, you must report to the test center by the time stated on your ticket, normally 8:00 a.m. If you are late, you will not be admitted to test. If your ticket does not list a specific room, test center staff or posted signs will direct you.

## Requirements for Admission

**At check-in, you will be required to show both your ticket and acceptable photo ID or you will not be admitted to test.** See ID requirements on your ticket or at [www.actstudent.org](http://www.actstudent.org).

## In the Test Room

- The supervisor or proctor will direct you to a seat. If you need a left-handed desk, tell your supervisor as you enter.
- Do not leave the test room after you have been admitted.
- Only pencils, erasers, a permitted calculator, and your ticket will be allowed on your desk.
- You will be required to put all other personal belongings away.
- You are not allowed to have scratch paper, books, dictionaries, notes or other aids, highlighters, colored pens or pencils, mechanical pencils, ink pens, correction fluid, reading material, or any electronic devices other than a permitted calculator.
- You may not use tobacco in any form or have food or drink (including water) in the test room. You may have snacks and drinks outside the test room during break.
- Testing will begin as soon as all examinees present at 8:00 a.m. are checked in and seated.
- Listen carefully to all directions read by your supervisor.
- It is important that you *follow all directions* carefully.

## Taking the Tests

It is important that you understand what is considered prohibited behavior on the ACT. **If you are involved in any of the actions listed below, you will be dismissed and your answer document will not be scored.**

Prohibited behaviors include:

- filling in or altering ovals on a test or continuing to write the essay after time is called on that test (You must put your pencil down immediately when time is called.)
- looking at another examinee's test booklet or answer document
- giving or receiving assistance
- looking back at a test on which time has been called
- looking ahead in the test booklet
- using highlight pens, colored pens or pencils, notes, dictionaries, or other aids

- using a prohibited calculator
- using a calculator on any test other than the Mathematics Test
- sharing a calculator with another examinee
- using any device to share or exchange information at any time during testing or during break (**all** electronic devices, including cell phones, must be turned off from the time you are admitted to test until you are dismissed after testing concludes)
- using any device to take an image of any portion of the test materials
- attempting to remove test materials, including questions or answers, from the test room by any means
- not following instructions or abiding by the rules of the test center
- exhibiting confrontational, threatening, or unruly behavior
- creating a disturbance or allowing an alarm or phone to sound in the test room

On certain test dates, ACT tries out test questions to develop future versions of the ACT. Your responses to these questions are not reflected in your scores.

## Test Day Problems

If you have to leave the test center before completing all your tests, you must decide whether or not you want your answer document scored and inform your supervisor of your decision. If you do not, your answer document will be scored.

Once you break the seal on your multiple-choice test booklet, you cannot request a Test Date Change. If you do not complete all your tests and want to test again, you will have to pay the full fee for your test option again. If you want to take the ACT again, see [www.actstudent.org](http://www.actstudent.org) for your options. Once you begin filling out your answer document, you cannot change from ACT Plus Writing to the ACT No Writing or the reverse.

## Testing More Than Once

You may not receive scores from more than one test taken during a scheduled national or international test date. For example, you may test on Saturday or on an authorized non-Saturday date or on a rescheduled test date—but not on more than one of those days. If you are admitted and allowed to test a second time, we will report only the scores from the first test. The second set of scores will be cancelled without refund.

## Test Information Release

On certain national test dates, if you test at a national test center, you may order (for an additional fee) a copy of the test questions, a copy of your answers, a list of correct answers, and scoring instructions. This service is not available for all test dates or for other testing programs (e.g., International, State, Special). If you want to request and pay for this service, check [www.actstudent.org](http://www.actstudent.org) to see which test dates offer this service.

# 4 Taking the Practice Tests

Take the practice tests under conditions as similar as possible to those you will experience on test day. The following tips will help you:

- The four multiple-choice tests require 2 hours and 55 minutes. Take them in order in one sitting, with a 10- to 15-minute break between Tests 2 and 3.
- You will need only sharpened No. 2 pencils with good erasers. Remove all other items from your desk. You will not be allowed to use scratch paper.
- If you plan to use a permitted calculator on the Mathematics Test, use the same one you will use on test day.
- Use a digital timer or clock to time yourself on each practice test. Set your timer for five minutes less than the time allowed for each test so you can get used to the verbal announcement of five minutes remaining.
- Give yourself only the time allowed for each test.
- Detach and use the sample multiple-choice answer document on pages 63–64.
- Read the test directions on the first page of the practice multiple-choice tests. These are the same directions that will appear on your test booklet on test day.
- Start your timer and begin with Test 1. Continue through Test 4, taking a 10- to 15-minute break between Tests 2 and 3. If you do not plan to take the ACT Plus Writing, score your multiple-choice tests using the information beginning on page 55.
- If you plan to take the ACT Plus Writing, read the directions on the first page of the practice ACT Writing Test (page 53). These are the same directions that will appear on your test booklet on test day. Start your timer, then read the prompt on page 56. After you understand what the prompt is asking you to do, plan your essay and then write it on lined paper. (On test day, your answer document will have lined pages for you to write your essay.) Score your essay using the information on pages 61–62.

# Practice Multiple-Choice Tests

## EXAMINEE STATEMENT, CERTIFICATION, AND SIGNATURE

1. Read the following **Statement**: By opening this test booklet, I agree to the terms and conditions set forth in the ACT registration booklet or website for this exam, including the arbitration and dispute remedy provisions. I understand that ACT owns the test questions and responses and affirm that I will not share any test questions or responses with anyone by any form of communication. I understand that assuming anyone else's identity to take this test may violate the law and be subject to legal penalty.
2. Copy the **Certification** shown below (only the text in *italics*) on the lines provided. Write in your normal handwriting.

**Certification:** *I agree to the Statement above and certify that I am the person whose name appears on this form.*

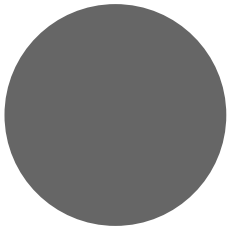
---

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3. Sign your name as you would any official document and enter today's date.

\_\_\_\_\_  
Your Signature

\_\_\_\_\_  
Today's Date



The **ACT**<sup>®</sup>

Form 1267C

## Directions

This booklet contains tests in English, Mathematics, Reading, and Science. These tests measure skills and abilities highly related to high school course work and success in college. ***CALCULATORS MAY BE USED ON THE MATHEMATICS TEST ONLY.***

The questions in each test are numbered, and the suggested answers for each question are lettered. On the answer document, the rows of ovals are numbered to match the questions, and the ovals in each row are lettered to correspond to the suggested answers.

For each question, first decide which answer is best. Next, locate on the answer document the row of ovals numbered the same as the question. Then, locate the oval in that row lettered the same as your answer. Finally, fill in the oval completely. Use a soft lead pencil and make your marks heavy and black. ***DO NOT USE INK OR A MECHANICAL PENCIL.***

Mark only one answer to each question. If you change your mind about an answer, erase your first mark thoroughly before marking your new answer. For each question, make certain that you mark in the row of ovals with the same number as the question.

Only responses marked on your answer document will be scored. Your score on each test will be based only on the number of questions you answer correctly during the time allowed for that test. You will NOT be penalized for guessing. ***IT IS TO YOUR ADVANTAGE TO ANSWER EVERY QUESTION EVEN IF YOU MUST GUESS.***

You may work on each test **ONLY** when your test supervisor tells you to do so. If you finish a test before time is called for that test, you should use the time remaining to reconsider questions you are uncertain about in that test. You may NOT look back to a test on which time has already been called, and you may NOT go ahead to another test. To do so will disqualify you from the examination.

Lay your pencil down immediately when time is called at the end of each test. You may NOT for any reason fill in or alter ovals for a test after time is called for that test. To do so will disqualify you from the examination.

Do not fold or tear the pages of your test booklet.

**DO NOT OPEN THIS BOOKLET  
UNTIL TOLD TO DO SO.**



P.O. BOX 168  
IOWA CITY, IA 52243-0168

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## ENGLISH TEST

45 Minutes—75 Questions

**DIRECTIONS:** In the five passages that follow, certain words and phrases are underlined and numbered. In the right-hand column, you will find alternatives for the underlined part. In most cases, you are to choose the one that best expresses the idea, makes the statement appropriate for standard written English, or is worded most consistently with the style and tone of the passage as a whole. If you think the original version is best, choose “NO CHANGE.” In some cases, you will find in the right-hand column a question about the underlined part. You are to choose the best answer to the question.

You will also find questions about a section of the passage, or about the passage as a whole. These questions do not refer to an underlined portion of the passage, but rather are identified by a number or numbers in a box.

For each question, choose the alternative you consider best and fill in the corresponding oval on your answer document. Read each passage through once before you begin to answer the questions that accompany it. For many of the questions, you must read several sentences beyond the question to determine the answer. Be sure that you have read far enough ahead each time you choose an alternative.

## PASSAGE I

## Dragonfly

The nature trail is six feet wide and seven miles long. It slithers through the forest like a snake curving, and bending along the banks of the river.

1

The county cleared this path and paved it with packed

2

gravel, so they would have a peaceful place to hike and bike.

3

I ride this trail nearly every day—not on a bike, but on “Luigi.” That’s the nickname I gave my

4

motorized wheelchair. 5 Today, Luigi’s battery

1. A. NO CHANGE  
B. snake, curving and bending  
C. snake curving and bending,  
D. snake, curving, and bending,
2. Which of the following alternatives to the underlined portion would NOT be acceptable?  
F. path, paving  
G. path and then paved  
H. path before paving  
J. path paved
3. A. NO CHANGE  
B. knowing they  
C. that they  
D. people
4. F. NO CHANGE  
G. day; not on a bike  
H. day not on a bike  
J. day, not on a bike;
5. If the writer were to delete the preceding sentence, the essay would primarily lose:  
A. a reason why the narrator is in the forest.  
B. a detail important for understanding the essay.  
C. a contrast to the lighthearted tone of the essay.  
D. nothing at all; this information is irrelevant to the essay.



is fully charged, I know I can go all the way to the end  
 of the trail and back. But I always carry a cell phone on  
 me just in case.

Luigi's motor moves slowly as we venture along  
 the trail. I can hear the gravel quietly crunching beneath

Luigi's rubber wheels. I hear the songs of cardinals in the  
 trees and the clamor of crickets in the grasses. I hear the  
 murmur of water slipping over time-smoothed rocks. It is  
 September, and some of the trees are starting to blush red  
 and orange at their tips. The wind ruffles my hair and  
 chills my face as I bounce gently, along in my padded  
 chair.

Bicyclists streak past in a blur of color and a cloud of

dust I don't understand their hurry. Luigi can go fast, but I  
 like to ride slowly, to see like a hovering dragonfly. I want  
 to see everything that has changed, grown, bloomed, or  
 died since yesterday. Today I notice that a spider has  
 woven a web between some honeysuckle bushes by the  
 bridge. I see that the bank of vibrant yellow black-eyed  
 Susans by the barbed wire fence is starting to dry and fade  
 away. I spend an hour; looking and listening and learning.

6. F. NO CHANGE  
 G. charged, because of that,  
 H. charged, this means that  
 J. charged, so

7. Which choice would most logically and effectively  
 emphasize the positive, friendly attitude the narrator  
 has toward Luigi?

A. NO CHANGE  
 B. travels safely  
 C. proceeds carefully  
 D. purrs softly

8. F. NO CHANGE  
 G. You can hear  
 H. One can even hear  
 J. While hearing

9. A. NO CHANGE  
 B. Due to the fact that it is  
 C. It turns into the month of  
 D. Because it has turned into

10. F. NO CHANGE  
 G. gentle, along  
 H. gently along  
 J. gentle along,

11. Which choice most effectively leads into the new sub-  
 ject of this paragraph?

A. NO CHANGE  
 B. The sun begins to set  
 C. Nature always impresses me  
 D. Days can go by quickly

12. F. NO CHANGE  
 G. dust, however,  
 H. dust.  
 J. dust,

13. A. NO CHANGE  
 B. hour, looking,  
 C. hour looking;  
 D. hour looking



And now my ride is finished for today. I leave the trail and come out into the open, manicured park at the trails end. There, my older brother helps me out of my <sup>14</sup> chair and into his waiting van. He puts Luigi in the back, and I return to the world of pavement, streetlights, and traffic. But in my mind, I am still gliding through the forest. I am like the water, flowing over ancient stones. Inside, I am still a dragonfly.

14. F. NO CHANGE  
G. trail's  
H. trails'  
J. trails's

Question 15 asks about the preceding passage as a whole.

15. Suppose the writer's goal had been to write an essay illustrating the pleasure that people can take in nature. Would this essay accomplish that goal?
- A. Yes, because it focuses on a variety of wildflowers that the narrator enjoys.  
B. Yes, because it focuses on the narrator's joy at having access to nature.  
C. No, because it describes the world of the city as being more important to the narrator.  
D. No, because it focuses primarily on the functioning of the narrator's motorized wheelchair.

## PASSAGE II

### Beneath the Streets of New York

At 2 p.m., on October 27, 1904; thousands of <sup>16</sup> New York City residents poured into the streets of Manhattan. Their cheers competed with the blare of ferryboat horns and the whistle of power plants. The city was celebrating an incredible engineering feat; the <sup>17</sup> completion of the first section of the New York City

Subway. 18

16. F. NO CHANGE  
G. 2 p.m. on October 27, 1904, thousands  
H. 2 p.m., on October 27, 1904; thousands,  
J. 2 p.m. on October 27, 1904, thousands,

17. A. NO CHANGE  
B. feat, over  
C. feat:  
D. feat

18. The writer is concerned about the level of detail in the preceding sentence and is considering deleting the phrase "the first section of" from it. If the writer were to make this deletion, the paragraph would primarily lose information that:
- F. reveals how expansive the New York City Subway would become.  
G. clarifies that only part of the subway system had been completed by October 27, 1904.  
H. makes clear that by October 27, 1904, construction of the second section of the subway was already underway.  
J. provides evidence that New York City residents at this celebration believed the entire subway system was complete.



The original subway line was 9.1 miles long and had twenty-eight stations. [A] The first train took twenty-six minutes to complete the route, which ran from City Hall to West 145th Street in under a half an hour. Tens of thousands of New Yorkers could now avoid traffic jams

by traveling underneath the streets. [B]

As early as 1865, there had been proposals for a New York subway, but that took decades to resolve the many political, financial, and technical challenges. The engineer, William Barclay Parsons accepted responsibility for overseeing this project.

Parsons decided that most of the subway tunnel would be constructed using an innovation engineering method known as “cut and cover.” [C] First, workers used picks and shovels to remove roads and dig a deep trench. After installing wooden braces to hold back the earth, workers built a concrete floor. Tunnel walls were

created: with layers of brick, ceramic blocks, tar-soaked felt for waterproofing, and concrete. The roof was made from arch-shaped wooden molds also covered with concrete. Next, track beds were filled with crushed stone, and rails were secured to wooden ties. Finally, the roof was covered with tar-soaked felt, and the roads were rebuilt.

19. A. NO CHANGE  
B. in the completion of its route.  
C. in twenty-six minutes.  
D. DELETE the underlined portion and end the sentence with a period.
20. Which choice would most effectively conclude the sentence by indicating clearly how the subway system could address the problem described in the first part of the sentence?  
F. NO CHANGE  
G. traveling more effectively.  
H. trying something new.  
J. using a system.
21. A. NO CHANGE  
B. it  
C. those  
D. DELETE the underlined portion.
22. F. NO CHANGE  
G. engineer—William Barclay Parsons  
H. engineer William Barclay Parsons,  
J. engineer William Barclay Parsons
23. A. NO CHANGE  
B. innovate engineer  
C. innovative engineering  
D. innovate engineering
24. F. NO CHANGE  
G. into the ground deeply under where the roads had previously been removed by them.  
H. a trench far down below since it was necessary to shovel deep into the earth in this method known as “cut and cover.”  
J. DELETE the underlined portion and end the sentence with a period.
25. A. NO CHANGE  
B. created, with  
C. created with  
D. created with:



Brightly lit stations welcomed the public, many  
of them were skeptical of traveling underground. [D] It  
<sup>26</sup>

didn't take long for New Yorkers to adapt, <sup>27</sup>however. The  
day after the subway opened, one newspaper reported that  
the riders were emerging from underground "having  
finished what will be to them the daily routine of the  
rest of their lives." <sup>28</sup>

26. F. NO CHANGE  
G. of whom  
H. of who  
J. DELETE the underlined portion.

27. A. NO CHANGE  
B. therefore.  
C. for instance.  
D. that is.

28. The writer wishes to add a sentence that describes the magnitude and expansiveness of the New York City Subway system today. Given that all the following statements are true, which one, if added here, would most clearly and effectively accomplish the writer's goal?

- F. Even today, for many New Yorkers that newspaper's account is right!  
G. Today, riding a portion of the New York City Subway's 656 miles of mainline track is a daily routine for more than 4 million people.  
H. Today, the New York City Transit Authority continuously maintains two separate fleets of subway cars.  
J. Now, a typical New York City Subway waiting platform ranges from 400 to 700 feet.

Question 29 asks about the preceding passage as a whole.

29. Upon reviewing the essay and finding that some information has been left out, the writer composes the following sentence incorporating that information:

This technique, also known as "open excavation," became the standard for subway tunneling for nearly sixty years.

If the writer were to add this sentence to the essay, the sentence would most logically be placed at Point:

- A. A.  
B. B.  
C. C.  
D. D.



## PASSAGE III

**Diego Rivera: The People's Painter**

In the 1920s, Mexican artist Diego Rivera (1886–1957) practiced<sup>30</sup> the art of painting frescoes, large murals done on fresh plaster. Rivera's frescoes appeared on the outside walls of buildings in Mexico City, in plain sight of any passerby. This brought art out of the elite galleries by catering<sup>31</sup> to the upper class and literally to the public.

Rivera attracted for his belief controversy that the working class should wield more political power.<sup>32</sup> His

dominant artistic subject in his art<sup>33</sup> was as expansive

than his frescoes:<sup>34</sup> the role played by laborers in the past,

present, and future of humanity. One of his frescoes depict<sup>35</sup> a progression through time and can be read as time lines from left to right. For example, on the left side of a fresco, there might be field workers hunched over in fatigue and surrounded by the tools of their trade. On the right side, after they have moved through history.<sup>36</sup> The same workers stand tall, radiating strength and confidence. Such

empowerment of the worker were to be the bright future<sup>37</sup> Rivera envisioned for all the workers of the world.

30. The writer wants to suggest that the art of the fresco had been in decline previous to Rivera. Which choice best accomplishes that goal?

- F. NO CHANGE
- G. engaged in
- H. influenced
- J. revived

31. A. NO CHANGE  
B. that catered  
C. while catering  
D. and catered

32. F. NO CHANGE  
G. Rivera should wield more political power for his belief that controversy attracted the working class.  
H. Rivera for his controversy attracted belief that the working class should wield more political power.  
J. Rivera attracted controversy for his belief that the working class should wield more political power.

33. A. NO CHANGE  
B. that he was interested in  
C. that he focused on  
D. DELETE the underlined portion.

34. F. NO CHANGE  
G. then  
H. as  
J. if

35. A. NO CHANGE  
B. Many  
C. Each  
D. Any one

36. F. NO CHANGE  
G. history; the  
H. history, the  
J. history—the

37. A. NO CHANGE  
B. if it were  
C. was  
D. if it was

Rivera received various prestigious commissions<sup>38</sup> while he was in the United States. In the 1930s, he was commissioned by the Ford Motor Company to paint a twenty-seven-panel fresco<sup>39</sup> in the Detroit Institute of Arts. The fresco, *Detroit Industry*, portrays some of the varied groups that shaped American culture and constituted its workforce. The central panel on the north wall shows the manufacture of a 1932 Ford V-8 engine, when the central panel on the south wall shows the production of this same<sup>40</sup> car's exterior. Smaller panels depicting workers in a<sup>41</sup> variety of other Detroit industries. 42 The fresco is a dynamic work because,<sup>43</sup> by capturing the energy, humanity, and collective achievement of the Detroit workers, celebrates all working men and women. However,<sup>44</sup> Rivera considered it the greatest achievement of his career.

38. F. NO CHANGE  
 G. various, prestigious,  
 H. various, and prestigious  
 J. various and prestigious,
39. If the underlined phrase were deleted, the sentence would primarily lose a detail that:  
 A. repeats information found elsewhere in the sentence.  
 B. is necessary for the sentence to be grammatically complete.  
 C. provides new and relevant information to the sentence.  
 D. is ambiguous and unnecessary to the sentence.
40. F. NO CHANGE  
 G. since  
 H. thus  
 J. and
41. A. NO CHANGE  
 B. depict  
 C. depicting some  
 D. had depicted
42. The writer is thinking of adding the following phrase to the end of the preceding sentence (changing the period after *industries* to a comma):  
 such as medicine, pharmaceuticals, and chemicals.  
 Should the writer make this addition there?  
 F. Yes, because it offers relevant examples that help to specify a broad term.  
 G. Yes, because it helps explain how the panels were physically constructed.  
 H. No, because it provides a sampling of industries rather than a full listing.  
 J. No, because it digresses from the main point of the sentence.
43. A. NO CHANGE  
 B. that,  
 C. while,  
 D. that was,
44. F. NO CHANGE  
 G. Despite this,  
 H. Regardless,  
 J. DELETE the underlined portion.



PASSAGE IV

After All These Years

[1]

[1] I met Joan, the person who would be my best friend for the next twenty years, the first morning I played outside my family's new California home. [2] I was five years old. [3] We became inseparable childhood friends, and we remained close, even though we attended different high schools and colleges.

[2]

Joan enjoyed jogging and painting cityscapes. I loved hiking trips and writing. We shared an appreciation of the outdoors and a passion for our creative work. More importantly though we enjoyed being together. Through our history of shared experiences, we formed a rare understanding of each other.

[3]

[1] Last February, I had to travel to Fairbanks, Alaska, for my work. [2] Though we had rarely spoken to each other in fifteen years, when I called Joan to suggest a meeting, her voice sounded wonderfully familiar.

45. A. NO CHANGE  
B. close, yet even  
C. close; even  
D. close. Even

46. Which of the following alternatives to the underlined portion would NOT be acceptable?  
F. cityscapes, while I  
G. cityscapes; I  
H. cityscapes. I, on the other hand,  
J. cityscapes I

47. A. NO CHANGE  
B. important though  
C. importantly, though,  
D. important, though

48. Which choice would best express the narrator's positive reaction to speaking with Joan and the narrator's fondness for her friend?  
F. NO CHANGE  
G. she said that she would rearrange her schedule so that we could meet.  
H. she told me that she immediately recognized my voice.  
J. her quick words and the sound of her laugh surprised me.

[3] Through my parents, whom were still in touch with

49

Joan's father, I learned that Joan was currently living in

50

Fairbanks. 51

[4]

I parked my rental car in downtown Fairbanks,  
and to keep the battery from freezing, I plugged the  
engine into an electrical outlet in the parking lot  
so the battery would stay warm. It was twenty below

52

zero that afternoon, and the sky shone with a pale gray

53

light. 54 I called Joan from a pay phone. She soon met  
me on a street corner that was close to her art studio.

[5]

As we walked upstairs to her studio,  
we slipped into our familiar habits, talking about

55

the people in our lives and our work. We talked just  
as easily as we had in the past, when we would sit  
in the field behind Joan's house atop the rabbit hutch  
and discuss our friends and our hopes for the future.

56

49. A. NO CHANGE  
B. who  
C. whose  
D. which

50. F. NO CHANGE  
G. we  
H. they  
J. he

51. Which of the following sequences of sentences makes Paragraph 3 most logical?  
A. NO CHANGE  
B. 1, 3, 2  
C. 2, 1, 3  
D. 3, 2, 1

52. F. NO CHANGE  
G. located in the downtown area of the city.  
H. so the battery would continue to work properly despite the cold weather.  
J. DELETE the underlined portion and end the sentence with a period.

53. Which of the following alternatives to the underlined portion would NOT be acceptable?  
A. was glowing  
B. glowed  
C. shined  
D. shoned

54. If the writer were to delete the preceding sentence, the essay would primarily lose:  
F. an indication of the narrator's response to the weather conditions in Fairbanks.  
G. a detailed analysis of why the narrator had to plug the car engine into an electrical outlet.  
H. descriptive details that help set the scene of the narrator's meeting with Joan.  
J. unnecessary details that repeat information given earlier in the paragraph.

55. A. NO CHANGE  
B. fell upon  
C. dropped by  
D. returned with

56. F. NO CHANGE  
G. in the field atop the rabbit hutch behind Joan's house  
H. atop the rabbit hutch in the field behind Joan's house  
J. behind Joan's house in the field atop the rabbit hutch





[6]

When I saw Joan's new paintings, I immediately remembered her distinct way of emphasizing shadows and light. I remembered everything about her: how she would get so absorbed in her work that she'd forget to eat, how  
57

she disliked talking in the morning, how she was firm in  
58

her decisions. The years of separation had not affected the  
59  
heart of our connection, our friendship.  
59

57. Which of the following alternatives to the underlined portion would NOT be acceptable?
- A. engrossed in
  - B. acquired by
  - C. immersed in
  - D. engaged in
58. Which of the following alternatives to the underlined portion would NOT be acceptable?
- F. with
  - G. regarding
  - H. along
  - J. about
59. Given that all the choices are true, which one would best conclude this essay by effectively summarizing its main idea?
- A. NO CHANGE
  - B. Sadly, I realized that although we might be able to meet once a year, Joan and I would probably never again live in the same city.
  - C. Even though we had followed different interests, I was glad to know that both Joan and I had been able to devote time to our creative work.
  - D. As a result of the time we spent together when we were very young, I'll always remember Joan.

Question 60 asks about the preceding passage as a whole.

60. Upon reviewing the essay and finding that some information has been left out, the writer composes the following sentence incorporating that information:
- Yet, despite such strong ties, we moved far apart as adults and lost touch.
- This sentence would most logically be placed:
- F. after Sentence 2 in Paragraph 1.
  - G. at the end of Paragraph 2.
  - H. at the end of Paragraph 4.
  - J. after the first sentence in Paragraph 6.

## PASSAGE V

## Three Stars, Many Stories

Many thousands of years ago, people around the world began attaching different stories to the stars in the  
61

night sky. The Sun sets gradually the images of a winged  
62  
horse, a drinking gourd, a heartbroken hero appear in lights overhead. In some cases, a pattern of stars may represent a simple object that has meaning in day-to-day life. In other cases, the pattern, or constellation, may be  
63

a figure with a different kind of meaning.  
64

Three bright stars that I've read about have acquired  
65

significance for many viewers around the globe. In some  
66

agricultural parts of Japan, for instance, these three stars  
67  
are commonly referred to as *Karasuki* and represent a

three-pronged plow. It's awesome that in other parts of  
68  
Japan, the same three stars appear in a constellation

61. A. NO CHANGE  
B. stories, which they connected to  
C. stories, to which they related to  
D. stories because of
62. F. NO CHANGE  
G. sets, gradually,  
H. sets, and gradually  
J. setting gradually
63. A. NO CHANGE  
B. pattern, or constellation  
C. pattern or constellation,  
D. pattern or constellation:
64. Given that all the choices are true, which one ends this paragraph with the clearest allusion to *Orion*, as the constellation is described later in the essay?  
F. NO CHANGE  
G. that is interesting but hard to see without a telescope.  
H. who plays a dramatic role in a myth that has been told and retold for centuries.  
J. that is also represented in the night sky once the Sun has set and the stars emerge.
65. Given that all the choices are true, which one offers visual information about the stars as they appear in modern times?  
A. NO CHANGE  
B. have different names in different cultures  
C. formed long before any of us were born  
D. together roughly form a straight line
66. Which of the following alternatives to the underlined portion would NOT be acceptable?  
F. observers  
G. overseers  
H. night-sky watchers  
J. stargazers
67. Given that all the choices are true, which one provides a detail that has the most direct connection to the information that follows in this sentence?  
A. NO CHANGE  
B. distant  
C. populated  
D. historic
68. F. NO CHANGE  
G. You'll be amazed to learn that in  
H. Consider, if you will, the notion that in  
J. In



representing the floor-length sleeve of a woman's kimono.

In still other parts of Japan, this shining trio appears in the center of an hourglass-shaped drum, a *tsuzumi*.

On the other side of the world, the same three stars <sup>69</sup>has traditionally represented three zebras to the Namaqua people of South Africa. In

the <sup>70</sup>mythology, of the Tswana people of South Africa, these same stars represent three pigs.

[1] *Orion* is the name many Westerners use for a constellation that contains these three stars. [2] In Greek mythology, Orion is a mighty hunter. [3] In the night sky, he carries a bow and arrow and is accompanied by his loyal dogs, *Canis Major* and *Canis Minor*. [4] The three stars form the brilliant belt around the hunter's waist. [5] In the sky with Orion are the animals he used to hunt on Earth—from a small rabbit to a huge bull. [6] The scorpion that, according to myth, killed Orion inhabits the sky as well, but at such a distance <sup>71</sup>because it can never sting the hunter again. [7] Even in an age of big-screen televisions, <sup>72</sup>their is still no show on Earth as big as the night sky. [8] Stars up there play different roles around the <sup>73</sup>world, <sup>74</sup>their dazzling careers span thousands of years. 75

69. A. NO CHANGE  
B. In Japan's imagination, this  
C. In Japan, this  
D. This
70. F. NO CHANGE  
G. have  
H. could of  
J. has been
71. A. NO CHANGE  
B. mythology of the Tswana people, of South Africa  
C. mythology, of the Tswana people, of South Africa  
D. mythology of the Tswana people of South Africa,
72. F. NO CHANGE  
G. so when  
H. this means  
J. that
73. A. NO CHANGE  
B. they're  
C. there  
D. but there
74. F. NO CHANGE  
G. world, and their  
H. world, with  
J. world,
75. The writer wants to divide the preceding paragraph into two to create a concluding paragraph that is free of direct references to a specific culture's view of the three stars. The best place to begin the new paragraph would be at the beginning of Sentence:
- A. 4.  
B. 5.  
C. 6.  
D. 7.

END OF TEST 1

STOP! DO NOT TURN THE PAGE UNTIL TOLD TO DO SO.



## MATHEMATICS TEST

60 Minutes—60 Questions

**DIRECTIONS:** Solve each problem, choose the correct answer, and then fill in the corresponding oval on your answer document.

Do not linger over problems that take too much time. Solve as many as you can; then return to the others in the time you have left for this test.

You are permitted to use a calculator on this test. You may use your calculator for any problems you choose,

but some of the problems may best be done without using a calculator.

Note: Unless otherwise stated, all of the following should be assumed.

1. Illustrative figures are NOT necessarily drawn to scale.
2. Geometric figures lie in a plane.
3. The word *line* indicates a straight line.
4. The word *average* indicates arithmetic mean.

1. The weekly fee for staying at the Pleasant Lake Campground is \$20 per vehicle and \$10 per person. Last year, weekly fees were paid for  $v$  vehicles and  $p$  persons. Which of the following expressions gives the total amount, in dollars, collected for weekly fees last year?
  - A.  $20v + 10p$
  - B.  $20p + 10v$
  - C.  $10(v + p)$
  - D.  $30(v + p)$
  - E.  $10(v + p) + 20p$
2. If  $r = 9$ ,  $b = 5$ , and  $g = -6$ , what does  $(r + b - g)(b + g)$  equal?
  - F.  $-20$
  - G.  $-8$
  - H.  $8$
  - J.  $19$
  - K.  $20$
3. A copy machine makes 60 copies per minute. A second copy machine makes 80 copies per minute. The second machine starts making copies 2 minutes after the first machine starts. Both machines stop making copies 8 minutes after the first machine started. Together, the 2 machines made how many copies?
  - A. 480
  - B. 600
  - C. 680
  - D. 720
  - E. 960
4. Marlon is bowling in a tournament and has the highest average after 5 games, with scores of 210, 225, 254, 231, and 280. In order to maintain this exact average, what *must* be Marlon's score for his 6th game?
  - F. 200
  - G. 210
  - H. 231
  - J. 240
  - K. 245
5. Joelle earns her regular pay of \$7.50 per hour for up to 40 hours of work in a week. For each hour over 40 hours of work in a week, Joelle is paid  $1\frac{1}{2}$  times her regular pay. How much does Joelle earn for a week in which she works 42 hours?
  - A. \$126.00
  - B. \$315.00
  - C. \$322.50
  - D. \$378.00
  - E. \$472.50
6. Which of the following mathematical expressions is equivalent to the verbal expression "A number,  $x$ , squared is 39 more than the product of 10 and  $x$ " ?
  - F.  $2x = 39 + 10x$
  - G.  $2x = 39x + 10x$
  - H.  $x^2 = 39 - 10x$
  - J.  $x^2 = 39 + x^{10}$
  - K.  $x^2 = 39 + 10x$
7. If  $9(x - 9) = -11$ , then  $x = ?$ 
  - A.  $-\frac{92}{9}$
  - B.  $-\frac{20}{9}$
  - C.  $-\frac{11}{9}$
  - D.  $-\frac{2}{9}$
  - E.  $\frac{70}{9}$





8. Discount tickets to a basketball tournament sell for \$4.00 each. Enrico spent \$60.00 on discount tickets, \$37.50 less than if he had bought the tickets at the regular price. What was the regular ticket price?
- F. \$ 2.50  
G. \$ 6.40  
H. \$ 6.50  
J. \$ 7.50  
K. \$11.00
9. The expression  $(3x - 4y^2)(3x + 4y^2)$  is equivalent to:
- A.  $9x^2 - 16y^4$   
B.  $9x^2 - 8y^4$   
C.  $9x^2 + 16y^4$   
D.  $6x^2 - 16y^4$   
E.  $6x^2 - 8y^4$
10. A rectangle has an area of 32 square feet and a perimeter of 24 feet. What is the shortest of the side lengths, in feet, of the rectangle?
- F. 1  
G. 2  
H. 3  
J. 4  
K. 8
11. In  $\triangle ABC$ , the sum of the measures of  $\angle A$  and  $\angle B$  is  $47^\circ$ . What is the measure of  $\angle C$ ?
- A.  $47^\circ$   
B.  $86^\circ$   
C.  $94^\circ$   
D.  $133^\circ$   
E.  $143^\circ$
12. In the school cafeteria, students choose their lunch from 3 sandwiches, 3 soups, 4 salads, and 2 drinks. How many different lunches are possible for a student who chooses exactly 1 sandwich, 1 soup, 1 salad, and 1 drink?
- F. 2  
G. 4  
H. 12  
J. 36  
K. 72
13. For 2 consecutive integers, the result of adding the smaller integer and triple the larger integer is 79. What are the 2 integers?
- A. 18, 19  
B. 19, 20  
C. 20, 21  
D. 26, 27  
E. 39, 40
14. A function  $f(x)$  is defined as  $f(x) = -8x^2$ . What is  $f(-3)$ ?
- F. -72  
G. 72  
H. 192  
J. -576  
K. 576
15. If  $3^x = 54$ , then which of the following must be true?
- A.  $1 < x < 2$   
B.  $2 < x < 3$   
C.  $3 < x < 4$   
D.  $4 < x < 5$   
E.  $5 < x$
16. What is the least common multiple of 70, 60, and 50?
- F. 60  
G. 180  
H. 210  
J. 2,100  
K. 210,000
17. Hot Shot Electronics is designing a packing box for its new line of Acoustical Odyssey speakers. The box is a rectangular prism of length 45 centimeters, width 30 centimeters, and volume 81,000 cubic centimeters. What is the height, in centimeters, of the box?
- A. 75  
B. 60  
C. 48  
D. 27  
E. 18
18. Four points,  $A$ ,  $B$ ,  $C$ , and  $D$ , lie on a circle having a circumference of 15 units.  $B$  is 2 units counterclockwise from  $A$ .  $C$  is 5 units clockwise from  $A$ .  $D$  is 7 units clockwise from  $A$  and 8 units counterclockwise from  $A$ . What is the order of the points, starting with  $A$  and going clockwise around the circle?
- F.  $A, B, C, D$   
G.  $A, B, D, C$   
H.  $A, C, B, D$   
J.  $A, C, D, B$   
K.  $A, D, C, B$
19. A group of cells grows in number as described by the equation  $y = 16(2)^t$ , where  $t$  represents the number of days and  $y$  represents the number of cells. According to this formula, how many cells will be in the group at the end of the first 5 days?
- A. 80  
B. 160  
C. 400  
D. 512  
E. 1,280



20. The length of a rectangle is 3 times the length of a smaller rectangle. The 2 rectangles have the same width. The area of the smaller rectangle is  $A$  square units. The area of the larger rectangle is  $kA$  square units. Which of the following is the value of  $k$ ?

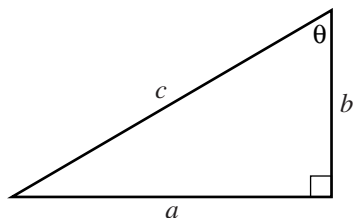
F.  $\frac{1}{9}$   
 G.  $\frac{1}{3}$   
 H. 1  
 J. 3  
 K. 9

21.  $(a + 2b + 3c) - (4a + 6b - 5c)$  is equivalent to:

A.  $-4a - 8b - 2c$   
 B.  $-4a - 4b + 8c$   
 C.  $-3a + 8b - 2c$   
 D.  $-3a - 4b - 2c$   
 E.  $-3a - 4b + 8c$

22. The dimensions of the right triangle shown below are given in feet. What is  $\sin \theta$ ?

F.  $\frac{a}{b}$   
 G.  $\frac{a}{c}$   
 H.  $\frac{b}{c}$   
 J.  $\frac{b}{a}$   
 K.  $\frac{c}{a}$



23. In a basketball passing drill, 5 basketball players stand evenly spaced around a circle. The player with the ball (the passer) passes it to another player (the receiver). The receiver cannot be the player to the passer's immediate right or left and cannot be the player who last passed the ball. A designated player begins the drill as the first passer. This player will be the receiver for the first time on which pass of the ball?

A. 4th  
 B. 5th  
 C. 6th  
 D. 10th  
 E. 24th

24. Lines  $p$  and  $n$  lie in the standard  $(x,y)$  coordinate plane. An equation for line  $p$  is  $y = 0.12x + 3,000$ . The slope of line  $n$  is 0.1 greater than the slope of line  $p$ . What is the slope of line  $n$ ?

F. 0.012  
 G. 0.02  
 H. 0.22  
 J. 1.2  
 K. 300

25. The expression  $-8x^3(7x^6 - 3x^5)$  is equivalent to:

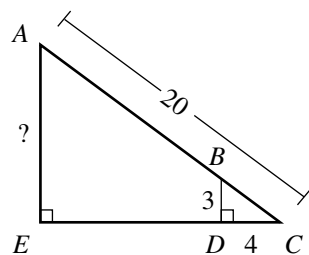
A.  $-56x^9 + 24x^8$   
 B.  $-56x^9 - 24x^8$   
 C.  $-56x^{18} + 24x^{15}$   
 D.  $-56x^{18} - 24x^{15}$   
 E.  $-32x^4$

26.  $-3|-6 + 8| = ?$

F. -42  
 G. -6  
 H. -1  
 J. 6  
 K. 42

27. In right triangle  $\triangle ACE$  below,  $\overline{BD}$  is parallel to  $\overline{AE}$ , and  $\overline{BD}$  is perpendicular to  $\overline{EC}$  at  $D$ . The length of  $\overline{AC}$  is 20 feet, the length of  $\overline{BD}$  is 3 feet, and the length of  $\overline{CD}$  is 4 feet. What is the length, in feet, of  $\overline{AE}$ ?

A. 10  
 B. 12  
 C. 15  
 D. 16  
 E. 17



28. As part of a lesson on motion, students observed a cart rolling at a constant rate along a straight line. As shown in the chart below, they recorded the distance,  $y$  feet, of the cart from a reference point at 1-second intervals from  $t = 0$  seconds to  $t = 5$  seconds.

$t$	0	1	2	3	4	5
$y$	14	19	24	29	34	39

Which of the following equations represents this data?

F.  $y = t + 14$   
 G.  $y = 5t + 9$   
 H.  $y = 5t + 14$   
 J.  $y = 14t + 5$   
 K.  $y = 19t$



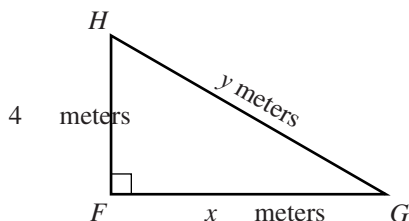
29. The inequality  $6(x + 2) > 7(x - 5)$  is equivalent to which of the following inequalities?

A.  $x < -23$   
 B.  $x < 7$   
 C.  $x < 17$   
 D.  $x < 37$   
 E.  $x < 47$

30. The sides of a square are 3 cm long. One vertex of the square is at  $(2,0)$  on a square coordinate grid marked in centimeter units. Which of the following points could also be a vertex of the square?

F.  $(-4, 0)$   
 G.  $(0, 1)$   
 H.  $(1, -1)$   
 J.  $(4, 1)$   
 K.  $(5, 0)$

31. For  $\triangle FGH$ , shown below, which of the following is an expression for  $y$  in terms of  $x$ ?

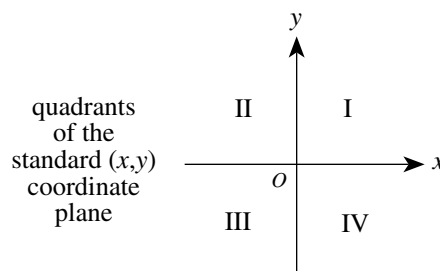


A.  $x + 4$   
 B.  $\sqrt{x^2 + 4}$   
 C.  $\sqrt{x^2 + 8}$   
 D.  $\sqrt{x^2 - 16}$   
 E.  $\sqrt{x^2 + 16}$

32. A bag contains 12 red marbles, 5 yellow marbles, and 15 green marbles. How many additional red marbles must be added to the 32 marbles already in the bag so that the probability of randomly drawing a red marble is  $\frac{3}{5}$ ?

F. 13  
 G. 18  
 H. 28  
 J. 32  
 K. 40

33. What are the quadrants of the standard  $(x,y)$  coordinate plane below that contain points on the graph of the equation  $4x - 2y = 8$ ?



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

34. The graph of  $y = -5x^2 + 9$  passes through  $(1, 2a)$  in the standard  $(x,y)$  coordinate plane. What is the value of  $a$ ?

F. 2  
 G. 4  
 H. 7  
 J. -1  
 K. -8

35. Jerome, Kevin, and Seth shared a submarine sandwich. Jerome ate  $\frac{1}{2}$  of the sandwich, Kevin ate  $\frac{1}{3}$  of the sandwich, and Seth ate the rest. What is the ratio of Jerome's share to Kevin's share to Seth's share?

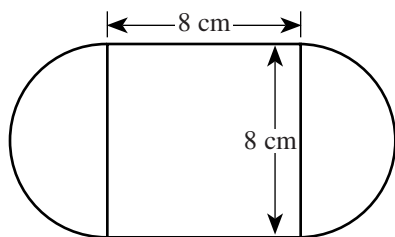
A. 2:3:6  
 B. 2:6:3  
 C. 3:1:2  
 D. 3:2:1  
 E. 6:3:2

36. A particular circle in the standard  $(x,y)$  coordinate plane has an equation of  $(x - 5)^2 + y^2 = 38$ . What are the radius of the circle, in coordinate units, and the coordinates of the center of the circle?

	radius	center
F.	$\sqrt{38}$	$(5, 0)$
G.	19	$(5, 0)$
H.	38	$(5, 0)$
J.	$\sqrt{38}$	$(-5, 0)$
K.	19	$(-5, 0)$

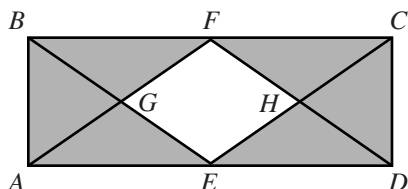


37. The figure below consists of a square and 2 semicircles, with dimensions as shown. What is the outside perimeter, in centimeters, of the figure?



- A.  $8 + 8\pi$   
 B.  $16 + 8\pi$   
 C.  $16 + 16\pi$   
 D.  $32 + 8\pi$   
 E.  $32 + 16\pi$

38. In the figure below, points  $E$  and  $F$  are the midpoints of sides  $\overline{AD}$  and  $\overline{BC}$  of rectangle  $ABCD$ , point  $G$  is the intersection of  $\overline{AF}$  and  $\overline{BE}$ , and point  $H$  is the intersection of  $\overline{CE}$  and  $\overline{DF}$ . The interior of  $ABCD$  except for the interior of  $EGFH$  is shaded. What is the ratio of the area of  $EGFH$  to the area of the shaded region?



- F. 1:2  
 G. 1:3  
 H. 1:4  
 J. 1:6  
 K. Cannot be determined from the given information

39. The coordinates of the endpoints of  $\overline{CD}$ , in the standard  $(x,y)$  coordinate plane, are  $(-4,-2)$  and  $(14,2)$ . What is the  $x$ -coordinate of the midpoint of  $\overline{CD}$ ?

- A. 0  
 B. 2  
 C. 5  
 D. 9  
 E. 10

40. What is the surface area, in square inches, of an 8-inch cube?

- F. 512  
 G. 384  
 H. 320  
 J. 256  
 K. 192

41. The equations below are linear equations of a system where  $a$ ,  $b$ , and  $c$  are positive integers.

$$\begin{aligned} ay + bx &= c \\ ay - bx &= c \end{aligned}$$

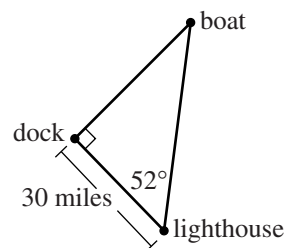
Which of the following describes the graph of at least 1 such system of equations in the standard  $(x,y)$  coordinate plane?

- I. 2 parallel lines  
 II. 2 intersecting lines  
 III. A single line

- A. I only  
 B. II only  
 C. III only  
 D. I or II only  
 E. I, II, or III

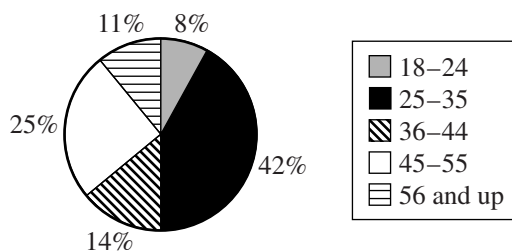
42. According to the measurements given in the figure below, which of the following expressions gives the distance, in miles, from the boat to the dock?

- F.  $30 \tan 52^\circ$   
 G.  $30 \cos 52^\circ$   
 H.  $30 \sin 52^\circ$   
 J.  $\frac{30}{\cos 52^\circ}$   
 K.  $\frac{30}{\sin 52^\circ}$



43. The circle graph below shows the distribution of registered voters, by age, for a community. Registered voters are randomly selected from this distribution to be called for jury duty. What are the odds (in the age range: not in the age range) that the first person called for jury duty is in the age range of 25–35 years?

Distribution of Registered Voters by Age

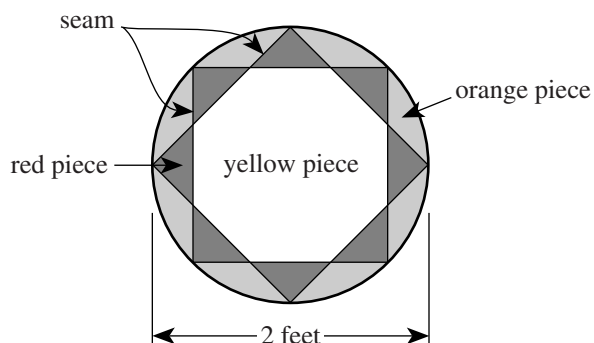


- A. 1:3  
 B. 7:8  
 C. 7:43  
 D. 21:29  
 E. 42:25



Use the following information to answer questions 44–46.

The figure below shows the design of a circular stained-glass panel on display at Hopewell's Antique Shop. Seams separate the pieces of the panel. All red triangular pieces shown are congruent and have a common vertex with each adjoining triangular piece. The 2 squares shown are inscribed in the circle. The diameter of the panel is 2 feet.



44. The design of the stained-glass panel has how many lines of symmetry in the plane of the panel?

F. 2  
G. 4  
H. 8  
J. 16  
K. Infinitely many

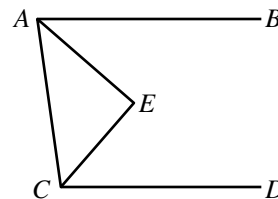
45. What is the area of the stained-glass panel, to the nearest 0.1 square foot?

A. 3.1  
B. 4.0  
C. 6.2  
D. 8.0  
E. 12.6

46. Kaya wants to install a new circular stained-glass window in her living room. The design of the window will be identical to that of the panel. The diameter of the new window will be 75% longer than the diameter of the panel. The new window will be how many feet in diameter?

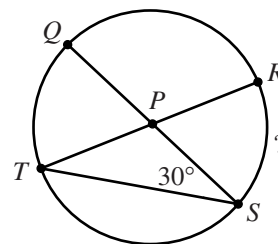
F. 1.50  
G. 2.50  
H. 2.75  
J. 3.50  
K. 4.00

47. In the figure below,  $\overline{AB} \parallel \overline{CD}$ ,  $\overline{AE}$  bisects  $\angle BAC$ , and  $\overline{CE}$  bisects  $\angle ACD$ . If the measure of  $\angle BAC$  is  $82^\circ$ , what is the measure of  $\angle AEC$ ?



- A.  $86^\circ$   
B.  $88^\circ$   
C.  $90^\circ$   
D.  $92^\circ$   
E. Cannot be determined from the given information

48. In the circle shown below, chords  $\overline{TR}$  and  $\overline{QS}$  intersect at  $P$ , which is the center of the circle, and the measure of  $\angle PST$  is  $30^\circ$ . What is the degree measure of minor arc  $\widehat{RS}$ ?



- F.  $30^\circ$   
G.  $45^\circ$   
H.  $60^\circ$   
J.  $90^\circ$   
K. Cannot be determined from the given information

49. For what value of  $a$  would the following system of equations have an infinite number of solutions?

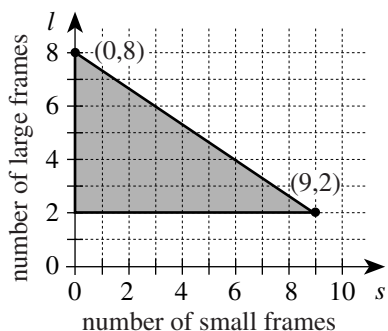
$$\begin{aligned} 2x - y &= 8 \\ 6x - 3y &= 4a \end{aligned}$$

- A. 2  
B. 6  
C. 8  
D. 24  
E. 32



Use the following information to answer questions 50–52.

Marcia makes and sells handcrafted picture frames in 2 sizes: small and large. It takes her 2 hours to make a small frame and 3 hours to make a large frame. The shaded triangular region shown below is the graph of a system of inequalities representing weekly constraints Marcia has in making the frames. For making and selling  $s$  small frames and  $l$  large frames, Marcia makes a profit of  $30s + 70l$  dollars. Marcia sells all the frames she makes.



50. The weekly constraint represented by the horizontal line segment containing  $(9, 2)$  means that each week Marcia makes a minimum of:

F. 2 large frames.  
G. 9 large frames.  
H. 2 small frames.  
J. 9 small frames.  
K. 11 small frames.

51. For every hour that Marcia spends making frames in the second week of December each year, she donates \$3 from that week's profit to a local charity. This year, Marcia made 4 large frames and 2 small frames in that week. Which of the following is closest to the percent of that week's profit Marcia donated to the charity?

A. 6%  
B. 12%  
C. 14%  
D. 16%  
E. 19%

52. What is the maximum profit Marcia can earn from the picture frames she makes in 1 week?

F. \$410  
G. \$460  
H. \$540  
J. \$560  
K. \$690

53. The *determinant* of a matrix  $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$  equals  $ad - cb$ .

What must be the value of  $x$  for the matrix  $\begin{bmatrix} x & 8 \\ x & x \end{bmatrix}$  to

have a determinant of  $-16$ ?

A.  $-4$   
B.  $-2$   
C.  $-\frac{8}{5}$   
D.  $\frac{8}{3}$   
E.  $4$

54. A formula for finding the value,  $A$  dollars, of  $P$  dollars invested at  $i\%$  interest compounded annually for  $n$  years is  $A = P(1 + 0.01i)^n$ . Which of the following is an expression for  $P$  in terms of  $i$ ,  $n$ , and  $A$ ?

F.  $A - 0.01i^n$   
G.  $A + 0.01i^n$   
H.  $\left(\frac{A}{1 + 0.01i}\right)^n$   
J.  $\frac{A}{(1 - 0.01i)^n}$   
K.  $\frac{A}{(1 + 0.01i)^n}$

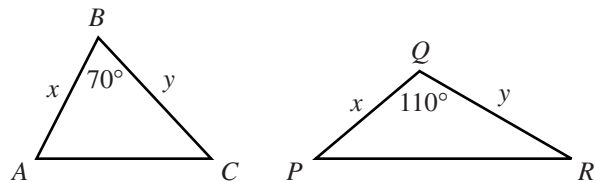
55. If  $x$  and  $y$  are real numbers such that  $x > 1$  and  $y < -1$ , then which of the following inequalities *must* be true?

A.  $\frac{x}{y} > 1$   
B.  $|x|^2 > |y|$   
C.  $\frac{x}{3} - 5 > \frac{y}{3} - 5$   
D.  $x^2 + 1 > y^2 + 1$   
E.  $x^{-2} > y^{-2}$





56. Triangles  $\triangle ABC$  and  $\triangle PQR$  are shown below. The given side lengths are in centimeters. The area of  $\triangle ABC$  is 30 square centimeters. What is the area of  $\triangle PQR$ , in square centimeters?



- F. 15  
G. 19  
H. 25  
J. 30  
K. 33
57. Triangle  $\triangle ABC$  is shown in the figure below. The measure of  $\angle A$  is  $40^\circ$ ,  $AB = 18$  cm, and  $AC = 12$  cm. Which of the following is the length, in centimeters, of  $\overline{BC}$  ?
- (Note: For a triangle with sides of length  $a$ ,  $b$ , and  $c$  opposite angles  $\angle A$ ,  $\angle B$ , and  $\angle C$ , respectively, the law of sines states  $\frac{\sin \angle A}{a} = \frac{\sin \angle B}{b} = \frac{\sin \angle C}{c}$  and the law of cosines states  $c^2 = a^2 + b^2 - 2ab \cos \angle C$ .)
- 
- A.  $12 \sin 40^\circ$   
B.  $18 \sin 40^\circ$   
C.  $\sqrt{18^2 - 12^2}$   
D.  $\sqrt{12^2 + 18^2}$   
E.  $\sqrt{12^2 + 18^2 - 2(12)(18) \cos 40^\circ}$
58. What is the sum of the first 4 terms of the arithmetic sequence in which the 6th term is 8 and the 10th term is 13 ?
- F. 10.5  
G. 14.5  
H. 18  
J. 21.25  
K. 39.5
59. In the equation  $x^2 + mx + n = 0$ ,  $m$  and  $n$  are integers. The *only* possible value for  $x$  is  $-3$ . What is the value of  $m$  ?
- A. 3  
B.  $-3$   
C. 6  
D.  $-6$   
E. 9
60. The solution set of which of the following equations is the set of real numbers that are 5 units from  $-3$  ?
- F.  $|x + 3| = 5$   
G.  $|x - 3| = 5$   
H.  $|x + 5| = 3$   
J.  $|x - 5| = 3$   
K.  $|x + 5| = 3$

END OF TEST 2

STOP! DO NOT TURN THE PAGE UNTIL TOLD TO DO SO.  
DO NOT RETURN TO THE PREVIOUS TEST.

## READING TEST

35 Minutes—40 Questions

**DIRECTIONS:** There are several passages in this test. Each passage is accompanied by several questions. After reading a passage, choose the best answer to each question and fill in the corresponding oval on your answer document. You may refer to the passages as often as necessary.

## Passage I

**LITERARY NARRATIVE:** This passage is adapted from the short story “From Aboard the Night Train” by Kimberly M. Blaeser (©1993 by Kimberly M. Blaeser), which appeared in *Earth Song, Sky Spirit: Short Stories of the Contemporary Native American Experience*.

The passage begins with a female narrator traveling to her hometown.

The moon gives some light and I can make out the contours of the land, see the faint reflection in the lakes and ponds we pass. Several times I see or imagine I see glowing eyes staring back at me from a patch of woods  
5 beside the track. When we pass through the tiny towns, I try to read their signs, catch their names from their water towers or grain elevators. Occasionally the train stops at . . . Portage . . . Winona . . . Red Wing.

In my sleeping compartment, watching the night  
10 countryside, so much world rolls by my window. Like a voyeur I watch the various reunion scenes. I feel these scenes add up to something, some meaning or lesson about all life, and I try to put it into words for myself but find I can’t. I finally give up, roll over, go to sleep,  
15 and dream.

But now I am awake, keeping my vigil over the Midwest’s pastoral kingdom. Chicago, even Minneapolis seems a long way away. A few hours later, still in the deep night hours, the train arrives at my stop,  
20 Detroit Lakes, Minnesota, the closest I can get to my destination.

Suddenly, as I descend the two steps from the train, the porter hands me into one of the reunion scenes. “Hi, honey, how was the trip? Did you get any  
25 sleep?” “A little. Been waiting long?” “Long enough to beat your dad in two games of cribbage . . .” Glancing back at the train windows, I imagine I am looking into eyes hidden behind mirrored sunglasses.

\* \* \*

I think about progress a lot in the next few days and about what passes for progress. Nightly we walk about town, talk marriages and funerals, then sit on the newly installed benches on Main Street. Together we assemble from our memories the town as it was twenty  
35 or twenty-five years ago. We remember the little Model

Meat Market and the old Pioneer office. We rebuild the Landmark Hotel, take down the vinyl fronts from the grocery store, change the light posts, the awnings, the names of the current businesses. I put back the old  
40 depot, you the corner funeral home. But soon we are distracted and leave things half constructed when we begin to add the people, what’s-his-name, the square dance caller; Ed, the fire chief; and Lydia, the town’s best gossip. On the walk back home, we have begun to  
45 list very specific things, which is the closest we get to the intangibles: the rental meat lockers, the four-digit telephone numbers, the free ice cream during dairy month.

Late at night in my old bed, I listen to the night  
50 sounds of the house and fall asleep counting the changes that have come to my little hometown: The park is off limits after dark now, the football field is fenced in, one-hour photo has come to town along with a tanning salon and a pizza parlor. The dry goods store  
55 is gone, the dairy, long gone. People lock their houses now more than once a year when the carnival comes to town. But all of these changes pale in comparison to what has replaced the bait shop, the used car lot, and Mr. Morton’s small farm, what has sprung up on High-  
60 way 59 at the edge of town: Las Vegas-style gambling.

\* \* \*

Taking the train back, I decide to put on pajamas and crawl under the sheets, hoping to trick myself into a good night’s sleep. It seems to work. I have slept  
65 soundly for several hours, but then the dreams start. I fall in and out of them. But they are not the usual nightmares. I am in a place where folks know you ten, fifteen, twenty years after you’ve left and still see in your face that of your grandfather or aunt or cousin. I know I  
70 am home and I feel safe.

I have an early breakfast with a would-be journalist and some ski vacationers who want to talk about election prospects. I merely feign attention. I nod or laugh on cue, while I try to read upside-down a story in  
75 the would-be journalist’s newspaper that has caught my eye. It is about the Russian space station and the cosmonaut who had been up in orbit during the takeover attempt and ultimate dissolution of the Soviet Union. After sixteen long months, they are bringing the capsule back. While the train carries me back to my current  
80 home and away from my former, I keep thinking about

that poor cosmonaut coming back to find his whole world changed, to find himself a man without a country—at least without the country he left behind.

85 I watch the ten o'clock national news broadcast. I see him emerge from the capsule. I see him try to stand and have his knees buckle. I know they said it was because he hadn't been able to exercise for such a long time, but I wonder if his weak-kneed feeling might not  
90 have more to do with what he saw out the window of the space station and with how the world was happening around without him.

1. The point of view from which the passage is told is best described as that of:
  - A. a young adult riding a train through the small towns of the Upper Midwest.
  - B. a young adult preparing to move away from her hometown.
  - C. an adult missing the new home she has established.
  - D. an adult reflecting on the past and pondering the present.
2. The passage contains recurring references to all of the following EXCEPT:
  - F. dreams.
  - G. reunion scenes.
  - H. photographs.
  - J. train trips.
3. The first three paragraphs (lines 1–21) establish all of the following about the narrator EXCEPT that she is:
  - A. passing through a number of towns.
  - B. originally from Chicago.
  - C. traveling by train.
  - D. observant of the landscape.
4. It can reasonably be inferred from the passage that the narrator thinks her hometown has:
  - F. improved significantly over the years.
  - G. made little genuine progress.
  - H. remained about the same as it was years ago.
  - J. a chance of being rebuilt as it used to be.
5. Based on the narrator's account, all of the following were part of the past, rather than the present, in her hometown EXCEPT:
  - A. four-digit phone numbers.
  - B. the fenced-in football field.
  - C. free ice cream during dairy month.
  - D. the depot.
6. According to the narrator, which of the following businesses is relatively new to her hometown?
  - F. The tanning salon
  - G. The bait shop
  - H. The dry goods store
  - J. The used-car lot
7. When the narrator refers to the cosmonaut as "a man without a country" (lines 83–84), she is most likely directly referring to the:
  - A. cosmonaut's feeling that he is now a citizen of space, not the former Soviet Union.
  - B. cosmonaut's unrealized expectation that he will be treated like a hero.
  - C. political transformation that occurred while the cosmonaut was in space.
  - D. sixteen months that the cosmonaut spent in orbit around Earth.
8. Details in the passage most strongly suggest that the people meeting the narrator at the train station include:
  - F. her father.
  - G. her sister.
  - H. a neighbor.
  - J. a journalist.
9. The narrator indicates that the most significant change to her hometown has been the addition of:
  - A. square dancing.
  - B. vinyl storefronts.
  - C. benches on Main Street.
  - D. Las Vegas-style gambling.
10. According to the passage, news reports attributed the cosmonaut's knees buckling to:
  - F. his gratitude at being back on Earth.
  - G. political changes in the world.
  - H. a lack of exercise.
  - J. his dismay at what he had seen from the space station.

## Passage II

**SOCIAL SCIENCE:** This passage is adapted from the article “Green Music in the Rain Forest” by Suzanne Charlé, which appeared in the Fall 2002 *Ford Foundation Report*.

OELA is an acronym based on Portuguese words rather than the English words used in this article. A *luthier* is a maker of stringed musical instruments.

The Amazonian Workshop School for Fabrication of Stringed Instruments (OELA) is a small part of a larger effort to create a sustainable harvest of the great Amazon forest and to give employment to the region’s  
5 burgeoning population.

“Few people know that the Amazon is one of the most rapidly urbanizing regions of the world,” observes José Gabriel López, a Ford Foundation program officer in Brazil. The city of Manaus, for example, has grown  
10 in the past decade from 850,000 to 1.5 million. “This rural-urban migration and the resultant urban shantytowns stand as living symbols of failed or nonexistent rural development policies,” López says. “In many places, small-scale rural producers have been abandoned—devoid of health and education services, credit,  
15 technical assistance and opportunity. What Rubens Gomes, founder of the workshop school, and his colleagues have created in Manaus is hope.”

Gomes knows how to build hope. The school, he  
20 notes proudly, is the first to make stringed instruments in the Amazon. And it is the first in all of the Americas to construct instruments exclusively of lumber harvested in an environmentally and socially sustainable manner certified by the Forest Stewardship Council.

“Officially, there are 30 million cubic meters of wood cut in the Amazon annually,” Gomes says. “Twenty million of this is wasted—sawdust, scraps, unwanted wood left to rot. And those are the official  
25 numbers. The motive of this school is to transform what is lost into things of value. Many people could do this—but there are no schools teaching carpentry in the Amazon.”

OELA is meant to help fill the void. To graduate, each student must make a stringed instrument. All the  
35 guitars are made from certified wood. Gomes explains that traditionally, Brazilian rosewood and ebony were used in the construction of guitars. But because of intense harvesting, these trees are close to extinction. “I’ve been working for years, trying to find Amazon  
40 woods that are unknown on the market, that are in plentiful supply and that can be used in instrument making,” Gomes says. He experimented with dozens before he found types that have the right strength and sound. (Like other master luthiers, he can tell by touching the wood whether it will reverberate well.) Once he  
45 identified the woods as possible substitutes, he sent them to a laboratory to be tested for the right grain and density. Today, *Brosimum rubescens* is substituted for rosewood, *Aniba canellila* for ebony, and *Protium*  
50 species for Brazilian mahogany and cedar. These and

some 25 other undervalued tropical hardwoods have found their way into the luthiers’ workshop, taking the pressure off the better-known woods.

For the past year, master luthier Raúl Lage from  
55 the Fernando Ortiz Instrument-Making School of the Cuban Music Institute has been working with the students. There are hurdles, he cautions, a number of them technical. The high humidity in Manaus means that the wood will crack in drier climates unless properly  
60 treated. Glue frequently doesn’t hold. These problems are slowly being resolved.

There is also a major obstacle outside the workshop: The resistance of buyers to new woods. Thus far, most of the instruments have been sold to environmentalists, some of whom “adopt” a student by paying his  
65 or her tuition; the student’s “project guitar” is then given to the donor as a gift.

There is also the possibility of contract work from outside the Amazon. Gomes’s hopes were raised  
70 recently when the president of a well-known guitar company based in Nashville, Tennessee, ordered 15 guitars to be auctioned off for the Rainforest Alliance.

Lage cautions that it will be a long time before any  
75 of the students can command a master luthier’s fee. “There is a saying,” Lage says. “Anyone can make one good guitar; it takes a master to make one every time.”

José Lucio do Nascimento Rabelo, director of the technical school, says, “By learning this skill, students  
80 come to look at the forest in a new way; there are ways other than logging for plywood and firewood to earn a living, to better the life of the people.” One of the woods being used as a replacement for the precious rosewood, he notes, is typically used to make charcoal.

Such an appreciation for the forest, says Rabelo,  
85 could have a huge effect on the survival of the rain forest; some 80 percent of the students come from other parts of the state of Amazonas, and virtually all of them return to their home towns. “Some,” he adds, “go on to  
90 become politicians who will have a direct influence on the future of the forest.”

11. Which of the following assumptions would be most critical for a reader to accept in order to agree fully with the author’s claims in the passage?

- A. Shantytowns in the Amazon need to be relocated if the forest is to be saved.
- B. Learning to make consistently good guitars requires access to the best materials available.
- C. Small-scale rural producers in the Amazon can help preserve the forest by being innovative.
- D. Consumers outside of the Amazon can do little to help prevent deforestation.

12. In the context of the passage, the statement “All the guitars are made from certified wood” (lines 34–35) most nearly suggests that Gomes’s workshop:
- F. uses environmentally sustainable woods in its guitars.
  - G. isn’t doing enough to stop unnecessary deforestation in the Amazon.
  - H. has little chance of pleasing both musicians and environmentalists.
  - J. uses only traditional woods in making its guitars.
13. It can most reasonably be inferred from the passage that regarding OELA, the author feels:
- A. skeptical of the workshop’s aims.
  - B. dismayed by the workshop’s low productivity.
  - C. supportive of the workshop’s goals.
  - D. confident that the workshop could be duplicated in other places.
14. The main purpose of the second paragraph (lines 6–18) is to:
- F. draw attention to the Amazon’s tremendous population growth.
  - G. explain the necessity for ventures such as Gomes’s.
  - H. explain the presence of the Ford Foundation in the Amazon.
  - J. justify raising taxes to increase social services in the Amazon.
15. The main function of the fifth paragraph (lines 33–53) is to:
- A. demonstrate the woodworking skills required to be a master luthier.
  - B. explore the limitations of science as compared to intuition.
  - C. outline the scientific reasons why one type of wood cannot be replaced by another.
  - D. show that experiments led to the discovery of good substitutes for rare woods.
16. The passage notes all of the following as problems that the fledgling Amazon guitar industry has experienced EXCEPT that:
- F. glue on the guitars sometimes doesn’t hold.
  - G. the wood used may crack in drier climates.
  - H. woods usable for guitars have become extinct.
  - J. buyers resist guitars made with nontraditional woods.
17. The passage indicates that, as a group, the OELA students may impact the survival of the rain forests because most of them:
- A. care deeply enough about music to spend their lives making musical instruments.
  - B. will return to their homes and spread their environmental knowledge.
  - C. are willing to endure personal hardships in order to use their new skills.
  - D. will have political careers after they return home.
18. In the passage, Gomes indicates that of the wood cut in the Amazon rain forest each year, approximately how much wood is wasted?
- F. One-fourth
  - G. One-third
  - H. One-half
  - J. Two-thirds
19. The passage states that all of the following are woods traditionally used for making stringed instruments EXCEPT:
- A. Aniba canellila.
  - B. rosewood.
  - C. Brazilian mahogany.
  - D. ebony.
20. According to the passage, when an OELA student is “adopted,” he or she receives:
- F. tuition.
  - G. room and board.
  - H. food and clothing.
  - J. a musical instrument.



## Passage III

**HUMANITIES:** This passage is adapted from the article “Finding Philosophy” by Colin McGinn (©2003 by Prospect).

*Descartes* (line 63) refers to René Descartes (1596–1650), a French mathematician, philosopher, and scientist.

I have been an academic philosopher for the past 30 years. I came from an academically disinclined background in the northeast of England, my relatives being mainly coalminers and other manual workers. I was the first in my family to attend university, and indeed had no thought of it until age 17, when a teacher mentioned it at school. My father had become a successful builder, so we were not materially deprived, and it was expected that I would become some sort of technical worker. The idea that I might one day become a professional philosopher was inconceivable in those days, to me and everyone else. I was simply not living in a place where that kind of thing ever happened; it was far likelier—though still not at all likely—that I would become a pop star (I played drums in a rock band).

The paperback British edition of my memoir *The Making of a Philosopher* has a photograph on the cover of a man sitting on a bench, placed in a grey and listless landscape. He is overlooking the sea on a misty grim day, and the atmosphere is bleak and melancholy. The man, hunched up, immobile, coiled almost, has a pensive posture, as if frozen in thought. This picture is based on a story I tell in the book about sitting on a bench in Blackpool, aged 18, pondering the metaphysical question of how objects relate to their properties. Is an object just the sum total of its properties, a mere coalescence of general features, or does it somehow lie behind its properties, supporting them, a solid peg on which they happen to hang? When I look at an object do I really see the object itself, or just the appearance its properties offer to me? I remember the feeling of fixation that came over me when I thought about these questions—a kind of floating fascination, a still perplexity.

When I look back on this period in my late teens, I recall the harnessing of undirected mental energy by intellectual pursuits. Up until then, my mental energy had gone into things like reading *Melody Maker*, which contained fairly serious articles about pop musicians; I always knew the top 20 off by heart, and studied the articles about drummers intensely, hoping to improve my own technique. I suspect that this kind of swashing mental energy is fairly typical of boys that age. School doesn't seem to connect with it, and it goes off in search of some object of interest, often trivial, sometimes destructive. In my case, it was philosophy that seized that energy and converted it into a passion—though one that took several years to form fully. It is a delicate and fastidious energy that I am speaking of, despite its power, and it will only be satisfied by certain employments, which of course vary from person to person. I had had a similar passion for chemistry when

I was ten, and for butterflies and lizards before that. How to harness such passions to formal education remains a great and unresolved problem.

It was—of course—a teacher who tapped into my formless and fizzing mental energy. Mr Marsh, teacher of divinity, brimmingly Christian, a man with very active eyebrows and sharp enunciation, in love with scholarship (oh, how he relished that word)—it was he who first brought out my inner philosopher. From him I heard of Descartes, locked up in his room, wondering whether anything could really be known beyond his own existence. But what I mainly got from the enthusiastic Mr Marsh was the desire to study. His own passion for study shone through, and he managed to make it seem, if not glamorous, then at least exhilarating—when done the right way and in the right spirit. Pencils and stationery were made to seem like shiny tools, and the pleasure of making one's mark on a blank sheet of paper hymned. Choosing a good spot to study was emphasised. Above all, I learned a very valuable lesson, one that had hitherto escaped me: make notes. Thinking and writing should be indissoluble activities, the hand ministering to the thought, the thought shaped by the hand. Today, if I find myself without pen and paper and thoughts start to arrive, my fingers begin to twitch and I long for those implements of cogitation. With such rudimentary tools you can perform the miracle of turning an invisible thought into a concrete mark, bringing the ethereal interior into the public external world, refining it into something precious and permanent. The physical pleasure of writing, which I find survives in the use of a computer, is something worth dwelling on in matters of education.

21. The passage is best described as being told from the point of view of a philosopher who is:
  - A. discussing metaphysical questions that have troubled philosophers since the time of Descartes.
  - B. presenting in chronological order the key events in his thirty-year professional career.
  - C. reflecting on his own early, developing interest in philosophy and in scholarship generally.
  - D. advising professional educators on how to get more students to study philosophy.
22. Based on the passage, which of the following was most likely the first to engage the author's passionate interest?
  - F. Drumming
  - G. Philosophy
  - H. Chemistry
  - J. Butterflies



23. The main purpose of the last paragraph is to:
- A. reveal the enduring impact of Mr. Marsh's lessons on the author.
  - B. acknowledge that the author came to doubt some of Mr. Marsh's teachings.
  - C. describe a typical class as taught by Mr. Marsh.
  - D. present a biographical sketch of Mr. Marsh.
24. The passage indicates that the man in the book-cover photograph represents:
- F. Descartes, wondering what could be known.
  - G. Mr. Marsh, deep in scholarly thought.
  - H. the author at age seventeen, thinking about enrolling in college.
  - J. the author at age eighteen, contemplating a philosophical issue.
25. The author mentions *Melody Maker*, the top 20, and articles about musicians primarily to suggest that his:
- A. early interest in music has remained with him to the present.
  - B. time spent playing music should instead have been spent reading.
  - C. fascination with pop music and musicians gave focus to his life for a time.
  - D. commitment to study enabled him to perfect his drumming technique.
26. In the third paragraph (lines 36–56), the author most nearly characterizes the energy he refers to as:
- F. potent yet difficult to channel in a constructive way.
  - G. powerful and typically leading to destructive results.
  - H. delicate and inevitably wasted in trivial undertakings.
  - J. gentle yet capable of uniting people who have different interests.
27. Viewed in the context of the passage, the statement in lines 55–56 is most likely intended to suggest that:
- A. schools should require students to take philosophy courses.
  - B. students can become passionate when learning about science in school.
  - C. schools need to keep searching for ways to tap into students' deeply held interests.
  - D. students should resolve to take school courses that interest them.
28. The author calls pen and paper “rudimentary tools” (line 80) as part of his argument that:
- F. the use of computers has made the use of pen and paper obsolete.
  - G. students should become skilled with pen and paper before moving on to better tools.
  - H. while writing with pen and paper can be pleasant, it can also be physically painful.
  - J. although seemingly simple, pen and paper allow people to perform great feats.
29. In the context of the passage, lines 17–23 are best described as presenting images of:
- A. gloom, tension, and fascination.
  - B. anger, bitterness, and betrayal.
  - C. stillness, peacefulness, and relaxation.
  - D. frustration, surprise, and satisfaction.
30. Which of the following does NOT reasonably describe the transition the author presents in lines 80–84?
- F. Precious to commonplace
  - G. Fleeting to permanent
  - H. Invisible to visible
  - J. Private to public

## Passage IV

**NATURAL SCIENCE:** This passage is adapted from *Consider the Eel* by Richard Schweid (©2002 by Richard Schweid).

The known facts, as they are pretty much universally accepted among biologists and naturalists today, are that all the eels in all the rivers of eastern North America and the Caribbean countries, and all the eels in all the rivers of eastern and western Europe, are born in the same area of the Sargasso Sea, a huge area within the Atlantic Ocean, between Bermuda and the Azores, the surface of which is frequently covered with sargassum seaweed. In fact, the word “Sargasso” comes from the Portuguese *sargaço*, meaning seaweed. The sea is about 2,000 miles long and 1,000 miles wide, set off from the surrounding waters of the Atlantic by strong currents. It includes the area known in popular legend as the Bermuda Triangle.

Eels hatch in the Sargasso as larvae and are carried by the ocean currents to either Europe or the United States, a journey that can cover thousands of miles and take years. Where they end up depends on which of two similar species they belong to. Those that are *Anguilla anguilla* invariably wind up in European rivers, and those that enter North American rivers always belong to the species *Anguilla rostrata*. The first person to find eel larvae in the Sargasso Sea was Danish researcher Johannes Schmidt, who published his findings in 1924, after spending 18 years hauling nets in search of eels.

The larvae of both species are shaped like small oval leaves and are called leptocephali. Each leptocephalus begins to assume the form of a tiny eel, called an elver or glass eel, when it gets close to the coasts of either Europe or the Americas. By the time it reaches brackish water, where fresh and salt water mix, it is thin and transparent, hardly bigger than a hair, with a pair of eyes like black dots at one end.

From the estuaries and mouths of rivers, the tiny eels frequently continue upstream, particularly the females, who sometimes go great distances inland. American eels have been found as far up the Mississippi River system as the rivers of Iowa. They keep going upriver until something tells them they’ve reached home, and then they stop. Whatever it is that signals to eels that they are home is definitive—they settle in and live there for as long as 20 years, growing up to a yard long before beginning their journey back to the Sargasso Sea. Scientists determine an eel’s age using a microscope to read the growth rings of its otolith—a small, hard calcium deposit at the base of its skull.

In preparation for the return journey to the Sargasso, sexually mature female eels feed voraciously and change color from the muddy-yellow/green of adult eels, often called yellow eels, to a darker green on top and snow-white on their bellies. At this stage, they are called silver eels. They swim downriver in the fall, on the first leg of their journey to the Sargasso, and when

they reach estuarine waters, they rest, completing their final transformation as silver eels. They will have eaten heavily and will be about 28 percent body fat. They will never eat again, and their digestive systems will atrophy. Their pupils will expand and turn blue. They will need a new kind of sight adapted to the depths of the sea, where there is little light. They will also have to go through a drastic adjustment, via osmosis, in their blood chemistry, to prepare for the tremendous change in water pressure, going from some 14 pounds of freshwater pressure per inch of their bodies to over a ton of ocean pressure per inch. Once they are back in the Sargasso Sea, the females produce eggs for the males to fertilize, and then the adults die.

At least that is what today’s marine biologists and naturalists tell us, although adult eels have never been seen swimming, reproducing, or dying in the Sargasso. In fact, live adult eels have never been seen there at all. The only two adult eels ever reported in the Sargasso Sea were dead, found in the stomachs of other fish. The eel’s migration back to its birthplace and what it actually does when it gets there are assumed to take place far below the water’s surface and, as of the year 2001, were still completely unobserved. However, the eel larvae—the leptocephali that Schmidt found in the Sargasso—were so small that it was certain they had been born recently, and nearby. Such small larvae have never been seen elsewhere, and while eels have never been observed reproducing in the Sargasso, they have never been seen doing so anywhere else either. Scientists believe the larvae hatch out of eggs at a depth of 100–300 yards and rise slowly toward the light at the sea’s surface.

31. One of the main ideas established by the passage is that:

- A. researchers have nearly exhausted their resources after spending decades investigating the Sargasso Sea.
- B. significant gaps still remain in researchers’ understanding of the life cycle of eels.
- C. eels live their entire lives in the Sargasso Sea, but no one has ever seen them there.
- D. female eels turn into silver eels toward the end of their lives.

32. Learning about which of the following had the largest impact on scientists’ current understanding of where eels breed?

- F. The direction in which ocean currents carry eel larvae
- G. The relationship of the yellow eel stage to the silver eel stage
- H. Schmidt’s discovery of eel larvae in the Sargasso Sea
- J. The adult eels found in the stomachs of other fish

33. The main purpose of the fourth paragraph (lines 34–47) is to describe the:
- A. eels' transition from freshwater to the ocean.
  - B. method of determining the age of eels.
  - C. complexity of the Mississippi River system.
  - D. river stage of the eel life cycle.
34. The passage states that the Sargasso Sea is set off from the rest of the Atlantic Ocean by:
- F. the Azores.
  - G. several Caribbean countries.
  - H. powerful winds.
  - J. strong currents.
35. The passage notes that the Sargasso Sea includes:
- A. the eastern North American shore.
  - B. the Bermuda Triangle.
  - C. certain coastal estuaries.
  - D. the mouth of the Mississippi River.
36. As it is used in line 13, the word *popular* most nearly means:
- F. well liked.
  - G. commonly known.
  - H. scientifically accepted.
  - J. most admired.
37. As it is used in line 45, the word *read* most nearly means to:
- A. learn from print.
  - B. observe.
  - C. think about.
  - D. predict.
38. The passage indicates that female eels' pupils expand and turn blue because the eels:
- F. must adapt to see in an environment with much less light than they are used to.
  - G. are about to undergo a change in their blood chemistry.
  - H. no longer need to be able to recognize food sources since they have stopped eating.
  - J. need to be able to recognize the male eels that will fertilize their eggs.
39. The passage most strongly emphasizes that the process of osmosis is necessary for the eels' transition from:
- A. shallower to deeper water.
  - B. feeding to nonfeeding.
  - C. immature to mature form.
  - D. elver to yellow eel.
40. According to the passage, which of the following characteristics of the eel larvae found by Schmidt provided the best evidence that the larvae were hatched in the Sargasso Sea?
- F. Size
  - G. Shape
  - H. Color
  - J. Species

**END OF TEST 3**

**STOP! DO NOT TURN THE PAGE UNTIL TOLD TO DO SO.**

**DO NOT RETURN TO A PREVIOUS TEST.**



## SCIENCE TEST

35 Minutes—40 Questions

**DIRECTIONS:** There are several passages in this test. Each passage is followed by several questions. After reading a passage, choose the best answer to each question and fill in the corresponding oval on your answer document. You may refer to the passages as often as necessary.

You are NOT permitted to use a calculator on this test.

## Passage I

Finch beak depth (see Figure 1) is an *inheritable* trait (it can be passed from parents to offspring).



Figure 1

Researchers studied the beak depth of 2 species of finches, *Geospiza fortis* and *Geospiza fuliginosa*. Both species live on Island A. *G. fortis* alone lives on Island B, and *G. fuliginosa* alone lives on Island C. For both species, the primary food is seeds. Birds with shallower beaks can efficiently crush and eat only small seeds. Birds with deeper beaks can crush and eat both large and small seeds, but they prefer small seeds.

## Study 1

Researchers captured 100 *G. fortis* finches and 100 *G. fuliginosa* finches on Island A. They tagged each bird, measured its beak depth, and released it. Then they calculated the percent of birds having each of the beak depths that had been measured. The researchers followed the same procedures with 100 *G. fortis* finches from Island B and 100 *G. fuliginosa* finches from Island C. The results of this study are shown in Figure 2.

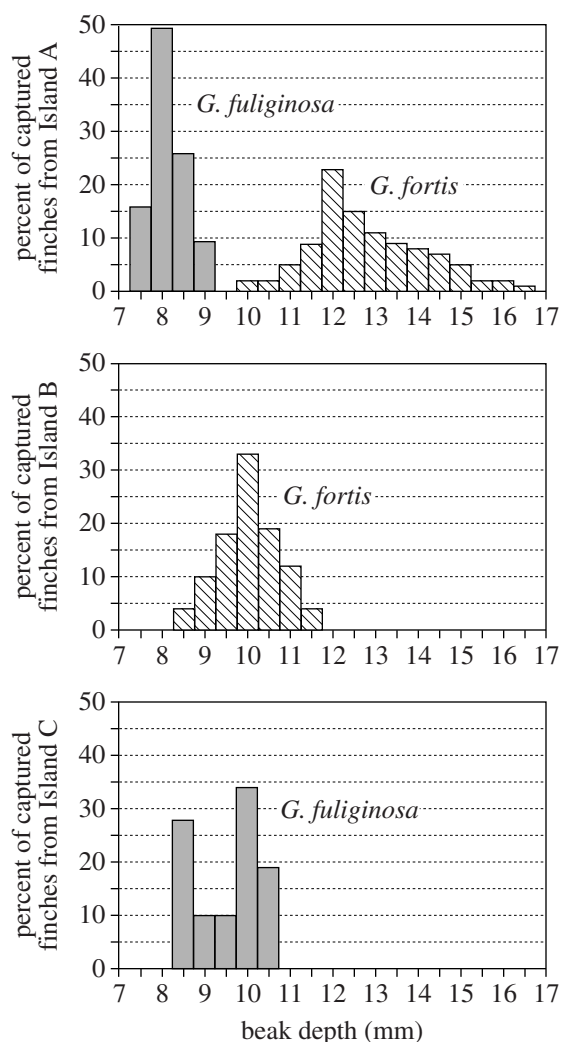


Figure 2

## Study 2

After completing Study 1, the researchers returned to Island B each of the next 10 years, from 1976 to 1985. During each visit, the researchers captured at least 50 *G. fortis* finches and measured their beak depths. Then



they calculated the average *G. fortis* beak depth for each of the 10 years. The researchers noted that, during the 10-year period, 3 years were exceptionally dry, and 1 year was very wet (see Figure 3). Small seeds are abundant during wet years. During dry years, all seeds are less abundant, and the average size of the available seeds is larger.

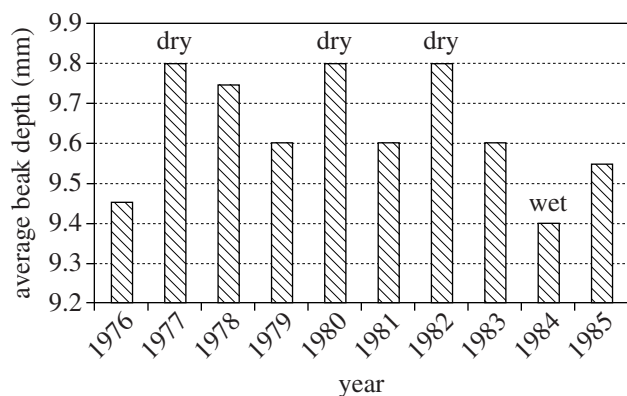


Figure 3

Figures adapted from Neil A. Campbell, Jane B. Reece, and Lawrence G. Mitchell, *Biology*, 5th ed. ©1999 by Benjamin/Cummings.

1. Based on the results of Study 1, the highest percent of finches on Island B and Island C had a beak depth of:

	Island B	Island C
A.	8 mm	8 mm
B.	9 mm	12 mm
C.	10 mm	8 mm
D.	10 mm	10 mm

2. During which of the following years were small seeds likely most abundant on Island B ?

F. 1977  
G. 1980  
H. 1982  
J. 1984

3. Study 1 differed from Study 2 in which of the following ways?

A. *G. fortis* finches were captured during Study 1 but not during Study 2.  
B. *G. fuliginosa* finches were captured during Study 1 but not during Study 2.  
C. The beak depth of captured birds was measured during Study 1 but not during Study 2.  
D. The beak depth of captured birds was measured during Study 2 but not during Study 1.

4. It is most likely that the researchers tagged the birds that they captured during Study 1 to:

F. determine how beak depth was affected by rainfall on Island A.  
G. determine the average age of each finch population.  
H. ensure that the beak depth of each finch was measured multiple times during Study 1.  
J. ensure that the beak depth of each finch was measured only once during Study 1.

5. Based on the results of Study 2, would a finch with a beak depth of 9.4 mm or a finch with a beak depth of 9.9 mm more likely have had a greater chance of survival during 1977 ?

A. A finch with a beak depth of 9.4 mm, because, on average, the size of available seeds is larger during dry years.  
B. A finch with a beak depth of 9.4 mm, because, on average, the size of available seeds is smaller during dry years.  
C. A finch with a beak depth of 9.9 mm, because, on average, the size of available seeds is larger during dry years.  
D. A finch with a beak depth of 9.9 mm, because, on average, the size of available seeds is smaller during dry years.

6. A researcher hypothesized that there would be more variation in the beak depths measured for the *G. fortis* finches when they were forced to compete with another finch species for seeds. Do the results of Study 1 support this hypothesis?

F. Yes; the range of beak depths measured for *G. fortis* finches was greater on Island A than on Island B.  
G. Yes; the range of beak depths measured for *G. fortis* finches was greater on Island B than on Island A.  
H. No; the range of beak depths measured for *G. fortis* finches was greater on Island A than on Island B.  
J. No; the range of beak depths measured for *G. fortis* finches was greater on Island B than on Island A.

## Passage II

Substances in the atmosphere, such as  $\text{Cu}^{2+}$ ,  $\text{Zn}^{2+}$ ,  $\text{Cl}^-$ , and  $\text{SO}_4^{2-}$  ions, are carried down to Earth's surface by precipitation. This process is known as *wet deposition*.  $\text{Cu}^{2+}$  and  $\text{Zn}^{2+}$  ions are put into the atmosphere by high-temperature combustion processes. The presence of  $\text{Cl}^-$  and  $\text{SO}_4^{2-}$  ions in the atmosphere can be attributed to road-salt dust and electrical power generation, respectively.

### Study 1

A rain gauge, placed on the roof of a 1-story building, at a specific urban site was used to collect precipitation over a 12-month period. At the same time each evening, the amount of precipitation in the rain gauge was recorded, after which the collected precipitation was emptied from the gauge and stored. (Assume no measurable evaporation occurred during any day.) Figure 1 shows the measured monthly precipitation in centimeters.

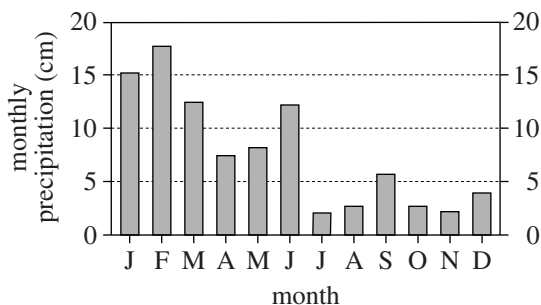


Figure 1

At the end of each month, all the samples collected during that month were mixed, and some of this combined sample was analyzed for the concentrations of  $\text{Cu}^{2+}$  and  $\text{Zn}^{2+}$  ions. Using these data, the monthly wet deposition of each substance, in micrograms ( $\mu\text{g}$ ) per meter<sup>2</sup>, was calculated (see Figure 2).

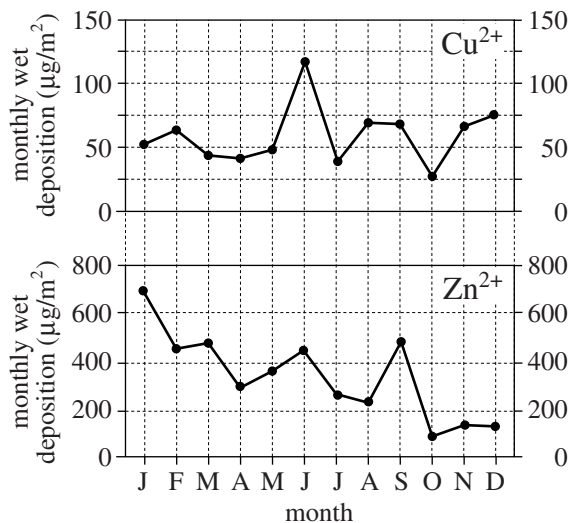


Figure 2

### Study 2

Another portion of the combined sample for each month was analyzed for the concentrations of  $\text{Cl}^-$  and  $\text{SO}_4^{2-}$  ions. Using these data, the monthly wet deposition of each substance, in milliequivalents (meq) per m<sup>2</sup>, was calculated (see Figure 3).

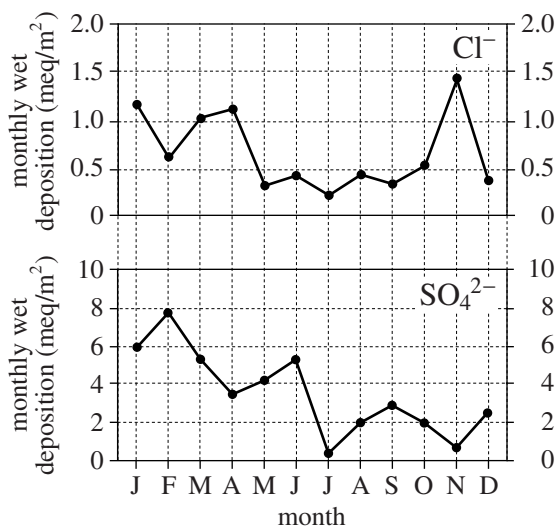


Figure 3

### Study 3

The *annual* wet deposition of  $\text{Cu}^{2+}$  and of  $\text{Zn}^{2+}$  for the 12-month period, in  $\mu\text{g}/\text{m}^2$ , was calculated for the urban site (the source of the  $\text{Cu}^{2+}$  and  $\text{Zn}^{2+}$ ) and also for Rural Sites 1 and 2, located 50 km and 100 km east, respectively, of the urban site (see Figure 4).

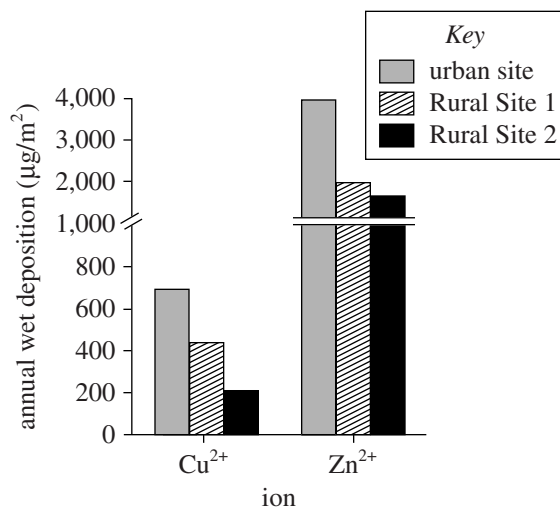


Figure 4

Figures adapted from Kathryn Conko et al., "Atmospheric Wet Deposition of Trace Elements to a Suburban Environment, Reston, Virginia, USA." ©2004 by Elsevier, Ltd.





7. According to Figure 1, over the 12-month period, the monthly precipitation at the urban site was maximum in February and minimum in July. According to Figures 2 and 3, the wet deposition of which ion was also maximum in February and minimum in July?
- A.  $\text{Cu}^{2+}$
  - B.  $\text{Zn}^{2+}$
  - C.  $\text{Cl}^-$
  - D.  $\text{SO}_4^{2-}$
8. Based on the results of Study 1, the average monthly wet deposition for  $\text{Cu}^{2+}$  over the 12-month period was:
- F. less than  $50 \mu\text{g}/\text{m}^2$ .
  - G. between  $50 \mu\text{g}/\text{m}^2$  and  $75 \mu\text{g}/\text{m}^2$ .
  - H. between  $75 \mu\text{g}/\text{m}^2$  and  $100 \mu\text{g}/\text{m}^2$ .
  - J. greater than  $100 \mu\text{g}/\text{m}^2$ .
9. Is the statement “The values for  $\text{Cl}^-$  wet deposition were greater during the winter and early spring when road salt is typically applied” supported by the results of Study 2 ?
- A. Yes, because  $\text{Cl}^-$  wet deposition values were, on average, greater from November to April than they were from May to October.
  - B. Yes, because  $\text{Cl}^-$  wet deposition values were, on average, less from November to April than they were from May to October.
  - C. No, because  $\text{Cl}^-$  wet deposition values were, on average, greater from November to April than they were from May to October.
  - D. No, because  $\text{Cl}^-$  wet deposition values were, on average, less from November to April than they were from May to October.
10. Suppose there had been no precipitation during 1 entire month of the 12-month period. Based on the information provided, during that month there would have been:
- F. significant wet deposition of all 4 substances.
  - G. significant wet deposition of  $\text{Cu}^{2+}$  and  $\text{Zn}^{2+}$ , but no wet deposition of  $\text{Cl}^-$  and  $\text{SO}_4^{2-}$ .
  - H. no wet deposition of any of the 4 substances.
  - J. no wet deposition of  $\text{Cu}^{2+}$  and  $\text{Zn}^{2+}$ , but significant wet deposition of  $\text{Cl}^-$  and  $\text{SO}_4^{2-}$ .
11. According to Study 3, as distance from the urban site increased, the annual wet deposition:
- A. increased for both  $\text{Cu}^{2+}$  and  $\text{Zn}^{2+}$ .
  - B. increased for  $\text{Cu}^{2+}$  but decreased for  $\text{Zn}^{2+}$ .
  - C. decreased for both  $\text{Cu}^{2+}$  and  $\text{Zn}^{2+}$ .
  - D. remained the same for both  $\text{Cu}^{2+}$  and  $\text{Zn}^{2+}$ .
12. Which of the following variables was kept constant in Study 2 ?
- F. Site
  - G. Monthly rainfall
  - H. Wet deposition of  $\text{Zn}^{2+}$
  - J. Wet deposition of  $\text{Cl}^-$



### Passage III

Cloud cover is the percent of Earth's surface covered by clouds. Cloud cover may increase because of an increase in the *cosmic ray flux* (number of high-energy particles from space reaching Earth per  $\text{m}^2$  per hour). Table 1 shows how Earth's cover of *low clouds* (0 km to 3.2 km altitude) varies with the cosmic ray flux. Figures 1–3 show the *relative cosmic ray flux*, RCRF (the percent below the flux measured on October 1, 1965), and the monthly average cover of *high clouds* (6.0 km to 16.0 km altitude), *middle clouds* (3.2 km to 6.0 km altitude), and low clouds, respectively, from January 1980 to January 1995.

Table 1	
Cosmic ray flux (particles/ $\text{m}^2/\text{hr}$ )	Cover of low clouds (%)
340,000	27.8
360,000	28.1
380,000	28.4
400,000	28.7
420,000	29.0

Table 1 adapted from E. Palle Bagó and C. J. Butler, "The Influence of Cosmic Rays on Terrestrial Clouds and Global Warming." ©2000 by Institute of Physics Publications, Ltd.

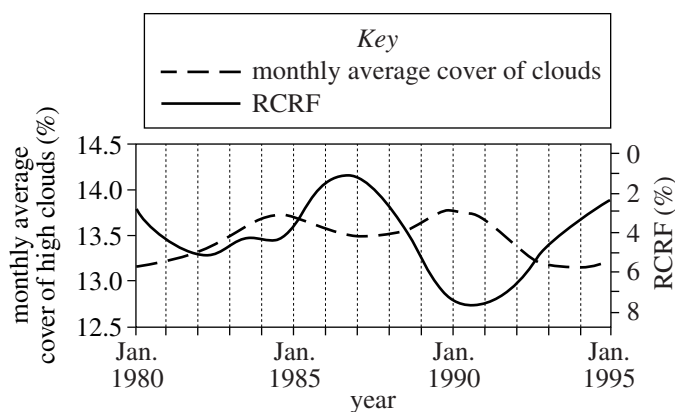


Figure 1

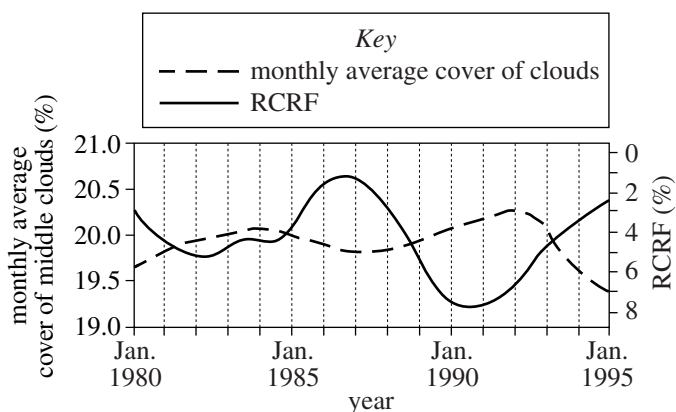


Figure 2

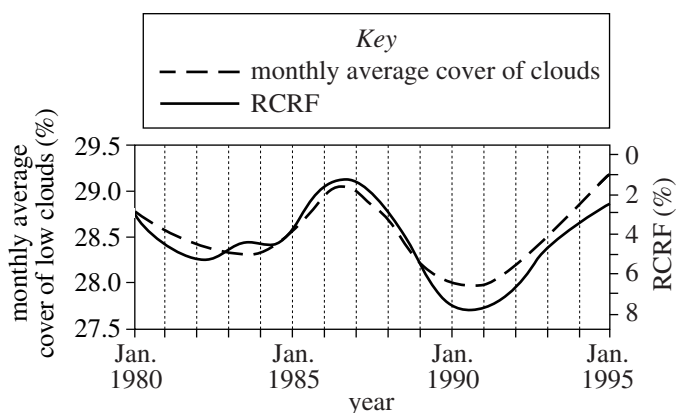
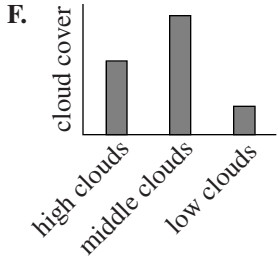
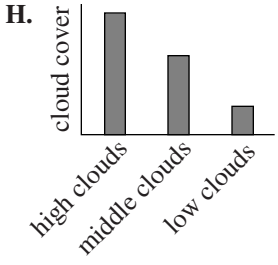
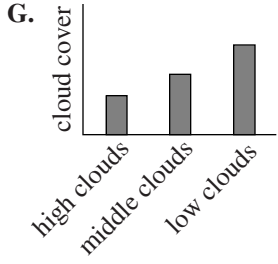
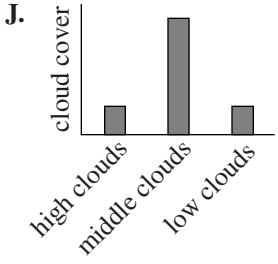


Figure 3

Figures adapted from Nigel Marsh and Henrik Svensmark, "Low Cloud Properties Influenced by Cosmic Rays." ©2000 by The American Physical Society.



13. The percent of Earth's surface covered by high clouds in January 1987 was closest to which of the following?
- 13.0%
  - 13.5%
  - 14.0%
  - 14.5%
14. Based on Table 1, a cosmic ray flux of 440,000 particles/m<sup>2</sup>/hr would correspond to a cover of low clouds that is closest to which of the following?
- 28.7%
  - 29.0%
  - 29.3%
  - 29.6%
15. Is the statement "The monthly average cover of low clouds is more directly correlated with cosmic ray flux than is the monthly average cover of high clouds" consistent with Figures 1 and 3 ?
- Yes, because the plot for the monthly average cover of low clouds more closely parallels the plot for RCRF.
  - Yes, because the plot for the monthly average cover of high clouds more closely parallels the plot for RCRF.
  - No, because the plot for the monthly average cover of low clouds more closely parallels the plot for RCRF.
  - No, because the plot for the monthly average cover of high clouds more closely parallels the plot for RCRF.
16. Which of the following figures best represents the monthly average cover of high, middle, and low clouds in January 1992 ?
- F.** 
- H.** 
- G.** 
- J.** 
17. High clouds are composed primarily of ice crystals, whereas low clouds are composed primarily of water droplets. This difference is most likely because the average air temperature at altitudes from:
- 0 km to 3.2 km is at or below 0°C, whereas the average air temperature at altitudes from 3.2 km to 6.0 km is above 0°C.
  - 0 km to 3.2 km is at or below 0°C, whereas the average air temperature at altitudes from 6.0 km to 16.0 km is above 0°C.
  - 0 km to 3.2 km is above 0°C, whereas the average air temperature at altitudes from 3.2 km to 6.0 km is at or below 0°C.
  - 0 km to 3.2 km is above 0°C, whereas the average air temperature at altitudes from 6.0 km to 16.0 km is at or below 0°C.



### Passage IV

*Acid-base titration* is a technique in which precise volumes of a *titrant* (an acid or base solution) are added incrementally to a known volume of a *sample solution* (a base or acid solution, respectively). This process can be monitored by adding an *acid-base indicator* (a substance that changes color over a certain pH range) to the sample solution or by measuring the sample solution's *conductivity*. Conductivity (measured in kilosiemens per centimeter, kS/cm) is a measure of a substance's ability to conduct electricity.

Two titration experiments were done at 25°C using a 0.10 M sodium hydroxide (NaOH) solution and either a 0.0010 M hydrochloric acid (HCl) solution or a 0.0010 M acetic acid solution (where M is moles of acid or base per liter of solution). All solutions were aqueous. An acid-base indicator solution of *nitrazine yellow* was also used. Nitrazine yellow is yellow if the pH is less than 6.0 or blue if the pH is greater than 7.0.

### Experiment 2

Experiment 1 was repeated, except that the acetic acid solution was used instead of the HCl solution (see Figure 2).

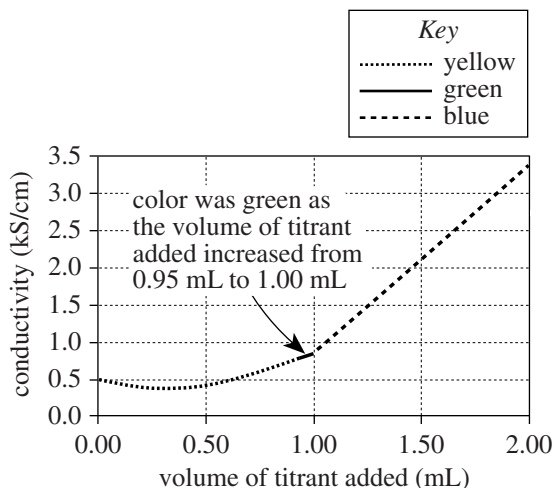


Figure 2

Figures adapted from J. West Loveland, "Conductance and Oscillography," in Gary D. Christian and James E. O'Reilly, eds., *Instrumental Analysis*, 2nd ed. ©1986 by Allyn and Bacon, Inc.

### Experiment 1

A drop of nitrazine yellow solution was added to a flask containing 100.0 mL of the HCl solution. A probe that measures conductivity was placed in the solution. The NaOH solution was slowly added to the HCl solution in small increments. After each addition, the HCl solution was stirred and then the solution's color and conductivity were recorded (see Figure 1).

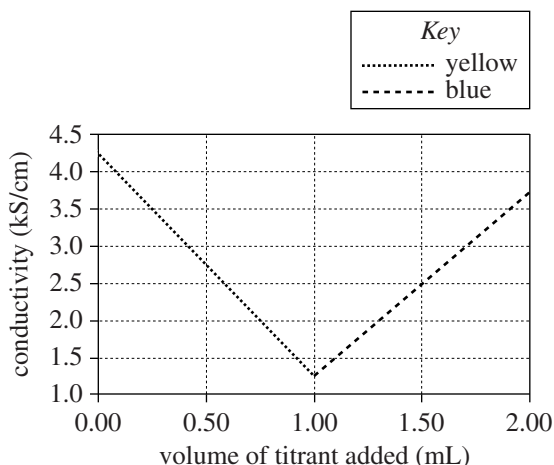


Figure 1

18. In Experiment 1, the sample solution was yellow at which of the following values for the volume of titrant added?

F. 0.80 mL  
G. 1.20 mL  
H. 1.60 mL  
J. 2.00 mL

19. In Experiment 2, the sample solution was neutral at which of the following values for the volume of titrant added?

A. 0.50 mL  
B. 1.00 mL  
C. 1.50 mL  
D. 2.00 mL



20. In Experiment 1, if 2.30 mL of titrant had been added to the sample solution, the conductivity would most likely have been:
- F. less than 0.80 kS/cm.
  - G. between 0.80 kS/cm and 2.30 kS/cm.
  - H. between 2.30 kS/cm and 3.80 kS/cm.
  - J. greater than 3.80 kS/cm.
21. In Experiment 2, which solution was the titrant and which solution was the sample solution?
- |    | <u>titrant</u> | <u>sample solution</u> |
|----|----------------|------------------------|
| A. | acetic acid    | NaOH                   |
| B. | HCl            | NaOH                   |
| C. | NaOH           | acetic acid            |
| D. | NaOH           | HCl                    |
22. In Experiments 1 and 2, the probe that was placed in the sample solution most likely did which of the following?
- F. Cooled the solution to its freezing point
  - G. Heated the solution to its boiling point
  - H. Detected the concentration of nitrazine yellow in the solution
  - J. Passed an electrical current through a portion of the solution
23. A chemist claimed that in Experiment 2, the pH of the sample solution was greater at a value of 0.2 mL of titrant added than at a value of 1.8 mL of titrant added. Do the results of Experiment 2 support this claim?
- A. No; at a value of 0.2 mL of titrant added, the sample solution was yellow, and at a value of 1.8 mL of titrant added, the sample solution was blue.
  - B. No; at a value of 0.2 mL of titrant added, the sample solution was blue, and at a value of 1.8 mL of titrant added, the sample solution was yellow.
  - C. Yes; at a value of 0.2 mL of titrant added, the sample solution was yellow, and at a value of 1.8 mL of titrant added, the sample solution was blue.
  - D. Yes; at a value of 0.2 mL of titrant added, the sample solution was blue, and at a value of 1.8 mL of titrant added, the sample solution was yellow.

**Passage V**

An astronomy class is given the following facts about stellar evolution.

1. A star's evolution can be divided into 3 stages: *pre-main sequence* (pre-MS), *main sequence* (MS), and *post-main sequence* (post-MS).
2. Gravity causes part of a cloud of gas and dust to collapse and heat up, creating a pre-MS star. The star's hot dust and gas emit its energy.
3. A pre-MS star becomes an MS star when the star produces the majority of its energy by fusing hydrogen nuclei (protons) at its center to make helium nuclei.
4. An MS star becomes a post-MS star when the star expands in volume and produces the majority of its energy by fusing hydrogen to make helium in a shell surrounding its center.
5. The more massive a star, the more rapidly the star passes through each of the 3 stages of its evolution.

Two students discuss the evolution of the *Algol system*—Algol A, a 3.6-solar-mass MS star; Algol B, a 0.8-solar-mass post-MS star; and Algol C, a 1.7-solar-mass MS star. (One solar mass = the Sun's mass.) The 3 stars orbit a mutual center of mass, with Algol A and Algol B much closer to each other and to the center of mass than to Algol C.

*Student 1*

The 3 stars of the Algol system formed at the same time from the same cloud of gas and dust. Algol B, originally the most massive of the 3 stars, became a post-MS star and expanded in volume while Algol A remained an MS star. Because the matter in the outer parts of Algol B was more strongly attracted to Algol A than to the matter in the inner parts of Algol B, this matter flowed from Algol B to Algol A, and, over time, Algol A became more massive than Algol B.

*Student 2*

Algol B was not part of the original Algol system (Algol A and Algol C). Algol B and the original Algol system formed in different clouds of gas and dust at different times and moved in 2 different but intersecting orbits around the center of the galaxy. During a particular orbit, Algol B encountered the original Algol system at the intersection of the 2 orbits and became part of the Algol system.

Algol B became a post-MS star while Algol A and Algol C remained MS stars. Algol B never lost mass to Algol A. Algol B was always less massive than Algol A.

24. Based on Student 2's discussion, Algol B is part of the present Algol system because of which of the following forces exerted on Algol B by the original Algol system?
  - F. Electric force
  - G. Magnetic force
  - H. Gravitational force
  - J. Nuclear force
25. Based on Student 1's discussion and Fact 4, while matter flowed between Algol A and Algol B, Algol B produced the majority of its energy by fusing:
  - A. hydrogen nuclei to make helium nuclei at its center.
  - B. hydrogen nuclei to make helium nuclei in a shell surrounding its center.
  - C. helium nuclei to make hydrogen nuclei at its center.
  - D. helium nuclei to make hydrogen nuclei in a shell surrounding its center.
26. Suppose that chemical composition is uniform among stars formed from the same cloud of gas and dust, but that chemical composition varies among stars formed from different clouds of gas and dust. Student 2 would most likely agree with which of the following statements comparing the chemical compositions of the stars in the present-day Algol system at the time they formed?
  - F. Algol A and Algol B had the most similar compositions.
  - G. Algol A and Algol C had the most similar compositions.
  - H. Algol B and Algol C had the most similar compositions.
  - J. Algol A, Algol B, and Algol C had the same composition.
27. If the mass of the Sun is  $2.0 \times 10^{30}$  kg, what is the mass of Algol C?
  - A.  $1.6 \times 10^{30}$  kg
  - B.  $2.0 \times 10^{30}$  kg
  - C.  $3.4 \times 10^{30}$  kg
  - D.  $7.2 \times 10^{30}$  kg
28. Which of the following statements best explains why the reaction described in Fact 3 requires a high temperature and pressure?
  - F. All protons are positively charged, and like charges attract each other.
  - G. All protons are positively charged, and like charges repel each other.
  - H. All electrons are negatively charged, and like charges attract each other.
  - J. All electrons are negatively charged, and like charges repel each other.





**29.** Based on Fact 5 and Student 1's discussion, which of the 3 stars in the Algol system, if any, was most likely the first to become an MS star?

- A.** Algol A
- B.** Algol B
- C.** Algol C
- D.** The 3 stars became MS stars at the same time.

**30.** Based on Fact 5, would Student 2 agree that by the time Algol A stops being an MS star, Algol A will have spent as much time being an MS star as Algol B spent being an MS star?

- F.** Yes, because according to Student 2, Algol A has always been more massive than Algol B.
- G.** Yes, because according to Student 2, Algol A has always been less massive than Algol B.
- H.** No, because according to Student 2, Algol A has always been more massive than Algol B.
- J.** No, because according to Student 2, Algol A has always been less massive than Algol B.

**Passage VI**

Three experiments were done using CO<sub>2</sub>, krypton (Kr), or O<sub>2</sub>. For each gas:

1. A 3 L steel vessel was fitted with a cap that contained a gas inlet valve and a pressure and temperature sensor.
2. Air was pumped out of the vessel until the pressure measured 0.00 torr.
3. The vessel was placed on a balance, and the balance was reset to 0.000 g.
4. Some of the gas was added to the vessel.
5. When the gas in the vessel reached room temperature (22°C), mass and pressure were recorded.
6. Steps 4 and 5 were repeated several times.

The experiments were then repeated, except that a 6 L vessel was used (see Figures 1 and 2).

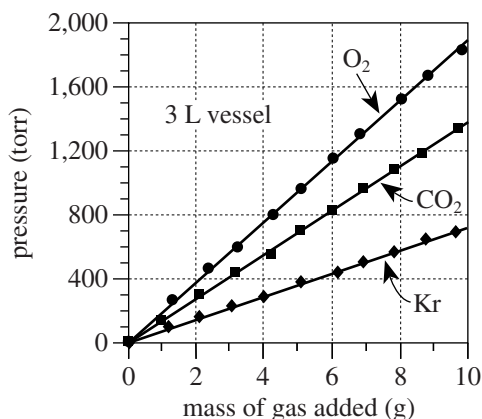


Figure 1

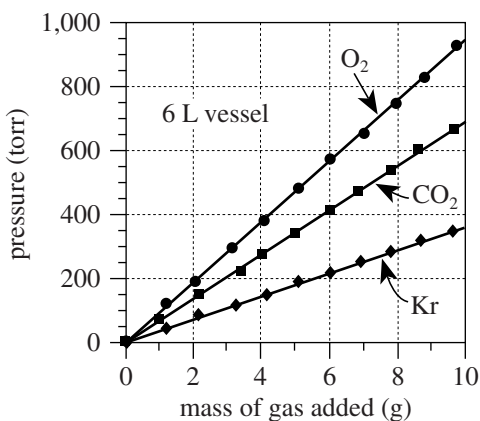


Figure 2

31. Based on Figure 2, if 13 g of Kr had been added to the 6 L vessel, the pressure would have been:
  - A. less than 200 torr.
  - B. between 200 torr and 400 torr.
  - C. between 400 torr and 600 torr.
  - D. greater than 600 torr.
32. Suppose the experiments had been repeated, except with a 5 L vessel. Based on Figures 1 and 2, the pressure exerted by 7 g of CO<sub>2</sub> would most likely have been:
  - F. less than 500 torr.
  - G. between 500 torr and 1,000 torr.
  - H. between 1,000 torr and 1,500 torr.
  - J. greater than 1,500 torr.
33. Based on Figures 1 and 2, for a given mass of O<sub>2</sub> at 22°C, how does the pressure exerted by the O<sub>2</sub> in a 6 L vessel compare to the pressure exerted by the O<sub>2</sub> in a 3 L vessel? In the 6 L vessel, the O<sub>2</sub> pressure will be:
  - A.  $\frac{1}{2}$  as great as in the 3 L vessel.
  - B. the same as in the 3 L vessel.
  - C. 2 times as great as in the 3 L vessel.
  - D. 4 times as great as in the 3 L vessel.
34. Which of the following best explains why equal masses of O<sub>2</sub> and CO<sub>2</sub> at the same temperature and in the same-size vessel had different pressures? The pressure exerted by the O<sub>2</sub> was:
  - F. less, because there were fewer O<sub>2</sub> molecules per gram than there were CO<sub>2</sub> molecules per gram.
  - G. less, because there were more O<sub>2</sub> molecules per gram than there were CO<sub>2</sub> molecules per gram.
  - H. greater, because there were fewer O<sub>2</sub> molecules per gram than there were CO<sub>2</sub> molecules per gram.
  - J. greater, because there were more O<sub>2</sub> molecules per gram than there were CO<sub>2</sub> molecules per gram.
35. Suppose the experiment involving O<sub>2</sub> and the 6 L vessel had been repeated, except at a room temperature of 14°C. For a given mass of O<sub>2</sub>, compared to the pressure measured in the original experiment, the pressure measured at 14°C would have been:
  - A. less, because pressure is directly proportional to temperature.
  - B. less, because pressure is inversely proportional to temperature.
  - C. greater, because pressure is directly proportional to temperature.
  - D. greater, because pressure is inversely proportional to temperature.

## Passage VII

The *human threshold of hearing* is the minimum intensity at each sound frequency required for a sound to be heard by humans. The *human threshold of pain* is the maximum intensity at each sound frequency that humans can tolerate without pain.

The figure below displays, for sounds in water and in air, the human thresholds of hearing and of pain. The figure also shows  $S$ , the percent increase in air density and water density that accompanies the compression of air and water by sound waves of given intensities. Sound intensities are given in decibels (db) and frequencies are given in hertz [(Hz); 1 Hz = 1 cycle/sec].

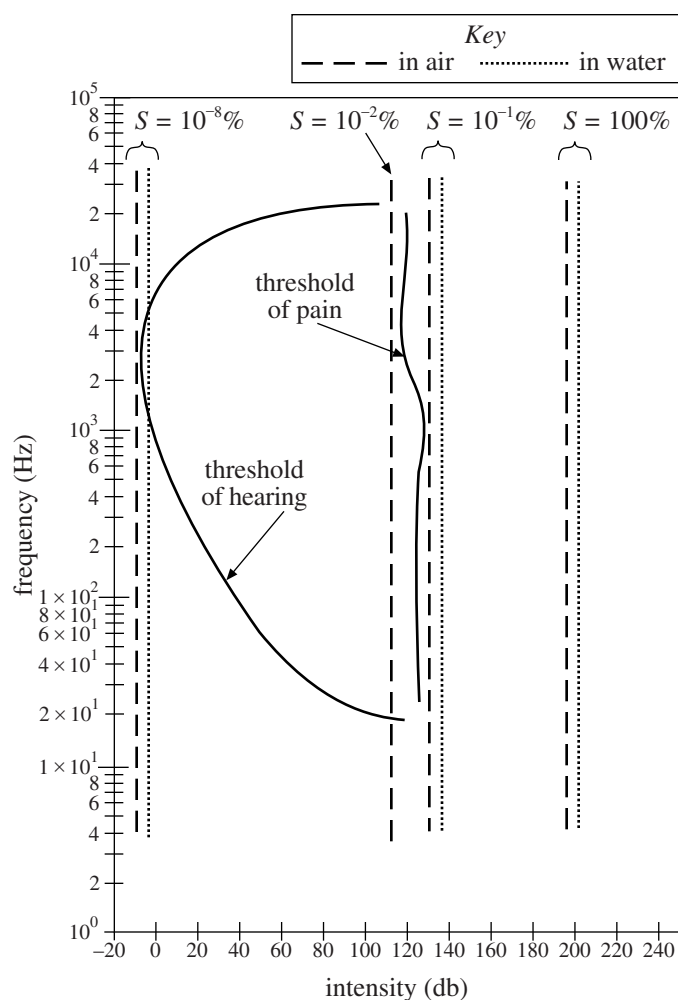
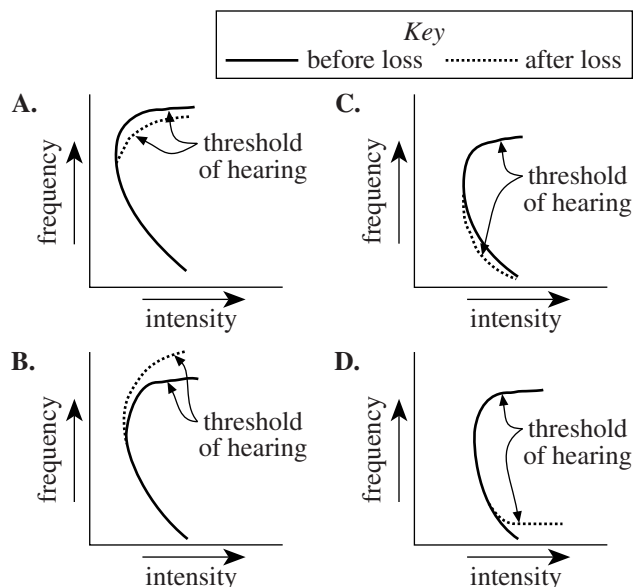


Figure adapted from Rita G. Lerner and George L. Trigg, eds., *Encyclopedia of Physics*, 2nd ed. ©1991 by VCH Publishers, Inc.

36. According to the figure, which of the following is closest to the lowest frequency that can be heard by a human being?

- F. 8 Hz
- G. 20 Hz
- H. 1,000 Hz
- J. 20,000 Hz

37. As humans age, it is common for selective hearing loss to occur at high sound frequencies. Which of the following figures best illustrates this loss?



38. Based on the figure, a sound of a given frequency will have the highest intensity for which of the following sets of conditions?

Sound is passing through:		$S$
F.	water	100%
G.	water	$10^{-8}\%$
H.	air	100%
J.	air	$10^{-8}\%$

39. A student hypothesized that sounds of any intensity at a frequency of  $10^5$  Hz would be painful for humans to hear. Do the data in the figure support this hypothesis?

- A. Yes, because the threshold of pain is relatively constant with changes in frequency.
- B. Yes, because as frequency increases above  $10^5$  Hz, the threshold of pain increases.
- C. No, because humans cannot hear sounds at  $10^5$  Hz.
- D. No, because the threshold of pain is relatively constant with changes in frequency.

40. Based on the figure, does  $S$  depend on the frequency of a sound wave of a given intensity?

- F. Yes, because as frequency increases,  $S$  increases.
- G. Yes, because as frequency increases,  $S$  remains constant.
- H. No, because as frequency increases,  $S$  increases.
- J. No, because as frequency increases,  $S$  remains constant.

END OF TEST 4

STOP! DO NOT RETURN TO ANY OTHER TEST.

**If you plan to take the ACT Plus Writing, sharpen your pencils and continue with the Writing Test on page 53.**

**If you do not plan to take the ACT Plus Writing, skip to page 55 for instructions on scoring your multiple-choice tests.**

## Practice Writing Test

Your Signature: \_\_\_\_\_  
(Do not print.)

Print Your Name Here: \_\_\_\_\_

Your Date of Birth:									
<input type="text"/>	<input type="text"/>	-	<input type="text"/>	<input type="text"/>	-	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Month			Day			Year			

# Form 14R



## WRITING TEST BOOKLET

**You must take the multiple-choice tests before you take the Writing Test.**

### Directions

This is a test of your writing skills. You will have thirty (30) minutes to write an essay in English. Before you begin planning and writing your essay, read the writing prompt carefully to understand exactly what you are being asked to do. Your essay will be evaluated on the evidence it provides of your ability to express judgments by taking a position on the issue in the writing prompt; to maintain a focus on the topic throughout the essay; to develop a position by using logical reasoning and by supporting your ideas; to organize ideas in a logical way; and to use language clearly and effectively according to the conventions of standard written English.

You may use the unlined pages in this test booklet to plan your essay. These pages will not be scored. ***You must write your essay in pencil on the lined pages in the answer folder.*** Your writing on those lined pages will be scored. You may not need all the lined pages, but to ensure you have enough room to finish, do NOT skip lines. You may write corrections or additions neatly between the lines of your essay, but do NOT write in the margins of the lined pages. ***Illegible essays cannot be scored, so you must write (or print) clearly.***

If you finish before time is called, you may review your work. Lay your pencil down immediately when time is called.

**DO NOT OPEN THIS BOOKLET UNTIL TOLD TO DO SO.**



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IOWA CITY, IA 52243-0168

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## **ACT Writing Test Prompt**

Rather than concentrating on doing one thing at a time, high school students often divide their attention among several activities, such as watching television and using the computer while doing homework. Educators debate whether performing several tasks at the same time is too distracting when students are doing homework. Some educators believe multitasking is a bad practice when doing homework because they think dividing attention between multiple tasks negatively affects the quality of students' work. Other educators do not believe multitasking is a bad practice when doing homework because they think students accomplish more during their limited free time as a result of multitasking. In your opinion, is it too distracting for high school students to divide their attention among several activities when they are doing homework?

In your essay, take a position on this question. You may write about either one of the two points of view given, or you may present a different point of view on this question. Use specific reasons and examples to support your position.

### **Note**

- For your practice essay, you will need scratch paper to plan your essay and four lined sheets of paper for your response.
- On test day, you will receive a test booklet with space to plan your essay and four lined pages on which to write your response.
- Read pages 61–62 for information and instructions on scoring your practice Writing Test.



# 5 Scoring Your Tests

## How to Score the Multiple-Choice Tests

Follow the instructions below and on the following pages to score your practice multiple-choice tests and review your performance.

### Raw Scores

The number of questions you answered correctly on each test and in each subscore area is your raw score. Because there are many forms of the ACT, each with different questions, some forms will be slightly easier (and some slightly harder) than others. A raw score of 67 on one form of the English Test, for example, may be about as difficult to earn as a raw score of 70 on another form of that test.

To compute your raw scores, check your answers with the scoring keys on pages 56–58. Count the number of correct answers for each of the four tests and seven subscore areas, and enter the number in the blanks provided on those pages. These numbers are your raw scores on the tests and subscore areas.

### Scale Scores

To adjust for the small differences that occur among different forms of the ACT, the raw scores for tests and subscore areas are converted into *scale scores*. Scale scores are printed on the reports sent to you and your college and scholarship choices.

When your raw scores are converted into scale scores, it becomes possible to compare your scores with those of examinees who took different test forms. For example, a scale score of 26 on the English Test has the same meaning regardless of the form of the ACT on which it is based.

To determine the scale scores corresponding to your raw scores on the practice test, use the score conversion tables on pages 59–60. Table 1 on page 59 shows the raw-to-scale score conversions for each test, and Table 2 on page 60 shows the raw-to-scale score conversions for the subscore areas. Because each form of the ACT is unique, each form has somewhat different conversion tables. Consequently, these tables provide only approximations of the raw-to-scale score conversions that would apply if a different form of the ACT were taken. Therefore, the scale scores obtained from the practice tests don't match precisely the scale scores received from an actual administration of the ACT.

### Computing the Composite Score

The Composite score is the average of the four scale scores in English, Mathematics, Reading, and Science. If you left any of these tests blank, do not calculate a Composite score. If you take the ACT Plus Writing, your Writing results do **not** affect your Composite score.

## Comparing Your Scores

You may want to know how your scores compare to the scores of other students who took the ACT.

Table 3A on page 61 lets you compare your scores on the practice multiple-choice tests with the scores of recent high school graduates who took the ACT. The numbers reported are cumulative percents. A cumulative percent is the percent of students who scored *at or below* a given score. If a Composite score of 20 has a cumulative percent of 48, this means that 48% of students had a Composite score of 20 or lower.

Your scores and percent at or below are only *estimates* of the scores that you will receive during an actual administration of the ACT. Test scores are only one indicator of your level of learning. Consider your scores in connection with your grades, your performance in outside activities, and your career interests.

## College Readiness Standards

The College Readiness Standards describe the types of skills, strategies, and understandings you will need to make a successful transition from high school to college. For English, Mathematics, Reading, and Science, standards are provided for six score ranges that reflect the progression and complexity of the skills in each of the academic areas measured by the ACT tests. For Writing, standards are provided for five score ranges. The College Readiness Standards and benchmark scores for each test can be found at [www.act.org/standard](http://www.act.org/standard) and [www.act.org/education/benchmarks.html](http://www.act.org/education/benchmarks.html).

## Reviewing Your Performance on the Practice Multiple-Choice Tests

Consider the following as you review your scores.

- Did you run out of time? Reread the information in this booklet on pacing yourself. You may need to adjust the way you use your time in responding to the questions.
- Did you spend too much time trying to understand the directions for the tests? The directions for the practice tests are the same directions that will appear in your test booklet on test day. Make sure you understand them before test day.
- Review the questions that you missed. Did you select a response that was an incomplete answer or that did not directly respond to the question being asked? Try to figure out what you overlooked in answering the questions.
- Did a particular type of question confuse you? Did the questions you missed come from a particular subscore area? In reviewing your responses, check to see whether a particular type of question or a particular subscore area was more difficult for you.

## Scoring Keys for the ACT Practice Tests

Use the scoring key for each test to score your answer document for the multiple-choice tests. Mark a “1” in the blank for each question you answered correctly. Add up the numbers in each subscore area and enter the total number correct for each subscore area in the blanks provided. Also enter the total number correct for each test in the blanks provided. The total number correct for each test is the sum of the number correct in each subscore area.

### Test 1: English—Scoring Key

Subscore Area*			Subscore Area*		
Key	UM	RH	Key	UM	RH
1. B	___		39. C		___
2. J	___		40. J		___
3. D		___	41. B	___	
4. F	___		42. F	___	___
5. B		___	43. B	___	
6. J	___		44. J		___
7. D		___	45. A	___	
8. F	___		46. J	___	
9. A		___	47. C	___	
10. H	___		48. F		___
11. A		___	49. B	___	
12. H	___		50. F	___	
13. D	___		51. B		___
14. G	___		52. J		___
15. B		___	53. D	___	
16. G	___		54. H		___
17. C	___		55. A	___	
18. G		___	56. H	___	
19. D		___	57. B		___
20. F		___	58. H	___	
21. B	___		59. A		___
22. J	___		60. G		___
23. C	___		61. A	___	
24. F		___	62. H	___	
25. C	___		63. A	___	
26. G	___		64. H		___
27. A		___	65. D		___
28. G		___	66. G		___
29. C		___	67. A		___
30. J		___	68. J		___
31. B		___	69. A		___
32. J		___	70. G	___	
33. D		___	71. D	___	
34. H	___		72. J	___	
35. B	___		73. C	___	
36. H	___		74. G	___	
37. C	___		75. D		___
38. F	___				

#### Number Correct (Raw Score) for:

Usage/Mechanics (UM) Subscore Area \_\_\_\_\_  
(40)

Rhetorical Skills (RH) Subscore Area \_\_\_\_\_  
(35)

Total Number Correct for English Test  
(UM + RH) \_\_\_\_\_  
(75)

\*UM = Usage/Mechanics

RH = Rhetorical Skills

1267C

### Test 2: Mathematics—Scoring Key

Subscore Area*				Subscore Area*			
Key	EA	AG	GT	Key	EA	AG	GT
1. A	___			35. D	___		
2. F	___			36. F		___	
3. E	___			37. B			___
4. J	___			38. G			___
5. C	___			39. C		___	
6. K	___			40. G			___
7. E	___			41. B		___	
8. H	___			42. F			___
9. A	___			43. D	___		
10. J			___	44. H			___
11. D			___	45. A			___
12. K	___			46. J	___		
13. B	___			47. C			___
14. F		___		48. H			___
15. C		___		49. B		___	
16. J	___			50. F		___	
17. B			___	51. C	___		
18. J			___	52. J		___	
19. D	___			53. E		___	
20. J			___	54. K	___		
21. E	___			55. C	___		
22. G			___	56. J			___
23. B	___			57. E			___
24. H		___		58. G		___	
25. A		___		59. C	___		
26. G	___			60. F		___	
27. B			___				
28. H		___					
29. E		___					
30. K		___					
31. E			___				
32. G	___						
33. D		___					
34. F		___					

#### Number Correct (Raw Score) for:

Pre-Alg./Elem. Alg. (EA) Subscore Area \_\_\_\_\_  
(24)

Inter. Alg./Coord. Geo. (AG) Subscore Area \_\_\_\_\_  
(18)

Plane Geo./Trig. (GT) Subscore Area \_\_\_\_\_  
(18)

Total Number Correct for Math Test (EA + AG + GT) \_\_\_\_\_  
(60)

\*EA = Pre-Algebra/Elementary Algebra

AG = Intermediate Algebra/Coordinate Geometry

GT = Plane Geometry/Trigonometry

1267C

### Test 3: Reading—Scoring Key

Subscore Area*			Subscore Area*			Subscore Area*		
Key	SS	AL	Key	SS	AL	Key	SS	AL
1. D		_____	15. D	_____		29. A		_____
2. H		_____	16. H	_____		30. F		_____
3. B		_____	17. B	_____		31. B	_____	
4. G		_____	18. J	_____		32. H	_____	
5. B		_____	19. A	_____		33. D	_____	
6. F		_____	20. F	_____		34. J	_____	
7. C		_____	21. C		_____	35. B	_____	
8. F		_____	22. J		_____	36. G	_____	
9. D		_____	23. A		_____	37. B	_____	
10. H		_____	24. J		_____	38. F	_____	
11. C	_____		25. C		_____	39. A	_____	
12. F	_____		26. F		_____	40. F	_____	
13. C	_____		27. C		_____			
14. G	_____		28. J		_____			

#### Number Correct (Raw Score) for:

Social Studies/Sciences (SS) Subscore Area	_____
	(20)
Arts/Literature (AL) Subscore Area	_____
	(20)
Total Number Correct for Reading Test (SS + AL)	_____
	(40)

\*SS = Social Studies/Sciences  
AL = Arts/Literature

### Test 4: Science—Scoring Key

Key	Key	Key
1. D	15. A	29. B
2. J	16. G	30. H
3. B	17. D	31. C
4. J	18. F	32. G
5. C	19. B	33. A
6. F	20. J	34. J
7. D	21. C	35. A
8. G	22. J	36. G
9. A	23. A	37. A
10. H	24. H	38. F
11. C	25. B	39. C
12. F	26. G	40. J
13. B	27. C	
14. H	28. G	

#### Number Correct (Raw Score) for:

Total Number Correct for Science Test	_____
	(40)

**TABLE 1****Explanation of Procedures Used to Obtain Scale Scores from Raw Scores**

On each of the four multiple-choice tests on which you marked any responses, the total number of correct responses yields a raw score. Use the table below to convert your raw scores to scale scores. For each test, locate and circle your raw score or the range of raw scores that includes it in the table below. Then, read across to either outside column of the table and circle the scale score that corresponds to that raw score. As you determine your scale scores, enter them in the blanks provided on the right. The highest possible scale score for each test is 36. The lowest possible scale score for any test on which you marked any responses is 1.

Next, compute the Composite score by averaging the four scale scores. To do this, add your four scale scores and divide the sum by 4. If the resulting number ends in a fraction, round it off to the nearest whole number. (Round down any fraction less than one-half; round up any fraction that is one-half or more.) Enter this number in the blank. This is your Composite score. The highest possible Composite score is 36. The lowest possible Composite score is 1.

**ACT Test 67C****Your Scale Score**

English \_\_\_\_\_

Mathematics \_\_\_\_\_

Reading \_\_\_\_\_

Science \_\_\_\_\_

**Sum of scores** \_\_\_\_\_**Composite score (sum ÷ 4)** \_\_\_\_\_

NOTE: If you left a test completely blank and marked no items, do not list a scale score for that test. If any test was completely blank, do not calculate a Composite score.

Scale Score	Raw Scores				Scale Score
	Test 1 English	Test 2 Mathematics	Test 3 Reading	Test 4 Science	
36	75	59-60	40	40	36
35	73-74	57-58	39	39	35
34	71-72	55-56	38	38	34
33	70	54	—	37	33
32	69	53	37	—	32
31	68	52	36	36	31
30	67	50-51	35	35	30
29	66	49	34	34	29
28	64-65	47-48	33	33	28
27	62-63	45-46	32	31-32	27
26	60-61	43-44	31	30	26
25	58-59	41-42	30	28-29	25
24	56-57	38-40	29	26-27	24
23	53-55	36-37	27-28	24-25	23
22	51-52	34-35	26	23	22
21	48-50	33	25	21-22	21
20	45-47	31-32	23-24	19-20	20
19	42-44	29-30	22	17-18	19
18	40-41	27-28	20-21	16	18
17	38-39	24-26	19	14-15	17
16	35-37	19-23	18	13	16
15	33-34	15-18	16-17	12	15
14	30-32	12-14	14-15	11	14
13	29	10-11	13	10	13
12	27-28	8-9	11-12	9	12
11	25-26	6-7	9-10	8	11
10	23-24	5	8	7	10
9	20-22	4	7	6	9
8	17-19	—	6	5	8
7	14-16	3	5	4	7
6	11-13	—	4	3	6
5	9-10	2	3	—	5
4	6-8	—	—	2	4
3	5	1	2	1	3
2	3-4	—	1	—	2
1	0-2	0	0	0	1

# TABLE 2

## Explanation of Procedures Used to Obtain Scale Subscores from Raw Scores

For each of the seven subscore areas, the total number of correct responses yields a raw score. Use the table below to convert your raw scores to scale subscores. For each of the seven subscore areas, locate and circle either the raw score or the range of raw scores that includes it in the table below. Then, read across to either outside column of the table and circle the scale subscore that corresponds to that raw score. As you determine your scale subscores, enter them in the blanks provided on the right. The highest possible scale subscore is 18. The lowest possible scale subscore is 1.

If you left a test completely blank and marked no responses, do not list any scale subscores for that test.

ACT Test 67C Your Scale Subscore

### English

Usage/Mechanics \_\_\_\_\_

Rhetorical Skills \_\_\_\_\_

### Mathematics

Pre-Algebra/Elementary Algebra \_\_\_\_\_

Intermed. Algebra/Coord. Geometry \_\_\_\_\_

Plane Geometry/Trigonometry \_\_\_\_\_

### Reading

Social Studies/Sciences \_\_\_\_\_

Arts/Literature \_\_\_\_\_

Scale Subscore	Raw Scores							Scale Subscore
	Test 1 English		Test 2 Mathematics			Test 3 Reading		
	Usage/ Mechanics	Rhetorical Skills	Pre-Algebra/ Elem. Algebra	Inter. Algebra/ Coord. Geometry	Plane Geometry/ Trigonometry	Social Studies/ Sciences	Arts/ Literature	
18	39-40	35	23-24	18	18	20	20	18
17	37-38	34	22	17	17	19	18-19	17
16	35-36	33	21	16	16	18	—	16
15	34	31-32	20	15	14-15	17	17	15
14	32-33	29-30	19	13-14	13	16	16	14
13	31	27-28	18	12	11-12	15	15	13
12	29-30	25-26	17	10-11	10	14	14	12
11	27-28	22-24	16	9	9	12-13	13	11
10	24-26	20-21	15	7-8	7-8	11	12	10
9	22-23	18-19	13-14	6	6	9-10	11	9
8	20-21	15-17	11-12	4-5	5	8	10	8
7	18-19	13-14	9-10	—	4	6-7	9	7
6	16-17	12	6-8	3	3	5	8	6
5	14-15	10-11	5	2	—	4	6-7	5
4	12-13	8-9	3-4	—	2	3	5	4
3	9-11	5-7	2	1	—	2	3-4	3
2	6-8	3-4	1	—	1	1	2	2
1	0-5	0-2	0	0	0	0	0-1	1

# TABLES 3A and 3B

## Norms Tables

Use the norms tables below (3A and 3B) to determine your estimated percent at or below for each of your multiple-choice scale scores (3A), and for your Writing scores (3B), if applicable.

In the far left column of the multiple-choice norms table (3A), circle your scale score for the English Test (from page 59). Then read across to the percent at or below column for that test; circle or put a check mark beside the corresponding percent at or below. Use the same procedure for each test and subscore area. Use the far right column of scale scores in Table 3A, for your Science Test and Composite scores. Follow the same procedure on the Writing Test norms to get your estimated percent at or below for your Writing subscore and Combined English/Writing score.

As you mark your percents at or below, enter them in the blanks provided at the right. You may also find it helpful to compare your performance with the national mean (average) score for each of the tests, subscore areas, and the Composite as shown at the bottom of the norms tables.

**Your Estimated  
Percent At or Below  
on Practice Test**

### English

Usage/Mechanics

Rhetorical Skills

### Mathematics

Pre-Algebra/Elem. Alg.

Alg./Coord. Geometry

Plane Geometry/Trig.

### Reading

Soc. Studies/Sciences

Arts/Literature

### Science

### Composite

### Combined English/Writing

### Writing

## 3A

### National Distributions of Cumulative Percents for ACT Test Scores ACT-Tested High School Graduates from 2010, 2011, and 2012

Score	ENGLISH	Usage/Mechanics	Rhetorical Skills	MATHEMATICS	Pre-Algebra/Elem. Alg.	Alg./Coord. Geometry	Plane Geometry/Trig.	READING	Soc. Studies/Sciences	Arts/Literature	SCIENCE	COMPOSITE	Score
36	99			99				99			99	99	36
35	99			99				99			99	99	35
34	98			99				99			99	99	34
33	97			98				97			99	99	33
32	96			97				95			98	98	32
31	94			96				93			97	97	31
30	92			95				90			96	95	30
29	90			93				88			95	93	29
28	88			91				85			93	91	28
27	85			88				82			91	87	27
26	82			84				78			87	83	26
25	78			79				75			83	79	25
24	74			73				71			77	74	24
23	68			67				66			70	68	23
22	63			61				61			62	62	22
21	57			55				54			56	55	21
20	50			51				48			47	48	20
19	43			46				42			38	41	19
18	38	99	99	41	99	99	99	36	99	99	31	34	18
17	34	96	99	34	96	99	99	30	97	97	24	28	17
16	29	92	98	26	91	98	98	25	93	91	19	22	16
15	24	88	92	14	87	95	95	20	87	85	15	16	15
14	19	83	86	05	81	92	90	15	82	79	11	11	14
13	14	77	79	02	74	83	82	10	76	73	08	06	13
12	12	72	70	01	66	72	73	07	69	65	05	03	12
11	09	64	60	01	58	63	62	03	59	57	03	01	11
10	06	55	48	01	48	50	51	02	50	48	02	01	10
09	04	44	39	01	40	36	38	01	40	39	01	01	09
08	02	35	27	01	32	22	25	01	29	31	01	01	08
07	01	27	19	01	21	12	15	01	19	23	01	01	07
06	01	19	13	01	09	07	09	01	10	17	01	01	06
05	01	13	09	01	03	04	05	01	05	09	01	01	05
04	01	08	05	01	01	02	03	01	02	04	01	01	04
03	01	04	02	01	01	01	02	01	01	01	01	01	03
02	01	01	01	01	01	01	01	01	01	01	01	01	02
01	01	01	01	01	01	01	01	01	01	01	01	01	01
Mean	20.5	10.2	10.5	21.0	10.9	10.6	10.5	21.3	10.8	10.8	20.9	21.1	
S.D.	6.5	4.0	3.4	5.3	3.6	2.9	3.1	6.2	3.5	3.9	5.1	5.2	

Note: These norms are the source of national norms, for multiple-choice tests, printed on ACT score reports during the 2012–2013 testing year. Sample size: 4,853,875.

## 3B

### National Distributions of Cumulative Percents for ACT Writing Test Scores

#### ACT-Tested High School Graduates from 2010, 2011, and 2012

Score	Combined English/Writing	Writing
36	99	
35	99	
34	99	
33	99	
32	99	
31	98	
30	95	
29	93	
28	90	
27	87	
26	84	
25	79	
24	74	
23	69	
22	61	
21	55	
20	47	
19	41	
18	34	
17	29	
16	24	
15	19	
14	15	
13	11	
12	8	99
11	6	99
10	4	99
9	2	95
8	1	87
7	1	51
6	1	37
5	1	11
4	1	7
3	1	2
2	1	1
1	1	
Mean	20.8	7.1
S.D.	5.7	1.6

Note: These norms are the source of the Writing Test norms printed on the ACT score reports of students who take the optional Writing Test during 2012–2013. Sample size: 2,705,197.



# How to Score the Writing Test

It is difficult to be objective about one's own work. However, it is to your advantage to read your own writing critically. Becoming your own editor helps you grow as a writer and as a reader. It may also be helpful for you to give your practice essay to another reader: a classmate, parent, or teacher. To rate your essay, you and your reader(s) should review the scoring guidelines and sample essays at [www.actstudent.org/writing](http://www.actstudent.org/writing), and then assign your practice essay a score of 1 (low) through 6 (high).

## Scoring Guidelines (below)

These are the guidelines that will be used to score your essay. To score your paper, read your response and try to determine which score point best describes your essay.

Because your Writing Test subscore (2–12 range) is the sum of two readers' ratings of your essay, you should multiply your score

by 2 when you use Table 4, on page 62, to find your Combined English/Writing score. If two readers score your practice essay, add those scores together.

## Comparing Your Scores

The Writing Test norms table (Table 3B on page 60) allows you to compare your score on the practice Writing Test with the scores of recent high school graduates who took the ACT Plus Writing. If a Writing subscore of 8 has a cumulative percent of 86, this means that 86% of students had a Writing subscore of 8 or lower. Your scores and percents at or below are only *estimates* of the scores you will receive on an actual administration of the ACT Plus Writing. They should be considered in connection with your performance on other essay tests and your planned college curriculum.

## Scoring Guidelines for the ACT Writing Test

Papers at each level exhibit *all* or *most* of the characteristics described at each score point.

### Score = 6—Essays within this score demonstrate effective skill in responding to the task.

The essay shows a clear understanding of the task. The essay takes a position on the issue and may offer a critical context for discussion. The essay addresses complexity by examining different perspectives on the issue, or by evaluating the implications and/or complications of the issue, or by fully responding to counterarguments to the writer's position. Development of ideas is ample, specific, and logical. Most ideas are fully elaborated. A clear focus on the specific issue in the prompt is maintained. The organization of the essay is clear: the organization may be somewhat predictable or it may grow from the writer's purpose. Ideas are logically sequenced. Most transitions reflect the writer's logic and are usually integrated into the essay. The introduction and conclusion are effective, clear, and well developed. The essay shows a good command of language. Sentences are varied and word choice is varied and precise. There are few, if any, errors to distract the reader.

### Score = 5—Essays within this score demonstrate competent skill in responding to the task.

The essay shows a clear understanding of the task. The essay takes a position on the issue and may offer a broad context for discussion. The essay shows recognition of complexity by partially evaluating the implications and/or complications of the issue, or by responding to counterarguments to the writer's position. Development of ideas is specific and logical. Most ideas are elaborated, with clear movement between general statements and specific reasons, examples, and details. Focus on the specific issue in the prompt is maintained. The organization of the essay is clear, although it may be predictable. Ideas are logically sequenced, although simple and obvious transitions may be used. The introduction and conclusion are clear and generally well developed. Language is competent. Sentences are somewhat varied and word choice is sometimes varied and precise. There may be a few errors, but they are rarely distracting.

### Score = 4—Essays within this score demonstrate adequate skill in responding to the task.

The essay shows an understanding of the task. The essay takes a position on the issue and may offer some context for discussion. The essay may show some recognition of complexity by providing some response to counterarguments to the writer's position. Development of ideas is adequate, with some movement between general statements and specific reasons, examples, and details. Focus on the specific issue in the prompt is maintained throughout most of the essay. The organization of the essay is apparent but predictable. Some evidence of logical sequencing of ideas is apparent, although most transitions are simple and obvious. The introduction and conclusion are clear and somewhat developed. Language is adequate, with some sentence variety and appropriate word choice. There may be some distracting errors, but they do not impede understanding.

### Score = 3—Essays within this score demonstrate some developing skill in responding to the task.

The essay shows some understanding of the task. The essay takes a position on the issue but does not offer a context for discussion. The essay may acknowledge a counterargument to the writer's position, but its development is brief or unclear. Development of ideas is limited and may be repetitious, with little, if any, movement between general statements and specific reasons, examples, and details. Focus on the general topic is maintained, but focus on the specific issue in the prompt may not be maintained. The organization of the essay is simple. Ideas are logically grouped within parts of the essay, but there is little or no evidence of logical sequencing of ideas. Transitions, if used, are simple and obvious. An introduction and conclusion are clearly discernible but underdeveloped. Language shows a basic control. Sentences show a little variety and word choice is appropriate. Errors may be distracting and may occasionally impede understanding.

### Score = 2—Essays within this score demonstrate inconsistent or weak skill in responding to the task.

The essay shows a weak understanding of the task. The essay may not take a position on the issue, or the essay may take a position but fail to convey reasons to support that position, or the essay may take a position but fail to maintain a stance. There is little or no recognition of a counterargument to the writer's position. The essay is thinly developed. If examples are given, they are general and may not be clearly relevant. The essay may include extensive repetition of the writer's ideas or of ideas in the prompt. Focus on the general topic is maintained, but focus on the specific issue in the prompt may not be maintained. There is some indication of an organizational structure, and some logical grouping of ideas within parts of the essay is apparent. Transitions, if used, are simple and obvious, and they may be inappropriate or misleading. An introduction and conclusion are discernible but minimal. Sentence structure and word choice are usually simple. Errors may be frequently distracting and may sometimes impede understanding.

### Score = 1—Essays within this score show little or no skill in responding to the task.

The essay shows little or no understanding of the task. If the essay takes a position, it fails to convey reasons to support that position. The essay is minimally developed. The essay may include excessive repetition of the writer's ideas or of ideas in the prompt. Focus on the general topic is usually maintained, but focus on the specific issue in the prompt may not be maintained. There is little or no evidence of an organizational structure or of the logical grouping of ideas. Transitions are rarely used. If present, an introduction and conclusion are minimal. Sentence structure and word choice are simple. Errors may be frequently distracting and may significantly impede understanding.

### No Score—Blank, Off-Topic, Illegible, Not in English, or Void

**TABLE 4****Calculating Your Combined English/Writing Score**

Complete these steps to calculate your Combined English/Writing score for your practice tests.

1. Locate your scale score for the English Test on page 61 and enter it here: \_\_\_\_\_.
2. Enter your Writing Test score (1–6) here \_\_\_\_\_ and double it to get your Writing subscore (2–12): \_\_\_\_\_  
(If two people read and scored your Writing Test, add those two scores to get your Writing subscore.)
3. Use the table below to find your Combined English/Writing score.

- First, circle your ACT English Test score in the left column.
- Second, circle your ACT Writing subscore at the top of the table.

- Finally, follow the English Test score row across and the Writing subscore column down until the two meet. Circle the Combined English/Writing score where the row and column meet. (For example, for an English Test score of 19 and a Writing subscore of 6, the Combined English/Writing score is 18.)

4. Using the number you circled in the table below, write your Combined English/Writing score here: \_\_\_\_\_.  
(The highest possible Combined English/Writing score is 36 and the lowest possible score is 1.)

ACT English Test score \_\_\_\_\_

Writing subscore \_\_\_\_\_

**Combined English/Writing Score** \_\_\_\_\_  
(from table below)

<b>Combined English/Writing Scale Scores</b>											
English Test Score	Writing Subscore										
	2	3	4	5	6	7	8	9	10	11	12
1	1	2	3	4	5	6	7	8	9	10	11
2	2	3	4	5	6	6	7	8	9	10	11
3	2	3	4	5	6	7	8	9	10	11	12
4	3	4	5	6	7	8	9	10	11	12	13
5	4	5	6	7	8	9	10	11	12	13	14
6	5	6	7	7	8	9	10	11	12	13	14
7	5	6	7	8	9	10	11	12	13	14	15
8	6	7	8	9	10	11	12	13	14	15	16
9	7	8	9	10	11	12	13	13	14	15	16
10	8	9	9	10	11	12	13	14	15	16	17
11	8	9	10	11	12	13	14	15	16	17	18
12	9	10	11	12	13	14	15	16	17	18	19
13	10	11	12	13	14	14	15	16	17	18	19
14	10	11	12	13	14	15	16	17	18	19	20
15	11	12	13	14	15	16	17	18	19	20	21
16	12	13	14	15	16	17	18	19	20	20	21
17	13	14	15	16	16	17	18	19	20	21	22
18	13	14	15	16	17	18	19	20	21	22	23
19	14	15	16	17	18	19	20	21	22	23	24
20	15	16	17	18	19	20	21	21	22	23	24
21	16	17	17	18	19	20	21	22	23	24	25
22	16	17	18	19	20	21	22	23	24	25	26
23	17	18	19	20	21	22	23	24	25	26	27
24	18	19	20	21	22	23	23	24	25	26	27
25	18	19	20	21	22	23	24	25	26	27	28
26	19	20	21	22	23	24	25	26	27	28	29
27	20	21	22	23	24	25	26	27	28	28	29
28	21	22	23	24	24	25	26	27	28	29	30
29	21	22	23	24	25	26	27	28	29	30	31
30	22	23	24	25	26	27	28	29	30	31	32
31	23	24	25	26	27	28	29	30	30	31	32
32	24	25	25	26	27	28	29	30	31	32	33
33	24	25	26	27	28	29	30	31	32	33	34
34	25	26	27	28	29	30	31	32	33	34	35
35	26	27	28	29	30	31	31	32	33	34	35
36	26	27	28	29	30	31	32	33	34	35	36



**Marking Directions:** Mark only **one** oval for each question. Fill in response completely. Erase errors cleanly without smudging.

**Correct mark:** ○ ● ○ ○

**Do NOT use these incorrect or bad marks.**

Incorrect marks: ☒ ☒ ☒ ☒  
 Overlapping mark: ☐ ☐ ☐ ☐  
 Cross-out mark: ☐ ☐ ☐ ☐  
 Smudged erasure: ☐ ☐ ☐ ☐  
 Mark is too light: ☐ ☐ ☐ ☐

## BOOKLET NUMBER

1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9
0	0	0	0	0	0

## FORM

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Print your 3-character Test Form in the boxes above and fill in the corresponding oval at the right.

BE SURE TO FILL IN THE CORRECT FORM OVAL.

○ 67C

## TEST 1

1 (A B C D)	14 (F G H J)	27 (A B C D)	40 (F G H J)	53 (A B C D)	66 (F G H J)
2 (F G H J)	15 (A B C D)	28 (F G H J)	41 (A B C D)	54 (F G H J)	67 (A B C D)
3 (A B C D)	16 (F G H J)	29 (A B C D)	42 (F G H J)	55 (A B C D)	68 (F G H J)
4 (F G H J)	17 (A B C D)	30 (F G H J)	43 (A B C D)	56 (F G H J)	69 (A B C D)
5 (A B C D)	18 (F G H J)	31 (A B C D)	44 (F G H J)	57 (A B C D)	70 (F G H J)
6 (F G H J)	19 (A B C D)	32 (F G H J)	45 (A B C D)	58 (F G H J)	71 (A B C D)
7 (A B C D)	20 (F G H J)	33 (A B C D)	46 (F G H J)	59 (A B C D)	72 (F G H J)
8 (F G H J)	21 (A B C D)	34 (F G H J)	47 (A B C D)	60 (F G H J)	73 (A B C D)
9 (A B C D)	22 (F G H J)	35 (A B C D)	48 (F G H J)	61 (A B C D)	74 (F G H J)
10 (F G H J)	23 (A B C D)	36 (F G H J)	49 (A B C D)	62 (F G H J)	75 (A B C D)
11 (A B C D)	24 (F G H J)	37 (A B C D)	50 (F G H J)	63 (A B C D)	
12 (F G H J)	25 (A B C D)	38 (F G H J)	51 (A B C D)	64 (F G H J)	
13 (A B C D)	26 (F G H J)	39 (A B C D)	52 (F G H J)	65 (A B C D)	

## TEST 2

1 (A B C D E)	11 (A B C D E)	21 (A B C D E)	31 (A B C D E)	41 (A B C D E)	51 (A B C D E)
2 (F G H J K)	12 (F G H J K)	22 (F G H J K)	32 (F G H J K)	42 (F G H J K)	52 (F G H J K)
3 (A B C D E)	13 (A B C D E)	23 (A B C D E)	33 (A B C D E)	43 (A B C D E)	53 (A B C D E)
4 (F G H J K)	14 (F G H J K)	24 (F G H J K)	34 (F G H J K)	44 (F G H J K)	54 (F G H J K)
5 (A B C D E)	15 (A B C D E)	25 (A B C D E)	35 (A B C D E)	45 (A B C D E)	55 (A B C D E)
6 (F G H J K)	16 (F G H J K)	26 (F G H J K)	36 (F G H J K)	46 (F G H J K)	56 (F G H J K)
7 (A B C D E)	17 (A B C D E)	27 (A B C D E)	37 (A B C D E)	47 (A B C D E)	57 (A B C D E)
8 (F G H J K)	18 (F G H J K)	28 (F G H J K)	38 (F G H J K)	48 (F G H J K)	58 (F G H J K)
9 (A B C D E)	19 (A B C D E)	29 (A B C D E)	39 (A B C D E)	49 (A B C D E)	59 (A B C D E)
10 (F G H J K)	20 (F G H J K)	30 (F G H J K)	40 (F G H J K)	50 (F G H J K)	60 (F G H J K)

## TEST 3

1 (A B C D)	8 (F G H J)	15 (A B C D)	22 (F G H J)	29 (A B C D)	36 (F G H J)
2 (F G H J)	9 (A B C D)	16 (F G H J)	23 (A B C D)	30 (F G H J)	37 (A B C D)
3 (A B C D)	10 (F G H J)	17 (A B C D)	24 (F G H J)	31 (A B C D)	38 (F G H J)
4 (F G H J)	11 (A B C D)	18 (F G H J)	25 (A B C D)	32 (F G H J)	39 (A B C D)
5 (A B C D)	12 (F G H J)	19 (A B C D)	26 (F G H J)	33 (A B C D)	40 (F G H J)
6 (F G H J)	13 (A B C D)	20 (F G H J)	27 (A B C D)	34 (F G H J)	
7 (A B C D)	14 (F G H J)	21 (A B C D)	28 (F G H J)	35 (A B C D)	

## TEST 4

1 (A B C D)	8 (F G H J)	15 (A B C D)	22 (F G H J)	29 (A B C D)	36 (F G H J)
2 (F G H J)	9 (A B C D)	16 (F G H J)	23 (A B C D)	30 (F G H J)	37 (A B C D)
3 (A B C D)	10 (F G H J)	17 (A B C D)	24 (F G H J)	31 (A B C D)	38 (F G H J)
4 (F G H J)	11 (A B C D)	18 (F G H J)	25 (A B C D)	32 (F G H J)	39 (A B C D)
5 (A B C D)	12 (F G H J)	19 (A B C D)	26 (F G H J)	33 (A B C D)	40 (F G H J)
6 (F G H J)	13 (A B C D)	20 (F G H J)	27 (A B C D)	34 (F G H J)	
7 (A B C D)	14 (F G H J)	21 (A B C D)	28 (F G H J)	35 (A B C D)	

**ACT STUDENT REVIEW:** The test administrator will give you instructions for completing this section.

The **ACT**®

**Student Review:** Your responses to these items will assist ACT and your test center in providing the best possible conditions for testing and planning for the future. Fill in the oval indicating your response to each item printed on the back of your test booklet.

Yes	No	Yes	No	Yes	No
1 ○	○	6 ○	○	11 ○	○
2 ○	○	7 ○	○	12 ○	○
3 ○	○	8 ○	○	13 ○	○
4 ○	○	9 ○	○	14 ○	○
5 ○	○	10 ○	○	15 ○	○

