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# Preparing for the ACT® Test

## What's Inside

- Full-length practice ACT test, including the optional Science and Writing test
- Information about the multiple-choice and writing sections
- Test-taking strategies
- What to expect on test day

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The ACT® www.act.org

## A Message to Students

This document is an important first step as you get ready for college and your career.

The information here is intended to help you do your best on the ACT to gain admission to colleges and universities. Included are helpful hints and test-taking strategies, as well as a complete practice ACT, with "retired" questions from earlier test subjects given on previous test dates at ACT test centers. Also featured are a practice writing test, a sample answer document, answer keys, and self-scoring instructions.

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

You may also want to consider *The Official ACT® Self-Paced Course, Powered by Kaplan®* to learn test content and strategies in a virtual classroom. To view all of our test preparation options, go to www.act.org/the-act/testprep.

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## Overview of the ACT

The ACT test consists of three multiple-choice sections—English, mathematics, and reading. Students may opt to take an optional multiple-choice science section and/or an optional writing section. Some colleges and universities require or accept ACT science or writing scores, so you may consider taking the science and writing sections.

| Test | Questions | Minutes per Test |
|---|---|---|
| English | 50 (40 scored) | 35 |
| Mathematics | 45 (41 scored) | 50 |
| Reading | 36 (27 scored) | 40 |
| Science (optional) | 40 (34 scored) | 40 |
| Writing (optional) | 1 essay | 40 |

Each of the multiple-choice sections will include some embedded field test items that will not be included in your score. The results of the embedded field test items help develop future test questions. These items are not labeled, so you will not know which items contribute to your score. You should try your best on all items.

# Test-Taking Strategies

## Test Strategies for the ACT

Each multiple-choice section contains questions with four answers from which you are to choose the correct or best answer.

If you do not complete all your sections and want to test again, you will need to re-register and pay for a new test date. Once you access test content, you cannot request a Test Date Change.

### Strategies to help you prepare for the ACT

✓ *Get familiar with the content of the sections.*

Review the information in this document. Note which content areas make up a large proportion of the sections. The topics included in each content area are examples of possible topics; they do not include all possibilities.

✓ *Update your knowledge and skills in the content areas.*

Review content areas that you have studied but that are not fresh in your mind. Refresh your knowledge in the content areas that make up large portions of the test.

✓ *Study content areas you are not familiar with.*

If some content areas of the ACT are unfamiliar to you, consider taking coursework in those areas before you take the test.

### Tips for Taking the Multiple-Choice Sections

✓ *Pace yourself.*

It is important that you have enough time to read the passages/questions and figure out your responses. For each section, subtract the number of minutes you estimate you will spend skimming the passages or reading the information provided, then divide the total number of remaining minutes allowed by the number of questions to determine the estimated time you should spend on each question. If possible, spend less time on each question and use the remaining time allowed for a section to review your work and return to the questions in that section that were most difficult for you.

The time limits set for each section give nearly everyone enough time to finish all the questions.

However, you will want to pace yourself to avoid spending too much time on one passage or puzzling over an answer to a specific problem. If you don't know how to work toward an answer to a question, it is a better strategy to guess, flag the question, and then move on to other questions that you know how to do. If there is time, you can come back to the flagged questions.

✓ *Read the directions carefully.*

Before you begin each section, read the directions carefully.This should occur before you take the test so that you do not use testing time.

- The English, reading, and science sections ask for the best answer. Read and consider all of the answer choices and choose the answer that best responds to the question.
- The mathematics section asks for the correct answer. 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 the answer choices.

✓ *Read each question carefully.*

You need to understand exactly 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.*

A good strategy is to answer the easy questions and skip the questions you find difficult. After answering the easy questions, go back and answer the more difficult questions if you have time.

✓ *Use logic on more difficult questions.*

When you return to the more difficult questions, try to use logic to eliminate incorrect answers. 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 scores in the sections will be based only on the number of questions that you answer correctly; there is no penalty for guessing. Try to answer every question within the time allowed for each section.

✓ *Review your work.*

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

### When testing on an answer document:

✓ *Be precise in choosing your responses.*

If you are taking the ACT on paper, make sure that you properly select the desired answer on your answer document. Marks on your answer document that extend beyond the intended oval may be scored as incorrect.

✓ *Erase completely.*

If you want to change a multiple-choice answer on paper, make sure you erase completely. Do not cross out answers or use correction fluid or tape; you must erase. Smudges or unintended marks may cause errors in scoring.

## Get Ready

Prepare well in advance for the ACT.

- Know what to expect on test day. Review this document and visit www.actstudent.org for more information, including an overview of each test subject, multiple test prep resources, and a comprehensive test day checklist.
- Take the practice tests in the order they are shown in this booklet, time yourself, and review your responses using the answer keys.
- Get plenty of rest the night before the tests.

***Note:*** *Most procedures in this document refer to testing on a National test date at an ACT test center (within the United States, US territories, or Puerto Rico). Procedures may differ slightly if you take a different administration of the ACT test.*

## On Test Day

### Report on Time

- For National test dates, you must report to your assigned test center by the time stated on your admission ticket (usually 8:00 a.m.). If you are late, you will not be admitted to test. If your ticket does not list a specific test room, the test staff or posted signs will direct you. If you are unfamiliar with the test center, you should allow extra time and try to arrive early to prevent the possibility of being late.

### What to Bring

- A printed copy of your admission ticket. Your ticket contains important information that helps connect your answer document to the registration on file. If you have lost your ticket, you can print another through your MyACT account. If you do not bring your ticket on test day, your scores may be delayed.
- Acceptable photo identification. You will not be permitted to test if your ID does not meet ACT requirements. See ACT requirements for ID on your ticket or at www.act.org/the-act/id.
- If you have registered for the Bring Your Own Device (BYOD) option at a participating location, it is your responsibly to ensure you have your testing device and have performed the appropriate device readiness.
- Number 2 pencil. Bring sharpened No. 2 pencils and good erasers (no mechanical pencils or ink pens). Do not bring any other writing instruments. You will not be allowed to use them. *Note: International test centers provide approved whiteboards and erasable markers.*
- Watch or other timing device. You may bring a watch to pace yourself, but it may not have an alarm. Your watch or other timing device must be removed and placed on your desk while in the test room, so that it remains visible to staff during the test. If your alarm sounds during testing, you'll be dismissed and your answers will not be scored.
- Calculator. If you wish to use a calculator (use of a calculator is not required), it is your responsibility to ensure the calculator is permitted according to the ACT Calculator Policy.
- Word-to-Word Bilingual Dictionary. If you are an English Learner student, you may bring a word-to-word bilingual dictionary as long as it is listed in ACT-Approved Bilingual Word-to-Word Dictionaries list. If it is not on the approved list, you may not use it for the ACT test. Doing so will void your testing scores.
- Snacks. You may consume snacks and drinks outside the test room during the break.

### What NOT to Bring

- Textbooks, notes, dictionaries (unless approved by the test administrator for translations), or other aids
- Highlighter pens, colored pens or pencils, or correction fluid/tape
- Any electronic device other than a permitted testing device and calculator
- Reading material

## In the Test Room

- Test staff will direct you to a seat. If you need a left-handed desk, tell the staff as you enter.
- Do not leave the test room after you have been admitted.
- Only pencils, erasers, a permitted calculator, your watch (if brought to the test center), and your paper ticket will be allowed on your desk. If you are testing on computer, you may be provided with scratch paper.
- You will be required to put all other personal belongings away.
- Reporting time for the test will be 8:00 a.m. Testing will begin as soon as all examinees who are present at 8:00 a.m. are checked in and seated.
- Listen carefully to all directions read by the test staff.
- It is important that you follow all directions carefully.
- ACT estimates that if you are taking the English, mathematics and reading sections you will be dismissed between 11 and 11:15 a.m.; if you add either science or writing, you will be dismissed between 12:00 and 12:15 p.m.; and if you add both science and writing, you will be dismissed between 12:45 and 1:00 p.m..

## For Students Approved to Test at National Test Center with One and One-Half Time

Testing with one and one-half time is available on the multiple-choice and writing sections for students with diagnosed disabilities and/or limited English proficiency.

If you are approved for one and one-half time at a National test center, you will have 50% additional time to complete each section.

The ACT:

| Test | Questions | Minutes per Test |
|---|---|---|
| English | 50 (40 scored) | 52 min 30 seconds |
| Mathematics | 45 (41 scored) | 75 |
| Reading | 36 (27 scored) | 60 |
| Science (optional) | 40(34 scored) | 60 |
| Writing (optional) | 1 essay | 60 |

# After Testing

## Voiding Your Test on Test Day

If you have to leave the test center before completing all sections, you must decide whether you want your test scored and then inform the test staff of your decision. If you do not inform the staff, your test will be scored.

If you do not complete all your sections and want to test again, you will need to re-register and pay for a new test date. Once you access test content, you cannot request a Test Date Change.

## Testing More Than Once

ACT will calculate and report a superscore for students who have taken the ACT test more than once. This gives colleges the option to use the student's best scores from all test administrations, rather than scores from just one sitting, in their admission and scholarship decisions.

For information about superscoring, see www.act.org/the-act/superscore.

For more information about retaking the ACT, see www.act.org/the-act/retaking.

## Testing More Than Once in the Same Administration

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, on an authorized non-Saturday date, or on a rescheduled test date—but not on more than one of those days on a particular test date. If you are admitted and allowed to test a second time on a particular test date, we will report only the scores from the first test. The second set of scores will be canceled without refund.

## Requesting a Copy of Your Test Questions and Answers

On certain test dates, you may order (for an additional fee) a copy of the multiple-choice test questions used to determine your scores, a list of your answers, and the answer key. If you took the writing section, you will also receive a copy of the writing prompt, scoring guidelines, and the scores assigned to your essay.

This service is not available for all test dates and is available only for National testing or Special testing in the United States, US territories, and Puerto Rico. Restrictions apply.

If you are interested in this service, check www.act.org/the-act/tir for more detail.

# Prohibited Behavior at the Test Center

A complete list of the prohibited behaviors was provided during the registration process. The following behaviors can also result in dismissal. Please be reminded of the following:

- You may not fill in or alter responses to any multiple-choice questions or continue to write or alter the essay after time has been called. This includes fixing stray marks.
- You may not look at any section of the test outside of the designated time for that test.
- Using a watch or other timing device with recording, internet, communication, or calculator capabilities (e.g., a smart watch or fitness band). Accessing any electronic device other than an approved calculator or watch. All other electronic devices, including cell phones and other wearable devices, must be powered off and stored out of sight from the time you are admitted to test until you leave the test center.
- You may not give or receive assistance by any means. This includes looking at another person's test.
- The test is confidential and remains so even after the exam is complete. You may not remove any materials from the test room. You may not discuss or share test questions, answers, or test form identification numbers during test administration, during breaks, or after the test.
- You may not disclose test questions or answers in any way or at any time, including through social media, in whole or in part.
- You may not eat, drink, or use reading materials in the test room.

If you are observed or suspected of engaging in prohibited behavior, you will be dismissed and your test will not be scored.

# Content of the ACT Sections

## English Section

The English section consists of several essays, or passages, each accompanied (English items appear alongside the essay, not after) by a set of multiple-choice questions.

- Some questions refer to the passage as a whole. Others refer to underlined or highlighted portions of the passage and offer several alternatives to that portion. You decide which answer choice is most appropriate in the context of the passage.
- Many questions offer **"No Change"** to the passage as one of the choices.

The English section puts you in the position of a writer who makes decisions to revise and edit a text. Essays in different genres provide a variety of rhetorical situations. These English passages are written in-house, not chosen from existing content like reading passages for their appropriateness in assessing writing and language skills and to reflect students' interests and experiences.

Four scores are reported for the English section: a score for the section overall and three reporting category scores based on specific knowledge and skills. The approximate percentage of the section devoted to each reporting category is as follows:

### Production of Writing (38-43%)

This category requires you to apply your understanding of the purpose and focus of a piece of writing.Topic Development: Demonstrate an understanding of, and control over, the rhetorical aspects of texts. Identify the purposes of parts of texts, determine whether a text or part of a text has met its intended goal, and evaluate the relevance of material in terms of a text's focus.

- **Organization, Unity, and Cohesion:** Use various strategies to ensure that a text is logically organized, flows smoothly, and has an effective introduction and conclusion.

### Knowledge of Language (18–23%)

These questions require you to demonstrate effective language use through ensuring precise and concise word choice and maintaining consistency in style and tone.

### Conventions of Standard English (38–43%)

These questions require you to apply an understanding of the conventions of Standard English grammar, usage, and mechanics to revise and edit text.

- **Sentence Structure and Formation:** Apply understanding of sentence structure and formation in a text and make revisions to improve the writing.
- **Punctuation:** Recognize common problems with Standard English punctuation and make revisions to improve the writing.

- **Usage:** Recognize common problems with Standard English usage in a text and make revisions to improve the writing.

### Tips for Taking the English Section

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

The 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 responding to a question, be sure to understand the context of the question. Consider how the sentence containing an underlined or highlighted portion fits in with the surrounding sentences and into the passage as a whole.

✓ *Examine the underlined or highlighted portions of the passage.*

Before responding to a question with an underlined or highlighted portion, carefully examine what is underlined or highlighted in the text. Consider the elements of writing included in each underlined or highlighted 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 or highlighted 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 or by a highlighted asterisk in brackets.

Questions about the entire passage are placed at the end of the passage. For paper testing, these questions are introduced by a horizontal box enclosing the following instruction: "Questions __ and __ ask about the preceding passage as a whole." For online testing, similar instructions will appear above the individual questions.

✓ *Note the differences in the answer choices.*

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

✓ *Determine the best answer.*

When a question asks you to choose the best alternative to an underlined or highlighted portion, consider the following approach:

- Decide how the underlined or highlighted portion might best be phrased in standard written English or in terms of the particular question posed.
    - If the underlined or highlighted portion is the best answer, select "No Change."
    - If not, check to see whether your phrasing is one of the other answer choices. If you do not find your phrasing, choose the best of the answers presented.
- For questions cued by a number in a box or a highlighted asterisk in brackets, 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.

## Mathematics Section

The mathematics section is designed to assess the mathematical skills students have typically acquired in courses taken up to the beginning of grade 12. All questions are self-contained.

The material covered emphasizes the major content areas that are prerequisites to successful performance in entry-level courses in college mathematics. Knowledge of basic formulas and computational skills are assumed as background for the problems, but recall of complex formulas and extensive computation are not required.

***Note:*** *You may use a permitted calculator on the mathematics section. See* www.act.org/calculator-policy.html *for details about prohibited models and features.*

Nine scores are reported for the mathematics section: a score for the section overall and eight reporting category scores based on specific mathematical knowledge and skills. The approximate percentage of the section devoted to each reporting category is as follows:

 

## Preparing for Higher Math (80%)

This category covers the mathematics that students have learned more recently, starting with using algebra as a general way of expressing and solving equations. This category is divided into five subcategories:

- **Number and Quantity (10-12%):** Demonstrate knowledge of real and complex number systems. Reason with numerical quantities in many forms, including expressions with integer and rational exponents and vectors and matrices.
- **Algebra (17-20%):** Solve, graph, and model multiple types of expressions. Interpret and use many different kinds of equations, such as linear, polynomial, radical, and exponential relationships. Find solutions to systems of equations, even when represented by a simple matrix equation, and apply results to real-world contexts.
- **Functions (17-20%):** Demonstrate knowledge of functions: definition, notation, representation, and application. Use functions including linear, radical, piecewise, polynomial, exponential, and logarithmic. Manipulate and translate functions, as well as interpret and use important features of graphs.
- **Geometry (17-20%):** Apply your knowledge of shapes and solids, using concepts such as congruence and similarity relationships or surface area and volume measurements. Apply your understanding to composite objects and solve for missing values in triangles, circles, and other figures. Use trigonometric ratios and equations of conic sections.
- **Statistics & Probability (12-15%):** Describe center and spread of distributions. Apply and analyze data collection methods. Understand and model relationships in bivariate data. Calculate probabilities by recognizing the related sample spaces.

## Integrating Essential Skills (20%)

This category focuses on measuring how well you can synthesize and apply your knowledge and skills to solve more complex problems. The questions ask you to address concepts such as

- rates and percentages;
- proportional relationships;
- area, surface area, and volume;
- average and median; and
- expressing numbers in different ways.

You will solve non-routine problems that involve combining skills in chains of steps, applying skills in varied contexts, understanding connections, and demonstrating fluency.

## Modeling

This category represents all questions that involve producing, interpreting, understanding, evaluating, and improving models. Each question is also counted in other appropriate mathematics reporting categories. This category is an overall measure of how well you use modeling skills across mathematical topics.

## Tips for Taking the Mathematics Section

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

All of the mathematics problems can be solved without a calculator. Many of the problems are best done without a calculator. Use good judgment in deciding when 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.

✓ *Solve the problem.*

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

✓ *Find 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 will involve several steps. Make sure your answer accounts for all the necessary steps. Frequently, an answer choice is an intermediate result, not the final answer.

✓ *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 answer.*

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

# Reading Section

The reading section measures your ability to read closely, reason logically about texts using evidence, and integrate information from multiple sources.

The questions focus on the mutually supportive skills that readers must bring to bear in studying written materials across a range of subject areas. Specifically, questions will ask you to do the following:

- 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
- analyze the author's or narrator's voice and method
- analyze claims and evidence in arguments
- integrate information from multiple texts or formats

The reading section is composed of multiple parts. Some parts consist of one long prose passage and others consist of shorter prose passages. The passages represent the levels and kinds of texts commonly encountered in first-year college curricula.

Each passage is preceded by a heading that identifies the author and source; it may also include important background information to help you understand the passage. Each portion contains a set of multiple-choice questions. These questions do not test the rote recall of facts from outside the passage or rules of formal logic, nor do they contain isolated vocabulary questions. In sections that contain two shorter passages, some of the questions involve both of those passages.

Four scores are reported for the reading section: a score for the section overall and three reporting category scores based on specific knowledge and skills. The approximate percentage of the section devoted to each reporting category is as follows:

## Key Ideas & Details (44-52%)

This category requires you to read texts closely to determine central ideas and themes; summarize information and ideas accurately; draw logical inferences and conclusions; and show an understanding of relationships, including sequential, comparative, and cause-effect relationships.

## Craft & Structure (26-33%)

These questions ask you to do the following:

- determine word and phrase meanings
- analyze an author's word choice rhetorically
- analyze text structure
- understand the author's purpose and perspective
- analyze characters' points of view
- interpret authorial decisions rhetorically
- differentiate between various perspectives and sources of information

## Integration of Knowledge & Ideas (19-26%)

This category requires you to understand authors' claims, differentiate between facts and opinions, and use evidence to make connections between different texts that are related by topic. Some questions will require you to analyze how authors construct arguments and to evaluate reasoning and evidence from various sources.

## Visual and Quantitative Information in the Reading Section

One passage may be accompanied by an element like a graph, figure, or table that contains information relevant to the reading task. In the passage containing these visual and quantitative elements, some of the questions will ask you to identify or interpret information from the graphic or integrate the information from the passage and graphic to determine the best answer.

## Tips for Taking the Reading Section

✓ *Read each passage carefully.*

Before you begin answering a question, read all of the content carefully. Be conscious of relationships between or among ideas. Take notes 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 passages. Other questions will require you to determine implicit meanings and to draw conclusions, comparisons, and generalizations. Consider the text before you answer any question.

# Science Section(optional)

If you are taking the optional science section, it will be administered after the reading test. The science section measures the interpretation, analysis, evaluation, reasoning, and problem-solving skills required in the natural sciences. The section presents several authentic scientific scenarios, each followed by a number of multiple-choice questions.

The content includes biology, chemistry, Earth/space sciences (e.g., geology, astronomy, and meteorology), and physics. Advanced knowledge in these areas is not required, but background knowledge acquired in general, introductory science courses may be needed to correctly answer some of the questions.

The science section focuses on multidimensional assessment, with questions that assess science content in concert with science skills and practices.

The questions require you to:

- recognize and understand the basic features of, and concepts related to, the provided information;
- examine critically the relationship between the information provided and the conclusions drawn or hypotheses developed; and
- generalize from given information to gain new information, draw conclusions, or make predictions.

***Note:*** *You are not permitted to use a calculator in the science section.*

Four scores are reported for the science section: a score for the section overall and three reporting category scores based on scientific knowledge, skills, and practices. The approximate percentage of the section devoted to each reporting category is as follows:

## Interpretation of Data (38-50%)

This category asks you to manipulate and analyze scientific data presented in scientific tables, graphs, and diagrams (e.g., recognize trends in data, translate tabular data into graphs, interpolate and extrapolate, and reason mathematically).

## Scientific Investigation (18-32%)

This category requires you to understand experimental tools, procedures, and design (e.g., identify controls and variables) and compare, extend, and modify experiments (e.g., predict the results of additional trials).

## Evaluation of Scientific Arguments and Models with Evidence (24-38%)

These questions ask you to judge the validity of scientific information and formulate conclusions and predictions based on that information (e.g., determine which explanation for a scientific phenomenon is supported by new findings).

The science section presents information in three formats:

- **Data Representation (26-32%):** 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 recognizing relationships among data in tables and graphs; interpolating and extrapolating; and translating tabular data into graphs.
- **Research Summaries (50-56%):** This format provides descriptions and results of one or more related experiments. The questions focus on the design of the experiments and the interpretation of experimental results.
- **Conflicting Viewpoints (18-21%):** This format presents two or more explanations for the same scientific phenomena that, because they are based on differing premises or incomplete data, are inconsistent with one another. The questions focus on the understanding, analysis, and comparison of alternative viewpoints or hypotheses.

## Tips for Taking the Science Section

✓ *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 take notes about important ideas. 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 the different viewpoints in passages.*

Some material will present conflicting viewpoints, and the questions will ask you to distinguish among them. It may be helpful for you to take notes summarizing each viewpoint.

# Writing Section (Optional)

If you register for the ACT with writing, you will take the writing section after all the multiple-choice sections. Your score in the writing section will not affect your scores on the multiple-choice sections or your Composite score.

The writing section is a 40-minute essay test that measures your writing skills—specifically, writing skills taught in high school English classes and in entry-level college composition courses.

The section consists of one writing prompt that describes a complex issue and provides three different perspectives on the issue. You are asked to read the prompt and write an essay in which you develop your own perspective on the issue. Your essay must analyze the relationship between your own perspective and one or more other perspectives. You may adopt one of the perspectives given in the prompt as your own, or you may introduce one that is completely different from those given. Your score will not be affected by the perspective you take on the issue.

Five scores are reported for the writing section: a single subject-level writing score reported on a scale of 2–12 and four domain scores that are based on an analytic scoring rubric. The subject score is the rounded average of the four domain scores. The four writing domains are as follows:

## Ideas and Analysis

Scores in this domain reflect the ability to generate productive ideas and engage critically with multiple perspectives on the given issue. Competent writers understand the issue they are invited to address, the purpose for writing, and the audience. They generate ideas that are relevant to the situation.

## Development and Support

Scores in this domain reflect the ability to discuss ideas, offer rationale, and bolster an argument. Competent writers explain and explore their ideas, discuss implications, and illustrate through examples. They help the reader understand their thinking about the issue.

## Organization

Scores in this domain reflect the ability to organize ideas with clarity and purpose. Organizational choices are integral to effective writing. Competent writers arrange their essay in a way that clearly shows the relationship between ideas, and they guide the reader through their discussion.

## Language Use and Conventions

Scores in this domain reflect the ability to use written language to convey arguments with clarity. Competent writers make use of the conventions of grammar, syntax, word usage, and mechanics. They are also aware of their audience and adjust the style and tone of their writing to communicate effectively.

## Tips for Taking the Writing Section

✓ *Pace yourself.*

Budget your time based on your experience in taking essay tests in school or when you have done writing within a time limit. It is unlikely that you will have time to draft, revise, and recopy your essay.

✓ *Plan.*

Before writing, carefully read and consider all prompt material. Be sure you understand the issue, the different perspectives on the issue, and your essay task.

Included with the prompt are planning questions that will help you analyze the different perspectives and develop your own. Use these questions to think critically about the prompt and generate an effective response. How would you best organize and support your ideas in a written argument? Spend time structuring or outlining your response.

***Note:*** *The planning questions are optional and are not scored.*

 

✓ *Write.*

Establish the focus of your essay by making clear your argument and its main ideas.

- Explain and illustrate your ideas with sound reasoning and meaningful examples.
- Discuss the significance of your ideas: what are the implications of what you have to say, and why is your argument important to consider?

As you write, ask yourself if your logic is clear, if you have supported your claims, and if you have chosen precise words to communicate your ideas.

✓ *Review your essay.*

Try to make your essay as polished as you can. Take a few minutes before time is called to read over your essay and correct any mistakes.

If you take the ACT on paper, be sure to write your essay legibly. If you find words that are hard to read, recopy them. Make corrections and revisions neatly, between the lines. Do not write in the margins.

✓ *Practice.*

There are many ways to prepare for the writing section. Read newspapers and magazines; watch or listen to news analyses online, on TV, or on the radio; or participate in discussions and debates, thinking carefully about other perspectives in relation to your own.

One good way to prepare for the writing section is to practice writing with different purposes for different audiences. The writing you do in your classes will help you, as will writing a personal journal, stories, essays, editorials, or other writing you do on your own.

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

# Taking the Practice Tests

It is a good idea to take the practice tests under conditions as similar as possible to those you will experience on test day. The following tips will help you:

- If you are taking the ACT (without science or writing), the three multiple-choice tests require 2 hours 20 minutes to complete. Take them in order, in one sitting, with a 10-to-15-minute break between Tests 2 and 3. If you take the ACT with science, the four multiple-choice sections of the test require 3 hours, with a 10- to 15- minute break between Tests 2 and 3.
- You will need only sharpened, soft lead No. 2 pencils and good erasers. Remove all other items from your desk. You will not be allowed to use unapproved scratch paper, but you can use the test booklet to make notes.
- 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 answer document on pages 64–60.
- Read the test directions on the first page of each multiple-choice test. These are the same directions that will appear in your test booklet on test day.
- Start your timer and begin with Test 1. Continue through Test 4,if taking the optional science section, or end after Test 3 if you are not taking the science section. taking a 10-to-15-minute break between Tests 2 and 3. Use the timing table on page 2 to time each section of the test.
- Score your multiple-choice tests using the information beginning on page 72.
- If you plan to take the ACT with writing, read the directions on the first page of the practice ACT writing test (page 81 ). These are the same directions that will appear in your test booklet on test day. Start your timer (set for 40 minutes), then read the prompt on page 61. After you understand what the prompt is asking you to do, plan your essay and then write it on lined paper. On test day, if you test on paper, your answer document will have lined pages on which you will write your essay. Score your essay using the information on pages 78–80.
- A screen reader accessible practice test is available at https://practice.actdigitalservices.org/.

 

# Practice Test 1

**EXAMINEE STATEMENTS, CERTIFICATION, AND SIGNATURE**

1. **Statements:** I understand that by registering for, launching, starting, or submitting answer documents for an ACT® test, I am agreeing to comply with and be bound by the *Terms and Conditions: Testing Rules and Policies for the ACT® Test* ("Terms").

   **I UNDERSTAND AND AGREE THAT THE TERMS PERMIT ACT TO CANCEL MY SCORES IN CERTAIN CIRCUMSTANCES. THE TERMS ALSO LIMIT DAMAGES AVAILABLE TO ME AND REQUIRE ARBITRATION OF CERTAIN DISPUTES. BY AGREEING TO ARBITRATION, ACT AND I BOTH WAIVE THE RIGHT TO HAVE THOSE DISPUTES HEARD BY A JUDGE OR JURY.**

   I understand that ACT owns the test questions and responses, and I will not share them with anyone by any form of communication before, during, or after the test administration. I understand that taking the test for someone else may violate the law and subject me to legal penalties.

   I consent to the collection and processing of personally identifying information I provide, and its subsequent use and disclosure, as described in the ACT Privacy Policy (www.act.org/privacy.html). If I am taking the test outside of the United States, I also permit ACT to transfer my personally identifying information to the United States, to ACT, or to a third-party service provider, where it will be subject to use and disclosure under the laws of the United States, including being accessible to law enforcement or national security authorities.

2. **Certification:** Copy the italicized certification below, then sign, date, and print your name in the spaces provided.

   *I agree to the **Statements** above and certify that I am the person whose information appears on this form.*

Your Signature | Today's Date | Print Your Name

The ACT®

**Form 25MC1**

2025 | 2026

## 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 the testing staff 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.**

## ENGLISH TEST

*35 Minutes—50 Questions*

**DIRECTIONS:** In the passages that follow, certain words and phrases are underlined and numbered. In the right-hand column, you will find alternatives for the underlined part. You are to choose the best answer to each question. If you think the original version is best, choose "**No Change**."

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.

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**PASSAGE I**

### Alex Atala and Brazilian Cuisine

At first, [1] Brazilian chef Alex Atala opened his restaurant in São Paulo in 1999, people told him he'd never succeed. In a country where European cuisine was held in the highest regard, they said, no one would patronize a restaurant serving Brazilian food. Atala, whose restaurant has consistently ranked among the world's best, has long disproven the naysayers. Using traditional Brazilian ingredients, such as, manioc root [2] and even ants—in innovative ways, he has thrilled [3] diners from around the world.

Still, Atala felt he could do more for his country and its cuisine. [4] In 2012, he founded Instituto Atá to help promote lesser-known ingredients, particularly those of the Amazon basin, while working to protect Brazil's biodiversity. Hearts of palm, for example, were typically

**1.** Which choice makes the sentence most grammatically acceptable?

**A.** **No Change**
**B.** Years ago,
**C.** When
**D.** **Delete** the underlined portion.

**2.** Which choice makes the sentence most grammatically acceptable?

**F.** **No Change**
**G.** ingredients—such as manioc root
**H.** ingredients such as—manioc root
**J.** ingredients such as, manioc root,

**3.** The writer wants to emphasize the positive experience diners have had at Atala's restaurant. Which choice best accomplishes that goal?

**A.** **No Change**
**B.** mystified
**C.** shocked
**D.** startled

**4.** Given that all the choices are accurate, which one provides the best transition from the preceding paragraph to this paragraph?

**F.** **No Change**
**G.** Atala is known for sometimes incorporating fragrances into his dishes as well.
**H.** In fact, Atala's culinary training took place in classic European restaurants.
**J.** Atala's obvious affection for his homeland is said to be infectious.

**GO ON TO THE NEXT PAGE.**

harvested from Brazil's wild juçara palms in an unsustainable way. Needing eight years to mature, the tree dies once its[5] large heart is removed. Atala began persuading producers to cultivate Amazonian pupunha palms, which grow clusters of stems, each with a small heart. Careful harvesting ensures that the tree will live to yield[6] more hearts, resulting in environmentally friendly production.

Atala prioritizes his working relationships with Amazonian tribes. Utilizing their historical know-how they have,[7] he aims to bolster tribe members' livelihoods while exposing a wider audience to Brazilian ingredients. For instance, Baniwa women have farmed distinctly flavorful chili peppers for centuries that use[8] indigenous agricultural techniques, to create a seasoning called pimenta jiquitaia. Partnering with Instituto Atá have enabled[9] these women from a remote rain forest region to scale up production and market their product globally.

Expanding awareness of the rich diversity of Brazil's native ingredients, Atala continues to lead in deciphering[10] the country's food culture. With his characteristic passion and intensity, the renowned chef seeks to inspire Brazilians to rediscover the connections between culture, nature, and food.

**5.** Which choice makes the sentence most grammatically acceptable?

**A. No Change**
**B.** tree dies once their
**C.** trees die once its
**D.** tree dies once it's

**6.** Which choice most effectively maintains the essay's tone?

**F. No Change**
**G.** pull through and spawn
**H.** continue to churn out
**J.** keep doling out

**7.** Which choice is least redundant in context?

**A. No Change**
**B.** knowledge that tribe members know about local plants,
**C.** knowledge of local plants in the area,
**D.** knowledge of local plants,

**8.** Which choice makes the sentence most grammatically acceptable?

**F. No Change**
**G.** centuries, which use
**H.** centuries who use
**J.** centuries, using

**9.** Which choice makes the sentence most grammatically acceptable?

**A. No Change**
**B.** has enabled
**C.** are enabling
**D.** enable

**10.** Which choice is clearest and most precise in context?

**F. No Change**
**G.** transforming
**H.** dislocating
**J.** contorting

**GO ON TO THE NEXT PAGE.**

**PASSAGE II**

## Rediscovering Hrosvitha

Hrosvitha, a medieval author and dramatist—is [11] one of the earliest known European women playwrights. Although little is known about her life, scholars agree Hrosvitha was born to a noble family around 935 CE. As a relation of Holy Roman Emperor Otto I, she most likely spent her early years as part of his court. Later, sometime before 959 CE, she entered the abbey at Gandersheim, it was [12] well known as a significant center of learning.

Hrosvitha entered Gandersheim as a canoness rather than a nun. Her title did not require a vow of poverty, but Hrosvitha did take the abbey's customary vow of chastity, which absolved her of an obligation to marry. This circumstance made it okay for her to keep [13] her financial status without incurring responsibilities to a husband and children. Nevertheless, [14] Hrosvitha had a greater level of independence—she could acquire property, receive guests, employ servants, and visit the royal court—than most women of her time.

Hrosvitha produced at least eight narrative religious poems, two historical epics (about the court of Otto I and [15] Gandersheim), and six comedy-dramas. It is for these dramas that she is best known today.

**11.** Which choice makes the sentence most grammatically acceptable?

**A. No Change**
**B.** author and dramatist,
**C.** author, and dramatist
**D.** author and dramatist

**12.** Which choice makes the sentence most grammatically acceptable?

**F. No Change**
**G.** Gandersheim and, historically, this abbey was
**H.** Gandersheim, it was an abbey
**J.** Gandersheim, an abbey

**13.** Which choice most effectively maintains the essay's tone?

**A. No Change**
**B.** permitted her to hang on to
**C.** allowed her to retain
**D.** let her keep up

**14.** Which transition word or phrase is most logical in context?

**F. No Change**
**G.** On the other hand,
**H.** As a result,
**J.** In contrast,

**15.** Which choice best helps indicate that each historical epic covered different subject matter?

**A. No Change**
**B.** (each focused on the court of Otto I and
**C.** (focusing on the court of Otto I as well as
**D.** (one about the court of Otto I, the other about

**GO ON TO THE NEXT PAGE.**

**PASSAGE III**

## A Musical Detour

[1]

Every night while driving home from a hectic day at work, my three-year-old twins quarreling in the backseat, I take a short detour. I turn off the gridlocked highway, onto a stretch of Route 66 that is,[16] surrounded by arid New Mexico hills. When we're nearly three miles into our detour, I roll down the windows. Looking pointedly into the rearview mirror, windows rolled down,[17] I say something about not throwing anything out of the car, but neither boy is listening. I check my speed. [A] Carefully, I steer toward the fog line. "Here it is, boys!" I yell at the backseat, the passenger-side tires finding the rumble strips etched into the asphalt.

[2]

Normal rumble strips create that loud, grating noise when you drive over them—like a built-in alarm for drivers who drift too close to the road's edge.[18] These strips[18] are different. The boys abruptly stop their squalling as the car begins to vibrate. Then, instead of that jolting warning noise, we hear the distinct strain of the song "America the Beautiful." [B] The road is playing us a song.

[3]

I've been taking this detour out of Albuquerque for two years, ever since these musical rumble strips were installed.[19] City planners wanted to find out whether the novelty of hearing a snippet of song would give drivers an incentive to obey the speed limit; the tune is only recognizable if they're going a reasonable forty-five miles per hour. Whether this strategy works, I don't know.

**16.** Which choice makes the sentence most grammatically acceptable?

**F.** **No Change**
**G.** highway onto a stretch of Route 66, that is,
**H.** highway onto a stretch, of Route 66 that is
**J.** highway onto a stretch of Route 66 that is

**17.** Which choice is least redundant in context?

**A.** **No Change**
**B.** into the rearview mirror, three miles into our detour,
**C.** behind me by looking into the rearview mirror,
**D.** into the rearview mirror,

**18.** If the writer were to delete the underlined portion (adjusting the punctuation as needed), the paragraph would primarily lose:

**F.** information that indicates how prevalent rumble strips are on roadways.
**G.** a detail that reveals the narrator's opinion of distracted drivers.
**H.** information that clarifies a primary function of rumble strips.
**J.** a detail that indicates what the rumble strips look like.

**19.** Which choice is least redundant in context?

**A.** **No Change**
**B.** were implemented just outside Albuquerque.
**C.** that play music were put in.
**D.** were added a couple years ago.



[C] For me, this brief musical interlude is a charming curiosity, a welcome interruption in my work-week slog. Even though constant traffic has worn down the musical rumble strips and warped the sound of some of the notes, there are currently no plans to restore the strips. [20]

[4]

After the last one of the notes fades [21] into the darkening sky, I glance back at the boys, who have [22] been lulled by the wonder of the song. [D] I stop worrying about work, about how many toy cars might have gotten lost between there and home. Until then, [23] I feel like everything is going to be just fine. [24]

**20.** Given that all the choices are accurate, which one most effectively leads into the rest of the essay?

**F.** **No Change**
**G.** lots of other drivers, not just me, still make this detour to hear the tune.
**H.** sometimes drivers will turn around and drive over the strips again.
**J.** this detour on our drive home never fails to buoy my spirits.

**21.** Which choice makes the sentence most grammatically acceptable?

**A.** **No Change**
**B.** have disappeared
**C.** disappear
**D.** fade

**22.** Which choice makes the sentence most grammatically acceptable?

**F.** **No Change**
**G.** whom have
**H.** they have
**J.** whose

**23.** Which transition word or phrase is most logical in context?

**A.** **No Change**
**B.** Now and then,
**C.** For now,
**D.** Later,

**24.** At this point, the writer is considering adding the following accurate sentence:

I hear there is another musical road in the US, somewhere in California.

Should the writer make this addition?

**F.** Yes, because it makes clear that the narrator has plans to travel on other musical roads.
**G.** Yes, because it indicates that the musical road in New Mexico is not unique.
**H.** No, because it draws the focus away from the New Mexico musical road and its effect on the narrator.
**J.** No, because it fails to provide specific details about the construction of the musical road in California.

**GO ON TO THE NEXT PAGE.**

Question 25 asks about the preceding passage as a whole.

**25.** The writer wants to add the following sentence to the essay:

It is marvelously quiet.

The sentence would most logically be placed at:

**A.** Point A in Paragraph 1.
**B.** Point B in Paragraph 2.
**C.** Point C in Paragraph 3.
**D.** Point D in Paragraph 4.

---

**PASSAGE IV**

**The Case for Visible Storage**

[1]

Public museums exist for two main reasons: to educate the public and provide stewardship (legal and ethical management, care, documentation, and use) of their collections. Unfortunately, due to space constraints, a typical museum only exhibits about ten percent of the items in its collection; the other ninety percent remains in storage. When displaying such a small portion of artifacts severely limits public access and therefore public education. Furthermore, maintaining such a large number of artifacts in storage while acquiring additional items makes finding enough suitable storage space difficult, especially for delicate items. [A]

[2]

To remain true to the goals of education and stewardship, museums should dedicate public access space to visible storage. [B] Also known as open storage, visible storage provides ways to display many items in small or irregular spaces, allowing more artifacts to be on exhibit. [C]

**26.** If the writer were to delete the underlined portion, the essay would primarily lose a:

**F.** suggestion that not all public museums provide proper stewardship for their artifacts.
**G.** clarification of what public museum stewardship entails.
**H.** list of reasons for educating the public on stewardship.
**J.** description of the daily tasks performed by curators.

**27.** Which choice makes the sentence most grammatically acceptable?

**A.** **No Change**
**B.** With the display of
**C.** While displaying
**D.** Displaying

**28.** Which choice makes the sentence most grammatically acceptable?

**F.** **No Change**
**G.** storage makes providing
**H.** storage, which provides
**J.** storage, providing

**GO ON TO THE NEXT PAGE.**

[3]

In a traditional museum display, each artifact is labeled and positioned at eye level with plenty of space between it (29) and the other objects.

**29.** Which choice makes the sentence most grammatically acceptable?

**A.** **No Change**
**B.** between them
**C.** among them
**D.** among it

Subsequently, (30) artifacts in visible storage spaces are placed close together and are often displayed from floor to ceiling with few labels. Areas of a museum that cannot house a traditional display, therefore, might be ideal for a visible storage display. Ceramic pottery where it (31) might otherwise be positioned in individual glass cases might be lined up on shelves behind a glass wall. An antique fork and spoon fastened to a large informational board might instead be part of an entire set of silverware arranged under glass in pull-out cabinet drawers. [D]

**30.** Which transition word is most logical in context?

**F.** **No Change**
**G.** Conversely,
**H.** Namely,
**J.** Granted,

**31.** Which choice makes the sentence most grammatically acceptable?

**A.** **No Change**
**B.** that which
**C.** that
**D.** **Delete** the underlined portion.

[4]

While some artifacts can never be displayed [32], many pieces that can—and should—be viewed are not. (33)

**32.** At this point, the writer is considering adding the following parenthetical phrase:

(whether because of light sensitivity or the request of a donor)

Given that the information is accurate, should the writer make this addition here?

**F.** Yes, because it gives specific examples to help explain why some objects can never be displayed in a museum.
**G.** Yes, because it offers specific examples of items that require special storage.
**H.** No, because it detracts from the paragraph's focus on the ideal museum layout.
**J.** No, because it diminishes the role museums play in educating the public.

**33.** Which choice makes the sentence most grammatically acceptable?

**A.** **No Change**
**B.** can and should—
**C.** can, and should
**D.** can and, should

**GO ON TO THE NEXT PAGE.**

Whereas a museum designates areas for visible storage, it [34] uses space efficiently, providing safe displays for artifacts and allowing visitors greater access to independently study the works that make the museum unique.

**34.** Which choice is clearest and most precise in context?

**F. No Change**
**G.** Although
**H.** When
**J.** Since

Question 35 asks about the preceding passage as a whole.

**35.** The writer wants to add the following sentence to the essay:

This potentially compromises stewardship.

For the sake of logic and cohesion, the sentence should be placed at:

**A.** Point A in Paragraph 1.
**B.** Point B in Paragraph 2.
**C.** Point C in Paragraph 2.
**D.** Point D in Paragraph 3.

---

**PASSAGE V**

**The Sociable Weavers' Complex Nest**

In the sparse yet relatively green environment of the Kalahari Desert, birds known as sociable weavers build their enormous nests atop the desert's signature camelthorn trees. Slung across the branches, each nest—which can measure up to thirteen feet wide and seven feet thick—is a sprawling community home to hundreds of birds. [36]

**36.** If the writer were to delete the phrase "which can measure up to thirteen feet wide and seven feet thick" from the preceding sentence (adjusting the punctuation as needed), the sentence would primarily lose:

**F.** specific information that illustrates the minimum height at which the weavers begin building their nests.
**G.** specific information that underscores the enormousness of the weavers' nests.
**H.** details that clarify how the weavers are able to survive in the Kalahari Desert.
**J.** details that explain how the weavers' nests differ from other birds' nests.

**GO ON TO THE NEXT PAGE.**

A weaver nest does not resemble a common bowl-like bird nest. Although the weavers use typical materials such as sticks, grass, and feathers to construct their nests, the nests look more like disorganized piles.[37] Built within each nest are as many as one hundred four-to-six-inch-wide chambers. A bird enters a chamber by flying to the underside of the nest, it squeezes[38] through a one-inch-wide entrance hole, and continuing up a passageway to a chamber. In each chamber, up to five of the sparrow-sized birds can huddle as a group together when the Kalahari nights get cold.[39]

The multi-chamber construction of the weaver nest has drawn comparisons to that of an apartment building. Indeed, the nests exemplify communal living at there[40] most effective. Each one houses multiple generations of birds, all of whom work together to maintain their home.

**37.** The writer wants to emphasize the unusual appearance of the weavers' nests by using playful language to evoke a specific image. Which choice best accomplishes this goal?

**A.** **No Change**
**B.** carelessly plunked-down haystacks.
**C.** collections of disparate items.
**D.** large knots.

**38.** Which choice makes the sentence most grammatically acceptable?

**F.** **No Change**
**G.** then squeezes
**H.** squeezing
**J.** to squeeze

**39.** Which choice is least redundant in context?

**A.** **No Change**
**B.** all together, staying warm when the temperature drops and gets colder at night.
**C.** and stay warm when temperatures plummet at night and it's cold.
**D.** for warmth during the cold Kalahari nights.

**40.** Which choice makes the sentence most grammatically acceptable?

**F.** **No Change**
**G.** when its at it's
**H.** at it's
**J.** at its



**PASSAGE VI**

**The Artful Stitch of *Paj Ntaub***

She depicts flowers with layers of petals, intricate spirals and rosettes, teardrops bending within circles, and dizzying mazes of lines—[41] embroidering them in vibrant reds, blues, pinks, yellows, and greens on fabric of delicate silk or cotton. Pang Xiong Sirirathasuk Sikoun is a master of *paj ntaub*, or "flower cloth" embroidery, the most difficult of the century's-oldest [42] Hmong needlework arts.

*Paj ntaub* is increasingly made in lighter, softer shades today. [43] She's been creating stitched textiles since she was a young woman living in northern Laos. For the past several decades, she's been designing *paj ntaub* in Philadelphia, Pennsylvania, where she also teaches her craft.

Flower cloth (commonly as a shirt, dress, coat, or collar) [44] is made to be worn as clothing and, depending on the amount of needlework on the piece, is designed either for everyday wear or for a special occasion.

**41.** Which choice best maintains the stylistic pattern of descriptions established earlier in the sentence?

**A.** **No Change**
**B.** something with a dizzying effect—
**C.** mazes that she creates—
**D.** so many lines—

**42.** Which choice makes the sentence most grammatically acceptable?

**F.** **No Change**
**G.** centuries-old
**H.** centuries'-old
**J.** century's-old

**43.** The writer is considering deleting the underlined sentence. Should the sentence be kept or deleted?

**A.** Kept, because it compares Pang Xiong's embroidery style with that of modern *paj ntaub*.
**B.** Kept, because it places the subject of the essay in a modern context.
**C.** Deleted, because it detracts from the paragraph's focus on the various styles of ancient Hmong needlework arts.
**D.** Deleted, because it adds a detail that is irrelevant to the paragraph's introduction of Pang Xiong's connection to *paj ntaub*.

**44.** The best placement for the underlined portion would be:

**F.** where it is now.
**G.** after the word *made*.
**H.** after the word *clothing*.
**J.** after the word *needlework*.

**GO ON TO THE NEXT PAGE.**

With pattern names such as "elephant's foot" and "snail house" and images of animals framed by geometric designs, *paj ntaub* patterns are versatile. [45] What distinguishes *paj ntaub* from other Hmong needlework arts are the artist's use of tiny, tight stitches and several complex techniques. One technique is reverse appliqué, in which [46] shapes are cut out from, rather than added on top of, the embroidered fabric. Another is elaborate overstitching: thousands of layered stitches are applied to its surface. [47]

Pang Xiong regrets that most people she knows today wear only regular [48] clothes. When she was growing up in Laos, she explains, she had few items of clothing, but each garment she owned was handcrafted *paj ntaub*.

**45.** Which choice most clearly builds on the information provided earlier in the sentence about a common theme in *paj ntaub* patterns and images?

**A.** **No Change**
**B.** only a master artist is able to create *paj ntaub* clothing for special occasions.
**C.** *paj ntaub* patterns are extraordinarily colorful.
**D.** *paj ntaub* celebrates the natural world.

**46.** Which choice makes the sentence most grammatically acceptable?

**F.** **No Change**
**G.** appliqué which
**H.** appliqué and
**J.** appliqué,

**47.** Which choice makes the sentence most grammatically acceptable?

**A.** **No Change**
**B.** the surface of the fabric.
**C.** the surface of it.
**D.** their surface.

**48.** The writer is considering revising the underlined portion to the following:

mass-produced

Should the writer make this revision?

**F.** Yes, because the revision creates a clearer contrast between the homogeneous styles of clothing that are popular today and the handcrafted *paj ntaub*.
**G.** Yes, because the revision emphasizes Pang Xiong's desire for her handcrafted *paj ntaub* to be sold on a large scale in stores.
**H.** No, because the original word reinforces the idea that although *paj ntaub* clothing can be used for everyday wear, it should be saved for special occasions.
**J.** No, because the original word more specifically describes the type of clothing Pang Xiong disapproves of.

**GO ON TO THE NEXT PAGE.**

However, she still wears flower cloth every day and
49
would like to inspire others to do so. Pang Xiong teaches *paj ntaub* in art museums—including at the Smithsonian Institution, where some of her textiles are on permanent display—and in community settings around Philadelphia.

50 Pang Xiong is showing a new generation the joys of *paj ntaub* and beautiful handcrafted clothing.

**49.** Which transition word or phrase, if any, is most logical in context?

**A. No Change**
**B.** For example, she
**C.** Besides, she
**D.** She

**50.** Which of the following true statements, if added here, would best build on the ideas presented in this paragraph and connect to the final sentence of the essay?

**F.** She loves when people, no matter what their ethnicity, wear traditional clothing every day.
**G.** She often teaches *paj ntaub* to Hmong adults her age who want to learn new techniques.
**H.** Recently, she worked with nine young Hmong women in a formal apprenticeship.
**J.** One of her own favorite pieces tells the story of her family.

**END OF TEST 1**

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

## MATHEMATICS TEST

*50 Minutes—45 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.

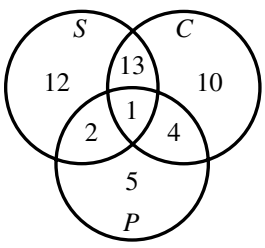
---

**DO YOUR FIGURING HERE.**

**1.** Cameron took 4 tests, and his scores were as follows: 100, 60, 80, and 30. Cameron took another test that was scored $x$. The mean score of the 5 tests he took is 72. What is the value of $x$?

**A.** 54
**B.** 67.5
**C.** 68.4
**D.** 90

**2.** In the Venn diagram below, circles $S$, $C$, and $P$ represent farms raising sheep, cows, and pigs, respectively. How many of the 47 farms represented in the diagram do **not** raise cows?




**F.** 15
**G.** 17
**H.** 18
**J.** 19

**GO ON TO THE NEXT PAGE.**

**DO YOUR FIGURING HERE.**

**3.** Marco designs a spinner wheel that has exactly 4 sections: red, blue, green, and yellow. He wants the spinner wheel to have a 25% chance of landing on each section. He spins the wheel 500 times. The results of the spins are shown in this table.

| Spinner wheel section | Number of times the spinner lands in each section |
|---|---|
| Red | 80 |
| Blue | 165 |
| Green | 130 |
| Yellow | 125 |

Based on the results in this table, one of the following changes would be the best fix. Which one?

**A.** He should decrease the area of the red section by increasing the area of the blue section.
**B.** He should increase the area of the red section by decreasing the area of the blue section.
**C.** He should increase the area of the red section by decreasing the area of any of the other three sections.
**D.** He should decrease the area of the blue section, and then it does **not** matter which section's area is increased.

**4.** In $\triangle ABC$, $\angle A$ and $\angle C$ are congruent, and the measure of $\angle B$ is 143.6°. What is the measure of $\angle A$?

**F.** 18.2°
**G.** 36.4°
**H.** 71.8°
**J.** 143.6°

**5.** Which of the following expressions is equivalent to $x^2 - x - 30$?

**A.** $(x + 3)(x - 10)$
**B.** $(x + 6)(x - 5)$
**C.** $(x - 6)(x + 5)$
**D.** $(x - 15)(x - 15)$

**6.** Which of the following matrices is equal to $5\begin{bmatrix} -4 & 2 \\ 0 & -5 \end{bmatrix}$?

**F.** $\begin{bmatrix} -20 & -15 \end{bmatrix}$

**G.** $\begin{bmatrix} -10 \\ -25 \end{bmatrix}$

**H.** $\begin{bmatrix} 1 & 7 \\ 5 & 0 \end{bmatrix}$

**J.** $\begin{bmatrix} -20 & 10 \\ 0 & -25 \end{bmatrix}$

**GO ON TO THE NEXT PAGE.**

**DO YOUR FIGURING HERE.**

**7.** Lavonne purchased some tickets and snack vouchers for an upcoming event and gave them to the members of her work group. Each member of her work group received the same number of tickets and the same number of snack vouchers. The total number of tickets she gave to her group was 30, and the total number of snack vouchers was 75. Which of the following could be the number of members in Lavonne's work group?

**A.** 10
**B.** 15
**C.** 25
**D.** 30

**8.** The initial speed, in miles per hour, of a certain car that skids to a stop can be estimated by multiplying the length of the skid, in feet, by 35 and then taking the square root of the product. According to this method, what is the estimated initial speed, in miles per hour, of the car when it makes a 108-foot skid?

**F.** $\sqrt{143}$
**G.** $7\sqrt{105}$
**H.** $6\sqrt{105}$
**J.** $210\sqrt{3}$

**9.** If $6y = 5x - 1$, then $x = ?$

**A.** $\frac{6}{5}y - 1$
**B.** $\frac{6}{5}y + 1$
**C.** $\frac{6y - 1}{5}$
**D.** $\frac{6y + 1}{5}$

**10.** A boat is traveling at a speed of 30 miles per hour. What is the boat's speed in feet per second?

(Note: 1 mile = 5,280 feet)

**F.** 20
**G.** 30
**H.** 44
**J.** 176

**GO ON TO THE NEXT PAGE.**

**DO YOUR FIGURING HERE.**

**11.** An object is launched vertically at 30 meters per second from a 55-meter-tall platform. The height, $h(t)$ meters, of the object $t$ seconds after launch is modeled by $h(t) = -4.9t^2 + 30t + 55$. What will be the height, in meters, of the object 3 seconds after launch?

**A.** 44.1
**B.** 100.9
**C.** 145
**D.** 189.1

**12.** The whole numbers 1 through 30 were each written on separate pieces of paper. Those 30 pieces of paper were put into a jar. One piece of paper will be randomly drawn from this jar. What is the probability that this piece of paper will have a prime number written on it?

**F.** $\frac{1}{30}$

**G.** $\frac{1}{20}$

**H.** $\frac{1}{10}$

**J.** $\frac{10}{30}$

**13.** For an angle with measure $\alpha$ in a right triangle, $\sin\alpha = \frac{5}{13}$ and $\tan\alpha = \frac{5}{12}$. What is the value of $\cos\alpha$?

**A.** $\frac{12}{13}$

**B.** $\frac{12}{\sqrt{194}}$

**C.** $\frac{12}{\sqrt{119}}$

**D.** $\frac{13}{12}$

**14.** Which of the following values, if any, is the $y$-value of the solution set to the system of equations below?

$2x - y = 7$
$-4x + 2y = 2$

**F.** 2
**G.** 5
**H.** 9
**J.** There is no such value for $y$.

**GO ON TO THE NEXT PAGE.**

**DO YOUR FIGURING HERE.**

**15.** Which of the following expressions is equivalent to $(y + 7)^3$?

**A.** $y^3 + 21y^2 + 147y + 343$
**B.** $y^3 + 14y + 343$
**C.** $y^3 + 14y + 49$
**D.** $y^3 + 343$

**16.** The sum of 3 positive integers is 180, and the ratio of the integers is 5:3:2. What is the value of the smallest of the integers?

**F.** 18
**G.** 36
**H.** 54
**J.** 90

**17.** Which of the following expressions is equivalent to $(x^2 - y^2) - (6x^2 + 4xy - y^2)$?

**A.** $-5x^2 - 4xy$
**B.** $-5x^2 + 4xy - 2y^2$
**C.** $7x^2 + 4xy - 2y^2$
**D.** $7x^2 + 4xy + 2y^2$

**18.** Given $i = \sqrt{-1}$, what is $\sqrt{9} + \sqrt{-16}$?

**F.** $7i$
**G.** $i\sqrt{7}$
**H.** $3 - 4i$
**J.** $3 + 4i$

**19.** The first 5 terms of an arithmetic sequence are 7, 21, 35, 49, and 63. Let $t_n$ represent the $n$th term of the sequence. What is the value of $t_{25}$?

**A.** 175
**B.** 343
**C.** 357
**D.** 371

**20.** At a certain time of day, a flagpole casts a 9.0-foot-long shadow and a nearby 4.0-foot-tall fence post casts a 2.4-foot-long shadow. Given that both the flagpole and the fence post are vertical and on level ground, what is the height, in feet, of the flagpole?

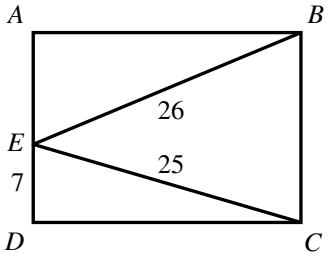
**F.** 5.4
**G.** 10.6
**H.** 15.0
**J.** 15.4

**GO ON TO THE NEXT PAGE.**

**DO YOUR FIGURING HERE.**

**21.** In rectangle $ABCD$ shown, segments $\overline{BE}$ and $\overline{CE}$ partition the rectangle into 3 triangles. Given $DE = 7$ centimeters, $BE = 26$ centimeters, and $CE = 25$ centimeters, what is the length, in centimeters, of $\overline{BC}$?




**A.** 10
**B.** 15
**C.** 17
**D.** 24

**22.** In a particular cleaning solution, the ratio of concentrated solution to water is 3:40. How many **cups** of concentrated solution should be added to 5 gallons of water to make the cleaning solution in the given ratio?

(Note: 4 cups = 1 quart; 4 quarts = 1 gallon)

**F.** 12

**G.** 6

**H.** $1\frac{1}{2}$

**J.** $\frac{3}{8}$

**23.** Let $f(t) = 7e^{3t} + 1$. Which of the following numbers is closest to the value of $f(5)$?

**A.** $-2 \times 10^{-1}$
**B.** $3 \times 10^{2}$
**C.** $2 \times 10^{7}$
**D.** $6 \times 10^{7}$

**24.** Which of the following expresses 40° in radians?

**F.** $\frac{2}{9\pi}$

**G.** $\frac{2\pi}{9}$

**H.** $\frac{9\pi}{2}$

**J.** $\frac{7{,}200}{\pi}$

**GO ON TO THE NEXT PAGE.**

**DO YOUR FIGURING HERE.**

**25.** Let the function $f$ be defined as $f(x) = -9x^2$. In the standard $(x,y)$ coordinate plane, the graph of $y = f(x)$ undergoes a transformation such that the result is the graph of $y = f(x) - 4$. Under this transformation the graph of $y = f(x)$ is:

**A.** shifted downward 4 coordinate units.
**B.** shifted left 4 coordinate units.
**C.** stretched horizontally by a factor of 4.
**D.** stretched vertically by a factor of 4.

**26.** For all positive values of $a$, $b$, $c$, and $d$, when $\frac{1}{2}ab^2 + c = d$, which of the following expressions is equal to $b$?

**F.** $\sqrt{\frac{a(d-c)}{2}}$

**G.** $\sqrt{\frac{2(d-c)}{a}}$

**H.** $\sqrt{\frac{2d-c}{a}}$

**J.** $\sqrt{\frac{d-c}{2a}}$

**27.** On a trip, 2 sisters counted 1,430 vehicles. They divided the vehicles into categories: cars, trucks, and other. They noted the color of each as white, black, red, or other, as shown in the table. What is the probability that a randomly selected truck is black?

| | White | Black | Red | Other | Total |
|---|---|---|---|---|---|
| Car | 118 | 62 | 97 | 197 | 474 |
| Truck | 100 | 31 | 116 | 232 | 479 |
| Other | 86 | 85 | 94 | 212 | 477 |
| Total | 304 | 178 | 307 | 641 | 1,430 |

**A.** $\frac{31}{178}$

**B.** $\frac{31}{479}$

**C.** $\frac{31}{1{,}430}$

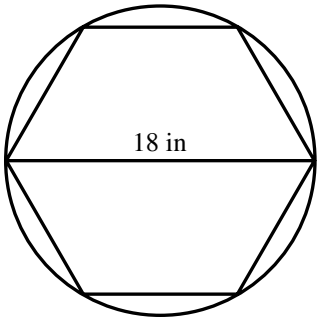
**D.** $\frac{479}{1{,}430}$

**GO ON TO THE NEXT PAGE.**

**DO YOUR FIGURING HERE.**

**28.** A regular hexagon is inscribed in a circle with diameter 18 inches, as shown. What is the perimeter, in inches, of the hexagon?




**F.** 54
**G.** 108
**H.** $27\sqrt{3}$
**J.** $54\sqrt{3}$

**29.** Tanya earns $34,000 in her 1st year at a job. She is given a raise of the same dollar amount each year, resulting in her earning $38,080 in the 4th year at the job. What is the total of Tanya's earnings during her 4 years at the job?

**A.** $136,000
**B.** $140,080
**C.** $144,160
**D.** $152,320

**30.** In the standard $(x,y)$ coordinate plane, how many points are both 5 coordinate units from the origin and also 2 coordinate units from the line $y = 0$?

**F.** 0
**G.** 1
**H.** 2
**J.** 4

**31.** In $\triangle ABC$, if the measure of $\angle A$ is less than the measure of $\angle B$, and the measure of $\angle B$ is less than the measure of $\angle C$, what is the correct ordering of the side lengths, from least to greatest?

**A.** $AB < BC < AC$
**B.** $AB < AC < BC$
**C.** $BC < AC < AB$
**D.** $BC < AB < AC$

**GO ON TO THE NEXT PAGE.**

**DO YOUR FIGURING HERE.**

**32.** Lajuan sells exactly 4 kinds of pies in his bakery: apple, pecan, coconut cream, and peach. Of the pies he sold on Thursday, $\frac{1}{4}$ were apple, $\frac{1}{2}$ were pecan, 24 were coconut cream, and 8 were peach. How many total pies did Lajuan sell on Thursday?

**F.** 40
**G.** 42
**H.** 56
**J.** 128

**33.** In a certain quadrilateral, 2 opposite angles each measure $(3x + 5)°$. The other 2 opposite angles each measure $(x + 3)°$. What is the value of $x$?

**A.** 1
**B.** 9
**C.** 43
**D.** 88

**34.** The first 4 terms of a sequence are shown in the table. The sequence is defined by $a_1 = 2$ and $a_n = a_{n-1} + (n-1)^2$ for $n \geq 2$. What is the sixth term, $a_6$, of this sequence?

| $a_1$ | $a_2$ | $a_3$ | $a_4$ |
|---|---|---|---|
| 2 | 3 | 7 | 16 |

**F.** 68
**G.** 57
**H.** 41
**J.** 32

**35.** On the real number line, how many integers are between $-\frac{65}{6}$ and $\frac{75}{2}$?

**A.** 8
**B.** 28
**C.** 48
**D.** 140

**GO ON TO THE NEXT PAGE.**

**DO YOUR FIGURING HERE.**

**36.** During a particular experiment, 2 events, A and B, can each occur. Events A and B are mutually exclusive during this experiment. Which of the following probabilities is 0?

**F.** P(A)
**G.** P(B)
**H.** P(A or B)
**J.** P(A and B)

**37.** The polynomial function defined by $p(x) = x^3 + x^2 - 8x - 12$ has $(x - 3)$ as one of its linear factors. What are all and only the zeros of $p$?

**A.** −3 and −2
**B.** −3 and 2
**C.** −2 and 3
**D.** 2 and 3

**38.** Jonathan rode his bike every day for 18 days. The table shows each of the distances he rode. The table also shows the number of days he rode each of those distances.

| Distance (in miles) | Number of days |
|---|---|
| 1 | 2 |
| 3 | 4 |
| 4 | 3 |
| 5 | 6 |
| 7 | 3 |

What is the median daily distance, in miles, that Jonathan rode his bike for the 18 days?

**F.** 3
**G.** 3.5
**H.** 4
**J.** 4.5

**39.** A tourism organization randomly selected 100 tourists finishing their summer visit to Spain. The organization asked them how many cities they had toured in the country. The table shows the results. Based on these data, for the population of tourists that visited Spain during the summer, what is the best estimate of the mean number of cities toured?

| Number of cities | 1 | 2 | 3 |
|---|---|---|---|
| Number of tourists | 10 | 40 | 50 |

**A.** 0.8
**B.** 2
**C.** 2.4
**D.** 3

**GO ON TO THE NEXT PAGE.**

**DO YOUR FIGURING HERE.**

**40.** Given the equation $\sqrt[4]{x} = y$, where $y$ is a real number, what **must** be true of $x$? $x$ is:

**F.** an even real number.
**G.** a rational number.
**H.** an integer.
**J.** a nonnegative real number.

**41.** Given that $1 \le m \le 4$, $4 \le n \le 6$, and $8 \le p \le 10$, what is the greatest possible value for $\left(\frac{m}{n}\right)\left(\frac{1}{p}\right)$?

**A.** $\frac{3}{20}$

**B.** $\frac{1}{15}$

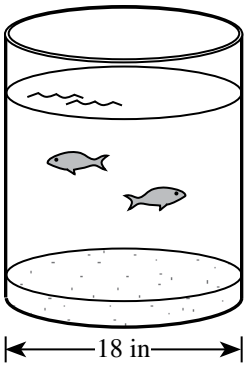
**C.** $\frac{1}{10}$

**D.** $\frac{1}{8}$

**42.** Which of the following datasets has the largest standard deviation?

**F.** 0, 0, 10, 10
**G.** 0, 1, 9, 10
**H.** 2, 3, 5, 7
**J.** 5, 5, 5, 5

**43.** Michael has a cylindrical fish tank, shown, that has an inside diameter of 18 inches. When he put colored gravel in his fish tank, the water level of the tank rose 2 inches. What is the volume of the gravel in cubic inches?




**A.** $18\pi$
**B.** $36\pi$
**C.** $162\pi$
**D.** $648\pi$

**GO ON TO THE NEXT PAGE.**

**DO YOUR FIGURING HERE.**

**44.** The table gives values of $f(x)$, $g(x)$, and $h(x)$ for all positive integers $x \leq 5$. Given $h(f(g(a))) = 1$ where $a$ is a positive integer less than or equal to 5, what is the value of $a$?

| $x$ | $f(x)$ | $g(x)$ | $h(x)$ |
|---|---|---|---|
| 1 | 2 | 4 | 3 |
| 2 | 1 | 5 | 1 |
| 3 | 4 | 2 | 5 |
| 4 | 5 | 3 | 4 |
| 5 | 3 | 1 | 2 |

**F.** 2
**G.** 3
**H.** 4
**J.** 5

**45.** Each time Coin C is tossed, it lands faceup or facedown. The probability of landing faceup is 3 times the probability of landing facedown. In a certain game, the player wins \$1.00 when Coin C lands faceup and the player wins \$2.00 when Coin C lands facedown. To the nearest cent, what is the expected value of each toss of Coin C in this game?

**A.** \$1.25
**B.** \$1.33
**C.** \$1.50
**D.** \$1.67

**END OF TEST 2**

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

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

## READING TEST

*40 Minutes—36 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 "Janus" by Ann Beattie (©1985 by The New Yorker Magazine, Inc.).

The bowl was perfect. Perhaps it was not what you'd select if you faced a shelf of bowls, and not the sort of thing that would inevitably attract a lot of attention at a crafts fair, yet it had real presence. It was as predictably admired as a mutt who has no reason to suspect he might be funny. Just such a dog, in fact, was often brought out (and in) along with the bowl.

Andrea was a real-estate agent, and when she thought that some prospective buyers might be dog-lovers, she would drop off her dog at the same time she placed the bowl in the house that was up for sale. She would put a dish of water in the kitchen for Mondo, take his squeaking plastic frog out of her purse and drop it on the floor. He would pounce delightedly, just as he did every day at home, batting around his favorite toy. The bowl usually sat on a coffee table, though recently she had displayed it on top of a pine blanket chest and on a lacquered table. It was once placed on a cherry table beneath a glorious still-life painting, where it held its own.

Everyone who has purchased a house or who has wanted to sell a house must be familiar with some of the tricks used to convince a buyer that the house is quite special: a fire in the fireplace in early evening; jonquils in a pitcher on the kitchen counter, where no one ordinarily has space to put flowers; perhaps the slight aroma of spring, made by a single drop of scent vaporizing from a lamp bulb.

The wonderful thing about the bowl, Andrea thought, was that it was both subtle and noticeable—a paradox of a bowl. Its glaze was the color of cream and seemed to glow no matter what light it was placed in. There were a few bits of color in it—tiny geometric flashes—and some of these were tinged with flecks of silver. They were as mysterious as cells seen under a microscope; it was difficult not to study them, because they shimmered, flashing for a split second, and then resumed their shape. Something about the colors and their random placement suggested motion. People who liked country furniture always commented on the bowl, but then it turned out that people who felt comfortable with opulence loved it just as much. But the bowl was not at all ostentatious, or even so noticeable that anyone would suspect that it had been put in place deliberately. They might notice the height of the ceiling on first entering a room, and only when their eye moved down from that, or away from the refraction of sunlight on a pale wall, would they see the bowl. Then they would go immediately to it and comment. Yet they always faltered when they tried to say something. Perhaps it was because they were in the house for a serious reason, not to notice some object.

Once, Andrea got a call from a woman who had not put in an offer on a house she had shown her. That bowl, she said—would it be possible to find out where the owners had bought that beautiful bowl? Andrea pretended that she did not know what the woman was referring to. A bowl, somewhere in the house? Oh, on a table under the window. Yes, she would ask, of course. She let a couple of days pass, then called back to say that the bowl had been a present and the people did not know where it had been purchased.

She was sure that the bowl brought her luck. Bids were often put in on houses where she had displayed the bowl. Sometimes the owners, who were always asked to be away or to step outside when the house was being shown, didn't even know that the bowl had been in their house. Once—she could not imagine how—she left it behind, and then she was so afraid that something might have happened to it that she rushed back to the house and sighed with relief when the owner opened the door. The bowl, Andrea explained—she had purchased a bowl and set it on the chest for safekeeping while she toured the house with the prospective buyers, and she . . . She felt like rushing past the frowning woman and seizing her bowl. The owner stepped aside. In the few seconds before Andrea picked up the bowl, she realized that the owner must have just seen that it had been perfectly placed, that the sunlight struck the bluer part of it. Her pitcher had been moved to the far side of the chest, and the bowl predominated. All the way home, Andrea wondered how she could have left the bowl behind. It was like leaving a friend at an outing—just walking off. Sometimes there were stories in the paper about families forgetting a child somewhere and driving to the next city. Andrea had only gone a mile down the road before she remembered.

**GO ON TO THE NEXT PAGE.**

**1.** The point of view from which the passage is told is best described as that of a:

**A.** first person narrator, present in the action, who relates events as they happen.
**B.** first person narrator, not present in the action, who relates events that happened in the past.
**C.** third person narrator, present in the action, who relates the thoughts and feelings of many characters.
**D.** third person narrator, not present in the action, who relates the thoughts and feelings of primarily one character.

**2.** The passage as a whole can best be described as an exploration of the:

**F.** career of a real estate agent and the agent's typically mundane transactions with clients.
**G.** special glaze on a bowl and why the glaze makes the bowl both subtle and noticeable.
**H.** perceived perfection of an object and that object's effect on people.
**J.** problems that can result from a person's unyielding focus on obtaining material goods.

**3.** The passage most strongly suggests that a useful characteristic of the bowl, in terms of Andrea's purpose for the object, is the bowl's:

**A.** universal appeal.
**B.** famous designer.
**C.** ostentatious look.
**D.** commercial availability.

**4.** In lines 53–75, Andrea responds to an inquiry about her bowl and explains why her bowl was placed in a client's home with statements that can best be described as:

**F.** vague generalizations.
**G.** absolute truths.
**H.** half-truths.
**J.** lies.

**5.** In the passage, Andrea is characterized as believing that compared to most tricks used by real estate agents to impress potential buyers, her trick of placing the bowl in a home is:

**A.** more humorous to potential buyers.
**B.** more obvious to potential buyers.
**C.** less familiar to potential buyers.
**D.** less enticing to potential buyers.

**6.** According to the passage, the random placement of colors in the bowl's glaze creates a surface that:

**F.** acts as a mirror.
**G.** seems to move.
**H.** appears cracked in the sunlight.
**J.** scatters prisms on the walls of a room.

**7.** One main point of the fifth paragraph (lines 53–62) is that:

**A.** Andrea's bowl sometimes attracts more interest than does the house itself.
**B.** Andrea's bowl does not actually belong to her, but she hopes to find its owner.
**C.** Andrea is often asked about the bowl when a client puts in an offer on a house.
**D.** Andrea sometimes forgets where in a house she has placed the bowl.

**8.** In the passage, the admiration the bowl receives is directly compared to the admiration received by:

**F.** a mutt.
**G.** a plastic frog.
**H.** a cherry table.
**J.** the aroma of spring.

**9.** The passage suggests that one reason prospective home buyers have difficulty sharing their thoughts about the bowl is that they realize:

**A.** they are not visiting the home for the purpose of noticing decorative objects.
**B.** they do not want to reveal that they have the financial means to buy the bowl.
**C.** Andrea might start talking about the bowl instead of discussing the home that is for sale.
**D.** Andrea might find the bowl even more intriguing than they do.

**GO ON TO THE NEXT PAGE.**

## Passage II

**INFORMATIONAL:** This passage is from the book *The Botany of Desire: A Plant's-Eye View of the World* by Michael Pollan.

Originally cultivated in the Ottoman Empire, tulips were introduced to Europe at the end of the sixteenth century and became wildly popular in the seventeenth century.

One crucial element of the beauty of the tulip that intoxicated the Dutch, the Turks, the French, and the English has been lost to us. To them the tulip was a magic flower because it was prone to spontaneous and brilliant eruptions of color. In a planting of a hundred tulips, one of them might be so possessed, opening to reveal the white or yellow ground of its petals painted, as if by the finest brush and steadiest hand, with intricate feathers or flames of a vividly contrasting hue. When this happened, the tulip was said to have "broken," and if a tulip broke in a particularly striking manner—if the flames of the applied color reached clear to the petal's lip, say, and its pigment was brilliant and pure and its pattern symmetrical—the owner of that bulb had won the lottery. For the offsets of that bulb would inherit its pattern and hues and command a fantastic price. The fact that broken tulips for some unknown reason produced fewer and smaller offsets than ordinary tulips drove their prices still higher. Semper Augustus was the most famous such break.

The closest we have to a broken tulip today is the group known as the Rembrandts—so named because Rembrandt painted some of the most admired breaks of his time. But these latter-day tulips, with their heavy patterning of one or more contrasting colors, look clumsy by comparison, as if painted in haste with a thick brush. To judge from the paintings we have of the originals, the petals of broken tulips could be as fine and intricate as marbleized papers, the extravagant swirls of color somehow managing to seem both bold and delicate at once. In the most striking examples—such as the fiery carmine that Semper Augustus splashed on its pure white ground—the outbreak of color juxtaposed with the orderly, linear form of the tulip could be breathtaking, with the leaping, wayward patterns just barely contained by the petal's edge.

Anna Pavord recounts the extraordinary lengths to which Dutch growers would go to make their tulips break, sometimes borrowing their techniques from alchemists, who faced what must have seemed a comparable challenge. Over the earth above a bed planted with white tulips, gardeners would liberally sprinkle paint powders of the desired hue, on the theory that rainwater would wash the color down to the roots, where it would be taken up by the bulb. Charlatans sold recipes believed to produce the magic color breaks; pigeon droppings were thought to be an effective agent, as was plaster dust taken from the walls of old houses. Unlike the alchemists, whose attempts to change base metals into gold reliably failed, now and then the would-be tulip changers would be rewarded with a good break, inspiring everybody to redouble their efforts.

What the Dutch could not have known was that a virus was responsible for the magic of the broken tulip, a fact that, as soon as it was discovered, doomed the beauty it had made possible. The color of a tulip actually consists of two pigments working in concert—a base color that is always yellow or white and a second, laid-on color called an anthocyanin; the mix of these two hues determines the unitary color we see. The virus works by partially and irregularly suppressing the anthocyanin, thereby allowing a portion of the underlying color to show through. It wasn't until the 1920s, after the invention of the electron microscope, that scientists discovered the virus was being spread from tulip to tulip by *Myzus persicae*, the peach potato aphid. Peach trees were a common feature of seventeenth-century gardens.

By the 1920s the Dutch regarded their tulips as commodities to trade rather than jewels to display, and since the virus weakened the bulbs it infected (the reason the offsets of broken tulips were so small and few in number), Dutch growers set about ridding their fields of the infection. Color breaks, when they did occur, were promptly destroyed, and a certain peculiar manifestation of natural beauty abruptly lost its claim on human affection.

I can't help thinking that the virus was supplying something the tulip needed, just the touch of abandon the flower's chilly formality called for. Maybe that's why the broken tulip became such a treasure in seventeenth-century Holland: the wayward color loosed on a tulip by a good break perfected the flower, even as the virus responsible set about destroying it.

On its face the story of the virus and the tulip would seem to throw a wrench into any evolutionary understanding of beauty.



**10.** The main purpose of the passage is to:

- **F.** highlight changes in the flower industry from the seventeenth century through today.
- **G.** examine the way certain plants have been represented in art over the centuries.
- **H.** provide an overview of plant viruses and the way they affect the flower market.
- **J.** explain a particular flower variation and how it has been perceived historically.

**GO ON TO THE NEXT PAGE.**

**11.** The main point of the second paragraph (lines 21–36) is that:

- **A.** modern Rembrandt tulips have been painted by many of today's most famous artists.
- **B.** compared to seventeenth-century broken tulips, today's multicolored tulips are less visually appealing.
- **C.** the tulip break known as Semper Augustus was a striking example of the seventeenth-century broken tulip.
- **D.** Rembrandt was responsible for painting the most famous tulip breaks of his time.

**12.** It can reasonably be inferred from the passage that some seventeenth-century tulip growers believed tulip breaks were mainly caused by:

- **F.** suppliers' storage conditions.
- **G.** diseased tulip bulbs.
- **H.** certain growing techniques.
- **J.** certain weather patterns.

**13.** The information in lines 57–64 primarily functions to:

- **A.** describe the range of potential tulip colors.
- **B.** explain how the color variation in a broken tulip occurs.
- **C.** argue that yellow and white are the only natural tulip colors.
- **D.** indicate why broken tulips contain no anthocyanin.

**14.** The sixth paragraph (lines 79–85) differs from the rest of the passage in that it:

- **F.** questions whether the virus that caused broken tulips was harmful to bulbs.
- **G.** argues that growers should have dealt with broken tulips differently.
- **H.** challenges the idea that broken tulips were beautiful.
- **J.** presents a personal meditation on broken tulips.

**15.** According to the passage, in the seventeenth century, the fact that broken tulip bulbs tended to produce fewer and smaller offsets compared to typical tulip bulbs resulted in:

- **A.** a decrease in the demand for broken tulips.
- **B.** a fear among growers that broken tulips were diseased.
- **C.** an increase in prices for broken tulips.
- **D.** a desire among growers to plant a wider variety of crops.

**16.** In the passage, the author compares broken tulips as they are represented in Rembrandt's paintings to:

- **F.** peach-tree blossoms.
- **G.** paint powders sprinkled on the ground.
- **H.** a painting hastily done with a thick brush.
- **J.** intricately marbleized papers.

**17.** The passage author most likely mentions that peach trees were a staple of seventeenth-century gardens to:

- **A.** highlight a crop favored by growers who did not cultivate tulips.
- **B.** emphasize that peach trees are not as popular in gardens today.
- **C.** explain how peach potato aphids spread the tulip virus.
- **D.** compare tulips to another popular seventeenth-century crop.

**18.** As it is used in line 80, the word *abandon* most nearly means:

- **F.** uninhibitedness.
- **G.** relinquishment.
- **H.** retreat.
- **J.** denial.

**GO ON TO THE NEXT PAGE.**

## Passage III

**INFORMATIONAL:** Passage A is from the book *Foundation: B-Boys, B-Girls, and Hip-Hop Culture in New York* by Joseph G. Schloss (©2009 by Oxford University Press). Passage B is from the book *The Tanning of America: How Hip-Hop Created a Culture That Rewrote the Rules of the New Economy* by Steve Stoute with Mim Eichler Rivas (©2011 by Steve Stoute).

### Passage A by Joseph G. Schloss

The term *b-boying* refers to break dancing.

In the first sense of the term, hip-hop refers collectively to a group of related art forms in different media (visual, sound, movement) that were practiced in Afro-Caribbean, African American, and Latino neighborhoods in New York City in the 1970s. The term, when used in this sense, also refers to the events at which these forms were practiced, the people who practiced them, their shared aesthetic sensibility, and contemporary activities that maintain those traditions.

Perhaps the most important aspect of this variety of hip-hop is that it is unmediated, in the sense that most of the practices associated with it are both taught and performed in the context of face-to-face interactions between human beings. To some degree, this constitutes an intentional rejection of the mass media by its practitioners, but to a great extent it is just the natural result of the practices themselves. Activities like b-boying and graffiti writing are simply not well suited to the mass media. Although in both cases, brief attempts were made to bring these forms of expression into mainstream contexts (b-boying in a series of low-budget "breaksploition" movies in the early 1980s and graffiti as part of a short-lived gallery trend around the same time), neither developed substantially in those environments. This, it has been suggested, was not so much because the forms lacked appeal, but because—on an economic level—b-boying was an advertisement with no product. This reality is reflected in the phrase that is often used to refer to this branch of hip-hop: "hip-hop culture," which suggests something that is lived rather than bought and sold.

The second sense of the term *hip-hop* refers to a form of popular music that developed, or was developed, out of hip-hop culture. This hip-hop, also known as "rap music," resulted from the interaction between hip-hop culture and the preexisting music industry. As we would expect, this hip-hop features elements of both sensibilities. My students are often surprised when I point out that, even when hip-hop lyrics seem to reject every aspect of mainstream culture and morality, the one thing they almost never reject is a strict 16-bar verse structure derived from Tin Pan Alley pop music. But this should not be surprising. This hip-hop, in contrast to hip-hop culture, is deeply intertwined with the mass media and its needs, largely because it *does* have a product: records, CDs, MP3s, and ringtones.

### Passage B by Steve Stoute

It wasn't until I was nine years old, late in 1979, that I even heard the words "hip" and "hop" strung together or was able to grasp the notion of what being a rapper actually meant. That was when, fatefully, I heard a record that changed my life (and pop culture) forever.

Like it's yesterday, I can still remember that moment over at my aunt's home in Brooklyn—where it seemed there was always a party under way with relatives and neighbors hanging out, a great spread of food, and new, hot music on the record player. Most stereo systems in those days could be adapted for the single two-sided records that were smaller and had the big hole in the middle (45 RPM) as well as the bigger records with the small holes (33⅓ RPM)—which were the full albums that had several songs on each side.

But as the intro plays to what I recognize as "Good Times" by the group Chic and I'm drawn into the living room because it's a familiar hit song from the previous summer, I encounter a record on the turntable that defies categorization. Instead of the sweet female lead vocals of that disco smash, I hear something totally different and spot a baby-blue label on the black vinyl record I've never seen before. Even though it's a twelve-inch disc, the size of an album, as I listen to the rhyming words being spoken—"*Singin' on 'n' 'n' on 'n' on / The beat don't stop until the break of dawn / Singin' on 'n' 'n' on 'n' on on 'n' on / Like a hot buttered a pop da pop da pop dibbie dibbie pop da pop pop / Ya don't dare stop*"—it hits me that this entire side is one long song.

Almost fifteen minutes long as it turns out. Or, to be exact, fourteen minutes and thirty-six seconds of pure fun laid over the thumping bass beat from the break of "Good Times" with sing-along words easy to remember and repeat. The record, I discover, is by an unknown group, the Sugarhill Gang, and is called "Rapper's Delight."

From then on, nobody ever has to tell me what rap is. It's whatever words are spoken, chanted, or talk-sung, or whatever philosophies, stories, or ideas are espoused, by the house party Master of Ceremonies.

**19.** According to Passage A, one reason elements of hip-hop culture such as b-boying are rarely represented in mass media is that these art forms:

- **A.** have never been brought to the public's attention.
- **B.** are not bought and sold as products.
- **C.** do not appeal to young people.
- **D.** declined in popularity after the 1970s.

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**20.** As it is used in line 38, the word *sensibilities* most nearly means:

- **F.** emotions.
- **G.** sensitivities.
- **H.** perspectives.
- **J.** feelings of gratitude.

**21.** Based on Passage A, which statement best captures the relationship between Tin Pan Alley pop music and rap music?

- **A.** Rap artists have rejected every aspect of Tin Pan Alley pop.
- **B.** Rap artists have been aware of Tin Pan Alley pop but not influenced by it.
- **C.** Tin Pan Alley pop developed at the same time as rap.
- **D.** Tin Pan Alley pop has influenced many rap artists.

**22.** Which of the following details does the author of Passage B highlight as one that caused "Rapper's Delight" to stand out as different compared to other songs he knew?

- **F.** The song's intro
- **G.** The female vocals
- **H.** The length of the song
- **J.** The fact that the song was on a vinyl record

**23.** In the context of Passage B, the main point of the third paragraph (lines 62–76) is that the author was:

- **A.** struck by the combination of new and established musical elements in the music he was hearing.
- **B.** uncomfortable with what he viewed as an unwelcome change to a favorite song.
- **C.** more interested in an unfamiliar album label than in the new music that was playing.
- **D.** convinced that the new form of music he was hearing would become more popular than disco.

**24.** Based on Passage B, it can reasonably be inferred that the author views his first exposure to rap music as:

- **F.** memorable but ultimately not very important.
- **G.** significant for his childhood but less so for his adulthood.
- **H.** a transformative experience.
- **J.** a disappointing experience.

**25.** Compared to Passage A, Passage B focuses more on:

- **A.** early hip-hop's interaction with the marketplace.
- **B.** attempts to move hip-hop art into galleries.
- **C.** the mass media.
- **D.** the author's personal experience.

**26.** Which of the following elements of Passage B is not included in Passage A?

- **F.** A story involving a particular rap song
- **G.** A discussion of the early days of hip-hop
- **H.** A mention of the New York City area in the context of hip-hop
- **J.** An acknowledgment of rap's interaction with other musical forms

**27.** The authors of both passages would most likely agree with the idea that early rap music:

- **A.** represented artists' rejection of the music industry and its practices.
- **B.** represented a significant development in American popular culture.
- **C.** was more popular than today's rap music.
- **D.** was slow to find an audience.

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## Passage IV

**INFORMATIONAL:**This passage is from the article "The Rise and Fall of the Living Fossil" by Ferris Jabr (©2015 by *Nautilus*).

The term "living fossil" refers to creatures that had emerged long ago and seemed to have stopped evolving.

Like all living fossils, crocodiles were thought to have emerged in the distant past and then stayed largely unchanged. The standard theory held that the crocodilian species we know today originated in Africa during the Cretaceous (145 to 66 million years ago), when the seven continents were much closer together. As the continents drifted apart, the crocodilians went with them, explaining how they ended up in a band of tropics encircling the globe. If that were true, then modern crocodilian species should be very different from one another at the level of genes and molecules, because there would have been more than enough time for substantial mutations to accumulate. By the 1990s, however, molecular analysis revealed that immune system molecules conserved across living crocodilian species were remarkably similar in structure and behavior.

Intrigued by this puzzle, a post-doctoral research fellow at the University of Washington named Jamie Oaks began collecting DNA samples from all 23 living crocodilian species, comparing sections of the genome where mutations were most likely to have appeared. Oaks did not find nearly as many differences between the modern crocodilian genomes as one would expect had those species diverged all the way back in the Cretaceous. He concluded that modern crocodilian species split from their last common ancestor between 8 and 13 million years ago, not long before ancient hominins split from their last common ancestor with chimpanzees. The living fossil theory of crocodiles had overestimated their evolutionary age by about a factor of 10.

Oaks also noticed something odd about the DNA samples he had acquired from the iconic Nile crocodiles (*Crocodylus niloticus*): they did not match up with each other. In fact, the variation between them was great enough to suggest that he was looking at two distinct species. If so, then not only were modern crocodiles much too young to be living fossils, but they had also continued to speciate after diverging from their basal ancestor—something living fossils are not supposed to do. On its own, Oaks' study was intriguing, but not enough to convince the larger scientific community to cleave the Nile crocodile into two species.

Unbeknownst to him, however, a separate team of scientists was preparing to corroborate his results. In the early 2000s, on an excursion to Chad, the wildlife conservationist Michael Klemens encountered some odd little crocodiles in a desert oasis. They were so docile that he and his companions could swim beside them without concern. He took a tissue sample from one that had recently perished and sent it to the American Museum of Natural History in New York City, where Evon Hekkala, an assistant professor at Fordham University studying crocodilian diversity, sequenced its genome. When she compared the docile croc's DNA to other Nile crocodiles, she noticed some rather striking differences. Could these tame crocs be an entirely distinct species?

DNA analysis of 123 African crocodiles—as well as 57 separate samples from museum specimens, including crocodiles mummified in ancient Egypt—confirmed her suspicion. In a few sections of their respective genomes, all the mild-mannered crocs would have one DNA sequence, and all the typical Nile crocs another. They even had different numbers of chromosomes. "That made us very confident that there were actually two different populations and they were not mixing their DNA," Hekkala says. The two different species had diverged between 3 and 6 million years ago: *Crocodylus niloticus* in the East and the smaller, less aggressive *Crocodylus suchus* in the West. The vast majority of mummified crocodiles were *C. suchus*, suggesting that ancient Egyptians had recognized the difference.

Together, Hekkala, Oaks, and other scientists helped redraw the map of how crocodilians evolved in space and time, and conclusively removed them from the category of living fossils.

**28.** In the context of the passage, how does the analysis of crocodilian immune system molecules relate to the living fossil theory of crocodilian evolution?

- **F.** The analysis confirms the living fossil theory.
- **G.** The analysis suggests the living fossil theory is accurate.
- **H.** The analysis supports the living fossil theory in some ways and does not support the theory in other ways.
- **J.** The analysis does not support the living fossil theory.

**29.** Which of the following statements best summarizes Oaks's analysis of Nile crocodiles' DNA as it is presented in the third paragraph (lines 31–42)?

- **A.** It suggested that Nile crocodiles are older than what was previously believed, which does not support the living fossil theory of crocodiles.
- **B.** It suggested that different species of crocodiles do not share a basal ancestor, which the scientific community has confirmed.
- **C.** It suggested that the analysis was hastily done, which prompted the scientific community to ignore it.
- **D.** It suggested that the DNA came from two species, which did not support the living fossil theory of crocodiles.

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**30.** The main purpose of the fifth paragraph (lines 58–73) is to:

- **F.** describe the DNA analysis that confirmed *Crocodylus niloticus* and *Crocodylus suchus* were two distinct species.
- **G.** provide information on the mummification of crocodiles that was pertinent to Hekkala's analysis.
- **H.** explain how Hekkala revolutionized DNA analysis by comparing the DNA of 123 different African crocodiles.
- **J.** introduce the behavioral differences between *Crocodylus niloticus* and *Crocodylus suchus*.

**31.** According to the passage, molecular analysis revealed that immune system molecules from living crocodilian species were similar in:

- **A.** structure and behavior.
- **B.** color and size.
- **C.** density and age.
- **D.** shape and weight.

**32.** In the context of the passage, the statement in lines 47–49 mainly serves to:

- **F.** indicate that Klemens and his companions believed that the crocodiles were diseased.
- **G.** establish the tameness of the crocodiles in the desert oasis.
- **H.** suggest that Klemens and his companions suspected they were swimming with *Crocodylus niloticus*.
- **J.** indicate that the crocodiles in the desert oasis had not yet fully matured.

**33.** According to the passage, after Klemens sent a tissue sample of a perished crocodile to Hekkala, Hekkala then:

- **A.** estimated the crocodile's age.
- **B.** studied the crocodile's immune system.
- **C.** sequenced the crocodile's genome.
- **D.** identified mutations in the crocodile's molecular structure.

**34.** In the context of the passage, the detail that *Crocodylus niloticus* and *Crocodylus suchus* have different numbers of chromosomes provides support for the claim that the two species:

- **F.** diverged during the Cretaceous.
- **G.** had similar diets.
- **H.** did not evolve from the same ancestor.
- **J.** were not mixing their DNA.

**35.** According to the passage, *Crocodylus niloticus* and *Crocodylus suchus* diverged between:

- **A.** 1 and 2 million years ago.
- **B.** 3 and 6 million years ago.
- **C.** 8 and 13 million years ago.
- **D.** 66 and 145 million years ago.

**36.** Based on the passage, the phrase "redraw the map" (line 75) is most likely meant to be read:

- **F.** literally; scientists no longer believed crocodiles originated in Africa.
- **G.** literally; scientists no longer believed crocodiles once lived in a band of tropics.
- **H.** figuratively; scientists amended the narrative of the natural history of crocodiles.
- **J.** figuratively; scientists believed their findings would have broader implications on archaeology.

**END OF TEST 3**

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

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

 

## SCIENCE TEST

*40 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.

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### Passage I

Green anoles and brown anoles (2 species of reptiles) behave differently when the species are together in a habitat than when the species are in separate habitats. Table 1 lists the anole species present in each of 3 habitats (Habitats X, Y, and Z).

Table 1

| Habitat | Anole species present: |
|---|---|
| X | green only |
| Y | green and brown |
| Z | brown only |

Figure 1 shows, for each anole species, the average perching height in a habitat.

Figure 1

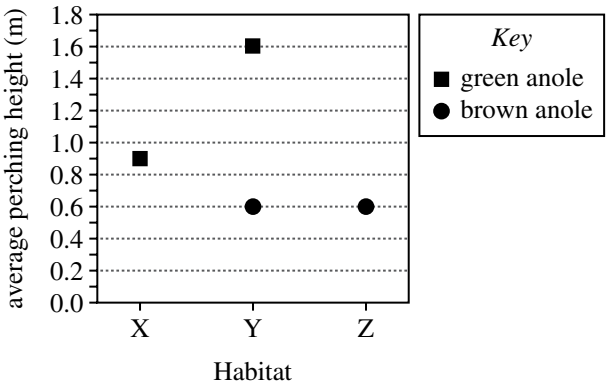


Table 2 lists the number of times each of Behaviors 1–4 was displayed by the anoles in a habitat. Green anoles display Behaviors 1–3 only; brown anoles display Behavior 4 only.

Table 2

| Behavior | Number of times behavior was displayed in Habitat: | | |
|---|---|---|---|
| | X | Y | Z |
| 1 | 4 | 5 | N.A. |
| 2 | 3 | 6 | N.A. |
| 3 | 24 | 13 | N.A. |
| 4 | N.A. | 5 | 17 |

Note: N.A. indicates the behavior was not displayed in the habitat.

Table 3 lists, for the anole species in a habitat, the average display time for Behavior 5.

Table 3

| Anole species | Habitat | Average display time for Behavior 5 (s) |
|---|---|---|
| Green | X | 23.1 |
| Green | Y | 23.7 |
| Brown | Y | 49.6 |
| Brown | Z | 33.1 |

Figure 1 and Tables 2 and 3 adapted from Jessica R. Edwards and Simon P. Lailvaux, "Display Behavior and Habitat Use in Single and Mixed Populations of *Anolis carolinensis* and *Anolis sagrei* Lizards." ©2012 by Blackwell Verlag GmbH.

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**1.** Based on Table 2, which of the following ratios best represents the number of times Behavior 2 was displayed in Habitat X compared to the number of times Behavior 2 was displayed in Habitat Y?

**A.** 1:2
**B.** 1:8
**C.** 4:5
**D.** 5:6

**2.** Which of the following observations for brown anoles was(were) the same in both Habitats Y and Z?

1. Average perching height
2. The number of times Behavior 4 was displayed
3. Average display time for Behavior 5

**F.** 1 only
**G.** 3 only
**H.** 1 and 2 only
**J.** 2 and 3 only

**3.** Based on Table 3, how many display times were measured for Behavior 5 in Habitat Z?

**A.** 2
**B.** 4
**C.** 12
**D.** Cannot be determined from the given information

**4.** Based on Figure 1, for green anoles, the difference in average perching height between Habitat X and Habitat Y was closest to which of the following?

**F.** 0.0 m
**G.** 0.3 m
**H.** 0.7 m
**J.** 1.0 m

**5.** A student claimed that anoles are endotherms. Which of the following explains why this claim is incorrect? Anoles are:

**A.** amphibians and primarily generate heat from internal metabolic processes to maintain body temperature.
**B.** amphibians and primarily absorb heat from the surrounding environment to maintain body temperature.
**C.** reptiles and primarily generate heat from internal metabolic processes to maintain body temperature.
**D.** reptiles and primarily absorb heat from the surrounding environment to maintain body temperature.

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## Passage II

The coastline of Antarctica consists of many ice shelves (floating 100–1,000 m thick sheets of ice that extend from a landmass). Many of these ice shelves are melting, causing them to calve (break off) large pieces known as icebergs. Four students each explain iceberg calving.

*Student 1*

Antarctic ice shelves melt due to the warming of the air above the surface of the ice during the summer. When the air temperature increases, the surface ice melts and water pools. The meltwater moves downward into the ice shelf, causing fractures to form. The accumulation of many fractures in the ice over many summers gradually leads to icebergs calving from an ice shelf.

*Student 2*

Student 1 is correct that an increase in air temperature during the summer leads to surface ice melting and water pooling, causing fractures to form in the ice. However, the action of the meltwater alone is insufficient to produce fractures deep enough to cause calving. When the air temperature lowers at the beginning of winter, falling snow accumulates in the fractures, increasing the pressure on the ice, eventually causing calving. After a large snowfall, calving can occur within a few days.

*Student 3*

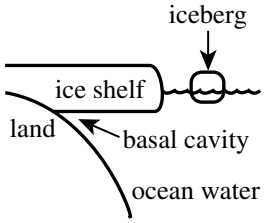
Antarctic ice shelves melt only from below. During the summer, ocean currents circulate water that is just above freezing into and out of the basal cavity (the area underneath an ice shelf), causing the ice within the cavity to melt. For every 0.1°C that the ocean water is above freezing, the water melts a thickness of 10 m of ice from the bottom per year. When the ice shelf thickness has been reduced by at least 50 m, calving occurs.

*Student 4*

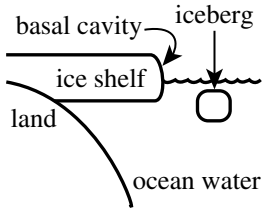
The warmer water circulated by ocean currents melts the ice shelf as described by Student 3. However, calving cannot occur from this process alone. Snow accumulates on the surface of the ice each winter, but each following summer, warm air leads to the melting and compaction of the snow. The compaction lowers the surface of the ice shelf, pushing the ice down into the basal cavity, where it is melted by the ocean water. After several winter-summer cycles, the ice shelf becomes top-heavy due to the snow and the melting from below, and calving occurs.

**6.** Which of the following diagrams best shows the location of the basal cavity as described by Student 3?

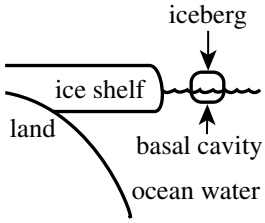
**F.**



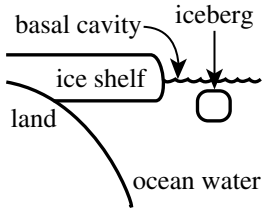

**H.**




**G.**




**J.**

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**7.** Suppose that the air temperature along the Antarctic coastline is never warmer than −10°C and that the atmospheric pressure is always 1.0 atmosphere. Does this information support the description given by Student 1?

**A.** Yes, because ice cannot melt at those temperatures.
**B.** Yes, because ice can melt at those temperatures.
**C.** No, because ice cannot melt at those temperatures.
**D.** No, because ice can melt at those temperatures.

**8.** Based on the description of the icebergs that are calved along the coastline of Antarctica, do the icebergs sink or float?

**F.** Sink; they are more dense than ocean water.
**G.** Sink; they are less dense than ocean water.
**H.** Float; they are more dense than ocean water.
**J.** Float; they are less dense than ocean water.

**9.** Which of Students 1 and 4, if either, implied that the processes involved in iceberg calving will take more than one year to result in the formation of an iceberg?

**A.** Student 1 only
**B.** Student 4 only
**C.** Both Student 1 and Student 4
**D.** Neither Student 1 nor Student 4

**10.** In regard to the season(s) involved in iceberg calving, how does Student 2's description differ from Student 3's description? Student 2 indicated that:

**F.** summer and winter are involved in calving, whereas Student 3 indicated that only summer is involved in calving.
**G.** summer and winter are involved in calving, whereas Student 3 indicated that only winter is involved in calving.
**H.** only summer is involved in calving, whereas Student 3 indicated that summer and winter are involved in calving.
**J.** only winter is involved in calving, whereas Student 3 indicated that only summer is involved in calving.

**11.** Which of Students 2, 3, and 4 agree(s) with Student 1 that some form of melting occurs on the ice shelf surface?

**A.** Student 2 only
**B.** Students 2 and 3 only
**C.** Students 2 and 4 only
**D.** Students 3 and 4 only

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## Passage III

*Amphiprion percula*, a species of clownfish, are kept in many home aquariums. Two experiments were conducted to determine how diet and stocking density (number of fish per liter of seawater, fish/L) affect the specific growth rate (SGR; percent increase in length per day, percent/day) in *A. percula*.

*Experiment 1*

Each of 12 identical 15 L tanks received 10 L of seawater having a salinity of 33 parts per thousand (ppt), a temperature of 27°C, and a pH of 8.2. Salinity, temperature, and pH were kept constant over the course of the experiment. *A. percula* of similar lengths were selected, and their lengths were measured, in cm, with a ruler. Then they were equally distributed among the tanks at a stocking density of 1 fish/L. The tanks were then divided equally into 4 groups.

For 4 months, each group was fed a different diet (Diets Q–T). Each group was fed the same mass of food 3 times daily. At the end of 4 months, the length of each fish was measured, in cm, with a ruler, and the SGR of each fish was calculated. The average SGR was then determined for each group (see Table 1).

Table 1

| Diet | Average SGR (percent/day) |
|---|---|
| Q | 0.30 |
| R | 0.40 |
| S | 0.50 |
| T | 0.35 |

*Experiment 2*

The procedures for Experiment 1 were repeated except that each group was kept at a different stocking density, 0.5 fish/L, 1 fish/L, 2 fish/L, or 3 fish/L, and all fish were fed Diet T. At the end of 4 months, the average SGR was determined for each group (see Table 2).

Table 2

| Stocking density (fish/L) | Average SGR (percent/day) |
|---|---|
| 0.5 | 0.50 |
| 1 | 0.35 |
| 2 | 0.25 |
| 3 | 0.20 |

Tables adapted from João Chambel et al., "Effect of Stocking Density and Different Diets on Growth of Percula Clownfish, *Amphiprion percula* (Lacepede, 1802)." ©2015 by Springer.

**12.** Which of the following statements about the relationship between the number of *A. percula* per tank and the average SGR is consistent with the results of Experiment 2? On average, as the number of *A. percula* per tank increased, the average SGR:

**F.** increased only.
**G.** decreased only.
**H.** remained the same.
**J.** varied with no general trend.



**13.** The following table gives the percent protein in each of the 4 diets.

| Diet | Percent protein |
|---|---|
| Q | 52.5 |
| R | 48.0 |
| S | 41.1 |
| T | 38.1 |

Which of the following statements about the percent protein in each diet and the average SGR is consistent with the data shown in the table and the results of Experiment 1? The diet that resulted in the:

**A.** highest average SGR also had the highest percent protein.
**B.** highest average SGR had the lowest percent protein.
**C.** lowest average SGR had the highest percent protein.
**D.** lowest average SGR also had the lowest percent protein.

**14.** Based on the results of Experiment 1, if Experiment 2 were repeated except that all the *A. percula* were fed Diet R, would the average SGRs more likely have been lower or higher for each group?

**F.** Lower; on average, *A. percula* fed Diet R had an SGR 0.05 percent/day less than those fed Diet T.
**G.** Lower; on average, *A. percula* fed Diet R had an SGR 0.10 percent/day less than those fed Diet T.
**H.** Higher; on average, *A. percula* fed Diet R had an SGR 0.05 percent/day greater than those fed Diet T.
**J.** Higher; on average, *A. percula* fed Diet R had an SGR 0.10 percent/day greater than those fed Diet T.

**15.** Suppose that, in the experiments, 1 g of food were added to each tank at each feeding. A total of how many grams of food would have been placed into an individual tank each day?

**A.** 1 g
**B.** 3 g
**C.** 12 g
**D.** 36 g

**16.** How many *A. percula* were placed in each of the tanks in Experiment 1?

**F.** 1
**G.** 4
**H.** 10
**J.** 12

**17.** Which of the following was a dependent variable in Experiment 1?

**A.** Volume of seawater in each tank
**B.** Specific growth rate
**C.** Diet fed to the *A. percula*
**D.** Stocking density of the *A. percula*

**GO ON TO THE NEXT PAGE.**

## Passage IV

Scientists hypothesized that heating tomatoes affects the concentration of nutrients such as vitamin C and lycopene (a red pigment) in the tomatoes. They conducted 2 experiments to test their hypothesis.

*Experiment 1*

Two kilograms of a particular variety of raw tomatoes were sliced and then blended in a food processor until a homogeneous (uniform) tomato mixture was produced. The mixture was divided into 4 equal samples (Samples 1–4). Each sample was placed in a separate plastic bag, and the bags were sealed. The bag containing Sample 1 was immediately frozen at −40°C. The bags containing Samples 2–4 were each incubated in a water bath at 88°C for a different period of time (see Table 1) and then frozen at −40°C.

Table 1

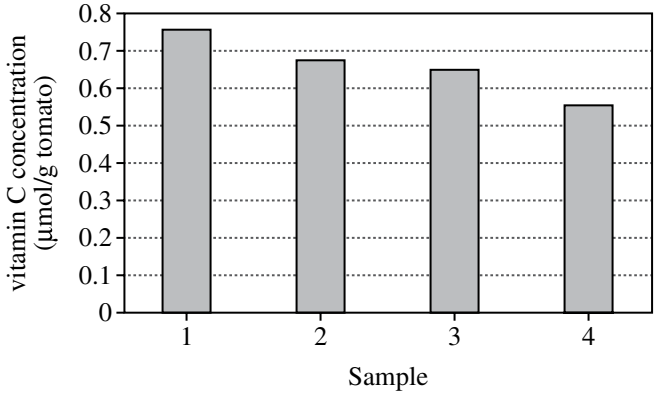
| Sample | Incubation time at 88°C (min) |
|---|---|
| 1 | 0 |
| 2 | 2 |
| 3 | 15 |
| 4 | 30 |

Then, 2 days later, Steps 1–3 were performed for each sample.

1. The sample was thawed, and then 100 g of the sample was placed in a beaker containing 200 mL of Solvent A.
2. The contents of the beaker were mixed for 5 min at 25°C and then filtered using a paper filter. The filtered liquid was collected.
3. The filtered liquid was analyzed to determine the vitamin C concentration in micromoles per gram of tomato (μmol/g tomato).

The results for each sample are shown in Figure 1.

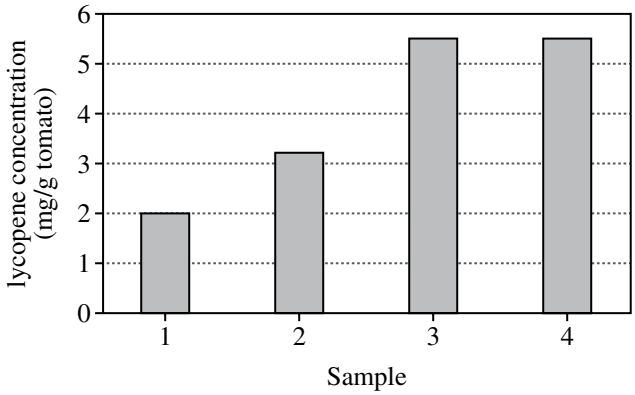
Figure 1




*Experiment 2*

Experiment 1 was repeated except that in Step 3 the filtered liquid was analyzed to determine the lycopene concentration in milligrams per gram of tomato (mg/g tomato). The results for each sample are shown in Figure 2.

Figure 2




Figures 1 and 2 adapted from Veronica Dewanto et al., "Thermal Processing Enhances the Nutritional Value of Tomatoes by Increasing Total Antioxidant Activity." ©2002 by American Chemical Society.



**18.** Which of the samples in Experiment 1 was most likely intended as a control for the concentration of vitamin C present in the unheated tomatoes?

**F.** Sample 1
**G.** Sample 2
**H.** Sample 3
**J.** Sample 4

**19.** Based on the results of Experiment 2, which of the following incubation times would most likely have produced a tomato mixture with a lycopene concentration between 5 mg/g tomato and 6 mg/g tomato?

**A.** 0 min
**B.** 0.2 min
**C.** 2 min
**D.** 20 min

**20.** A student claimed that heating tomatoes decreases the concentration of nutrients present. This claim is consistent with the results shown for which of vitamin C and lycopene, if either?

**F.** Vitamin C only
**G.** Lycopene only
**H.** Both vitamin C and lycopene
**J.** Neither vitamin C nor lycopene

**21.** Assume that, in the experiments, the water bath contained pure water at standard atmospheric pressure (1 atmosphere; atm). While the bags containing the samples were being incubated, was the water in the water bath most likely boiling?

**A.** Yes; the incubation temperature was less than the boiling point of water at 1 atm.
**B.** Yes; the incubation temperature was greater than the boiling point of water at 1 atm.
**C.** No; the incubation temperature was less than the boiling point of water at 1 atm.
**D.** No; the incubation temperature was greater than the boiling point of water at 1 atm.

**22.** In Experiment 1, how many of the samples had a vitamin C concentration of less than 1.0 μmol/g tomato?

**F.** 0
**G.** 1
**H.** 3
**J.** 4

**23.** Consider the following procedures performed in Experiment 2 for Sample 2.

1. The sample was frozen.
2. The sample was incubated in the water bath.
3. The sample and solvent mixture was filtered.

These procedures were performed in what order?

**A.** 1, 2, 3
**B.** 1, 3, 2
**C.** 2, 1, 3
**D.** 2, 3, 1

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## Passage V

A molten alloy (a mixture of 2 or more metallic elements) can be poured into a cylindrical mold and cooled to form an ingot. Crystals form inside the ingot as it cools. The average crystal length, $L$, in micrometers (μm), determines how brittle the ingot will be. A method for reducing $L$ using rotating magnetic fields was applied to Alloy Q as it cooled in the molds. Table 1 shows the elemental composition of Alloy Q. Figure 1 shows the effect of the relative magnetic stirring force, $F$, on $L$ for ingots formed from molten Alloy Q that had an initial temperature of either 280°C or 550°C.

Table 1

| Element | Symbol | Percent by mass in Alloy Q |
|---|---|---|
| Aluminum | Al | 88.7 |
| Silicon | Si | 10.8 |
| Manganese | Mn | 0.28 |
| Magnesium | Mg | 0.22 |

Figure 1

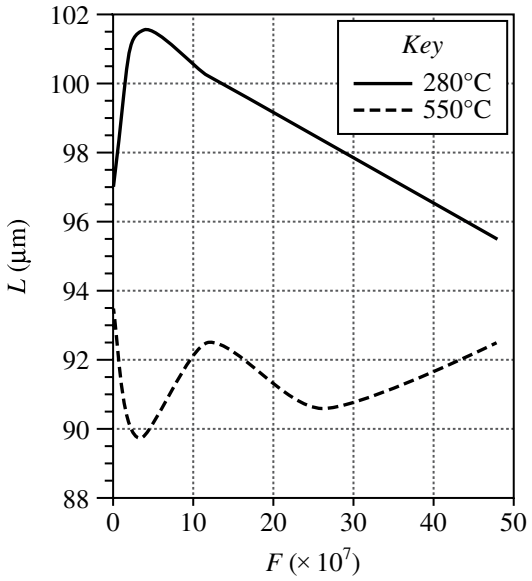


Figure 1 is adapted from S. Denisov, et al., "The Effect of Traveling and Rotating Magnetic Fields on the Structure of Aluminum Alloy During Its Crystallization in a Cylindrical Crucible." ©2014 by Institute of Physics, University of Latvia.



 

**24.** A linear region of a graph is a range of data that can be approximated with a straight line. Based on Figure 1, for Alloy Q initially at a temperature of 550°C, which of the following ranges of $F$ best represents a linear region?

**F.** Between 0 and $10 \times 10^7$
**G.** Between $10 \times 10^7$ and $20 \times 10^7$
**H.** Between $20 \times 10^7$ and $30 \times 10^7$
**J.** Between $30 \times 10^7$ and $40 \times 10^7$

**25.** Consider the 2 trends shown for Alloy Q initially at the temperatures of 280°C and 550°C, from $F = 40 \times 10^7$ through $F = 48 \times 10^7$. If these lines were to continue along the same trend, at which of the following values of $F$ would the average crystal lengths most likely be the same?

**A.** $F = 50 \times 10^7$
**B.** $F = 60 \times 10^7$
**C.** $F = 70 \times 10^7$
**D.** $F = 80 \times 10^7$

**26.** Based on Figure 1, which of the following combinations of values for initial temperature and $F$ would produce the shortest average crystal length in an ingot of Alloy Q? The smallest $L$ would be produced with a temperature of:

**F.** 280°C and $F = 10 \times 10^7$.
**G.** 280°C and $F = 40 \times 10^7$.
**H.** 550°C and $F = 10 \times 10^7$.
**J.** 550°C and $F = 40 \times 10^7$.

**27.** The following table lists the mass of silicon in 50 g samples of 4 different alloys, one of which is Alloy Q.

| Sample | Mass of Si (g) |
|---|---|
| W | 0.11 |
| X | 0.14 |
| Y | 2.7 |
| Z | 5.4 |

Given the composition of Alloy Q, which sample is most likely Alloy Q?

**A.** Sample W
**B.** Sample X
**C.** Sample Y
**D.** Sample Z

**28.** Based on Table 1, if an ingot of Alloy Q had a mass of 200 g, that ingot would contain what mass of Mg?

**F.** 0.22 g
**G.** 0.44 g
**H.** 2.2 g
**J.** 4.4 g

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## Passage VI

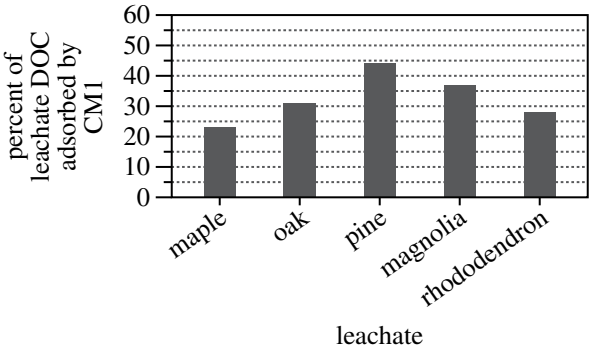
In a lake, water leaches (dissolves out) soluble organic compounds from decaying tree leaves, producing dissolved organic carbon (DOC). DOC is subsequently removed from the water if it is adsorbed by (becomes adhered to the surface of) clay mineral particles that are suspended in the water. Three studies done at a lake examined DOC adsorption by 3 clay minerals—CM1, CM2, and CM3—found in the lake's sediment.

Green leaves were collected from 5 types of trees around the lake (maple, oak, pine, magnolia, and rhododendron). A 5 L volume of lake water was filtered to remove all solid particles. The following procedures were performed for each type of leaf: A 100 g sample of the leaves was mixed with a 1 L volume of the filtered lake water. The mixture was then placed in the dark for 10 weeks at 4°C while leaching occurred. At 10 weeks, the mixture was filtered to remove all solid particles. The resulting liquid (the leachate) was analyzed for DOC.

*Study 1*

The following procedures were performed for each leachate: A 100 mL volume of the leachate was mixed with 10 g of CM1. The mixture was stirred continuously for 2 hr, then filtered to remove all solid particles. The resulting liquid (the filtrate) was analyzed for DOC. The percent of the leachate DOC that had been adsorbed by CM1 was calculated (see Figure 1).

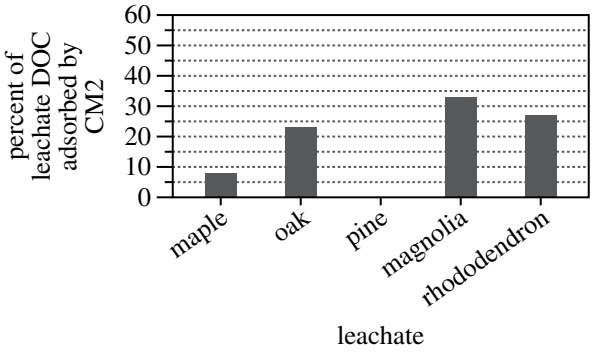
Figure 1




*Study 2*

Study 1 was repeated, substituting CM2 for CM1 (see Figure 2).

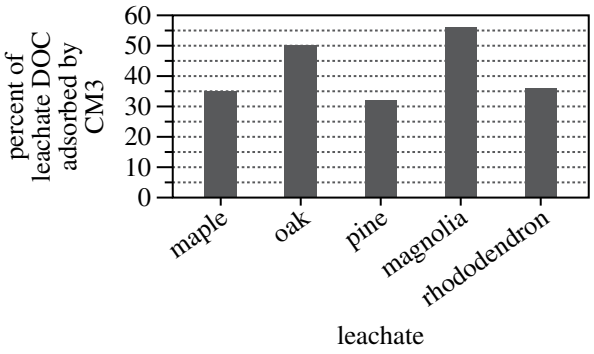
Figure 2




*Study 3*

Study 1 was repeated, substituting CM3 for CM1 (see Figure 3).

Figure 3




Figures and table adapted from Todd Tietjen, Anssi Vähätalo, and Robert Wetzel, "Effects of Clay Mineral Turbidity on Dissolved Organic Carbon and Bacterial Production." ©2005 by the Swiss Federal Institute for Environmental Science and Technology.

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**29.** Based on the results of the studies, from which of the 5 leachates was the greatest percent of DOC adsorbed by CM1, CM2, and CM3, respectively?

**A.** CM1: maple
CM2: maple
CM3: rhododendron

**B.** CM1: oak
CM2: pine
CM3: magnolia

**C.** CM1: pine
CM2: magnolia
CM3: rhododendron

**D.** CM1: pine
CM2: magnolia
CM3: magnolia

**30.** Based on the results of Study 3, the percent of leachate DOC adsorbed by CM3, averaged across the 5 types of leaves, is closest to which of the following?

**F.** 10%
**G.** 20%
**H.** 30%
**J.** 40%

**31.** Is the statement "CM2 adsorbed a greater percent of the DOC in the maple leachate than did CM3" supported by the results of Studies 2 and 3?

**A.** Yes; CM2 adsorbed 35% of the leachate DOC, whereas CM3 adsorbed 7%.
**B.** Yes; CM2 adsorbed 55% of the leachate DOC, whereas CM3 adsorbed 17%.
**C.** No; CM2 adsorbed 7% of the leachate DOC, whereas CM3 adsorbed 35%.
**D.** No; CM2 adsorbed 17% of the leachate DOC, whereas CM3 adsorbed 55%.

**32.** Based on the results of the studies, which of the 3 clay minerals, if any, reduced the DOC in the oak leachate by more than 50%?

**F.** CM1 only
**G.** CM2 only
**H.** CM1 and CM3 only
**J.** None of the 3 clay minerals

**33.** Is a mixture of any one of the leachates and any one of the clay minerals properly considered a solution?

**A.** Yes, because the clay mineral particles are dissolved in the leachate.
**B.** Yes, because the clay mineral particles are not dissolved in the leachate.
**C.** No, because the clay mineral particles are dissolved in the leachate.
**D.** No, because the clay mineral particles are not dissolved in the leachate.

**34.** In lake water, DOC is broken down into simpler compounds by electromagnetic energy in the visible wavelength range. What action was taken in the studies to prevent this process from occurring?

**F.** Each mixture of leaves and filtered lake water was placed in the dark.
**G.** Each mixture of filtrate and clay mineral was placed in the dark.
**H.** Each mixture of leaves and lake water was filtered.
**J.** Each mixture of leachate and clay mineral was filtered.

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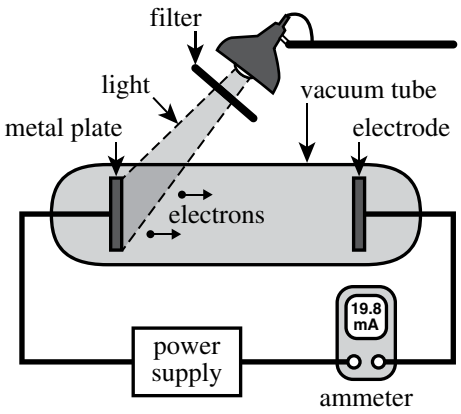
## Passage VII

When light shines on a metal plate, electrons can be ejected from the plate. An electron will be ejected if the energy, $E$, of a photon (particle of light) striking the plate is greater than the minimum energy, $M$, required for the electron to be removed from the plate. The maximum kinetic energy of the ejected electron, $K$, is the difference between $E$ and $M$ as shown in the equation:

$K = E - M$

Students conducted 2 experiments to examine how differences in the light striking a metal plate affect $K$. The setup included a light source, a removable filter, a circuit with an ammeter to measure current, a power supply that could be adjusted to measure $K$, and a vacuum tube containing a metal plate and an electrode (see Figure 1).

Figure 1




*Experiment 1*

A filter was placed between the metal plate and the light source, and the $K$ of the ejected electrons was measured. This procedure was repeated with each of 4 additional filters. Each filter transmitted light of only one frequency. Table 1 lists the following:

- color of light transmitted by the filter
- frequency of light in hertz, Hz
- $E$ in electron volts, eV
- $K$ in electron volts

Table 1

| Color | Frequency ($\times 10^{14}$ Hz) | $E$ (eV) | $K$ (eV) |
|---|---|---|---|
| Red | 4.4 | 1.81 | N.A.* |
| Yellow | 5.2 | 2.14 | N.A.* |
| Green | 5.6 | 2.31 | 0.11 |
| Blue | 6.3 | 2.60 | 0.40 |
| Violet | 7.5 | 3.10 | 0.90 |

*N.A.—Not available; no electrons were ejected.

*Experiment 2*

With the same setup as in Experiment 1 except without a filter, the current, in milliamperes (mA), and $K$ were measured as the intensity of the light was varied. Table 2 shows the current and $K$ for 4 different relative light intensities, each given as a percent of maximum intensity.

Table 2

| Relative intensity | Current (mA) | $K$ (eV) |
|---|---|---|
| 100% | 40.0 | 0.90 |
| 50% | 19.8 | 0.90 |
| 25% | 9.8 | 0.90 |
| 12.5% | 4.8 | 0.90 |

**35.** Consider the current shown on the ammeter in Figure 1. Based on the results of Experiment 2, when this current was measured, what was the relative intensity of the light?

**A.** 100%
**B.** 50%
**C.** 25%
**D.** 12.5%



**36.** What aspect of the experimental setup was held constant in Experiment 2 but not in Experiment 1?

**F.** Color of light
**G.** Light source
**H.** Type of metal plate
**J.** Distance between metal plate and electrode

**37.** Based on Figure 1, are the particles ejected from the metal plate moving toward the electrode or away from the electrode, and are those particles positively charged or negatively charged?

**A.** Toward; positively charged
**B.** Toward; negatively charged
**C.** Away from; positively charged
**D.** Away from; negatively charged

**38.** Based on the equation in the passage and the results of Experiment 1, what was the value of $M$ for the metal plate used in the setup?

**F.** 2.14 eV
**G.** 2.20 eV
**H.** 2.31 eV
**J.** 2.42 eV

**39.** The *cutoff frequency* for a particular metal is the lowest frequency of light at which electrons are ejected from the metal. Based on the results of Experiment 1, the cutoff frequency for the metal plate was:

**A.** less than $4.4 \times 10^{14}$ Hz.
**B.** between $4.4 \times 10^{14}$ Hz and $5.2 \times 10^{14}$ Hz.
**C.** between $5.2 \times 10^{14}$ Hz and $5.6 \times 10^{14}$ Hz.
**D.** greater than $5.6 \times 10^{14}$ Hz.

**40.** The relationship between $E$ and the frequency of light is given by the equation:

$E = hf$

where $h$ is Planck's constant and $f$ is the frequency of light. Based on the data for green light in Table 1, which of the following expressions could be used to determine the value of $h$?

**F.** $\frac{5.6 \times 10^{14}\ \text{Hz}}{0.11\ \text{eV}}$

**G.** $\frac{0.11\ \text{eV}}{5.6 \times 10^{14}\ \text{Hz}}$

**H.** $\frac{5.6 \times 10^{14}\ \text{Hz}}{2.31\ \text{eV}}$

**J.** $\frac{2.31\ \text{eV}}{5.6 \times 10^{14}\ \text{Hz}}$

**END OF TEST 4**

**STOP! DO NOT RETURN TO ANY OTHER TEST.**

# Practice Writing Test Prompt 1

Your Signature: _____
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Print Your Name Here: _____

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| | | | | | | | | |
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| | | – | | | – | | | | |
| Month | | | Day | | | Year | | |

## Form 24WT2

# The ACT® 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 **forty** (40) minutes to read the prompt, plan your response, and write an essay in English. Before you begin working, read all material in this test booklet carefully to understand exactly what you are being asked to do.

You will write your essay on the lined pages in the **answer document** provided. Your writing on those pages will be scored. You may use the unlined pages in this test booklet to plan your essay. Your work on these pages will not be scored.

Your essay will be evaluated based on the evidence it provides of your ability to:

- clearly state your own perspective on a complex issue and analyze the relationship between your perspective and at least one other perspective
- develop and support your ideas with reasoning and examples
- organize your ideas clearly and logically
- communicate your ideas effectively in standard written English

Lay your pencil down immediately when time is called.

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

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# Outer Space

The United States and other nations have been exploring outer space for more than 50 years. Orbiting Earth, visiting the Moon, and maintaining an international space station have been landmarks of technological and scientific achievement. But major problems persist on the home planet, including hunger, disease, and pollution. Plans for further space exploration—sending people to Mars, for example—compete for financial and intellectual resources that could be used to help address these problems. To what extent, then, should we continue to explore outer space?

*Read and carefully consider these perspectives. Each suggests a particular way of thinking about the question above.*

**Perspective One**

The pursuit of greater knowledge is worth any expense. Even if exploring space does not solve problems at home, it increases our understanding of the universe and our place within it.

**Perspective Two**

Life on Earth must always be our first priority. Exploring outer space is not more important than feeding people on Earth and ensuring the health of the planet.

**Perspective Three**

Scientific and technological achievements are the key to progress for humankind. By exploring outer space, we may discover new solutions to old problems.

## Essay Task

Write a unified, coherent essay in which you address the question of whether we should continue to explore outer space. In your essay, be sure to:

- clearly state your own perspective and analyze the relationship between your perspective and at least one other perspective
- develop and support your ideas with reasoning and examples
- organize your ideas clearly and logically
- communicate your ideas effectively in standard written English

Your perspective may be in full agreement with any of those given, in partial agreement, or completely different.

 

## Planning Your Essay

*Your work on these prewriting pages will not be scored.*

Use the space below and on the back cover to generate ideas and plan your essay. You may wish to consider the following as you think critically about the task:

Strengths and weaknesses of different perspectives on the issue

- What insights do they offer, and what do they fail to consider?
- Why might they be persuasive to others, or why might they fail to persuade?

Your own knowledge, experience, and values

- What is your perspective on this issue, and what are its strengths and weaknesses?
- How will you support your perspective in your essay?

**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, if you are taking the paper test, you will receive a test booklet with space to plan your essay and an answer document with four lined pages on which to write your response.
- Read pages 78 –80 for information and instructions on scoring your practice writing test.

 

## Planning Your Essay

*Use this page to continue planning your essay. Your work on this page will not be scored.*

 

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*I agree to the **Statements** above and certify that I am the person whose information appears on this form.*

Your Signature _____ Today's Date _____

Do NOT mark in this shaded area.

**USE A NO. 2 PENCIL ONLY.**
**(Do NOT use a mechanical pencil, ink, ballpoint, correction fluid, or felt-tip pen.)**

**A** NAME, MAILING ADDRESS, AND TELEPHONE (Please print.)

Last Name | First Name | MI (Middle Initial)

House Number & Street (Apt. No.); or PO Box & No.; or RR & No.

City | State/Province | ZIP/Postal Code

( ) / Area Code | Number | Country

**ACT Education Corp.—Confidential Restricted when data present**

**ALL examinees must complete block A – please print.**

**Blocks B, C, and D** are required for all examinees. Find the MATCHING INFORMATION on your ticket. Enter it EXACTLY the same way, even if any of the information is missing or incorrect. Fill in the corresponding ovals. If you do not complete these blocks to match your previous information EXACTLY, your scores will be **delayed up to 8 weeks.**

**B** MATCH NAME (First 5 letters of last name)

**C** MATCH NUMBER

**D** DATE OF BIRTH

| Month | Day | Year |
|---|---|---|
| January | | |
| February | | |
| March | 0 0 | 0 0 0 0 |
| April | 1 1 | 1 1 1 1 |
| May | 2 2 | 2 2 2 2 |
| June | 3 3 | 3 3 3 3 |
| July | | 4 4 4 |
| August | | 5 5 5 |
| September | | 6 6 6 |
| October | | 7 7 7 |
| November | | 8 8 8 |
| December | | 9 9 9 |

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PLEASE DO NOT WRITE IN THIS AREA.

**SERIAL #**

**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**

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

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

**FORM**

| | | |
|---|---|---|
| | | |
| F | 0 | 0 |
| G | 1 | 1 |
| H | 2 | 2 |
| J | 3 | 3 |
| K | 4 | 4 |
| L | 5 | 5 |
| M | 6 | 6 |
| N | 7 | 7 |
| P | 8 | 8 |
| Z | 9 | 9 |

## TEST 1: ENGLISH

| | | | | |
|---|---|---|---|---|
| 1 Ⓐ Ⓑ Ⓒ Ⓓ | 11 Ⓐ Ⓑ Ⓒ Ⓓ | 21 Ⓐ Ⓑ Ⓒ Ⓓ | 31 Ⓐ Ⓑ Ⓒ Ⓓ | 41 Ⓐ Ⓑ Ⓒ Ⓓ |
| 2 Ⓕ Ⓖ Ⓗ Ⓙ | 12 Ⓕ Ⓖ Ⓗ Ⓙ | 22 Ⓕ Ⓖ Ⓗ Ⓙ | 32 Ⓕ Ⓖ Ⓗ Ⓙ | 42 Ⓕ Ⓖ Ⓗ Ⓙ |
| 3 Ⓐ Ⓑ Ⓒ Ⓓ | 13 Ⓐ Ⓑ Ⓒ Ⓓ | 23 Ⓐ Ⓑ Ⓒ Ⓓ | 33 Ⓐ Ⓑ Ⓒ Ⓓ | 43 Ⓐ Ⓑ Ⓒ Ⓓ |
| 4 Ⓕ Ⓖ Ⓗ Ⓙ | 14 Ⓕ Ⓖ Ⓗ Ⓙ | 24 Ⓕ Ⓖ Ⓗ Ⓙ | 34 Ⓕ Ⓖ Ⓗ Ⓙ | 44 Ⓕ Ⓖ Ⓗ Ⓙ |
| 5 Ⓐ Ⓑ Ⓒ Ⓓ | 15 Ⓐ Ⓑ Ⓒ Ⓓ | 25 Ⓐ Ⓑ Ⓒ Ⓓ | 35 Ⓐ Ⓑ Ⓒ Ⓓ | 45 Ⓐ Ⓑ Ⓒ Ⓓ |
| 6 Ⓕ Ⓖ Ⓗ Ⓙ | 16 Ⓕ Ⓖ Ⓗ Ⓙ | 26 Ⓕ Ⓖ Ⓗ Ⓙ | 36 Ⓕ Ⓖ Ⓗ Ⓙ | 46 Ⓕ Ⓖ Ⓗ Ⓙ |
| 7 Ⓐ Ⓑ Ⓒ Ⓓ | 17 Ⓐ Ⓑ Ⓒ Ⓓ | 27 Ⓐ Ⓑ Ⓒ Ⓓ | 37 Ⓐ Ⓑ Ⓒ Ⓓ | 47 Ⓐ Ⓑ Ⓒ Ⓓ |
| 8 Ⓕ Ⓖ Ⓗ Ⓙ | 18 Ⓕ Ⓖ Ⓗ Ⓙ | 28 Ⓕ Ⓖ Ⓗ Ⓙ | 38 Ⓕ Ⓖ Ⓗ Ⓙ | 48 Ⓕ Ⓖ Ⓗ Ⓙ |
| 9 Ⓐ Ⓑ Ⓒ Ⓓ | 19 Ⓐ Ⓑ Ⓒ Ⓓ | 29 Ⓐ Ⓑ Ⓒ Ⓓ | 39 Ⓐ Ⓑ Ⓒ Ⓓ | 49 Ⓐ Ⓑ Ⓒ Ⓓ |
| 10 Ⓕ Ⓖ Ⓗ Ⓙ | 20 Ⓕ Ⓖ Ⓗ Ⓙ | 30 Ⓕ Ⓖ Ⓗ Ⓙ | 40 Ⓕ Ⓖ Ⓗ Ⓙ | 50 Ⓕ Ⓖ Ⓗ Ⓙ |

## TEST 2: MATHEMATICS

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

## TEST 3: READING

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

## TEST 4: SCIENCE

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

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

**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 | | Yes | No | | Yes | No |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ⬭ | ⬭ | 4 | ⬭ | ⬭ | 7 | ⬭ | ⬭ | 10 | ⬭ | ⬭ | 13 | ⬭ | ⬭ |
| 2 | ⬭ | ⬭ | 5 | ⬭ | ⬭ | 8 | ⬭ | ⬭ | 11 | ⬭ | ⬭ | 14 | ⬭ | ⬭ |
| 3 | ⬭ | ⬭ | 6 | ⬭ | ⬭ | 9 | ⬭ | ⬭ | 12 | ⬭ | ⬭ | 15 | ⬭ | ⬭ |

 

Print your name in the spaces below (one letter per space).

Last Name | First Name | MI

# The ACT® Writing Test

Do NOT mark in this shaded area.

**NOTE: When finished, close document with page 1 facing you.**

PLEASE DO NOT WRITE IN THIS AREA.

SERIAL #

 

**Please enter the information at the right before beginning the writing test.**

**Use a No. 2 pencil only. Do NOT use a mechanical pencil, ink, ballpoint, or felt-tip pen.**

**WRITING TEST BOOKLET NUMBER**

Print your 9-digit **Booklet Number** in the boxes at the right.

**WRITING TEST FORM**

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

| | | |
|---|---|---|
| | | |
| 0 | A | A |
| 1 | B | B |
| 2 | C | C |
| 3 | D | D |
| 4 | E | E |
| 5 | F | F |
| 6 | G | G |
| 7 | H | H |
| 8 | J | J |
| 9 | Z | Z |

## Begin WRITING TEST here.

**If you need more space, please continue on the next page.**

1

**Do not write in this shaded area.**

 

## WRITING TEST

If you need more space, please continue on the back of this page.

2

Do not write in this shaded area.

 

## WRITING TEST

If you need more space, please continue on the next page.

3

PLEASE DO NOT WRITE IN THIS AREA.

SERIAL #

 

## WRITING TEST

STOP here with the writing test.

4

Do not write in this shaded area.

 

DO NOT WRITE
ON THIS PAGE.

Close document with
page 1 facing you.

ACT®
PO Box 168
Iowa City, IA 52243-0168

PLEASE DO NOT WRITE IN THIS AREA.

SERIAL #

 

# How to Score the Practice Multiple-Choice Tests

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

To calculate your writing score, use Scoring the Practice Writing Test, page 78.

## Raw Scores

The number of questions you answered correctly on each test section is a raw score. Because there are many forms of the ACT, each with different questions, the difficulty level varies between the forms. A raw score of 35 on one form of the mathematics test section, for example, may be about as difficult to earn as a raw score of 37 on another form of that test section.

**Computing raw scores:** To compute your raw scores, check your answers with the scoring information in the scoring keys and conversion table, then do the following:

1. Mark a one (1) in the blank for each question answered correctly.
2. Count the number of correct answers for each of the multiple-choice test sections.
3. Add up the total number correct for each category and test section and capture it as directed beneath its scoring key.

Use the scoring key for each test to score your answer document for the sections in the practice test. Mark a "1" in the blank for each question you answered correctly and add up the total number correct for each test. Do not count correct answers for gray cells, as those are for field test items not included in converting raw scores to scale scores.

Please note, the placement of these field test questions varies across different test forms, and will NOT remain in the same test item slots each test administration.

These numbers are your raw scores on the individual multiple-choice test sections. The highest raw score for a given test section is the number of questions included on that test section:

- English: 40
- Mathematics: 41
- Reading: 27
- Science: 34

***Note:*** *Raw scores are also provided as part of the Summary Report for each test section taken online in TestNav.*

## Scale Scores

To adjust for the small differences among different forms of the ACT test, raw scores are converted into scale scores. Scale scores appear on reports sent to your school.

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 mathematics test section has the same meaning for any form of the ACT.

**Converting Raw Scores to Scale Scores:** Each ACT test section generates a single scale score between 1 and 36. Use the scale score conversion table to convert your raw scores to scale scores for each test section.

 

## *English Scoring Key*

| English Number | Correct Answer | Correct (Mark 1) | Reporting Categories |
|---|---|---|---|
| **1** | C | | CSE |
| **2** | G | | CSE |
| **3** | A | | POW |
| **4** | F | | POW |
| **5** | A | | CSE |
| **6** | F | | KLA |
| **7** | D | | KLA |
| **8** | J | | CSE |
| **9** | B | | CSE |
| **10** | G | | KLA |
| **11** | B | | CSE |
| **12** | J | | CSE |
| **13** | C | | KLA |
| **14** | H | | POW |
| **15** | D | | POW |
| **16** | J | | CSE |
| **17** | D | | KLA |
| **18** | H | | POW |
| **19** | A | | KLA |
| **20** | J | | POW |
| **21** | A | | CSE |
| **22** | F | | CSE |
| **23** | C | | POW |
| **24** | H | | POW |
| **25** | D | | POW |
| **26** | G | | POW |
| **27** | D | | CSE |
| **28** | F | | CSE |
| **29** | A | | CSE |
| **30** | G | | POW |
| **31** | C | | CSE |
| **32** | F | | POW |
| **33** | A | | CSE |
| **34** | H | | KLA |
| **35** | A | | POW |
| **36** | G | | POW |
| **37** | B | | POW |
| **38** | H | | CSE |
| **39** | D | | KLA |
| **40** | J | | CSE |
| **41** | A | Not Scored | ——— |
| **42** | G | Not Scored | ——— |
| **43** | D | Not Scored | ——— |
| **44** | H | Not Scored | ——— |
| **45** | D | Not Scored | ——— |
| **46** | F | Not Scored | ——— |
| **47** | B | Not Scored | ——— |
| **48** | F | Not Scored | ——— |
| **49** | D | Not Scored | ——— |
| **50** | H | Not Scored | ——— |

### English Reporting Categories

(Capture raw scores/correct answers.)

Production of Writing (POW) = ____ of 15

Knowledge of Language (KLA) = ____ of 8

Conventions of Standard English (CSE) = ____ of 17

**Total English Raw Score (POW + KLA + CSE)** = ____ of 40

### English Scale Score Conversion Table

Use the Total English Raw Score number from the previous table to find the scale score you could expect if you got that number correct on test day.

| English Raw Score | English Scale Score |
|---|---|
| 40 | 36 |
| 39 | 35 |
| 38 | 35 |
| 37 | 33 |
| 36 | 31 |
| 35 | 29 |
| 34 | 28 |
| 33 | 27 |
| 32 | 26 |
| 31 | 25 |
| 30 | 24 |
| 29 | 23 |
| 28 | 22 |
| 27 | 22 |
| 26 | 21 |
| 25 | 20 |
| 24 | 20 |
| 23 | 19 |
| 22 | 18 |
| 21 | 17 |
| 20 | 16 |

| English Raw Score | English Scale Score |
|---|---|
| 19 | 15 |
| 18 | 15 |
| 17 | 14 |
| 16 | 13 |
| 15 | 13 |
| 14 | 12 |
| 13 | 11 |
| 12 | 11 |
| 11 | 10 |
| 10 | 10 |
| 9 | 10 |
| 8 | 9 |
| 7 | 8 |
| 6 | 7 |
| 5 | 7 |
| 4 | 6 |
| 3 | 5 |
| 2 | 3 |
| 1 | 2 |
| 0 | 1 |

**English Scale Score** = ____

 

## *Mathematics Scoring Key*

| Math Number | Correct Answer | Correct (Mark 1) | Reporting Categories |
|---|---|---|---|
| 1 | D | | IES |
| 2 | J | | S |
| 3 | B | | IES |
| 4 | F | | IES |
| 5 | C | | A |
| 6 | J | | N |
| 7 | B | Not Scored | ——— |
| 8 | H | | N |
| 9 | D | | A |
| 10 | H | | IES |
| 11 | B | | IES |
| 12 | J | | S |
| 13 | A | | G |
| 14 | J | | IES |
| 15 | A | | A |
| 16 | G | Not Scored | ——— |
| 17 | A | | A |
| 18 | J | | N |
| 19 | B | | F |
| 20 | H | | G |
| 21 | C | | IES |
| 22 | G | | IES |
| 23 | C | | F |
| 24 | G | | F |
| 25 | A | | F |
| 26 | G | | A |
| 27 | B | | S |
| 28 | F | | G |
| 29 | C | Not Scored | ——— |
| 30 | J | | G |
| 31 | C | | G |
| 32 | J | | IES |
| 33 | C | | IES |
| 34 | G | | IES |
| 35 | C | | IES |
| 36 | J | | S |
| 37 | C | | A |
| 38 | J | | IES |
| 39 | C | | S |
| 40 | J | Not Scored | ——— |
| 41 | D | | IES |
| 42 | F | | IES |
| 43 | C | | IES |
| 44 | J | | F |
| 45 | A | | S |

### Mathematics Reporting Categories

(Capture raw scores/correct answers.)

Preparing for Higher Math (PHM) (A + F + G + N + S) = ____ of 25

A = Algebra
F = Functions
G = Geometry
N = Number & Quantity
S = Statistics & Probability

Integrating Essential Skills (IES) = ____of 16

Total Mathematics Raw Score (PHM + IES) = ____ of 41

### Mathematics Scale Score Conversion Table

Use the Total Mathematics Raw Score from the previous table to find the scale score you could expect if you got that number correct on test day.

| Math Raw Score | Math Scale Score |
|---|---|
| 41 | 36 |
| 40 | 36 |
| 39 | 35 |
| 38 | 34 |
| 37 | 34 |
| 36 | 33 |
| 35 | 32 |
| 34 | 31 |
| 33 | 30 |
| 32 | 29 |
| 31 | 29 |
| 30 | 28 |
| 29 | 27 |
| 28 | 27 |
| 27 | 26 |
| 26 | 25 |
| 25 | 24 |
| 24 | 23 |
| 23 | 22 |
| 22 | 21 |
| 21 | 20 |

| Math Raw Score | Math Scale Score |
|---|---|
| 20 | 19 |
| 19 | 19 |
| 18 | 18 |
| 17 | 17 |
| 16 | 17 |
| 15 | 17 |
| 14 | 16 |
| 13 | 16 |
| 12 | 15 |
| 11 | 15 |
| 10 | 15 |
| 9 | 14 |
| 8 | 14 |
| 7 | 13 |
| 6 | 13 |
| 5 | 12 |
| 4 | 11 |
| 3 | 9 |
| 2 | 7 |
| 1 | 5 |
| 0 | 1 |

Mathematics Scale Score = ____

 

## *Reading Scoring Key*

| Reading Number | Correct Answer | Correct (Mark 1) | Reporting Categories |
|---|---|---|---|
| 1 | D | Not Scored | —— |
| 2 | H | Not Scored | —— |
| 3 | A | Not Scored | —— |
| 4 | J | Not Scored | —— |
| 5 | C | Not Scored | —— |
| 6 | G | Not Scored | —— |
| 7 | A | Not Scored | —— |
| 8 | F | Not Scored | —— |
| 9 | A | Not Scored | —— |
| 10 | J | | CS |
| 11 | B | | KID |
| 12 | H | | KID |
| 13 | B | | CS |
| 14 | J | | CS |
| 15 | C | | KID |
| 16 | J | | KID |
| 17 | C | | CS |
| 18 | F | | CS |
| 19 | B | | KID |
| 20 | H | | CS |
| 21 | D | | KID |
| 22 | H | | KID |
| 23 | A | | KID |
| 24 | H | | KID |
| 25 | D | | IKI |
| 26 | F | | IKI |
| 27 | B | | IKI |
| 28 | J | | IKI |
| 29 | D | | KID |
| 30 | F | | CS |
| 31 | A | | KID |
| 32 | G | | CS |
| 33 | C | | KID |
| 34 | J | | IKI |
| 35 | B | | KID |
| 36 | H | | CS |

### Reading Reporting Categories

(Capture raw scores/correct answers.)

Key Ideas & Details (KID) = ____ of 13

Craft & Structure (CS) = ____ of 9

Integration of Knowledge & Ideas (IKI) = ____ of 5

Total Reading Raw Score (KID + CS + IKI) = ____ of 27

### Reading Scale Score Conversion Table

Use the Total Reading Raw Score from the previous table to find the scale score you could expect if you got that number correct on test day.

| Reading Raw Score | Reading Scale Score | Reading Raw Score | Reading Scale Score |
|---|---|---|---|
| 27 | 36 | 13 | 17 |
| 26 | 35 | 12 | 16 |
| 25 | 34 | 11 | 15 |
| 24 | 32 | 10 | 14 |
| 23 | 30 | 9 | 13 |
| 22 | 28 | 8 | 12 |
| 21 | 26 | 7 | 12 |
| 20 | 25 | 6 | 11 |
| 19 | 24 | 5 | 10 |
| 18 | 23 | 4 | 9 |
| 17 | 22 | 3 | 7 |
| 16 | 21 | 2 | 5 |
| 15 | 20 | 1 | 3 |
| 14 | 18 | 0 | 1 |

Reading Scale Score = ____

 

## *Science Scoring Key*

| Science Number | Correct Answer | Correct (Mark 1) | Reporting Categories |
|---|---|---|---|
| **1** | A | | IOD |
| **2** | F | | IOD |
| **3** | D | | IOD |
| **4** | H | | IOD |
| **5** | D | | EMI |
| **6** | F | | EMI |
| **7** | C | | EMI |
| **8** | J | | IOD |
| **9** | C | | EMI |
| **10** | F | | EMI |
| **11** | C | | EMI |
| **12** | G | | EMI |
| **13** | C | | EMI |
| **14** | H | | SIN |
| **15** | B | | SIN |
| **16** | H | | SIN |
| **17** | B | | SIN |
| **18** | F | | SIN |
| **19** | D | | SIN |
| **20** | F | | EMI |
| **21** | C | | SIN |
| **22** | J | | IOD |
| **23** | C | | SIN |
| **24** | J | | IOD |
| **25** | B | | IOD |
| **26** | J | | IOD |
| **27** | D | | IOD |
| **28** | G | | IOD |
| **29** | D | Not Scored | —— |
| **30** | J | Not Scored | —— |
| **31** | C | Not Scored | —— |
| **32** | J | Not Scored | —— |
| **33** | D | Not Scored | —— |
| **34** | F | Not Scored | —— |
| **35** | B | | IOD |
| **36** | F | | SIN |
| **37** | B | | IOD |
| **38** | G | | IOD |
| **39** | C | | IOD |
| **40** | J | | IOD |

### Science Reporting Categories

(Capture raw scores/correct answers.)

Interpretation of Data (IOD) = ____ of 16

Scientific Investigation (SIN) = ____ of 9

Evaluation of Models, Inferences & Experimental Results (EMI) = ____ of 9

Total Science (IOD + SIN + EMI) = ____ of 34

### Reading Scale Score Conversion Table

Use the Total Science Raw Score from the previous table to find the scale score you could expect if you got that number correct on test day.

| Science Raw Score | Science Scale Score |
|---|---|
| 34 | 36 |
| 33 | 35 |
| 32 | 34 |
| 31 | 33 |
| 30 | 32 |
| 29 | 31 |
| 28 | 30 |
| 27 | 29 |
| 26 | 28 |
| 25 | 27 |
| 24 | 26 |
| 23 | 25 |
| 22 | 25 |
| 21 | 24 |
| 20 | 23 |
| 19 | 23 |
| 18 | 22 |

| Science Raw Score | Science Scale Score |
|---|---|
| 17 | 21 |
| 16 | 20 |
| 15 | 19 |
| 14 | 18 |
| 13 | 18 |
| 12 | 17 |
| 11 | 16 |
| 10 | 15 |
| 9 | 14 |
| 8 | 12 |
| 7 | 12 |
| 6 | 11 |
| 5 | 10 |
| 4 | 9 |
| 3 | 7 |
| 2 | 6 |
| 1 | 3 |
| 0 | 1 |

Science Scale Score = ____

 

# Calculating a Composite Score

This version of Preparing for the ACT is geared towards students taking the "Enhanced ACT". If you are taking the test on paper prior to September 2025, please refer to the version of the Preparing for the ACT guide labeled 2024|2025. If you are preparing for State and District prior to spring of 2026, you should refer to the *Fall 2025 Preparing for the ACT* provided by your school.

An ACT test generates a single Composite score of 1–36. Compute the Composite score by averaging the three scale scores:

1. Add your English, Mathematics, and Reading scale scores. Enter this sum in the blanks below.
2. Divide the sum by 3. If the resulting number ends in a fraction, round it to the nearest whole number. (Round down any fraction less than one-half, except for averages lower than one; round up any fraction that is one-half or more. Also round up averages that are less than one.)
3. Enter this number in the blank below. This is your Composite score.

**Composite of scale scores:**

| | |
|---|---|
| English Scale Score | = ____ |
| Mathematics Scale Score | = ____ |
| Reading Scale Score | = ____ |
| **Sum of Scale Scores** | **= ____** |
| **Composite score (sum ÷ 3)** | **= ____** |

***Note:*** *If you left a test section completely blank and marked no items, do not list a scale score for that section and do not calculate a Composite score.*

 

# Scoring the Practice Writing Test

It's difficult to be objective about your own work. However, it's to your advantage to read your own writing critically, as doing so can help you grow as a writer and as a reader. It may also be helpful for you to give your practice essay to another reader, such as a classmate, parent, or teacher. To rate your essay, you and your reader(s) should review the guidelines and sample essays at http://www.actstudent.org and then use The ACT Writing Test Scoring Rubric, starting on the next page to assign your practice essay a score of 1 (low) through 6 (high) in each of the four writing domains (Ideas & Analysis, Development & Support, Organization, and Language Use).

## Scoring Rubric

The rubric presents the standards by which your essay will be evaluated. Readers will use this rubric to assign your essay four unique scores, one per writing domain. These are the six possible rubric scores:

**Score 6:** Responses demonstrate effective skill in writing an argumentative essay.

**Score 5:** Responses demonstrate well-developed skill in writing an argumentative essay.

**Score 4:** Responses demonstrate adequate skill in writing an argumentative essay.

**Score 3:** Responses demonstrate some developing skill in writing an argumentative essay.

**Score 2:** Responses demonstrate weak or inconsistent skill in writing an argumentative essay.

**Score 1:** Responses demonstrate little or no skill in writing an argumentative essay.

Because each domain receives its own score, the four scores you assign need not be identical. For example, you may find that your essay exhibits stronger skill in organization than in the development of ideas. In this case, you may determine that your essay should receive a higher score in Organization than in Development & Support.

### Calculating Your Writing Score

The writing test section generates a single score of 2–12. Complete these steps to calculate your writing score:

1. Determine which score (range 1–6) in each of the four domains best describes the features of your writing.
2. Multiply each rubric score by 2 to get a score for each domain (range 2–12).
3. Add your four domain scores. Enter this sum of domain scores in the blank below (range 8–48).
4. Divide the sum by 4. If the resulting number ends in a fraction, round it to the nearest whole number. (Round down any fraction less than one-half; round up any fraction that is one-half or more.)

**Writing test rubric and domain scores:**

Ideas & Analysis = ____ x 2 = ____

Development & Support = ____ x 2 = ____

Organization = ____ x 2 = ____

Language Use = ____ x 2 = ____

Sum of domain scores = ____

Writing subject score (sum ÷ 4) = ____

 

## *The ACT Writing Test Scoring Rubric*

Ideas & Analysis Domain

| Rubric Score | Ideas & Analysis Scoring Standards |
|---|---|
| **6** | The writer generates an argument that critically engages with multiple perspectives on the given issue. The argument's thesis reflects nuance and precision in thought and purpose. The argument establishes and employs an insightful context for analysis of the issue and its perspectives. The analysis examines implications, complexities, tensions, and/or underlying values and assumptions. |
| **5** | The writer generates an argument that productively engages with multiple perspectives on the given issue. The argument's thesis reflects precision in thought and purpose. The argument establishes and employs a thoughtful context for analysis of the issue and its perspectives. The analysis addresses implications, complexities, tensions and/or underlying values and assumptions. |
| **4** | The writer generates an argument that engages with multiple perspectives on the given issue. The argument's thesis reflects clarity in thought and purpose. The argument establishes and employs a relevant context for analysis of the issue and its perspectives. The analysis recognizes implications, complexities, tensions, and/or underlying values and assumptions. |
| **3** | The writer generates an argument that responds to multiple perspectives on the given issue. The argument's thesis reflects some clarity in thought and purpose. The argument establishes a limited or tangential context for analysis of the issue and its perspectives. Analysis is simplistic or somewhat unclear. |
| **2** | The writer generates an argument that weakly responds to multiple perspectives on the given issue. The argument's thesis, if evident, reflects little clarity in thought and purpose. Attempts at analysis are incomplete, largely irrelevant, or consist primarily of restatement of the issue and its perspectives. |
| **1** | The writer fails to generate an argument that responds intelligibly to the task. The writer's intentions are difficult to discern. Attempts at analysis are unclear or irrelevant |

Development & Support Domain

| Rubric Score | Development & Support Scoring Standards |
|---|---|
| **6** | Development of ideas and support for claims deepen insight and broaden context. An integrated line of skillful reasoning and illustration effectively conveys the significance of the argument. Qualifications and complications enrich and bolster ideas and analysis. |
| **5** | Development of ideas and support for claims deepen understanding. A mostly integrated line of purposeful reasoning and illustration capably conveys the significance of the argument. Qualifications and complications enrich ideas and analysis. |
| **4** | Development of ideas and support for claims clarify meaning and purpose. Lines of clear reasoning and illustration adequately convey the significance of the argument. Qualifications and complications extend ideas and analysis. |
| **3** | Development of ideas and support for claims are mostly relevant but are overly general or simplistic. Reasoning and illustration largely clarify the argument but may be somewhat repetitious or imprecise. |
| **2** | Development of ideas and support for claims are weak, confused, or disjointed. Reasoning and illustration are inadequate, illogical, or circular, and fail to fully clarify the argument. |
| **1** | Ideas lack development and claims lack support. Reasoning and illustration are unclear, incoherent, or largely absent. |

 

Organization Domain

| Rubric Score | Organization Scoring Standards |
|---|---|
| 6 | The response exhibits a skillful organizational strategy. The response is unified by a controlling idea or purpose, and a logical progression of ideas increases the effectiveness of the writer's argument. Transitions between and within paragraphs strengthen the relationships among ideas. |
| 5 | The response exhibits a productive organizational strategy. The response is mostly unified by a controlling idea or purpose, and a logical sequencing of ideas contributes to the effectiveness of the argument. Transitions between and within paragraphs consistently clarify the relationships among ideas. |
| 4 | The response exhibits a clear organizational strategy. The overall shape of the response reflects an emergent controlling idea or purpose. Ideas are logically grouped and sequenced. Transitions between and within paragraphs clarify the relationships among ideas. |
| 3 | The response exhibits a basic organizational structure. The response largely coheres, with most ideas logically grouped. Transitions between and within paragraphs sometimes clarify the relationships among ideas. |
| 2 | The response exhibits a rudimentary organizational structure. Grouping of ideas is inconsistent and often unclear. Transitions between and within paragraphs are misleading or poorly formed. |
| 1 | The response does not exhibit an organizational structure. There is little grouping of ideas. When present, transitional devices fail to connect ideas. |

Language Use Domain

| Rubric Score | Language Use Scoring Standards |
|---|---|
| 6 | The use of language enhances the argument. Word choice is skillful and precise. Sentence structures are consistently varied and clear. Stylistic and register choices, including voice and tone, are strategic and effective. While a few minor errors in grammar, usage, and mechanics may be present, they do not impede understanding. |
| 5 | The use of language works in service of the argument. Word choice is precise. Sentence structures are clear and varied often. Stylistic and register choices, including voice and tone, are purposeful and productive. While minor errors in grammar, usage, and mechanics may be present, they do not impede understanding. |
| 4 | The use of language conveys the argument with clarity. Word choice is adequate and sometimes precise. Sentence structures are clear and demonstrate some variety. Stylistic and register choices, including voice and tone, are appropriate for the rhetorical purpose. While errors in grammar, usage, and mechanics are present, they rarely impede understanding. |
| 3 | The use of language is basic and only somewhat clear. Word choice is general and occasionally imprecise. Sentence structures are usually clear but show little variety. Stylistic and register choices, including voice and tone, are not always appropriate for the rhetorical purpose. Distracting errors in grammar, usage, and mechanics may be present, but they generally do not impede understanding. |
| 2 | The use of language is inconsistent and often unclear. Word choice is rudimentary and frequently imprecise. Sentence structures are sometimes unclear. Stylistic and register choices, including voice and tone, are inconsistent and are not always appropriate for the rhetorical purpose. Distracting errors in grammar, usage, and mechanics are present, and they sometimes impede understanding. |
| 1 | The use of language fails to demonstrate skill in responding to the task. Word choice is imprecise and often difficult to comprehend. Sentence structures are often unclear. Stylistic and register choices are difficult to identify. Errors in grammar, usage, and mechanics are pervasive and often impede understanding. |

 

# Next Steps

Your practice test score is an estimate of the score that you would receive during an actual administration of the ACT test. Reflecting on your practice experience can be useful as you continue to prepare for test day.

Consider the following as you review your scores as part of your general test performance:

- **Pacing:** 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.
- **Directions:** Did you spend too much time trying to understand the directions for the test sections? Make sure you understand them before test day.
- **Misses:** 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.
- **Types:** Did a particular type of question confuse you? In reviewing your responses, check to see whether a particular type of question was more difficult for you.

ACT is committed to representing the diversity of society in all its aspects, including race, ethnicity, and gender. Questions, passages, and writing prompts are chosen to reflect a range of cultures and are written to not disadvantage any particular group of examinees. ACT employs extensive reviews and statistical procedures to ensure the fairness of test materials.

ACT conducts research and periodically updates tests to provide test content that reflects classroom instruction and continues to be a relevant predictor of college and career readiness. There may be subtle differences between the ACT practice test in this booklet and the test students take on test day.

ACT endorses the *Code of Fair Testing Practices in Education* and the *Code of Professional Responsibilities in Educational Measurement*, which guide 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. You may locate copies of these Codes through the following organizations:

- Code of Fair Testing Practices in Education: American Psychological Association (https://www.apa.org/science/programs/testing/fair-testing.pdf)
- Code of Professional Responsibilities in Educational Measurement: National Council on Measurement in Education (https://www.ncme.org/resources-publications/professional-learning/library)