

The Perfect Score Computer Preparation for the SAT

Reference Card

Hardware Requirements

One of the Apple II family of microcomputers
48K
Single disk drive

Loading Instructions

1. Open the disk drive door.
2. Insert the diskette you want to use. Note: This program contains double-sided diskettes. The label of the side you want to use should face up.
3. Close the disk drive door.
4. Turn on the computer and the monitor (or tv set). The title of the program, "The Perfect Score," will appear on the screen. From this point on, follow the simple instructions on the screen.

Note: The diskette should remain in the disk drive as long as the program is in use.

Upper/Lower Case Characters

If you have an Apple IIe or IIc, the program will automatically display upper- and lower-case letters.

If you have an Apple II or IIPlus with a lower-case adapter, you can get lower-case letters by typing an asterisk (*) immediately after the last character in your first name. (The program asks you to type your name when you begin working on any of the SAT diskettes.)

Special Key Functions

For all diskettes:

Key	Function
C	Turns the clock on or off so that you can see how long it takes you to answer questions. It works in the Learning Mode and the Testing Mode.
Q	Takes you to an "end-of-work" screen where you can quit working or quickly start up another diskette.
CTRL RESET	Restarts the diskette you're working on.

For the test diskette only:

Key	Function
CTRL B	Takes you back to the previous question in a section.
Space bar	Takes you to the next question in a section. It allows you to skip questions or quickly preview all the questions in a section.
CTRL L	Takes you to the last unanswered question in a section.
CTRL N	Takes you to the next unanswered question in a section. If you've skipped some questions and want to go back later to answer them, CTRL L and CTRL N will help you get there quickly.
CTRL P	Lets you pause, or stop the program if interruptions occur while you're working. Press CTRL P again when you're ready to continue.
ESC	Lets you exit early from a section of the test.

General Information

There are six double-sided diskettes in the package: 5 study diskettes and one test diskette. Each study diskette focuses on a different type of SAT question: antonyms, analogies, sentence completion, reading comprehension, and math. The test diskette presents one sample SAT exam and one Test of Standard Written English.

To answer questions on the computer, you use the arrow keys and RETURN. Use the arrow keys to position the pointer on the screen next to your answer choice. Then press RETURN. That's all there is to it.

Special Notation

In the math portion of the program, we have used special notation for several math symbols because they cannot be easily reproduced on the computer.

Sq. rt. stands for $\sqrt{\quad}$ (square root). "5(sq. rt. of 3)" means $5\sqrt{3}$.

Pi stands for π . "6 \times pi" means 6 times π , or 6π .

/ indicates division. "6/3" means $6 \div 3$.

The Perfect Score: Computer Preparation for the SAT

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Reading Passage #4. Source: *Aramco World Magazine*
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Reading Passage #7. Source: *Aramco World Magazine*
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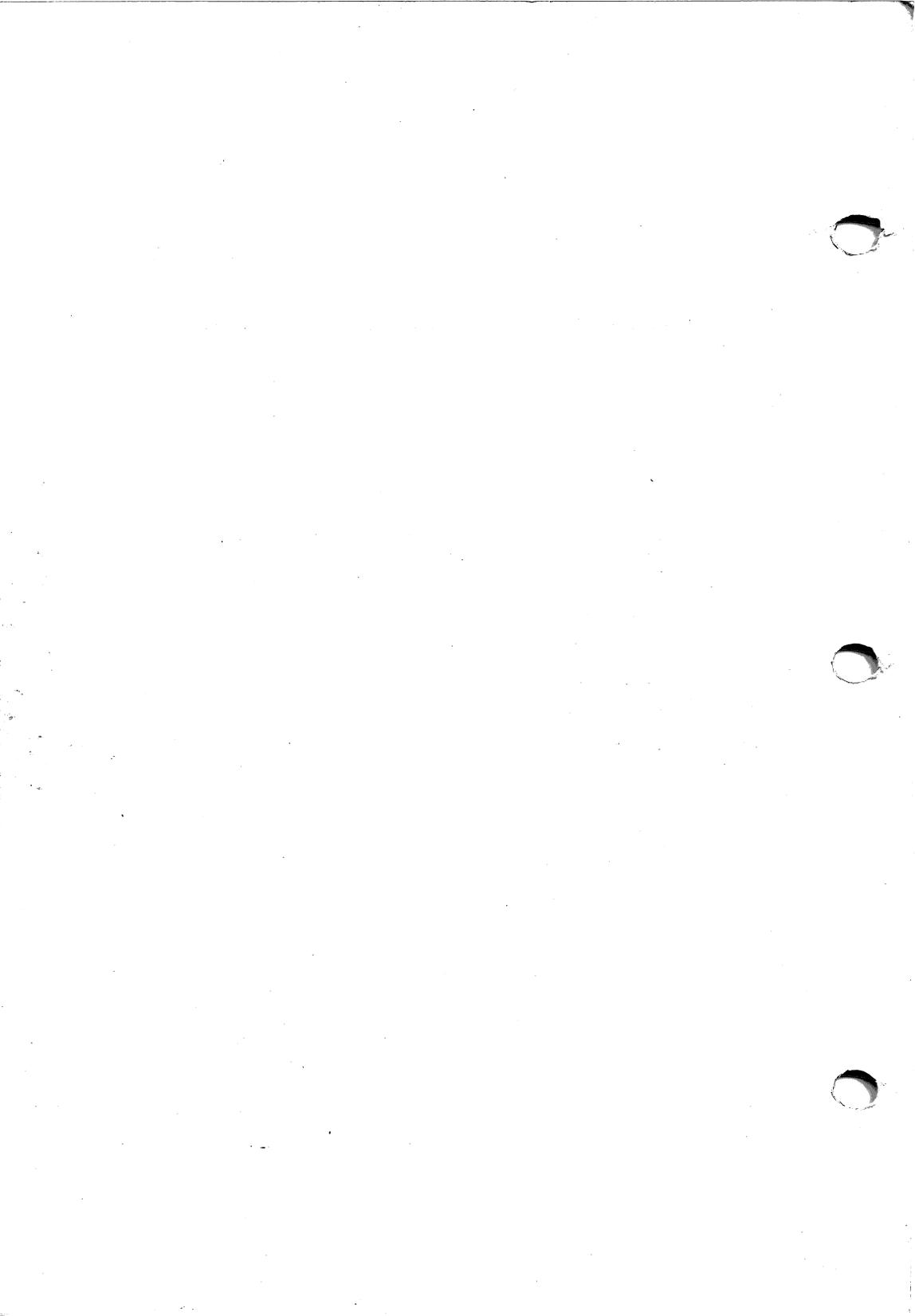
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An Overview of the Program

The program is designed to provide a comprehensive overview of the various components and processes involved in the system. It covers the following areas:

- System Architecture
- Operational Procedures
- Security Protocols
- Reporting Mechanisms

This program is designed for anyone who is faced with taking the Scholastic Aptitude Test (SAT) in the not-too-distant future. It will help you build your skills in answering the various kinds of questions on the SAT. To ensure that you will be fully prepared for the test, this program parallels the SAT in both scope and sequence. To further prepare you for the exam, this program includes a timed test disk that actually simulates the test-taking experience. SAT preparation was never this easy — or this fun.

The **Perfect Score** consists of five study diskettes, a test diskette, and a user's manual. There is one study disk for each of the four verbal components of the SAT — Antonyms, Analogies, Sentence Completion, and Reading Comprehension — and one for Math.

The basic format is essentially the same for all the study disks: it consists of multiple-choice questions like those found on the SAT. Each disk is divided into 10 Question Sets of 10 questions each, offering a total of 100 questions per diskette. Each offers tutorials through the Learning Mode and test-taking practice through the Testing Mode.

The test disk contains a sample SAT and a sample Test of Standard Written English. Both exams give you practice under conditions like those you will experience when you take the actual exam. The test diskette is timed, just as the SAT is; you are only allowed 30 minutes for each section. The questions are similar to those found on SAT exams.

This manual contains additional information on the SAT, test-taking strategies, and Vocabulary and Math Review sections. Combined, the manual and disks provide a comprehensive study package to help you aim for that perfect score and college success.

Features

"Preparing for the SAT" offers many important features:

Comprehensive coverage on diskette of each question type on the exam. The manual also contains test-taking strategies, and Vocabulary and Math Review sections.

Sample SAT and Test of Standard Written English that offer timed test-taking practice.

Easy-to-use program design so that even inexperienced computer users can use the diskettes with no training. All the information and instructions needed appear right on the screen.

Flexible, self-paced learning that lets you study in the Learning Mode or practice taking tests in the Testing Mode. Full explanations of incorrect answers are also included.

Extensively field-tested products that high-school students have given their stamp of approval.

Constructive feedback after all responses you make in the Learning Mode. After correct answers, you'll get positive reinforcement and an option to see an explanation of the answer. After incorrect answers, you'll get full, skill-building explanations. Learning occurs after every response.

Randomization of questions and answer choices in the Learning Mode, making the program different each time you run it.

Repeatable test situations in the Testing Mode, creating a true grading standard.

Scorecards that give you your percentage of correct answers at the end of each Question Set.

Built-in clock that keeps track of the time you take to answer questions. If you wish, the clock will appear on the screen while you work. Even if you choose not to see the clock as you work, the Scorecard at the end of the Question Set will tell you the amount of time you spent.

Print-out capability that enables you to obtain printed copies of individual Scorecards if you have a printer connected to your computer system.

Fail-safe programs that continue operating even if you press the wrong keys on the keyboard.

Optional sound effects that add interest and excitement to the learning experience. However, in situations where these sound effects might be distracting to others, the sound can easily be turned off; the program can be run without it.

Operating Modes

Each diskette, except for the SAT test diskette, is designed to operate in two distinct modes: Learning and Testing. In each mode, you work with one Question Set of 10 questions at a time.

Learning Mode

In the Learning Mode, the computer carries on a “dialogue” with you. Each of your answers is followed by an appropriate response from the computer. Learning occurs after every response, regardless of whether that response is right or wrong. This mode helps you build your verbal and math skills and helps improve your test-taking ability.

You have three chances to get the correct answer to each question. Each time you answer a question, a message appears, letting you know right away whether your answer is right or wrong. If your answer is correct, you will get a reinforcing message and have the option to see **why** the answer is correct.

If your answer is wrong, you learn **why** it is wrong and then get another chance at the question. After two wrong answers, you get “help” — a hint that helps you answer the question. And if your answer is wrong three times in a row, the program supplies the right answer for you as well as an explanation of why it is correct.

There is also a Key Word Review feature on the Antonyms and Analogies diskettes and a Sentence Review feature on the Sentence Completion diskette. After the computer supplies an explanation of the correct answer, you have the option on the Antonyms and Analogies diskettes to see the Key Words defined and used in a sentence. On the Sentence Completion diskette, you have the option to see the Key Sentence with a synonym filled in for the correct answer.

If you want to time yourself while you answer questions, press C. A clock will appear on the screen to show you how much time you’re taking. Press C again if you want to clear the clock from the screen. The built-in clock continues to keep track of the time regardless of whether the clock is displayed on the screen. You can make the clock appear and disappear as often as you like during a Question Set.

Testing Mode

Each of the five study diskettes—Antonyms, Analogies, Sentence Completion, Reading Comprehension, and Math—offers a Testing Mode in addition to the Learning Mode. In the Testing Mode, the computer presents you with a series of 10 questions and then grades your answers and reports your score. In this mode, the program does not tell you whether your answers are right or wrong until you finish the Question Set. At that point, the program displays a Scorecard, which shows your score and the time it took you to complete the set.

Then you have the option to see the questions you missed and to try again to answer them correctly. If you do try again, you will receive feedback after each response, as you do in the Learning Mode, to ensure that you understand the correct answer.

If you want to work against the clock in the Testing Mode, press C, and a clock will appear on the screen, showing you how much time you take to answer questions. Press C again, and the clock will disappear.

As a general rule, you should try to complete a Question Set (10 questions) in math in about 10 minutes. Figure an average of one question per minute of test time. For the Question Sets in the verbal categories, set a goal of seven to eight minutes per set. However, it may take you longer than that to complete a set of 10 reading comprehension questions because you have to read the passages first.

During the test itself, you will have to answer questions at about this pace in order to complete the different sections of the test within the 30-minute time limit. If you find that you cannot complete a set within these time limits, you may want to go back to the Learning Mode for more practice.

Scorecard

At the end of each Question Set in the Learning and Testing Modes, a Scorecard appears, giving you your score and the time it took you to complete the set. In the Learning Mode, your Scorecard will also display the number of questions you answered correctly on the first try, the second try, and the third try. And it will keep track of the number of strikeouts, too—that is, the questions that you missed three times in a row.

Scorecard Printouts

If you have a printer connected to your system, you can easily obtain a hard-copy version of your Scorecards. This option is available in both the Learning and Testing Modes.

At the end of each Question Set, this message is displayed:

YOU HAVE COMPLETED QUESTION SET NO. X.
PRESS SPACE BAR FOR YOUR SCORE.

If you want to receive a printout of your Scorecard, press "P" instead of the space bar. This will put the computer in a "Print" mode. Full instructions will then appear on the screen to guide you through the print-out process.

If a printer is not available, simply follow the on-screen directions:

PRESS SPACE BAR FOR YOUR SCORE.

The computer will then display the Scorecard on the screen.

Understanding the SAT: What the Test Is all About

What Does the Test Cover?

The Scholastic Aptitude Test (SAT) is a multiple-choice exam comprised of math and verbal questions. The Test of Standard Written English (TSWE), another multiple-choice test, and an Experimental section are given at the same time that you take the SAT. Altogether, there are six 30-minute sections. In a typical test, these six sections might be presented as follows:

- Section 1 Verbal
- Section 2 Mathematics
- Section 3 Test of Standard Written English
- Section 4 Verbal
- Section 5 Mathematics
- Section 6 Experimental

Several different versions of the test are administered simultaneously. The content in each of these versions is identical, but the order in which the sections are presented varies from test booklet to booklet.

Of the six sections on the test, only four count toward your actual SAT score. The ones that count are the two verbal sections and the two mathematics sections. The Test of Standard Written English and the Experimental section are not used for calculating your SAT score. The Test of Standard Written English measures your ability to recognize clear and grammatically correct writing. The score you receive on this section is used by some colleges to place freshmen in appropriate English courses. The Educational Testing Service (ETS) uses the Experimental section to design questions for future SATs. When you take the test, though, you won't know which section is the Experimental one.

The questions on the verbal portion of the test cover four different categories:

- Antonyms
- Analogies
- Sentence Completion
- Reading Comprehension

The questions on the math portion of the test are divided into two categories:

- Standard Multiple-Choice
- Quantitative Comparisons

Each of these question types is fully explained in other sections of this manual. For a description of antonym questions and test-taking strategies, for example, go to the Antonyms section and look under "How to Answer Antonym Questions."

What Does the Test Measure?

Most authorities agree that the SAT measures “developed verbal and mathematical reasoning abilities.” Note the use of the word “developed.” The test measures how well you have developed your vocabulary, for example, but it does not necessarily indicate how much native verbal ability you might have. Thus, the name of the exam — Scholastic Aptitude Test (SAT) — is a little misleading, since it is not a general aptitude or intelligence test. Most experts believe, however, that SAT scores provide a reasonably good indication of how well you will perform in college.

Does It Pay to Study for the SAT?

Since the test measures “developed” abilities, it seems reasonable to assume that some type of study is helpful in preparing for the test. Most authorities believe that the best type of study involves serious attention to academic courses and lots of outside reading over a long period of time. Unfortunately, that answer is not very helpful if you will be taking the test in the near future.

Short-term study of the right sort can help, however. Through drill and practice sessions on the computer with questions similar to those found on the SAT, you can:

1. become familiar with the types of questions on the test.
2. gain confidence in your ability to handle test questions in a timed situation.
3. sharpen your test-taking skills by becoming more aware of the subtleties of many test questions.
4. develop strategies for selecting and rejecting possible answers for each category of question on the test.

How Is the SAT Scored?

The scoring system is based on a “raw score.” You receive one raw score point for each question answered correctly and no points for questions that you leave blank. You lose one-fourth of a raw score point for each question you get wrong.

The verbal portion of the test consists of 85 questions. Thus, the highest possible verbal raw score is 85. The math portion of the test contains 60 questions. The highest possible raw score for math is 60.

A special formula is used to convert raw scores into scaled scores, which range from 200 (the lowest) to 800 (the highest). The following tables show the approximate relationship between these scores.

Verbal

Raw Score	Scaled Score
0	200
5	220
10	250
15	290
20	320
25	350
30	390
35	420
40	450
45	480
50	520
55	550
60	580
65	620
70	660
75	700
80	740
85	800

Math

Raw Score	Scaled Score
0	250
5	290
10	330
15	370
20	420
25	460
30	510
35	560
40	610
45	650
50	700
55	740
60	800

As you can see, you can achieve excellent scores without answering every question correctly. In fact, a perfect score of 800 is unlikely.

General Test-Taking Strategies

You can improve your performance on the SAT — and reduce your anxiety — by following the general strategies listed below. To see specific strategies for answering each type of question — antonyms, analogies, etc. — refer to the appropriate sections of this manual.

Understand the Directions for Each Type of Question Spend some time reading the test instructions for each type of question. You should be very familiar with them before you go in to take the test. The actual instructions that appear on the SAT are printed in the appropriate sections of this manual (in the Antonyms section, the Analogies section, etc.).

Answer the Easy Questions First The questions on the SAT are arranged in sections. Easier questions are usually found at the beginning of a section, while more difficult questions are usually placed toward the end. The only exception to this is in the Reading Comprehension section, where the questions are not arranged according to difficulty. However, the more difficult reading passages are placed at the end of the section. Since you get the same amount of credit for correctly answering an easy or a difficult question, make sure you attempt the easier ones.

Skip Extremely Difficult Questions It can pay to skip extremely difficult questions. Don't penalize yourself by leaving easy questions unanswered simply because you have used up your time trying to answer the hard ones. As far as scoring goes, it only matters whether your answer is right or wrong, not how difficult the question is. You get one raw score point for each correct answer. You can still score well on the test even if you skip a few questions or answer a few incorrectly.

Make Educated Guesses It doesn't pay to take wild or random guesses. Remember that if you take a wild guess and get the answer wrong, you will lose one-fourth of a raw score point. But if you skip a question, you don't gain or lose any points.

On the other hand, if you can eliminate one or two answer choices as being **obviously incorrect**, it is probably worthwhile to take an educated guess. In the verbal portion of the SAT, for example, each question has five answer choices. So, your chances of guessing the correct answer are one out of five, or 20%. But if you can eliminate one answer choice as being obviously wrong, your chances increase to 25% (one out of four). If you can eliminate two choices, your chances improve to 33⅓% (one out of three).

Mark Each Answer Clearly on Your Answer Sheet Make sure you fill in the blank space next to your answer choice. If your mark is too light to be read by the

scoring machine or if you have marked two answer choices, you won't get credit for a correct answer.

Check Your Place on the Answer Sheet from Time to Time Make sure that you put your answers in the right place. It sounds simple, but it is extremely important. If your answers are off by one, for example — if you put your answer to Question #2 in the place where the answer to Question #1 goes, and continue with that pattern throughout an entire section — you may get the entire section marked wrong simply because your right answers were put in the wrong places. Be especially careful about your answer placement if you skip questions within a section.

Similarly, make sure you put your answers in the right section of the answer sheet. If you are working on Section 4, for example, don't put your answers in Section 5.

Use Your Time Wisely You have 30 minutes to work on each section of the SAT. Work as quickly as you can to complete as many questions as possible. When the 30-minute period ends, you may not return to that part of the test again to complete unanswered questions. Thus, it doesn't pay to spend a lot of time trying to solve one question.

The verbal sections of the test contain 45 and 40 questions. So, the average time you spend on each verbal question should be less than a minute. Don't assume, however, that you can answer the reading comprehension questions in that time period. Be sure to read each reading passage carefully before answering questions about it.

The math sections of the test have 35 and 25 questions each. Although some questions will take more time than others, the average time you spend on a math question should be about one minute.

Antonyms

Running the Antonyms Program

If you haven't already done so, load the Antonyms program into the computer and select an operating mode — Learning or Testing. Choose a Question Set and press RETURN. The first problem will appear on the screen. (If you need instructions for loading the program and advancing to this point, see the Reference Card at the beginning of the manual.)

Learning Mode

If all has gone well so far, you've selected a Question Set and pressed RETURN. An SAT question is on the screen. Choose your answer using the arrow keys and RETURN.

After you make your choice, the computer evaluates your answer and offers a response, depending on whether your answer is right or wrong. You get three chances, if you need them, to answer each question.

If you want to time yourself as you answer questions, press C. A clock will appear on the screen. Press C again if you want to clear the clock from the screen. The clock option is available whenever you want it. It keeps track of the time regardless of whether the clock is displayed on the screen. When the computer displays your score at the end of each Question Set, it also tells you how much time you took to complete the set.

At the end of each Question Set, you will see this message, "You have completed Question Set No. _____. Press the space bar to see your Scorecard." If you press the space bar, your Scorecard will appear, displaying your name, the Question Set completed, the time taken to finish the set, and your score. The Scorecard also shows the number of questions you got right on the first, second, and third try.

If you have a printer attached to your system and want to receive a hard-copy print-out of your Scorecard, press "P" instead of the space bar when you see the above message, and follow the instructions on the screen.

After seeing your Scorecard, press the space bar again, and this question will appear, "Do you want to try another Question Set?" If you decide to work on another set, press Y and follow the instructions on the screen. If you decide not to try another set, press N. A goodbye message will appear, and the program will automatically reset itself to the beginning.

Testing Mode

After you select a Question Set, the program generates the first question. Choose your answer using the arrow keys and the RETURN key.

When you press RETURN, the program displays the second question. Each question in the set is presented this way, without comment of any kind. The computer tells you whether you're right or wrong only **after** you complete the set — that is, after the tenth question.

If you want to work against the clock, press C, and a clock will appear on the screen, showing you how much time you take to answer questions. Press C again, and the clock will disappear.

At the end of the Question Set, you will see this message, "You have completed Question Set No. _____. Press the space bar to see your Scorecard." Your Scorecard includes your name, the Question Set, your score, and the time it took you to finish the set. If you have a printer and want to have a hard-copy print-out of your Scorecard, press "P" instead of the space bar when you see the above message and then follow the instructions on the screen.

After seeing your Scorecard, you have the option to review all the questions that you missed and to try again to answer them correctly. (Of course, if you get a perfect score of 100%, this option does not come up.) If you decide to review the questions, you will receive feedback on each response, as you do in the Learning Mode, to ensure that you understand the correct answer.

At the end of this review, you have the option to try another Question Set or quit working.

How to Answer Antonym Questions on the SAT

An antonym is a word that means the opposite of another word. The antonym questions on the SAT are designed to test the range of your vocabulary. Each question consists of a key word and five answer choices. Your task is to select the antonym — the answer choice that is most nearly opposite in meaning to the key word. Here are the actual instructions for this part of the exam, exactly as they have appeared on past SATs. Make sure you fully understand them before going any further.

Directions: Each question below consists of a word in capital letters, followed by five lettered words or phrases. Choose the word or phrase that is most nearly opposite in meaning to the word in capital letters. Since some of the questions require you to distinguish fine shades of meaning, consider all the choices before deciding which is best.

It is important to remember that the correct word is not necessarily a precise or exact opposite of the Key Word (in capital letters). Consider this sample question:

FRUGAL:

- (A) wealthy
- (B) clumsy
- (C) wasteful
- (D) productive
- (E) distant

First, try to define the key word. Frugal means thrifty. Now think of the opposite. The opposite of being frugal is spending too much.

Only two of the answer choices, wealthy and wasteful, are real possibilities. Wealthy means rich, which might be considered nearly opposite at first glance. But wealthy and frugal are not antonyms. Wealthy people may also be frugal, preferring to save rather than spend their money. So, the best answer is "wasteful."

Not all questions are as straightforward as the example above. Consider a second example:

CONTINENT:

- (A) nation
- (B) unrestrained
- (C) rational
- (D) satirical
- (E) shy

You are familiar with the word “continent.” As a noun it refers to a large land mass. But none of the answer choices seems to be an exact opposite. “Nation” might appear to be a possibility. Nations, independent political states with specific boundaries, are found on continents but are not the opposite of continents.

Sometimes words have a second meaning — a meaning in addition to the one you know. As an adjective, continent means being temperate or having self-control. Of the choices, “unrestrained” is the best answer because it is most nearly opposite in meaning to “continent.”

In order to answer antonym questions correctly, it is wise to follow a logical, step-by-step procedure. Here is one that has worked well for many students.

Step 1 Read the Key Word twice, slowly and carefully. Try to define the Key Word. Then read all of the answer choices. Think: what is the opposite of the Key Word? Select the one answer that seems the best — that is, the one most nearly opposite in meaning to the Key Word.

Step 2 If you know the meaning of the Key Word but none of the answer choices seems to be its opposite, stop and think for a moment. The Key Word may have a second meaning. Reexamine all the answer choices to see if any of them is the opposite of the Key Word’s second meaning.

Step 3 If, after searching for a second meaning, you still cannot find an antonym among the answer choices, check to see if one or two of the choices can be eliminated. If so, it may pay to make an educated guess.

Step 4 If you have only a vague idea of the meaning of the Key Word, make up a sentence that uses the Key Word. The sentence may help clarify the Key Word’s meaning for you. If so, read all the choices again until you find the best answer.

Step 5 If you are totally unfamiliar with the Key Word, try to determine its root. (The Vocabulary Review section in this manual defines many prefixes, roots, and suffixes.) The word “pseudonym,” for example, means false name. Its roots are “pseudo” (false) and “nym” (name).

If you can determine the root of the Key Word, it is probably worthwhile to take a chance and answer the question. After you figure out the root of the Key Word, look at the answer choices again. Select the one that is most nearly opposite to the Key Word.

Step 6 If, after trying Steps 1-5, you still don't know what the Key Word means, don't take a wild guess. Skip the question and move on.

Note: When you use the "Antonyms" diskette, you don't have the option to skip questions, as you do on the actual test. The program has been designed this way so that each question will be a learning experience. Since each incorrect response is explained, wrong answers can actually help increase your vocabulary, which in turn will help you answer antonym questions on the SAT.

Analogies

Running the Analogies Program

If you haven't already done so, load the Analogies program into the computer and select an operating mode, Learning or Testing. Choose a Question Set and press RETURN. The first problem will appear on the screen. (If you need instructions for loading the program and advancing to this point, see the Reference Card at the beginning of the manual.)

Learning Mode

You've selected a Question Set and pressed RETURN. An SAT question is on the screen. Choose your answer using the arrow keys and RETURN.

After you make your choice, the computer evaluates your answer and offers a response, depending on whether the answer is right or wrong. You get three chances, if you need them, to answer each question.

If you want to time yourself as you work, press C. A clock will appear on the screen. Press C again if you want to clear the clock from the screen.

At the end of each Question Set, you will see this message, "You have completed Question Set No. _____. Press the space bar to see your Scorecard." If you press the space bar, your Scorecard will appear, displaying your name, the Question Set completed, the time taken to finish the set, and your score. The Scorecard also shows the number of questions you got right on the first, second, and third try. If you have a printer and want to receive a hard-copy print-out of your Scorecard, press "P" instead of the space bar when you see the above message, and follow the instructions on the screen.

After seeing your Scorecard, press the space bar again, and this question will appear, "Do you want to try another Question Set?" If you decide to work on another set, press Y and follow the instructions on the screen. If you decide not to try another set, press N. A goodbye message will appear, and the program will automatically reset itself to the beginning.

Testing Mode

After you select a Question Set, the program generates the first question. Choose your answer using the arrow keys and the RETURN key.

When you press RETURN, the program displays the second question. Each question in the set is presented this way, without comment of any kind. The computer tells you whether you're right or wrong only **after** you complete the set — that is, after the tenth question.

The "clock" option is available in the Testing Mode just as it is in the Learning Mode. If you press C, a clock will appear on the screen, showing you how much time you take to answer questions. Press C again if you want to clear the clock from the screen.

At the end of the Question Set, you will see this message, "You have completed Question Set No. _____. Press the space bar to see your Scorecard." Your Scorecard includes your name, the Question Set, your score, and the time it took you to finish the set. If you have a printer and want to have a hard-copy print-out of your Scorecard, press "P" instead of the space bar when you see the above message, and then follow the instructions on the screen.

After seeing your Scorecard, you have the option to review all the questions that you missed and to try again to answer them correctly. (Of course, if you get a perfect score of 100%, this option does not come up.) If you decide to review the questions, you will receive feedback on each response, as you do in the Learning Mode, to ensure that you understand the correct answer.

At the end of this review, you have the option to try another Question Set or quit working.

How to Answer Analogy Questions on the SAT

The analogy questions on the SAT are designed to test your skill in recognizing word relationships. Each question consists of a pair of Key Words or phrases and five answer choices; each answer choice consists of two words or phrases. Your task is to find the word relationship that is parallel to the one between the Key Words.

You are looking for an analogy — a similarity — between two pairs of words, the Key Words and the two words in the correct answer. Here are the instructions exactly as they have appeared on past SATs. Make sure you understand them before going any further.

Directions: Each question below consists of a related pair of words or phrases, followed by five lettered pairs of words or phrases. Select the lettered pair that best expresses a relationship similar to that expressed in the original pair.

It is important to remember that the correct answer does not necessarily express exactly the same relationship as that expressed by the Key Words. The trick is to select the pair of words (the answer choice) whose relationship **most closely resembles** the one between the Key Words. Consider this question:

MAESTRO: ORCHESTRA::

- (A) violin: flute
- (B) tuba: wind
- (C) conductor: baton
- (D) playing: musically
- (E) principal: faculty

In analogy questions, the two Key Words are separated by a colon(:). The colon means that the first word ("MAESTRO") has a relationship to the second word ("ORCHESTRA"). The two colons that appear after the second word mean that these Key Words have a relationship that is similar to the relationship between the two words in one of the answer choices.

To answer this or any other analogy question, it is helpful to follow a logical, step-by-step approach. Here is one that has worked well for many students.

Step 1 Read the Key Words twice, slowly and carefully. Think about what the words mean. How is MAESTRO related to ORCHESTRA?

Step 2 If you know the meaning of the Key Words, construct a sentence using both of the words. The sentence should express the relationship between the two words. It must use the Key Words exactly as they are presented. Define the relationship as precisely as possible because many questions will require you to distinguish between several choices that are fairly similar.

In the sample question, it is not enough for you to say, "MAESTRO and ORCHESTRA are both musical terms." Nor is it sufficient to say, "A MAESTRO has something to do with an ORCHESTRA." To be useful, your sentence must specify the exact relationship between the words. You could say, for example, "A MAESTRO leads, or conducts, an ORCHESTRA."

Step 3 Plug every pair of words into your sentence to see which pair (which answer choice) fits best. Don't make a final decision about your answer until you've tested all the choices.

Test sentence: “A violin leads or conducts a flute.”

Judgment: Doesn’t make sense.

Test sentence: “A tuba leads or conducts a wind.”

Judgment: Absurd.

Test sentence: “A conductor leads or conducts a baton.”

Judgment: Silly

Test sentence: “A playing leads or conducts a musically.”

Judgment: Doesn’t make sense. Another clue: these words don’t match the Key Words in terms of parts of speech.

Test sentence: “A principal leads or conducts a faculty.”

Judgment: Not exact, perhaps, but the best choice of the lot. These two words — principal and faculty — have the closest relationship to the one expressed by the Key Words.

When you make your comparisons, remember that you’re trying to find a relationship between two pairs of words. Don’t split up the pairs when forming your test sentence. For example, don’t compare the second Key Word (ORCHESTRA) to the second word (faculty) of the last answer choice. Don’t say, “An orchestra plays music” as “a faculty teaches students.” That will only confuse you. Keep both words of each pair together.

Step 4 If you know the meaning of only one of the Key Words, you should still try to construct a test sentence using both words. You may find that by putting the words in the context of a sentence, you can clarify the meaning of the unfamiliar word.

If you don’t know what the Key Words mean but do know what part of speech they are, you may be able to eliminate some of the answer choices and improve your chances of making a successful guess. The pair of words in the correct answer will always parallel the Key Words in their parts of speech. If the Key Words have a noun/verb relationship — if the Key Words are DOG:BARKS, for example — the words in the correct answer choice will also have a noun/verb relationship, such as “cat: meows.” The correct answer could not be “cat: stealthy,” for example, because that is a noun/adjective relationship.

Step 5 If you have only a vague idea of what the Key Words mean, try to decipher them by breaking them down into their prefixes, roots, and suffixes. In the Vocabulary Review section of this manual you will find lists of helpful prefixes, roots, and suffixes with their definitions. If you can figure out the Key Words this way, then go ahead and construct your test sentence and answer the question.

Step 6 If after trying Steps 1-5 above, you still don't know what the Key Words mean, you probably can't eliminate any of the answer choices. Skip the question and move on. The odds of guessing correctly are against you in this situation.

Note: When you use the "Analogies" diskette, you don't have the option to skip questions, as you do on the actual test. The program has been designed this way so that each question will be a learning experience whether you get it right or wrong. Since each incorrect response is explained, wrong answers can actually increase your vocabulary, which in turn will help you answer analogy questions on the SAT.

Sentence Completion

In this section you will find a guide to the Sentence Completion discourse and a list of strategies for answering sentence completion questions. The strategy section, "How To Answer Sentence Completion Questions," contains test-taking tips that you'll want to study to ensure that you're well prepared for the SAT.

Running the Sentence Completion Program

If you haven't already done so, load the Sentence Completion program into the computer and select an operating mode — Learning or Testing. Choose a Question Set and press RETURN. The first SAT question will appear on the screen. (If you need instructions for loading the program and advancing to this point, see the Reference Card at the beginning of this manual.)

Learning Mode

If all has gone well so far, you've selected a Question Set and pressed RETURN. An SAT question — the first one in the Question Set — is on your monitor or tv screen. Now choose your answer using the arrow keys and RETURN.

After you answer the question, the computer evaluates your answer and offers a response, depending on whether the answer is right or wrong. You get three chances to answer each question correctly.

You also have the option to time yourself as you answer questions. If you press C, a clock will appear on the screen. If you want to make the clock disappear, press C again. You can make the clock appear and disappear as often as you like.

At the end of each Question Set, you will see this message, "You have completed Question Set No. _____. Press the space bar to see your Scorecard." If you press the space bar, your Scorecard will appear, displaying your name, the Question Set completed, the time taken to finish the set, and your score. The Scorecard also shows the number of questions you got right on the first, second, and third try. If you have a printer and want to receive a hard-copy print-out of your Scorecard, press "P" instead of the space bar when you see the above message, and follow the instructions on the screen.

After seeing your Scorecard, press the space bar again, and this question will appear, "Do you want to try another Question Set?" If you decide to work on another set, press Y and follow the instructions on the screen. If you decide not to try another set, press N. A goodbye message will appear, and the program will automatically reset itself to the beginning.

Testing Mode

After you select a Question Set, the program generates the first question. Choose your answer using the arrow keys and the RETURN key.

When you press RETURN, the program displays the second question. Each question in the set is presented this way, without comment of any kind. The computer tells you whether you're right or wrong only **after** you complete the set — that is, after the tenth question.

If you want to see how much time you are taking to answer questions, press C, and a clock will appear on the screen. If you want to make the clock disappear, simply press C again.

At the end of the Question Set, you will see this message, "You have completed Question Set No. _____. Press the space bar to see your Scorecard." Your Scorecard includes your name, the Question Set, your score, and the time it took you to finish the set. If you have a printer and want to have a hard-copy print-out of your Scorecard, press "P" instead of the space bar when you see the above message, and then follow the instructions on the screen.

After seeing your Scorecard, you have the option to review all the questions that you missed and to try again to answer them correctly. (Of course, if you get a perfect score of 100%, this option does not come up.) If you decide to review the questions, you will receive feedback on each response, as you do in the Learning Mode, to ensure that you understand the correct answer.

At the end of this review, you can either try another Question Set or quit working.

How to Answer Sentence Completion Questions

The sentence completion questions on the SAT are designed to test your ability to recognize the relationship between different parts of a sentence. The more clearly you understand this relationship, the easier it is to answer the questions. These questions also measure your ability to put vocabulary words into their proper context.

Each question consists of a sentence with one or two missing words, and a list of five words or pairs of words (the answer choices). Your task is to select the answer choice that best completes the sentence. On the actual SAT, questions with one missing word and those with two missing words are mixed within the same section. The instructions for sentence completion questions are printed below exactly as they have appeared on past SATs. Before going any further, make sure you read and understand them.

Directions: Each sentence below has one or two blanks, each blank indicating that something has been omitted. Beneath the sentence are five lettered words or sets of words. Choose the word or set of words that *best* fits the meaning of the sentence as a whole.

To put it another way, the correct answer to any sentence completion question is the one that causes the sentence to make the best possible sense.

Consider this sample question:

We were concerned when we learned that Dr. Henderson, the world famous microbiologist, had made an important ____.

- (A) discovery
- (B) invention
- (C) antibiotic
- (D) microscope
- (E) miscalculation

In order to answer this kind of question correctly, it is wise to follow a logical procedure. This one has worked well for many students.

Step 1 Read the sentence twice. Do not even look at the answers until you have done so. This step will help you avoid foolish, impulsive mistakes.

Step 2 As you read the sentence, try to get its general meaning clearly in mind. Try to ignore (to the extent you can) the blanks in the sentence. Concentrate on the words that **are** there.

When you first read the sentence in the sample question, you may feel a “positive-sounding” word is needed to complete it. After all, the sentence speaks of “Dr. Henderson, the world famous microbiologist” and states that he “had made an important ____.” It certainly sounds impressive. What could be more natural than to assume that the missing word must be something like “discovery” or “breakthrough” or “advance”?

If you read the sentence carefully, though, you will note the first three words: “We were concerned. . . .” Since the word “concerned” means worried or troubled, Dr. Henderson must have done something bad, not good.

Step 3 Once you clearly understand the meaning of the sentence, choose a word of your own to fill in the blank. (In questions with two missing words, choose a word for each blank.) For this question, you might use the word “mistake.” If so, the sentence would read: “We were concerned when we learned that Dr. Henderson, the world famous microbiologist, had made an important mistake.” This sentence makes sense and is grammatically correct.

Step 4 Once you have a good idea of the meaning of the missing word, study the answer choices to see if you can find a synonym for the word you have inserted. Looking at the answer choices in the sample question, you can see that “discovery” and “invention” are wrong because they are “positive” words. We are trying to find a “negative” word that is a synonym for “mistake.”

The words “antibiotic” and “microscope” are also wrong. They are neither negative nor positive in tone; they are scientific terms put there to lead careless students astray. Most importantly, neither of these words is a synonym for “mistake.” In fact, “miscalculation” is the only answer choice that has negative connotations. It may not be an exact synonym for the word “mistake,” but it’s the best choice here. So, it is the correct answer.

Step 5 Plug your answer into the sentence to ensure that it makes good sense. If you insert “miscalculation” into the sentence in the sample problem, you will see that the statement is logical and grammatically correct. If you find that the sentence is not meaningful when your answer is inserted, go back to the remaining choices and look again.

Step 6 If none of the answer choices seems to be a synonym for the word you have plugged in, you have a problem. But don’t give up yet. Try inserting each answer choice, one at a time, into the sentence. See if any of them causes the sentence to make sense, even if the sentence meaning turns out to be different from what you thought it would be.

If you don’t know the meaning of any of the words in the answer choices, try to decipher them by figuring out what their prefix, root, or suffix means. (The Vocabulary Review section in this manual provides definitions for many prefixes, roots, and suffixes.) If you can use this method to decide on a final choice, go ahead and answer the question. There is a good chance that you will be right.

Step 7 If you are working on a sentence that has two missing words, make sure that **both** words fit. Don’t settle for an answer that is half right. Remember, half right on the SAT is all wrong. Consider this example:

Despite the ____ weather, the climbers felt ____ when they finally reached their goal – the summit of the mountain.

- (A) stormy . . . depressed
- (B) sunny . . . happy
- (C) inclement . . . exhilarated
- (D) rainy . . . exhausted
- (E) excellent . . . bored

As you can see, all of the adjectives describing the weather — “stormy,” “sunny,” etc. — make sense if you plug them into the first blank in the sentence. But **both** words in your answer choice just fit. That makes the question a little bit trickier.

Your first clue here is the word “despite.” Whenever you see words like “however,” “although,” “yet,” and “despite,” you know that one clause of the sentence is set up in opposition to the other.

Using the example above, we might normally think that when the weather is good (“sunny,” “excellent”), the climbers would feel good, especially when they have reached their goal. On the other hand, if the weather is bad, it might spoil the climb and dampen the climbers’ spirits (so to speak).

But because of the word “despite” in the first clause, you know that the climbers’ mood will be the opposite of what you would normally expect. So, if the weather is bad, they are likely to feel good in spite of it. That seems to make sense. They may be so excited to reach the top of the mountain that even a spell of bad weather can’t ruin their mood.

But when you try the sentence the other way, it doesn’t make sense: If the weather is good, the climbers are likely to feel bad when they reach the summit of the mountain. Hmm . . . The combination of reaching their goal (the summit) and having good weather to boot would probably not make them feel bad. The other way — bad weather and good spirits — seems more meaningful.

So, we could complete the sentence using our own words and then look for synonyms: “Despite the (bad) weather, the climbers felt (excited) when they finally reached their goal — the summit of the mountain.” That sounds logical enough. Now plug in the answer choices.

Sentence: “Despite the (stormy) weather, the climbers felt (depressed) when they finally reached the summit of the mountain.”

Judgment: Doesn’t make sense.

Sentence: “Despite the (sunny) weather, the climbers felt (happy) . . .”

Judgment: This one doesn’t make sense either.

Sentence: “Despite the (inclement) weather, the climbers felt (exhilarated) . . .”

Judgment: This looks like a reasonable choice. Inclement means bad or stormy and exhilarated means excited. The sentence makes sense.

Sentence: “Despite the (rainy) weather, the climbers felt (exhausted) . . .”

Judgment: This doesn’t work. The climbers might feel exhausted when they reached the top of the mountain, but not “despite the rainy weather.”

Sentence: “Despite the (excellent) weather, the climbers felt (bored) . . .”

Judgment: At first glance, this sentence might seem like a possibility. But it is unlikely because of the context. Climbers will probably not feel bored when they finally reach the top of the mountain, regardless of the weather.

So, of all the choices, “inclement . . . exhilarated” is the best. It is the only choice where **both** words fit into the sentence.

Step 8 If you have tried Steps 1-7 and still don't have a good idea of the correct answer, leave the question blank and go on. If you take wild guess, you're likely to get the answer wrong.

Note: When you use the “Sentence Completion” diskette, you don't have the option to skip questions, as you do on the actual test. The program has been designed this way so that each question will be a learning opportunity, whether you get it right or wrong. Since you receive an explanation for each wrong answer you make, you can actually increase your vocabulary this way, which in turn will help you answer sentence completion questions on the SAT.

Reading Comprehension

Running the Reading Comprehension Program

If you haven't already done so, load the Reading Comprehension program into the computer and select an operating mode — Learning or Testing. Choose a Question Set and press RETURN. The first SAT question will appear on the screen. (If you need instructions for loading the program and advancing to this point, see the Reference Card at the beginning of the manual.)

Learning Mode

If everything has gone well so far, you've selected a Question Set and pressed RETURN. An SAT question is on the screen.

The question will direct you to a specific reading passage. Read the passage. Then choose your answer using the arrow keys and RETURN.

Note: all reading passages are printed at the end of this section of the manual. All the questions pertaining to those passages are displayed on your monitor or TV screen. This arrangement allows you to always have the passage in front of you as you answer questions. There are several questions for each passage. When it is time to read the next passage, a message will appear on the screen, referring you to that passage.

After you answer the question, the computer evaluates your answer and offers a response, depending on whether the answer is right or wrong. You get three chances to answer each question correctly. (Of course, if you get the answer right on the first or second try, so much the better.)

You also have the option to time yourself as you answer questions. If you press C, a clock will appear on the screen. If you want to make the clock disappear, press C again. You can make the clock appear and disappear as often as you like.

At the end of each Question Set, you will see this message, "You have completed Question Set No. _____. Press the space bar to see your Scorecard." If you press the space bar, your Scorecard will appear, displaying your name, the Question Set completed, the time taken to finish the set, and your score. The Scorecard also shows the number of questions you got right on the first, second, and third try. If you have a printer and want to receive a hard-copy print-out of your Scorecard, press "P" instead of the space bar when you see the above message, and follow the instructions on the screen.

After seeing your Scorecard, press the space bar again, and this question will appear, "Do you want to try another Question Set?" If you decide to work on another set, press Y and follow the instructions on the screen. If you decide not to try another set, press N. A goodbye message will appear, and the program will automatically reset itself to the beginning.

Testing Mode

After you select a Question Set, the program generates the first question. The question will direct you to one of the reading passages.

To answer a question, read the passage. Then choose your answer using the arrow keys and the RETURN key.

Note: Although the questions are all displayed on the screen, the reading passages are all printed at the end of this section of the manual. This arrangement allows you to keep the passage in front of you all the time while you answer questions.

When you press RETURN, the program displays the second question. Each question in the set is presented this way, without comment of any kind. The computer tells you whether you're right or wrong only **after** you complete the set — that is, after the tenth question.

If you want to work against the clock, press C, and a clock will appear on the screen, showing you how much time you take to answer questions. Press C again if you want to make the clock disappear.

At the end of the Question Set, you will see this message, "You have completed Question Set No. _____. Press the space bar to see your Scorecard." Your Scorecard includes your name, the Question Set, your score, and the time it took you to finish the set. If you have a printer and want to have a hard-copy print-out of your Scorecard, press "P" instead of the space bar when you see the above message, and then follow the instructions on the screen.

After seeing your Scorecard, you have the option to review all the questions that you missed and to try again to answer them correctly. (Of course, if you get a perfect score of 100%, this option does not come up.) If you decide to review the questions, you will receive feedback on each response, as you do in the Learning Mode, to ensure that you understand the correct answer.

At the end of this review, you can either try another Question Set or quit working.

How to Answer Reading Comprehension Questions

The reading comprehension questions on the SAT test your ability to understand, analyze, and interpret various types of reading passages. It is important to understand that the reading comprehension portion of the SAT is not a test of memory. On the test, as in this program, the reading passages are available to you at all times. Feel free to refer to the passages as often as necessary while answering the questions.

Remember that the passages themselves are printed at the end of this section of the manual, while the questions appear on the screen.

In general, the reading passages on the SAT deal with three major areas of knowledge: Social Studies, Humanities, and Science. Each passage forms the basis for two or more test questions.

Each question is accompanied by five answer choices. Your task is to select the choice that best answers the question. The instructions for reading comprehension questions are printed below exactly as they have appeared on past SATs. Read them now and make sure you understand them.

Directions: The passage below is followed by questions based on its content. Answer all questions following the passage on the basis of what is stated or implied in that passage.

In other words, rely on the information in the passage, not on your own opinions, when answering questions. Look at this sample passage and the questions that follow:

1 Perhaps the strongest feature in
2 [George Washington's] character was prudence:
3 never acting until every circumstance, every
4 consideration, was maturely weighed; refraining
5 if he saw a doubt, but, when once decided, going
6 through with his purpose, whatever obstacles
7 opposed. His integrity was most pure, his
8 justice the most inflexible I have ever known;
9 no motives of interest or consanguinity, of
10 friendship or hatred, being able to bias his
11 decision.

12 He was, indeed, in every sense of the word, a
13 wise, a good, and a great man. His temper was
14 naturally irritable and high-toned; but
15 reflection and resolution had obtained a firm
16 and habitual ascendancy over it. If ever,
17 however, it broke its bounds, he was most
18 tremendous in his wrath.

19 In his expenses he was honorable, but exact;
20 liberal in contributions to whatever promised
21 utility, but frowning and unyielding on all
22 visionary projects and all unworthy calls on his
23 charity. His heart was not warm in its
24 affections, but he exactly calculated every
25 man's value, and gave him a solid esteem
26 proportioned to it.

27 His person, you know, was fine; his stature
28 exactly what one would wish; his deportment
29 easy, erect, and noble; the best horseman of his
30 age, and the most graceful figure that could be
31 seen on horseback. Although in the circle of his
32 friends, where he might be unreserved with
33 safety, he took a free share in conversation, his
34 colloquial talents were not above mediocrity,
35 possessing neither copiousness of ideas nor
36 fluency of words.

1. The primary purpose of this passage is to
- (A) give a physical description of Washington
 - (B) list Washington's accomplishments
 - (C) present an honest picture of Washington's character
 - (D) praise Washington
 - (E) criticize the flaws on Washington's character

The passage does not say much about choices A and B. They can be eliminated.

Choices C, D, and E, however, all seem to be possibilities at first glance. The passage does "praise Washington," and does mention some of the "flaws in Washington's character," but neither of these alone is the main purpose of the passage.

The correct answer is C. The passage presents a balanced appraisal of Washington. Lines 12-18 show good and bad sides of Washington's temper. Lines 27-36 contain both positive and negative comments about Washington.

2. The content of the passage allows the reader to infer that the author
- (A) was a relative of Washington
 - (B) had only read about Washington
 - (C) had worked closely with Washington
 - (D) had served under Washington in the army
 - (E) had met Washington only once

In this question, you must make an inference. That is, you must draw a conclusion based on what is implied, but not directly stated, in the passage. The correct answer is C.

It is clear from the level of detail in the passage that the author knew Washington well. The author probably could not have acquired this knowledge if he or she had "only read about Washington," or "had met Washington only once."

It is possible that the author “was a relative of Washington” or “had served under Washington in the army,” but we are not given enough information in the passage to infer that.

On the SAT, some reading comprehension questions, like Example 1 above, deal with facts or ideas that are given in the passage. You may be asked to “give the main idea” of the passage or decide, on the basis of what is stated in the passage, “which of the following statements the **author** would support.”

Other questions, like Example 2 above, ask you about what is implied, but not stated, in the passage. You may see questions like these: “It can be inferred that . . .” or “How would you describe the author’s attitude toward . . .” or “The tone of the passage can best be described as . . .”

It is helpful to use a step-by-step procedure when answering reading comprehension questions. The following strategy has worked well for many students.

Step 1 Skim the questions first. Try to get an idea of the kind of information you will need for your answers.

Step 2 Read the passage slowly and carefully. Concentrate.

Some students find it helpful to circle or underline portions of the reading passage. Be careful about this. Remember that you are not trying to understand or recall everything in the passage. Your goal is to answer the questions correctly. So, if you do underline, be sure it is something that relates to the questions being asked.

Step 3 Begin answering the questions that are based on the passage. Take the questions one at a time. Before selecting an answer, read all the choices carefully. For many questions, several choices may seem partially correct; your job is to find the **best** one.

Feel free to refer to the passage as often as necessary. The passage is there for your reference. Use it.

Step 4 If, after working through Steps 1-3, you don’t have any idea what the answer to a question is, skip it and go on to the next question. When you have answered that question, return to the question that was causing you trouble. Perhaps it will seem a little easier the second time around.

Some Additional Advice

When answering reading comprehension questions, keep these five points in mind:

1. Use only the information stated or implied in the passage. Don't use any outside knowledge that you may have on a subject.
2. Don't choose an answer simply because it makes a true statement. Once again, what you know about the subject from your outside reading does not matter.
3. Make sure your answer is **totally** correct. Several answer choices may be **partially** correct.
4. Don't panic if you don't see the answer to a question right away. Some reading comprehension questions are extremely difficult. They require careful reading and patient, reflective thought. Students who do careful work almost always achieve good results. Don't let your anxiety cheat you out of your chance for a good score.
5. Keep track of the time. These questions can take more time to answer than other types of questions on the SAT. Although you need to be patient and careful as you work, you can't afford to spend 20 minutes, say, answering 5 questions about a tough passage. So, if you can see right away that a passage is going to be extremely difficult, skip it and go on to one that is easier for you. Easy questions count just as much as difficult ones do. And, if you finish with time to spare, you can return to questions in this section that you skipped the first time through.

Reading Passages

The questions on the Reading Comprehension diskette are based on the reading passages printed in this section of the manual. Each passage is listed by number. To answer questions, read the specific passage referred to in the question. Then use the arrow keys and RETURN to select your answer on the computer.

Passage Number 1

1 In shooting rapids the boatman has this problem
2 to solve: to choose a circuitous and safe course
3 amid a thousand sunken rocks, scattered over a
4 long distance, at the same time that he is
5 moving steadily on at the rate of fifteen miles
6 an hour. Stop he can not: the only question is,
7 Where will he go? The bowman chooses the
8 course with all his eyes about him, striking
9 broad off with his paddle, and drawing the boat
10 by main force into her course. The sternsman
11 faithfully follows the bow.

12 Down the rapids we shot at a headlong rate. If
13 we struck a rock, we were split from end to end
14 in an instant. Now like a bait bobbing for some
15 river monster amid the eddies, now darting to
16 this side of the stream, now to that, gliding
17 swift and smooth near to our destruction, or
18 striking broad off with the paddle and drawing
19 the boat to right or left with all our might in
20 order to avoid a rock, we soon ran through the
21 mile, and floated in Quakish Lake.

22 After such a voyage, the troubled and angry
23 waters, which once had seemed terrible and not
24 to be trifled with, appeared tamed and subdued;
25 they had been bearded and worried in their
26 channels, pricked and whipped into submission
27 with the spike pole and paddle, and all their
28 spirit and their danger taken out of them; and
29 the moist swollen and impetuous rivers seemed
30 but playthings henceforth.

Passage Number 2

1 About this time I met with an odd volume of the
2 *Spectator*. It was the third. I had never before
3 seen any of them. I bought it, read it over and
4 over, and was much delighted with it. I thought
5 the writing excellent, and wished, if possible, to
6 imitate it. With this view I took some of the
7 papers, and, making short hints of the sentiment
8 in each sentence, laid them by a few days, and
9 then, without looking at the book, tried to
10 complete the papers again, by expressing each
11 hinted sentiment at length, and as fully as it
12 had been expressed before, in any suitable
13 words that should come to hand.

14 Then I compared my *Spectator* with the
15 original, discovered some of my faults, and
16 corrected them. But I found I wanted a stock of
17 words, or a readiness in recollecting and using
18 them, which I thought I should have acquired
19 before that time if I had gone on making verses;
20 since the continual occasion for words of the
21 same import, but of different length, to suit the
22 measure, or of different sound for the rhyme,
23 would have laid me under a constant necessity
24 of searching for variety, and also have tended
25 to fix that variety in my mind, and make me
26 master of it.

27 Therefore I took some of the tales and turned
28 them into verse, and after a time, when I had
29 pretty well forgotten the prose, turned them
30 back again.

31 I also sometimes jumbled my collection of hints
32 into confusion, and after some weeks
33 endeavored to reduce them into the best order,
34 before I began to form the full sentences and
35 complete the paper. This was to teach me
36 method in the arrangement of thoughts. By
37 comparing my work afterward with the original,
38 I discovered many faults, and amended them;
39 but I sometimes had the pleasure of fancying
40 that, in certain particulars of small import, I
41 had been lucky enough to improve the method
42 or the language; and this encouraged me to
43 think I might possibly, in time, come to be a
44 tolerable English writer — of which I was
45 extremely ambitious.

Passage Number 3

1 Despite our building roads and superhighways
2 and parking areas at top speed, freeway tie-ups
3 are multiplying to the point where at least 25
4 cities now have traffic spotters in helicopters,
5 broadcasting advice about freeways to avoid.
6 The congestion in some larger cities is
7 approaching that of ancient Rome, when Julius
8 Caesar found it necessary to ban all wheeled
9 vehicles during daylight hours.

10 We have traffic jams not only on the ground but
11 in the air over airports. We have noise
12 abatement problems. We have water shortages
13 that will be serious in more than a thousand
14 U.S. communities next summer. We have water
15 pollution that will require an expenditure of
16 over \$900 million per year to bring under
17 control, according to figures from the U.S.
18 Public Health Service.

19 As for air pollution, meteorologist
20 Morris Neiburger of the University of California
21 at Los Angeles has warned that within a century
22 the atmosphere will be too poisonous to support
23 life unless we reverse the trend.

24 Even our solid wastes—garbage and trash—
25 are piling mountain-high. Our cities spend more
26 than \$1.5 billion a year to haul it away and try
27 to dispose of it. But if they burn it they create
28 air pollution. If they grind it up and flush it
29 away they pollute somebody's water.

30 Complexity has bred such problems because our
31 civilization wasn't prepared. We didn't fully
32 realize our problems until they became major
33 problems sociologically, politically, and
34 scientifically. Like a victim of cancer, we
35 cannot wait until we are seriously incapacitated
36 to take action. By then it is far too late.

Passage Number 4

1 “Neither snow, nor rain, nor heat, nor gloom of
2 night stays these couriers from the swift
3 completion of their appointed rounds.”

4 Those words, carved on the lintels of post
5 offices across America, once capsuled a spirit
6 that was the foundation of today’s sophisticated
7 network of global communications — a spirit
8 that sent Western Union boys pedalling into the
9 rain with telegrams, urged pioneering pilots to
10 fly the early airmail letters through wintry
11 skies to Chicago and spurred the Pony Express
12 across the untamed plains with mail for
13 Sacramento.

14 But those inspiring words are much older than
15 airmail pilots, Western Union boys or Pony
16 Express riders. They were written by
17 Herodotus, the father of history, in 430 B.C.,
18 and described the communications network of
19 Xerxes, ruler of Persia in the fifth century,
20 B.C.

21 The need for an efficient postal system goes
22 back to the ancient need of a ruler for swift and
23 accurate information, a need clearly described
24 by Nizam al-Mulk, a prime minister under
25 Seljuk Turkish sultans in the ninth century:

26 “It is the king’s duty to enquire into the
27 conditions of his peasantry and army, both far
28 and near, and to know more or less how things
29 are. If he does not do this he is at fault and
30 people will charge him with negligence, laziness
31 and tyranny, saying, ‘Either the king knows
32 about the oppression and extortion going on in
33 this country, or he does not know. If he knows
34 and does nothing to prevent it and remedy it,
35 that is because he is an oppressor like the rest
36 and acquiesces in their oppression; and if he
37 does not know then he is negligent and
38 ignorant.’ Neither of these imputations is
39 desirable. Inevitably therefore he must have
40 postmasters.”

41 As early as 2000 B.C. the Egyptians had
42 developed a primitive postal system. By about
43 1000 B.C., ancient China had worked out a
44 system not unlike the one developed by
45 America's Pony Express. And by the time of
46 Islam other peoples — Greeks, Romans,
47 Byzantines and Sasanians — had refined and
48 polished elements of the earlier systems into
49 relatively sophisticated operations.

Passage Number 5

1 An astronaut in orbit around the earth is said to
2 be in a state of weightlessness, also called zero
3 gravity or zero g.

4 Zero g does not mean that the gravity of the
5 earth has disappeared, or that the object which
6 is in a weightless condition does not have
7 mass. It means, rather, that the "weightless"
8 object is subject not only to gravity, but also to
9 some other effect, which balances the force of
10 gravity, thus producing apparent lack of
11 gravitational pull, hence zero g.

12 The weightless state can be produced in an
13 airplane for a brief period (thirty to forty
14 seconds) by putting the craft into a flight path
15 variously called a ballistic trajectory, a
16 Keplerian trajectory or a parabolic arc. The
17 pilot first noses down to increase speed, then
18 turns the nose upward and directs it into an
19 arc. During this brief period no lift is produced
20 on the wings, the airplane is not supported by
21 the air, and the occupants are not supported by
22 the airplane. The result is zero gravity for the
23 airplane and its occupants. The procedure is
24 used to study weightlessness, and in the training
25 of astronauts.

26 The astronauts all report that the sensation of
27 weightlessness is a pleasant one. Astronaut
28 Edward H. White, during his time outside of
29 Gemini IV, reported that there was no difficulty
30 in sensing location and altitude. "I'm looking
31 right down," he said, "and it looks like we're
32 coming up on the coast of California, and I'm
33 going in slow rotation to the right. There is
34 absolutely no disorientation."

35 In the future of space exploration, when more
36 and more work of more and more kinds will
37 have to be accomplished in space — an example
38 would be the assembly of large space vehicles in
39 space by putting together components launched
40 separately from earth — weightlessness poses a
41 special problem in the use of tools. In a state
42 of weightlessness, when you put a wrench on a
43 nut and turn, the result is not the same as it
44 would be in normal circumstances. To make the
45 nut turn, you need a firm base from which to
46 exert the force which is to be transmitted
47 through the wrench to the nut. Lacking this,
48 you may turn instead of the nut, or both you and
49 the nut may turn. So special tools are being
50 developed which will provide the reaction
51 required to exert force.

Passage Number 6

1 Perhaps the strongest feature in
2 [George Washington's] character was prudence:
3 never acting until every circumstance, every
4 consideration, was maturely weighed; refraining
5 if he saw a doubt, but, when once decided, going
6 through with his purpose, whatever obstacles
7 opposed. His integrity was most pure, his
8 justice the most inflexible I have ever known;
9 no motives of interest or consanguinity, of
10 friendship or hatred, being able to bias his
11 decision.

12 He was, indeed, in every sense of the word, a
13 wise, a good, and a great man. His temper was
14 naturally irritable and high-toned; but
15 reflection and resolution had obtained a firm
16 and habitual ascendancy over it. If ever,
17 however, it broke its bounds, he was most
18 tremendous in his wrath.

19 In his expenses he was honorable, but exact;
20 liberal in contributions to whatever promised
21 utility, but frowning and unyielding on all
22 visionary projects and all unworthy calls on his
23 charity. His heart was not warm in its
24 affections, but he exactly calculated every
25 man's value, and gave him a solid esteem
26 proportioned to it.

27 His person, you know, was fine; his stature
28 exactly what one would wish; his deportment
29 easy, erect, and noble; the best horseman of his
30 age, and the most graceful figure that could be
31 seen on horseback. Although in the circle of his
32 friends, where he might be unreserved with
33 safety, he took a free share in conversation, his
34 colloquial talents were not above mediocrity,
35 possessing neither copiousness of ideas nor
36 fluency of words.

Passage Number 7

1 In a land as ancient as Egypt, the past is always
2 present. The mighty monuments of other times
3 — the pyramids and the Sphinx, the Mamluk
4 mosques and the citadel of Muhammad Ali —
5 cast their shadows over the hustle and bustle of
6 today, and modern Egypt is just as much a gift
7 of the Nile as it was when Herodotus first
8 coined the phrase. We know a great deal about
9 the ancient Egyptians thanks to the
10 documentary detail in the thousands of miles of
11 wall paintings and stone engravings with which
12 they decorated their temples and tombs. We
13 even know what they ate, how they grew,
14 gathered and prepared their food, even what
15 they flavored it with. And because of the basic
16 conservatism of the Egyptian people, it is
17 possible today to breakfast or dine off the same
18 dishes that the pharaohs and scribes and
19 pyramid-builders ate thousands of years ago.

20 Of course, since then, new fruits, grains and
21 vegetables have been brought in and
22 domesticated. In recent centuries, the Turks
23 have imparted unmistakable flavors and
24 textures to many dishes. Before that the Arabs,
25 Romans, Greeks, and Persians made their
26 contributions. But the basic elements of
27 Egyptian cooking — the beans and onions,
28 cereals and bread, the fish from the Nile and
29 the ducks from Fayyoun, the melons and
30 pomegranates and dates, the coriander, cumin,
31 rosemary and sage — remain as they were at
32 the time of Ramses the Great and Ikhnaton.

33 The tombs abound with pictures showing the
34 making of bread and beer — two jobs
35 conveniently combined by the bakers because of
36 their control of the supplies of yeast. The
37 ancient Egyptians are believed to have been the
38 first people to make leavened bread. Actual
39 examples of bread made 4,000 years ago have
40 been found in sealed tombs that were recently
41 opened. Egypt was one of the main suppliers of
42 wheat and barley to Rome, and wild barley is
43 still found on the shores of the Red Sea, where
44 it was originally discovered by the goddess Isis.

Passage Number 8

1 The Nisei (pronounced KNEE-SAY) are a
2 comparatively new and infinitesimal minority in
3 American life. On the mainland of the United
4 States there are about 200,000 of them.
5 Despite distinctive features, they are
6 Americans not only by birth, but by upbringing,
7 education and choice.

8 Like other Americans, the Nisei come in various
9 sizes, shapes, and vocational callings.

10 There are Nisei butlers and gardeners. There
11 are also Nisei space scientists, judges, college
12 professors, engineers, surgeons and editors.
13 They grow food on farms and flowers in
14 greenhouses. They seek the solution to the
15 mysteries of cancer and other diseases in
16 medical laboratories. Three Nisei represent
17 the State of Hawaii in Congress. There are
18 Nisei jockeys and ministers of the Gospel, cab
19 drivers and Air Force pilots, financiers and
20 social workers, house painters and architects.
21 There are Nisei serving the United States
22 abroad in both the armed and diplomatic
23 services. There are even a few Nisei — a very
24 few — in jail.

25 The only thing they have in common, aside from
26 their pride in American citizenship, is their
27 ancestry. Their parents, Issei (meaning “first
28 generation”), came as immigrants to the United
29 States about the turn of the century. Just as
30 immigrants from Europe first tended to settle
31 on the East Coast, these newcomers from Japan
32 remained largely in the Pacific coastal states.

33 Today, Nisei live in every one of the 50 states,
34 moving wherever opportunities beckon them.
35 Perhaps it is only natural that the largest
36 number on the continental mainland live in the
37 most populous state, California.

Passage Number 9

1 Where one city has been destroyed by volcanic
2 action, like Herculaneum, Pompeii and Stabiae,
3 twenty have been shaken down by the rocking
4 and heaving of earthquakes. The records of
5 ancient as well as modern times abound with
6 examples of these tremendous catastrophes.
7 Preeminent on the list is the city of Antioch.

8 Imagine the inhabitants of that great city,
9 crowded with strangers on a festival occasion,
10 suddenly arrested on a calm day by the earth
11 heaving and rocking beneath their feet and in a
12 few moments two hundred and fifty thousand of
13 them buried by falling houses, or the earth
14 opening and swallowing them up.

15 Such was the scene which that city presented in
16 the year 526; and several times before and since
17 that period has the like calamity fallen upon it,
18 and twenty, forty, and sixty thousand of its
19 inhabitants have been destroyed at each time.
20 In the year 17 after Christ, no less than thirteen
21 cities in Asia Minor were, in like manner,
22 overwhelmed in a single night.

23 Think of the terrible destruction that came
24 upon Lisbon in 1755. The sun had just dissipated
25 the fog in a warm, calm morning, when suddenly
26 the subterranean thundering and heaving began;
27 and in six minutes the city was a heap of ruins,
28 and sixty thousand of the inhabitants were
29 numbered among the dead. Hundreds had
30 crowded upon a new quay surrounded by
31 vessels. In a moment the earth opened beneath
32 them, and the wharf, the vessels, and the crowd
33 went down into its bosom; the gulf closed, the
34 sea rolled over the spot, and no vestige of
35 wharf, vessels, or man ever floated to
36 surface.

Passage Number 10

1 In the winter of 1804, some 1,600 miles from
2 their St. Louis starting point, Lewis and Clark
3 arrived in the North Dakota country of the
4 Mandan Indians, where they were befriended by
5 the tribe and spent a peaceful winter. Living
6 among the Mandans were a French Canadian fur
7 trader, Toussaint Charbonneau, and his young
8 Indian wife, Sacagawea. When the expedition
9 left Mandan country, the couple went with it:
10 Charbonneau, hired as an interpreter for \$25 a
11 month; and Sacagawea, her newborn baby on her
12 back.

13 If less than the heroine she has sometimes been
14 pictured to be, Sacagawea was unquestionably
15 of great value to the expedition in her role as
16 peace envoy and intermediary with Indian
17 tribes. Clark said of her — “Sacagawea
18 reconciles all the Indians as to our friendly
19 intentions. A woman with a party of men is a
20 token of peace.”

21 Across the Missouri River, Lewis and Clark
22 were faced with the snow-capped Rocky
23 Mountains. Crossing them would be impossible
24 without horses. Going on ahead, Lewis met a
25 band of Shoshone Indians, and persuaded them
26 to return with him to the expedition.

27 When she saw the Indian band, say the Journals
28 of Lewis and Clark, Sacagawea “danced with
29 extravagant joy.” She began sucking her fingers
30 to show that these were her people, among
31 whom she had grown up. A particularly moving
32 episode was the Indian girl’s reunion with her
33 brother, who had become chief of the tribe.
34 With the tremendous advantage of Sacagawea’s
35 relationship, the explorers were able to barter
36 for 29 fine Shoshone horses, and the journey
37 continued.

38 Sacagawea was among those Indians honored
39 with the prized Jefferson peace medal,
40 evidence of the genuine fondness Lewis and
41 Clark felt for her. After the journey, Clark
42 wrote to Charbonneau: "Your woman who
43 accompanied you that long, dangerous, and
44 fatiguing route to the Pacific Ocean and back
45 deserved a greater reward for her attention and
46 services on that route than we had in our power
47 to give her."

Passage Number 11

1 Dr. Robert Hutchings Goddard (1882-1945),
2 American physicist and engineer, was the
3 pioneer scientist and engineer who laid down
4 the technical foundations for most of today's
5 prodigious developments in long-range rockets,
6 missiles, earth satellites and space flight. He
7 founded a whole new field of science and
8 engineering, now grown into a multi-billion
9 dollar industry.

10 Dr. Goddard began his interest in rockets at the
11 age of seventeen, in 1899. As early as 1908 he
12 carried out static tests with small solid-fuel
13 rockets at Worcester Polytechnic Institute. In
14 1912 he worked out the detailed mathematical
15 theory of rocket propulsion, and showed that
16 the rocket, because it needs no air to push
17 against, could be sent to the moon or into
18 space, provided an efficient motor could be
19 developed.

20 After the entry of the United States in the first
21 World War in 1917, Dr. Goddard volunteered his
22 services to the nation, and was sent by the U.S.
23 Signal Corps to the task of exploring the
24 military possibilities of rockets.

25 He succeeded in developing several types of
26 solid-propellant rockets intended to be fired at
27 tanks or other military objectives, from a
28 launching tube held in the hands or steadied by
29 two short legs — devices similar in many
30 respects to the bazooka of World War II. These
31 developments he successfully demonstrated at
32 Aberdeen Proving Ground a few days before the
33 close of the first World War.

34 Dr. Goddard was the first modern scientist who
35 both perceived the possibilities of rockets and
36 space flight, and undertook the enormous work
37 of bringing them to practical realization. He
38 lived to see his dream of rocket power come to
39 fruition. His idea of the ultimate in rocket
40 development — flight into space — has now
41 become a reality. His contributions are
42 recognized as among the most important
43 technical achievements of modern times,
44 marking as they do a turning point in the history
45 of mankind.

August 2, 1939

F.D. Roosevelt
President of the United States
White House
Washington, D.C.

Sir:

1 Some recent work by E. Fermi and L. Szilard,
2 which has been communicated to me in
3 manuscript, leads me to expect that the
4 element uranium may be turned into a new and
5 important source of energy in the immediate
6 future. Certain aspects of the situation which
7 has arisen seem to call for watchfulness and, if
8 necessary, quick action on the part of the
9 Administration. I believe therefore that it is
10 my duty to bring to your attention the following
11 facts and recommendations:

12 In the course of the last four months it has been
13 made probable — through the work of Joliot in
14 France as well as Fermi and Szilard in America
15 — that it may become possible to set up a
16 nuclear chain reaction in a large mass of
17 uranium, by which vast amounts of power and
18 large quantities of new radium-like elements
19 would be generated. Now it appears almost
20 certain that this could be achieved in the
21 immediate future.

22 This new phenomenon would also lead to the
23 construction of bombs, and it is conceivable —
24 though much less certain — that extremely
25 powerful bombs of a new type may thus be
26 constructed. A single bomb of this type,
27 carried by boat and exploded in a port, might
28 very well destroy the whole port together with
29 some of the surrounding territory. However,
30 such bombs might very well prove to be too
31 heavy for transportation by air.

32 The United States has only very poor ores of
33 uranium in moderate quantities. There is some
34 good ore in Canada and the former
35 Czechoslovakia, while the most important
36 source of uranium is Belgian Congo.

37 In view of this situation you may think it
38 desirable to have some permanent contact
39 maintained between the Administration and the
40 group of physicists working on chain reactions
41 in America. One possible way of achieving this
42 might be for you to entrust with this task a
43 person who has your confidence and who could
44 perhaps serve in an inofficial capacity. His task
45 might comprise the following:

- 46 a. to approach Government Departments, keep
47 them informed of the further development, and
48 put forward recommendations for Government
49 action, giving particular attention to the
50 problem of securing a supply of uranium ore for
51 the United States;
- 52 b. to speed up the experimental work, which is
53 at present being carried on within the limits of
54 the budgets of University laboratories, by
55 providing funds, if such funds be required,
56 through his contacts with private persons who
57 are willing to make contributions for this cause,
58 and perhaps also by obtaining the co-operation
59 of industrial laboratories which have the
60 necessary equipment.

61 I understand that Germany has actually stopped
62 the sale of uranium from the Czechoslovakian
63 mines which she has taken over. That she
64 should have taken such early action might
65 perhaps be understood on the ground that the
66 son of the German Under-Secretary of State,
67 von Weizsacker, is attached to the Kaiser-
68 Wilhelm-Institut in Berlin where some of the
69 American work on uranium is now being
70 repeated.

Yours very truly,
Albert Einstein

Passage Number 13

1 China's central location in Asia, immense area
2 and population, and legacy of cultural
3 superiority have given it a dominant role in
4 Asian affairs. Tempering these factors of
5 strength, however, are serious limitations.
6 China must grow sufficient food for its rapidly
7 increasing population, and also provide raw
8 materials for the expansion of industry, from a
9 land of limited and already extensively
10 exploited agricultural resources. The regional
11 character of China — the distribution of
12 physical features, population, and resources —
13 provides a framework for an understanding and
14 evaluation of the problems and developments
15 within the People's Republic of China.

16 China often is compared to the United States
17 since both are about equal in area — China has
18 nearly 3.7 million square miles and the United
19 States slightly more than 3.6 million — and both
20 occupy similar latitudes. Differences, however,
21 are more important than similarities, and
22 perhaps none is of greater significance than the
23 higher proportion of land in China unsuited for
24 intensive agriculture and settlement. Most of
25 China consists of hills, mountains, and high
26 plateaus; only 12 percent of the surface is in
27 plains and about 19 percent in basins. Most of
28 the basins contain semiarid and arid deserts
29 which, though flat to rolling, are of little
30 agricultural use. Only 11 percent of China is
31 now under cultivation, and little additional land
32 is physically or economically suitable to
33 augment this total.

Passage Number 14

1 When the troubles began, most of the people
2 supposed themselves to be very loyal, and they
3 were ready to shout, "God save King George!"
4 Even after they had raised armies, and had
5 begun to fight, the Continental Congress said,
6 "We have not raised armies with the ambitious
7 design of separating from Great Britain, and
8 establishing independent States."

9 They would have been perfectly satisfied to go
10 on as they were, if the British Government had
11 only treated them in a manner they thought
12 just; that is, if Great Britain either had not
13 taxed them, or had let them send
14 representatives to Parliament in return for
15 paying taxes.

16 This wish was considered perfectly reasonable
17 by many of the wisest Englishmen of the day.
18 But King George III and his advisers would not
19 consent; and so they lost not only the
20 opportunity of taxing the American colonies,
21 but finally the colonies themselves.

Passage Number 15

1 It was Christmas time, 1968, that man broke his
2 bonds to Earth. Three Americans, Frank
3 Borman, James A. Lovell, Jr., and William A.
4 Anders, guided their Apollo 8 spacecraft across
5 nearly a quarter-million miles of black void, out
6 of the grasp of Earth, into orbit around the
7 Moon, and back once more to a chosen pinpoint
8 on their home planet.

9 Never before had man traveled so far, so fast or
10 looked so closely upon another celestial body.
11 Never before had so many millions listened and
12 watched, their imaginations stretched, as the
13 explorers spoke across the emptiness. Never,
14 indeed, had adventure ever borne all mankind so
15 daringly near the boundaries of its aspirations.

16 It was the first time that men had been
17 launched into space by the Saturn V, America's
18 most powerful machine. It was the first time,
19 too, that men had sped at nearly 25,000 miles
20 an hour, as Apollo 8 hurled itself from orbit of
21 the Earth and into flight toward the Moon.

22 Each time Astronauts Borman, Lovell and
23 Anders vanished behind the far side of the Moon
24 they lost all contact with the Earth for 45
25 minutes on each of the 10 orbits. During the
26 first long silence the black void crackled with
27 tension until Mission Control in Houston
28 reported: "We've got it! Apollo 8 is in lunar
29 orbit."

30 "Good to hear your voice," said Astronaut
31 Lovell.

Passage Number 16

1 When in the Course of human events, it
2 becomes necessary for one people to dissolve
3 the political bands which have connected them
4 with another, and to assume among the Powers
5 of the earth, the separate and equal station to
6 which the Laws of Nature and of Nature's God
7 entitle them, a decent respect to the opinions
8 of mankind requires that they should declare
9 the causes which impel them to the separation.

10 We hold these truths to be self-evident, that all
11 men are created equal, that they are endowed
12 by their Creator with certain unalienable
13 Rights, that among these are Life, Liberty, and
14 the pursuit of Happiness. That to secure these
15 rights, Governments are instituted among Men,
16 deriving their just powers from the consent of
17 the governed, that whenever any Form of
18 Government becomes destructive of these ends,
19 it is the Right of the People to alter or to
20 abolish it, and to institute new Government,
21 laying its foundation on such principles and
22 organizing its powers in such form, as to them
23 shall seem most likely to effect their Safety
24 and Happiness. Prudence, indeed, will dictate
25 that Governments long established should not be
26 changed for light and transient causes; and

27 accordingly all experience hath shown, that
28 mankind are more disposed to suffer, while evils
29 are sufferable, than to right themselves by
30 abolishing the forms to which they are
31 accustomed. But when a long train of abuses
32 and usurpations, pursuing invariably the same
33 Object evinces a design to reduce them under
34 absolute Despotism, it is their right, it is their
35 duty, to throw off such Government, and to
36 provide new Guards for their future security.
37 Such has been the patient sufferance of these
38 Colonies; and such is now the necessity which
39 constrains them to alter their former Systems
40 of Government. The history of the present King
41 of Great Britain is a history of repeated injuries
42 and usurpations, all having in direct object the
43 establishment of an absolute Tyranny over these
44 States.

Passage Number 17

1 In the course of an extended investigation into
2 the nature of inflammation, and the healthy and
3 morbid conditions of the blood in relation to it,
4 I arrived several years ago at the conclusion
5 that the essential cause of suppuration in
6 wounds is decomposition brought about by the
7 influence of the atmosphere upon blood or
8 serum retained within them, and, in the case of
9 contused wounds, upon portions of tissue
10 destroyed by the violence of the injury.

11 To prevent the occurrence of suppuration with
12 all its attendant risks was an object manifestly
13 desirable, but till lately apparently
14 unattainable, since it seemed hopeless to
15 attempt to exclude the oxygen which was
16 universally regarded as the agent by which
17 putrefaction was effected. But when it had
18 been shown by the researches of Pasteur that
19 the septic properties of the atmosphere
20 depended not on the oxygen, or any gaseous
21 constituent, but on minute organisms suspended
22 in it, which owed their energy to their vitality,
23 it occurred to me that decomposition in the
24 injured part might be avoided without excluding

25 the air, by applying as a dressing some material
26 capable of destroying the life of the floating
27 particles. Upon this principle I have based a
28 practice of which I will now attempt to give a
29 short account.

30 The material which I have employed is carbolic
31 or phenic acid, a volatile organic compound,
32 which appears to exercise a peculiarly
33 destructive influence upon low forms of life,
34 and hence is the most powerful antiseptic with
35 which we are at present acquainted.

36 The first class of cases to which I applied it was
37 that of compound fractures, in which the
38 effects of decomposition in the injured part
39 were especially striking and pernicious. The
40 results have been such as to establish
41 conclusively the great principle that all local
42 inflammatory mischief and general febrile
43 disturbances which follow severe injuries are
44 due to the irritating and poisonous influence of
45 decomposing blood or sloughs. For these evils
46 are entirely avoided by the antiseptic
47 treatment, so that limbs which would otherwise
48 be unhesitatingly condemned to amputation may
49 be retained, with confidence of the best results.

Passage Number 18

1 Virtues are, in the popular estimate, rather the
2 exception than the rule. There is the man *and*
3 his virtues. Men do what is called a good
4 action, as some piece of courage or charity,
5 much as they would pay a fine in expiation of
6 daily non-appearance on parade. Their works
7 are done as an apology or extenuation of their
8 living in the world — as invalids and the insane
9 pay a high board. Their virtues are penances. I
10 do not wish to expiate, but to live. My life is
11 not an apology, but a life. It is for itself and
12 not for a spectacle. I much prefer that it
13 should be of a lower strain, so it be genuine and
14 equal, than that it should be glittering and
15 unsteady. I wish it to be sound and sweet, and
16 not to need diet and bleeding. My life should be
17 unique; it should be an alms, a battle, a
18 conquest, a medicine. I ask primary evidence
19 that you are a man, and refuse this appeal from
20 the man to his actions. I know that for myself
21 it makes no difference whether I do or forbear
22 those actions which are reckoned excellent. I
23 cannot consent to pay for a privilege where I
24 have intrinsic right. Few and mean as my gifts
25 may be, I actually am, and do not need for my
26 own assurance or the assurance of my fellows
27 any secondary testimony.

28 What I must do is all that concerns me, not
29 what the people think. This rule, equally
30 arduous in actual and in intellectual life, may
31 serve for the whole distinction between
32 greatness and meanness. It is thus harder
33 because you will always find those who think
34 they know what is your duty better than you
35 know it. It is easy in the world to live after the
36 world's opinion; it is easy in solitude to live
37 after our own; but the great man is he who in
38 the midst of the crowd keeps with perfect
39 sweetness the independence of solitude.

Passage Number 19

1 The period for a new election of a Citizen, to
2 administer the Executive Government of the
3 United States, being not far distant, and the
4 time actually arrived, when your thoughts must
5 be employed in designating the person, who is to
6 be clothed with that important trust, it appears
7 to me proper, especially as it may conduce to a
8 more distinct expression of the public voice,
9 that I should now apprize you of the resolution I
10 have formed, to decline being considered among
11 the number of those, out of whom a choice is to
12 be made.

13 I beg you, at the same time, to do me the
14 justice to be assured, that this resolution has
15 not been taken, without a strict regard to all
16 the considerations appertaining to the relation,
17 which binds a dutiful citizen to his country — and
18 that, in withdrawing the tender of service which
19 silence in my situation might imply, I am
20 influenced by no diminution of zeal for your
21 future interest, no deficiency of grateful
22 respect for your past kindness; but am
23 supported by a full conviction that the step is
24 compatible with both.

25 The acceptance of, and continuance hitherto in,
26 the office to which your suffrages have twice
27 called me, have been a uniform sacrifice of
28 inclination to the opinion of duty, and to a
29 deference for what appeared to be your desire.
30 — I constantly hoped that it would have been
31 much earlier in my power, consistently with
32 motives, which I was not at liberty to disregard,
33 to return to that retirement, from which I had
34 been reluctantly drawn. — The strength of my
35 inclination to do this, previous to the last
36 election, had even led to the preparation of an
37 address to declare it to you; but mature
38 reflection on the then perplexed and critical
39 posture of our affairs with foreign Nations, and
40 the unanimous advice of persons entitled to my
41 confidence, impelled me to abandon the idea.

Passage Number 20

1 Poetry is the record of the best and happiest
2 moments of the happiest and best minds. We
3 are aware of evanescent visitations of thought
4 and feeling sometimes associated with place or
5 person, sometimes regarding our own mind
6 alone, and always arising unforeseen and
7 departing unbidden, but elevating and delightful
8 beyond all expression: so that even in the desire
9 and the regret they leave, there cannot but be
10 pleasure, participating as it does in the nature
11 of its object. It is as it were the
12 interpenetration of a diviner nature through our
13 own; but its footsteps are like those of a wind
14 over the sea, which the coming calm erases, and
15 whose traces remain only as on the wrinkled
16 sand which paves it. These and corresponding
17 conditions of being are experienced principally
18 by those of the most delicate sensibility and the
19 most enlarged imagination; and the state of
20 mind produced by them is at war with every
21 base desire. The enthusiasm of virtue, love,
22 patriotism, and friendship is essentially linked
23 with such emotions; and whilst they last, self
24 appears as what it is, an atom to a universe.
25 Poets are not only subject to these experiences
26 as spirits of the most refined organization, but
27 they can color all that they combine with the
28 evanescent hues of this ethereal world; a word,
29 a trait in the representation of a scene or a
30 passion will touch the enchanted chord, and
31 reanimate, in those who have ever experienced
32 these emotions, the sleeping, the cold, the
33 buried image of the past. Poetry thus makes
34 immortal all that is best and most beautiful in
35 the world; it arrests the vanishing apparitions
36 which haunt the interlunations of life, and
37 veiling them, or in language or in form, sends
38 them forth among mankind, bearing sweet news
39 of kindred joy to those with whom their sisters
40 abide — abide, because there is no portal of
41 expression from the caverns of the spirit which
42 they inhabit into the universe of things. Poetry
43 redeems from decay the visitations of the
44 divinity in man.

Passage Number 21

1 The Sciences gain by mutual support. When, as
2 the result of my first communications on the
3 fermentations in 1857-1858, it appeared that
4 the ferments, properly so-called, are living
5 beings, that the germs of microscopic organisms
6 abound in the surface of all objects, in the air
7 and in water; that the theory of spontaneous
8 generation is chimerical; that wines, beer,
9 vinegar, the blood, urine and all the fluids of
10 the body undergo none of their usual changes in
11 pure air, both Medicine and Surgery received
12 fresh stimulation. A French physician, Dr.
13 Davaine, was fortunate in making the first
14 application of these principles to Medicine, in
15 1863.

16 Our researches of last year, left the etiology of
17 the putrid disease, or septicemia, in a much less
18 advanced condition than that of anthrax. We
19 had demonstrated the probability that
20 septicemia depends upon the presence and
21 growth of a microscopic body, but the absolute
22 proof of this important conclusion was not
23 reached. To demonstrate experimentally that a
24 microscopic organism actually is the cause of a
25 disease and the agent of contagion, I know no
26 other way, in the present state of Science, than
27 to subject the *microbe* (the new and happy term
28 introduced by M. Sedillot) to the method of
29 cultivation out of the body. It may be noted
30 that in twelve successive cultures, each one of
31 only ten cubic centimeters volume, the original
32 drop will be diluted as if placed in a volume of
33 fluid equal to the total volume of the earth. It
34 is just this form of test to which M. Joubert and
35 I subjected the anthrax bacteridium. Having
36 cultivated it a great number of times in a
37 sterile fluid, each culture being started with a
38 minute drop from the preceding, we then
39 demonstrated that the product of the last
40 culture was capable of further development and
41 of acting in the animal tissues by producing
42 anthrax with all its symptoms. Such is — as we
43 believe — the indisputable proof that *anthrax is a*
44 *bacterial disease.*

Passage Number 22

1 Morbid matter of various kinds, when absorbed
2 into the system, may produce effects in some
3 degree similar; but what renders the cow-pox
4 virus so extremely singular is that the person
5 who has been thus affected is forever after
6 secure from the infection of the small-pox;
7 neither exposure to the variolous effluvia, nor
8 the insertion of the matter into the skin,
9 producing this distemper.

10 In support of so extraordinary a fact, I shall lay
11 before my reader a great number of instances.

12 Case I. — Joseph Merret, now an under gardener
13 to the Earl of Berkeley, lived as a servant with
14 a farmer near this place in the year 1770, and
15 occasionally assisted in milking his master's
16 cows. Several horses belonging to the farm
17 began to have sore heels, which Merret
18 frequently attended. The cows soon became
19 affected with the cow-pox, and soon after
20 several sores appeared on his hands. Swellings
21 and stiffness in each axilla followed, and he was
22 so much indisposed for several days as to
23 be incapable of pursuing his ordinary
24 employment. Previously to the appearance of
25 the distemper among the cows there was no
26 fresh cow brought into the farm, nor any
27 servant employed who was affected with the
28 cow-pox.

29 In April, 1795, a general inoculation taking
30 place here, Merret was inoculated with his
31 family; so that a period of twenty-five years
32 had elapsed from his having the cow-pox to this
33 time. However, though the variolous matter
34 was repeatedly inserted into his arm, I found it
35 impracticable to infect him with it; an
36 efflorescence only, taking on an erysipelatous
37 look about the centre, appearing on the skin
38 near the punctured parts. During the whole
39 time that his family had the smallpox, one of
40 whom had it very full, he remained in the house
41 with them, but received no injury from exposure
42 to the contagion.

43 It is necessary to observe that the utmost care
44 was taken to ascertain, with the most
45 scrupulous precision, that no one whose case is
46 here adduced had gone through the smallpox
47 previous to these attempts to produce that
48 disease.

49 Had these experiments been conducted in a
50 large city, or in a populous neighbourhood, some
51 doubts might have been entertained; but here,
52 where population is thin, and where such an
53 event as a person's having had the smallpox is
54 always faithfully recorded, no risk of
55 inaccuracy in this particular can arise.

Passage Number 23

1 When the division of labour has been once
2 thoroughly established, it is but a very small
3 part of a man's wants which the produce of his
4 own labour can supply. He supplies the far
5 greater part of them by exchanging that surplus
6 part of the produce of his own labour, which is
7 over and above his own consumption, for such
8 parts of the produce of other men's labour as he
9 has occasion for. Every man thus lives by
10 exchanging, or becomes in some measure a
11 merchant, and the society itself grows to be
12 what is properly a commercial society.

13 But when the division of labour first began to
14 take place, this power of exchanging must
15 frequently have been very much clogged and
16 embarrassed in its operations. One man, we
17 shall suppose, has more of a certain commodity
18 than he himself has occasion for, while another
19 has less. The former consequently would be
20 glad to dispose of, and the latter to purchase, a
21 part of this superfluity. But if this latter should
22 chance to have nothing that the former stands
23 in need of, no exchange can be made between
24 them. The butcher has more meat in his shop
25 than he himself can consume, and the brewer
26 and the baker would each of them be willing to
27 purchase a part of it. But they have nothing to
28 offer in exchange, except the different
29 productions of their respective trades, and the

30 butcher is already provided with all the bread
31 and beer he has immediate occasion for. No
32 exchange can, in this case, be made between
33 them. He cannot be their merchant, nor they
34 his customers; and they are all of them thus
35 mutually less servicable to one another. In
36 order to avoid the inconveniency of such
37 situations, every prudent man in every period of
38 society, after the first establishment of the
39 division of labour, must naturally have
40 endeavoured to manage his affairs in such a
41 manner, as to have at all times by him, besides
42 the peculiar produce of his own industry, a
43 certain quantity of some one commodity or
44 other, such as he imagined few people would be
45 likely to refuse in exchange for the produce of
46 their industry.

47 Many different commodities, it is probable,
48 were successively both thought of and employed
49 for this purpose. In the rude ages of society,
50 cattle are said to have been the common
51 instrument of commerce; and, though they must
52 have been a most inconvenient one, yet in old
53 times we find things were frequently valued
54 according to the number of cattle which had
55 been given in exchange for them. The armour
56 of Diomede, says Homer, cost only nine oxen;
57 but that of Glaucus cost an hundred oxen. Salt
58 is said to be the common instrument of
59 commerce and exchanges in Abyssinia; a species
60 of shells in some parts of the coast of India;
61 dried cod at Newfoundland; tobacco in Virginia;
62 sugar in some of our West India colonies; hides
63 or dressed leather in some other countries; and
64 there is at this day a village in Scotland where
65 it is not uncommon, I am told, for a workman to
66 carry nails instead of money to the baker's shop
67 or the alehouse.

68 In all countries, however, men seem at last to
69 have been determined by irresistible reasons to
70 give the preference, for this employment, to
71 metals above every other commodity. Metals
72 can not only be kept with as little loss as any
73 other commodity, scarce anything being less
74 perishable than they are, but they can likewise,
75 without any loss, be divided into any number of

76 parts, as by fusion those parts can easily be
77 reunited again; a quality which no other equally
78 durable commodities possess, and which more
79 than any other quality renders them fit to be
80 the instruments of commerce and circulation.

Passage Number 24

1 The citizens of the United States cherish
2 sentiments the most friendly, in favor of the
3 liberty and happiness of their fellow men on
4 that side of the Atlantic. In the wars of the
5 European powers, in matters relating to
6 themselves, we have never taken any part, nor
7 does it comport with our policy, so to do. It is
8 only when our rights are invaded, or seriously
9 menaced, that we resent injuries, or make
10 preparation for our defence. With the
11 movements in this hemisphere, we are, of
12 necessity, more immediately connected, and by
13 causes which must be obvious to all enlightened
14 and impartial observers. The political system
15 of the allied powers is essentially different, in
16 this respect, from that of America. This
17 difference proceeds from that which exists in
18 their respective governments. And to the
19 defence of our own, which has been achieved by
20 the loss of so much blood and treasure, and
21 matured by the wisdom of their most
22 enlightened citizens, and under which we have
23 enjoyed unexampled felicity, this whole nation
24 is devoted. We owe it, therefore, to candor,
25 and to the amicable relations existing between
26 the United States and those powers, to declare,
27 that we should consider any attempt on their
28 part to extend their system to any portion of
29 this hemisphere, as dangerous to our peace and
30 safety. With the existing colonies or
31 dependencies of any European power, we have
32 not interfered, and shall not interfere. But with
33 the governments who have declared their
34 independence, and maintained it, and whose
35 independence we have, on great consideration,
36 and on just principles, acknowledged, we could
37 not view any interposition for the purpose of

38 oppressing them, or controlling, in any other
39 manner, their destiny, by any European power,
40 in any other light than as the manifestation of
41 an unfriendly disposition towards the United
42 States.

Passage Number 25

1 In considering the origin of species, it is quite
2 conceivable that a naturalist, reflecting on the
3 mutual affinities of organic beings, on their
4 embryological relations, their geographical
5 distribution, geological succession, and other
6 such facts, might come to the conclusion that
7 species have not been independently created,
8 but had descended, like varieties, from other
9 species. Nevertheless, such a conclusion, even
10 if well founded, would be unsatisfactory, until it
11 could be shown how the innumerable species
12 inhabiting this world have been modified, so as
13 to acquire that perfection of structure and
14 coadaptation which justly excites our
15 admiration. Naturalists continually refer to
16 external conditions, such as climate, food, etc.,
17 as the only possible cause of variation. In one
18 limited sense, as we shall hereafter see, this
19 may be true; but it is preposterous to attribute
20 to mere external conditions, the structure, for
21 instance, of the woodpecker, with its feet, tail,
22 beak, and tongue, so admirably adapted to catch
23 insects under the bark of trees. In the case of
24 the mistletoe, which draws its nourishment
25 from certain trees, which has seeds that must
26 be transported by certain birds, and which has
27 flowers with separate sexes absolutely requiring
28 the agency of certain insects to bring pollen
29 from one flower to the other, it is equally
30 preposterous to account for the structure of
31 this parasite, with its relations to several
32 distinct organic beings, by the effects of
33 external conditions, or of habit, or of the
34 volition of the plant itself.

35 It is, therefore, of the highest importance to
36 gain a clear insight into the means of
37 modification and coadaptation. At the
38 commencement of my observations it seemed to

39 me probable that a careful study of
40 domesticated animals and of cultivated plants
41 would offer the best chance of making out this
42 obscure problem. Nor have I been disappointed;
43 in this and in all other perplexing cases I have
44 invariably found that our knowledge, imperfect
45 though it be, of variation under domestication,
46 afforded the best and safest clue. I may
47 venture to express my conviction of the high
48 value of such studies, although they have been
49 very commonly neglected by naturalists.

Passage Number 26

1 On observing the visible man with your own
2 eyes what do you try to find in him? The
3 invisible man. These words which your ears
4 catch, those gestures, those airs of the head, his
5 attire and sensible operations of all kinds, are,
6 for you, merely so many expressions; these
7 express something, a soul. An inward man is
8 hidden beneath the outward man, and the latter
9 simply manifests the former. You have
10 observed the house in which he lives, his
11 furniture, his costume, in order to discover his
12 habits and tastes, the degree of his refinement
13 or rusticity, his extravagance or economy, his
14 follies or his cleverness. You have listened to
15 his conversation and noted the inflexions of his
16 voice, the attitudes he has assumed, so as to
17 judge of his spirit, self-abandonment or gayety,
18 his energy or his rigidity. You consider his
19 writings, works of art, financial and political
20 schemes, with a view to measure the reach and
21 limits of his intelligence, his creative power and
22 self-command, to ascertain the usual order,
23 kind, and force of his conceptions, in what way
24 he thinks and how he resolves. All these
25 externals are so many avenues converging to
26 one center, and you follow these only to reach
27 that center; here is the real man, namely, that
28 group of faculties and of sentiments which
29 produces the rest. Behold a new world, an
30 infinite world; for each visible action involves
31 an infinite train of reasonings and emotions,
32 new or old sensations which have combined to

33 bring this into light and which, like long ledges
34 of rock sunk deep in the earth, have cropped out
35 above the surface and attained their level. It is
36 this subterranean world which forms the second
37 aim, the special object of the historian. If his
38 critical education suffices, he is able to
39 discriminate under every ornament in
40 architecture, under every stroke of the brush in
41 a picture, under each phrase of literary
42 composition, the particular sentiment out of
43 which the ornament, the stroke, and the phrase
44 have sprung; he is a spectator of the inward
45 drama which has developed itself in the breast
46 of the artist or writer; the choice of words, the
47 length or shortness of the period, the species of
48 metaphor, the accent of a verse, the chain of
49 reasoning — all are to him an indication; while
50 his eyes are reading the text his mind and soul
51 are following the steady flow and ever-changing
52 series of emotions and conceptions from which
53 this text has issued; he is working out its
54 *psychology*.

Passage Number 27

1 In the first place, then, when the chest of a
2 living animal is laid open and the capsule that
3 immediately surrounds the heart is slit up or
4 removed, the organ is seen now to move, now to
5 be at rest; there is a time when it moves, and a
6 time when it is motionless.

7 These things are more obvious in the colder
8 animals, such as toads, frogs, serpents, small
9 fishes, crabs, shrimps, snails, and shellfish.
10 They also become more distinct in warm-
11 blooded animals, such as the dog and hog, if
12 they be attentively noted when the heart begins
13 to flag, to move more slowly, and, as it were, to
14 die: the movements then become slower and
15 rarer, the pauses longer, by which it is made
16 much more easy to perceive and unravel what
17 the motions really are, and how they are
18 performed. In the pause, as in death, the heart
19 is soft, flaccid, exhausted, lying, as it were, at
20 rest.

21 In the motion, and interval in which this is
22 accomplished, three principal circumstances are
23 to be noted:

24 1. That the heart is erected, and rises
25 upwards to a point, so that at this time it
26 strikes against the breast and the pulse is felt
27 externally.

28 2. That it is everywhere contracted, but
29 more especially towards the sides so that it
30 looks narrower, relatively longer, more drawn
31 together. The heart of an eel taken out of the
32 body of the animal and placed upon the table or
33 the hand, shows these particulars; but the same
34 things are manifest in the hearts of all small
35 fishes and of those colder animals where the
36 organ is more conical or elongated.

37 3. The heart being grasped in the hand, is
38 felt to become harder during its action. Now
39 this hardness proceeds from tension, precisely
40 as when the forearm is grasped, its tendons are
41 perceived to become tense and resilient when
42 the fingers are moved.

43 4. It may further be observed in fishes, and
44 the colder blooded animals, such as frogs,
45 serpents, etc., that the heart, when it moves,
46 becomes of a paler color, when quiescent of a
47 deeper blood-red color.

Passage Number 28

1 And here comes in the question whether it is
2 better to be loved rather than feared, or feared
3 rather than loved. It might perhaps be
4 answered that we should wish to be both; but
5 since love and fear can hardly exist together, if
6 we must choose between them, it is far safer to
7 be feared than loved. For of men it may
8 generally be affirmed that they are thankless,
9 fickle, false, studious to avoid danger, greedy of
10 gain, devoted to you while you are able to
11 confer benefits upon them, and ready, as I said
12 before, while danger is distant, to shed their
13 blood, and sacrifice their property, their lives,
14 and their children for you; but in the hour of

15 need they turn against you. The Prince,
16 therefore, who without otherwise securing
17 himself builds wholly on their professions is
18 undone. For the friendships which we buy with
19 a price, and do not gain by greatness and
20 nobility of character, though they be fairly
21 earned are not made good, but fail us when we
22 have occasion to use them.

23 Moreover, men are less careful how they offend
24 him who makes himself loved than him who
25 makes himself feared. For love is held by the
26 tie of obligation, which, because men are a
27 sorry breed, is broken on every whisper of
28 private interest; but fear is bound by the
29 apprehension of punishment which never relaxes
30 its grasp.

31 Nevertheless a Prince should inspire fear in
32 such a fashion that if he does not win love he
33 may escape hate. For a man may very well be
34 feared and yet not hated, and this will be the
35 case so long as he does not meddle with the
36 property or with the women of his citizens and
37 subjects. And if constrained to put any to
38 death, he should do so only when there is
39 manifest cause or reasonable justification. But,
40 above all, he must abstain from the property of
41 others. For men will sooner forget the death of
42 their father than the loss of their patrimony.
43 Moreover, pretexts for confiscation are never
44 to seek, and he who has once begun to live by
45 rapine always finds reasons for taking what is
46 not his; whereas reasons for shedding blood are
47 fewer, and sooner exhausted.

Passage Number 29

1 I stood one day in a Swiss village at the foot of
2 the Jura, and watched the coming of the
3 storm. Heavy black clouds, their edges purpled
4 by the setting sun, were rapidly covering the
5 loveliest sky in Europe, save that of Italy.
6 Thunder growled in the distance, and gusts of
7 biting wind were driving huge drops of rain over
8 the thirsty plain. Looking upwards, I beheld a
9 large Alpine falcon, now rising, now sinking, as
10 he floated bravely in the very midst of the
11 storm and I could almost fancy that he strove to
12 battle with it. At every fresh peal of thunder,
13 the noble bird bounded higher aloft, as if in
14 answering defiance. I followed him with my
15 eyes for a long time, until he disappeared in the
16 east. On the ground, about fifty paces beneath
17 me, stood a stork; perfectly tranquil and
18 impassive in the midst of the warring
19 elements. Twice or thrice she turned her head
20 towards the quarter from whence the wind
21 came, with an indescribable air of half
22 indifferent curiosity; but at length she drew up
23 one of her long sinewy legs, hid her head
24 beneath her wing, and calmly composed herself
25 to sleep.

26 I thought of Byron and Goethe; of the stormy
27 sky that overhung both; of the tempest-tossed
28 existence, the life-long struggle, of the one, and
29 the calm of the other; and of the two mighty
30 sources of poetry exhausted and closed by
31 them. Byron and Goethe — the two names that
32 predominate, and, come what may, ever will
33 predominate, over our every recollection of the
34 fifty years that have passed away. They rule;
35 the master-minds, I might almost say the
36 tyrants, of a whole period of poetry; brilliant,
37 yet sad; glorious in youth and daring, yet
38 cankered by the worm i' the bud, despair. They
39 are the two representative poets of two great
40 schools; and around them we are compelled to
41 group all the lesser minds which contributed to
42 render the era illustrious. The qualities which
43 adorn and distinguish their works are to be
44 found, although more thinly scattered, in other

45 poets their contemporaries; still theirs are the
46 names that involuntarily rise to our lips
47 whenever we seek to characterize the
48 tendencies of the age in which they lived. Their
49 genius pursued different, even opposite routes;
50 and yet very rarely do our thoughts turn to
51 either without evoking the image of the other,
52 as a sort of necessary complement to the first.
53 The eyes of Europe were fixed upon the pair, as
54 the spectators gaze on two mighty wrestlers in
55 the same arena; and they, like noble and
56 generous adversaries, admired, praised, and held
57 out the hand to each other. Many poets have
58 followed in their footsteps; none have been so
59 popular. Others have found judges and critics
60 who have appreciated them calmly and
61 impartially; not so they: for them there have
62 been only enthusiasts or enemies, wreaths or
63 stones; and when they vanished into the vast
64 night that envelops and transforms alike men
65 and things — silence reigned around their
66 tombs. Little by little, poetry had passed away
67 from our world, and it seemed as if their last
68 sigh had extinguished the sacred flame.

Passage Number 30

1 To-day we come to a kind of attraction even
2 more curious than the last, namely, the
3 attraction which we find to be of a double
4 nature — of a curious and dual nature. And I
5 want, first of all, to make the nature of this
6 doubleness clear to you. Bodies are sometimes
7 endowed with a wonderful attraction, which is
8 not found in them in their ordinary state. For
9 instance, here is a piece of shellac, having the
10 attraction of gravitation, having the attraction
11 of cohesion, and if I set fire to it, it would have
12 the attraction of chemical affinity to the
13 oxygen in the atmosphere. Now all these
14 powers we find *in* it as if they were parts of its
15 substance; but there is another property which I
16 will try and make evident by means of this ball,
17 this bubble of air (a light India-rubber ball,
18 inflated and suspended by a thread). There is no
19 attraction between this ball and this shellac at

20 present; there may be a little wind in the rooms
21 slightly moving the ball about, but there is no
22 attraction. But if I rub the shellac with a piece
23 of flannel (rubbing the shellac, and then holding
24 it near the ball), look at the attraction which
25 has arisen out of the shellac simply by this
26 friction, and which I may take away as easily by
27 drawing it gently through my hand. (The
28 lecturer repeated the experiment of exciting
29 the shellac, and then removing the attractive
30 power by drawing it through his hand.) Again,
31 you will see I can repeat this experiment with
32 another substance; for if I take a glass rod, and
33 rub it with a piece of silk covered with what we
34 call amalgam, look at the attraction which it
35 has; how it draws the ball toward it; and then,
36 as before, by quietly rubbing it through the
37 hand, the attraction will be all removed again,
38 to come back by friction with this silk.

39 But now we come to another fact. I will take
40 this piece of shellac, and make it attractive by
41 friction; and remember that, when ever we get
42 an attraction of gravity, chemical affinity,
43 adhesion, or electricity (as in this case), the
44 body which attracts is attracted also, and just
45 as much as that ball was attracted by the
46 shellac, the shellac was attracted by the ball.

Mathematics

Running the Math Program

There are two types of math questions on the SAT and in this program: standard multiple choice and quantitative comparisons. In standard multiple-choice questions, you pick the answer choice that correctly solves the problem. In quantitative comparison questions, you compare two quantities and decide whether one is larger, whether they are equal, or whether you don't have enough information to compare them.

The standard multiple-choice questions are found in Part I of the Math diskette. The quantitative comparison questions are in Part II of the Math diskette.

If you haven't already done so, load the Math program into the computer. The label of the side you want to use should face up as you insert the diskette. Select an operating mode — Learning or Testing. Then choose a Question Set and press RETURN.

The first problem will appear on the screen. If you need instructions for loading the program and advancing to this point, see the Reference Card at the beginning of this manual.

Learning Mode

You've selected a Question Set and pressed RETURN. An SAT question is on the screen. Choose your answer using the arrow keys and RETURN.

Note: Some questions refer you to a specific geometric figure. Although all the math questions in this program are displayed on the monitor or TV screen, the geometric figures are all printed at the end of this section of the manual. This arrangement allows you to have the figure in front of you at all times as you work on the question.

After you answer the question, the computer evaluates your answer and offers a response, depending on whether your answer is right or wrong. You get three chances, if you need them, to answer each question correctly.

You always have the option to time yourself as you answer questions. If you press C, a clock will appear on the screen to keep track of your time. If you want to make the clock disappear, simply press C again. You can make the clock appear and disappear as often as you like.

At the end of each Question Set, you will see this message, "You have completed Question Set No. _____. Press the space bar to see your Scorecard." If you press the space bar, your Scorecard will appear, displaying your name, the Question Set completed, the time taken to finish the set, and your score. The Scorecard also shows the number of questions that were answered correctly on the first, second, and third try.

If you have a printer and want to receive a hard-copy print-out of your Scorecard, press "P" instead of the space bar when you see the above message, and follow the instructions on the screen.

After seeing or printing out your Scorecard, press the space bar again, and this question will appear, "Do you want to try another Question Set?" If you decide to work on another set, press Y and follow the instructions on the screen. If you decide not to, press N. A goodbye message will appear, and the program will automatically reset itself to the beginning.

Testing Mode

After you select a Question Set, the program generates the first question. Choose your answer using the arrow keys and the RETURN key.

Note: Some questions refer to geometric figures. Although the questions are always displayed on the screen, the figures are all printed at the end of this section of the manual.

When you press RETURN, the program displays the second question. Each question in the set is presented this way, without comment of any kind. The computer tells you whether you're right or wrong only **after** you complete the set — that is, after the tenth question.

The "clock" option is always available in the Testing Mode. Press C to make the clock appear on the screen. Press C again if you want to make the clock disappear.

At the end of the Question Set, you will see this message, "You have completed Question Set No. _____. Press the space bar to see your Scorecard." Your Scorecard includes your name, the Question Set, your score, and the time it took you to finish the set.

If you have a printer and want to have a hard-copy print-out of your Scorecard, press "P" instead of the space bar when you see the above message, and then follow the instructions on the screen.

After seeing your Scorecard, you have the option to review all the questions that you missed and to try again to answer them correctly. (Of course, if you get a perfect score of 100%, this option does not come up.) If you decide to review the questions, you will receive feedback on each response, as you did in the Learning Mode, to ensure that you understand the correct answer.

At the end of this review, you have the option to try another Question Set or quit working.

Math Figures

To answer some of the questions on the Math diskette, you'll need to use the geometric figures printed in this section of the manual. Each figure is listed by number. Whenever you need to use a figure, the question displayed on your screen will refer you to the appropriate figure in this section. Study the figure. Then, when you have solved the problem, use the arrow keys and RETURN to select your answer on the computer.

Figure 1

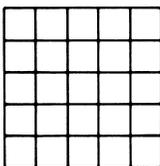


Figure 2

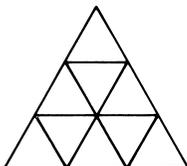


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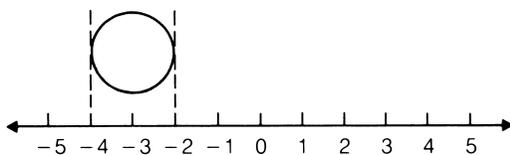


Figure 4

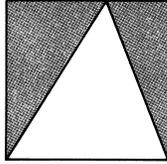


Figure 5



Figure 6

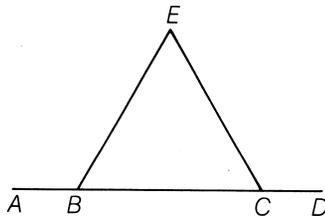


Figure 7

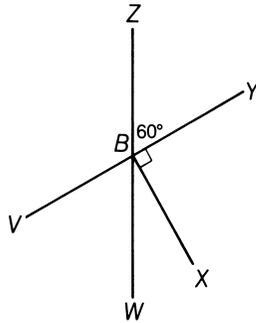


Figure 8

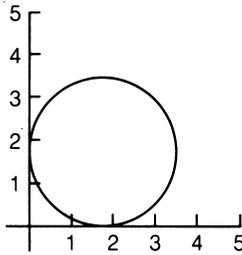


Figure 9

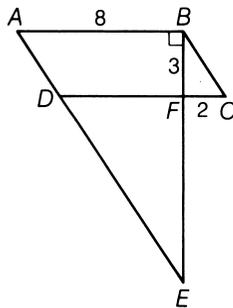


Figure 10

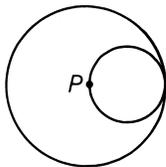


Figure 11

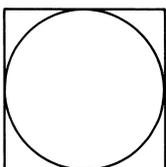


Figure 12

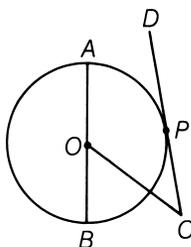


Figure 13

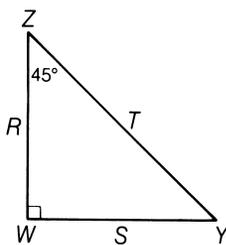
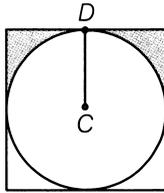
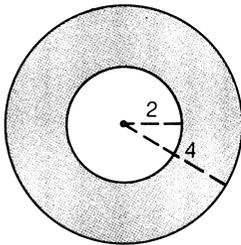


Figure 14



CD is a radius of the circle and equals 4.

Figure 15



The circles are concentric.
4 is a radius of the large circle.
2 is a radius of the small circle.

Figure 16

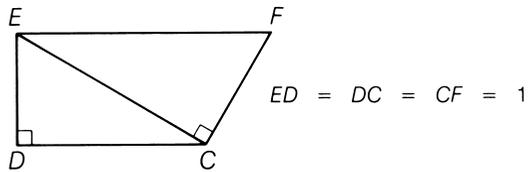
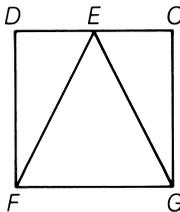


Figure 17



$FGCD$ is a square. E is on \overline{CD} .

Figure 18

w		
7	$2v$	$3 - 4v$
$v - 3$		

The sum of the three numbers in the column equals the sum of the three numbers in the row.

Figure 19

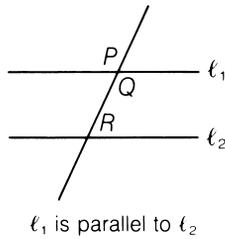
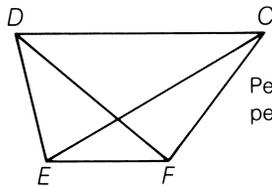


Figure 20



Perimeter of triangle EDF =
perimeter of triangle ECF

Figure 21

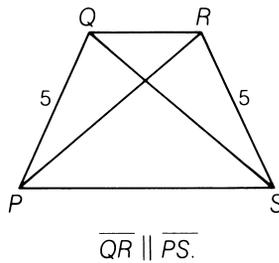
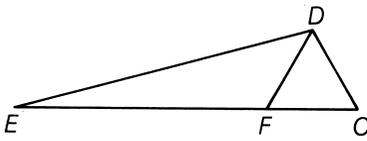


Figure 22



EFC is a straight line
measure of angle $DFE = 120^\circ$
measure of angle $DEF = 15^\circ$
measure of angle $DCF =$
measure of angle $DFC =$

Timed Test Diskette

The diskette labeled "Timed Test" is different from the other five diskettes in the package. Instead of providing practice on individual SAT question categories, the Test diskette actually contains a complete sample SAT on one side and a sample Test of Standard Written English on the other. Both tests are administered and timed by the computer.

The sample SAT consists of four sections: two verbal and two math. The sample Test of Standard Written English consists of one section.

These two sample tests are designed to simulate the actual test-taking experience. Both tests are timed, and the questions are similar in format and content to actual SAT questions. You have 30 minutes to complete each section and will be notified when your time is up. As you take these tests on the computer, you can skip questions, go back later to answer questions you skip, and change answers. See the Reference Card at the beginning of this manual for more information about utilizing these and other features of the test-taking program.

When you finish all test sections, the program will display your raw score and your approximate scaled score. Your SAT score will range from 200 to 800. Your Test of Standard Written English score will range from 20 to 60+.

At the end of either test, you can see the correct answers for any questions that you missed by typing "Y" when you see this message: "Would you like to review the questions you missed? Type Y or N." The computer will display each question you got wrong, showing your answer and the correct answer.

When you work on the reading comprehension questions, you will need to refer to the reading passages printed in **this section** of the manual. Each question will refer you by letter to one of the reading passages in this part of the manual.

Some of the math questions require you to solve problems involving geometric figures. In such cases, the question will refer to a lettered figure in **this part** of the manual. Use the figure to answer the questions on the computer.

Also included in this section of the manual are an introduction and test-taking strategies for the Test of Standard Written English. A description of test-taking strategies for the SAT is included in "Understanding the SAT: What the Test Is all About" at the beginning of the manual.

The Test of Standard Written English

The Test of Standard Written English (TSWE) is a 30-minute multiple-choice exam that measures your ability to distinguish between acceptable and unacceptable writing. The TSWE includes 50 questions: 25 usage questions, 15 sentence correction questions, and 10 more usage questions. To answer the questions, you must recognize grammatical, sentence structure, and word choice errors in agreement, tense, case, number, diction, and punctuation. Your goal is to choose answers that reflect clear and correct language according to the requirements of standard written American English.

The TSWE is scored separately from the verbal section of the SAT. The number of incorrect answers is divided by four and deducted from the number of correct answers to get a raw score. This is then converted to a number that reflects how well you did in relation to all others taking the test. This scaled score is a number from 20 to 60 +

Usage Questions

Usage Questions present sentences in which there may or may not be problems in grammar, usage, word choice (diction) and sentence structure. No sentence contains more than one error, and some sentences are correct. You are asked to look at the underlined parts of each sentence, and to determine which, if any, contains an error. You then blacken the corresponding letter on the answer sheet. If there is no error in a sentence, mark answer space E.

Example 1

According to my sister, who is a mechanic, each of these cars are in
A B C
"excellent condition." No error
D E

If you look closely at this sentence, you may recognize a subject/verb agreement error. "Each" is the subject of the sentence; "are" is the verb. As a singular pronoun, however, "each" requires a singular verb. The underlined "are" is therefore incorrect; the correct verb is "is." So, the answer to this example is C. This is a common error. Often, the object of a prepositional phrase, in this case "cars," is mistaken for the subject of a sentence. To make sure that subject and verb agree in constructions like this, cross out the prepositional phrase ("of these cars").

This question tests your recognition of two common errors: incorrect use of “less,” and a lack of parallel structure. “Less” is used to express degree or amount (His car consumes less gas); “fewer” refers to things that can be counted (Fewer stars were in the sky). Calories can be counted, and should therefore be modified by “fewer” instead of by “less.” Choices A and B use “less” incorrectly; they can be eliminated as incorrect choices. A parallel sentence requires all the items of a list to be phrased in similar ways. Choices A and C present unparallel grammatical constructions, and can be eliminated. Choice E is grammatically correct, but changes the meaning of the sentence. Therefore, D is the correct answer.

Example 2

Mrs. Allen told my sister and me about customs in Haiti.

- (A) told my sister and me about
 - (B) told us about
 - (C) told my sister and I about
 - (D) decided to tell my sister and I about
 - (E) told I and my sister about
-

In this example, the original sentence is correct, so choice A is the answer. C, D, and E incorrectly use the nominative pronoun “I” instead of the objective form “me.” In this case, read the sentence to yourself using “told me”; then read it a second time using “told I.” Your ear should lead you to the correct conclusion. “I” is used as a subject; “me” as an object. Choices D and B also change the meaning of the sentence.

Strategies for Answering TSWE Questions

You should approach the TSWE as you would any other multiple-choice test. Be careful to read the questions and choices carefully, choose the most complete and correct answer, and cross out incorrect answers as you spot them. Follow these additional guidelines as you take the TSWE:

1. Familiarize yourself with the directions for the two types of questions. This will save you time when you take the actual test later on.
2. Read each test item carefully. Read through the entire sentence and all of the choices before answering. Be sure to examine each underlined portion of the usage questions to see if anything should be changed. If you can, identify the error before you look at the choices.

3. For usage questions, check for the following:
 - a. subject/verb agreement;
 - b. sentence completion (fragments and run-ons);
 - c. pronoun/antecedent agreement;
 - d. consistency in verb tense;
 - e. parallel structure;
 - f. diction and word choice;
 - g. use of adjectives and adverbs;
 - h. dangling participles.
4. Never make a choice that changes the meaning of the original sentence, or one that creates a new problem.
5. Don't waste time on questions that are very difficult. Mark the test booklet in the margin next to that question, and go back to it later if you have time. Be sure to check your numbering on the answer sheet periodically.
6. If you can eliminate one or more of the answers as incorrect, try to choose the most likely answer. Otherwise, skip the question.

Reading Passages

Test Passage A

The most flourishing period of Anglo-Saxon poetry was between 650 and 825 A.D. It was produced for the most part in the north of England, which was overrun by the Danes about 800. These marauders destroyed many of the monasteries and silenced the voices of singers.

The subject matter of the poetry is principally war, the sea, and religion. The martial spirit and love of the sea, thus early shown, are typical of the nation that has raised her flag in every clime. The chief qualities of the poetry are earnestness, somberness, the consciousness of the approach of the "inevitable hour," and strength rather than delicacy or melody. Parallelisms and strong metaphorical expressions abound.

Anglo-Saxon should be studied not only because it is the foundation of the language in which Shakespeare wrote, but also for its own intrinsic merits. We can point to few other literatures which owe less to outside influences, or which at a like stage in the development of the race possessed as much power. A literature which could accomplish so much under such unfavorable conditions might justly have awakened great expectation.

Test Passage B

Manners and Customs The colonists had brought with them the ideas and tastes of the mother country, and these long survived in spite of the leveling tendencies and the free spirit of the new world. Distinctions of dress, to mark the higher and the lower ranks of society, as in Europe, were sedulously preserved throughout even democratic New England. Calf-skin shoes, up to the time of the Revolution, were the exclusive property of the gentry; the servants wore coarse "neat's leather". Farmers, mechanics, laborers, and working-men generally were clothed in red or green baize jackets, leather or striped ticking breeches, and a leather apron. On Sundays and holidays, a white shirt took the place of the checked one; the stiff, hard leather breeches were greased and blacked, and the heavy cow-hide shoes, home-made, were set off by huge brass buckles. The common laborer, even after independence was achieved, received only about "two shillings" per day, and, in rare cases, "two-and-six-pence".

Hired women wore short gowns of green baize and petticoats of linsey-woolsey. Their yearly wages never exceeded "ten pounds".

The colonial gentleman, however, was gay in his morning costume of silk or velvet cap and dressing gown, and his evening attire of blue, green, or purple flowered silk or handsomely embroidered velvet, enriched with gold or silver lace, buttons, and knee buckles. Wide lace ruffles fell over his hands; his street cloak glittered with gold-lace; while a gold-headed cane, and a gold or silver snuff-box were indispensable signs of his special position.

Test Passage C

1 And here comes in the question whether it is
2 better to be loved rather than feared, or feared
3 rather than loved. It might perhaps be
4 answered that we should wish to be both; but
5 since love and fear can hardly exist together, if
6 we must choose between them, it is far safer to
7 be feared than loved. For of men it may
8 generally be affirmed that they are thankless,
9 fickle, false, studious to avoid danger, greedy of
10 gain, devoted to you while you are able to
11 confer benefits upon them, and ready, as I said
12 before, while danger is distant, to shed their
13 blood, and sacrifice their property, their lives,
14 and their children for you; but in the hour of
15 need they turn against you. The Prince,
16 therefore, who without otherwise securing
17 himself builds wholly on their professions is
18 undone. For the friendships which we buy with
19 a price, and do not gain by greatness and
20 nobility of character, though they be fairly
21 earned are not made good, but fail us when we
22 have occasion to use them.

23 Moreover, men are less careful how they offend
24 him who makes himself loved than him who
25 makes himself feared. For love is held by the
26 tie of obligation, which, because men are a
27 sorry breed, is broken on every whisper of
28 private interest; but fear is bound by the
29 apprehension of punishment which never relaxes
30 its grasp.

31 Nevertheless a Prince should inspire fear in
32 such a fashion that if he does not win love he
33 may escape hate. For a man may very well be
34 feared and yet not hated, and this will be the
35 case so long as he does not meddle with the
36 property or with the women of his citizens and
37 subjects. And if constrained to put any to
38 death, he should do so only when there is
39 manifest cause or reasonable justification. But,
40 above all, he must abstain from the property of
41 others. For men will sooner forget the death of
42 their father than the loss of their patrimony.
43 Moreover, pretexts for confiscation are never
44 to seek, and he who has once begun to live by
45 rapine always finds reasons for taking what is
46 not his; whereas reasons for shedding blood are
47 fewer, and sooner exhausted.

Test Passage D

To be ready for six weightless days of voyaging to the Moon and back to Earth Astronauts Borman, Lovell, and Anders had invested thousands of hours in preparation. Their training was exacting both physically and mentally.

That they had done their homework well, in classroom and laboratory, could not be doubted by any who heard their reports to Earth. The astronauts knew their selenography (lunar topography) as well as they knew the landmarks around Houston. That they were physically fit was clear from the rapidity with which they threw off the effects of a virus on their voyage outward.

Nor had the spacecraft or the mission any surprises for them. In effect, they had been to the Moon many times, their trips simulated in an Earthbound Apollo which duplicated the features of the mission down to the thump of Apollo 8's jet thrusters and the visible waxing of the Moon as the spacecraft drew ever nearer.

They brought to the flight experience in high performance aircraft and in space itself. Anders is a nuclear engineer. Lovell holds a degree in Science. Borman is an aeronautical engineer. Both Borman and Lovell have orbited the Earth in the Gemini program. Lovell holds the record. He has been in space longer than any other man. It is this extensive training, education and experience that goes into the making of an astronaut.

Test Passage E

In December of 1875, the Indian Commissioner in Washington, alarmed by reports of Sioux hostilities, directed that all Indians in the area return to their agencies by January 31, 1876. When some Sioux bands, far afield in search of game, failed to meet this impossible deadline, Gen. George Crook was ordered to attack their winter settlements, and he sent Col. J.J. Reynolds to take Crazy Horse's village by surprise. Crazy Horse organized a counter-attack, recovered his warriors' scattered ponies, and drove off Crook's cattle. Without the food, the General was forced to return with his men to his post.

Realizing that Crazy Horse was a more formidable adversary than he had thought, Crook planned a new strategy, and the following June, with 15 troops of cavalry and 5 of infantry, marched up the Bozeman Trail to the Tongue River. On June 17, his army ran headlong into 1,200 Oglalas and Cheyennes under Crazy Horse at the Rosebud River. At the end of a day-long battle, Crook was forced to withdraw with heavy losses, chagrined at his second defeat at the hands of the Sioux chief.

A week later, Gen. George A. Custer attacked the fugitive village where more than 3,000 Indian warriors were encamped along Montana's Little Big Horn River. Again Crazy Horse played a leading role. After the repulse of Maj. Marcus A. Reno's battalion by Indians under Sitting Bull and other chiefs, the braves concentrated almost their entire force on Custer and his men, some 4 miles away. In little more than an hour, the Sioux and Cheyennes had overrun Custer and 224 men, slaughtering every one.

Test Passage F

1 I stood one day in a Swiss village at the foot of
2 the Jura, and watched the coming of the
3 storm. Heavy black clouds, their edges purpled
4 by the setting sun, were rapidly covering the
5 loveliest sky in Europe, save that of Italy.
6 Thunder growled in the distance, and gusts of
7 biting wind were driving huge drops of rain over
8 the thirsty plain. Looking upwards, I beheld a
9 large Alpine falcon, now rising, now sinking, as
10 he floated bravely in the very midst of the
11 storm and I could almost fancy that he strove to
12 battle with it. At every fresh peal of thunder,
13 the noble bird bounded higher aloft, as if in
14 answering defiance. I followed him with my
15 eyes for a long time, until he disappeared in the
16 east. On the ground, about fifty paces beneath
17 me, stood a stork; perfectly tranquil and
18 impassive in the midst of the warring
19 elements. Twice or thrice she turned her head
20 towards the quarter from whence the wind
21 came, with an indescribable air of half
22 indifferent curiosity; but at length she drew up
23 one of her long sinewy legs, hid her head
24 beneath her wing, and calmly composed herself
25 to sleep.

26 I thought of Byron and Goethe; of the stormy
27 sky that overhung both; of the tempest-tossed
28 existence, the life-long struggle, of the one, and
29 the calm of the other; and of the two mighty
30 sources of poetry exhausted and closed by
31 them. Byron and Goethe — the two names that
32 predominate, and, come what may, ever will
33 predominate, over our every recollection of the
34 fifty years that have passed away. They rule;
35 the master-minds, I might almost say the
36 tyrants, of a whole period of poetry; brilliant,
37 yet sad; glorious in youth and daring, yet
38 cankered by the worm i' the bud, despair. They
39 are the two representative poets of two great
40 schools; and around them we are compelled to
41 group all the lesser minds which contributed to
42 render the era illustrious. The qualities which
43 adorn and distinguish their works are to be
44 found, although more thinly scattered, in other

45 poets their contemporaries; still theirs are the
46 names that involuntarily rise to our lips
47 whenever we seek to characterize the
48 tendencies of the age in which they lived. Their
49 genius pursued different, even opposite routes;
50 and yet very rarely do our thoughts turn to
51 either without evoking the image of the other,
52 as a sort of necessary complement to the first.
53 The eyes of Europe were fixed upon the pair, as
54 the spectators gaze on two mighty wrestlers in
55 the same arena; and they, like noble and
56 generous adversaries, admired, praised, and held
57 out the hand to each other. Many poets have
58 followed in their footsteps; none have been so
59 popular. Others have found judges and critics
60 who have appreciated them calmly and
61 impartially; not so they: for them there have
62 been only enthusiasts or enemies, wreaths or
63 stones; and when they vanished into the vast
64 night that envelops and transforms alike men
65 and things — silence reigned around their
66 tombs. Little by little, poetry had passed away
67 from our world, and it seemed as if their last
68 sigh had extinguished the sacred flame.

Test Passage G

1 To-day we come to a kind of attraction even
2 more curious than the last, namely, the
3 attraction which we find to be of a double
4 nature — of a curious and dual nature. And I
5 want, first of all, to make the nature of this
6 doubleness clear to you. Bodies are sometimes
7 endowed with a wonderful attraction, which is
8 not found in them in their ordinary state. For
9 instance, here is a piece of shellac, having the
10 attraction of gravitation, having the attraction
11 of cohesion, and if I set fire to it, it would have
12 the attraction of chemical affinity to the
13 oxygen in the atmosphere. Now all these
14 powers we find *in* it as if they were parts of its
15 substance; but there is another property which I
16 will try and make evident by means of this ball,
17 this bubble of air (a light India-rubber ball,
18 inflated and suspended by a thread). There is no
19 attraction between this ball and this shellac at

20 present; there may be a little wind in the rooms
21 slightly moving the ball about, but there is no
22 attraction. But if I rub the shellac with a piece
23 of flannel (rubbing the shellac, and then holding
24 it near the ball), look at the attraction which
25 has arisen out of the shellac simply by this
26 friction, and which I may take away as easily by
27 drawing it gently through my hand. (The
28 lecturer repeated the experiment of exciting
29 the shellac, and then removing the attractive
30 power by drawing it through his hand.) Again,
31 you will see I can repeat this experiment with
32 another substance; for if I take a glass rod, and
33 rub it with a piece of silk covered with what we
34 call amalgam, look at the attraction which it
35 has; how it draws the ball toward it; and then,
36 as before, by quietly rubbing it through the
37 hand, the attraction will be all removed again,
38 to come back by friction with this silk.

39 But now we come to another fact. I will take
40 this piece of shellac, and make it attractive by
41 friction; and remember that, when ever we get
42 an attraction of gravity, chemical affinity,
43 adhesion, or electricity (as in this case), the
44 body which attracts is attracted also, and just
45 as much as that ball was attracted by the
46 shellac, the shellac was attracted by the ball.

Math Figures

To answer some of the math questions on the Timed Test diskette, you will need to use the geometric figures printed here. Whenever you need to use a figure, the question displayed on your screen will refer to the appropriate figure in this section.

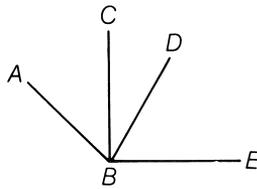
Figure A

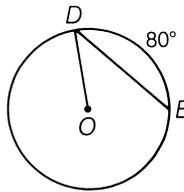
Figure B

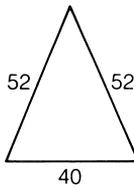
Figure C

Figure D

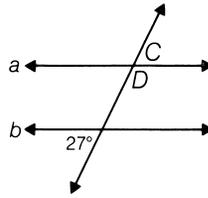


Figure E

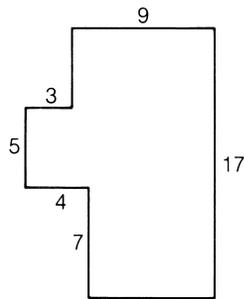


Figure F

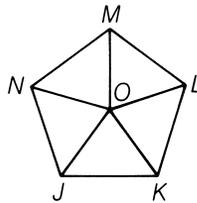


Figure G

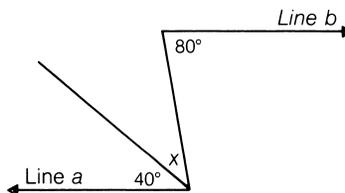


Figure H

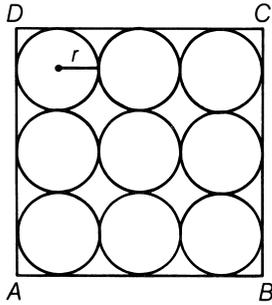


Figure I

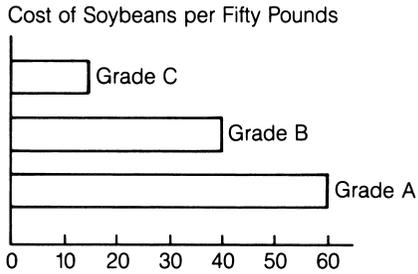


Figure J

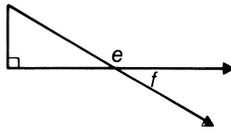


Figure K

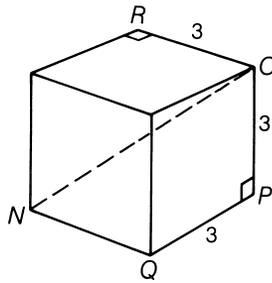


Figure L

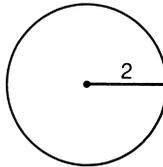
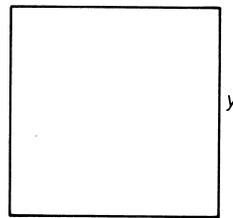
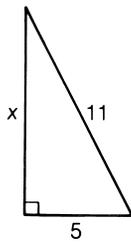


Figure M



Area of Square = 98

Vocabulary Review

Glossary

These 200 words appear often on SAT and other standardized tests of verbal ability. Each word is presented with its pronunciation, based on the following key:

a	hat	i	it	oi	oil	ch	child	æ = { a in about e in taken i in pencil o in lemon u in circus
ā	age	ī	ice	ou	out	ng	long	
ä	far	o	hot	u	cup	sh	she	
e	let	ō	open	û	put	th	thin	
ē	equal	ô	order	ü	rule	ʒ	then	
êr	term					zh	measure	< = derived from

Along with the pronunciations, you will see accent marks to show which syllables are stressed. Syllables which receive the strongest emphasis are followed by a primary accent ('):

chem ist (kem ' ist)
heart i ness (här ' tē nis)

Some words also have one or more syllables which are pronounced with medium stress. In the pronunciations, these syllables are followed by a secondary accent (^):

nee dle work (nē ' dl werk ^)
cur i os i ty (kyur ' ē os ' ə tē)
book case (buk ' kās ^)

To the right of the pronunciation of each word is an abbreviation referring to its part of speech, as listed below:

adj. adjective
adv. adverb
n. noun
v. verb

Following the part of speech is a short definition and a sentence that uses the word.

- **Abase** (ə bās ') v. humiliate; to lower in rank: The coward *abased* himself.
- Abate** (ə bāt ') v. lessen or stop: A letter of apology did not *abate* her anger.
- Abdicate** (ab ' di cāt) v. give up or resign: The king *abdicated* his throne.
- Abet** (ə bet ') v. aid or assist: He should not have *abetted* the murderer.
- Abrogate** (ab ' ra gāt) v. abolish; do away with: They *abrogated* their agreement.
- Abscond** (ab skond ') v. run off; go away secretly: George *absconded* with the cash.

Accolade (ak'ə lād) n. praise, award: She received an *accolade* from the President.

Acerbity (ə sēr' bə tē) n. bitterness: The loser responded to the questions with great *acerbity*.

Admonish (ad mon' ish) v. warn; scold gently: He was *admonished* to be careful.

Aggrandize (ə gran'dīz) v. enlarge; increase in power: The ruler sought to *aggrandize* herself by new conquests.

Alacrity (ə lak'r ə tē) n. liveliness; eager action: He attacked his chores with *alacrity*.

Ameliorate (ə mē'lyə rāt') v. improve; help: We hope to *ameliorate* these poor conditions.

Anomaly (ə nom'ə lē) n. irregularity; exception: A bird that cannot fly is an *anomaly*.

Antipathy (an tip'ə thē) n. strong dislike; hatred: His *antipathy* to dogs was well-known.

Arduous (är'jü əs) adj. difficult; hard to do: Mountain climbing is an *arduous* sport.

Assiduity (as'ə dū'ə tē) n. care; diligence: His *assiduity* was reflected in his work.

Austere (ō stir') adj. stern; simple; harsh: The child was afraid of her *austere* uncle.

■ **Beguile** (bi gīl') v. deceive: I was *beguiled* by your flattery.

Bellicose (bel'ə kōs) adj. warlike; quarrelsome: He looked peaceful, but had a *bellicose* nature.

Benign (bi nīn') adj. harmless, kindly: He was a *benign* wizard.

Blatant (blāt'nt) adj. offensively loud; obvious: He fooled nobody, because his lies were so *blatant*.

Bourgeois (būr zhvä') n. middle-class; common: The aristocrat scorned *bourgeois* customs.

■ **Cacophony** (ka kof'ə nē) n. harsh sound; discord: Your band creates *cacophony*, not good music.

Calumny (kal'əm nē) n. slander; a false statement: My opponent's comments are nothing but *calumny*.

Caprice (ka prēs') n. whim; impulsive change of mind: It was simply *caprice* which made her fly to Italy.

Castigate (kas'tə gāt) v. punish; criticize: The king *castigated* his soldiers after they lost the battle.

Cavil (kav'əl) v. find fault: You suggested this recipe, so don't *cavil* at the results.

Chicanery (shi kā'nər ē) n. deception; unfair practice: The mayor's office in this city has been known to engage in *chicanery*.

Coerce (kō ērs') v. force: The prisoner was *coerced* into confessing to the crime.

Cogent (kōj'ənt) adj. convincing: Her presentation was brief and *cogent*.

Complacent (kəm plā'snt) adj. self-satisfied; content: The winner's *complacent* smile annoyed me.

Convivial (kən viv'ē əl) adj. jovial; sociable: He's fun to visit with when he's *convivial*.

Corroborate (kə rob'ə rāt') v. confirm; support: You must *corroborate* that statement before you publish it.

Covert (kō'vərt) adj. secret; hidden: They had a *covert* plan to attack at midnight.

Cursory (kēr'sər ē) adj. hasty; superficial: He had time for a *cursory* glance at the plan.

■ **Dearth** (děrth) n. scarcity: The war was followed by a *dearth* of medical supplies.

Debase (di bās') v. lower; lessen the value of: He *debased* himself by those lies.

Decorous (dek'ər əs) adj. proper; suitable: Surprisingly, the children behaved in a *decorous* manner.

Deference (def'ər əns) n. great respect; He treated the wise women with *deference*.

Deleterious (del'ə tir'ē əs) adj. harmful: Too much sugar can be *deleterious* to your health.

Demur (di mēr') v. object: "Please," he *demurred*, "remove the cat from my presence."

Deprecate (dep'rə kāt) v. disapprove of: Lovers of peace *deprecate* war.

Derision (di rizh'ən) n. ridicule: His outrageous ideas were greeted with *derision*.

Desiccate (des'ə kāt) v. make dry: The hot sun *desiccated* the entire area.

Desultory (des'əl tōr'ē) adj. haphazard; random: This book deserves more than a *desultory* reading.

Diffident (dif'ə dənt) adj. shy; lacking confidence: Try not to be *diffident* during the job interview

Dissemble (di sem'bəl) v. disguise; pretend: She *dissembled* her anger with a smile.

Dolorous (dol'ər əs) adj. mournful; distressing: The *dolorous* news reached us too late — we missed the funeral.

Duplicity (dū plis'ə tē) n. deception: The spy was a master of *duplicity*.

- **Effete** (i fet') adj. worn-out; tired: Ancient Rome became an *effete* civilization.

Emulate (em'yə lāt) v. imitate; rival: Children often *emulate* their heroes.

Enerbate (en'ər vāt) v. weaken: A hot, damp climate *enerbates* many people.

Enigma (i nig'mə) n. puzzle; mystery: She was an *enigma*, even to her friends.

Ephemeral (i fem'ər əl) adj. short-lived: His fame was *ephemeral*; within a year he was forgotten.

Epithet (ep'ə thet) n. descriptive word or phrase: An *epithet* for King Richard was "The Lion-Hearted."

Epitome (i pit'ə mē) n. summary; representative: Solomon is often spoken of as the *epitome* of wisdom.

Erudite (er'ū dīt) adj. well-read; scholarly: Professor Black is certainly *erudite*, but she is also boring.

Esoteric (es'ə ter'ik) adj. hidden; understood by a select few: A knowledge of Sanskrit is considered *esoteric*.

Exacerbate (eg zas'ər bāt) v. make worse; irritate: The noise *exacerbated* his headache.

Exigency (ek'sə jan sē) n. urgency; need: The *exigencies* of business kept them from taking a vacation.

Expiate (ek'spē āt) v. atone for; pay the penalty of: Such a crime can never be *expiated*.

Extant (ek'stənt) adj. still existing: Some Roman coins are *extant*.

- **Facetious** (fa sē'shəs) adj. not serious; humorous: He is often *facetious*, even in serious situations.

Fatuous (fach'ū əs) adj. foolish: Ignore his *fatuous* comments; they mean nothing.

Fetid (fet'id) adj. stinking: The rotting fruit quickly became *fetid*.

Fortuitous (fôr tü'ə təs) adj. accidental; happening by chance: It was a *fortuitous* meeting, but it occurred at an excellent time.

Fulsome (ful'səm) adj. offensive; excessive: Her praise for her own child was *fulsome*.

Furtive (fêr'tiv) adj. secret; sly: He barely had time for a *furtive* glance into the forbidden room.

- **Gamut** (gam'ət) n. whole range: Her feelings about the contest ran the *gamut* from hope to despair.
- Garrulous** (gar'ə ləs) adj. talkative; wordy: That *garrulous* Mr. Smith just doesn't know when to stop talking.
- Gratuitous** (grə tü'ə təs) adj. without justification; free: That was a *gratuitous* insult.
- Gregarious** (grə ger'ē əs) adj. sociable: Hermits are not *gregarious*.

- **Halcyon** (hal'sē ən) adj. calm; peaceful: What a *halcyon* picture you paint of childhood.
- Harbinger** (här'bən jər) n. forerunner; omen: The robin is a *harbinger* of spring.
- Heinous** (hā'nəs) adj. very wicked; hateful: Even the judge was shocked to hear of such a *heinous* crime.
- Hiatus** (hī ā'təs) n. gap, empty space: The *hiatus* appears in the manuscript on p. 60.
- Hibernal** (hī bér'nɪ) adj. wintry: The postcard featured a *hibernal* setting, with snowmen and snow-covered trees.
- Histrionic** (his'trē on'ik) adj. theatrical; insincere: His manner was so *histrionic* that nobody believed his story.

- **Iconoclast** (ī kon'ə klast) n. attacker of beliefs: John was labeled an *iconoclast* when he opposed all of our ideals.
- Ignoble** (ig nō'bəl) adj. dishonorable; disgraceful: To betray a friend is *ignoble*.
- Immutable** (i myū'tə bəl) adj. unchangeable; steadfast: The laws of physics are *immutable*.
- Implicit** (im plis'it) adj. absolute; suggested: We offer our *implicit* support to your venture.
- Impugn** (im pyün') v. challenge; question: The attorney *impugned* the witness's testimony.
- Impute** (im pyüt') v. blame: Don't *impute* your failure to bad luck.
- Incipient** (in sip'ē ənt) adj. in an early stage; commencing: His cough suggested an *incipient* cold.
- Ineffable** (in ef'ə bəl) adj. not able to be expressed in words: Some concepts are *ineffable*.
- Inexorable** (in ek'sər ə bəl) adj. Unyielding; relentless: The forces of nature are *inexorable*.
- Ingenuous** (in jen'yü əs) adj. innocent: The *ingenuous* child completely believed the lies.

Inherent (in hir'ənt) adj. inborn; a permanent and essential quality: Her *inherent* honesty kept her from accepting the bribe.

Iniquitous (in ik'wə təs) adj. wicked; unjust: *Iniquitous* acts earned him a bad reputation.

Innocuous (in nok'yü əs) adj. harmless; mild: He sounds tough, but is really quite *innocuous*.

Inspid (in sip' id) adj. dull; lacking spirit: She was bored by the *insipid* conversation.

Intrepid (in trep' id) adj. brave; fearless: The *intrepid* adventurer plunged immediately into the dangerous jungle.

Invidious (in vid'ē əs) adj. causing ill will; offensive and unfair: Comparisons of children are often *invidious*.

Irascible (i ras'ə bəl) adj. irritable; easily angered: When Doug is *irascible*, we avoid him.

- **Jocose** (jō Kōs') adj. jesting; humorous: His *jocose* spirits enlivened the party.

Juxtapose (juk'stə pōz') v. place together; put side by side: Newspapers *juxtapose* pictures with related articles.

- **Ken** (ken) n. range of sight or knowledge: Outer space is no longer beyond our *ken*.

- **Lacerate** (las'ə rāt) v. tear roughly; mangle: The bear's claws *lacerated* the hunter's arm.

Laconic (lə kon' ik) adj. brief; concise: Her *laconic* remarks were worth waiting for.

Languid (lang'gwid) adj. without energy; indifferent: A hot, sticky day makes a person feel languid.

Latent (lāt'nt) adj. concealed; present but inactive: A grain of wheat has the *latent* power to grow into a plant.

Livid (liv' id) adj. angry; flushed; discolored from a bruise: He was *livid* with rage.

Loquacious (lō kwā'shəs) adj. talkative: My *loquacious* uncle takes forever to tell a story.

Lucid (lü'sid) adj. Easily understood; clear: I understand the theory now, after hearing your *lucid* explanation.

Lugubrious (lü gū' brē əs) adj. too sad; mournful: We heard the *lugubrious* howl of a lonely dog.

- **Malign** (mə līn') v. speak evil of; slander: You *malign* me by calling me a liar.
- Meander** (mē an'dər) v. follow a winding course: A brook *meanders* through the meadow.
- Mendacious** (men dā'sh əs) adj. untruthful: Don't believe what this *mendacious* traitor says.
- Mete** (mēt) v. allot; distribute: The king will *mete* out rewards and punishments at the feast.
- Misanthrope** (mis'an thrōp) n. hater of mankind: The *misanthrope* decided to live as a hermit.
- Mollify** (mol'ə fī) v. calm; appease: We had to *mollify* him when he heard the bad news.
- Moribund** (mōr'ə bund) adj. dying; near extinction: Our club is *moribund*; it will end soon.
- Mundane** (mun'dān) adj. worldly; ordinary: Ironically, the princess led a *mundane* life.

- **Nadir** (nā'dər) n. lowest point: Efforts to achieve agreement reached their *nadir*.
- Nebulous** (neb' yə ləs) adj. hazy; confused: His version of the story was *nebulous*.
- Nefarious** (ni fer'ē əs) adj. very wicked: His *nefarious* ideas were greeted with outrage.
- Neophyte** (nē'ə fit) n. beginner; convert: The *neophyte* was anxious to learn.
- Noisome** (noi'səm) adj. offensive; harmful: That chemical has a *noisome* smell.
- Nuance** (Nü äns') n. delicate variation in meaning or color: Look at the *nuances* of color in that quilt.
- Nugatory** (nū'gə tōr'ē) adj. worthless; useless: Our lawyer says the agreement is *nugatory*.

- **Obdurate** (ob'dər it) adj. stubborn: The *obdurate* mule refused to budge.
- Obfuscate** (ob fus' kāt) v. confuse; obscure: Don't *obfuscate* the issues by calling me names.
- Obsolete** (ob'sə lēt) adj. not in use; old-fashioned: We still use this *obsolete* machine.
- Obviate** (ob' vē āt) v. remove; prevent: I hope this decision will *obviate* the need for legal action.
- Onerous** (on'ər əs) adj. burdensome; oppressive: Susan finally quit the *onerous* job.

Opprobrious (ə prō' brē əs) adj. disgraceful: Coward, liar, and thief are *opprobrious* names.

Overt (ō' vert') adj. not hidden; open: His *overt* hostility was disturbing.

- **Panacea** (pan'ə sē'ə) n. cure-all: There is no *panacea* for the world's problems.

Panegyric (pan'ə jir' ik) n. formal praise: The general was embarrassed by the *panegyrics* published in the paper.

Pecuniary (pi kyū'nē er' ē) adj. pertaining to money: I don't expect a *pecuniary* reward for my advice.

Pejorative (pi jōr'ə tiv) adj. disparaging: Such a *pejorative* description is unfair.

Perfidious (pər fid'ē əs) adj. treacherous: Her *perfidious* uncle stole the family jewels.

Perfunctory (pər fungk' tər ē) adj. mechanical; indifferent: I gave my room a *perfunctory* cleaning.

Piquant (pē' kənt) adj. stimulating: That *piquant* bit of news caused quite a stir.

Pithy (pith'ē) adj. concise; substantive: Try not to ramble or generalize — be *pithy*.

Placid (plas' id) adj. peaceful; calm: She fell asleep while fishing on the *placid* river.

Plethora (pleth'ər ə) n. excess; overabundance: He had a *plethora* of excuses for his failure.

Prevaricate (pri var'ə kāt) v. lie: The witness planned to *prevaricate* to protect Jason.

Probity (prō' bə tē) n. uprightness; honesty: Her *probity* served as an example to us all.

Prodigious (prə dij'əs) adj. very great; vast: That horse has a *prodigious* appetite.

Prolific (prə lif' ik) adj. productive; fruitful: The *prolific* writer wrote 10 novels in a year.

Purge (perj) v. cleanse; purify; eliminate: The mayor set out to *purge* his enemies from the city council.

Purport (pər pōrt') v. claim: The document *purported* to be official.

- **Quell** (kwel) v. put an end to; overcome: This knowledge should *quell* your fears.

Quintessence (kwint es' ns) n. purest form; perfect example: Her dress was the *quintessence* of good taste and style.

Quixotic (kwik sot' ik) adj. idealistic; impractical: His *quixotic* schemes never work.

- **Rancor** (rang' kər) adj. ill will; hatred: His *rancor* prevented him from cooperating.
- Rapacious** (rə pā'shəs) adj. greedy; predatory: *Rapacious* animals such as hawks or sharks can be dangerous.
- Recalcitrant** (ri kal'sə trənt) adj. disobedient; uncooperative: The *recalcitrant* child ran away.
- Recondite** (rek'an dīt) adj. hard to understand; secret: He studied *recondite* sciences in order to understand the universe.
- Redolent** (red' l ənt) adj. fragrant; reminiscent: Our house is *redolent* of fresh paint.
- Rescind** (ri sind') v. repeal; cancel: The council *rescinded* its unpopular decision.
- Revile** (ri vil') v. abuse; slander: She *reviled* all those who displeased her.
- Risible** (riz'ə bəl) adj. laughable; inclined to laugh: The clown's antics were *risible*.

- **Salutary** (sal'yə ter'ē) adj. beneficial; wholesome: Walking is a *salutary* exercise.
- Sapient** (sā'pē ənt) adj. wise; sage: Her explanations were always amusing and *sapient*.
- Satiate** (sā'shē āt) v. satisfy fully; weary with excess: Children who are given as much candy as they want soon become *satiated*.
- Saturnine** (sat'ər nīn) adj. gloomy; taciturn: That *saturnine* man isn't laughing at my jokes.
- Sedate** (si dāt') adj. quiet; serious: The *sedate* child preferred reading to playing.
- Sophistry** (sof'ə strē) n. clever but misleading reasoning: His attempt to persuade was sheer *sophistry*.
- Specious** (spē' shəs) adj. deceptive: The teacher saw through that *specious* excuse.
- Stentorian** (sten tōr'ē ən) adj. very loud: Her *stentorian* voice commanded attention.
- Stoic** (stō' ik) adj. indifferent to feeling: Her response to pain was *stoic*.
- Succinct** (sək singkt') adj. concise; brief: "Blood, sweat, and tears" is a *succinct* description of war.
- Succor** (suk'ər) n. help; relief: We were grateful for the *succor* given by the government.
- Sully** (sul'ē) v. soil; tarnish: Are you afraid to *sully* your hands with hard work?
- Surfeit** (sēr' fit) n. excess: A *surfeit* of food makes one sick.
- Sylvan** (sil'vən) adj. rustic; pertaining to woods: He lived in a *sylvan* retreat.

- **Tacit** (tas' it) adj. silent; implied: His silence was a *tacit* support for her position.
- Temerity** (tə mer'ə tē) n. rashness; boldness: She had the *temerity* to approach the king.
- Tenuous** (ten' yū əs) adj. slight: His claim to the money was *tenuous*.
- Terse** (tērs) adj. concise; abrupt: His answers to the reporters were *terse*.
- Torpid** (tôr'pid) adj. inactive; sluggish: Animals that hibernate become *torpid* in winter.
- Trenchant** (tren'chənt) adj. keen; effective: Her *trenchant* wit is often sarcastic.
- Truculent** (truk'yə lənt) adj. cruel; fierce: The play presented a *truculent* satire of politics.
- Tumid** (tū'mid) adj. swollen; pompous: We all disliked his *tumid* style of speaking.
- Turbid** (tēr' bid) adj. muddy; confused: His *turbid* imagination created monsters of every sort.
- Turgid** (tēr' jid) adj. swollen; inflated : The rains added to an already *turgid* river.
- Tyro** (tī'rō) n. beginner; novice: Sometimes a *tyro* does as well as an old hand in this business.

- **Ubiquitous** (yū bik'wə təs) adj. present everywhere: A fear of snakes seems to be *ubiquitous*.
- Umbrage** (um' brij) n. resentment; offense: She takes *umbrage* at my innocent remarks.
- Unmitigated** (un mit'ə gā' tid) adj. not lessened; absolute: The play was an *unmitigated* disaster.
- Untenable** (un ten' ə bəl) adj. unsupportable: His theory about time travel is *untenable*.
- Urbane** (er' bān') adj. courteous; elegant: His manners were surprisingly *urbane*.

- **Vacuous** (vak'yū əs) adj. foolish; empty: His conversation was unfortunately, *vacuous*.
- Vagary** (və ger'ē) n. whim; caprice: He would follow any outlandish *vagary* of fashion.
- Vapid** (vap' id) adj. tasteless; dull: Her speech was incredibly *vapid*; it will probably lose her the election.
- Venal** (vē' nl) adj. corrupt; open to bribes: The *venal* judge was finally removed from office.

Vestige (ves'tij) n. trace; remnant: Ghost stories are *vestiges* of a former widespread belief in ghosts.

Vicissitude (və sis'ə tüd) n. change; variation: *Vicissitudes* of life may make a rich person very poor.

Vilify (vil'ə fī) v. speak evil of; slander: The candidate *vilified* his opponent.

Vitiate (vish'ē āt) v. impair; spoil: Sewage *vitiated* the stream.

Vituperative (vī tū'pə rā' tiv) adj. abusive; scolding: His *vituperative* reputation convinced salesmen to avoid his door.

Vociferous (vō sif'ər əs) adj. loud; clamoring: She was *vociferous in her demands*.

Voluble (vol'yə bəl) adj. talkative; fluent: The *voluble* stranger dominated the meeting.

■ **Weal** (wēl) n. well-being; prosperity: Good citizens act for the public *weal*.

Wreak (rēk) v. inflict: The cruel boy *wreaked his bad temper on his dog*.

Wry (rī) adj. twisted; ironic: She made a *wry* face to show her disgust.

■ **Zenith** (zē'nith) n. highest point: At the *zenith* of its power Rome ruled all of civilized Europe.

Word Analysis

You can analyze words that you do not know by identifying their parts. Roots provide the core of words. Prefixes appear before the root, and suffixes are added at the end of words. In addition to affecting the meaning of a word, a suffix may determine the word's part of speech in the sentence as well. For example, if you know that the root "chron" means "time," the prefix "syn" means "together," and the suffix "ize" means "cause to be," you will know that "synchronize" is a verb which means "make agree in time." The following lists present some common roots, prefixes, and suffixes.

Prefixes

Prefix	General Meaning	Examples
a, an	not, without	anarchy, amorphous
ambi	both	ambiguous, ambidextrous
ante	before	antecedent, anteroom
com, co, cor	with, together, very	commotion, cooperate
contra	against	contradict, contravene
de	down, from	demote, descend
e, ex	out	eradicate, exclude
eu	good	eulogy, euphemism
hyper	excessive	hyperactive, hyperbole
hypo	under	hypodermic, hypothesis
in, im, il, ir	not, within	illegal, immodest
inter	among, between	intercede, intermittent
intra, intro	inward	introvert, intravenous
mis	badly, not, hate	misfire, misanthrope
per	through, thoroughly	permeate, perforate
post	after	postpone, posthumous
pre	before	precede, preface
pro	for, forward	progress, propel
re	back, again	return, reiterate
retro	back, backward	retrospect, retroactive
sub	under	subordinate, submarine
syn, sym, sys	together, with	synonym, sympathy
trans	across, beyond	transmit, transcend

Roots

Root	Meaning	Example
amor	love	amorous
anthrop	man	philanthropy
annu	year	annual
arch	leader	monarch
aud	hear	audible
auto	self	automation
bene	good	benevolent
bio	life	biology
cent	hundred	centipede
chron	time	chronology
clude	shut	exclude
cred	believe	incredible
cycl	wheel	motorcycle
dem	people	democracy
derm	skin	dermatologist
dict	speak	dictaphone
ego	self	egocentric
fac	make	factory
fin	end	finite
flex	twist	flexible
flor	flower	floral
frac	break	fracture
geo	earth	geology
gnos	know	agnostic
grat	please	gratitude
iso	same, equal	isosceles
jud	judge	judiciary
logy	study of	theology
loq	talk	loquacious
mal	bad	malicious
manu	hand	manual
mega	huge	megalopolis
meter	measure	thermometer
micro	tiny	microbe
mono	one	monologue
morph	form	amorphous
mort	death	mortician
nav	sail	navigate
neo	new	neolithic
nym	name	synonym

Root	Meaning	Example
omni	all	omnipotent
pac	peace	pacify
path	feeling	sympathy
phob	fear	claustrophobia
phone	sound, voice	euphony
photo	light	photosynthesis
poly	many	polygamy
port	carry	export
pseudo	fake	pseudointellectual
psych	mind	psychology
sect	cut	dissect
simil	likeness	similarity
sol	alone	solitude
son	sound	resonant
tact	touch	tactile
tele	far away	telephone
ter	land	terrestrial
therm	heat	thermometer
uni	one	unison
ven	come	convention
vis	see	visual
volv	turn	revolve

Suffixes

Suffix	Meaning	Part of Speech	Examples
ance, ence	act, condition	n.	dependence
able, ible	likely, able	adj.	capable
er, or	doer	n.	writer
ette	little, feminine	n.	cigarette
fy	make, cause to	v.	magnify
ity	quality, condition	n.	purity
ite	formed, marked by	n., adj.	favorite
ize	cause to be	v.	synchronize
ly	like, in the manner	adj., adv.	quickly
ment	means, result	n.	enjoyment
ness	quality, state	n.	happiness
ose, ous	marked by, given to	adj.	verbose
some	apt to, showing	adj.	lonesome
tude, itude	quality, state	n.	magnitude
y	result, action, quality	v.	sympathy

Math Review

Fractions

1. Equal fractions can be obtained by multiplying or dividing the numerator and the denominator by the same nonzero number.

$$\text{A. } \frac{4}{5} = \frac{4 \cdot 3}{5 \cdot 3} = \frac{12}{15} \quad \text{B. } \frac{16}{40} = \frac{16 \div 8}{40 \div 8} = \frac{2}{5}$$

2. An improper fraction can be written as a whole number or a mixed number.

A. Write $\frac{39}{4}$ as a whole number or a mixed number.

Solution: Divide the numerator by the denominator.

$$39 \div 4 = 9 \text{ R}3, \text{ so } \frac{39}{4} = 9\frac{3}{4}.$$

B. Write $4\frac{7}{10}$ as a fraction.

Solution: Multiply the denominator by the whole number and add the numerator.

$$10 \cdot 4 + 7 = 47, \text{ so } 4\frac{7}{10} = \frac{47}{10}.$$

3. To multiply fractions, multiply the numerators and multiply the denominators. If possible, first divide a numerator and a denominator by a common factor.

$$\text{A. } \frac{5}{8} \cdot \frac{3}{4} = \frac{15}{32} \quad \text{B. } \frac{1}{15} \cdot \frac{3}{8} = \frac{1}{\cancel{15}^5} \cdot \frac{\cancel{3}^1}{8} = \frac{1}{40}$$

4. To divide fractions, invert the divisor and multiply.

$$\text{A. } \frac{1}{2} \div \frac{4}{5} = \frac{1}{2} \cdot \frac{5}{4} = \frac{5}{8}$$

5. When you multiply or divide whole numbers or mixed numbers, first rewrite them as fractions.

$$\text{A. } 3 \cdot 2\frac{2}{3} = \frac{3}{1} \cdot \frac{8}{3} = \frac{\cancel{3}^1}{1} \cdot \frac{8}{\cancel{3}_1} = \frac{8}{1} = 8$$

$$\text{B. } 1\frac{2}{5} \div 4 = \frac{7}{5} \div \frac{4}{1} = \frac{7}{5} \cdot \frac{1}{4} = \frac{7}{20}$$

6. To add, subtract, or compare fractions, first write the fractions with a common denominator.

A. Find $\frac{5}{8} - \frac{7}{12}$.

Solution: 24 is a common multiple of 8 and 12, so use it as a common denominator.

$$\frac{5}{8} = \frac{5 \cdot 3}{8 \cdot 3} = \frac{15}{24} \quad \text{and} \quad \frac{7}{12} = \frac{7 \cdot 2}{12 \cdot 2} = \frac{14}{24}$$

$$\text{so } \frac{5}{8} - \frac{7}{12} = \frac{15}{24} - \frac{14}{24} = \frac{1}{24}$$

- B. Write $\frac{5}{12}$, $\frac{5}{16}$ and $\frac{3}{8}$ from least to greatest.

Solution: $\frac{5}{12} = \frac{20}{48}$, $\frac{5}{16} = \frac{15}{48}$ and $\frac{3}{8} = \frac{18}{48}$

$$\frac{15}{48} < \frac{18}{48} < \frac{20}{48} \quad \text{so} \quad \frac{5}{16} < \frac{3}{8} < \frac{5}{12}$$

Decimals

1. Every decimal can be expressed as a fraction.

A. $0.7 = \frac{7}{10}$ B. $0.04 = \frac{4}{100} = \frac{1}{25}$ C. $0.317 = \frac{317}{1000}$

2. Equivalent decimals are formed by writing zeros on the right.

- A. Which is greatest: 0.801, 0.81, 0.811, or 0.8011?

Solution: Write each decimal with the same number of decimal places.

$$\begin{array}{rcl} 0.801 & = & 0.8010 \\ 0.81 & = & 0.8100 \\ 0.811 & = & 0.8110 \\ 0.8011 & = & 0.8011 \end{array} \quad \text{0.811 is greatest.}$$

3. To add or subtract decimals, line up the decimal points.

$$\begin{array}{r} \text{A.} \quad 6.03 \\ + 19.666 \\ \hline 25.696 \end{array} \quad \begin{array}{r} \text{B.} \quad 73 \\ - 12.59 \\ \hline 60.41 \end{array}$$

4. When decimals are multiplied, the number of decimal places in the product equals the total number of decimal places in the factors.

$$\begin{array}{r} \text{A.} \quad 0.83 \\ \times 5.8 \\ \hline 664 \\ 4150 \\ \hline 4.814 \end{array} \quad \begin{array}{r} \text{B.} \quad 0.15 \\ \times 0.13 \\ \hline 45 \\ 150 \\ \hline 0.0195 \end{array}$$

5. When dividing decimals, move the decimal point in the divisor all the way to the right. Move the decimal point in the dividend to the right the same number of places.

$$\begin{array}{r} \text{A.} \quad 2.3 \\ 4.2 \overline{)9.66} \\ \underline{84} \\ 126 \\ \underline{126} \\ 0 \end{array} \quad \begin{array}{r} \text{B.} \quad 0.081 \\ 17 \overline{)1.377} \\ \underline{136} \\ 17 \\ \underline{17} \\ 0 \end{array}$$

6. To express a fraction as a decimal, divide the numerator by the denominator.

- A. Write $\frac{7}{12}$ as a decimal. Round to the nearest hundredth.

Solution: $\frac{0.583 \approx 0.58}{12 \overline{)7.000}}$

Percent

1. Percent means hundredths.

$$\text{A. } 17\% = \frac{17}{100} = 0.17 \quad \text{B. } 120\% = \frac{120}{100} = 1\frac{20}{100} = 1\frac{1}{5}$$

2. Move the decimal point two places to the left when changing from a percent to a decimal. Move the decimal point two places to the right when changing from a decimal to a percent.

$$\text{A. } 5.2\% = 0.052 \quad \text{B. } 0.9 = 90\%$$

3. To write a fraction as a percent, first write the fraction as a decimal. Then write the resulting decimal as a percent.

4. To find a percent of a number, change the percent to a decimal and multiply.

A. 42% of 250 = $(0.42)(250) = 105$

5. When you solve a percent problem, think about the data in the problem as ___% of ___ is ___. Then write an equation and solve.

- A. 72 is what percent of 48?

Solution: ___% of 48 is 72.

$$n(48) = 72$$

$$\frac{48n}{48} = \frac{72}{48}$$

$$n = 1.5$$

Change the decimal to a percent by moving the decimal two places to the right. $n = 1.5 = 150\%$

- B. 44 is 40% of what number?

Solution: 40% of ___ is 44.

$$0.4n = 44$$

$$\frac{0.4n}{0.4} = \frac{44}{0.4}$$

$$n = 110$$

- C. A town's population rose from 2,400 to 3,000. Find the percent of increase.

Solution: The amount of increase is $3000 - 2400 = 600$.

Percents of increase or decrease are based on the *original amount*, which, in this case, is 2,400. ___% of 2400 = 600.

$$n(2400) = 600$$

$$\frac{2400n}{2400} = \frac{600}{2400}$$

$$n = 0.25 \quad \text{The population increased by } 25\%.$$

Average

1. The average of a set of values usually denotes the arithmetic mean. It is found by adding all the values in the set and then dividing by the number of values in the set.

A. The average of 6, 12, and 5 is $\frac{6 + 12 + 5}{3} = \frac{23}{3} = 7\frac{2}{3}$.

- B. The average of a set of five numbers is 24. Four of the numbers are 18, 22, 24, and 30. Find the fifth number.

Solution: The sum of the five numbers is $5 \cdot 24 = 120$.
 $18 + 22 + 24 + 30 = 94$. So the fifth number is
 $120 - 94 = 26$.

- C. There are 27 students in each of two classrooms and 23 students in each of six classrooms. What is the average number of students in the eight classrooms?

Solution: The total number of students in all eight classrooms is $2 \cdot 27 + 6 \cdot 23 = 192$. So the average number of students is $\frac{192}{8} = 24$. Notice that this is *not* the same as the average of 27 and 23, which is 25.

Ratio and Proportion

1. The ratio of 3 to 7 can be written as 3:7 or $\frac{3}{7}$. The ratio of 8:6 is equivalent to the ratio of 4:3 because $\frac{8}{6} = \frac{4}{3}$. Equal ratios form a proportion. Thus, $\frac{8}{6} = \frac{4}{3}$ is a proportion. In a proportion, the cross products are equal.

A. Solve for x . $\frac{8}{9} = \frac{56}{x}$

Solution: Write the cross products and solve the resulting equation.

$$\frac{8}{9} = \frac{56}{x}$$

$$8x = 56 \cdot 9$$

$$8x = 504$$

$$x = 63$$

B. The Martins spent \$1,800 on food in 5 months. At this rate, what will they spend on food in a year?

Solution: Let n represent the amount they spend in 12 months (1 year).

$$\frac{1800}{5} = \frac{n}{12}$$

$$5n = 21600$$

$$n = 4320$$

They will spend \$4,320.

Exponents and Roots

1. An exponent tells how many times a number is used as a factor. Thus, 2^4 means that 2 is used as a factor 4 times.

$$2^4 = 2 \cdot 2 \cdot 2 \cdot 2 = 16$$

Since $6^2 = 36$ and $(-6)^2 = 36$, both 6 and -6 are square roots of 36. $\sqrt{36}$ denotes the positive square root of 36. $\sqrt[3]{64}$ means the cube root of 64. $\sqrt[3]{64} = 4$ since $4^3 = 64$. However, $\sqrt[3]{-64} = -4$ because $(-4)^3 = -64$.

- A. Simplify $\sqrt{250}$.

Solution: 250 is not a perfect square. Look for a factor of 250 which is a perfect square.

$$\sqrt{250} = \sqrt{25 \cdot 10} = \sqrt{25} \cdot \sqrt{10} = 5\sqrt{10}$$

Order of Operations

1. To compute in standard order, first compute the value of any powers (exponents). Next, do the multiplications and divisions from left to right. Then do the additions and subtractions from left to right.

A. $16 + 2 \cdot 5^2 = 16 + 2 \cdot 25 = 16 + 50 = 66$

2. Do operations within parentheses first. Do operations above and below a fraction bar before dividing.

A. $40 + (12 - 9) \cdot 7 = 40 + 3 \cdot 7 = 40 + 21 = 61$

B. $\frac{7^2 + 1}{2 \cdot 5} = \frac{49 + 1}{2 \cdot 5} = \frac{50}{10} = 5$

Algebraic Concepts

1. When you evaluate an algebraic expression, compute in standard order.

A. If $x = 9$,

$$\text{then } 7(x + 3)^2 = 7(9 + 3)^2 = 7(12)^2 = 7 \cdot 144 = 1008.$$

$2b^2c$ and $-3b^2c$ are like terms because they have the same variables raised to the same power. $7x^2$ and $3x$ are not like terms, nor are $6a^2b$ and $6a^2c$. Only like terms can be combined.

B. $2m^2n - 4mn + m^2n = 3mn^2 - 4mn$

2. When working with powers of a number or variable, add exponents when you multiply and subtract exponents when you divide.

(Assume that the examples have nonzero divisors).

A. $x^4 \cdot x^9 = x^{13}$ B. $\frac{n^6}{n^4} = n^2$ C. $\frac{y^3}{y^7} = y^{-4} = \frac{1}{y^4}$

3. To multiply monomials, multiply the numerical coefficients and multiply the variables. To divide monomials, divide the numerical coefficients and divide the variables. (A monomial is a number, a variable, or a product of numbers and variables. Ex.: $2x^2$)

A. $(7x^2y^3)(-3xy^2) = (7)(-3)(x^2y^3 \cdot xy^2) = -21x^3y^5$

B. $\frac{8x^4}{x^3y^2} = \frac{8}{1} \cdot \frac{x^4}{x^3} \cdot \frac{1}{y^2} = 8 \cdot x \cdot \frac{1}{y^2} = \frac{8x}{y^2}$

4. To multiply (or divide) a polynomial by a monomial, multiply (or divide) each term of the polynomial by the monomial. (A polynomial is the sum of monomials. Ex.: $2x^2 + 2x$)

A. $2a(3a^2 + b - c) = 2a \cdot 3a^2 + 2a \cdot b - 2a \cdot c = 6a^3 + 2ab - 2ac$

B. $\frac{x^4 - 2x^3 + 17x^2}{x^2} = \frac{x^4}{x^2} - \frac{2x^3}{x^2} + \frac{17x^2}{x^2} = x^2 - 2x + 17$

5. When you multiply two binomials, think of FOIL. It reminds you to multiply the First terms, the Outer terms, the Inner terms, and the Last terms.

(A binomial is a polynomial that has two terms. Ex.: $15x + 6$)

A. $(2x + 5)(x - 2) = (2x \cdot x) + (2x \cdot -2) + (5 \cdot x) + (5 \cdot -2) = 2x^2 - 4x + 5x - 10 = 2x^2 + x - 10$

B. $(3x - 4y)^2 = (3x - 4y)(3x - 4y) = 9x^2 - 12xy - 12xy + 16y^2 = 9x^2 - 24xy + 16y^2$

6. When you factor a polynomial, first look for a common monomial.

A. Factor $10m^2 - 6m$. $2m$ is a common monomial.

$$10m^2 - 6m = 2m \cdot 5m = 2m \cdot 3 = 2m(5m - 3)$$

7. To factor the difference of two squares, recall that

$$a^2 - b^2 = (a + b)(a - b).$$

B. $25x^2 - 64y^2 = (5x + 8y)(5x - 8y)$

8. Some trinomials can be factored into two binomials.

(A trinomial is a polynomial with three terms. Ex.: $2x^2 + 2x - 48$)

A. Factor $x^2 + 3x - 28$.

Solution: Look for two factors of -28 (the third term) whose sum is 3 (the coefficient of the middle term). 7 and -4 work.

So $x^2 + 3x - 28 = (x + 7)(x - 4)$.

Solving Equations and Inequalities

1. You may add, subtract, multiply, or divide both sides of an equation by the same number. (Remember not to divide by zero.)

A. $\frac{2}{3}x - 4 = 32$

$$4 + \frac{2}{3}x - 4 = 32 + 4$$

$$\frac{2}{3}x = 36$$

$$\frac{3}{2} \cdot \frac{2}{3}x = 36 \cdot \frac{3}{2}$$

$$x = 54$$

B. $7x + 1 = 2x + 3$

$$-2x + 7x + 1 = 2x + 3 - 2x$$

$$5x + 1 = 3$$

$$5x = 2$$

$$\frac{5x}{5} = \frac{2}{5}$$

$$x = \frac{2}{5}$$

C. $\frac{x}{3} + \frac{1}{4} = \frac{5x}{6}$
 $12\left(\frac{x}{3} + \frac{1}{4}\right) = \left(\frac{5x}{6}\right)12$

$$4x + 3 = 10x$$

$$3 = 6x$$

$$\frac{1}{2} = x$$

D. $x^2 + 7x - 18 = 0$

$$(x + 9)(x - 2) = 0$$

$$x + 9 = 0 \text{ or } x - 2 = 0$$

$$x = -9 \text{ or } x = 2$$

E. Solve: $2x + 5y = -14$ and $x + y = -1$

Solution: Multiply the second equation by -2 and add.

$$\begin{array}{r} 2x + 5y = -14 \\ -2x - 2y = \underline{2} \\ \hline 3y = -12 \\ y = -4 \end{array}$$

Now substitute -4 for y in either of the original equations.

$$\begin{array}{r} x + y = -1 \\ x - 4 = -1 \\ x = 3 \end{array}$$

The solution is $x = 3$ and $y = -4$.

2. If you multiply or divide both sides of an inequality by a negative sign, remember to reverse the sign of inequality.

A. $12 - 4x < 16$
 $-12 + 12 - 4x < 16 - 12$
 $-4x < 4$

$$\begin{array}{r} \frac{-4x}{-4} > \frac{4}{-4} \\ x > -1 \end{array}$$

B. Let $x > 0$ and $y < 0$. Compare these quantities:

$$2x + 8^9 \text{ and } 3y + 8^9.$$

Solution: Since both expressions contain 8^9 , compare $2x$ and $3y$.

Since $x > 0$, $2x > 0$. Since $y < 0$, $3y < 0$.

Therefore, $2x > 3y$, so $2x + 8^9 > 3y + 8^9$.

Algebra Applications

- A. Craig is 12 years older than Dan. In 8 years, Craig will be twice as old as Dan. How old is Dan now?

Solution: Let D represent Dan's age now. Then Craig's age now is $D + 12$. Write an equation for their ages in 8 years.

$$\begin{aligned}D + 12 + 8 &= 2(D + 8) \\D + 20 &= 2D + 16 \\4 &= D\end{aligned}$$

Dan is 4 years old.

- B. Find a positive number whose square is 12 more than 4 times the number.

Solution: Let x represent the number.

$$\begin{aligned}x^2 &= 4x + 12 \\x^2 - 4x - 12 &= 0 \\(x - 6)(x + 2) &= 0 \\x &= 6 \text{ or } x = -2\end{aligned}$$

Since the number is positive, it is 6.

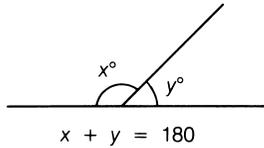
- C. Mark drove 135 miles at 45 miles per hour and 110 miles at 55 miles per hour. What was his average speed for the trip?

Solution: Use distance = rate \times time to find the driving time. For the first part of the trip, $135 = 45t$, so $t = 3$. For the second part, $110 = 55t$, so $t = 2$. Thus, for the two parts of the trip Mark drove $3 + 2$, or 5, hours. He covered a total distance of $135 + 110$, or 245 miles. Use $d = rt$ again and solve for r . $245 = r(5)$, so $r = 49$. Mark's average speed was 49 mph. Notice that this is *not* the average of 45 mph and 55 mph.

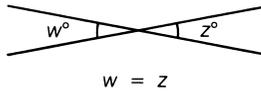
Parallel and Intersecting Lines

Review

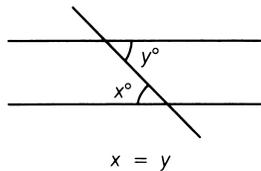
1. If two adjacent angles form a straight line, the sum of their degree measures is 180.



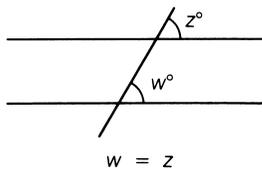
2. When two lines intersect, they form vertical angles that are equal.



3. When two parallel lines are cut by a third line, the alternate interior angles are equal.



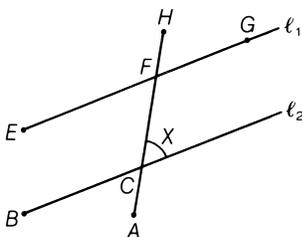
4. When two parallel lines are cut by a third line, the corresponding angles are equal.



Example

A. In the figure, line ℓ_1 is parallel to line ℓ_2 . What three angles are equal to the angle marked x ?

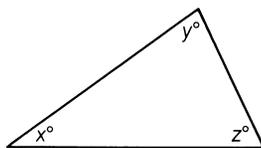
Solution: $\angle BCA = x$ because they are vertical angles. $\angle EFC = x$ because they are alternate interior angles. $\angle HFG = x$ because they are corresponding angles.



Triangles

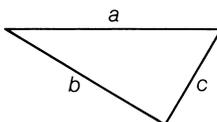
Review

1. The sum of the degree measures in a triangle is 180.



$$x + y + z = 180$$

2. The sum of the lengths of any two sides in a triangle is greater than the length of the third side.

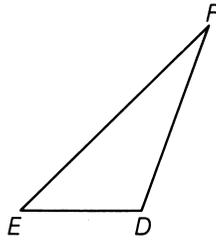


$$a + b > c$$

$$a + c > b$$

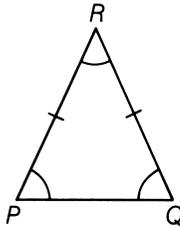
$$b + c > a$$

3. The longest side in a triangle is opposite the largest angle and the shortest side is opposite the smallest angle.



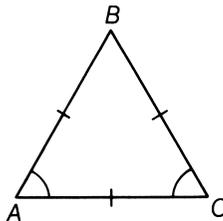
$$\angle D > \angle E > \angle F \text{ and } EF > DF > ED$$

4. An isosceles triangle has two angles of equal measure. The sides opposite these angles are equal in length.



$$\angle P = \angle Q \text{ and } PR = RQ$$

5. An equilateral triangle has three angles of equal measure and three sides of equal length.

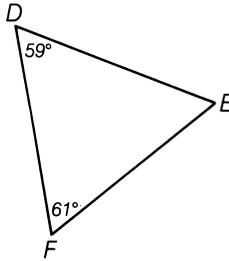


$$\angle A = \angle B = \angle C \text{ and } AB = BC = AC$$

Example

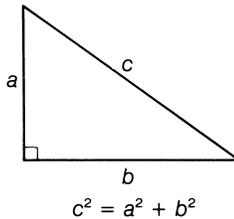
A. Which side of $\triangle DEF$ is the longest?

Solution: The sum of the degree measures in a triangle is 180, so $\angle E$ measures $180 - 59 - 61 = 60^\circ$. $\angle F$ is the largest angle in the triangle, so side DE , which is opposite $\angle F$, is the longest side.

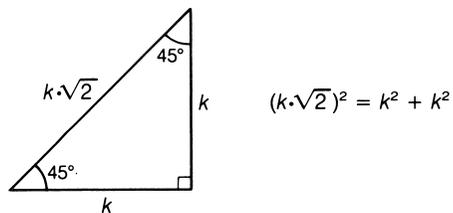


Right Triangles

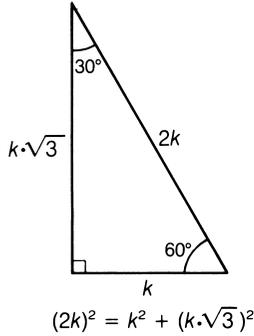
Review



2. In a 45-45-90 right triangle, the two legs are equal and the length of the hypotenuse is $\sqrt{2}$ times the length of a leg.



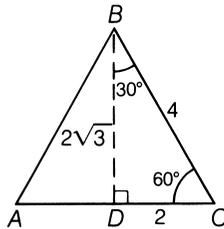
3. In a 30-60-90 right triangle, the leg opposite the 30° angle is one-half as long as the hypotenuse. The leg opposite the 60° angle is $\sqrt{3}$ times as long as the shorter leg.



Example

- A. What is the altitude of an equilateral triangle with side 4?

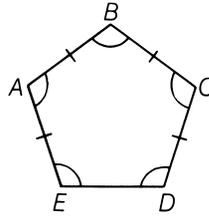
Solution: The altitude BD is perpendicular to the base AC , and $\angle C = 60^\circ$, so $\triangle BCD$ is a 30-60-90 triangle. The leg opposite the 30° angle is $\frac{1}{2}$ as long as the hypotenuse, so $DC = 2$. The leg opposite the 60° angle is $\sqrt{3}$ times as long as the shorter leg, so $BD = 2\sqrt{3}$.



Polygons

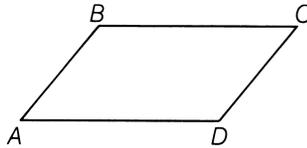
Review

1. A regular polygon is a polygon in which all the sides are equal in length and all the angles have equal measure.



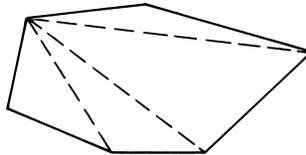
$$AB = BC = CD = DE = EA$$
$$\angle A = \angle B = \angle C = \angle D = \angle E$$

2. In a parallelogram, opposite sides are parallel and equal in length. Rectangles and squares are parallelograms that contain four right angles.



$$AB \parallel CD \quad BC \parallel AD$$
$$AB = CD \quad BC = AD$$

3. Triangles can be used to find angle measures in other polygons. The hexagon at the right is divided into four triangles, so the sum of its angle measures is $4 \cdot 180 = 720^\circ$.

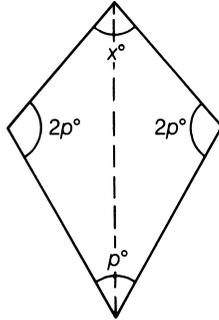


Example

A. Express x in terms of p .

Solution: The quadrilateral can be divided into two triangles, so the sum of its angle measures is $2 \cdot 180 = 360$. Therefore,

$$x + 2p + 2p + p = 360, \text{ so } x + 5p = 360 \text{ and } x = 360 - 5p.$$



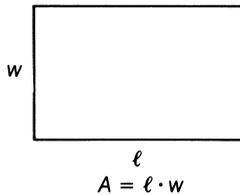
Area and Perimeter

Review

Note: Dimensions must be measured in the same units before they can be multiplied or added.

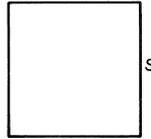
1. Rectangle

The area of a rectangle is equal to its length times its width. The perimeter is equal to the sum of two lengths and two widths.



2. Square

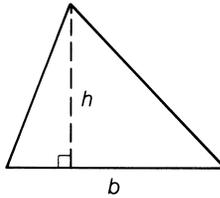
The area of a square is equal to the length of a side multiplied by itself. The perimeter is equal to four times the length of a side.



$$A = s^2$$

3. Triangle

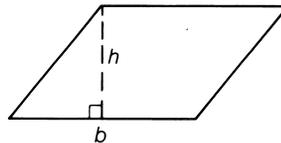
The area of a triangle is equal to $\frac{1}{2}$ times the product of the base and the height. The perimeter is equal to the sum of the lengths of the three sides.



$$A = \frac{1}{2} \cdot b \cdot h$$

4. Parallelogram

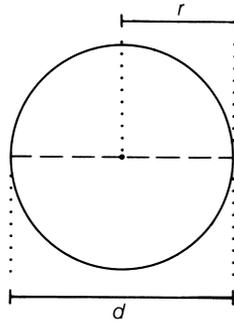
The area of a parallelogram is equal to the product of the base and the height. The perimeter is equal to the sum of the lengths of the four sides.



$$A = b \cdot h$$

5. Circle

The area of a circle is equal to π times the square of the radius. The circumference is equal to π times the diameter. Because the diameter is twice the radius, the circumference can be expressed as $2\pi r$.



$$A = \pi r^2$$

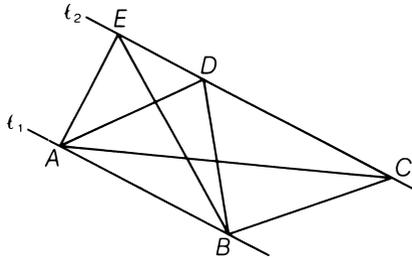
$$\text{Circumference} = \pi d = 2\pi r$$

Example

- A. In the figure, ℓ_1 is parallel to ℓ_2 . Which of the three triangles ABC, ABD, and ABE has the greatest area?

Solution: The area of a triangle is $\frac{1}{2}$ times the base times the altitude.

Since all three triangles have equal altitudes and the same base, their areas are equal.

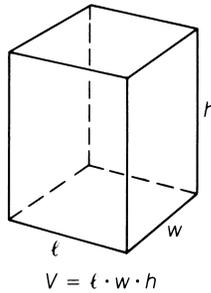


Three-Dimensional Solids

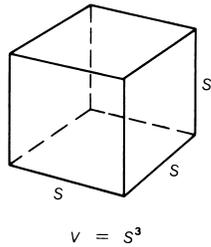
Review

Note: Dimensions must be measured in the same units before they can be multiplied.

1. The volume of a rectangle solid is equal to the product of the length, the width, and the height. The surface area is the sum of the areas of the six rectangular faces.



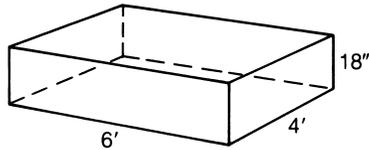
2. A cube with edge s has volume $s \cdot s \cdot s = s^3$. The surface area is $6s^2$ because it has six faces, each of which is a square.



Examples

A. What is the volume of the rectangular solid in the figure?

Solution: First change 18 inches to $1\frac{1}{2}$ feet. Then multiply the length, the width, and the height: $6 \cdot 4 \cdot 1\frac{1}{2} = 36$. The volume is 36 cubic feet.



B. What is the surface area of the solid in the figure above?

Solution: To find the surface area, add the areas of each of the six rectangular faces.

$$\text{Front and back: } 2 \cdot 6 \cdot 1\frac{1}{2} = 18$$

$$\text{Two sides: } 2 \cdot 4 \cdot 1\frac{1}{2} = 12$$

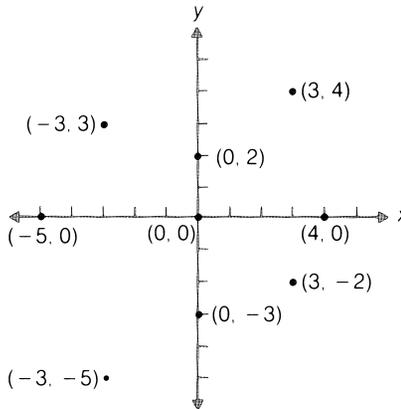
$$\text{Top and bottom: } 2 \cdot 6 \cdot 4 = 48$$

The total surface area is $18 + 12 + 48 = 78$ square feet.

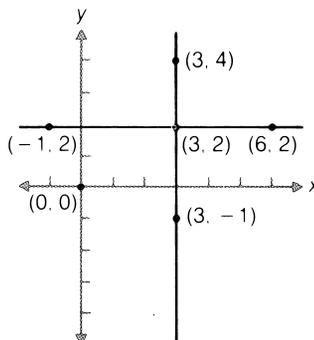
Coordinate Geometry

Review

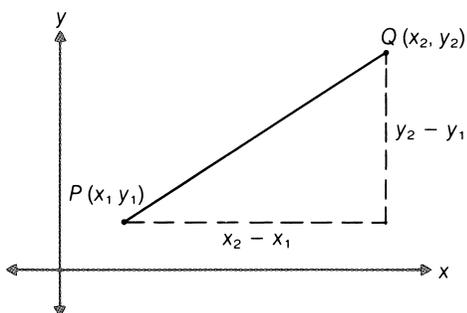
1. The coordinate plane uses ordered pairs of numbers to locate points. For all points on the x -axis, the y -coordinate is zero; for points on the y -axis, the x -coordinate is zero.



2. Points that lie on a line parallel to the x -axis all have the same y -coordinate. Points that lie on a line parallel to the y -axis all have the same x -coordinate.



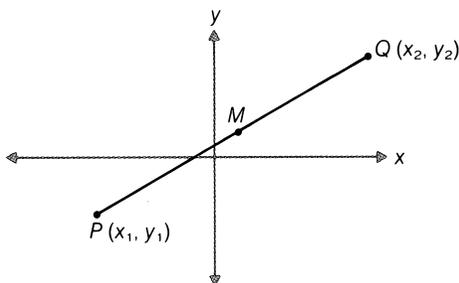
3. If point P has coordinates (x_1, y_1) and Q has coordinates (x_2, y_2) , then the distance between P and Q is $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$.



$$PQ = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

4. If point P has coordinates (x_1, y_1) and Q has coordinates (x_2, y_2) , then the midpoint M of the line segment PQ has coordinates

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$



Example

A. What is the length of the diagonal BD in square $ABCD$?

Solution: B has coordinates $(1, 6)$ and D has coordinates $(8, 3)$.

$$BD = \sqrt{(8 - 1)^2 + (3 - 6)^2}$$

$$BD = \sqrt{7^2 + (-3)^2} = \sqrt{49 + 9}$$

$$BD = \sqrt{58}$$

