The College Board

A Historical Perspective on the Content of the SAT®

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Abstract

This paper provides a historical perspective on the content of the SAT®. The review begins at the beginning, when the first College Board SAT (the "Scholastic Aptitude Test") was administered to 8,040 students on June 23, 1926. At that time, the SAT consisted of nine subtests: definitions, arithmetical problems, classification, artificial language, antonyms, number series, analogies, logical inference, and paragraph reading. Over the years, the SAT has evolved in the way it measures what is now referred to as verbal and mathematical "reasoning." With each redesign of the SAT, a variety of considerations were taken into account, including fairness issues, scaling issues, cost, public perception, face validity, changes in the test-taking population, changes in patterns of test preparation, and changes in the college admissions process. This paper describes the reasons for the various changes while emphasizing that the value of SAT scores rests on the test's high technical quality, and on the assumption that scores would maintain their meaning over time.

A Historical Perspective on the Content of the SAT®

The recent debate over admissions test requirements at the University of California sparked a national discussion about what is measured by the various tests—in particular, what is measured by the SAT, the popular name for the College Board's SAT I: Reasoning Test. The public's interest in the SAT was reflected in the media attention that greeted a June 2002 announcement that the College Board's Trustees had voted to develop a new SAT (the first administration of which is set for March 2005).

Frequently downplayed in the news stories was the fact that the SAT has been reconfigured several times over the years. Some of the modifications have involved changes in the types of questions used to measure verbal and mathematical skills. Other modifications focused on liberalizing time limits to ensure that speed of responding to questions has minimal effect on performance. There were other changes in the administration of the test, such as allowing students to use calculators on the math sections. Still other revisions have stemmed from a concern that certain types of questions might be more susceptible to coaching.

* The Appendix contains a copy of the 1926 SAT practice test.

Since 1970, test developers have also worked to ensure that test content is balanced and appropriate for persons with widely different cultural and educational backgrounds. The steepest increases in test volume since 1973 have been among students of Asian or Hispanic/Latino descent; the proportion of African American test-takers has also increased.

Each redesign has been intended to make the test more useful to students, teachers, high school counselors, and college admissions staff. As a result, today's test items are less like the "puzzle-solving" questions in the early SATs and more like problems students encounter regularly in school course work: problems that measure reasoning and thinking skills needed for success in college and in life.

This article presents an overview of changes in the verbal and mathematical content of the SAT since it was first administered in 1926. At the end, we will briefly discuss the latest planned changes to the test.

Early Versions of the SAT (1926–1930)

The 1926 version of the SAT bears little resemblance to the current test. It contained nine subtests: seven with verbal content (definitions, classification, artificial language, antonyms, analogies, logical inference, and paragraph reading) and two with mathematical content (number series and arithmetical problems).* The time limits were quite stringent: 315 questions were administered in 97 minutes. Early versions of the SAT were quite "speeded"—as late as 1943, students were told that they should not expect to finish. Even so, many of the early modifications to the test were aimed at providing more liberal time limits. In 1928, the test was reduced to seven subtests administered in 115 minutes, and in 1929, to six subtests.

In addition to seeking appropriate time limits, developers of these early versions of the SAT were also concerned with the possibility that the test would influence educational practices in negative ways. On the basis of empirical research that looked at the effects of practice on the various question types, antonyms and analogies were used because research indicated that they were less responsive to practice than were some of the other question types (Coffman, 1962).

Beginning in 1930, the SAT was split into two sections, one portion designed to measure "verbal

aptitude" and the other to measure "mathematical aptitude." Reporting separate verbal and mathematical scores allowed admissions staff to weight the scores differently depending on the type of college and the nature of the college curriculum.

Changes to the Verbal Portion of the SAT since 1930

Verbal tests administered between 1930 and 1935 contained only antonyms, double definitions (completing sentences by inserting two words from a list of choices), and paragraph reading. In 1936, the analogies that had been removed in 1930 were again added. Verbal tests administered between 1936 and 1946 included various combinations of item types: antonyms, analogies, double definitions, and paragraph reading. The amount of time to complete these tests ranged between 80 and 115 minutes, depending on the year the test was taken.

The antonym question type in use between 1926 and 1951 was called the "six-choice antonym." Test-takers were given a group of four words and told to select the two that were "opposite in meaning" (according to the directions given in 1934) or "most nearly opposite" (according to the 1943 directions). These were called "six-choice" questions because there were six possible pairs of numbers from which to choose: (1, 2), (1, 3), (1, 4), (2, 3), (2, 4), and (3, 4).

Here is an example of medium difficulty from 1934:

gregarious $_1$ solitary $_2$ elderly $_3$ blowy $_4$

(Answer: 1, 2)

Here is a difficult example from 1943:

1-divulged 2-esoteric 3-eucharistic 4-refined

(Answer: 1, 2)

In the 1934 edition of the test, test-takers were asked to do 100 of these questions in 25 minutes. They were given no advice about guessing strategies, and the instructions had a quality of inscrutable moralism: "Work steadily but do not press too hard for speed. Accuracy counts as well as speed. Do not penalize yourself by careless mistakes."

In 1943, test-takers were given an additional 5 minutes to complete 100 questions, but this seeming generosity was compensated for by instructions that seem bizarre by today's standards: "Work steadily and

as quickly as is consistent with accuracy. The time allowed for each subtest has been fixed so that very few test-takers can finish it. Do not worry if you cannot finish all the questions in each subtest before time is called." However, those directions were consistent with that era's experimental literature on using instructions to control the trade-off between speed and accuracy (e.g., Howell and Kreidler, 1964).

In 1952, the antonym format was changed to the more familiar five-choice question. Here is a sample from 1960:

VIRTUE: (A) regret   (B) hatred (C) penalty
         (D) denial   (E) depravity

(Answer: E)

The five-choice question is a more direct measure of vocabulary knowledge than the six-choice question, which is more like a puzzle. There are two basic ways to solve the six-choice antonym. The first is to read the four words, grasp them as a whole, and determine which two are opposites. This approach requires the ability to keep a large chunk of material in the clipboard of short-term memory while manipulating it and comparing it to the resources of vocabulary knowledge that one brings to the testing situation. The other approach is to apply a simple algorithm to the problem: "Is the first word the opposite of the second word? If not, is the first word the opposite of the third word? If not, is the first word…" and so forth until all six choices have been evaluated.

Most test-takers probably used some combination of the two methods, first trying the holistic approach and if that didn't work, using the more systematic approach. The latter approach probably took longer than the former; given the tight time constraints of the test at this time (18 seconds per item!), test-takers who relied solely on the systematic approach were at a disadvantage.

Note that in one of the samples above (1-divulged, 2-esoteric, 3-eucharistic, 4-refined), the vocabulary is quite specialized by the standards of today's test. The word "eucharistic" would never be used today, because it is a piece of specialized vocabulary that is more familiar to some Christians than to much of the general population. Even the sense of "divulged" as the opposite of "esoteric" is obscure, with "divulged" taking the sense of "revealed" or "given out," while "esoteric" has the sense of "secret" or "designed for, or appropriate to, an inner circle of advanced or privileged disciples."

The double-definition question type was a precursor of the sentence-completion question that served as a complement to antonyms by focusing on vocabulary knowledge from another angle. This question type was used from 1928 to 1941.

Here is an example of medium difficulty from 1934:

A_____is a venerable leader ruling by_____right.

mayor $_1$ patriarch $_2$ minister $_3$ general $_4$

paternal $_1$ military $_2$ ceremonial $_3$ electoral $_4$

(Answer: 2, 1)

This is a fairly straightforward measure of vocabulary knowledge, although it too contains some elements of "puzzle-solving" as the test-taker is required to choose among the 16 possible answer choices. In 1934, test-takers were given 50 of these questions to answer in 20 minutes.

A question type called paragraph reading was featured on the test from 1926 through 1945. These questions presented test-takers with one or two sentences of 30–70 words and asked them to identify the word in the paragraph that needed to be changed because it spoiled the "sense or meaning of the paragraph as a whole." From 1926 through 1938, test-takers were asked to cross out the inappropriate word, and from 1939 through 1946, they were asked to choose from one of 7 to 15 (depending on the year) numbered words.

Here is an easy example from 1943:

Everybody $_1$ in college who knew $_2$ them at all was convinced $_3$ to see what would come $_4$ of a friendship $_6$ between two persons so opposite $_7$ in tastes, and appearances.

(Answer: 3)

The task here is less like a reasoning task than a proofreading task, and the only real source of difficulty is the similarity in sounds between "convinced" and "curious." A careless test-taker might be unable to see "convinced" as the problem because he or she simply corrected it to "curious."

Here is a difficult (in more senses than one) example from the same year:

At last William bade his knights draw off $_1$ for a space $_2$, and bade the archers only continue the combat. He feared $_3$ that the English, who had no $_4$ bowmen on their side, would find the rain of arrows so unsupportable $_5$ that they would at last break their line and charge $_6$, to drive off their tormentors $_7$.

(Answer: 3)

This question tests reading skills, but it also tests informal logic and reasoning. The key to the difficulty is that as the test-taker reads the beginning of the second sentence, he or she probably assumes that William is English—it is only when the reader figures out that the

English have no bowmen that he or she realizes that William must be fighting the English. Here the issue of outside knowledge comes in. Readers who are familiar with English history know that a William who used archers successfully was William the Conqueror in his battles against the English. This knowledge imparts a terrific advantage, especially given the time pressure. It also helps if the test-taker knows enough about military matters to accept the idea that a military leader might want the opposing forces to charge.

The paragraph-reading question was dropped after 1945. The verbal test that appeared in 1946 contained antonyms, analogies, sentence completions, and reading comprehension. With the exception of antonyms, this configuration is similar to that of today's SAT and represents a real break with the test that existed before. Changes were made in the interest of making the test more relevant to the process of reading: the test is still a verbal reasoning test, but the balance has shifted somewhat from *reasoning* to *verbal*.

Critics of the SAT often point to its heritage in the intelligence tests of the early years of the last century and condemn the test on account of its pedigree, but it is worth noting that by 1946, those question types that were most firmly rooted in the traditions of intelligence testing had fallen by the wayside, replaced by questions that were more closely allied to English and language arts. According to a 1960 ETS document, "the double definition is a relatively restricted form; the sentence completion permits one the use of a much broader range of material. In the sentence completion item the candidate is asked to do a kind of thing which he does naturally when reading: to make use of the element of redundancy inherent in much verbal communication to obtain meaning from something less than the complete communication" (Loret, 1960, p. 4).

Here is an example of a current sentence completion item:

At a recent press conference, the usually reserved biochemist was unexpectedly_____in addressing the ethical questions posed by her work.

(A) correct   (B) forthright   (C) inarticulate
(D) retentive   (E) cautious

(Answer: B)

The change to reading comprehension items was made for a similar reason: "The paragraph reading item probably tends to be esoteric, coachable, and relatively inefficient, while the straightforward reading comprehension is commonplace, probably non-coachable, and reasonably efficient in that a number of questions are drawn from each passage" (Loret, 1960, pp. 4–5).

This shift in emphasis is seen most clearly by comparing the paragraph reading questions discussed above with the reading comprehension questions that replaced them. By the 1950s, about half of the testing time in the verbal section was devoted to reading. At this time the passages ranged between 120 words and 500 words. Here is a short reading comprehension passage that appeared in the descriptive booklet made available to students in 1957:

> Talking with a young man about success and a career, Doctor Samuel Johnson advised the youth "to know something about everything and everything about something." The advice was good—in Doctor Johnson's day, when London was like an isolated village and it took a week to get the news from Paris, Rome, or Berlin. Today, if a man were to take all knowledge for his province and try to know something about everything, the allotment of time would give one minute to each subject, and soon the youth would flit from topic to topic as a butterfly from flower to flower and life would be as evanescent as the butterfly that lives for the present honey and moment. Today commercial, literary, or inventive success means concentration.

The questions that followed were mostly what the descriptive booklet described as "plain sense" questions. Here is an easy to medium-difficult example:

> According to the passage, if we tried now to follow Doctor Johnson's advice, we would
>
> (A) lead a more worthwhile life
>
> (B) have a slower-paced, more peaceful, and more productive life
>
> (C) fail in our attempts
>
> (D) hasten the progress of civilization
>
> (E) perceive a deeper reality
>
> (Answer: C)

Although this question can be answered without making any complicated inferences, it does ask the test-taker to make a connection between the text and his or her own life.

Here is a question in which test-takers were asked to evaluate and pass judgment on the passage:

> In which one of the following comparisons made by the author is the parallelism of the elements least satisfactory?
>
> (A) Topics and flowers
>
> (B) The youth and the butterfly

> (C) London and an isolated village
>
> (D) Knowledge and province
>
> (E) Life and the butterfly
>
> (Answer: E)

Here the test writers were essentially asking test-takers to identify a serious flaw in the logic and composition of the passage. According to the rationale provided in the descriptive book, "the comparison" made in (E) "is a little shaky. What the author really means is that human life would be like the life of a butterfly—aimless and evanescent—not that human life would be like the butterfly itself. The least satisfactory comparison, then, is E." This question attempts to measure a higher-order critical-thinking skill.

Verbal tests administered between 1946 and 1957 were quite speeded: they typically contained between 107 and 170 questions and testing time ranged between 90 and 100 minutes. With each subsequent revision to the verbal test, an attempt was made to make the test less speeded. To accommodate different testing times and types of questions, and still administer a sufficient number of questions to maintain test reliability, the mix of discrete and passage-based questions was strategically altered.

Between 1958 and 1994, changes to the verbal content of the test were relatively minor, involving some shifts in format and testing time, but little change in test content. More substantial content changes were introduced in the spring of 1994 (see Curley and May, 1991):

- Increased emphasis on critical reading and reasoning skills

- Reading material that is accessible and engaging

- Passages ranging in length from 400 to 850 words

- Use of double passages with two points of view on the same subject

- Introductory and contextual information for the reading passages

- Reading questions that emphasize analytical and evaluative skills

- Passage-based questions testing vocabulary in context

- Discrete questions measuring verbal reasoning and vocabulary in context

Antonyms were removed, the rationale being that antonym questions present words without a context and encourage rote memorization. Another important change was an increase in the percentage of questions associated with passage-based reading material. For SATs administered between 1974 and 1994, the percentage of passage-based reading questions was 29

percent. To send a signal to schools about the importance of reading, in 1994, passage-based reading questions were increased to 50 percent. This added reading necessitated an increase in testing time and a decrease in the total number of questions. In comparison to earlier versions of the SAT, reading material in the revised test was chosen to be more like the kind of text students would be expected to encounter in college courses.

One of the major difficulties in talking about the SAT of today in print or in public forums is that critical reading does not fit neatly into a sound bite or a sidebar in a news magazine. To talk about critical reading and what the SAT measures, one has to take the time to do some reading. Here is the text of a recent SAT reading passage:

> *The following passage, taken from a book written in 1992, discusses the relative ease with which people can discern meaning from maps.*
>
> The eye and the brain seem to be particularly felicitous partners in the act of map-reading. It is as if we are physiologically disposed to extract information from maps more rapidly, more intuitively, more globally than from, for example, a text or visual scene. That process of visual mining begins with perception—a process that touches on both the physiological and the conceptual processing of map knowledge. Bearing that in mind, we might take a walk with astronomer Patrick Thaddeus, removing him from his preferred milieu, which is mapping carbon monoxide molecules in the Milky Way with a radio telescope at Harvard University, and placing him in a rather less exotic environment—namely, the woods surrounding his country home in upstate New York.
>
> "The forest goes on for miles and miles," Thaddeus explains. "And I love just walking through the woods by myself. You're not alone, in the sense that the forest is crisscrossed with deer trails. These deer trails are quite imperceptible. But after a while you know how to recognize them and you can see them. They're just very faint patterns that generally tend to go in a straight line. Now I followed one of these trails for a mile through the woods. And I suddenly stopped and asked myself, 'How do I know I'm on this trail?' But I *am* on it, and I suddenly get shaken off. The signal-to-noise ratio [the relevant information, or 'signal,' compared to irrelevant information, or noise] must be one in a thousand, or much less than that. That is, I know I'm on the trail because of a little leaf here, a very faint linear line. But there are much *stronger* sources of noise. Trees across the path, great rocks, and things like that—no computer in the world could possibly filter out that path from all of the conflicting signals around."

Thaddeus can do this, he believes, because of evolution. "Finding your way home, getting back to your babies, your families, is something which we and our ancestors, both human and animal, have had to do for not just millions but *tens* of millions of years," he continues. "Animals are *astonishingly* adept at that, following both visual traces and smell. Smell in humans is a very atrophied sense, but we're particularly good at visual recognition. So it is technically true that I can follow these trails with a high degree of confidence, where I don't think any computer in the world has ever been constructed, or could be programmed, to filter out all the noise and not lock onto the tree trunk or things like that. The point is, human beings think in terms of images, and they know what they are looking for. The educated eye knows what it's looking for, can see things that are, in the technical sense of signal to noise, way, way below one. A very weak, astonishingly weak signal. That is, the human brain is an *incredible* filter for extracting information from confusion."

Confusion is another name for the world unfiltered, and maps are external, constructed filters that make sense of the confusion, just as the eye and brain are internal, physiological filters that cut through the bewildering mix of signal and noise in a visual scene. By breaking down the graphic or pictorial vocabulary to a bare minimum, maps achieve a visual minimalism that, physiologically speaking, is easy on the eyes. They turn numbers into visual images, create pattern out of measurements, and thus engage the highly evolved human capacity for pattern recognition. Some of the most intense research in the neurosciences today is devoted to elucidating what are described as maps of perception: how perception filters and maps the relentless torrent of information provided by the sense organs, our biotic instruments of measurement. Maps *enable* humans to use inherent biological skills of perception, their "educated" eyes, to separate the message from the static, to see the story line running through random pattern.

This is a complex and challenging text, but a text that is very *interesting*. It has voice, it is original, and it presents ideas that will be unfamiliar to most American high school students in a way that they should be able to understand. It is the kind of thing that can actually change the way you think—if you have never thought about this sort of thing before, it will change the way you look at a forest. If you ask yourself what you want an incoming college freshman to be able to do, presum-

ably the ability to think critically about texts like this would be high on the list.

This passage was followed by 10 critical reading questions. Here is one that refers to the first lines of the passage:

Taking the reader on a "walk" (line 6) primarily serves to

(A) provide a vicarious experience of moving through space

(B) make a hypothesis more concrete through a narrative

(C) demonstrate the ease with which anyone can create a map

(D) increase respect for the science of astronomical mapping

(D) suggest the irony of an astronomer's becoming lost in the woods

(Answer: B)

In this question the test-taker is asked to think about why the writer chose to present his or her argument in a certain way. This is a high-level skill, and the ability to answer this question demonstrates an ability to understand not only what is said but why and how it is said.

The 1994 redesign of the SAT took seriously the idea that changes in the test should have a positive influence on education and that a major task of students in college is to read critically. This modification responded to a 1990 recommendation of the Commission on New Possibilities for the Admissions Testing Program to "approximate more closely the skills used in college and high school work" (Commission on New Possibilities for the Admissions Testing Program, page 5).

The table below shows how the format and content of the verbal portion of the test changed between 1958 and today.

TABLE 1

Numbers of Questions of Each Type in the Verbal Test

	1958–1974	1974–1978	1978–1994	1994–2002
Antonyms	18	25	25	
Analogies	19	20	20	19
Sentence Completions	18	15	15	19
Reading Comprehension	35 7 passages	25 5 passages	25 6 passages	
Critical Reading				40 4 passages
Total Verbal Questions	90	85	85	78
Total Testing Time	75 minutes	60 minutes	60 minutes	75 minutes

Changes to the Mathematical Portion of the SAT since 1930

The SATs given in 1928 and 1929 and between 1936 and 1941 contained no mathematics questions. The math section of the SAT administered between 1930 and 1935 contained only free-response questions, and students were given 100 questions to solve in 80 minutes.

The directions from a 1934 math subtest stated: "Write the answer to these questions as quickly as you can. In solving the problems on geometry, use the information given and your own judgment on the geometrical properties of the figures to which you are referred." Here are two questions from that test:
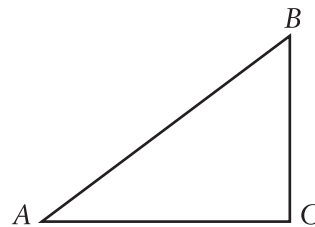

Figure 1

1. In Figure 1, if AC = 4, BC = 3, AB =

(Answer: AB = 5)

2. If $\frac{b}{2} + \frac{b}{5} = 14$, $b =$

(Answer: b = 20)

These questions are straightforward but are not as precise as those written today. In the first question, students were expected to assume that the measure of $\angle C$ was 90° because the angle looked like a right angle. The only way to find AB was to use the Pythagorean theorem assuming that $\triangle ABC$ was a right triangle. The primary challenge of these early tests was mental quickness: how many questions could the student answer correctly in a brief period of time (Braswell, 1978)?

Beginning in 1942 math content on the SAT was tested through the traditional multiple-choice question followed by five choices. The following item is from a 1943 test.

If $4b + 2c = 4$, $8b - 2c = 4$, $6b - 3c = (?)$

(a) -2   (b) 2   (c) 3   (d) 6   (e) 10

The solution to this problem involves solving simultaneous equations, finding values for b and c, and then substituting these values into the expression $6b - 3c$.

In 1959 a new math question type (data sufficiency) was introduced. Then in 1974 the data sufficiency questions were replaced with quantitative comparisons, after studies showed that the latter had strong predictive validity and could be answered quickly.

Both the data sufficiency and quantitative comparison questions have answer choices that are the same for all questions. However, the data sufficiency answer choices are much more involved, as the following two examples illustrate. (The directions for the quantitative comparison question are from an early version.)

Data Sufficiency Item

Directions: Each of the questions below is followed by two statements, labeled (1) and (2), in which certain data are given. In these questions you do not actually have to compute an answer, but rather you have to decide whether the data given in the statements are *sufficient* for answering the question. Using the data given in the statements *plus* your knowledge of mathematics and everyday facts (such as the number of days in July), you are to blacken the space on the answer sheet under

A   if statement (1) ALONE is sufficient but statement (2) alone is not sufficient to answer the question asked,

B   if statement (2) ALONE is sufficient but statement (1) alone is not sufficient to answer the question asked,

C   if BOTH statements (1) and (2) TOGETHER are sufficient to answer the question asked, but NEITHER statement ALONE is sufficient,

D   if EACH statement is sufficient by itself to answer the question asked,

E   if statements (1) and (2) TOGETHER are NOT sufficient to answer the question asked and additional data specific to the problem are needed.

Example:
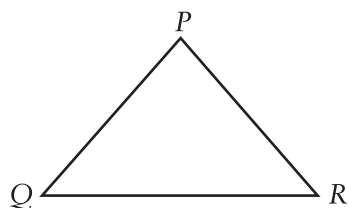
Can the size of angle *P* be determined?

(1)   *PQ = PR*

(2)   Angle *Q* = 40°

Explanation:

Since *PQ = PR* from statement (1), △ *PQR* is - isosceles. Therefore ∠*Q* = ∠*R*. Since ∠*Q* = 40° from statement (2), ∠*R* = 40°. It is known that ∠*P* + ∠*Q* + ∠*R* = *180°*. Angle *P* can be found by substituting the values of ∠*Q* and ∠*R* in this equation. Since the problem can be solved and both statements (1) and (2) are needed, the answer is C.

Quantitative Comparison Item

Directions: Each of the following questions consists of two quantities, one in Column A and one in Column B. You are to compare the two quantities and on the answer sheet blacken space

A   if the quantity in Column A is greater;

B   if the quantity in Column B is greater;

C   if the two quantities are equal;

D   if the relationship cannot be determined from the information given.
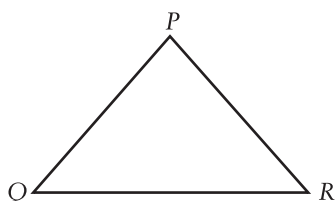
Notes:

1.   In certain questions, information concerning one or both of the quantities to be compared is centered above the two columns.

2.   A symbol that appears in both columns represents the same thing in Column A as it does in Column B.

3.   Letters such as *x*, *n*, and *k* stand for real numbers

Example:

Column A   Column B

Note: Figure not drawn to scale.

$$PQ = PR$$

| The measure of $\angle Q$ | The measure of $\angle P$ |

Explanation:

Since $PQ = PR$, the measure of $\angle Q$ equals the measure of $\angle R$. They could both equal 40°, in which case the measure of $\angle P$ would equal 100°. The measure of $\angle Q$ and the measure of $\angle R$ could both equal 80°, in which case the measure of $\angle P$ would equal 20°. In one case, the measure of $\angle Q$ would be less than the measure of $\angle P$ (40° < 100°). In the other case, the measure of $\angle Q$ would be greater than the measure of $\angle P$ (80° > 20°). Therefore, the answer to this question is (D) since a relationship cannot be determined from the information given.

Note that both questions test similar math content, but the quantitative comparison question takes much less time to solve and is less dependent on verbal skills than is the data sufficiency question. Quantitative comparison questions have been found to be generally more appropriate than data sufficiency items for students with less sophisticated educational backgrounds (Braswell, 1978).

Two major changes to the math section of the SAT took place in 1994: the inclusion of some questions that require test-takers to produce their own solutions rather than select multiple-choice alternatives and a policy permitting the use of calculators.

The 1994 changes were made for a variety of reasons (Braswell, 1991); three very important ones were to:

• Strengthen the relationship between the test and current mathematics curriculum

• Move away from an exclusively multiple-choice test

• Reduce the impact of speed on test performance.

An important impetus for change was that the National Council of Teachers of Mathematics (NCTM) had suggested increased attention in the mathematics curriculum to the use of real-world problems; probability and statistics; problem solving, reasoning, and analyzing; application of learning to new contexts; and solving problems that were not multiple-choice (including problems that had more than one answer). This group also strongly encouraged permitting the use of calculators on the test.

The 1994 changes were responsive to NCTM suggestions. Since then there has been a concerted effort to avoid contrived word problems and to include real-world problems that may be more relevant to today's students. Here is a real-world problem from a recent test:

An aerobics instructor burns 3,000 calories per day for 4 days. How many calories must she burn during the next day so that the average (arithmetic mean) number of calories burned for the 5 days is 3,500 calories per day?

(A) 6,000

(B) 5,500

(C) 5,000

(D) 4,500

(E) 4,000

(Answer: B)

The specifications changed in 1994 to require probability, elementary statistics, and counting problems on each test. Concepts of median and mode were also introduced.

20, 30, 50, 70, 80, 80, 90

Seven students played a game and their scores from least to greatest are given above. Which of the following is true of the scores?

I. The average (arithmetic mean) is greater than 70.

II. The median is greater than 70.

III. The mode is greater than 70.

(A) None

(B) III only

(C) I and II only

(D) II and III only

(E) I, II, and III

(Answer: B)
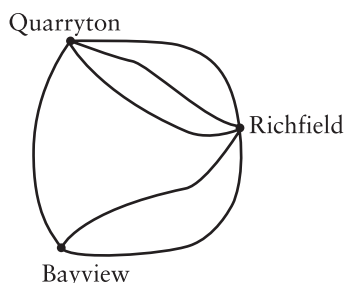
The figure above shows all roads between Quarryton, Richfield, and Bayview. Martina is traveling from Quarryton to Bayview *and back*. How many different ways could she make the round-trip, going through Richfield exactly once on a round-trip and not traveling any section of road more than once on a round trip?

(A) 5

(B) 6

(C) 10

(D) 12

(E) 16

(Answer: D)

Student-Produced Response Questions

Student-produced response (SPR) questions were also added to the test in 1994 in response to the NCTM Standards.

The SPR format has many advantages:

- It eliminates guessing and back-door approaches that depend on answer choices.

- The grid used to record the answer accommodates different forms of the correct answer (fraction versus decimal).

- It allows questions that have more than one correct answer.

The graphic below shows the directions for student-produced response questions that appear in the current SAT test book.

Student-produced response questions test reasoning skills that could not be tested as effectively in a multiple-choice format, as illustrated by the following example.

What is the greatest 3-digit integer that is a multiple of 10?

(Answer: 990)

Directions for Student-Produced Response Questions

Each of the remaining 8 questions (33-40) requires you to solve the problem and enter your answer by marking the ovals in the special grid, as shown in the examples below.

Answer: $\frac{7}{12}$ or 7/12

Answer: 2.5

Answer: 201
Either position is correct.

- Mark no more than one oval in any column.

- Because the answer sheet will be machine-scored, **you will receive credit only if the ovals are filled in correctly.**

- Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the ovals accurately.

- Some problems may have more than one correct answer. In such cases, grid only one answer.

- No question has a negative answer.

- **Mixed numbers** such as $2\frac{1}{2}$ must be gridded as 2.5 or 5/2. (If $2\frac{1}{2}$ is gridded, it will be interpreted as $\frac{21}{2}$, not $2\frac{1}{2}$.)

Note: You may start your answers in any column, space permitting. Columns not needed should be left blank.

- **Decimal Accuracy:** If you obtain a decimal answer, **enter the most accurate value the grid will accommodate.** For example, if you obtain an answer such as 0.6666 . . . , you should record the result as .666 or .667. **Less accurate values such as .66 or .67 are not acceptable.**

Acceptable ways to grid $\frac{2}{3}$ = .6666 . . .

There is reasoning involved in determining that 990 is the answer to this question. This would be a trivial problem if answer choices were given.

The SPR format also allows for questions with more than one answer. The following problem is an example of a question with a set of discrete answers.

> The sum of k and $k + 1$ is greater than 9 but less than 17. If k is an integer, what is one possible value of k?

Solving the inequality $9 < k + (k + 1) < 17$ yields $4 < k < 8$. Since k is an integer, the answer to this question could be 5, 6, or 7. Students may grid any of these three integers as an answer.

Another type of SPR question has correct answers in a range. The answer to the following question involving the slope of a line is any number between 0 and 1. Students may grid any number in the interval between 0 and 1 that the grid can accommodate: 1/2, .001, .98, etc. Slope was another topic added to the SAT in 1994 because of its increased importance in the curriculum.
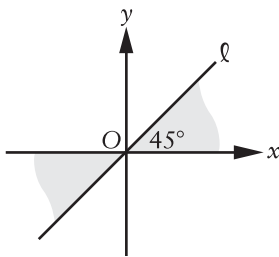
Line m (not shown) passes through O in the figure above. If m is distinct from ℓ and the x-axis, and lies in the shaded region, what is a possible slope for m?

The introduction of calculator use on the math portion of the test reflected changes in the use of calculators in mathematics instruction. The following quantitative comparison question was used in the SAT before calculator use was permitted, but it is no longer appropriate for the test (directions for quantitative comparison questions appear earlier in this article; basically, test-takers must decide which is greater, the quantity in Column A or Column B; they can also decide that the two quantities are equal or say that there is not enough information to answer the question).

Column A	Column B
$3 \times 352 \times 8$	$4 \times 352 \times 6$

Explanation:

Since 352 appears in the product in both Column A and Column B, it is only necessary to compare 3×8 with 4×6. These products are equal, so the answer to this problem is (C).

TABLE 2

Numbers of Questions of Each Type in the Mathematics Test

	1942–1959	1959–1974	1974–1994	1994–2002
5-Choice Multiple Choice	48	42	40	35
Data Sufficiency	12	18		
Quantitative Comparison			20	15
Student-Produced Response				10
Total Mathematical Items	60	60	60	60
Total Testing Time	75 minutes	75 minutes	60 minutes	75 minutes

This question tested reasoning when calculator use was not permitted, but it only tests button pushing when calculators are allowed. A more appropriate question for a current SAT would be:

Column A	Column B
$0 < x < 1 < y < z$	
$2xy$	$2yz$

This question invites a comparison of two products, and since both products contain $2y$, and $y > 0$, it is only necessary to compare x with z. Since $x < z$, the correct answer is (B), as the quantity in column B is greater than the quantity in column A.

The math portion of today's SAT can be described as a measure of the ability to use mathematical concepts and skills in order to engage in problem solving. It asks that students go beyond applying rules and formulas to think through problems they have not solved before. This emphasis on problem solving in mathematics mirrors the academic standards that are in effect in virtually every state today. The National Council of Teachers of Mathematics and other bodies have long argued that mathematics education should not merely inculcate students with knowledge of facts and algorithms but should aim to create flexible thinkers who are comfortable handling nonroutine problems.

Table 2 shows how the format and content of the math portion of the test has changed between 1942 and today.

Changes Planned for the 2005 SAT

This report has shown the various ways in which the SAT has evolved since its introduction in 1926. As we have shown, more recent changes have been heavily

influenced by a desire to reflect contemporary secondary school curriculum and reinforce sound educational standards and practices.

The pending redesign of the SAT will enhance its alignment with current high school curricula and emphasize skills needed for success in college, which include reading, writing, and mathematics. To highlight the importance of reading, the "verbal reasoning" section of the test will be renamed the "critical reading" section. Analogies, which are not covered in most high school English classes, will be replaced by more questions on both short and long reading passages from a variety of fields, including science and the humanities.

Current SAT test-takers are assumed to have had at least a year of high school algebra and geometry, but the math section of the new test will include items from more advanced courses such as second-year algebra; quantitative comparisons, which are not part of classroom instruction, will be eliminated. Concepts tested may include matrices, absolute value, rational equations and inequalities, radical equations, and geometric notation.

The biggest change to the SAT will be the addition of a writing section with multiple-choice questions on grammar and usage and a student-produced essay. Questions will require students to identify sentence errors, improve sentences, and improve paragraphs; for the essay, students may be asked to respond pro or con to a statement such as, "Novelty is too often mistaken for progress," or a question such as, "Should a book, film, or musical recording be removed from a public library because it contains material that is regarded as inappropriate by some members of the community?"

The writing section will measure basic writing skills, not creative writing ability. It will be about 50–60 minutes long (the essay portion will be 25 minutes), and the length of the reading and math tests will be adjusted so that the entire new SAT will require about three and a half hours to administer, rather than the current three hours.

Many of the motivations that led to previous modifications in the SAT continue to be relevant as the test is revised once again. The basic and most important challenge is to ensure that the SAT is as fair as possible and that it effectively meets the needs of college admissions offices.

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Appendix

SCHOLASTIC APTITUDE TEST

Practice Form A-B

SIGN YOUR NAME HERE AS YOU ORDINARILY SIGN IT:..

PRINT YOUR NAME HERE:

   (LAST NAME)   (FIRST NAME)   (MIDDLE NAME)

RESIDENCE...
   (STREET AND NUMBER)   (TOWN OR CITY)   (STATE)

DIRECTIONS

These tests are short samples of those which you will take in the regular scholastic aptitude test of the College Entrance Examination Board. Read the instructions for each sub-test in this sample booklet carefully. Make sure that you understand exactly how each test is to be answered. Answer every question.

The regular test will begin promptly at 9:00 a.m. *No candidate will be admitted after the test has begun.* Candidates will be admitted and seated at any time between 8:45 and 9:00, but admission will be refused after nine o'clock.

Bring two pencils with erasers. The pencil is preferable to the fountain pen for use in this sort of test.

Present this booklet, with all questions answered, at the examination room. *No candidate will be admitted unless he presents this booklet, which will constitute his ticket of admission to the scholastic aptitude test.*

The regular test will occupy three hours, and no candidate will be allowed to leave the room during that time.

SUB–TEST ONE

Find the answers to the problems below as quickly as you can. Do all your figuring on the margin of the page.

1. If a gallon of gasoline costs twenty-four cents, what will five gallons cost?

    Ans. $_____

2. A man buys a house and lot for $8,500 but is obliged to pay $500 back taxes on the property. He leases the property at the rate of $75 a month. What rate of interest does his investment bear?

    Ans. _____%

3. There are 2,240 pounds in a long ton. If a short ton of coal costs $15, what will ten long tons cost at the same rate per pound?

    Ans. $_____

4. How many square feet of paving will it take to make a walk one yard wide around a rectangular plot of grass forty by thirty feet?

    Ans. _____sq.ft.

5. A boat that can make forty miles an hour in still water makes a trip of one hundred miles down a certain stream. If this trip takes two hours, how long will the return trip take?

    Ans. _____hrs.

SUB–TEST TWO

In each line the numbers are arranged in accordance with some particular scheme. Write in the spaces at the margin the two numbers that should come next. The first two are answered correctly.

1	2	3	4	5	6 & 7	
13	11	9	7	5	3 & 1	
1	2	4	8	16	_____ & _____	
1	4	9	16	25	_____ & _____	
5	6	8	11	15	_____ & _____	
1/16	1/8	3/16	1/4	5/16	_____ & _____	
121	100	81	64	49	_____ & _____	
22	23	21	24	20	_____ & _____	
.0001	.0004	.0009	.0016	.0025	_____ & _____	
1/8	1/8	1/4	3/4	3	_____ & _____	

SUB–TEST THREE

Each group of four words in the fifteen lines below contains two words which are opposite or nearly the opposite in meaning. Find the two words that are opposite or nearly the opposite, and write the numbers of these two words in the columns at the right. The first group of words "hard$_1$ above$_2$ below$_3$ young$_4$" contains two words ("above" and "below") that are opposite in meaning, so 2 and 3 are entered in the column at the right. The second group is also marked correctly.

hard$_1$	above$_2$	below$_3$	young$_4$	..2.. & ..3..
ugly$_1$	soft$_2$	beautiful$_3$	acute$_4$	..1.. & ..3..
genuine$_1$	raw$_2$	square$_3$	cooked$_4$	.... & ....
inferior$_1$	superior$_2$	fancy$_3$	tart$_4$	.... & ....
selective$_1$	freakish$_2$	positive$_3$	negative$_4$	.... & ....
gradual$_1$	abrupt$_2$	universal$_3$	ribald$_4$	.... & ....
foolish$_1$	irritating$_2$	soothing$_3$	rapid$_4$	.... & ....
constant$_1$	fragrant$_2$	noisy$_3$	fickle$_4$	.... & ....
tired$_1$	pleased$_2$	naive$_3$	sophisticated$_4$	.... & ....
affected$_1$	genuine$_2$	manual$_3$	liberal$_4$	.... & ....
sanguine$_1$	inept$_2$	uncouth$_3$	polished$_4$	.... & ....
disjointed$_1$	clumsy$_2$	connected$_3$	stony$_4$	.... & ....
empirical$_1$	civilized$_2$	prudish$_3$	savage$_4$	.... & ....
obedient$_1$	sincere$_2$	dissembling$_3$	torpid$_4$	.... & ....
reluctant$_1$	stupid$_2$	efficient$_3$	willing$_4$	.... & ....

SUB–TEST FOUR

Each group contains six words. Three of these are related to each other in some definite way. Indicate which three are thus MOST CLOSELY RELATED by inserting the numbers of these words in the spaces at the right. The first two are answered correctly.

doll$_1$ ring$_2$ flower$_3$ drum$_4$ top$_5$ shoe$_6$............................	..1.. ..4.. & ..5..
bean$_1$ carrot$_2$ potato$_3$ beet$_4$ lettuce$_5$ cabbage$_6$...............	..2.. ..3.. & ..4..
ace$_1$ hearts$_2$ spades$_3$ cards$_4$ trumps$_5$ diamonds$_6$.............	.... & ....
snow$_1$ ski$_2$ slide$_3$ sled$_4$ toboggan$_5$ ice$_6$......................	.... & ....
stool$_1$ table$_2$ chair$_3$ desk$_4$ box$_5$ sofa$_6$......................	.... & ....
fly$_1$ oar$_2$ swim$_3$ propeller$_4$ scale$_5$ fin$_6$....................	.... & ....
day$_1$ night$_2$ star$_3$ pumpkin$_4$ lamp$_5$ sun$_6$.................	.... & ....
wage$_1$ fee$_2$ money$_3$ salary$_4$ wealth$_5$ legacy$_6$............	.... & ....
poverty$_1$ honesty$_2$ beauty$_3$ diligence$_4$ courage$_5$ conceit$_6$.............	.... & ....
organ$_1$ piano$_2$ violin$_3$ banjo$_4$ cornet$_5$ drum$_6$....................	.... & ....
tennis$_1$ golf$_2$ baseball$_3$ archery$_4$ chess$_5$ football$_6$.................	.... & ....
ore$_1$ coal$_2$ rain$_3$ stove$_4$ wind$_5$ water-fall$_6$.................	.... & ....
clerk$_1$ sin$_2$ bin$_3$ plant$_4$ cloth$_5$ tin$_6$....................	.... & ....
butcher$_1$ stoker$_2$ surgeon$_3$ milliner$_4$ lawyer$_5$ minister$_6$.................	.... & ....
Cuba$_1$ Asia$_2$ Alaska$_3$ Africa$_4$ Russia$_5$ Australia$_6$.................	.... & ....

SUB–TEST FIVE

Fifteen definitions are given below. From each definition, the word defined has been omitted, and a number in parentheses substituted. At the margin of the page, a list of thirty words is given in alphabetical order. Fifteen of the words in this list exactly fit the definitions given, and fifteen are not suitable. On the line before the appropriate word in this list, write the number substituted for the word in the definition.

The first three definitions are correctly marked. The word, indicated by (1), omitted from the first definition is "spire," so the figure 1 is placed before that word in the list. From the second definition, the word "dagger" has been omitted, so the figure 2 is placed before that word in the list. The third definition is also answered correctly.

A (1) is a steeply tapering roof analogous to a pyramid in construction.

A (2) is a short, pointed weapon fitted primarily for stabbing.

(3) is a thick, sweet syrup drained from sugar in the making.

(4) is the killing of a human being with malice aforethought.

A (5) is one who sacrifices his life for the sake of a principle.

(6) is acquisition by the payment of money or its equivalent.

A (7) is any rallying or battle cry.

A (8) is a pre-arranged sign designed to insure recognition.

A (9) is one who loves his country and zealously supports its authority and interests.

A (10) is the price paid for the redemption of a prisoner.

(11) is skill or shrewdness in invention.

(12) is that science which deals with the laws and properties of matter and the forces acting upon matter.

An (13) is an oblique hint.

An (14) is a ceremonial introduction.

An (15) is one who forsakes the faith, principles, or party to which he formerly adhered.

...............agnostic
...............apostate
...............chemistry
...............cupola
......2......dagger
...............hint
...............ingenuity
...............inheritance
...............initiation
...............injunction
...............innuendo
...............insult
...............imagination
...............martyr
......3......molasses
...............murder
...............password
...............patriot
...............physics
...............prophet
...............purchase
...............rapier
...............ransom
...............reparation
...............saccharine
...............signal
...............slogan
......1......spire
...............spy
...............suicide

SUB–TEST SIX

Read the vocabulary and rules of the artificial language given below. Then study the sample sentences. Do not try to memorize the vocabulary or forms, but consult them freely while translating the sentences at the bottom of the page.

VOCABULARY

I — ok
he — su
think — bina
grow — cola
rapidly — kon
so — ep

RULES

1. Plurals are formed by adding "i." Only nouns and pronouns have plurals.

> Example:
>
> we — oki

2. Past time is expressed by placing "ent" before the verb.

> Example:
>
> grew — entcola

3. Nouns are formed by substituting the ending "et" for the "a" ending of the verb.

> Example:
>
> growth — colet

SAMPLES

I	think	so		Su	cola	kon
ok	bina	ep		He	grows	rapidly

TRANSLATE THE SENTENCES BELOW

1. Thoughts grow
   --------------- --------

2. Ok entcola kon
   ------ ----------- --------

3. They think rapidly
   -------- ---------- -----------

4. Oki entbina ep
   ------ ----------- ----

Do not memorize the vocabulary or the rules for this sub-test, as you will be given a different vocabulary and another set of rules in the regular test.

SUB-TEST SEVEN

DIRECTIONS. In each argument below, assume the premise or premises to be true and unquestioned, and judge the conclusion in relation to them.

If with the premises true the conclusion must *necessarily be true*, write in the margin the number 1 for Nec. T₁.

If with the premises true the conclusion must *necessarily be false*, write in the margin the number 2 for Nec. F₂.

If the truth of the premises would clearly indicate that the conclusion is *probably true*, but not make it necessarily so, write in the margin the number 3 for Prob. T₃.

If the truth of the premises would clearly indicate that the conclusion is *probably false*, but not make it necessarily so, write in the margin the number 4 for Prob. F₄.

If the premises leave the conclusion *undetermined*, so that no necessity or clear probability of either its truth or falsity is indicated, write in the margin the number 5 for Undet₅.

SAMPLES: (a) Premise:—These shoes were made by Adam Brown, and all shoes made by Adam Brown are well-sewed.
Conclusion:—These shoes are well-sewed.
Nec. T₁ Nec. F₂ Prob. T₃ Prob. F₄ Undet₅ . . . .1...

(b) Premise:—All of the varnished canoes are in the boat-house.
Conclusion:—Some of the varnished canoes are not in the boat-house.
Nec. T₁ Nec. F₂ Prob. T₃ Prob. F₄ Undet₅ . . . .2...

(c) Premise:—Joseph has read a large number of books by Jint and has liked them all.
Conclusion:—Joseph will like this new book by Jint.
Nec. T₁ Nec. F₂ Prob. T₃ Prob. F₄ Undet₅ . . . .3...

(d) Premise:—In this country rain falls on the average about five days out of six during this season.
Conclusion:—It will not rain tomorrow.
Nec. T₁ Nec. F₂ Prob. T₃ Prob. F₄ Undet₅ . . . .4...

(e) Premise:—All of the houses on First Street were burned, but Mr. Smith's house was on Second Street.
Conclusion:—Mr. Smith's house was not burned.
Nec. T₁ Nec. F₂ Prob. T₃ Prob. F₄ Undet₅ . . . .5...

1. Premises:—I have read all of the magazines in this box.
Conclusion:—There are some magazines in this box which no one has read.
Nec. T₁ Nec. F₂ Prob. T₃ Prob. F₄ Undet₅ . . . .

2. Premises:—All of the short pencils are yours, and some of the short pencils are sharp.
Conclusion:—Some of the sharp pencils are yours.
Nec. T₁ Nec. F₂ Prob. T₃ Prob. F₄ Undet₅ . . . .

3. Premises:—The towns of Pitney, Paddet, Pidville, Penton, and Podridge are found, upon investigation, to have police systems better than the average.
Conclusion:—The town of Panvale, which also has a name beginning with P, will be found to have a police system better than the average.
Nec. T₁ Nec. F₂ Prob.T₃ Prob. F₄ Undet₅ . . . .

4. Premises:—All of the waxed floors have been swept.
Conclusion:—None of the unswept floors are waxed.
Nec. T₁ Nec. F₂ Prob. T₃ Prob. F₄ Undet₅ . . . .

5. Premises:—This man looks exactly as I remember Thomas Brown to have looked, and his clothes look exactly like Thomas Brown's. Furthermore, I know of no reason to suspect he is not Thomas Brown.
Conclusion:—This man is Thomas Brown.
Nec. T₁ Nec. F₂ Prob. T₃ Prob. F₄ Undet₅ . . . .

6. Premises:—All of the boxes are full, but some of the boxes are not closed.
Conclusion:—Some of the closed boxes are not full.
Nec. T₁ Nec. F₂ Prob. T₃ Prob. F₄ Undet₅ . . . .

7. Premises:—None of the library cards have been sold.
Conclusion:—Some of the cards sold were library cards.
Nec. T₁ Nec. F₂ Prob. T₃ Prob. F₄ Undet₅ . . . .

8. Premises:—These are Macintosh apples, and all of the Macintosh apples have been sold.
Conclusion:—These apples have not been sold.
Nec. T₁ Nec. F₂ Prob. T₃ Prob. F₄ Undet₅ . . . .

9. Premises:—A, B, C, and D are the only persons that have left the car. B left before C or D, and A was the last to leave.
Conclusion:—B was the first to leave.
Nec. T₁ Nec. F₂ Prob. T₃ Prob. F₄ Undet₅ . . . .

10. Premises:—Every animal of this species that has ever been dissected had exactly thirty-five vertebrae.
Conclusion:—This animal of the same species has exactly thirty-five vertebrae.
Nec. T₁ Nec. F₂ Prob. T₃ Prob. F₄ Undet₅ . . . .

11. Premises:—The sun shines on an average only one day in seven in this season of the year, but it has been sunny on five Saturdays in succession.
Conclusion:—It will be sunny next Saturday.
Nec. T₁ Nec. F₂ Prob. T₃ Prob. F₄ Undet₅ . . . .

12. Premises:—Thousands of samples of metal A, coming from many parts of the world, have been examined, and all so far have contained a small amount of metal B mixed with metal A.
Conclusion:—In many cases in which metal A is found in its natural state in the future it will not have metal B mixed with it.
Nec. T₁ Nec. F₂ Prob. T₃ Prob. F₄ Undet₅ . . . .

13. Premises:—The chances of throwing double sixes at dice are one in thirty-six. I have thrown a hundred times in succession without getting double sixes.
Conclusion:—I shall get double sixes in the next throw.
Nec. T₁ Nec. F₂ Prob. T₃ Prob. F₄ Undet₅ . . . .

14. Premises:—Simon's hand, of course, contains no card that has already been played. Two aces have already been played.
Conclusion:—Simon's hand contains all of the aces.
Nec. T₁ Nec. F₂ Prob. T₃ Prob. F₄ Undet₅ . . . .

15. Premises:—Among a tenth of the students in the class, chosen at random, all were able to answer the question.
Conclusion:—Most of the students in the class would be able to answer the question.
Nec. T₁ Nec. F₂ Prob. T₃ Prob. F₄ Undet₅ . . . .

16. Premises:—Only framed pictures have been accepted, and none of the new pictures are framed.
Conclusion:—None of the new pictures have been accepted.
Nec. T₁ Nec. F₂ Prob. T₃ Prob. F₄ Undet₅ . . . .

17. Premises:—Any man who can turn sand into gold has the means to great wealth, and any man who can turn sand into gold is a magician.
Conclusion:—Some magicians have the means to great wealth.
Nec. T₁ Nec. F₂ Prob. T₃ Prob. F₄ Undet₅ . . . .

SUB-TEST EIGHT

In each of the following paragraphs *one* important word and one word only has been substituted for another and spoils the meaning of the paragraph. Find this word and cross it out. For example, in the first paragraph the word "feasible" has been substituted for the word "visible." In the second paragraph, the word "boredom" has been substituted for the word "refreshment." In the third paragraph, the word "hoping" has been substituted for "afraid." In the fourth paragraph "affirm" has been substituted for "reward."

Remember that in taking this test you are not asked to substitute a word but merely to *cross out* the one important word which spoils the meaning of the paragraph. Cross out the words "feasible," "boredom," "hoping," "affirm," and "penalty," in the first five paragraphs below.

1. The fog enveloped the country-side in a soft gray veil, which blotted out the vistas and made things even close at hand seem blurred. The only feasible objects were the trees which bordered the road; they were etched like dark shadows against the foggy mist.

2. One of the strongest feelings planted in us is our aversion to bores. Biography, as by a short cut, admits us to the fellowship of the choice spirits of the past four thousand years, among whom we shall find endless varieties of boredom, and so gratify our desire for entertaining company.

3. Going yesterday to dine with an old acquaintance, I had the misfortune to find his whole family very much dejected. Upon asking him the occasion of it, he told me that his wife had dreamt a very strange dream the night before, which they were hoping portended some misfortune to themselves or to their children.

4. The immense foreign influx into America has failed to affirm our language to an appreciable extent. The millions of aliens from all the shores of the Seven Seas have contributed only a handful of words to our vocabulary, and they have had no perceptible effect on the framework of the language.

5. The college has no room for those who lack the capacity or the inclination for its strenuous discipline. College education should be a penalty of past promise and an earnest of future usefulness.

6. The real science of political economy is that which forbids nations to desire and labor for the things which lead to life; and which teaches them to scorn and destroy the things that lead to destruction.

7. The thinker works with laws of thought and scientific facts in just the same sense as the musical composer with tones. He must find accords, he must think out sequences, he must set the part in a meaningless relation to the whole. But for that he needs art.

8. Again we see that to understand the real relations of mysticism and science, we must turn to ages when, on neither side, had any accumulated mass of traditions effected an artificial divorce between two great natural trends. It has already been pointed out that if we go outside civilization the divorce is not found, the savage mystic is also the savage man of religion, the priest and the doctor are one.

9. The strong sanity he inherited from his father had made him a great soldier; the death of Aristotle had given him something of the scientific outlook upon the world.

10. The common interests of a nation bound together in thought and interest and action by the telegraph and the telephone, as well as by the rushing mails which every express train carries, have a scope and variety, an infinite subtraction and intricate interlacing of which a simpler day can have had no conception.

11. Johnson's writings, which once had such currency and celebrity, are now, as it were, disowned by the young generation. It is not wonderful; Johnson's opinions are fast becoming popular.

12. It is easy in the world to live after the world's opinion; it is easy in solitude to live after our own; but the ordinary man is he who in the midst of the crowd keeps with perfect sweetness the independence of solitude.

13. Coleridge remarks very pertinently somewhere, that wherever you find a sentence musically worded, of true rhythm and melody in the words, there is something deep and good in the meaning too. For body and soul, word and idea go strangely apart here as everywhere.

14. A great spirit errs as well as a little one; the little one because it confounds its own horizon with that of the universe and the latter because it knows no bounds.

15. Our intellectual and active powers increase with our affection for others. The scholar sits down to write, and all his years of meditation do not furnish him with one good thought; but it becomes necessary to write a letter to a sorrowing friend and forthwith, troops of strident thoughts invest themselves with chosen words.

16. A long time ago, when living was simpler than it is today, numerous canals crisscrossed the country, carrying freight and passengers between towns and cities too centralized for the employment of wagons over the rough and unimproved roads.

17. Foreign words introduced into the English language should be immediately anglicized and stripped of alien accents. In fact, I endorse borrowing from other tongues, for I maintain that English is abundant enough to express all thoughts and that authors who use foreign words reveal an ignorance of their own speech.

18. Children "inherit" from their parents in several senses of the word. There are features and instincts physically transmitted from the one to the other. There are unconscious imitations in early childhood of the child's speech and gesture, and deliberate and conscious imitation at a later stage when the child is sufficiently mature to appreciate its parent's character.

19. Ancient Greek society perished at least as long ago as the seventh century A.D. Many historians would date its death a good many centuries earlier, and they would deny that even if there are symptoms that life still lingered in the body down to this time, its mental and physical energies had long failed, and that the change from lethargy to death was hardly perceptible when it came.

20. A child should be corrected—must be corrected—in accordance with the nature of his deed. It must be impressed upon him that he has brought upon himself the causes of a wrong act; when he destroys the property of another, deprive him of some favorite possession of his own. He will soon get the connection.

SUB–TEST NINE

Read these words:

blotter—ink :: sponge—(1 wet, 2 bath, 3 water, 4 spore, 5 rag). . . . .3.......

One of the words in the parentheses has the same relation to "sponge" as "ink" has to "blotter." The word is "water." A blotter is to ink as sponge is to water, because a blotter absorbs ink, and a sponge absorbs water. Each of the five words in the parentheses has a number. As "water" is number 3, the figure 3 is placed in the space at the margin.

Read these words:

surgeon—skilful :: marksman—(1 brave, 2 gunner, 3 mark, 4 steady, 5 target) . . . .4.......

In this line, the correct word in the parentheses is "steady," for a surgeon is skilful, and a marksman is steady. As the word "steady" is number 4, the figure 4 is placed in the margin. Notice that none of the other four words in the parentheses is related to the word "marksman" in the same way that "skilful" is related to "surgeon." A marksman is not necessarily brave, for instance. Skill is essential to a surgeon, and steadiness is essential to a marksman.

Read these words:

alphabet—letters :: vocabulary—(1 translation, 2 words, 3 language, 4 glossary, 5 vocational) . . . .2.......

In this line, the correct word is "words," for an alphabet is made up of letters, and a vocabulary is made up of words. As the correct word is number 2, the figure 2 is placed in the margin. Notice here, also, that some of the words in the parentheses may, at first glance, seem to be right, but none of them, except "words," is related to "vocabulary" as "letters" is to "alphabet."

Read these words:

poison—death :: food—(1 stove, 2 dinner, 3 digestion, 4 mood, 5 life) . . . .5.......

In this line, the correct word is "life," for poisons will cause death, and food is essential to life. As the correct word is number 5, the figure 5 is placed in the margin.

In each of the lines below, the first two words are related to each other in some way. You are to see what the relation is between the first two words, and find the one word in the parentheses that is related in the same way to the third word, writing the number of that word in the margin at the end of each line. The correct word in the first line below is number 4, so that the figure 4 must be written at the end of that line.

plague—death :: famine—(1 thirst, 2 health, 3 gamin, 4 starvation, 5 relief) . . . .

shepherd—flock :: nursemaid—(1 children, 2 governess, 3 policeman, 4 house, 5 nurse) . . . .

eating—fleshiness :: fasting—(1 prayer, 2 dieting, 3 slenderness, 4 cooking, 5 fastening) . . . .

bait—fish :: wine—(1 drunkard, 2 beer, 3 grape, 4 whine, 5 whiskey) . . . .

banker—shrewd :: aviator—(1 daring, 2 height, 3 handsome, 4 flight, 5 bomb) . . . .

second—minute :: minute—(1 day, 2 man, 3 time, 4 minimum, 5 hour) . . . .

stud—shirt :: latch—(1 lift, 2 desk, 3 door, 4 shut, 5 catch) . . . .

tree—fruit :: investment—(1 greed, 2 loss, 3 salary, 4 interest, 5 bonds) . . . .

author—book :: artist—(1 picture, 2 architect, 3 sculptor, 4 pallet, 5 paint) . . . .

sorrow—tears :: joy—(1 love, 2 joke, 3 smiles, 4 joyful, 5 play) . . . .

electricity—trolley :: steam—(1 cream, 2 vapor, 3 kettle, 4 locomotive, 5 pipe) . . . .

stage—theater :: pulpit—(1 rostrum, 2 church, 3 minister, 4 pulley, 5 preach) . . . .

penny—dime :: dime—(1 savings, 2 quarter, 3 dim, 4 ten, 5 dollar) . . . .

artery—blood :: pipe—(1 stripe, 2 conduit, 3 water, 4 tobacco, 5 spigot) . . . .

core—apple :: plot—(1 blot, 2 thickens, 3 villain, 4 drama, 5 plan) . . . .

fall—injury :: treatment—(1 surgery, 2 cure, 3 help, 4 perjury, 5 doctor) . . . .

stamp—letter :: ticket—(1 traveler, 2 wicket, 3 punch, 4 conductor, 5 pass) . . . .

stingy—miser :: cringing—(1 cowardly, 2 beggar, 3 singing, 4 fawning, 5 flower) . . . .

taste—tongue :: vision—(1 visit, 2 hearing, 3 eye, 4 sight, 5 beauty) . . . .

penny—nickel :: nickel—(1 dime, 2 nicotine, 3 money, 4 slot, 5 quarter) . . . .