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PLANNING TESTS TO MEASURE OUTCOMES OF THE RESEARCH PROGRAM EDUCATION THROUGH VISION. FINAL REPORT.

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CONCEPTS FOR USE IN LINKING VISUAL INPUTS TO COGNITIVE OUTCOMES WERE PRESENTED. IN ADDITION, TWO EVALUATION PROPOSALS FOR THE CONTINUING CURRICULUM DEVELOPMENT PROGRAM, EDUCATION THROUGH VISION, WERE DETAILED. SAMPLES OF THIS PROGRAM'S TEST BATTERY WERE INCLUDED IN THE REPORT WITH THE TWO EVALUATION PROPOSALS FOR DETERMINING THE EFFECTS OF THE PROGRAM IN TERMS OF RELEVANT ABILITY AND ACHIEVEMENT VARIABLES. (GD)

6-3150

FINAL REPORT

Planning Tests to Measure Outcomes of the Research Program Education Through Vision

United States Office of Education Contract No. OE-6-10-342

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Educational Testing Service

Princeton, New Jersey

May 1966

Pilot courses in the Education Through Vision program were conducted in fifteen public schools during the 1965-66 school year. Visits to classrooms, talks with teachers and students, examination of progress reports by participating schools, and discussions with Bartlett H. Hayes, Jr., the program Director, all combined to evoke the impression of a carefully conceived yet still evolving curriculum. However, it should not be surprising that a curriculum, the major activities of which are visually and tactually oriented, should prove elusive and at times frustrating to describe in verbal terms.

The inputs to the learning process in this curriculum are visual. These inputs are embodied in a series of classroom activities, which superficially resemble those pursued in many public school art courses. In addition, a series of audio-visual displays ("slide-tapes") orient the students to various topics and develop subject matter.[1] However, the intended outcomes of the curriculum are cognitive. This report details concepts which may prove useful in linking visual inputs to cognitive outcomes.

Rationale Underlying the Hypothesized Link Between Visual-Tactual Input and Cognitive Change

This section identifies a frame of reference for selecting criteria of cognitive change. Several considerations are involved. The frame of reference should bear a direct and obvious relationship to modes of perceiving and interacting with the visual world. That is, it should have an apparent bearing on

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[1] The following two documents contain useful descriptions of the curriculum activities and materials:

Research Program in Education Through Vision, Interim Report, June 30, 1965.

Young, Laura N. (Ed.), Research Program in Education Through Vision: Tentative Syllabus 1965-66.

the actual activities pursued by students of the curriculum and on the behavioral outcomes anticipated by the curriculum designers. In addition, the frame of reference should be related to a substantial body of established research. Thus, it would be defined through experimentally established relationships among many variables in a wide variety of situations. The advantages of demonstrating curriculum effects within such a frame of reference are obvious. Research and evaluation can proceed in a systematic and knowledgeable manner, rather than as an unintegrated series of tests of loosely conceived armchair hypotheses.

In order to gain firsthand knowledge of classroom activities, and to obtain suggestions with regard to course outcomes directly from teacher and student participants, the following schools were visited:

Melbourne High School, Melbourne, Florida
Stone Elementary School, Melbourne, Florida
Alderdice High School, Pittsburgh, Pennsylvania
Langley High School, Pittsburgh, Pennsylvania
Milford High School, Milford, New Hampshire

Further information was obtained from school progress reports and conversations with participating teachers at an Education Through Vision Conference held at Phillips Academy in Andover, Massachusetts, in February 1966. Finally, conversations with Bartlett H. Hayes, Jr., Director of the Education Through Vision program, provided valuable insights into the methods and purposes of the curriculum.

"Field-independence" was selected as a frame of reference likely to give focus and direction to the initial evaluation effort. Supported by an extensive literature, it fulfills the requirements of relevance to both the input and output characteristics of the curriculum. The following descriptive passages convey the flavor of the field-independence concept:

> This ability /field-independence/, when developed, makes possible an analytical way of experiencing; inability to overcome a context results in a global way of experiencing. The dimension of individual differences with which we are dealing thus represents, at its extremes, contrasting ways of approaching a field, whether the field is immediately present or represented symbolically. It may therefore best be described as an analytical vs. global field approach.[2]

Witkin et al state that "... an investigation that had dealt with individual differences in a seemingly narrow perceptual activity developed into a study of broad differences among people in what seemed to add up to a 'style of life.'"[3] Thus it seems that in dealing with field independence one is using a specific perceptual component as the gateway to a more general cognitive style. In a similar vein:

> The person with a more field-independent way of perceiving tends to experience his surroundings analytically, with objects experienced as discrete from their backgrounds. The person with a more field-dependent way of perceiving tends to experience his surroundings in a relatively global fashion, passively conforming to the influence of the prevailing field or context.[4]

An important aspect of field-independence is that it may be abandoned, when necessary, by persons capable of its use:

> Apparently field-independent perceivers may adopt either an analytical or a global attitude when the task requirements are left ambiguous. When the situation requires an analytical approach for effective performance, they are able to adopt it; field-dependent people, on the other hand, cannot and so, enforcedly, use a global approach.[5]

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2 Witkin, H.A., Dyk, R.B., Faterson, H.F., Goodenough, D.R., and Karp, S.A. Psychological Differentiation. New York: John Wiley and Sons, Inc., 1962, pp. 69-70.

3 Ibid., p. 4.

4 Ibid., p. 35.

5 Ibid., p. 54.

Finally, the broad educational implications of field-independence are apparent in this description of "cognitive clarity," a related concept:

> This dimension /cognitive clarity/ is a continuous one and reflects the extent to which information and impressions are discrete, structured, and assimilated, or blurred, confused, and unassimilated. We considered that a high level of cognitive clarity may be manifested by a child in the following ways: he tends to experience the world and himself in a relatively clear and organized way, rather than as blurred and poorly structured; he is likely to be aware of the discreteness of events, as well as their connections, and to be aware of people both in their separate roles and in their interrelationships; his view is not limited to the immediate present, but includes past, present, and future in a continuous association; he tends to be aware that people, including himself, have reasons for the things they do; he is apt to define people in terms of attributes that go deeper than their actions or physical characteristics. Amount of knowledge is not as important in cognitive clarity as is the degree of assimilation of knowledge. Even though circumstances and interests may have limited a child's fund of information, the information he does have may be well assimilated. In contrast, a child may have a very large fund of facts; yet because he has failed to achieve appropriate assimilation of these facts his account of them may be confused, circumstantial, overspecific and overconcrete, and have a generally "out-of-focus" quality.[6]

The Education Through Vision Tentative Syllabus contains many classroom exercises which demand analytical modes of perception for their accomplishment. However, it is necessary to determine whether correspondence exists between the empirically established correlates of field-independence and the objectives of the Education Through Vision curriculum as stated by its developers. A crucially important group of these objectives are subsumed under the heading of changes in cognitive abilities. If indeed the curriculum has an effect upon the ability to perceive analytically, then existing research literature supports the hypothesis of accompanying effects in the area of cognition.

Woerner and Levine have found field independence to be related to scores on the Wechsler Intelligence Scale for Children (WISC), and in particular to scores on performance subtests such as Block Design.[7] Goodenough and Karp

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6 Ibid., p. 104.

7 Woerner, Margaret, and Levine, T. "A preliminary study of the relation between perception and thinking in children." Unpublished study, 1950, reported in Witkin et al., op. cit., p. 59.

found evidence linking field independence with the Block Design, Picture Completion, and Object Assembly subtests of the WISC.[8] Numerous other studies have demonstrated relationships between field-independence and various aspects of intellectual functioning. Karp[9] found a relationship to a factor which Guilford[10] labeled "adaptive flexibility," characterized by tasks which require a predominant organization or context to be overcome. A relationship between field-independence and the ability to solve insight problems was demonstrated by Harris.[11] Studies of the relationship between field-independence and the ability to overcome set, as measured by problem solving in an Einstellung situation, have produced somewhat inconsistent results, although Fenchel did find a relation in the expected direction.[12]

The evidence linking field-independence and intellectual functioning lends impressive credibility to the objectives stated by the developers of the Education Through Vision curriculum. Therefore, it was decided to include in the set of evaluation measures the tests of cognitive abilities described in a later section of this report. Each is a measure of one relatively independent aspect of cognitive ability, and data from the set should make possible a mapping of the cognitive domain as it is affected by the Education Through Vision program.

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8 Goodenough, D.R., and Karp, S.A. "Field dependence and intellectual functioning" J. abnorm. soc. Psychol., 63, 1961, pp. 241-46.

9 Karp, S.A. "Overcoming embeddedness in perceptual and intellectual functioning." Unpublished study, 1962, reported ir Witkin et al., op. cit., p. 73.

10 Guilford, J.P. "A revised structure of intellect." Rep. psychol. Lab., No. 19, Los Angeles, University of Southern California, 1957.

11 Harris, Frances. Personal communication, reported in Witkin et al., op. cit., pp. 74-75.

12 Fenchel, G.H. "Cognitive rigidity as a behavioral variable manifested in intellectual and perceptual tasks by an outpatient population." Unpublished doctoral dissertation, New York University, 1958.

The available research evidence does not support the belief that field-independence and "verbal ability" are related. Nevertheless, because "verbal ability" is a global term serving as a catchall for many variables, and because there are conceptual reasons for believing that the Education Through Vision curriculum may have effects in certain specific areas of verbal functioning, the "Simile Interpretations" and "Understanding Metaphor" tests are suggested for inclusion in the battery of evaluation measures.

The remainder of this report, an evaluation proposal, serves two functions:

1. A detailed description of a major portion of the work done under the present contract (see Procedure (d), page 5 of the Small Contract Proposal "Planning Tests to Measure Outcomes of the Research Program Education Through Vision," submitted by Educational Testing Service and transmitted September 9, 1965).

2. A formal proposal for an evaluation of the Education Through Vision program, to be carried out during the 1966-67 and 1967-68 school years. The two years will be treated separately in the material to follow.

Evaluation Proposal 1966-67

1. Abstract

(a) Objectives:

(1) to determine whether the Education Through Vision curriculum has cumulative effects over the period of one school year in each of several cognitive and verbal areas.

(2) to determine group achievement levels in each of three subsections of the Education Through Vision curriculum.

(3) to determine the item and test characteristics of each of four instruments to be constructed specially for this evaluation program, and to accomplish any necessary revisions in these instruments.

(b) Procedures:

(1) to administer in September 1966 and May 1967 a battery of tests in each of several cognitive and verbal areas.

(2) to administer in each Education Through Vision class, at the appropriate time, each of three achievement tests corresponding to the curriculum subdivisions entitled "Looking," "Seeing," and "Building."

(3) to perform analyses on the data collected appropriate to the accomplishment of objectives (a) 1, (a) 2, and (a) 3 above.

2. Problem

The Education Through Vision curriculum has, for the past several years, been undergoing a continuous process of development, tryout, and modification of its instructional materials and methods. As a result of this evolutionary process, there now exists among the various pilot courses

a common core of audio-visual instructional materials ("slide-tapes") and classroom activities as outlined in the Tentative Syllabus. Nevertheless, as might properly be expected in a curriculum which is still being refined and defined in actual practice, there exists considerable variation among schools and even among classes within schools with respect to the order of presentation of materials, the relative emphases placed on various units of study, the choice of topics to be included or excluded, the length of the course, the number and length of the class periods, the academic backgrounds of the instructors, and the ability levels and areas of interest of the students. It is therefore a matter of concern to curriculum developers, participants, and evaluators alike that the prospect of an evaluation does not imply the immediate freezing of the curriculum in whatever developmental configuration it happens to have attained at the time the evaluation is to begin. Similarly, it is important that the initial phase of an evaluation provide feedback information to curriculum developers and participants in order that the developmental process through which the curriculum has hitherto been proceeding shall be aided and facilitated rather than halted. Finally, such feedback from the initial evaluation phase should result in a sharper definition and focus of the curriculum as it develops in the direction of its optimal form. It is only after this more mature stage has been reached that a formal comparative evaluation of the curriculum yields meaningful results.

Thus, the problem in broad terms is threefold. Firstly, evaluation procedures which encourage rather than stifle curriculum evolution must be introduced. Secondly, relevant variables must be isolated and instruments appropriate to their measurement must be selected or developed.

Finally, the comparative evaluation of the curriculum may be undertaken--a curriculum stabilized by means of feedback data, evaluated in terms of variables whose relevance has been experimentally established, and measured by means of valid and reliable instruments appropriate for the special population to be studied.

The first and second aspects of the total evaluation problem, as stated above, are the concern of the proposed plan for the school year 1966-67. The final stage of evaluation is proposed for the school year 1967-68.

3. Related Literature

This proposal, as explained previously, constitutes a major portion of the final report for Contract # OE-6-10-342, and the proposed activities and services represent a logical continuance of that contract. Contract # OE-6-10-342 was, in turn, an adjunct to U.S.O.E. Project # 3085, Contract # OE-510-323.

4. Objectives

(a) The determination of whether the Education Through Vision curriculum has cumulative effects in each of several cognitive and verbal areas implies three subobjectives. The first is the identification of variables with respect to which an effect might reasonably be expected. The second is the development or selection of valid and reliable measuring instruments. The third, and possibly the most difficult of attainment at this stage of evaluation, is the introduction of an experimental design structure such that any identifiable effects can be logically attributed to the curriculum. Techniques for accomplishing these objectives are discussed in detail in the section on Procedures.

(b) In order to determine group achievement levels in each of the three curriculum subsections "Looking," "Seeing," and "Building," special tests will be developed in these areas. The common objective is to determine achievement level at the conclusion of each unit, in order that each teacher may assess the results of his own presentation of the material. Thus, only a single administration of each test is proposed, since the assessment of behavior change is not required, as in objective (a) above.

(c) The data from the four tests to be constructed for this evaluation, "Looking," "Seeing," "Building," and "Understanding Metaphor," will be analyzed to determine test reliability, difficulty, and speededness characteristics. Appropriate revision of these tests will be undertaken on the basis of the 1966-67 data, to insure that appropriate final forms will be available for the 1967-68 phase of the evaluation.

5. Procedures

(a) Test selection and development.

As discussed in the previous section of this report on the identification of a rationale linking visual-tactual input and cognitive change, a battery of tests intended to explore effects in the various facets of the cognitive domain has been selected. Following is a brief description of each of these tests and the variables they are intended to measure.[1] The test booklets are contained in Appendix A.

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[1] For a more complete description, see: French, John W., Ekstrom, Ruth B., and Price, Leighton A. Manual for Kit of Reference Tests for Cognitive Factors. Princeton: Educational Testing Service, 1963.

Hidden Figures:

The task is to decide which of five geometrical figures is embedded in a complex pattern. This test is a measure of the "flexibility of closure" factor, which is defined as the ability to keep one or more definite configurations in mind so as to make identification in spite of perceptual distractions. Tests of this factor require the subject to search in a perceptual field containing irrelevant or distracting material in order to find one or more given configurations.

Simile Interpretations:

Incomplete sentences of the form "A woman's beauty is like the autumn because..." are presented. The task is to complete the sentences in as many ways as possible by giving different explanations for the simile.

This test is a measure of the "expressional fluency" factor, which is defined as the ability to think rapidly of appropriate wording for ideas. It concerns fluency in composing connected discourse as contrasted with fluency in producing single words. It also contrasts with Ideational Fluency in that the ideas are already given or are not central to the task. The data will provide evidence regarding the Education Through Vision hypothesis that simile interpretation and the ability to recall visual stimuli are related.

Estimation of Length:

Each item consists of lines 1/2 to 1 1/2 inches in length oriented in different directions. This is to be compared with a set of 5 pairs of companion lines at the center of the page. The test lines may be as long as or twice as long as the companion lines. This test is a measure of the "length estimation" factor, which is defined as the ability to judge and compare visually perceived distances on paper. Research has not progressed far enough to have explored the importance or generalizability of this factor; for example, the judgment of areas and volumes may not be factorially discriminable from the perception of distance. For the time being, Length Estimation should be considered to involve distance perception in two dimensions. Tests of this factor are likely to involve variance in proneness to optical illusions, but this may be a separate ability and will therefore be regarded as error in measuring Length Estimation.

Symbol Production:

The task is to produce symbols to represent given activities and objects. This test is a measure of the "originality" factor, which is defined as the ability to produce remotely associated, clever, or uncommon responses.

Object Synthesis:

The task is to name an object that could be made by combining two specified objects. This test is a measure of the "semantic redefinition" factor, which is defined as the ability to shift the function of an object or part of an object and use it in a new way. There is some evidence that there are "redefinition" factors in the figural and, perhaps, the symbolic areas as well as this one. "Hidden Figures" and "Camouflage" tests represent figural redefinition. This factor, on the other hand, offers unambiguous pictures or descriptions of objects. The task is to break conventional sets about the objects and visualize new functions for them, an ability opposite to what has been called "functional fixedness."

Surface Development:

In this test, drawings are presented of solid forms that could be made with paper or sheet metal. With each drawing there is a diagram showing how a piece of paper might be cut and folded so as to make the solid form. Dotted lines show where the paper is folded. One part of the diagram is marked to correspond to a marked surface in the drawing. The subject is to indicate which lettered edges in the drawing correspond to numbered edges or dotted lines in the diagram.

The test is a measure of the "visualization" factor, which is defined as the ability to manipulate or transform the image of spatial patterns into other visual arrangements. Tests of this factor require the examinee to rotate, turn, fold, or invert the images of objects or parts of objects according to explicit directions and to make comparisons of the resulting manipulated images with drawings. The solution of the problem can be either to draw appropriate responses or to select the appropriate response from given alternatives.

Match Problems II:

The task is to indicate up to four different sets of a specified number of lines, representing matches, which may be taken away from a pattern of such lines in order to leave a certain number of squares or triangles.

This test is a measure of the "figural adaptive flexibility" factor, which is defined as the ability to change set in order to meet new requirements imposed by figural problems.

Utility:

The score in this test is the number of times the class of uses is changed as the subject lists different uses for a given object.

This test is a measure of the "semantic spontaneous flexibility" factor, which is defined as the ability to produce a diversity of verbally expressed ideas in a situation that is relatively unrestricted. In tests of Adaptive Flexibility the subject changes set in order to arrive at a particular answer, while, in tests of this factor, it pays him to change set in as many different ways as possible, although this is not essential so far as he knows.

In addition to the above tests from the Kit of Reference Tests for Cognitive Factors, the following two tests of cognitive ability will be administered:

School and College Ability Test (Form 2B):

This test measures the two kinds of school-related abilities which are most important in the greatest number of school and college endeavors: verbal and quantitative. In order to shorten testing time, an abbreviated "Survey" version will be administered, which consists of Parts I and II of the complete test (Sentence Understanding and Numerical Computation, respectively). The chief purpose of administering the SCAT Survey is to obtain an estimate of the ability level of the sample with respect to a national norms group. The test booklet is included in Appendix A.

Understanding Metaphor:

This is a test to be developed specially for this project. It will consist of a series of metaphoric passages, both prose and poetry. The task is to choose the best answer to each of two items for each passage. If test production schedules permit, the test will be administered as part of the cognitive battery in September 1966 and May 1967. If not, it will be administered whenever feasible. In either case, it should properly be regarded as an experimental instrument undergoing pretest and possible revision. See Appendix A for sample items.

One achievement test for each of the curriculum units "Looking," "Seeing," and "Building" will be developed for this project. The items for these tests will be presented via colored slides and tape recordings. As in the case of "Understanding Metaphor," these tests should be regarded as experimental instruments undergoing pretest and possible revision. Sample item descriptions are included in Appendix A.

(b) Sample selection.

It is the belief of its developers that, in order to be effective, the Education Through Vision curriculum must be taught by an instructor who has been thoroughly oriented with respect to its purposes, methods, and materials. This has been accomplished in the past by the attendance of prospective teachers at summer workshops conducted by Bartlett Hayes and his staff. These teachers constitute a purposive sample, selected to represent a wide range of geographical location, environment, and background. Because only a very limited number of teachers

have been thus prepared, the entire population is to be used for this evaluation. The requirement that teachers attend an orientation workshop precludes the random selection of teachers from some larger population. Likewise, respect for the educational needs of students precludes the random selection of students for assignment to Education Through Vision classes. In the unlikely event that a school should have more candidates for admission to the program than it can accommodate, random assignment might be possible, but this situation will not exist during the 1966-67 school year for any significant numbers of students. Thus, the sample of teacher-class units for the 1966-67 evaluation will of necessity be a rather special and probably relatively heterogeneous one, representative of no clearly describable population. The limited, although still useful, generalization of the obtained results will be to a population of teacher-class units "like these."

Certain non-Education Through Vision classes will be selected from each school for comparative purposes. The purposes and procedures of this selection can be more meaningfully discussed within an experimental design context, and will therefore be treated in the following section.

(c) Experimental design.

Some hint of the experimental design problems associated with the 1966-67 evaluation has already been given in the preceding section on Sampling. It is relatively easy to test the hypothesis of change on each criterion variable and to make the appropriate generalization to a population of teacher-class units "like these." It is not easy, under the restrictive conditions imposed by the realities of the educational world, to make a valid

causal inference. That is, it is not easy to attribute observed effects solely to the influence of the curriculum. The objective of the experimental design is to eliminate as many as possible of the plausible rival hypotheses, thus leaving the influence of the curriculum itself as the only credible explanation of observed effects.

Perhaps the hypothesis which poses the most serious threat to an apparent curriculum effect is that of maturation. Thus it could be argued that an observed change over the period from September 1966 to May 1967 is caused by the natural growth within the individual of the abilities measured. A closely related rival hypothesis is that an observed change is caused by uncontrolled events external to the Education Through Vision classroom.

The procedure most appropriate to the elimination of these rival hypotheses would be the creation, by random assignment of students and teachers, of equivalent control classes. This procedure can be notated as follows, where "O" is an observation or measurement, "X" is the introduction of an experimental treatment (in this case the curriculum), and "R" indicates random assignment of students to classes and classes to treatments:

R O X O
R O O

A less desirable variation of this design would involve accepting classes as they are constituted by the usual administrative procedures and assigning them randomly to treatments:

R O X O
classes O O

However, as previously indicated, the following design will probably be necessary, where the dashed line indicates the lack of random assignment, and the probable consequence of a non-equivalent control group.

$$-\frac{O}{O}\ \frac{X}{}\ -\ \frac{O}{O}\ -$$

One further design complication is present in the situation. The instruments included in the battery of cognitive tests are of a rather unique nature, and as such might easily be remembered by the students. Equivalent forms are not available. Thus, in order to avoid practice effect, a different random half of each class will be tested in September and May. These data will then be treated as repeated measures on each experimental unit (class). The three designs previously presented thus become, by extension:

	R	O	X	
	R		X	O
	R	O		
	R			O
	R	O	X	
R	R		X	O
classes	R	O		
	R			O
	R	O	X	
	R		X	O
	R	O		
	R			O

Either of the first two designs will be used if conditions within particular schools permit, but as previously pointed out, this is not likely. Therefore it is anticipated that the third design will be used predominantly. This means that in each school a number of non-Education Through Vision classes approximately equal to the number of Education Through Vision classes will be selected. This selection will be made from the same grade level, but in most other respects it is likely that these classes may differ systematically from those in the Education Through Vision program.

Naturally, the price which must be paid for weak experimental control is an increase in the number of assumptions which must be made in interpreting the data. The weaknesses of non-equivalent groups can be <u>partially</u> overcome by certain techniques of analysis, which will be discussed in the section on data processing and analysis.

(d) Administrative control of the evaluation study.

The multitude of administrative functions necessary to the accomplishment of this evaluation will be the responsibility of the Curriculum Studies Group of Educational Testing Service. A detailed description would be both dreary and unnecessary, but the following listing is provided as an indication of the scope of proposed activities:

(1) selection and/or development of measurement instruments

(2) procurement or production of measurement instruments

(3) planning and supervision of test administrations

(4) shipping and return receipt of testing materials

(5) development, production, shipping, and analysis of teacher classroom logs

(6) scoring of measurement instruments

(7) processing and analysis of test data

(8) production of a final report

(e) Data processing and analysis

A primary objective of the 1966-67 evaluation effort is the identification of variables in terms of which curriculum effects can be demonstrated. Given random assignment of experimental units to experimental and control groups, an appropriate

analytical procedure would be the analysis of covariance, using posttest scores as the criterion, and pretest scores plus one or more other variables as covariates. However, this procedure results only in an imperfect adjustment of the groups on a selected set of dimensions, and thus does not produce conclusive results when used with systematically different groups. Nevertheless, it can and will be used, although the results must be considered only suggestive, and interpreted with extreme caution.

In order to identify variables which appear to be affected by the curriculum and which are therefore fruitful data for the application of the previously described covariance analyses, analyses of variance will be performed to test differences between pre and posttest means within the experimental group. Since each pre and posttest class mean will be based on observations from a random half of the students in each class, the analysis will be that of a repeated measures design with each class acting as its own control.

Intercorrelation matrices of all variables will be obtained separately for the random halves of the experimental group tested in September 1966 and May 1967. These will be examined to determine whether patterns of intercorrelation have changed markedly, presumably as a result of exposure to the curriculum. Striking changes might suggest a more sophisticated factor analytic treatment of the data, although such analysis is not proposed at present.

Item and test analyses for the four specially developed tests ("Understanding Metaphor," "Looking," "Seeing," and "Building") will be performed, yielding information on test difficulty, reliability, and speededness. Item difficulty (delta) and discrimination (r biserial) indices will be computed and examined to aid in any necessary test revision. These analyses will be based on random samples of cases drawn from the entire experimental group.

Appendix B gives estimated cost of the foregoing 1966-67 Evaluation Proposal.

Evaluation Proposal 1967-68

1. Abstract

(a) Objectives

to determine the relative effects of the Education Through Vision Curriculum, or more than one identifiable version of it, and one or more comparison curricula, in terms of relevant ability and achievement variables.

(b) Procedures

(1) to define, describe, and specify the various curricula or variations of curricula to be compared.

(2) to create equivalent groups of subjects in each of the treatment groups to be compared, by the process of random assignment of students or classes.

(3) to perform comparative analyses of the data.

2. Problem

In contrast to the 1966-67 evaluation, the principal problem in 1967-68 is concerned with the comparison of two or more curricula in terms of common objectives. There are two prerequisites to such an evaluation.

The first is that the curricula to be compared be so specified that classes within each are indeed undergoing the same educational experiences. This is necessary from a logical point of view so that reference to a given curriculum and its effects has a unique meaning. It also has implications for the statistical test of significance, in that variation among classes within treatment reduces the power of the test.

The second prerequisite to this type of evaluation is control over the assignment of individuals and/or classes to treatments (curricula). Although this is not easy to accomplish in a school setting, it is the only procedure which will permit truly rigorous conclusions to be drawn from the data. Thus, there is a shift in emphasis for the 1967-68 evaluation procedures toward increased manipulation of the educational environment, accompanied by an increase in interpretability of the results.

3. Related Literature

See section 3 of the preceding Evaluation Proposal 1966-67.

4. Objectives

To state that the value of a comparative evaluation is to a large degree dependent on the choice of elements to be compared is perhaps so obvious as to seem trivial. Nevertheless, it is a consideration which is crucially important to this type of comparative evaluation. Inasmuch as the Education Through Vision curriculum is at present still evolving, it would be premature to specify at this time logical comparison groups. When ultimate stabilization of the curriculum permits such a selection to be made, it will be a primary objective to choose comparison groups which share cognitive goals with Education Through Vision.

5. Procedures

(a) Test development and production

Hopefully, the 1966-67 evaluation will have resulted in the identification of a comprehensive set of variables relevant to the objectives and effects of the Education Through Vision curriculum. Measures of these variables will have been revised if necessary. Thus the 1967-68 evaluation will require only production of these instruments in sufficient quantities, provided the efforts of the previous year have been successful.

(b) Sample selection

It is not anticipated that the supply of trained Education Through Vision teachers will be substantially increased by 1967-68. Therefore, it will still be necessary to work with a small but rather heterogeneous population of teachers and students. The difference in the 1967-68 procedure lies in the requirement of complete control over the allocation of the members of that population to various curricula.

(c) Experimental design

While the requirement of increased control introduces complications into the physical aspects of the evaluation study, it decreases the problems of design and analysis. Random assignment of experimental units in sufficient numbers precludes the necessity for pretest, although pretest data may be collected in order to increase the sensitivity of the experiment.

Because equivalent forms of many of the instruments are not available, the most practical design is:

R X O
R O

Note that, although no estimate of growth is available from this design, it permits a valid comparison of the type described previously.

(d) Administrative control of the evaluation study

As in the 1966-67 evaluation, the various administrative functions will be the responsibility of the Curriculum Studies Group of Educational Testing Service. These functions will include:

(1) procurement or production of measurement instruments
(2) planning and supervision of test administrations
(3) shipping and return receipt of testing materials
(4) scoring of measurement instruments
(5) processing and analysis of test data
(6) production of a final report

(e) Data processing and analysis

The design proposed above implies a straightforward analysis of variance. As in the 1966-67 evaluation, the classroom is considered to be the experimental unit.

The following sections refer to both the 1966-67 and 1967-68 evaluation proposals.

6. Personnel

Dr. Donald A. Trismen, staff member of the Educational Testing Service, will direct the investigations and supervise the necessary staff.

7. Facilities

Test data will be obtained at some or all of the schools participating in the Education Through Vision program. All other activities and services will be performed at Educational Testing Service in Princeton, New Jersey.

8. Other Information

(a) Support from other sources - none

(b) Proposal submitted elsewhere - no

(c) Extension of USOE project - yes, contract OE-6-10-342

(d) Request previously made - no

9. Budget

Inasmuch as 1967-68 services are impossible to specify in detail at this time, an estimate of cost is provided for the 1966-67 Evaluation Proposal only. See Appendix B.

Appendix A

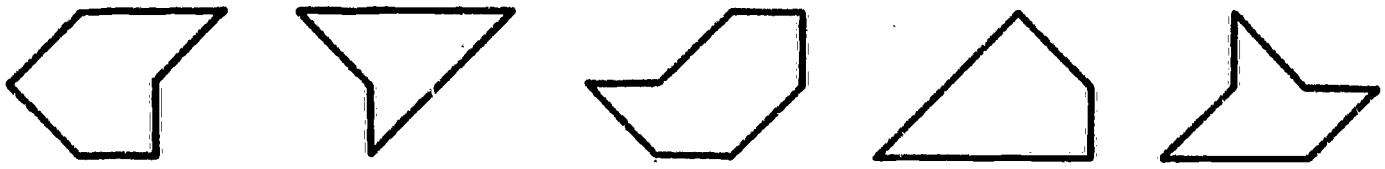
Name: _____

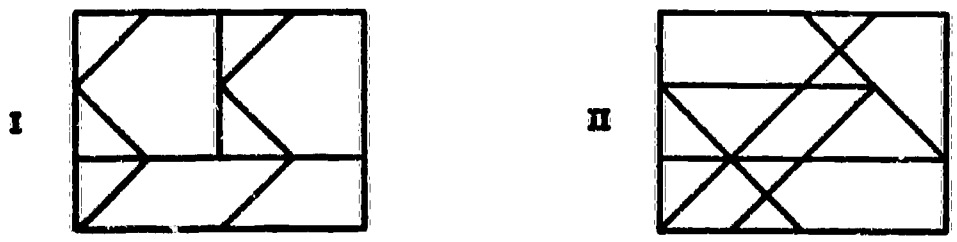
HIDDEN FIGURES TEST — Cf-1

This is a test of your ability to tell which one of five simple figures can be found in a more complex pattern. At the top of each page in this test are five simple figures lettered A, B, C, D, and E. Beneath each row of figures is a page of patterns. Each pattern has a row of letters beneath it. Indicate your answer by putting an X through the letter of the figure which you find in the pattern.

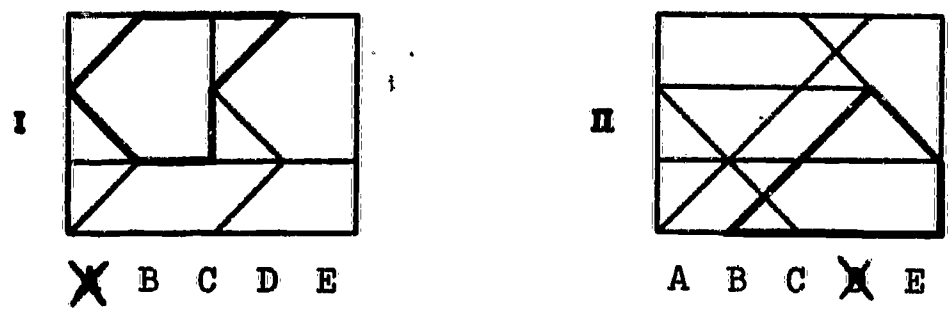
NOTE: There is only one of these figures in each pattern, and this figure will always be right side up and exactly the same size as one of the five lettered figures.

Now try these 2 examples.





The figures below show how the figures are included in the problems. Figure A is in the first problem and figure D in the second.



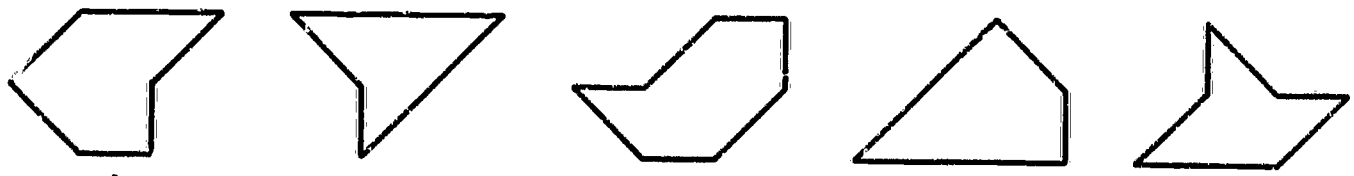
Your score on this test will be the number marked correctly minus a fraction of the number marked incorrectly. Therefore, it will not be to your advantage to guess unless you are able to eliminate one or more of the answer choices as wrong.

You will have 10 minutes for each of the two parts of this test. Each part has 2 pages. When you have finished Part 1, STOP. Please do not go on to Part 2 until you are asked to do so.

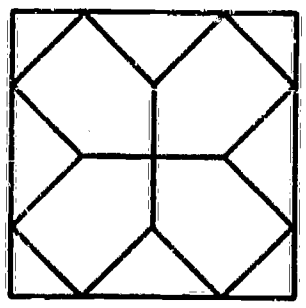
DO NOT TURN THIS PAGE UNTIL ASKED TO DO SO.

Developed under NIMH Contract M-4186

Part 1 (10 minutes)

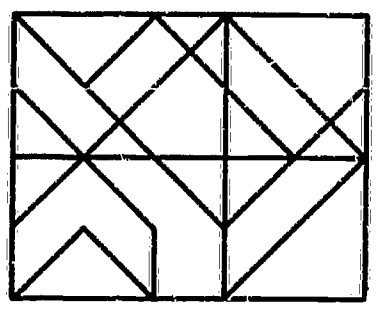


1.



A B C D E

2.



A B C D E

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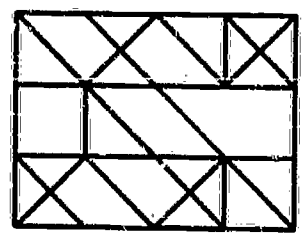

A B C D E

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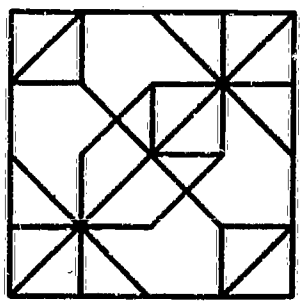
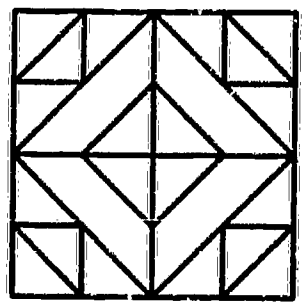


A B C D E

5.



A B C D E

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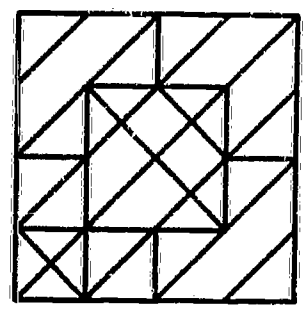
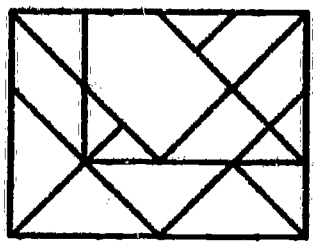


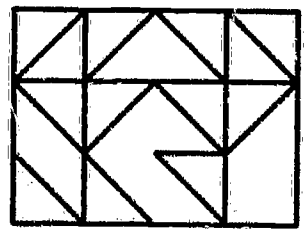
A B C D E

7.



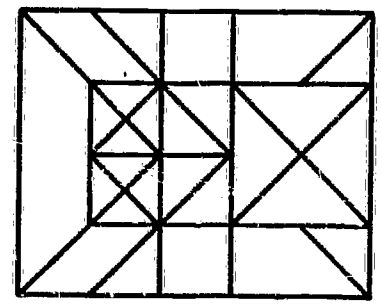
A B C D E

8.



A B C D E

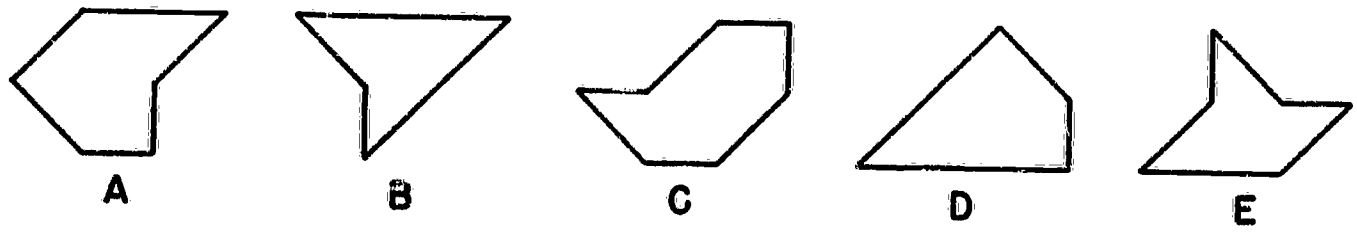
9.



A B C D E

GO ON TO THE NEXT PAGE

Part 1 (continued)



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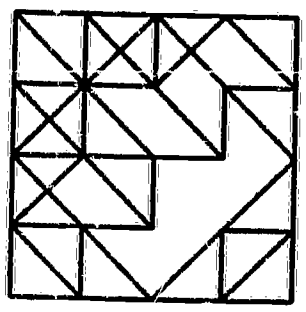
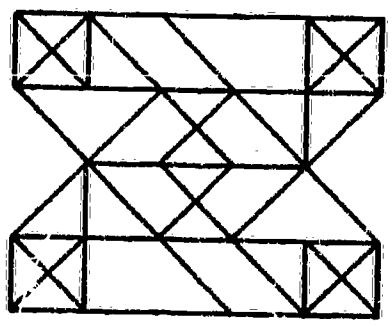


A B C D E

11.



A B C D E

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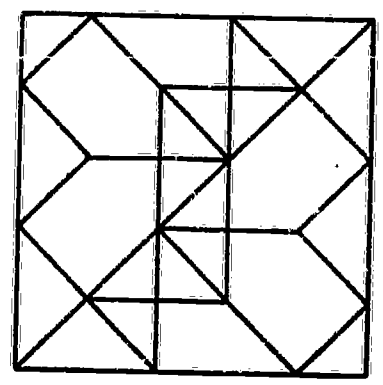

A B C D E

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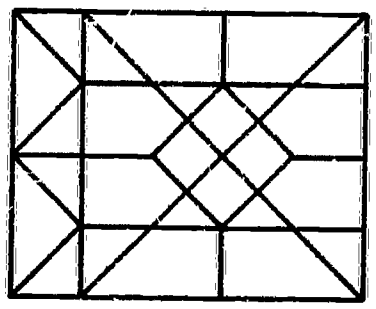

A B C D E

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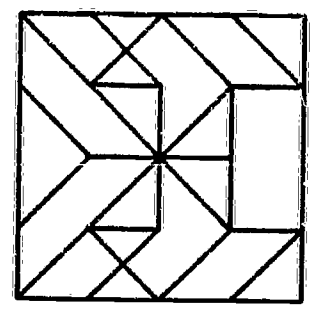

A B C D E

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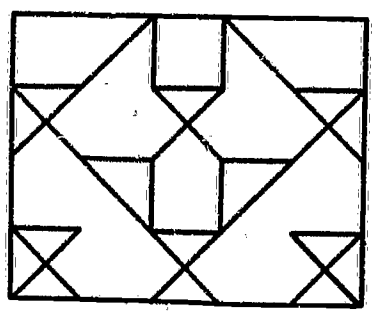
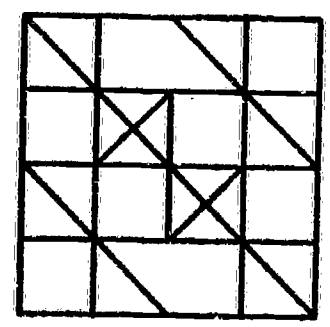


A B C D E

16.

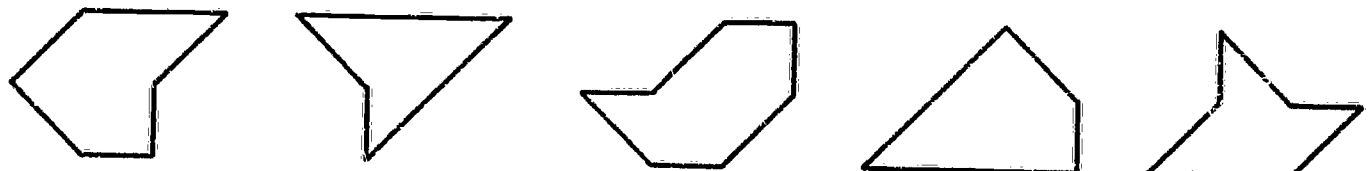


A B C D E

DO NOT TURN THIS PAGE UNTIL ASKED TO DO SO.

STOP.

Part 2 (10 minutes)



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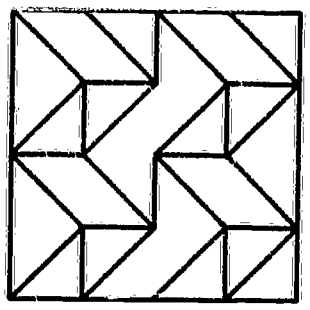

A B C D E

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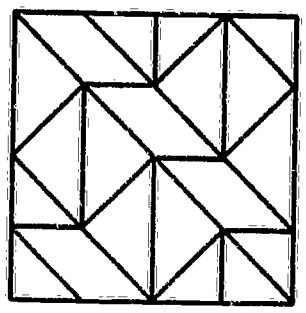

A B C D E

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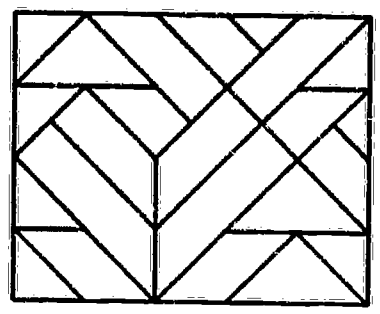

A B C D E

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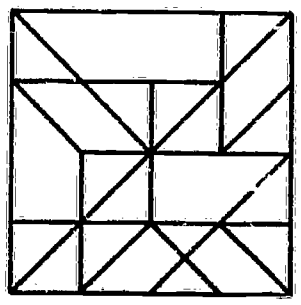
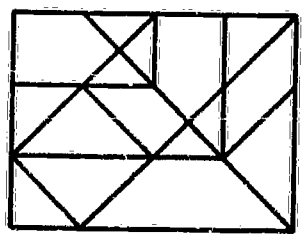


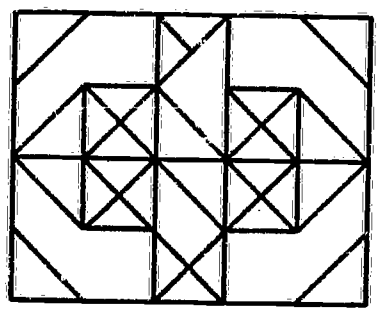
A B C D E

21.



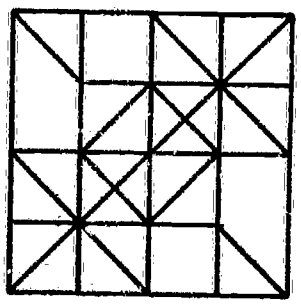
A B C D E

22.



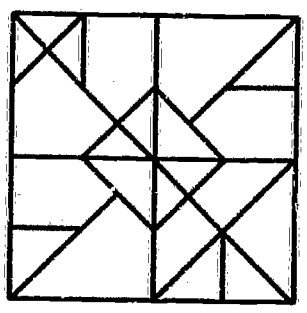
A B C D E

23.



A B C D E

24.



A B C D E

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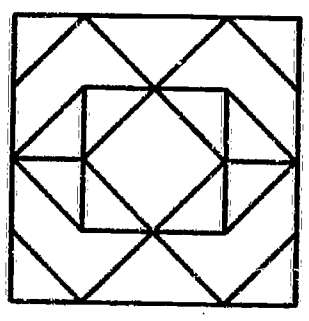
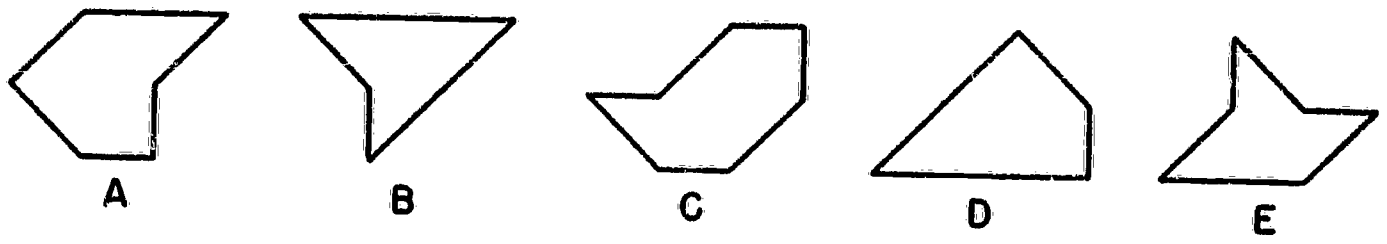


A B C D E

GO ON TO THE NEXT PAGE

Part 2 (continued)



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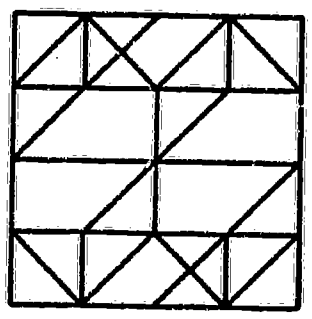

A B C D E

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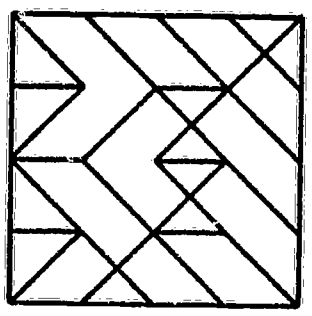
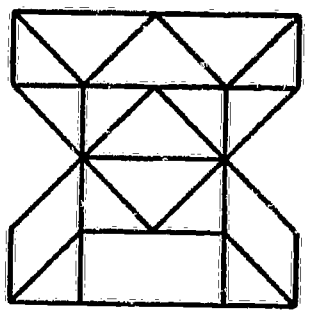


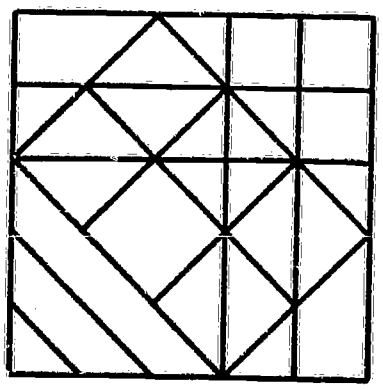
A B C D E

28.



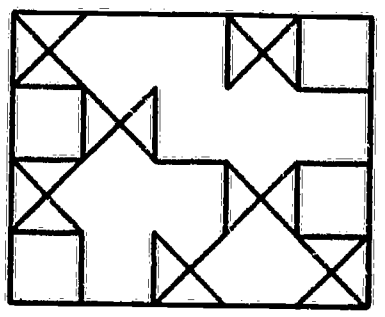
A B C D E

29.



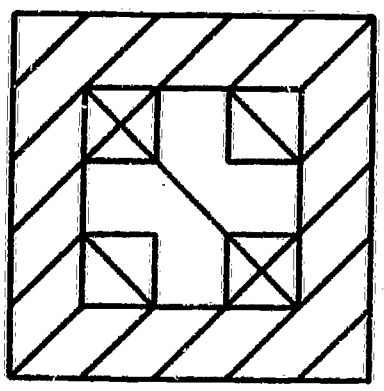
A B C D E

30.



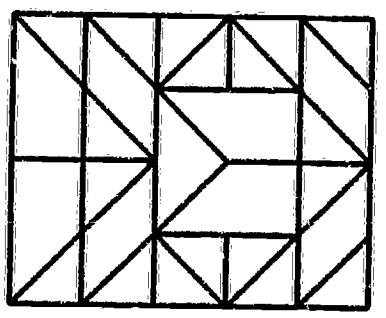
A B C D E

31.



A B C D E

32.



A B C D E

DO NOT GO BACK TO PART 1, AND
DO NOT GO ON TO ANY OTHER TEST UNTIL ASKED TO DO SO.

STOP.

Name _____

SIMILE INTERPRETATIONS--Fe-2

Often in writing or speaking we can express ourselves more clearly and with more interest if we use comparisons of our topic with something else. For example, in discussing a woman's beauty, we can compare it to the autumn season. There are many possibilities.

SAMPLE ITEM:

A woman's beauty is like the autumn because

a. it passes before it can be fully appreciated.

b. it is enhanced by many changes of dress and color.

c. it can be enjoyed with the eyes.

d. _____

In this test you will be given incomplete sentences such as the one above. Your task will be to complete each sentence in several different ways.

There are two parts to this test with two items in each part. You will have 2 minutes for each part.

If you have questions, ask them now.

DO NOT TURN THIS PAGE UNTIL ASKED TO DO SO

This test was prepared under U. S. Government Contract N6onr-23810.

PART I (2 minutes)

1. Drinking is like skiing because

a. _____

b. _____

c. _____

d. _____

e. _____

f. _____

2. A baby is like tomorrow because

a. _____

b. _____

c. _____

d. _____

e. _____

f. _____

DO NOT TURN THIS PAGE UNTIL ASKED TO DO SO

STOP

PART II (2 minutes)

3. Life is like riding a tiger because

a. _____

b. _____

c. _____

d. _____

e. _____

f. _____

4. Experience is like playing cards because

a. _____

b. _____

c. _____

d. _____

e. _____

f. _____

DO NOT TURN BACK TO PART I AND

DO NOT GO ON TO ANY OTHER TEST UNTIL ASKED TO DO SO.

STOP.

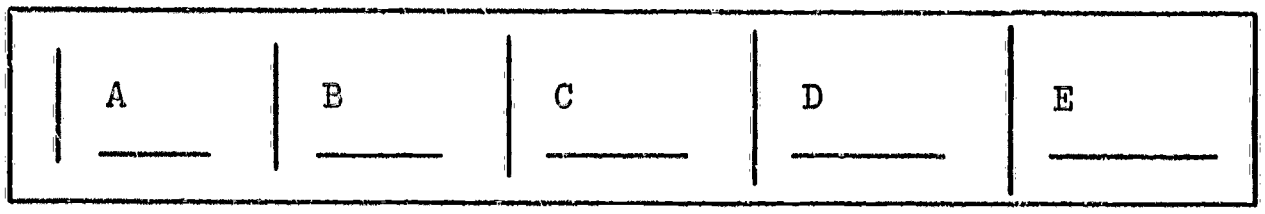
Name: _____

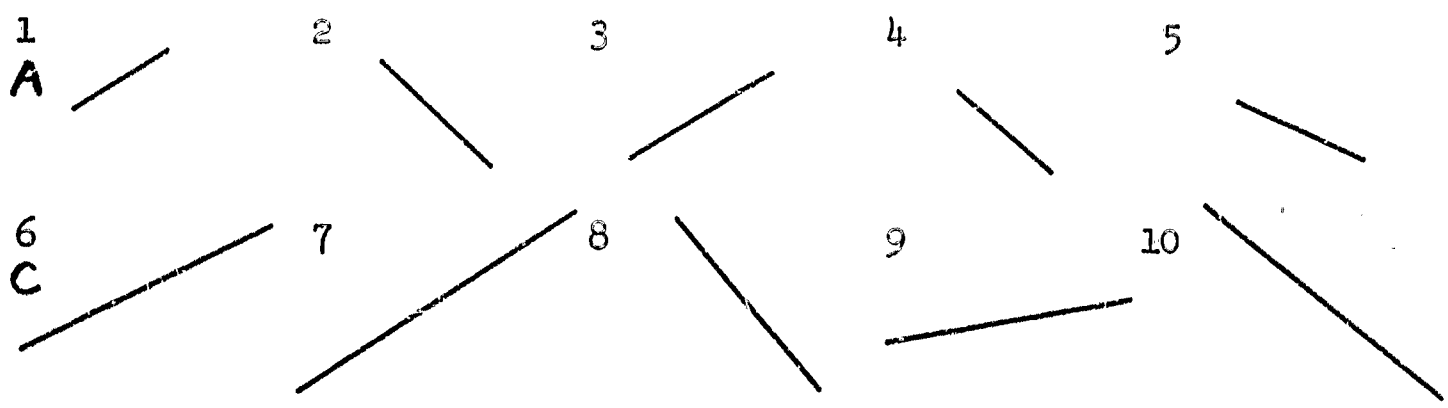
ESTIMATION OF LENGTH TEST – Le-1

This is a test of your ability to compare lengths of lines by eye. Shown below is a box containing 5 pairs of lines of differing lengths marked A, B, C, D, and E. Each pair consists of a vertical and a horizontal line of the same length. The lines marked A are the shortest and those marked E are the longest. (Both vertical and horizontal lines are shown in the box because some people think that 2 lines of the same length look different lengths when one is vertical and the other is horizontal.)

Below the box of lines are two rows of test lines numbered from 1 to 10. The lines in the first row are the <u>same length</u> as ones in the box. The lines in the second row are <u>twice as long</u> as ones in the box. Beneath the number for each test line write the <u>letter</u> of the line which is the <u>same length</u> or <u>half as long</u> as the test line. Measure the lines with your eyes. Do not use your fingers or your pencil.

Now try the practice items. The correct letter has been written beneath the number of the first item in each row.





The answers to the other practice items are as follows:

2 - D ; 3 - E ; 4 - B ; 5 - C ;
7 - E ; 8 - A ; 9 - B ; 10 - D .

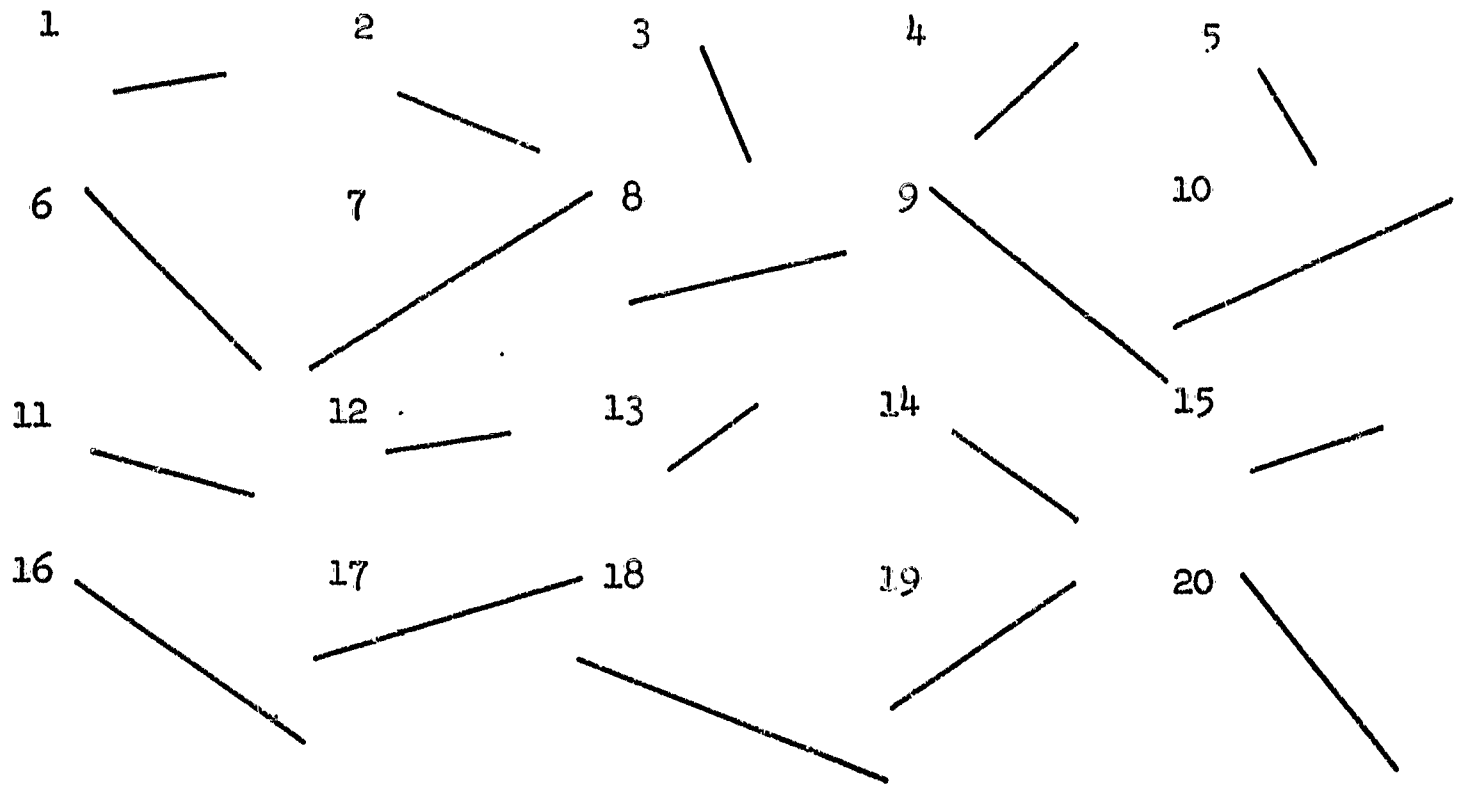
On the test, be sure to work across each row and do not skip any rows. Remember, you should measure the lines with your <u>eyes</u>. Do <u>not</u> use your fingers or your pencil.

Your score on this test will be the number marked correctly minus a fraction of the number marked incorrectly. Therefore, it will <u>not</u> be to your advantage to guess unless you are able to eliminate one or more of the answer choices as wrong. Work as quickly as you can without sacrificing accuracy.

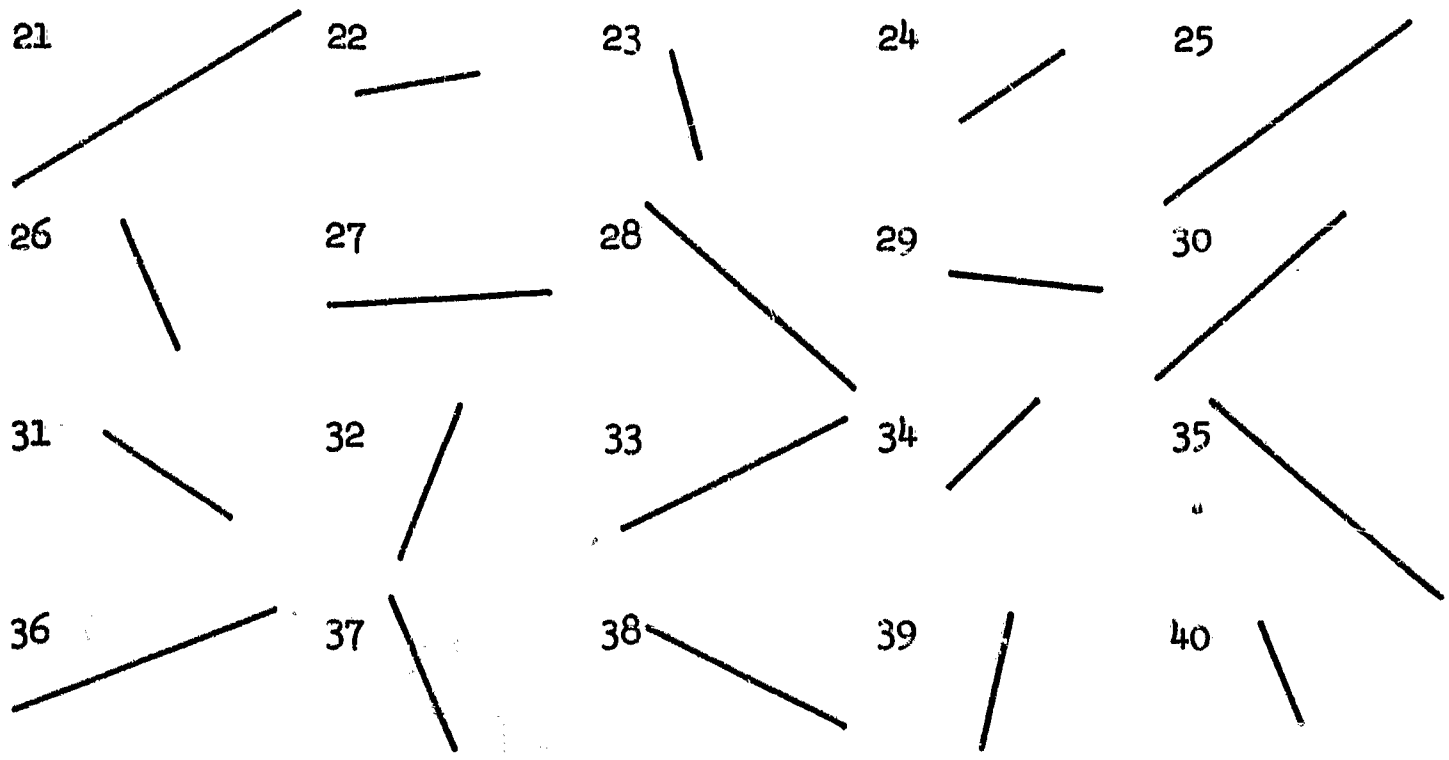
You will have <u>3 minutes</u> for each of the two parts of this test. Each part has 1 page. When you have finished Part 1, STOP Please do not go on to Part 2 until you are asked to do so.

DO NOT TURN THIS PAGE UNTIL ASKED TO DO SO.

Part 1 (3 minutes)



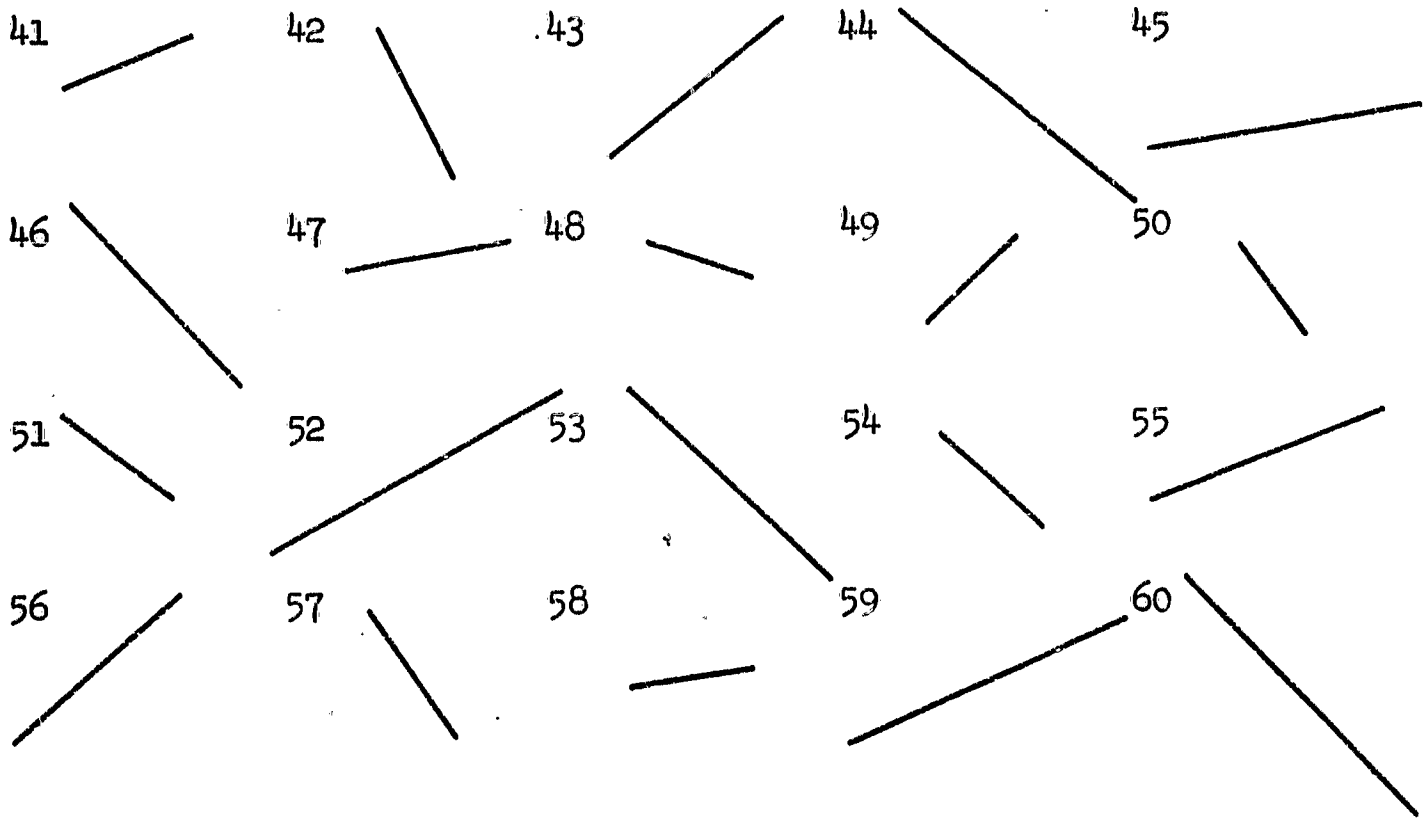
A	B	C	D	E



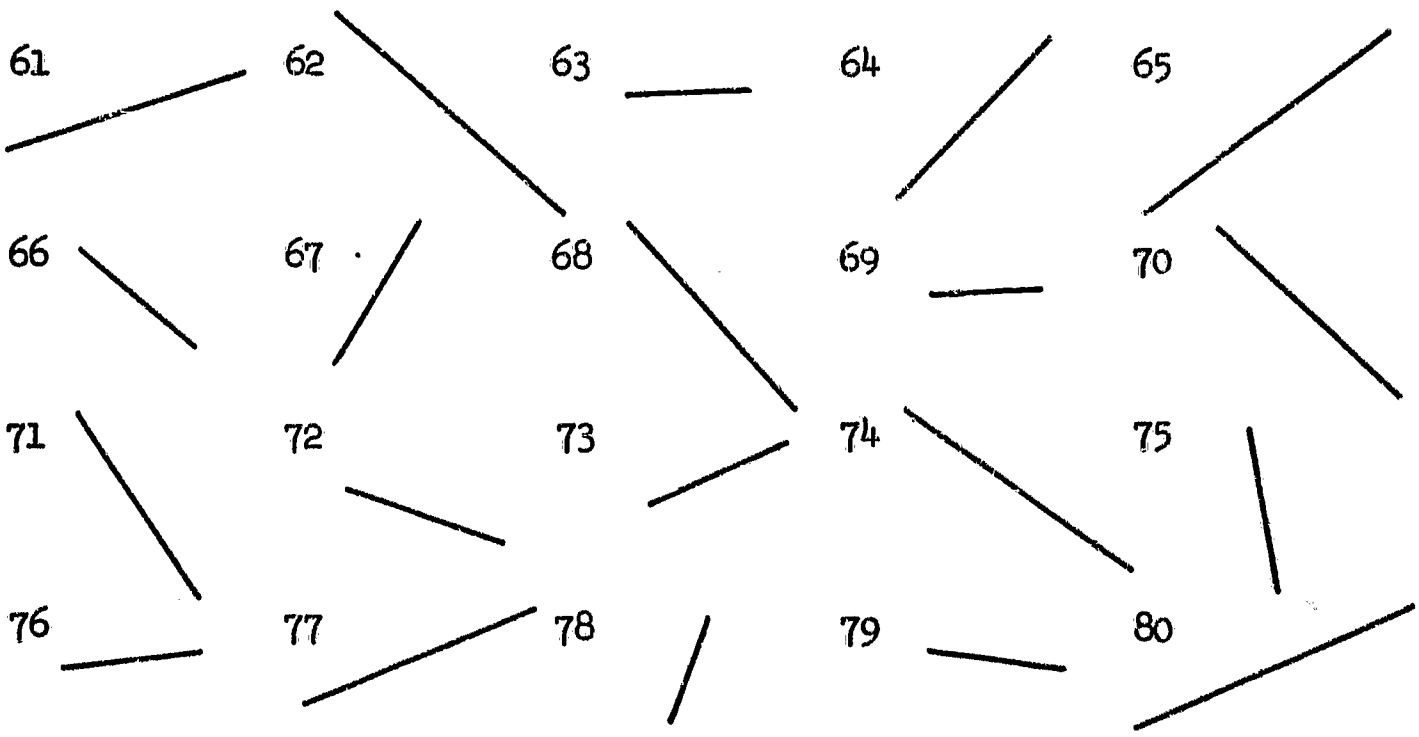
DO NOT GO ON TO THE NEXT PAGE UNTIL YOU ARE ASKED TO DO SO.

STOP

Part 2 (3 minutes)



A	B	C	D	E



DO NOT GO BACK TO PART 1, AND

DO NOT GO ON TO ANY OTHER TEST UNTIL YOU ARE ASKED TO DO SO.

STOP

Name _____

SYMBOL PRODUCTION--O-2

This is a test of your ability to devise a set of symbols to represent some situation. Symbols are brief representations of ideas; these ideas may be concrete, such as objects, or more abstract, such as actions. In the test, activities and objects will be given and your task will be to set down symbols of your own design to represent the activities and objects. Look at the example below:

Ring the **bell**
(1) (2)

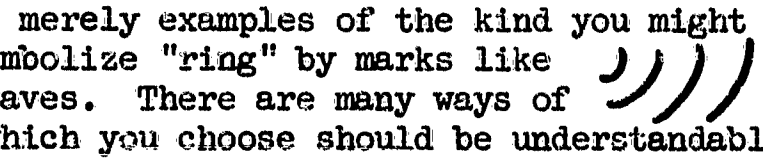
Open the **door**
(3) (4)

Look into the **room**
(5) (6)

Close the **window**
(7) (8)

(1) 	(2) 
(3) 	(4) 
(5) 	(6) 
(7) 	(8) 

The words underlined above are numbered and symbols were drawn in the corresponding numbered squares at the right-hand side of the page.

The symbols you see above are merely examples of the kind you might make. For instance, you might want to symbolize "ring" by marks like  because they remind you of sound waves. There are many ways of representing things, but the way which you choose should be understandable. Your symbols should get ideas across to other people. Usually, it is some important property of the thing symbolized that is used. In devising a symbol, ask yourself the question "Can I point out very quickly to someone else why I chose this symbol?" Use as few lines as possible in drawing a symbol. A detailed picture is more than a symbol and is not what is called for.

In the test itself you will be given statements of activities similar to those above. You are to write symbols of <u>your own</u>. You are <u>not</u> to use letters, numbers, or the symbols of the example above in your answers. Do <u>not</u> draw stick-figures or cartoon figures performing actions, but try to symbolize the actions themselves.

Work as rapidly as you can; do not spend too much time on any one symbol. If you have difficulty in thinking of a symbol, leave it and return later if you have time. Your score will depend on the number of good symbols you give.

The test is divided into two parts; you will be allowed 5 minutes per part. Are there any questions?

DO NOT TURN THIS PAGE UNTIL ASKED TO DO SO

This test was prepared under U. S. Government Contract N6onr-23810.

PART I (5 minutes)

Symbolize the underlined words:

Airplane takes off
(1) (2)

Rowing against current
(3) (4)

Pull ship into harbor
(5) (6)

Man sells picture to art shop
(7) (8)

Entire structure is disassembled
(9) (10) (11)

Put heater on the floor
(12) (13) (14)

Push signal for elevator
(15) (16) (17)

(1)	(2)	
(3)	(4)	
(5)	(6)	
(7)	(8)	
(9)	(10)	(11)
(12)	(13)	(14)
(15)	(16)	(17)

GO ON TO THE NEXT PAGE

PART I (Continued)

Assemble parts
(18) (19)

Thunderstorm damages plane
(20) (21)

Horse trips and throws rider
(22) (23) (24)

Man walks along shore
(25) (26)

Search for a clue
(27) (28)

Artist paints from memory
(29) (30) (31)

(18)	(19)	
(20)	(21)	
(22)	(23)	(24)
(25)	(26)	
(27)	(28)	
(29)	(30)	(31)

DO NOT TURN THIS PAGE UNTIL ASKED TO DO SO

STOP

Part II (5 minutes)

Symbolize the underlined words:

Unload (1) on platform (2)

Reject (3) as unsuitable (4)

Weigh (5) the problem (6) thoroughly (7)

Man takes (8) prize (9)

Guards (10) fall out (11)

Pilot falls asleep (12) and loses control (13)

Man leaves (14) and feels depressed (15)

(1)	(2)
(3)	(4)
(5)	(6)
(7)	
(8)	(9)
(10)	(11)
(12)	(13)
(14)	(15)

GO ON TO THE NEXT PAGE

PART II (Continued)

Compare (16) wires for thickness (17)

Man travels (18) to the city (19)

Back up (20) to curb (21)

Descend (22) to basement (23)

Musician plays (24) (25) solo (26)

Finish (27) eating (28)

Steal (29) affections (30)

(16)	(17)	
(18)	(19)	
(20)	(21)	
(22)	(23)	
(24)	(25)	(26)
(27)	(28)	
(29)	(30)	

DO NOT GO BACK TO PART I AND
DO NOT GO ON TO ANY OTHER TEST UNTIL ASKED TO DO SO.

STOP.

Name _____

OBJECT SYNTHESIS--Re-2

In each of the following items you will be given two objects. Your task is to tnink of something you could make by combining the two objects. For example:

Given: Nail and a cane _____ ?

You could make a paper picker or a spear as the result of one way of combining the objects. You could make a hook, if the objects were combined in another way.

Given: Volley ball steel spring *punching bag*

One answer that might serve has been written in the answer space above.

The objects given should be sufficient in themselves to make the new object. You should not use objects other than those stated. Be sure to use both of the original objects in making the new object.

The test is divided into two parts of 12 items each. You will be allowed 5 minutes for each part. Only one answer is required for each item. Work rapidly. If you have trouble with any item, go on to the next one. You may come back to those not answered if time permits, but do not return to Part I after starting on Part II.

Are there any questions?

DO NOT TURN THIS PAGE UNTIL ASKED TO DO SO

This test was prepared under U. S. Government Contract N6onr-23810.

PART I (5 minutes)

1.	sheet of paper	glue	_____
2.	push broom	coat	_____
3.	clamshells	shoelace	_____
4.	paper clip	playing card	_____
5.	wire coat hanger	newspaper	_____
6.	rubber band	oak leaf	_____
7.	manhole cover	chain	_____
8.	wire	powder puff	_____
9.	needle	clothes pin	_____
10.	wire coat hanger	rock	_____
11.	brick	dish towel	_____
12.	rubber sponge	screw	_____

DO NOT TURN THIS PAGE UNTIL ASKED TO DO SO

STOP

PART II (5 minutes)

13.	screwdriver	rag	_____
14.	pliers	shoestring	_____
15.	cellophane	candle	_____
16.	hairpin	button	_____
17.	golf club	necktie	_____
18.	safety pin	string	_____
19.	inner tube	barrel	_____
20.	key chain	stick	_____
21.	cork	spring	_____
22.	cotton	scissors	_____
23.	window pane	tin foil	_____
24.	thread spool	nail	_____

DO NOT GO BACK TO PART I AND

DO NOT GO ON TO ANY OTHER TEST UNTIL ASKED TO DO SO.

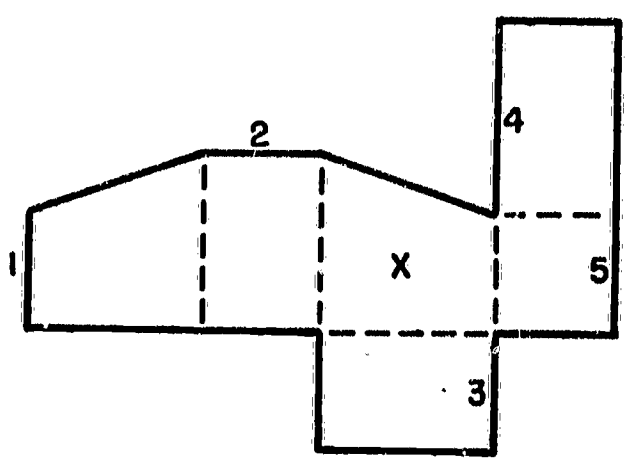
STOP.

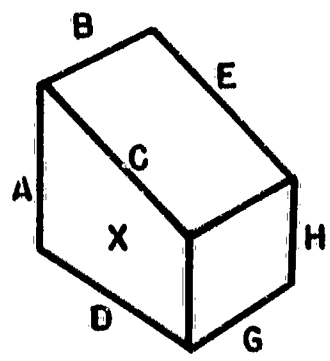
Name: _____

SURFACE DEVELOPMENT TEST — Vz-3

In this test you are to try to imagine or visualize how a piece of paper can be folded to form some kind of object. Look at the two drawings below. The drawing on the left is of a piece of paper which can be folded on the dotted lines to form the object drawn at the right. You are to imagine the folding and are to figure out which of the lettered edges on the object are the same as the numbered edges on the piece of paper at the left. Write the letters of the answers in the numbered spaces at the far right.

Now try the practice problem below. Numbers 1 and 4 are already correctly marked for you.





1: H
2:
3:
4: C
5:

NOTE: The side of the flat piece marked with the X will always be the same as the side of the object marked with the X. Therefore, the paper must always be folded so that the X will be on the outside of the object.

In the above problem, if the side with edge 1 is folded around to form the back of the object, then edge 1 will be the same as edge H. If the side with edge 5 is folded back, then the side with edge 4 may be folded down so that edge 4 is the same as edge C. The other answers are as follows: 2 is B; 3 is G; and 5 is H. Notice that two of the answers can be the same.

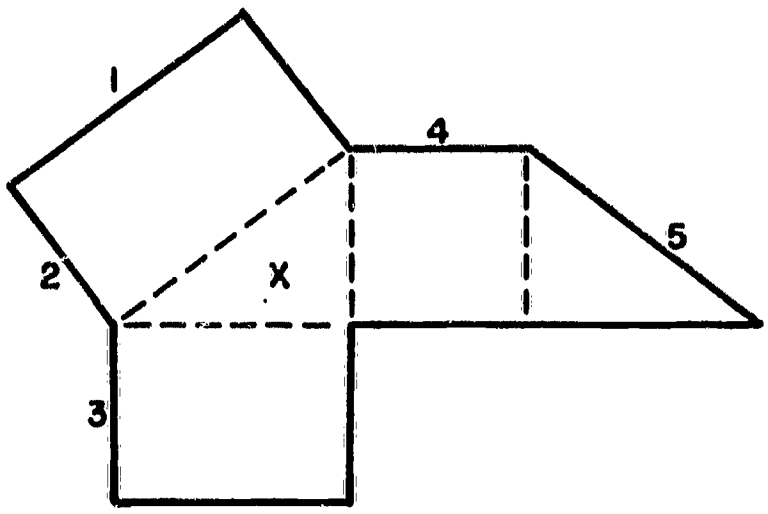
Your score on this test will be the number of correct letters minus a fraction of the number of incorrect letters. Therefore, it will not be to your advantage to guess unless you are able to eliminate one or more of the answer choices as wrong.

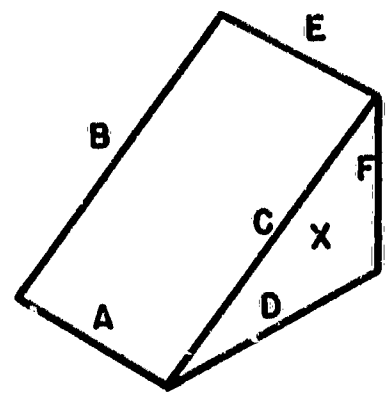
You will have 6 minutes for each of the two parts of this test. Each part has 2 pages. When you have finished Part 1 (pages 2 and 3), STOP. Please do not go on to Part 2 until you are asked to do so.

DO NOT TURN THIS PAGE UNTIL ASKED TO DO SO.

Part 1 (6 minutes)

1





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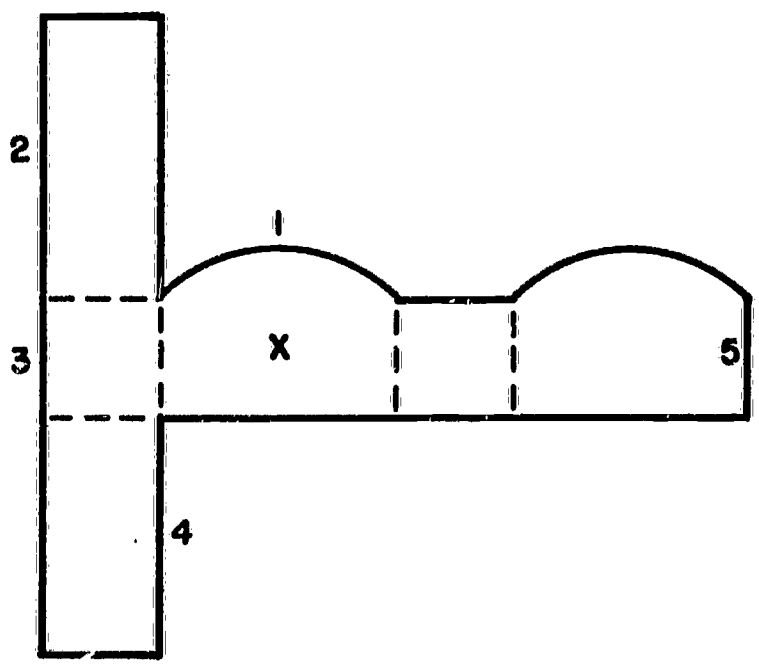

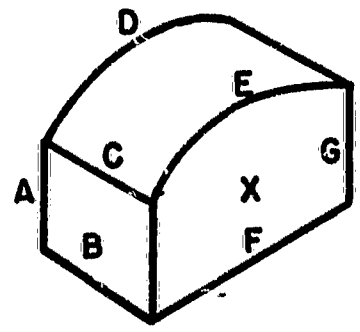

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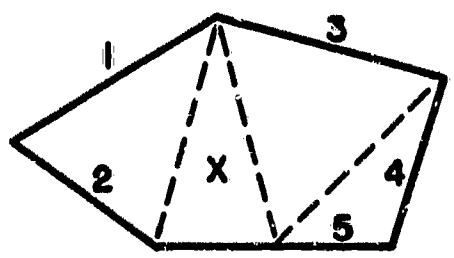

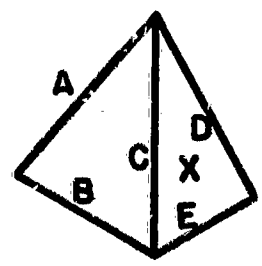

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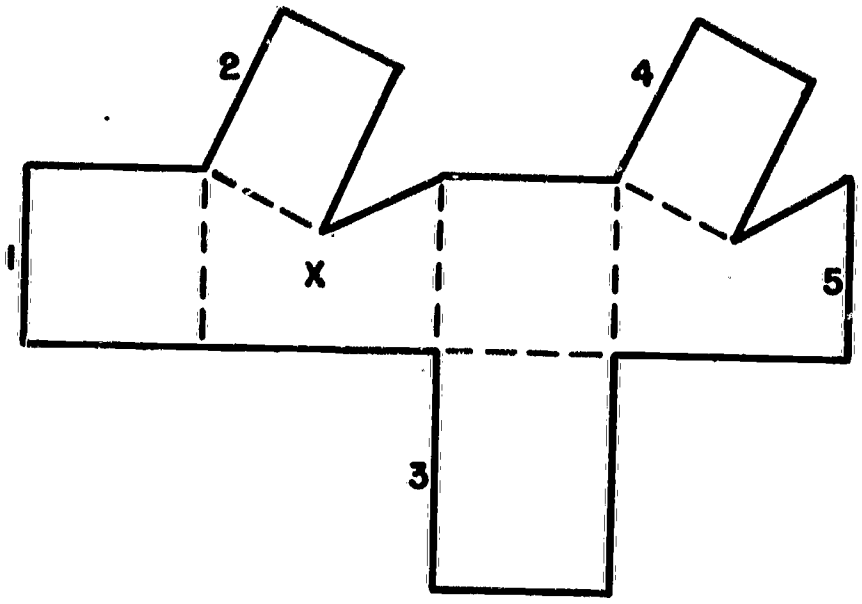
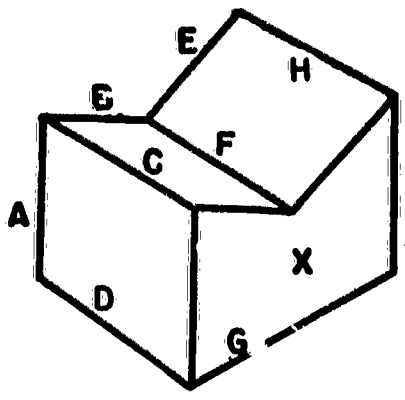
GO ON TO THE NEXT PAGE

Part 1 (continued)

4





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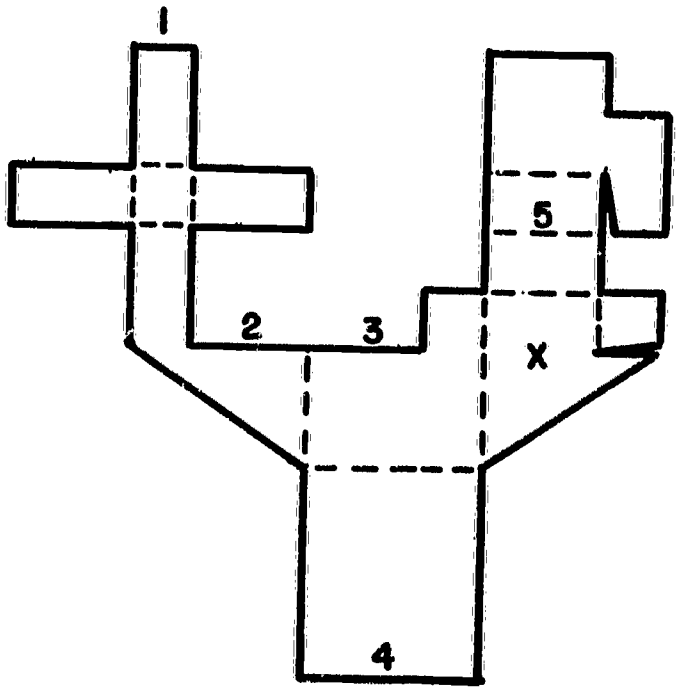

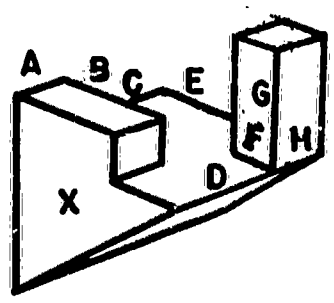

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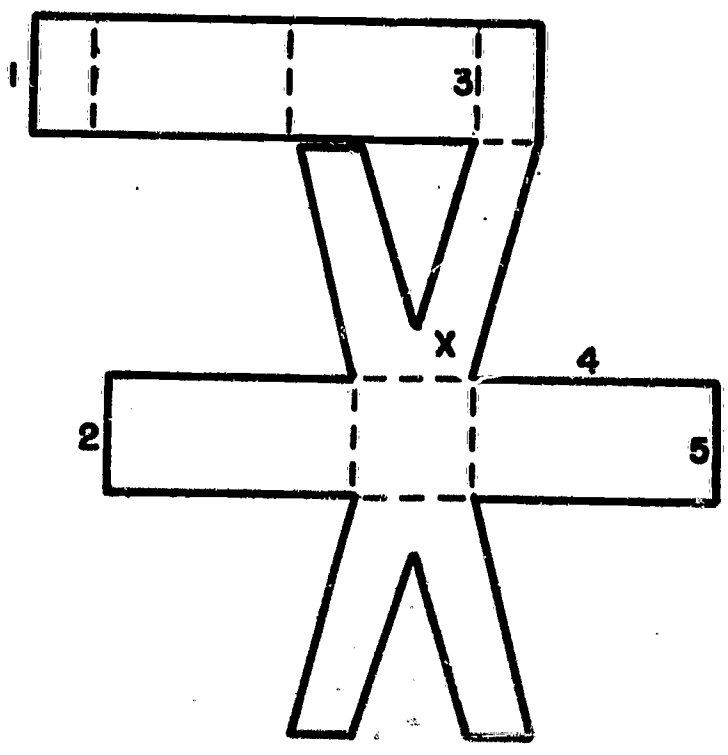

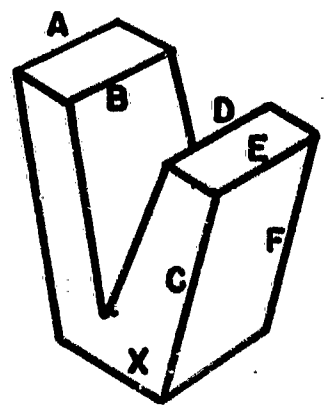

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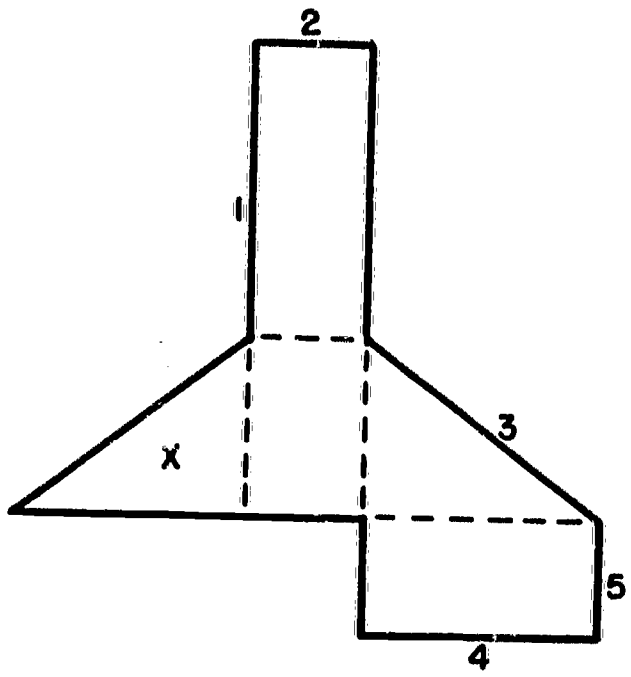
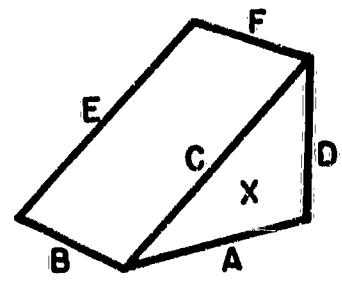
DO NOT GO ON TO THE NEXT PAGE UNTIL ASKED TO DO SO.

STOP.

Part 2 (6 minutes)

7





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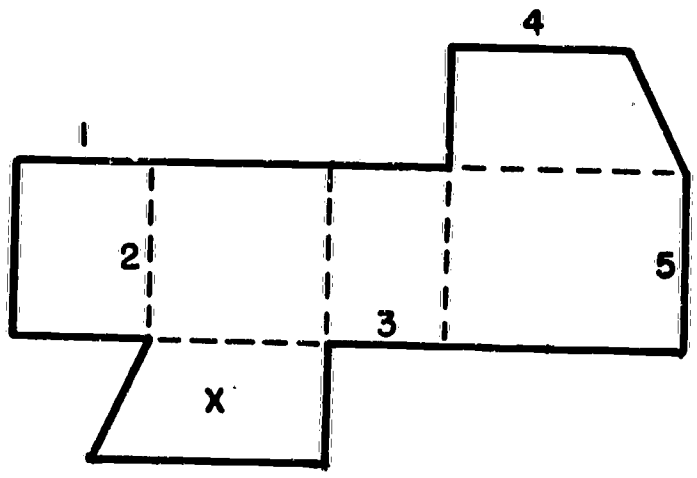

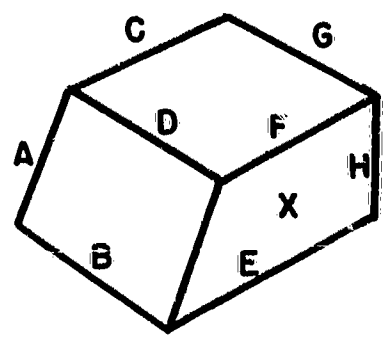

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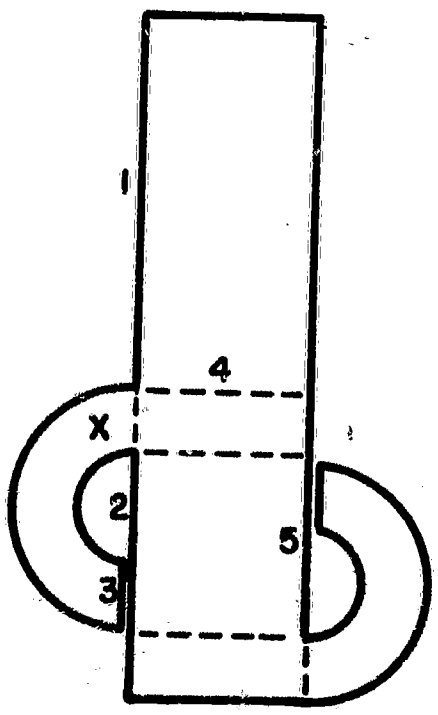

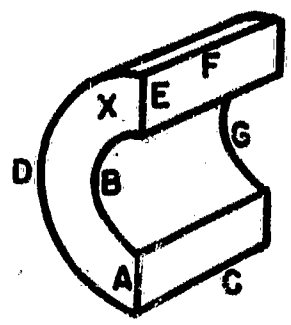

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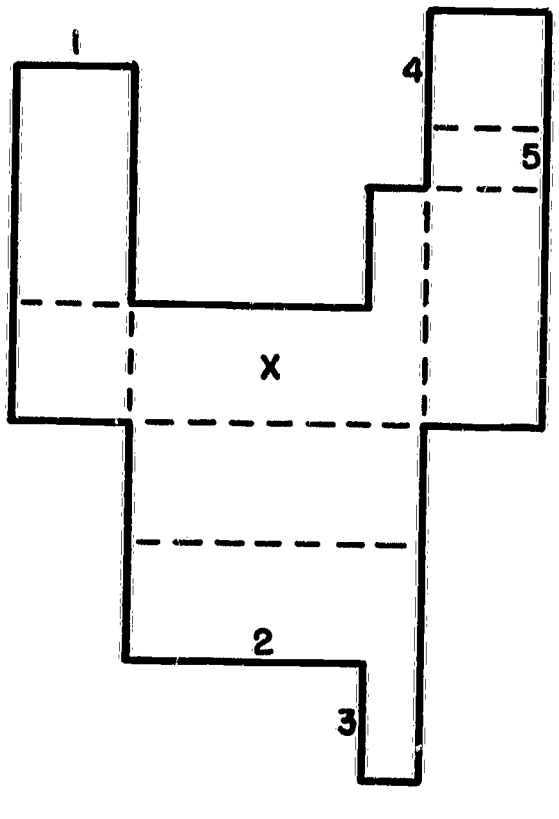
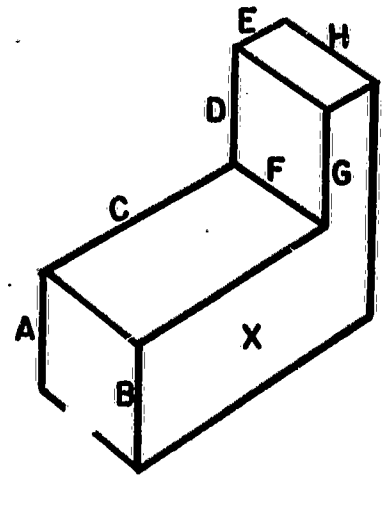
Part 2 (continued)

10





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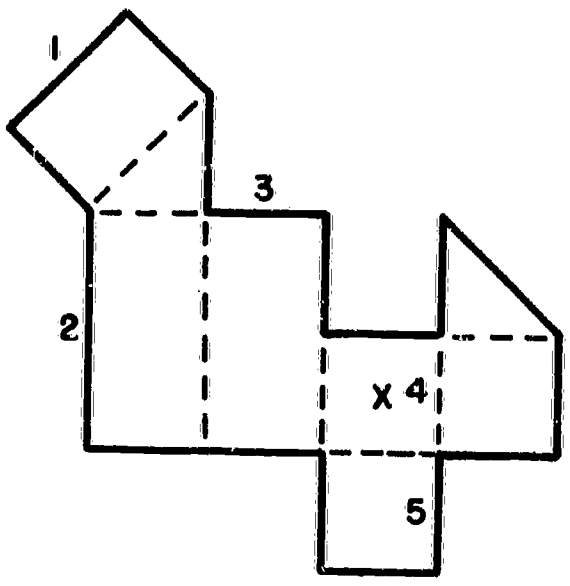

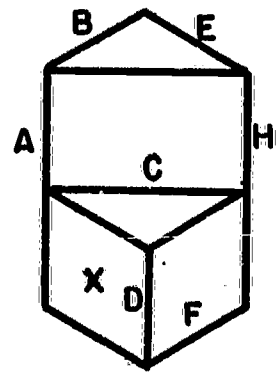

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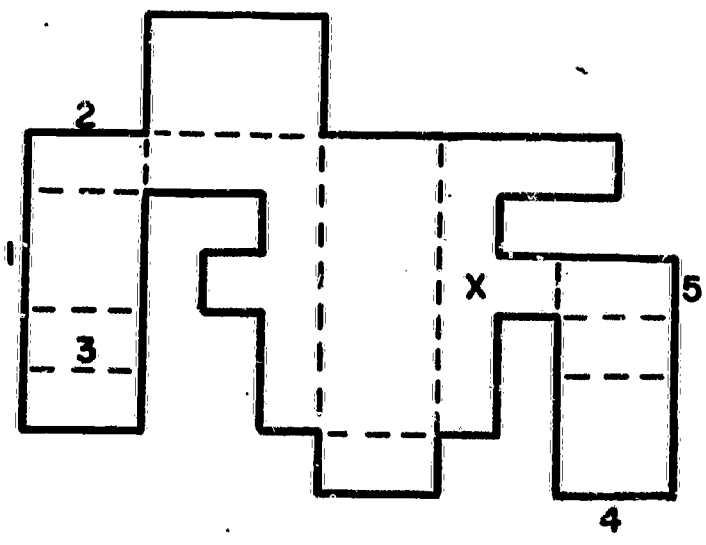

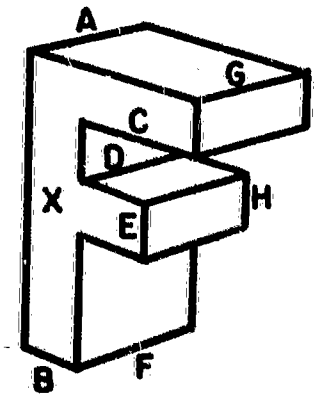

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DO NOT GO BACK TO PART 1, AND

DO NOT GO ON TO ANY OTHER TEST UNTIL ASKED TO DO SO.

STOP.

MATCH PROBLEMS

Form A

Raymond M. Berger and J. P. Guilford

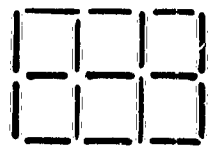
NAME _____ SEX: M___ SCORES:
(Print) Last First Middle F___ Part I _____
Part II _____
GROUP _____ DATE _____ Total _____

In this test you will see drawings of headless matches laid out in patterns. You are to remove some of the matches so that the ones left form new patterns.

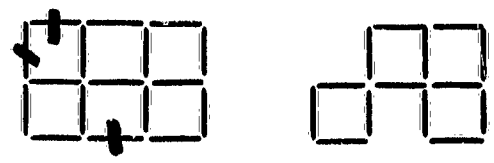
Look at this example:

TAKE AWAY 3 MATCHES
LEAVING 4 SQUARES

Given



Solution A



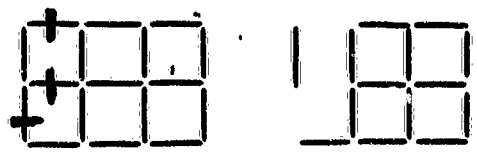
Your instructions for each item appear at the left. The drawing under "Given" presents the pattern of squares with which you start. To indicate a solution, mark through the matches you want removed. In the example, the solution marked would look like the pattern at the extreme right if the matches were actually removed. Note that only complete squares are left.

The attempt below is not an acceptable solution.

TAKE AWAY 3 MATCHES
LEAVING 4 SQUARES

Given

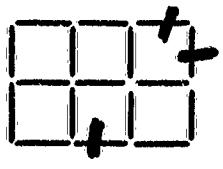
Wrong



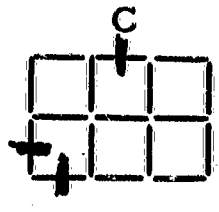
This attempt is wrong because it leaves two matches that are not parts of the required four squares. You must remove matches so that exactly the required number of complete squares remain, with no matches left over.

In this test you will add to your score by giving additional different solutions to each problem. Here are some other possible ways of doing the same problem.

B

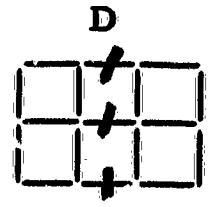


C



Notice that B and C use the same rule as solution A in the first example—two matches from a corner and the middle match from the opposite side. In getting really different solutions you apply different rules. Here B and C would not be counted.

D



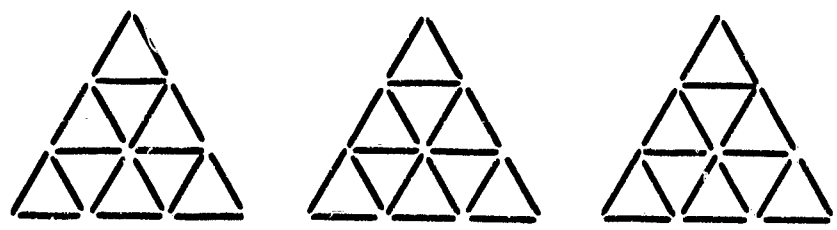
D uses a rule different from that in A, and also meets the instruction that all matches remaining are parts of remaining squares, so D is counted as a second acceptable solution.

GO TO THE NEXT PAGE FOR FURTHER INSTRUCTIONS.

(Instructions continued)

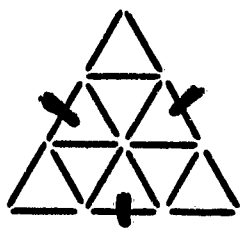
Here is another problem, this time using triangles. Try to find three different solutions.

TAKE AWAY 3 MATCHES
LEAVING 6 TRIANGLES

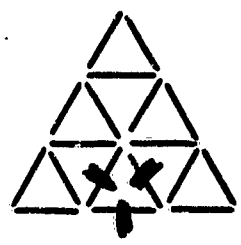


Three solutions are shown below. Notice especially that each solution is in some way a pattern different from the others. All the triangles are complete, no matches being left over.

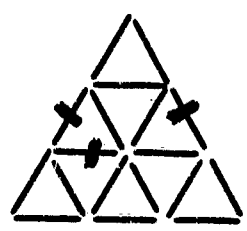
E

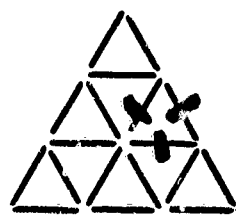
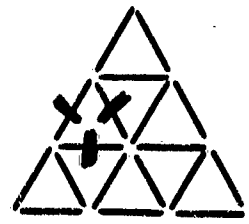


F



G



Suppose you had given solution F and also  or 

You would not be given credit for either additional solution since the pattern is the same as for F. Patterns must be different in order to receive credit.

There are two parts to this test, with 5 problems in each part. You are to find different solutions to each problem.

You will be allowed 7 minutes per part. Work rapidly. If you have difficulty with one problem, go on to the others and return later if time permits. Use a pencil. If you wish to change a solution, erase completely the marks you want to remove.

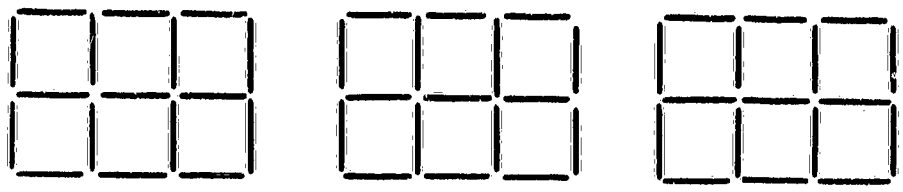
If you have questions, ask them now.

STOP HERE. WAIT FOR FURTHER INSTRUCTIONS.

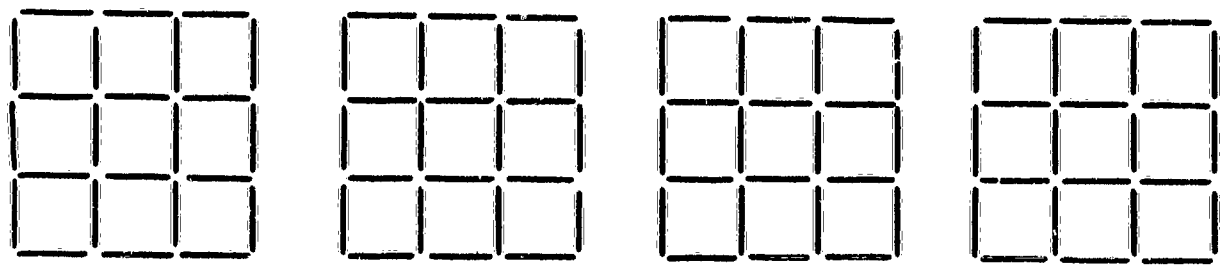
PART I

GIVE DIFFERENT SOLUTIONS FOR EACH PROBLEM.

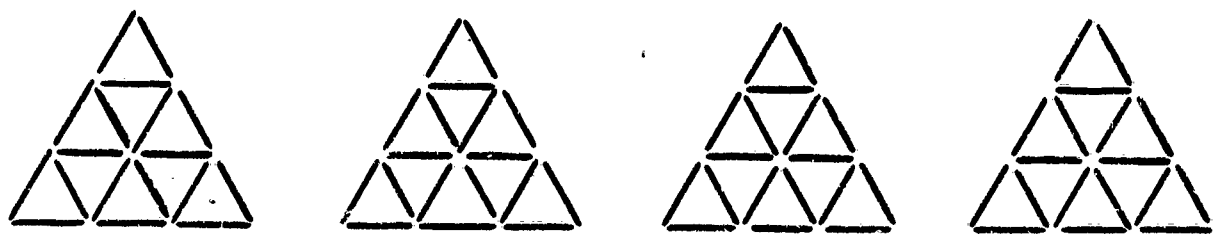
1. TAKE AWAY 7 MATCHES LEAVING 3 SQUARES



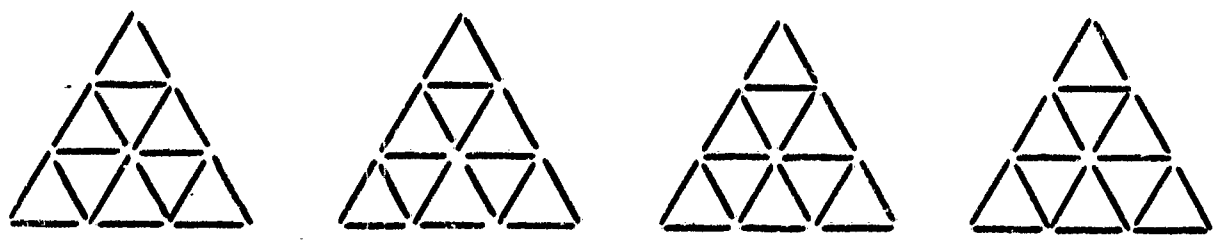
2. TAKE AWAY 6 MATCHES LEAVING 6 SQUARES



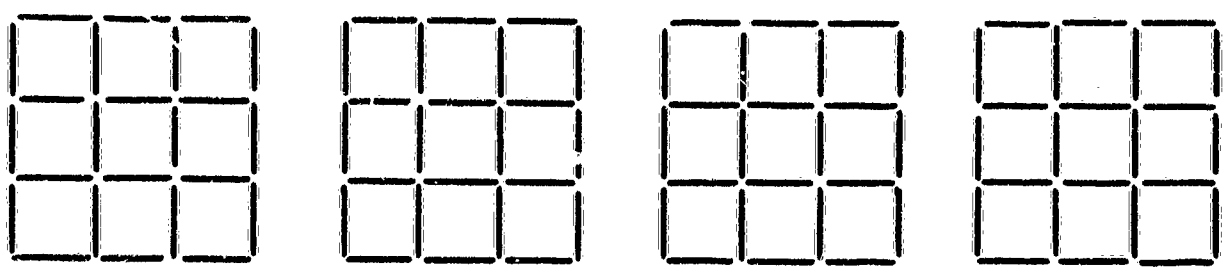
3. TAKE AWAY 5 MATCHES LEAVING 6 TRIANGLES



4. TAKE AWAY 7 MATCHES LEAVING 4 TRIANGLES



5. TAKE AWAY 8 MATCHES LEAVING 5 SQUARES

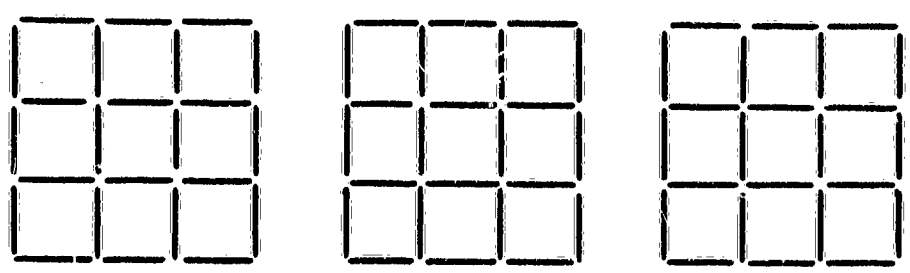


STOP HERE. WAIT FOR FURTHER INSTRUCTIONS.

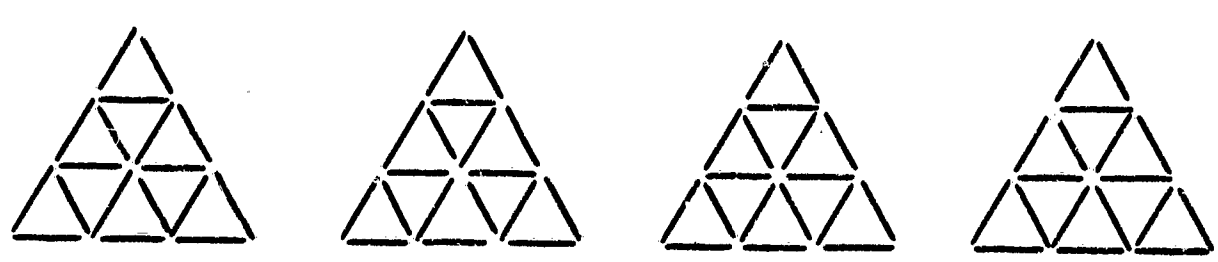
PART II

GIVE DIFFERENT SOLUTIONS FOR EACH PROBLEM.

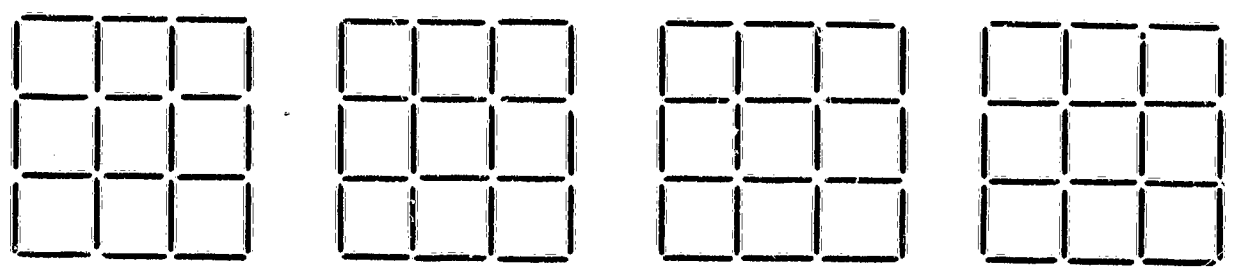
6. TAKE AWAY 4 MATCHES LEAVING 7 SQUARES



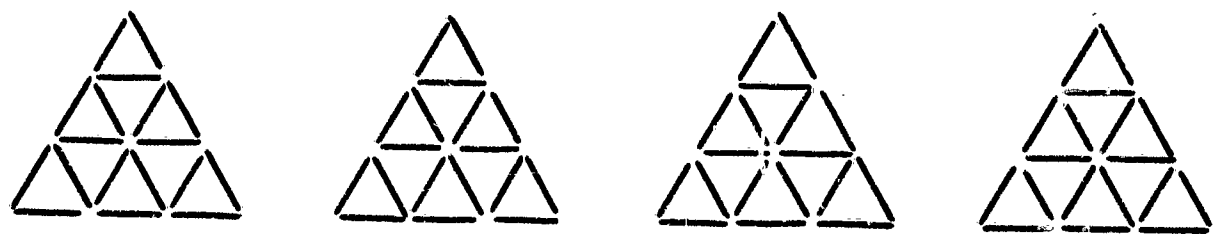
7. TAKE AWAY 6 MATCHES LEAVING 5 TRIANGLES



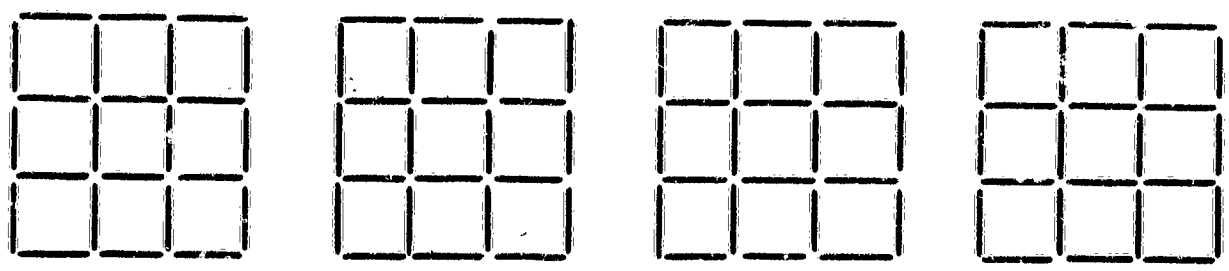
8. TAKE AWAY 5 MATCHES LEAVING 6 SQUARES



9. TAKE AWAY 8 MATCHES LEAVING 4 TRIANGLES



10. TAKE AWAY 7 MATCHES LEAVING 5 SQUARES



STOP HERE. WAIT FOR FURTHER INSTRUCTIONS.

NAME _____

UTILITY TEST--Xs-1

In this test you are to list as many uses as you can think of for a common object.

Write as rapidly as you can. Give all the uses you can think of. Your answers do not have to be complete sentences. You may use short phrases.

There will be numbered lines on which to write. Use one line for each answer. When the signal is given (not yet) turn the page, read the name of the object and the example, then list all the uses of the object that you can think of.

There are two parts in this test. You will have 5 minutes for each part. No questions will be answered.

STOP HERE. WAIT FOR FURTHER INSTRUCTIONS.

This test was prepared under U. S. Government Contract N6onr-23810.

Part I (5 minutes)

List as many uses as you can think of for a brick.
Write each use on a separate line.

Example: build a house.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____
21. _____
22. _____
23. _____
24. _____
25. _____

STOP HERE. WAIT FOR FURTHER INSTRUCTIONS.

Part II (5 minutes)

List as many uses as you can think of for a wooden pencil.
Write each use on a separate line.

Example: write a letter.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____
21. _____
22. _____
23. _____
24. _____
25. _____

STOP HERE. WAIT FOR FURTHER INSTRUCTIONS.

School Ability Test

Cooperative Test Division • Educatio

Form 2B

General Directions

This is a test of some of the skills you have been learning ever since you first entered school. You should take it in the same way that you would work on any other new and interesting assignment.

The test is divided into four parts, which you will take one at a time. Give each one your close attention and do your best on every question. You probably will find some of the questions quite easy and others more difficult. You are *not* expected to answer every question correctly.

There are a few general rules for taking this test that will help you to earn your best score:

- Work carefully, but do not spend too much time on any one question. It usually is better to answer first all of the questions in the part that you know well and can answer quickly. Then go back to the questions that you want to think about.
- If you work at average speed you will have plenty of time to read and answer all of the questions. By leaving until last the questions that are most difficult, you will make best use of your time.
- You may answer questions even when you are not perfectly sure that your answers are correct. Your score will be the number of correct answers you mark.
- Put *all* of your answers on the answer sheet. This test booklet should not be marked in any way. Your examiner will give you an extra sheet of scratch paper to use when you do the number problems.
- Fill in all the information called for on the answer sheet and PRINT your name so that it can be read.
- Make sure that you understand instructions *before* you start work on any part. Ask the examiner to repeat the instructions if you do not understand exactly what you are to do.
- Make your answer marks on the answer sheet heavy and black. If you change your mind about an answer, be sure to erase your first mark completely.

If you give this test your best effort, your score will provide a good estimate of your ability in these important skills.

DIRECTIONS FOR PART I

Each question in Part I consists of a sentence in which one word is missing; a blank indicates where the word has been removed from the sentence. Beneath each sentence are five words, one of which is the missing word. You are to select the missing word by deciding which one of the five words *best* fits in with the meaning of the sentence.

Sample Question

We had worked hard all day so that by evening we were quite

A small **B** tired **C** old
D untrained **E** intelligent

If you understand the sample sentence you will realize that "tired" is the missing word because none of the other words fits in with the meaning of the sentence. Next, on the answer sheet, you find the line numbered the same as the question and blacken the space which has the same letter as the missing word. Because "tired" is the correct word to use in the sample sentence, and its letter is **B**, the space marked **B** on the answer sheet is blackened. See how it has been marked on the answer sheet. Do *not* make any marks in your test booklet.

Do not turn this page until you are told to do so.

PART I / TIME: 15 MINUTES

1 In order not to ( ) what he had to buy he repeated the list as he walked to the store.

A take B carry C forget D change E lose

2 The zoo's present success in keeping hummingbirds alive is due to the discovery of the proper ( ), which contains milk, honey, and vitamin concentrate.

F care G environment H consumption J treatment K diet

3 After they had hidden the treasure they drew a map, and with great ceremony Peter tore it and gave Bobby half; they were almost authentic ( ).

A playmates B pirates C explorers D youngsters E students

4 I have ( ) upon no one and therefore am indebted to no one.

F relied G trod H waited J descended K looked

5 The "Eighth Wonder of the World" has been applied to so many minor scenic wonders that the phrase has become ( ).

A specific B respected C meaningless D timely E exclusive

6 On returning from abroad he looked up his former acquaintances, particularly those he knew to be in ( ), and whose aid he might need.

F residence G retirement H disfavor J power K retreat

7 The final attainment of the successful locomotive was the result of a long series of experiments by many contrivers; Stephenson in 1830 ( ) rather than invented it.

A publicized B evolved C supervised D popularized E perfected

8 Although there were more than fifty printers in the shop, he was ( ) because of his speed.

F distinguished G tired H mediocre J idle K careless

9 One could tell from his ( ) brow that he had banished anger from his thoughts.

A wrinkled B blackened C reddened D furrowed E smoothed

10 Rather than be ( ) we played the game although it didn't interest us.

F busy G bored H idle J contented K friendly

11 It would be difficult to name a field in which a knowledge of human nature and skill in motivating it would not be an important ( ).

A ideal B asset C revelation D incentive E opportunity

12 Among the audience were four kings and seven princes, all attempting to ( ) one another in the splendor of their retinues.

F regale G attract H follow J excel K interest

13 We seem to have an inbred notion that peoples who are below us in latitude are ( ) also in virtue.

A inferior B primitive C narrow D southern E eccentric

14 It was an ( ) rather than an ordinary everyday circumstance.

F illustration G outgrowth H accident J actuality K attitude

15 Always ( ) of the powers of the central government, states'-rights men rejoiced at the whittling down of federal authority.

A students B suspicious C solicitous D admirers E respectful

16 The ( ) man is always dependent upon popular favor.

F educated G successful H just J honest K elected

17 The Eastern factory owners, fearing that migration would make labor scarce and wages high, looked upon the abundance of land open to settlement as a ( ) to themselves.

A reference B mandate C concession D disadvantage E necessity

18 In the South, it had become apparent that profit lay in raising only one staple crop, whereas in the North the crops were ( ).

F cultivated G unified H poor J similar K diversified

Go on to the next page.

19 If virtue were ( ), policemen and jailers would disappear and lawyers would have little or nothing to do.

A admired B necessary C possible
D protected E universal

20 Since he felt that the war was ( ) he ascribed its cause to fate.

F unavoidable G unnecessary H coming
J evil K justified

21 Despite the many bribes they offered him, they did not once succeed in ( ) his integrity.

A discovering B revealing C corrupting
D enhancing E discouraging

22 A fortunate minority of people work at tasks which are in themselves ( ) and are not performed chiefly for the return which they bring.

F useless G necessary H duties
J pleasurable K contributions

23 Some beliefs are obviously false even though there is little evidence to ( ) them.

A disprove B substantiate C clarify
D understand E verify

24 An estimate of the incidence of measles in a community is ( ), not because of poor statistical techniques but because the disease is not well reported.

F variable G unreliable H disturbing
J made K essential

25 The local or state health department has the responsibility in each community of determining when the need is sufficiently great to ( ) dipping into the relatively small reservoir.

A justify B prevent C anticipate
D continue E chance

26 Because of its volume and carrying power, the clavier was the solo instrument most capable of maintaining its ( ) when supported by an accompanying body of strings.

F tempo G individuality H position
J stability K compatibility

27 The frontier settlements, cutting across colonial boundary lines as they did, tended to break down local peculiarities and to lay the foundations of a truly ( ) point of view.

A pioneer B agricultural C general
D national E political

28 There are rumors and highly ( ) suppositions, that the Phoenicians may have sailed as far north as the Baltic, though of course there are no written records or definite traces of any such visits.

F contradictory G plausible
H improbable J legendary K deceptive

29 A writer who has worked years for a magazine which nowadays can pay its authors no more than it did a decade ago, because it has to pay its typographers and shipping men so much more, is not likely to be ( ) about the lot of the man of letters today.

A complacent B biased C uneasy
D concerned E consulted

30 Culture originally meant not the ( ) of cultivation but the process of cultivation, not the crop but the raising of the crop.

F type G act H means J method
K product

Stop. If you finish before time is called, check your work on this part. Do *not* go on to Part II until you are told to do so.

DIRECTIONS FOR PART II

There are 25 problems in Part II of the test. Following each problem there are five suggested answers. Work each problem in your head or on a piece of scratch paper. Then look at the five suggested answers and decide which one is correct. Blacken the space under its letter on the answer sheet.

Sample Problem

$$\begin{array}{r} 5413 \\ -4827 \\ \hline \end{array}$$

F 586 G 596 H 696
J 1586 K None of these

Because the correct answer to the sample problem is 586, which is lettered F, the space marked F on the answer sheet is blackened. See how it has been marked on the answer sheet. Do *not* make any marks in your test booklet.

Do not turn this page until you are told to do so.

PART II / TIME: 20 MINUTES

1 $\begin{array}{r} 338{,}420 \\ -140{,}621 \\ \hline \end{array}$

A 197,799
B 197,801
C 197,809
D 197,899
E None of these

2 $5\frac{1}{3}$ equals how many thirds?

F 1
G 5
H 6
J 15
K 16

3 $\begin{array}{r} \frac{1}{2} \\ +\frac{3}{4} \\ \hline \end{array}$

A $\frac{3}{8}$
B $\frac{7}{8}$
C 1
D $1\frac{1}{8}$
E None of these

4 $3\% \times 9$

F .27
G 2.7
H 3
J 27
K $33\frac{1}{3}$

5 8362×2003

A 1,697,486
B 16,749,086
C 16,974,086
D 167,265,086
E None of these

6 $\begin{array}{r} \text{13 feet 1 inch} \\ -\ \text{7 feet 2 inches} \\ \hline \end{array}$

F 5 feet
G 5 feet 9 inches
H 5 feet 11 inches
J 6 feet 1 inch
K 6 feet 11 inches

7 1000×2.72

A .000272
B .00272
C 2720
D 27,200
E None of these

8 $\begin{array}{r} 5 \\ -4\frac{1}{4} \\ \hline \end{array}$

F $\frac{1}{4}$
G $1\frac{1}{4}$
H $1\frac{3}{4}$
J $9\frac{1}{4}$
K None of these

9 What is the remainder when 38,127 is divided by 6?

A 1
B 2
C 3
D 4
E 5

10 $715 \div 5000$

F .000143
G .00143
H .0143
J .143
K 1.43

11 $1\frac{2}{7} \times 4\frac{2}{3}$

A $4\frac{6}{7}$
B 5
C $5\frac{1}{3}$
D $5\frac{17}{21}$
E 6

12 $701.3 - 2.901$

F 698.399
G 699.399
H 798.399
J 4112
K None of these

13 $\frac{7}{5} = (?)\%$

A 14
B $71\frac{3}{7}$
C 125
D $128\frac{4}{7}$
E 140

14 $3\frac{1}{5} \div 5\frac{1}{3}$

F $\frac{15}{256}$
G $\frac{3}{5}$
H 1
J $\frac{5}{3}$
K $\frac{256}{15}$

15 $\frac{17}{28} - \frac{2}{7}$

A $\frac{9}{28}$
B $\frac{11}{28}$
C $\frac{15}{28}$
D $\frac{5}{7}$
E None of these

16 $.8 - .007$

F .1
G .793
H .807
J .893
K None of these

17 $.625 \times 924$

A 515
B 576.5
C 577.4
D 577.5
E None of these

18 $\dfrac{1\frac{1}{4} - \frac{1}{8}}{\frac{1}{8}}$

F $\frac{1}{9}$
G $\frac{1}{4}$
H $1\frac{1}{4}$
J 4
K 9

19 $0 \div \frac{2}{5}$

A 0
B $\frac{2}{5}$
C 1
D $2\frac{1}{2}$
E None of these

Go on to the next page.

20 $3\frac{2}{3} + 1\frac{3}{4}$

F $\frac{21}{44}$
G $2\frac{3}{21}$
H $3\frac{1}{2}$
J $6\frac{5}{12}$
K $8\frac{5}{9}$

21 5 weeks 2 days
−1 week 6 days

A 3 weeks 3 days
B 3 weeks 6 days
C 4 weeks 3 days
D 4 weeks 4 days
E None of these

22 $\frac{.7}{.05}$ is equal to which of the following?

F $\frac{7}{50}$
G $\frac{7}{5}$
H 14
J 35
K None of these

23 What is the sum of .325 and $\frac{1}{4}$ written as a decimal?

A .00350
B .00575
C .350
D .575
E .625

24 The average of $\frac{5}{6}$ and $\frac{5}{8}$ is

F $\frac{5}{7}$
G $\frac{17}{24}$
H $\frac{25}{48}$
J $\frac{35}{48}$
K None of these

25 Change $\frac{75}{37500}$ to a per cent.

A .02%
B .05%
C .2%
D .5%
E None of these

Stop. If you finish before time is called, check your work on this part. Do *not* go back to the previous part. Do *not* go on to Part III until you are told to do so.

DIRECTIONS FOR PART III

Each of the questions in Part III consists of one word in large letters followed by five words or phrases in small letters. Read the word in large letters and then pick, from the words or phrases following it, the one that is closest in meaning to the capitalized word. For example:

Sample Question

chilly

A tired B nice C dry
D cold E sunny

In order to find the correct answer you look at the word **chilly** and then look for a word or phrase below it that has the same or almost the same meaning. When you do this you see that "cold" is the answer because "cold" is closest in meaning to the word "chilly." Next, on the answer sheet you find the line numbered the same as the question and blacken the space which has the same letter as the word you have selected as the correct one. Because "cold" is the correct answer to the sample question, the space marked D on the answer sheet is blackened. See how it has been marked on the answer sheet. Do *not* make any mark in your test booklet.

Do not turn this page until you are told to do so.

PART III / TIME: 10 MINUTES

1 irritate
A dislike
B uncover
C annoy
D authorize
E subdue

2 dune
F sand hill
G legislative body
H sentence
J administrator
K haven

3 analyze
A criticize unfavorably
B discriminate
C experiment
D comment on
E study the parts of

4 solitary
F in low spirits
G alone
H unfriendly
J quiet
K monastic

5 blunder
A swagger
B defect
C vulgarity
D deception
E error

6 flog
F stun
G tread
H bother
J soak
K beat

7 induce
A grant
B prolong
C mix
D persuade
E convict

8 tinge
F slight trace
G feeling of regret
H thin coating of metal
J funeral song
K increasing darkness

9 bequeath
A crawl under
B leave in one's will
C discharge without warning
D conceal carefully
E accumulate

10 anticipate
F supplant
G endorse
H take part in
J oppose
K foresee

11 notorious
A very religious
B easily discerned
C negative
D unfavorably known
E criminally insane

12 retort
F twisted statement
G brief account
H sharp reply
J second attempt
K second thought

13 humane
A scholarly
B kind
C witty
D sensible
E anthropoid

14 repudiate
F accuse
G cancel
H reject
J distrust
K evict

15 diminish
A flatten
B default
C undermine
D finish
E lessen

16 eminent
F outstanding
G candid
H discreet
J about to happen
K coming from

17 propulsion
A driving forward
B attraction
C rhythmic motion
D movement upward
E strong inward feeling

18 radical
F obstructionist
G extremist
H nonbeliever
J arc
K heating device

19 depict
A prove
B flatter
C obscure
D describe
E expose

20 alignment
F taking away
G straightening
H union
J procession
K configuration

21 arbitrate
A act as a judge
B seclude oneself
C talk to oneself
D witness a document
E sign a contract

Go on to the next page.

22 bias

F prejudice
G horizontal line
H basis
J ridicule
K restraint

23 chronic

A cowardly
B recorded
C weak
D constant
E grouchy

24 assent

F protest
G agree
H deliver
J rest
K retard

25 adage

A mental weakness
B later years
C proverb
D normal condition
E custom

26 ransack

F take inventory
G pack in bundles
H invade
J turn sour
K plunder

27 repellent

A poisonous
B aggressive
C unbending
D disagreeable
E horrifying

28 genealogy

F study of rocks
G study of the earth's formation
H study of family trees
J study of plant life
K study of social customs

29 gratis

A harsh
B appreciative
C famous
D without payment
E pleasing

30 formidable

F frightening
G incomplete
H arrogant
J taciturn
K properly made

Stop. If you finish before time is called, check your work on this part. Do *not* go back to either previous part. Do *not* go on to Part IV until you are told to do so.

DIRECTIONS FOR PART IV

There are 25 problems in Part IV of the test. Following each problem there are five suggested answers. Work each problem in your head or on a piece of scratch paper. Then look at the five suggested answers and decide which one is correct. Blacken the space under its letter on the answer sheet.

Because the correct answer to the sample problem is 8, which is lettered H, the space marked H on the answer sheet is blackened. See how it has been marked on the answer sheet.

Do *not* make any marks in your test booklet.

Sample Problem

Four $10-bills are equal to how many $5-bills?

F 20 G 10 H 8
J 40 K 2

Do not turn this page until you are told to do so.

PART IV / TIME: 25 MINUTES

1 How many inches are there in $2\frac{1}{2}$ feet?

A 24
B 26
C 28
D 30
E 32

2 For the first 4 days of the week a boy paid 55 cents each day for lunch. If his lunch allowance was $3.00 for 5 days, how many cents did he have left to spend for lunch the fifth day?

F 60
G 65
H 70
J 75
K 80

3 How many more tens are there in 617 than in 547?

A 3
B 7
C 13
D 30
E 70

4 On 5 successive days the attendance at a certain school was 416, 420, 400, 434, and 390, respectively. What was the average daily attendance during this period?

F 400
G 412
H 416
J 1030
K 2060

5 Four $20-bills are equal to how many $5-bills?

A 16
B 20
C 25
D 40
E 400

6 Tom received 50 cents per week allowance when he was 10 years old. If he got a raise of 20 cents a week each year, how much per week was he getting when he was 18?

F $1.60
G $1.70
H $1.80
J $2.00
K $2.10

7 George buys newspapers for 3 cents each and sells them for 5 cents each. How many newspapers must he sell to make a profit of $3.00?

A 15
B 60
C 100
D 150
E 600

8 A printer charged $5.00 to print the first 100 posters, and $2.00 for each 100 posters thereafter. How much will it cost to have 800 posters printed?

F $16.00
G $19.00
H $21.00
J $37.00
K $40.00

9 If John gets $\frac{1}{100}$ and Frank gets $\frac{1}{10}$ of a given sum of money, then Frank gets how many times as much as John?

A $\frac{1}{100}$
B $\frac{1}{10}$
C $\frac{1}{2}$
D 10
E 100

10 Fred takes 6 hours to lay 600 bricks. Sam takes only 4 hours to lay 600 bricks. If they work together, how many bricks should they be able to lay in 1 hour?

F 60
G 120
H 150
J 240
K 250

THE AUTOMOBILE TRIP

TRIP DATA

Price of gas	28.5 cents per gallon
Distance traveled	2000 miles
Hours spent driving	50

EXPENSES

Gas	$31.92
Oil	1.20
Depreciation	12.88
Meals	32.80
Hotel	42.00
Miscellaneous	10.40
Total	$131.20

Problems 11 through 13 are based on the tables above.

Go on to the next page.

1 What was the average speed in miles per hour?

A 40
B 45
C 50
D 55
E 60

2 Approximately how many gallons of gasoline were purchased?

F 10
G 90
H 100
J 110
K 910

3 What per cent of the total expenses was spent for meals?

A 4
B 20
C 25
D 30
E 40

---

4 If tires selling for $20 each are sold at a 10% discount in lots of 4, what is the price of 4 tires?

F $48.00
G $70.00
H $72.00
J $78.00
K $79.20

5 There are 24 packages for 4 girls and 3 boys to carry. Each boy carries 1 more package than each girl carries. How many packages does each boy carry?

A 2
B 3
C 4
D 5
E 6

6 If a woman buys a crate of 200 oranges for $5.50, how many cents per dozen is she paying?

F 11
G 33
H 44
J 65
K 92

7 X, Y, and Z did a job together. X did 21% of the work, which is $\frac{1}{3}$ of what Y did. What per cent of the job did Z do?

A 7
B 16
C 63
D 72
E 84

18 If 1 gallon is about 3.8 liters, then 1 liter is about how many gallons?

F 0.26
G 0.38
H 0.62
J 2.8
K 14.4

19 What per cent of a 15-foot square floor is covered by a 9-foot by 12-foot rug?

A 14
B 48
C 60
D 75
E 80

20 If the sum of five consecutive numbers is 125, what is the smallest number?

F 21
G 22
H 23
J 24
K 25

21 The cost of an item, including a 20% luxury tax, was $384. How much was the tax?

A $7.68
B $32
C $64
D $76.80
E $96

22 A water tank with a square base holds 7000 cubic feet when filled to a depth of one foot. Approximately how many feet long is one side of the base?

F 25
G 45
H 85
J 250
K 450

23 If a 12-ounce bottle of root beer costs 5 cents, and 8 ounces of root beer at a soda fountain cost 10 cents, then root beer at the fountain is how many times as expensive per ounce as root beer in the bottle?

A $\frac{25}{48}$
B $\frac{4}{3}$
C $\frac{3}{2}$
D 2
E 3

Go on to the next page.

24 48 years from now, John will be 4 times as old as he is now. How old is he now?

F 8
G 10
H 12
J 16
K 24

25 In a social studies class, 10% of the girls and 15% of the boys failed a test. If 20% of the class are girls, what per cent of the whole class failed the test?

A 5
B 11
C $12\frac{1}{2}$
D 14
E 25

If you finish before time is called, check your work on this part. Do not go back to any previous part.

Looking, Seeing, and Building Tests - Item Descriptions

All items will be presented via 35 mm. slides, synchronized with tape recorded instructions. The slides will present either two or four images, labelled L and R, or TL, TR, BL, and BR respectively.

I. Looking (subtopic Light)

Given four photographs of a man made under top, back, front, and side lighting conditions:

Item: Which of these photographs illustrates side lighting?

(1) TL

(2) TR

(3) BL

(4) BR

II. Seeing (subtopic Perceptual Seeing)

Given (1) a black and white design in a checkerboard pattern, such that they cancel each other out, and (2) black and white squares in unequal numbers such that they form a figure ground design:

Item: Which of these designs best illustrates the figure-ground relationship?

(1) L

(2) R

III. Building

Given a reproduction of the (1) Parthenon and (2) Chartres Cathedral:

Item: Which of these buildings uses post and lintel construction?

(1) L

(2) R

Appendix B

Education Through Vision
Budget Worksheet

Investigator: Donald A. Trismen
Institution: Educational Testing Service

Duration: 1 year, 6 months
Beginning Date: June 1, 1966
Ending Date: November 30, 1967

		Hours	Amount
I.	Staff		
	Professional Staff:		
	Program Director - Donald A. Trismen	565	$ 5 880
	Professional Assistant	410	2 800
	Professional Test Specialists	360	3 700
	Computer Programmers and System Analysts	340	2 780
	Other Staff:		
	Data Processing Supervisory Staff	400	2 240
	Hand Scorers	9 000	18 000
	Machine Operators	180	800
	Secretaries	810	2 675
	Typists	250	700
	Clerks	1 450	3 250
	Total Staff	13 765	42 825
II.	Data Processing Machine Usage		1 715
III.	Professional Services-Honoraria for Test Administrators		3 750
IV.	Materials, Supplies and Services		
	Test books and answer sheets		5 500
	Color slides		500
	Tapes		240
	Postage and express		2 100
	Telephone		200
	Office supplies		1 250
	Building and equipment use charge		3 575
V.	Travel		
	Transportation		1 625
	Subsistence		375
VI.	Total Direct Charges		63 655
VII.	Indirect Costs - @ 20% of total direct charges		12 731
VIII.	Total Budget		$76 386