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ABSTRACT

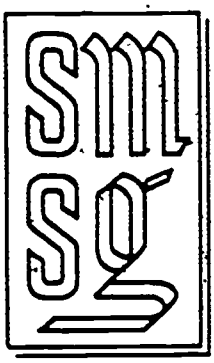
In the fall of 1966, the School Mathematics Study Group embarked upon a four-year longitudinal study of mathematical learning in the primary grades, the Elementary Mathematics Project (ELMA). The primary purpose of the study was to assess children's progress in learning particular mathematical ideas during the beginning school years. This volume contains information related to the grade 1 tests. The first part of the volume contains procedures for giving the tests and the test batteries. The second part of the volume contains the description and statistical properties of the grade 1 scales derived from these test batteries. (RH)

SCHOOL MATHEMATICS STUDY GROUP

ELMA TECHNICAL REPORTS

No. 2

Grade 1 Test Batteries, Description and Statistical Properties of Scales



Financial support for the School Mathematics Study Group has been provided by the National Science Foundation.

FOREWORD

In the fall of 1966, the School Mathematics Study Group embarked upon a four-year longitudinal study of mathematical learning in the primary grades, The Elementary Mathematics Project (ELMA). The primary purpose of this study is to assess children's progress in learning particular mathematical ideas during the beginning school years. With these findings, the possibility exists of developing, in the future, more effective materials and procedures for teaching children coming to school with differential pre-school experiences as well as better understanding young children's learning of mathematics.

The pilot phase of this longitudinal study was undertaken from 1964 to 1966 in the Special Curriculum Project* during which time the tests for kindergarten and Grade 1 were developed, pre-tested, and modified.

The study population included approximately 2,000 children entering kindergarten in September, 1966, in selected schools in two large cities. The schools selected met two criteria: they drew on residential areas which were predominantly either lower or middle income groups, and each particular group of elementary schools fed into a common junior high school. Within one city, four cells were formed, two each from lower income areas and two from middle to higher income areas. One lower and one middle income cell were using the School Mathematics Study Group curriculum, and the other, comparable cells were using the Science Research Associates program which is the state adopted mathematics textbook series in California for the primary grades. In the second city, three cells were formed, the omitted cell being the middle income SMSG curriculum group. The data in this volume are reported for City 1.

The children were tested twice a year, one battery in the fall and another in the spring, starting in kindergarten and extending through Grade 3. The format of the tests gradually moved from individually administered, object-oriented

*The two SMSG publications which report on the Special Curriculum Study are: Leiderman, Gloria F., Chinn, W. G., and Dunkley, M. E., SMSG Reports No. 2, The Special Curriculum Project: Pilot Program on Mathematics Learning of Culturally Disadvantaged Primary School Children. Stanford University, 1966; and Chinn, W. G. and Summerfield, Jeanette O., SMSG Reports No. 4, The Special Curriculum Project: 1965-1966. Stanford University, 1967.

tests to group administered, printed tests as the children became better able to comprehend and attend to printed materials and verbal directions in a group situation. Various standardized intelligence tests (one per year) were also administered by ELMA in the middle of the first three school years. Attitude scales were given in Grades 2 and 3. In addition, the results of standardized tests administered by the school systems participating in ELMA were obtained and included in the data analyses.

Test administrators were carefully chosen for each battery from graduate students and primary teachers with course work or experience in psychological testing plus experience in working with young children. All testers were required to attend training sessions before each test battery. Throughout the training sessions, emphasis was placed on the importance of careful adherence to the instructions when giving the tests.

GUIDE FOR THE USE OF THIS VOLUME

The first part of this volume contains the test batteries which were administered during the second year of the Elementary Mathematics Project. The Introductions to the Grade 1 Fall Test Battery and the Grade 1 Spring Test Battery on pages 3 and 35 describe the format and information to be found in this part of the report.

The second part of this volume contains the description and statistical properties of the Grade 1 scales derived from these test batteries. Figure 1 is a sample page from this part of the report. The information for most scales is in this basic format. (Those scales describing ratings by the tester are reported in a different format.)

A Key for explaining Figure 1 follows:

1. Grade Level and Time of Administration. Two pieces of information are indicated for each scale: (1) the grade level of the students taking the scale, and (2) whether it was given in the fall or the spring.

2. Form Number. The form number of the test in which the scale is included.

3. Scale Identification Code. Each code number consists of a three-digit number. The first digit indicates when a scale was administered: "2" for the fall of the second year and "3" for the spring of the second year. The second and third digits number the scales within a test battery. For instance, scale code 309 indicates a scale from the spring, second year test battery which is scale number 9 from that battery. Not all code numbers used during the second year of the study are reported in this volume. (Those assigned for weighted scores of selected scales and for internal identification purposes are not included.)

Grade 1 (1)
Spring

(2) Form 1-04
(3) Scale 309

309 (3) APPLICATION (4) (5) (7 items; group administered)

This scale is composed of seven story problems which are designed to measure the pupil's ability to select and perform the relevant arithmetic operations. Six of the items involve either addition or subtraction, while the seventh deals with partitioning a set into two equivalent groups. The format for all the items in this scale is multiple choice. It is the same as 404 and is an extension of 333. (6)

The items which make up this scale come from Form 1-04 which is reproduced elsewhere in this report. The item numbers and page references are listed below.

(7) Items 6 - 12 Pages 141 - 144

SCALE STATISTICS:

(8) NUMBER OF CASES	=	1375
(5) NUMBER OF ITEMS	=	7
(9) MEAN TOTAL SCORE	=	3.907
(10) STANDARD DEVIATION	=	1.721
(11) CRONBACH'S ALPHA	=	0.607
(12) ERROR OF MEASUREMENT	=	1.079

ITEM STATISTICS:

(13) ITEM	(14) P'S	(15) ADJ. P'S	(16) N.S. BIS	(17) PERCENT NT
6	0.812	0.825	0.488	1.600
7	0.669	0.684	0.475	2.109
8	0.876	0.890	0.429	1.527
9	0.400	0.414	0.435	3.273
10	0.468	0.479	0.437	2.255
11	0.337	0.345	0.518	2.400
12	0.345	0.352	0.267	2.182

Figure 1

4. Scale Name. The scale name is usually descriptive of the content of the scale (e.g., Counting Buttons, Ordering Geometric Shapes, or Identifying Triangles). In some cases an S (either alone or followed by a number) follows the scale name to indicate a shortened scale that includes only selected items from another scale. If only one scale within a test battery is composed of a sub-set of items, an S follows the scale name. If more than one shortened scale is reported, each new sub-set is assigned a sequential number after the S.

5. Scale Length, Sub-Group Information and Type Administration. The number of items in the scale is indicated in parentheses following the scale name. This number is also reported in the second line under the Scale Statistics. If the scale was administered to less than the entire population, the nature of the sub-group is indicated. Since both individual and group tests were administered during the second year, the type administration is indicated for each scale.

6. Scale Description. A brief description of the scale is given, telling what the scale is designed to measure, and giving any special information about the scale. In particular, cross-referencing is given to other scales that are the same as the scale being described. This cross-referencing is done across years. If a scale is an extension or shortened form of another scale within a test battery, that information is also noted.

7. Item and Page Reference. The item numbers and the pages in the first part of this report where the items are reproduced are recorded for reference.

8. Number of Cases. The data in this volume are reported on the total number of students to whom the scale was administered in the test center which had all four cells (low income-SMSG, low income-SRA, middle income-SMSG, and middle income-SRA, i.e., City 1).

9. Mean Total Score. This is the mean for scale scores. The scale score is the number of items correct.

10. Standard Deviation. The standard deviation of scale scores.

11. Cronbach's Alpha. The coefficient alpha is an estimate of the internal consistency reliability of the scale.

12. Error Of Measurement. The standard error of measurement of a scale is an index of the extent to which scores would vary over similar tests. It is a function of the standard deviation and alpha,

$$(\text{ERR.MEAS}) = (\text{ST.DEV}) \sqrt{(1.0 - \text{ALPHA})}.$$

It can be used to establish a confidence interval around an obtained score to estimate the region in which a true score probably lies.

13. Item. This is the number of the item for which the statistics are reported. Page references for all items in the scale are given in 7 above.

14. Item Mean. P is the mean on the item for all students in the sample.

15. Adjusted Item Mean. ADJ. P for an item is the mean for all students who attempted the item. Not tried responses eliminate the student from the calculation of ADJ. P. An item is defined as not-tried if there was no response to the item.

16. Biserial Correlation. N.S. BIS is given as an index of item discrimination.

In general, the biserial correlation is a correlation between a discrete variable (e.g., a test item) and a continuous variable (e.g., a total test score).

The biserial correlations given in this volume are non-spurious. That is, these correlations are between the item and the total scale score with the item removed. These non-spurious correlations are sometimes referred to as "item vs. item-remainder correlations," the correlation of the item with the remainder of the scale.

17. Percent Not Tried. The percent of students for whom the item was not tried is indicated by PERCENT NT.

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(continued)

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GRADE 1

FALL TEST BATTERY

FORM 1-01

INTRODUCTION

Grade 1 - Fall Testing

Form 1-Q1

Form 1-01 was designed to measure retention of mathematical ideas included in the kindergarten program. The battery was given during the first week of school to a random sample of first graders participating in the study. The sample consisted of 227 students (approximately one-sixth of the total ELMA sample), selected by school and sex through a random number program. All of the students chosen for testing were from the test center which had all four cells (low income-SMSG, low income-SRA, middle income-SMSG, and middle income-SRA) active in the study.

The battery is made up of selected scales previously administered in the spring kindergarten battery (Form K-02)*; no new test material was presented. These tests had been developed to minimize possible differential between disadvantaged and more advantaged children in handling the test situation and materials. The battery was administered individually and took approximately twenty minutes. The tests were devised so that the children responded, in most tasks, to concrete materials. Verbal directions given by the tester were brief, simple statements, and short verbal responses were necessary in only a few of the test items.

Because the testers were chosen from those who had previously administered the spring kindergarten battery and because all scales used in Form 1-01 were taken from Form K-02, no tester training session was felt to be necessary. The directions to the testers concerning preparations for testing, general rules to follow, etc., are reproduced on the following pages.

The pupil score sheet used by the testers to record responses is also reproduced in its entirety here. For the reader's convenience, the section of the score sheet which pertains to a particular scale is also reproduced immediately after the test directions.

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*See ELMA Technical Report No. 1, Kindergarten Test Batteries, Description and Statistical Properties of Scales.

SCHOOL MATHEMATICS STUDY GROUP

ELEMENTARY MATHEMATICS PROJECT

FORM 1-01

Fall Inventory, 1967 --- First Grade

GENERAL DIRECTIONS FOR ADMINISTERING FORM 1-01

1. Setting for Administration of Tests

It is important to have a separate room, if at all possible, so that interruptions and distractions are minimized.

In introducing these tests to the child, make certain that they are always referred to as games and not as tests. The child will feel more comfortable if this is not presented as a testing situation and if the tester chats with the child to put him at ease before starting.

2. Equipment

You will need a table and two chairs. Preferably, the table and chairs should be low (from the kindergarten or first-grade classroom) so that they are a comfortable height for the child. Seat the child across the table from you.

The materials you will need are those supplied and are contained in the test kit (except for the construction paper which is in the manila envelope with the score sheets).

3. Procedure

Read over the instructions for administering the tests several times, and become familiar with the materials before you start testing your children.

The instructions for you, as tester, are typed in lower case. What you actually say to the child is typed in capital letters.

Follow the written directions carefully. Do not probe to get an answer beyond what is suggested in the directions. This is an evaluation and should not be used as a teaching situation.

Use reassurance without specifying that responses are right or wrong. This may be done in a variety of ways:

Repeating what the child has said in a reassuring voice.
Remarks such as "Um - Hum," "All right."
Comments between tests such as "You do these very well."
Conversation with the child between tests.

In order that the child not experience failure, certain tests are not to be continued if the child fails 3 tasks in that part of the test. This will be noted in the instructions for the specific tests. On tests such as Ordering you will continue the entire test whether the child misses three tasks or not.

Keep all equipment in a box under the table to your right. Place on the table only those items required for a given task, along with the instructions and score sheets for that particular task. Remove materials used for a task from the table before beginning the next part of the testing.

You will find that many of the children become fascinated by the toys being used as test materials. This may interfere with their attention to the task itself. In these instances, tell the child that he will have a chance to play with the toys after you and he have finished the games you will do together. Make certain that you do, then, permit the child to have a few minutes to play with the toys he found most interesting. This can be done without spending much extra time by allowing the child to play while you are sorting your materials and getting them ready for testing the next child.

4. Scoring

The scoring sheets should be completely filled out.

Be certain to enter the pupil's name, I.D. number (4-digit number to left of name), school, teacher's name, tester's name and date of the testing on each scoring sheet. Use the "Comments" space whenever relevant. If there is insufficient space for comments for any sub-test, make the comments on the last sheet of the booklet (labeled "Additional Comments"). Identify clearly the sub-test to which the comments refer. If doubtful about the correctness of a response, write exactly what the child said in the comment space.

Read over specific scoring directions for each test (e.g., instructions for scoring Ordering).

5. Rating the Child's Behavior

The last two items on the last page of the Pupil Score Sheet, entitled Response to Verbal Directions and Attention to Tasks, are rating scales. These are included as a method of evaluating the child's behavior in the testing situation. Make a rating on each of these two scales as soon as you finish testing the child. Mark the point on each scale that best describes a given child's behavior on these particular dimensions during the testing situation. (Note that the end points on these two scales are in reverse order.)

6. Important Considerations,

In order for these test results to be meaningful:

(a) It is imperative that the tester adhere to the written directions as closely as possible. Rapport with the child is crucial; however, cueing the child beyond the written directions invalidates the results.

(b) It is imperative that recording of children's performance on the score sheet be as accurate as possible. Score sheets may be completed in pencil; overemphasis on neatness may be unnecessarily time-consuming. Entries should be legible and accurate; neatness is not a primary consideration.

(c) It is imperative that every sub-test be completely recorded.

Form 1-01

PUPIL SCORE SHEET First Grade : Fall Inventory, 1967 .

Pupil's Name: _____ Teacher's Name: _____

I.D. Number : _____ Tester's Name : _____

School: _____ Date Given: _____

GEOMETRIC SHAPES

Identifying

Item No.			Correct Response	Incorrect Response	No Response
1	1	Triangle			
2	2	Rectangle			
3	3	Star			
4	4	Circle			
5	5	Square			

Comments:

COUNTING MEMBERS OF A GIVEN SET

Picture Cards

Item No.	Card No.	Counted Correctly	Attempted, Incorrect	No Attempt
6	1			
7	2			
8	3			
9	4			
10	5			
11	6			
12	7			
13	8			
14	9			
15	10			

Comments:

EQUIVALENT SETS

Dots

Item No.	Card No.	Correct Response	Incorrect Response	No Attempt
16	1			
17	2			
18	3			
19	4			
20	5			
21	6			

Comments:

ORDERING

Item No.	Ordered:		Ordered correctly Largest-smallest or Smallest-largest	Ordered with error (ends correct, confusion in middle size items or some other partially correct attempt)	Randomly ordered	No Attempt	Handed:		Correct (✓) Response	Incorrect (✓) Response	No. (✓) Attempt
22-23	1a	Circular Shapes					1b	smallest circle			
24	2	Triangular Shapes									
25-26	3a	Buttons					3b	smallest button			
27-28	4a	Blocks					4b	largest block			
29-30	5a	Plastic Straws					5b	shortest straw			
31-32	6a	Rectangular Shapes					6b	longest shape			

Comments:

RESPONSE TO VERBAL DIRECTIONS:

(Mark appropriate space)

Item No.

33

- (a) No compliance. Did not do what was asked. ☐
- (b) Little compliance. Did not do what was asked in most instances unless controls used. ☐
- (c) Some compliance. Did (or tried to do) what was asked in some tasks. ☐
- (d) Full compliance. Did exactly (or tried to do) what was asked on each task. ☐

ATTENTION TO TASKS:

(Mark appropriate space)

Item No.

34

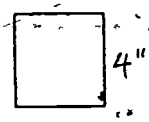
- (a) Attended well to all tasks. ☐
- (b) Attended well to some tasks but not to all. ☐
- (c) Attention wandered periodically. ☐
- (d) Inattentive unless continually directed. ☐

Additional Comments:

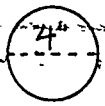
GEOMETRIC SHAPES - IDENTIFYING

TEST MATERIALS:

1 set of monochromatic geometric shapes cut from light-weight cardboard

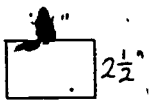


square

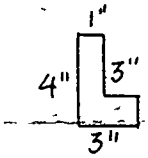


circle

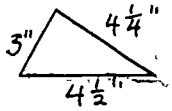
star



rectangle



L-shape



triangle

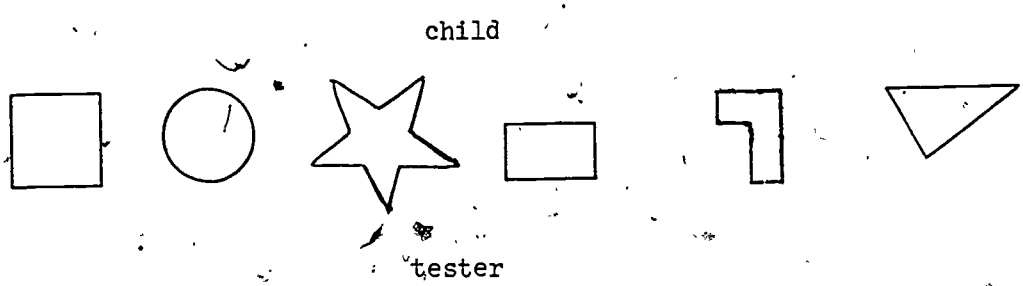
TEST DIRECTIONS:

I HAVE SOME SHAPES HERE.

I AM GOING TO PUT THEM ON THE TABLE.

Place the set of shapes in front of you. Arrange from your left to right: square, circle, star, rectangle, L-shape, triangle. Orient them in the following way: bases of triangle and L-shape toward the child, point of star toward tester, and flange of L to tester's left.

In administering this test, you will be asking the child to give you specified shapes. Be certain to replace each shape in the same location after the child has handed it to you before asking for the next shape.



Say:

WOULD YOU GIVE ME THE TRIANGULAR SHAPE?

WOULD YOU GIVE ME THE RECTANGULAR SHAPE?

WOULD YOU GIVE ME THE STAR-SHAPE?

NOW, THE CIRCULAR SHAPE.

AND THE SQUARE.

Record as Correct, Incorrect, or No Attempt by shape listed on Pupil Score Sheet.

TESTER'S SCORING GRID:

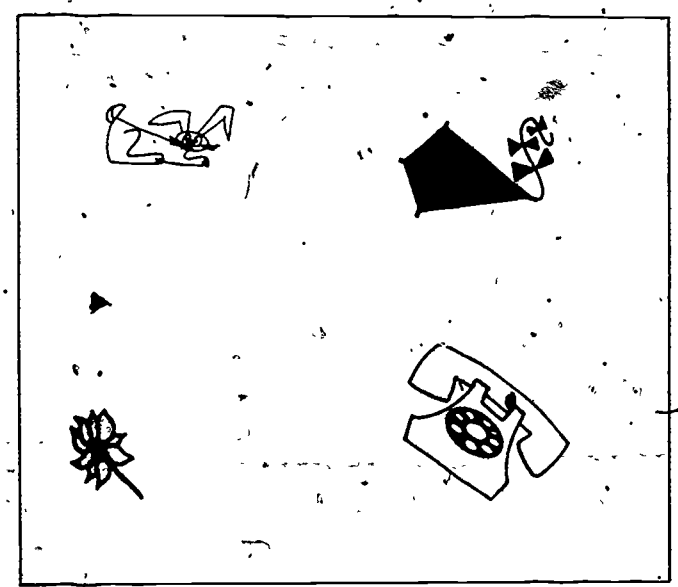
Item No.			Correct Response	Incorrect Response	No Response
1	1	Triangle			
2	2	Rectangle			
3	3	Star			
4	4	Circle			
5	5	Square			

COUNTING MEMBERS OF A GIVEN SET - PICTURE CARDS

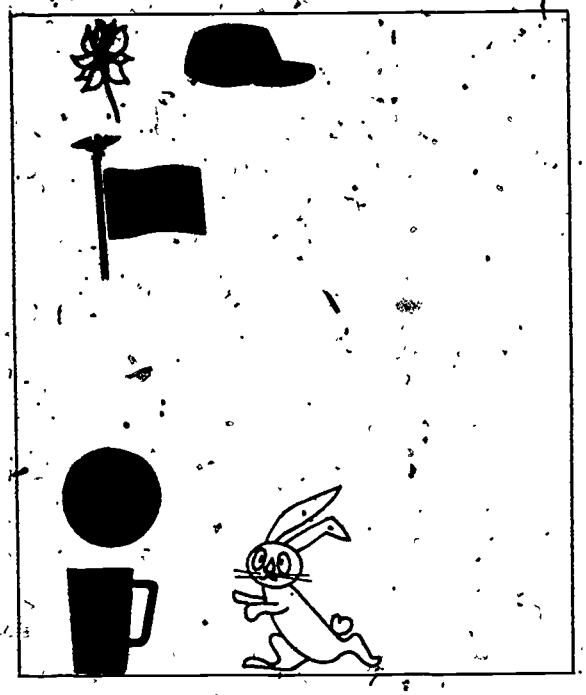
TEST MATERIALS:

10 6" × 7" cards with varying numbers of drawings of familiar objects on each card. On the back of each card at the top is printed "Counting Members of a Given Set - Top of Card ..." (the cards are numbered 1 through 10 to indicate the order in which they are to be presented to the child), and a digit in the lower left corner which indicates the number of objects pictured on the front of the card.

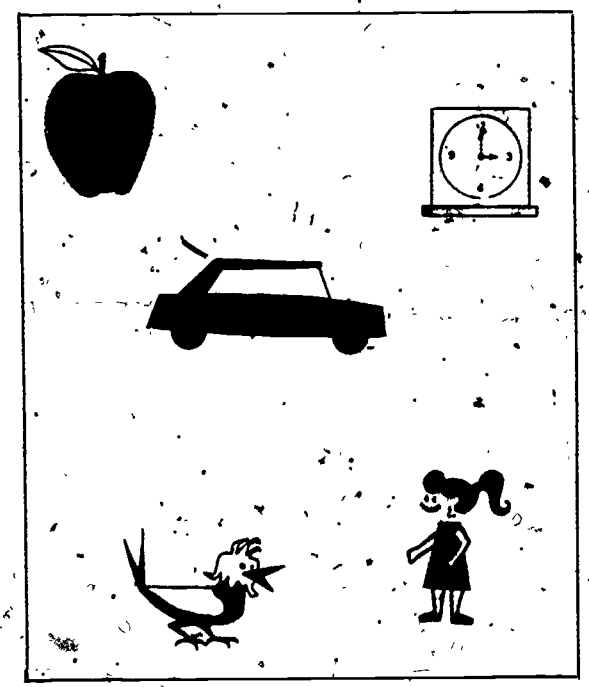
The cards are reproduced below.



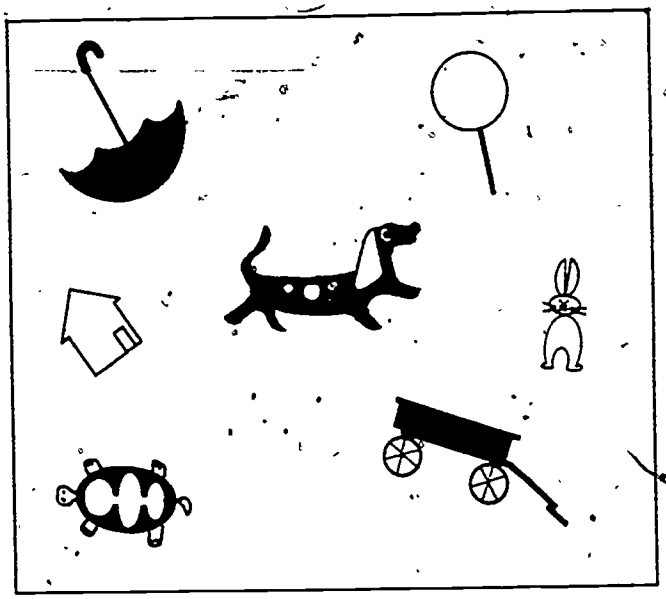
Card 1



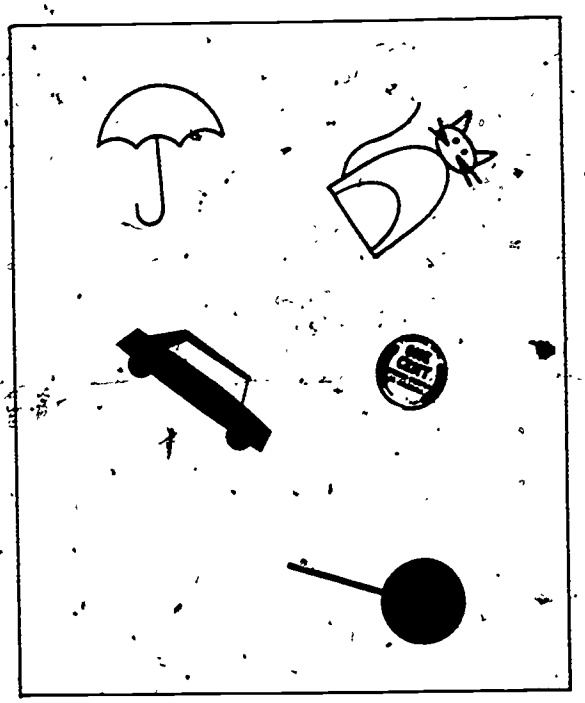
Card 2



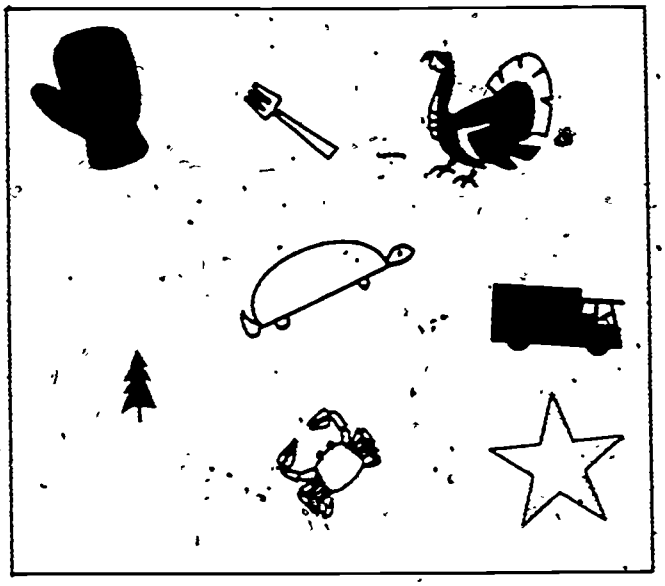
Card 3



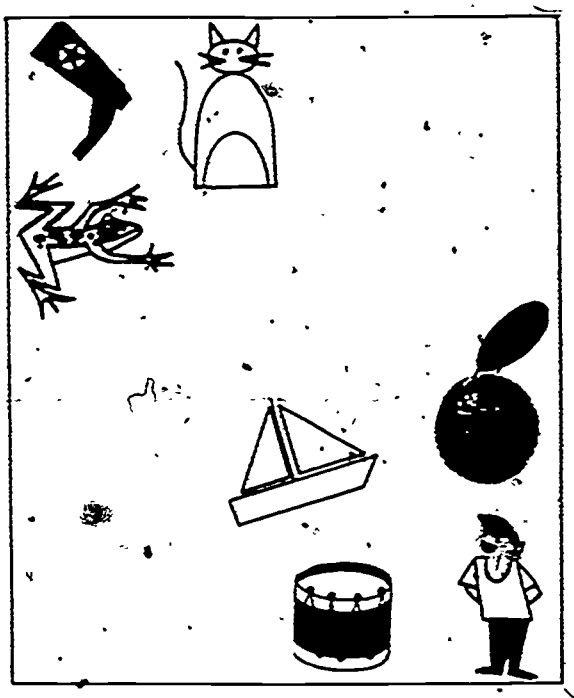
Card 4



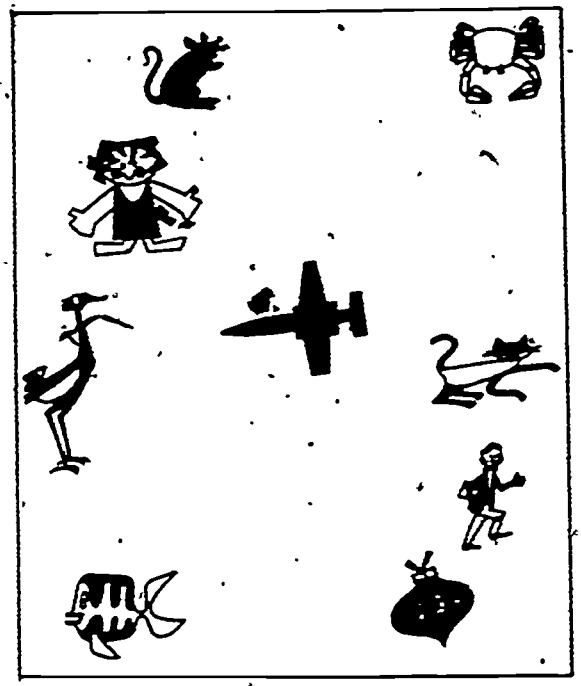
Card 5



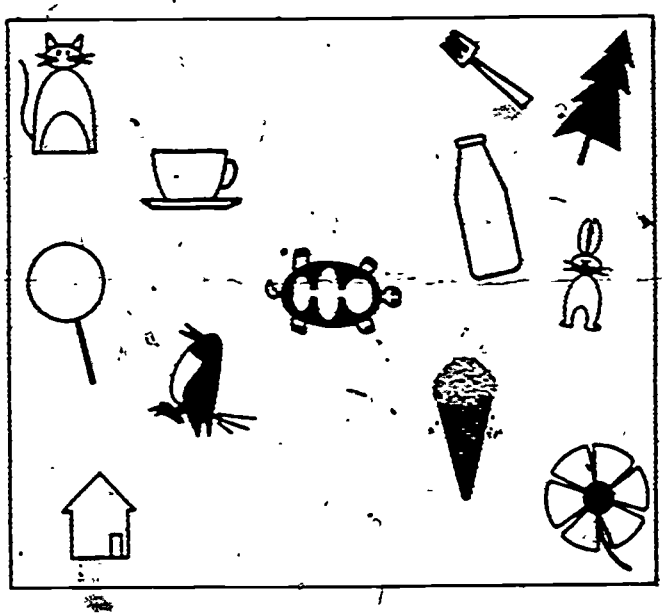
Card 6



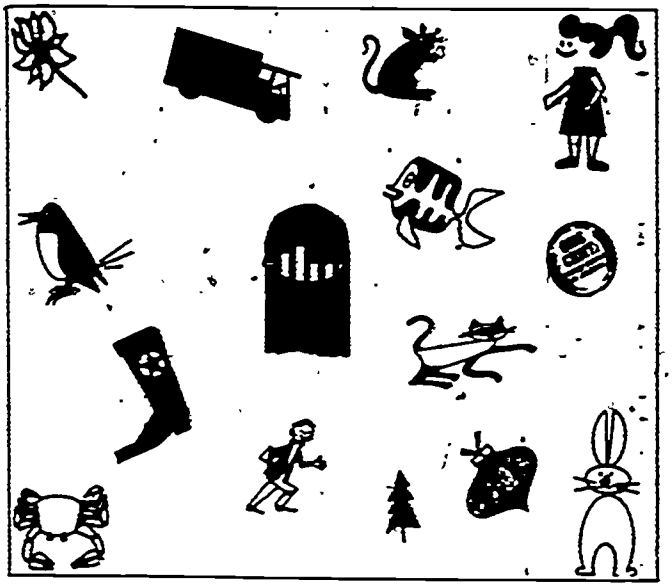
Card 7



Card 8



Card 9



Card 10

TEST DIRECTIONS:

Place Card 1 in front of the child and say:

HOW MANY MEMBERS ARE THERE IN THIS SET?

If no response, say:

HOW MANY DRAWINGS ARE ON THIS CARD?

Continue in the order and with the position of the cards as marked on the back for each card, using the same directions as for Card 1.

Stop after the child has made three errors in counting.

Note that the correct answer is printed in the lower left corner on the back of each card.

TESTER'S SCORING GRID:

Item No.	Card No.	Counted Correctly	Attempted, Incorrect	No Attempt
6	1			
7	2			
8	3			
9	4			
10	5			
11	6			
12	7			
13	8			
14	9			
15	10			

EQUIVALENT SETS - DOTS

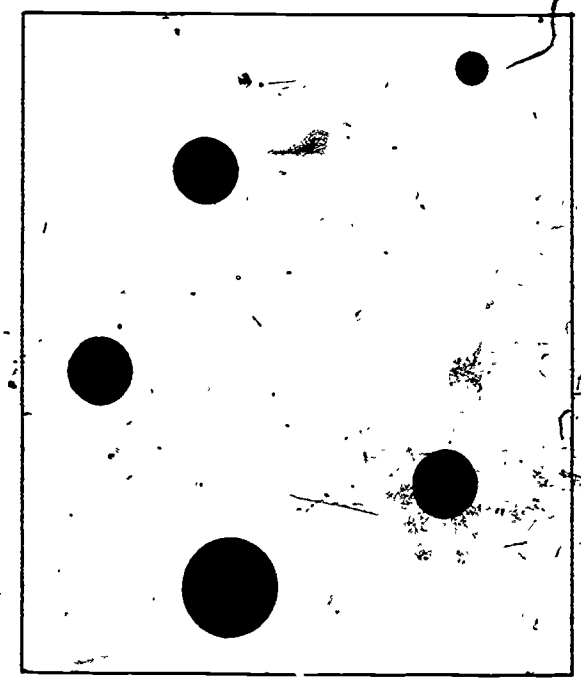
TEST MATERIALS:

20 buttons - 1/2 inch diameter, white, plastic

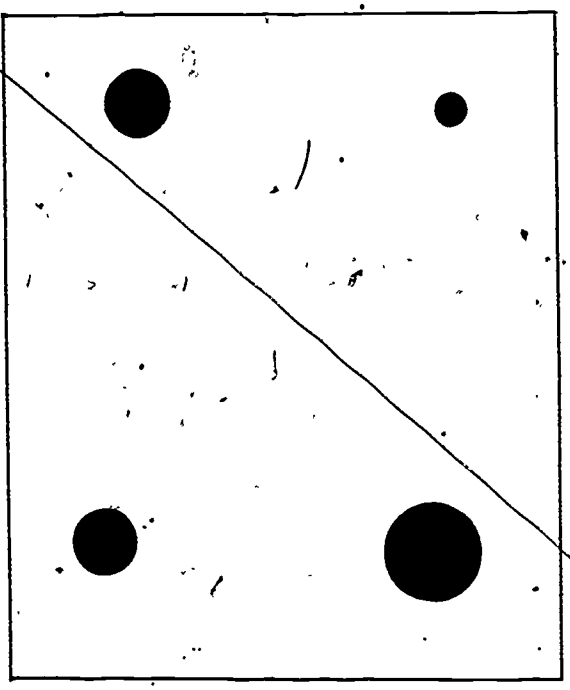
1 sheet of 11" × 14" white construction paper

6 6" × 7" cards with varying numbers of dots of varying sizes on each card. On the back of each card at the top is printed "Equivalent Sets - Top of Card ..." (the cards are numbered 1 through 6 to indicate the order in which they are to be presented to the child), and a digit in the lower left corner which indicates the number of dots pictured on the front of the card.

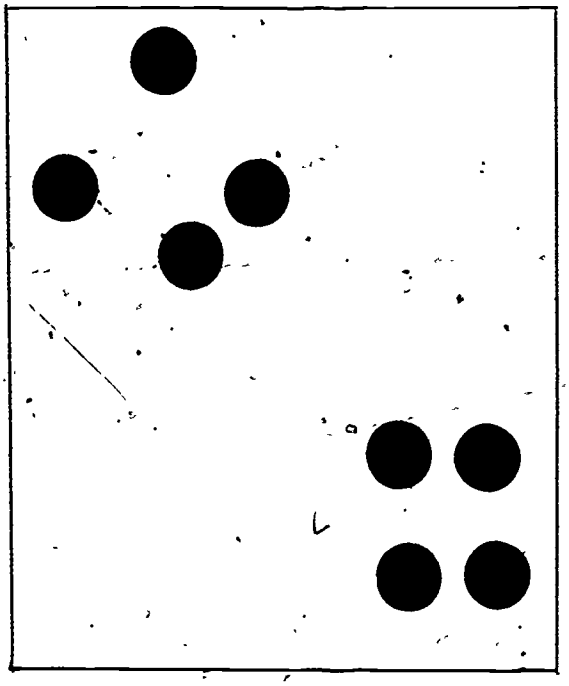
The cards are reproduced below.



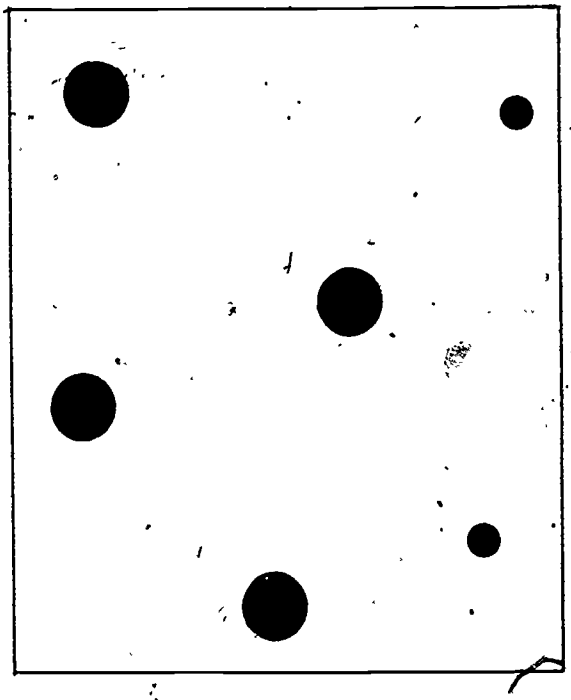
Card 1



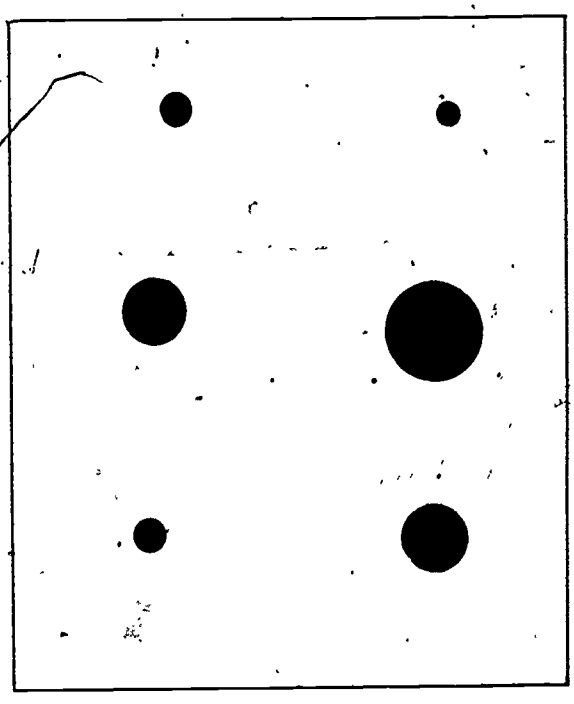
Card 2



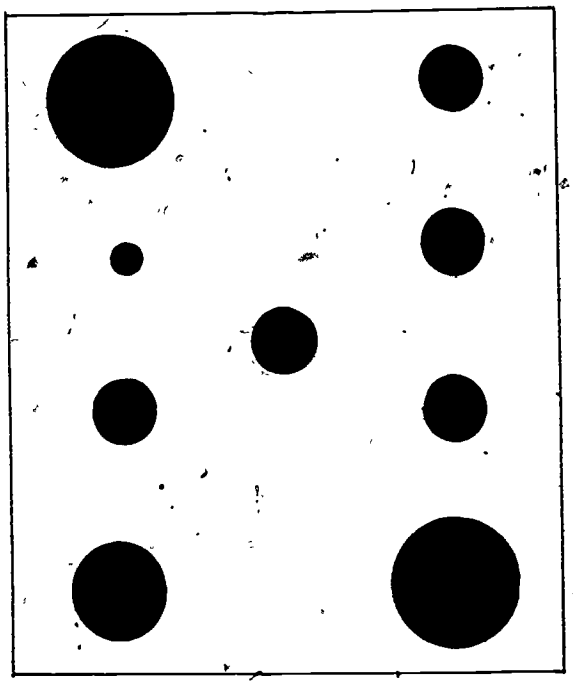
Card 3



Card 4



Card 5



Card 6

TEST DIRECTIONS:

Heap the buttons to the child's left. Place the sheet of construction paper in front of him.

I AM GOING TO SHOW YOU SOME CARDS WITH DOTS ON THEM.

Show the child Card 1. Place it above his sheet of paper and say:

ON THIS SHEET (point to his construction paper) MAKE A SET, WITH THE BUTTONS, WHICH IS EQUIVALENT TO THIS SET (pointing to the card).

If the child does not respond, say:

MAKE A SET WITH YOUR BUTTONS ON THIS SHEET (point to construction paper) THAT HAS THE SAME NUMBER OF MEMBERS AS MY SET HAS (point to your number card).

Pause after the child finishes, and remove the buttons from his paper to the side of the table each time. Continue with the cards in the order and position as marked on the back of each card, using the same directions as for Card 1.

Have on the table only the card for which the child is constructing an equivalent set. Keep all other cards off of the table.

Stop after the child has made three errors in constructing sets.

Note that the correct response (number of dots on the card) is printed in the lower left corner on the back of each card.

TESTER'S SCORING GRID:

Item No.	Card No.	Correct Response	Incorrect Response	No Attempt
16	1			
17	2			
18	3			
19	4			
20	5			
21	6			

ORDERING - OBJECTS AND SHAPES

TEST MATERIALS:

4 buttons - brown, plastic, measuring the following diameters:

1", $\frac{7}{8}$", $\frac{3}{4}$", $\frac{5}{8}$"

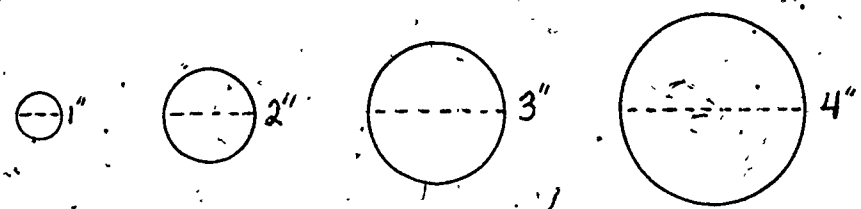
5 cubes - styrofoam, measuring the following dimensions:

3", $2\frac{1}{2}$", 2", $1\frac{1}{2}$", 1"

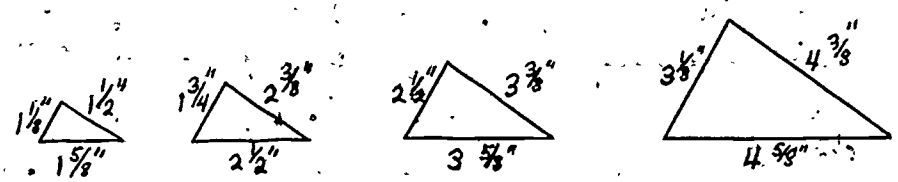
5 drinking straws - plastic, measuring the following lengths:

$5\frac{1}{4}$", $4\frac{1}{2}$", $3\frac{1}{2}$", 3", $2\frac{1}{2}$".

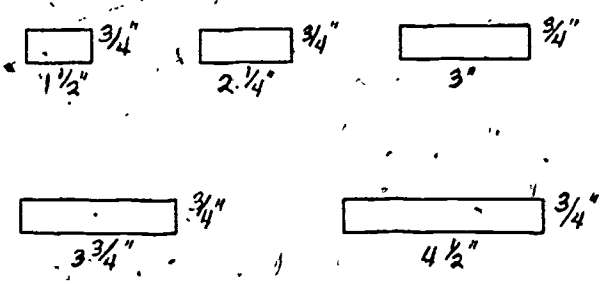
4 circles - red, cut from light-weight cardboard



4 triangles - red, cut from light-weight cardboard



5 rectangles - red, cut from light-weight cardboard



TEST DIRECTIONS:

Scoring Instructions for "Ordered" Items (1a, 2, 3a, 4a, 5a, and 6a)

In recording the Ordered items, the "Ordered with error" column should be checked when the child is able to partially order the set of objects or shapes (e.g., ends correct, confusion in middle size items; one reversal; or some other partially correct attempt). The "Randomly ordered" column should be checked when the child has no concept of ordering, as evidenced by no systematic, ordered placement of the shapes or objects.

Directions:

1. Circular Shapes

   a. Hand the child the 4 circular regions in a stack. Have the shapes arranged in the following order before handing them to him: 3rd largest on top, smallest, largest, 2nd to largest on bottom.

      HERE ARE SOME CIRCULAR SHAPES. CAN YOU PUT THESE IN A LINE SO THAT THEY GO FROM THE LARGEST TO THE SMALLEST?

      Record on scoring sheet, item 1a, under Ordered.

   b. GIVE ME THE SMALLEST CIRCLE.

      Record on scoring sheet, item 1b, under Handed.

2. Triangular Shapes

   Hand the child the 4 triangular regions in a stack. Have the shapes arranged in the following order before handing them to him: 2nd to largest on top, largest, smallest, 3rd to largest on bottom.

   HERE ARE SOME TRIANGULAR SHAPES. CAN YOU PUT THESE IN A LINE SO THEY GO FROM THE SMALLEST TO THE LARGEST?

   Record on scoring sheet, item 2, under Ordered.

3. Buttons

   a. Place the 4 buttons in a pile in front of the child.

      HERE ARE SOME BUTTONS OF DIFFERENT SIZES. PUT THEM IN A LINE FROM THE SMALLEST TO THE LARGEST.

      Record on scoring sheet, item 3a, under Ordered.

   b. NOW GIVE ME THE SMALLEST BUTTON.

      Record on scoring sheet, item 3b, under Handed.

4. Blocks

a. Place the 5 styrofoam blocks in a heap in front of the child.

HERE ARE SOME BLOCKS. PUT THEM IN A LINE SO THEY GO FROM THE LARGEST TO THE SMALLEST.

Record on scoring sheet, item 4a, under Ordered.

b. GIVE ME THE LARGEST BLOCK.

Record on scoring sheet, item 4b, under Handed.

5. Plastic Straws

a. Hand the child the 5 straws in a bundle (with rubber band removed).

HERE ARE SOME STRAWS OF DIFFERENT LENGTHS. PUT THESE IN A LINE SO THEY GO FROM THE LONGEST TO THE SHORTEST.

In scoring this item, note that the child's placement of the straws in either a vertical or horizontal position to himself is acceptable as long as the straws are correctly ordered.

Record on scoring sheet, item 5a, under Ordered.

b. NOW HAND ME THE SHORTEST STRAW.

Record on scoring sheet, item 5b, under Handed.

6. Rectangular Shapes

a. Hand the child the 5 rectangular shapes in a stack in the following order: next to smallest on top, 3rd to largest, smallest, largest, 2nd to largest on the bottom.

HERE ARE SOME RECTANGULAR SHAPES. CAN YOU PUT THESE IN A LINE FROM THE LONGEST TO THE SHORTEST?

In scoring this item, note that the child's placement of the rectangular shapes in either a vertical or horizontal position to himself is acceptable as long as the shapes are correctly ordered.

Record on scoring sheet, item 6a, under Ordered.

b. NOW HAND ME THE LONGEST RECTANGULAR SHAPE.

Record on scoring sheet, item 6b, under Handed.

Grade 1
Fall

TESTER'S SCORING GRID:

Item No.	Ordered:		Ordered correctly Largest-smallest or Smallest-largest	Ordered with error (ends correct, confusion in middle size items or some other partially correct attempt)	Randomly ordered	No Attempt	Handed:		Correct Response (✓)	Incorrect Response (✓)	No Attempt (✓)
22-23	1a	Circular Shapes					1b	smallest circle			
24	2	Triangular Shapes									
25-26	3a	Buttons					3b	smallest button			
27-28	4a	Blocks					4b	largest block			
29-30	5a	Plastic Straws					5b	shortest straw			
31-32	6a	Rectangular Shapes					6b	longest shape			

Form 1-01
Items 22-32

GRADE 1

SPRING TEST BATTERY

FORMS 1-02, 1-03, 1-04, AND 1-05

INTRODUCTION

Grade 1 - Spring Testing

Forms 1-02, 1-03, 1-04 and 1-05

All scales in the Grade 1 spring tests were designed to measure mathematics achievement. Form 1-02 was individually administered and contained five scales previously given in the kindergarten batteries in addition to one new scale. It took approximately ten minutes to give. For the first time, printed, group administered tests were used, although all items were still read by the tester as well as being printed in the booklets. Forms 1-03, 1-04, and 1-05 were administered to small groups of five or six students at a time. Form 1-03 took approximately fifteen minutes to administer, and Forms 1-04 and 1-05 about thirty minutes apiece.

Because of the total length of the end-of-year test batteries for Grade 1, they were given in two phases; Forms 1-02 and 1-03 were administered during April, and Forms 1-04 and 1-05 during the last two weeks in May. In addition, the population was divided into four sub-populations. Thirteen basic scales were given to the entire population, while each of the other five basic scales in the batteries was given to only one or two of the sub-populations. The assignment of students to one of the four sub-populations was determined by the sub-population assignment in kindergarten.

The assignment of the spring, Grade 1 scales to the total or sub-populations is outlined below.

Basic Scales Administered to Total Population	Scales Derived from Basic Scales
Comprehension (Individual)	329, 305 (composite)
Number Comparison - Order	307, 330, 337
Place Value	306, 331
Identifying Triangles	321
Identifying Rectangles	322
Curved Figures	323
Comprehension (Group)	328, 305 (composite)

(continued)

Basic Scales Administered to Total Population (continued)	Scales Derived from Basic Scales
Application	309, 333, 338
Rationals	310, 334
Number Line	308, 332
Computation - Addition	311, 335, 339
Computation - Subtraction	312, 336, 340
Computation - Multiplication	313
Basic Scales Administered to Sub-Population W	
Counting Members of a Given Set - Picture Cards (also given to Sub-Population Y)	301, 324, 325
Basic Scales Administered to Sub-Population X	
Counting Buttons	302, 326, 327
Basic Scales Administered to Sub-Population Y	
Counting Members of a Given Set - Picture Cards (also given to Sub-Population W)	301, 324, 325
Basic Scales Administered to Sub-Population Z	
Ordering Pictured Sets (Individual)	303
Conservation - Pictures	314, 304 } composite
Conservation - Dots	315, 304

An unexpectedly high attrition rate among the ELMA sample between kindergarten and first grade made it necessary to supplement the sample by adding more students to the program at the time of spring testing for Grade 1. These students came from the same schools and classes as the original sample; however, they were drawn from only one test center, the larger center which had all four cells represented in the study. By adding 625 first graders to the spring testing, the total sample tested came to approximately 1700 students.

All testers attended a training session before testing began in which the manner of administering the test was demonstrated. This training session dealt with both the first and second phase of spring testing.

The tests have been reproduced exactly as they were given with two exceptions. (1) Originally, the items were not numbered (although the item numbers did appear as part of the page number in the upper corner of the page) for Forms 1-03, 1-04, and 1-05. However, for the reader's information, item numbers enclosed by parentheses have been added where more than one item appears on a page. For scoring purposes, item numbers were added for each separate figure which appeared on the geometry items in Form 1-03. (2) In the original test booklets for Forms 1-03, 1-04, and 1-05, the items were always printed on the right-hand page, leaving the left page blank, so that the child would be confronted with only one perceptual stimulus at a time. In this report, items are printed on both pages.

The four pupil score sheets (one each for the W, X, Y, and Z sub-populations) used by the testers to record responses for Form 1-02 are reproduced here in their entirety. For the reader's convenience, the section of the score sheet which pertains to a particular scale is also reproduced immediately after the test directions. The responses made by the students in the Forms 1-03, 1-04, and 1-05, test booklets were scored at SMSG Headquarters.

SCHOOL MATHEMATICS STUDY GROUP

ELEMENTARY MATHEMATICS PROJECT

FORMS 1-02 AND 1-03

General Instructions for Testers

The April battery of tests for first grade students in the Elementary Mathematics Project will include some tests that are to be administered individually and other tests that can be administered to small groups of five or six children.

You will find that some of the test items deal with mathematics content that is not taught in all of the schools. Therefore there may be children who will not be able to do some items.

(1) For each student there will be a Pupil Score Sheet on which you will record the responses for the individual test (Form 1-02) and an answer booklet in which the student will mark his answers for the group test (Form 1-03).

(2) Both the Pupil Score Sheet and the answer booklet will have a label attached giving the name of the student, his school and teacher. You should test only those students for whom you have a Pupil Score Sheet and answer booklet.

(3) Be certain to fill in your name and the date of testing on both of these forms.

(4) Record the number of tests administered and the hours worked each day on the Weekly Time Sheets.

(5) Mail the time sheets and completed tests to us at the end of each week.

In so far as possible, all the students in a school should be given the individual tests first and the group test should then be given in that school before starting individual tests in another school. This procedure may have to be altered slightly when a student is absent from school.

If a child is not in the class indicated on the label, check to see whether he has transferred to another class within the school. If told that he has moved from the school, please note this on both the Pupil Score Sheet and the answer booklet and return them to us.

The tester should ask the principal at each school whether the children may return to the classroom by themselves or whether they should be accompanied by the tester. It is important that the children miss as little classroom time as possible, and should be taken or sent back to their classroom (depending upon school policy) immediately after the testing has been completed. Children may not leave the school grounds under any circumstances while under your supervision.

If you will be unable to test on a given day for which you are scheduled, be sure to notify the school that you will not be there. If your time schedule changes unexpectedly, i.e., you will miss more than one day during the testing program, please notify us immediately. You may call collect 321-2300, Extension 2681, and speak to either Mrs. Terry Chay or Mrs. Diana Scheffler.

It is expected that you will use mature judgment in your behavior and appearance and that you will evidence respect for the teachers and children with whom you are in contact.

SCHOOL MATHEMATICS STUDY GROUP

ELEMENTARY MATHEMATICS PROJECT

FORM 1-02

SPRING INVENTORY 1968 - GRADE 1

DIRECTIONS FOR INDIVIDUAL TEST: Form 1-02

1. Setting for Administration of Tests.

It is important to have a separate room so that interruptions and distractions are minimized.

The child will feel more comfortable if this is not presented as a testing situation and if the tester chats with the child to put him at ease before starting. Tell the child that, "We are going to do some things together."

If the child seems anxious, assure him that we are interested in what he is learning in school, but that what you do together will in no way affect his grade.

You will need a table and two chairs. Preferably, the table and chairs should be low (from the kindergarten or first grade classroom) so that they are a comfortable height for the child. Seat the child across the table from you.

2. Materials.

Directions for administering Form 1-02

Pupil Score Sheets (one for each child)

80 buttons

12 wooden blocks

3 boxes with tops

1 set of 9 cards marked "Counting Members of a Given Set"

1 set of 15 cards marked "Ordering Pictured Sets"

1 set of 6 cards marked "Conservation - Pictures"

1 set of 6 cards marked "Conservation - Dots"

Booklet marked "Comprehension of Addition and Subtraction"
(Extra copies of this booklet are included to replace those that get smudged or torn.)

Pencils (to be used for group test, but included with above materials for packaging convenience)

List of schools with address, phone number, and principal's name

Return mailing envelopes

Time sheets

3. Procedure.

Read over the instructions for administering the tests several times, and become familiar with the materials before you start testing the children.

The instructions for you, as tester, are typed in lower case. What you actually say to the child is typed in capital letters.

Follow the written directions carefully. Do not probe to get an answer beyond what is suggested in the directions. This is an evaluation and should not be used as a teaching situation.

Use reassurance without specifying that responses are right or wrong. This may be done in a variety of ways:

Repeating what the child has said in a reassuring voice.

Remarks such as "Um - Hum," "All right."

Comments between tests such as, "You do these very well."

Conversation with the child between tests.

Place on the table only those items required for the task being given, along with the instructions and score sheets for that particular task. Remove materials used for a task from the table before beginning the next part of the testing.

If the child becomes interested in the testing materials, tell him he will have a chance to play with them after you have finished what you are doing together. Make certain that you do then permit the child to have a few minutes to play with them.

The students have been randomly assigned to four sub-populations, W, X, Y, and Z. The tests on the first page of the Pupil Score Sheet for Form 1-02 are different for each sub-population. The student label on the Pupil Score Sheet has the appropriate letter printed on it. Give each child only those individual tests which appear on his Pupil Score Sheet.

The answers on all the tests included in Form 1-02 will be recorded by the tester at the time they are administered. Please try to place the score sheet on the table or hold it in such a way that those students who can read the column headings will not see how their responses are being recorded.

After the child has finished the items on pages 1 and 2, the tester should complete the rating scales on page 3. These are included as a method of evaluating the child's behavior in the testing situation. Make a rating on each of these two scales as soon as you finish testing the child. Mark the point on each scale that best describes a given child's behavior on these particular dimensions during the

testing situation. (Note that the end points on these two scales are in reverse order.) If you feel that any of the sub-tests, or the entire test may be invalid, please say so in the areas provided for comments, and give your reasons.

4. Important Considerations.

In order for these test results to be meaningful:

a) It is imperative that the tester adhere to the written directions as closely as possible. Rapport with the child is crucial; however, cueing the child beyond the written directions invalidates the results.

b) It is imperative that recording of children's performance on the score sheet be as accurate as possible. Score sheets may be completed in pencil; over-emphasis on neatness may be unnecessarily time-consuming. Entries should be legible and accurate; neatness is not a primary consideration. Be sure to fill in your name and the date on each score sheet.

c) It is imperative that every sub-test be completely recorded. At the end of each day of testing, please check each score sheet to see that you have not omitted any item from administration or scoring.

d) We hope to complete most of the testing during the first week (April 1-5) with only a small amount of testing left to be done the week of April 15-19. In several schools, however, the number of students is so large that it will not be possible to complete testing that soon. The final date by which all testing must be completed in all schools is April 26. Please let us know if you anticipate any difficulty in this respect.

5. Returning Materials.

It is essential that tests be sent to us each Friday afternoon. At the end of each week, mail all completed Pupil Score Sheets and your time sheet for the week to SMSG. Record the name of the school where you are testing, the number of tests administered, and the number of hours worked for each day you are testing. Please include any score sheets for students who have transferred from the school with a notation regarding their moving.

After the final test has been given, you may leave the box of materials in the principal's office. We will pick them up at the end of April.

PUPIL SCORE SHEET Grade 1: Spring Inventory, 1968 Form 1-02 W

W

Tester's Name: _____

Date Given : _____, 1968

COUNTING MEMBERS OF A GIVEN SET

Picture Cards

Comments:

Item No.	Card No.	Counted Correctly	Attempted, Incorrect	No Attempt
1	2			
2	3			
3	4			
4	6			
5	7			
6	8			
7	9			
8	10			
9	11			

COMPREHENSION OF ADDITION AND SUBTRACTION

Item No. 34

Check the statement which best describes child's response. If Other (No. 4), be sure to explain under Comments.

____ 1. Counts out 7 blocks.

____ 2. Counts out 4 blocks, adds 3 more, forming set of 7 blocks.

____ 3. Forms 2 separate sets of blocks: a set of 3 and a set of 4. Pushes them together to form set of 7.

____ 4. Other relevant strategy. Describe: _____

_____

_____

_____

____ 5. Plays with blocks without forming any relevant sets.

____ 6. No attempt, or "I don't know."

Comments:

Item No. 35

Check the statement which best describes child's response. If Other (No. 5), be sure to explain under Comments.

____ 1. Counts out 9 blocks, removes 4.

____ 2. Counts out 9 blocks, removes 5.

____ 3. Counts out set of 4 and separate set of 5. He may or may not push them together.

____ 4. Counts out set of 5 blocks.

____ 5. Other relevant strategy. Describe: _____

_____

_____

_____

____ 6. Plays with blocks without forming any relevant sets.

____ 7. No attempt, or "I don't know."

Comments:

Item No. 36

Check the 1 mathematical sentence selected by the child.

____ 4 + 4 = 8

____ 8 - 3 = 5

____ 5 + 3 = 8

____ 2 + 6 = 8

____ No attempt, or "I don't know."

Comments:

Item No. 37

Check the 1 mathematical sentence selected by the child.

____ 9 - 4 = 5

____ 9 - 3 = 6

____ 2 + 7 = 9

____ No attempt, or "I don't know."

Comments:

RESPONSE TO VERBAL DIRECTIONS (Mark appropriate space.)

Item No. 38

(a) No compliance. Did not do what was asked. ☐

(b) Little compliance. Did not do what was asked in most instances unless controls used. ☐

(c) Some compliance. Did (or tried to do) what was asked in some tasks. ☐

(d) Full compliance. Did exactly (or tried to do) what was asked on each task. ☐

ATTENTION TO TASKS (Mark appropriate space.)

Item No. 39

(a) Attended well to all tasks. ☐

(b) Attended well to some tasks but not to all. ☐

(c) Attention wandered periodically. ☐

(d) Inattentive unless continually directed. ☐

Comments:

PUPIL SCORE SHEET Grade 1: Spring Inventory, 1968 Form 1-02, X

Tester's Name: _____

X

Date Given : _____, 1968

COUNTING BUTTONS

Comments:

Item No.	Number Asked	Correct Response	Incorrect Response	No Response
10	5			
11	7			
12	6			
13	8			
14	9			
15	12			
16	10			
17	17			
18	23			

COMPREHENSION OF ADDITION AND SUBTRACTION

Item No. 34

Check the statement which best describes child's response. If Other (No. 4), be sure to explain under Comments.

____ 1. Counts out 7 blocks.

____ 2. Counts out 4 blocks, adds 3 more, forming set of 7 blocks.

____ 3. Forms 2 separate sets of blocks: a set of 3 and a set of 4. Pushes them together to form set of 7.

____ 4. Other relevant strategy. Describe: _____

_____

_____

_____

____ 5. Plays with blocks without forming any relevant sets.

____ 6. No attempt, or "I don't know."

Comments:

Item No. 35

Check the statement which best describes child's response. If Other (No. 5), be sure to explain under Comments.

____ 1. Counts out 9 blocks, removes 4.

____ 2. Counts out 9 blocks, removes 5.

____ 3. Counts out set of 4 and separate set of 5. He may or may not push them together.

____ 4. Counts out set of 5 blocks.

____ 5. Other relevant strategy. Describe: _____

_____

_____

_____

____ 6. Plays with blocks without forming any relevant sets.

____ 7. No attempt, or "I don't know."

Comments:

Item No. 36

Check the 1 mathematical sentence selected by the child.

____ 4 + 4 = 8

____ 8 - 3 = 5

____ 5 + 3 = 8

____ 2 + 6 = 8

____ No attempt, or "I don't know."

Comments:

Item No. 37

Check the 1 mathematical sentence selected by the child.

____ 9 - 4 = 5

____ 9 - 3 = 6

____ 2 + 7 = 9

____ No attempt, or "I don't know."

Comments:

RESPONSE TO VERBAL DIRECTIONS (Mark appropriate space.)

Item No. 38

(a) No compliance. Did not do what was asked. ☐

(b) Little compliance. Did not do what was asked in most instances unless controls used. ☐

(c) Some compliance. Did (or tried to do) what was asked in some tasks. ☐

(d) Full compliance. Did exactly (or tried to do) what was asked on each task. ☐

ATTENTION TO TASKS (Mark appropriate space.)

Item No. 39

(a) Attended well to all tasks. ☐

(b) Attended well to some tasks but not to all. ☐

(c) Attention wandered periodically. ☐

(d) Inattentive unless continually directed. ☐

Comments:

PUPIL SCORE SHEET Grade 1: Spring Inventory, 1968 Form 1-02 Y

Tester's Name: _____

Date Given : _____, 1968

COUNTING MEMBERS OF A GIVEN SET

Picture Cards

Comments:

Item No.	Card No.	Counted Correctly	Attempted, Incorrect	No Attempt
1	2			
2	3			
3	4			
4	6			
5	7			
6	8			
7	9			
8	10			
9	11			

COMPREHENSION OF ADDITION AND SUBTRACTION

Item No. 34

Check the statement which best describes child's response. If Other (No. 4), be sure to explain under Comments.

____ 1. Counts out 7 blocks.

____ 2. Counts out 4 blocks, adds 3 more, forming set of 7 blocks.

____ 3. Forms 2 separate sets of blocks: a set of 3 and a set of 4. Pushes them together to form set of 7.

____ 4. Other relevant strategy. Describe: _____

_____

_____

_____

____ 5. Plays with blocks without forming any relevant sets.

____ 6. No attempt, or "I don't know."

Comments:

Item No. 35

Check the statement which best describes child's response. If Other (No. 5), be sure to explain under Comments.

____ 1. Counts out 9 blocks, removes 4.

____ 2. Counts out 9 blocks, removes 5.

____ 3. Counts out set of 4 and separate set of 5. He may or may not push them together.

____ 4. Counts out set of 5 blocks.

____ 5. Other relevant strategy. Describe: _____

_____

_____

_____

____ 6. Plays with blocks without forming any relevant sets.

____ 7. No attempt, or "I don't know."

Comments:

Item No. 36

Check the 1 mathematical sentence selected by the child.

____ 4 + 4 = 8 Comments:

____ 8 - 3 = 5

____ 5 + 3 = 8

____ 2 + 6 = 8

____ No attempt, or "I don't know."

Item No. 37

Check the 1 mathematical sentence selected by the child. Comments:

____ 9 - 4 = 5

____ 9 - 3 = 6

____ 2 + 7 = 9

____ No attempt, or "I don't know."

RESPONSE TO VERBAL DIRECTIONS (Mark appropriate space.)

Item No. 38

(a) No compliance. Did not do what was asked. ☐

(b) Little compliance. Did not do what was asked in most instances unless controls used. ☐

(c) Some compliance. Did (or tried to do) what was asked in some tasks. ☐

(d) Full compliance. Did exactly (or tried to do) what was asked on each task. ☐

ATTENTION TO TASKS (Mark appropriate space.)

Item No. 39

(a) Attended well to all tasks. ☐

(b) Attended well to some tasks but not to all. ☐

(c) Attention wandered periodically. ☐

(d) Inattentive unless continually directed. ☐

Comments:

PUPIL SCORE SHEET Grade 1: Spring Inventory, 1968 Form 1-02 Z

Tester's Name: _____

Date Given : _____, 1968

ORDERING

Pictured Sets

Item No.	Set No.	Ordered correctly Most-fewest or Fewest-most (✓)	Both end sets ordered correctly Middle sets reversed (✓)	Attempted, but unsuccessful (✓)	No Attempt (✓)
	Prac.				
19	1				
20	2				
21	3	✓			

Comments:

CONSERVATION

Pictures

Item No.	Card No.	Child asserts more dots in TOP row (✓)	Child asserts more dots in BOTTOM row (✓)	Child asserts same number dots each row (✓)	No Attempt (✓)
22	1				
23	2				
24	3				
25	4				
26	5				
27	6				

Comments:

CONSERVATION

Dots

Item No.	Card No.	Child asserts more dots in TOP row (✓)	Child asserts more dots in BOTTOM row (✓)	Child asserts same number dots each row (✓)	No Attempt (✓)
28	1				
29	2				
30	3				
31	4				
32	5				
33	6				

Comments:

COMPREHENSION OF ADDITION AND SUBTRACTION

Item No. 34

Check the statement which best describes child's response. If Other (No. 4), be sure to explain under Comments.

____ 1. Counts out 7 blocks.

____ 2. Counts out 4 blocks, adds 3 more, forming set of 7 blocks.

____ 3. Forms 2 separate sets of blocks: a set of 3 and a set of 4. Pushes them together to form set of 7.

____ 4. Other relevant strategy. Describe: _____

_____

_____

_____

____ 5. Plays with blocks without forming any relevant sets.

____ 6. No attempt, or "I don't know."

Comments:

Item No. 35

Check the statement which best describes child's response. If Other (No. 5), be sure to explain under Comments.

____ 1. Counts out 9 blocks, removes 4.

____ 2. Counts out 9 blocks, removes 5.

____ 3. Counts out set of 4 and separate set of 5. He may or may not push them together.

____ 4. Counts out set of 5 blocks.

____ 5. Other relevant strategy. Describe: _____

_____

_____

_____

____ 6. Plays with blocks without forming any relevant sets.

____ 7. No attempt, or "I don't know."

Comments:

Item No. 36

Check the 1 mathematical sentence selected by the child.

____ 4 + 4 = 8

____ 8 - 3 = 5

____ 5 + 3 = 8

____ 2 + 6 = 8

____ No attempt, or "I don't know."

Comments:

Item No. 37

Check the 1 mathematical sentence selected by the child.

____ 9 - 4 = 5

____ 9 - 3 = 6

____ 2 + 7 = 9

____ No attempt, or "I don't know."

Comments:

RESPONSE TO VERBAL DIRECTIONS (Mark appropriate space.)

Item No. 38

(a) No compliance. Did not do what was asked. ☐

(b) Little compliance. Did not do what was asked in most instances unless controls used. ☐

(c) Some compliance. Did (or tried to do) what was asked in some tasks. ☐

(d) Full compliance. Did exactly (or tried to do) what was asked on each task. ☐

ATTENTION TO TASKS (Mark appropriate space.)

Item No. 39

(a) Attended well to all tasks. ☐

(b) Attended well to some tasks but not to all. ☐

(c) Attention wandered periodically. ☐

(d) Inattentive unless continually directed. ☐

Comments:

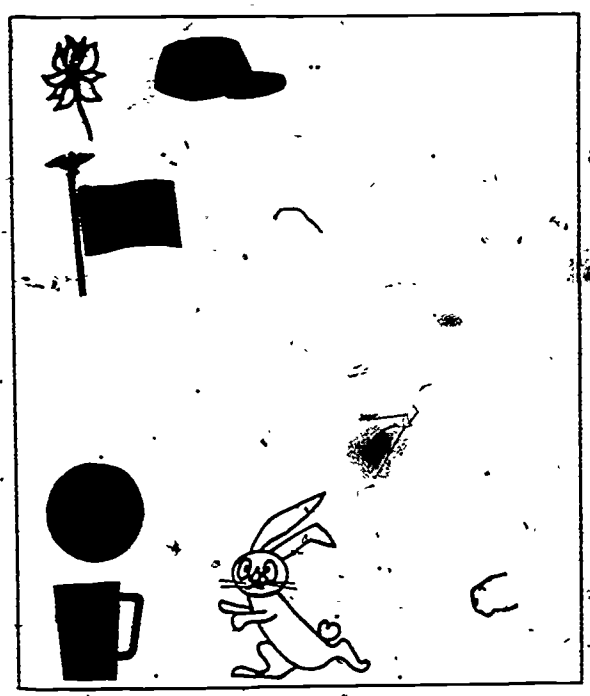
W, Y

COUNTING MEMBERS OF A GIVEN SET - PICTURE CARDS

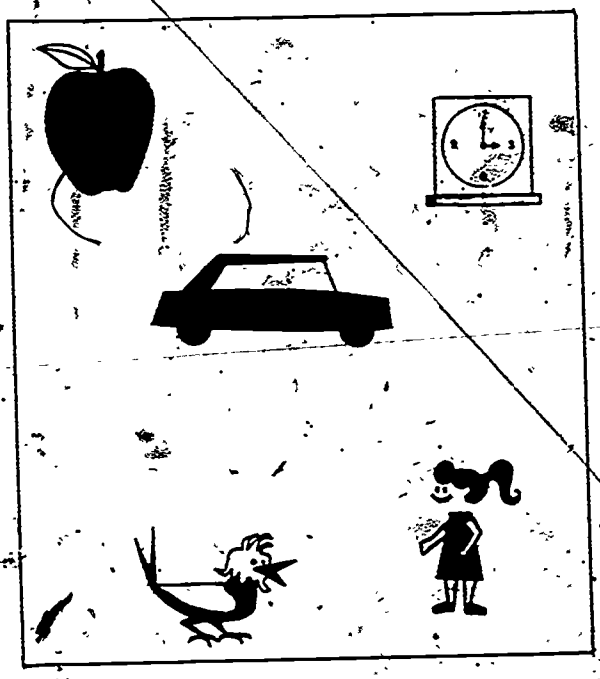
TEST MATERIALS:

9 6" × 7" cards with varying numbers of drawings of familiar objects printed on each card. On the back of each card at the top is printed "Counting Members of a Given Set - Top of Card ..." (the cards are numbered 2 through 11, with number 5 omitted, to indicate the order in which they are to be presented to the child), and a digit in the lower left corner which indicates the number of objects pictured on the front of the card.

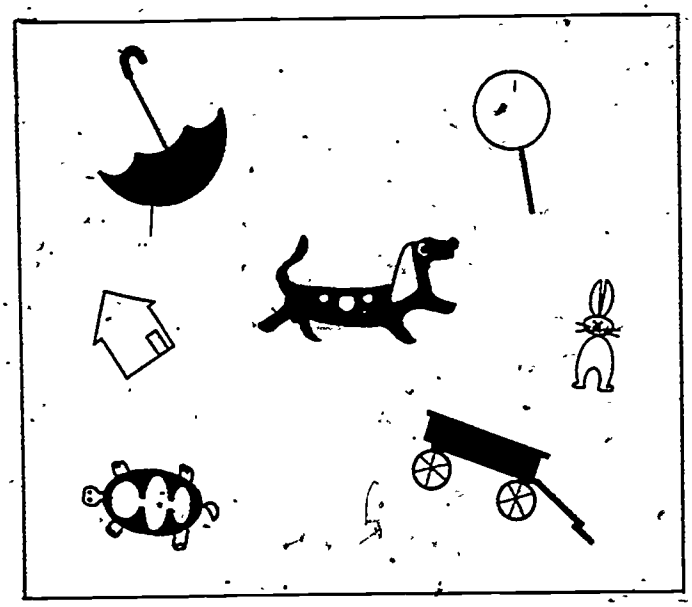
The cards are reproduced below.



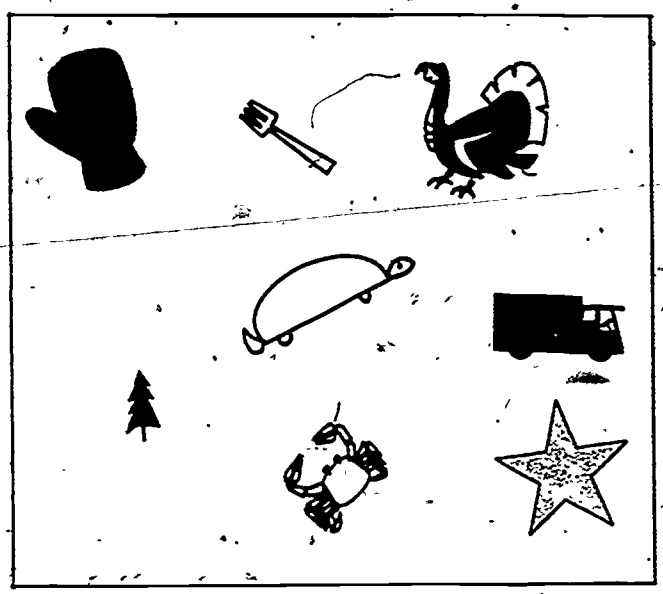
Card 2



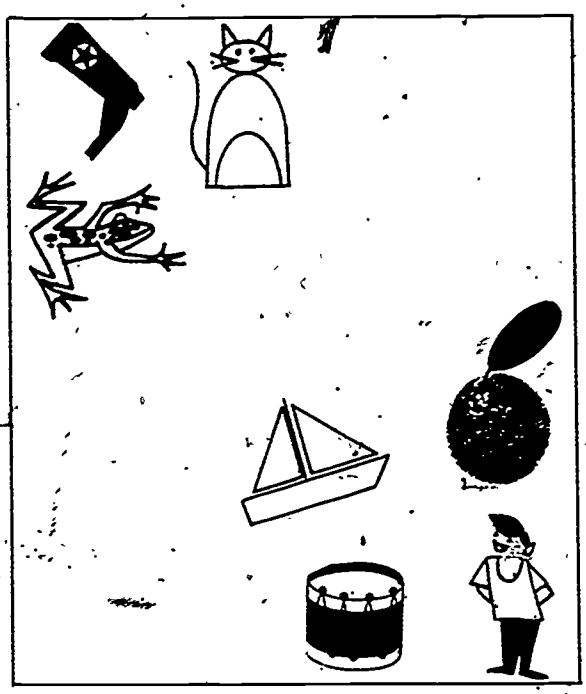
Card 3



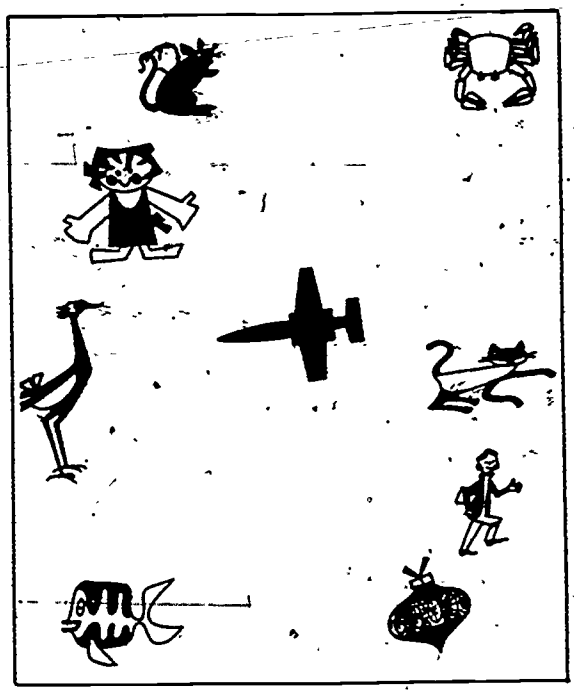
Card 4



Card 6

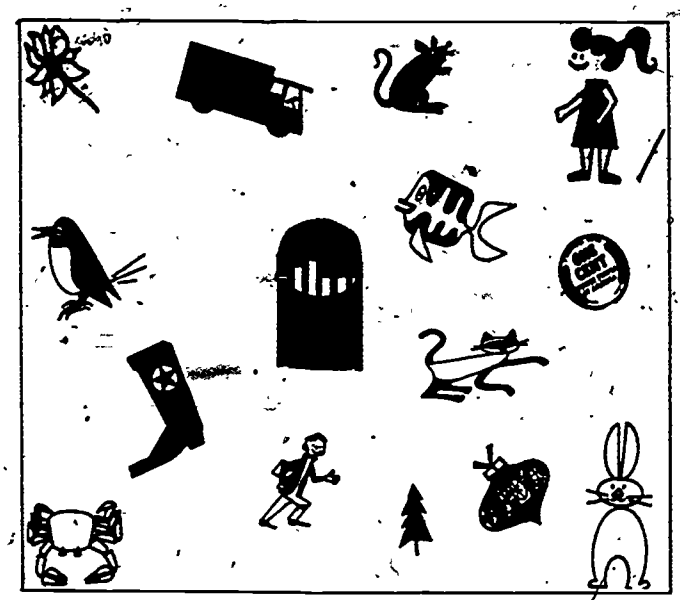


Card 7

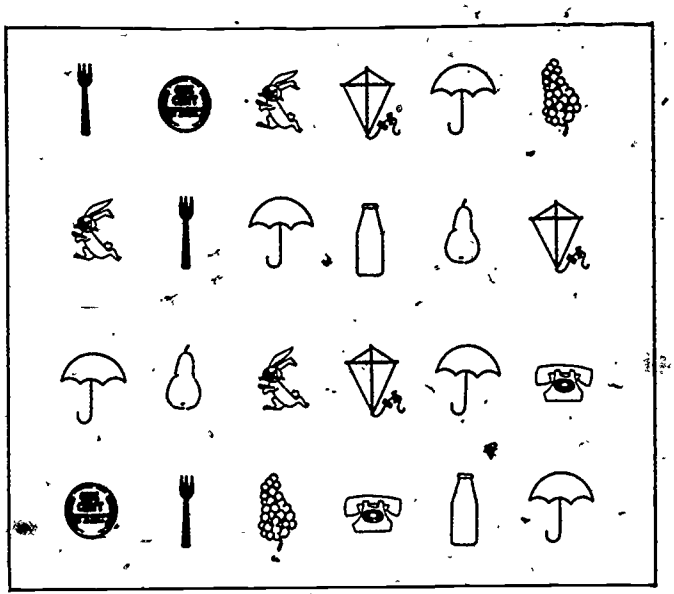


Card 8

Card 9



Card 10



Card 11

TEST DIRECTIONS:

Place Card 2 in front of the child and say:

HOW MANY MEMBERS ARE THERE IN THIS SET?

If no response, say:

HOW MANY DRAWINGS ARE ON THIS CARD?

Continue in the order and with the position of the card as marked on the back for each card, using the same directions as for Card 2.
(Note that there are no cards with numbers 1 or 5.)

Stop after the child has made three errors in counting.

Note that the correct answer is printed in the lower left corner on the back of each card.

TESTER'S SCORING GRID:

Item No.	Card No.	Counted Correctly	Attempted Incorrect	No Attempt
1	2			
2	3			
3	4			
4	6			
5	7			
6	8			
7	9			
8	10			
9	11			

X

COUNTING BUTTONS

TEST MATERIALS:

80 buttons - $\frac{1}{2}$ inch diameter, white, plastic

3 boxes with lids - approximately $3\frac{1}{2}" \times 3\frac{1}{2}" \times 1\frac{1}{2}"$, light-weight cardboard. (The lids of the boxes were also used as boxes in the testing.)

TEST DIRECTIONS:

LET'S PUT SOME BUTTONS IN THESE BOXES.

Place a heap of buttons in front of the child and give him a box.

WILL YOU PUT TWO BUTTONS IN THE BOX?

(This is a practice item and is not to be recorded on the score sheet.)

Push the box to your right.

Place another box in front of the child and say:

WOULD YOU PUT FIVE BUTTONS IN THIS BOX?

Continue in the order listed on the scoring sheet. After the first five items have been completed, empty the boxes and re-use the buttons and boxes for the remaining four items.

Stop after child has made three errors in counting.

TESTER'S SCORING GRID:

Item No.	Number Asked	Correct Response	Incorrect Response	No Response
10	5			
11	7			
12	6			
13	8			
14	9			
15	12			
16	10			
17	17			
18	23			

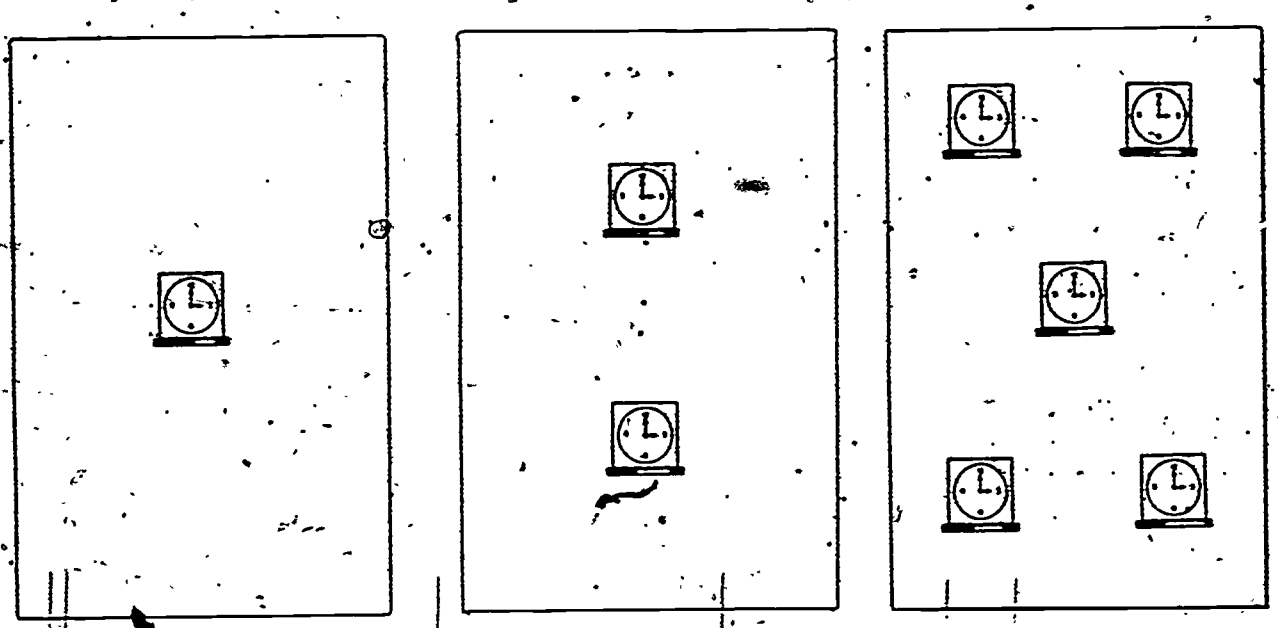
ORDERING PICTURED SETS

TEST MATERIALS:

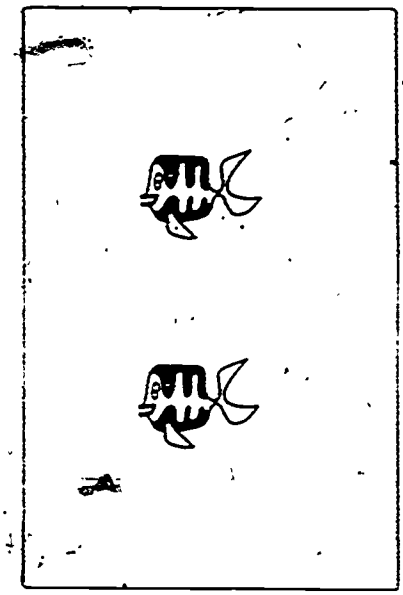
4 sets of 4" x 6" cards with varying numbers of drawings of a familiar object placed in symmetric patterns on the cards

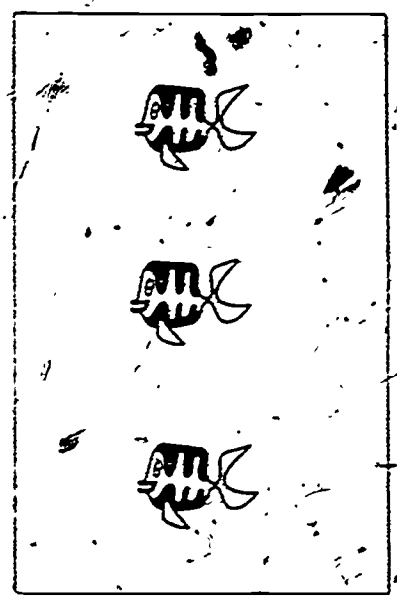
The cards are reproduced below.

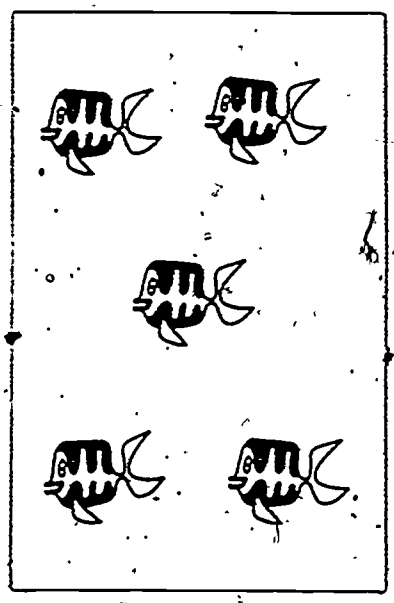
Practice Set

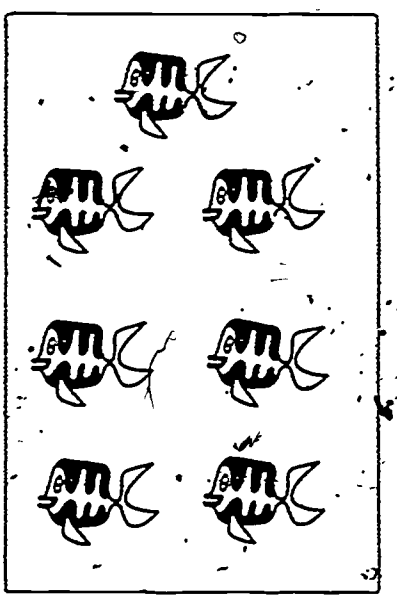


Set 1

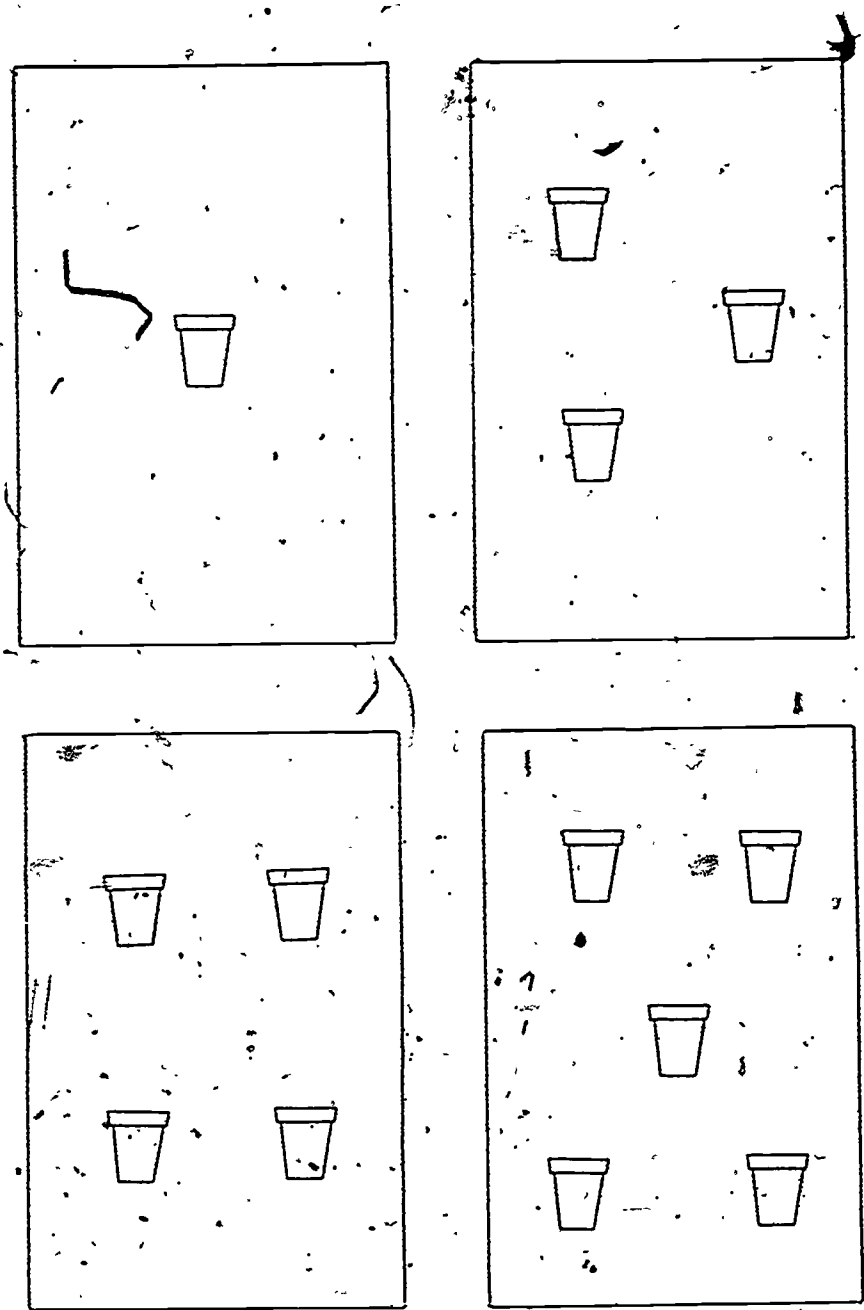








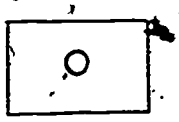
Set 2



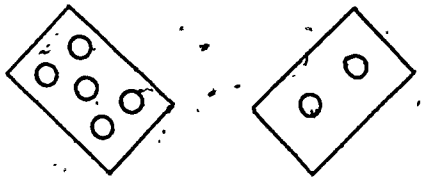
Set 3

TEST DIRECTIONS:

Lay out on the table the three cards in the first set (marked Practice Set) as indicated:



(Practice Set)



HERE ARE THREE CARDS. EACH CARD HAS A SET OF PICTURES OF CLOCKS ON IT. CAN YOU PUT THESE SETS IN A LINE SO THAT THEY GO FROM THE SET WITH THE MOST PICTURES AT ONE END TO THE SET WITH THE FEWEST PICTURES AT THE OTHER END?

If the child does not respond, say:

PUT THE CARDS IN A LINE SO THEY ARE IN ORDER WITH THE MOST CLOCKS AT ONE END AND THE FEWEST CLOCKS AT THE OTHER END.

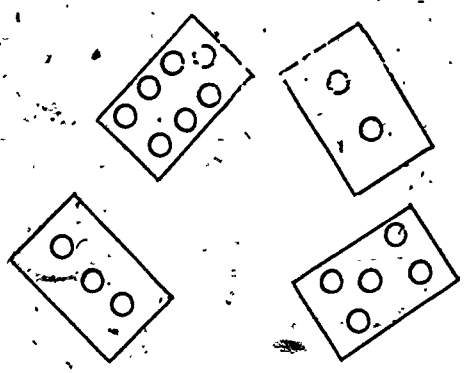
Give the child a score for the practice set by checking either Ordered Correctly (1st column), Attempted, But Unsuccessful (3rd column), or No Attempt (4th column).

If the child has failed to order the cards correctly or has made no attempt, put the three cards of the practice set in order and say:

SEE, I HAVE PUT THE CARDS IN ORDER SO THAT THEY GO FROM THE CARD WITH THE MOST CLOCKS AT THIS END (point to the card with the most clocks) TO THE CARD WITH THE FEWEST CLOCKS (point to card with fewest clocks) AT THE OTHER END.

Remove the cards and replace them with Set 1, placed as indicated:

(Set 1)

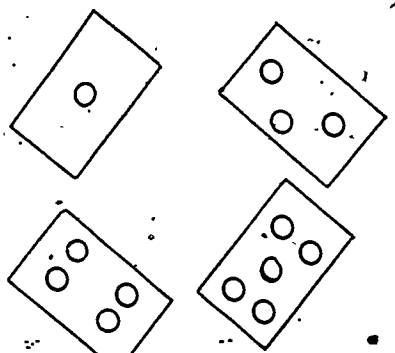


HERE ARE FOUR CARDS. EACH CARD HAS A SET OF PICTURES OF FISH ON IT. CAN YOU PUT THESE IN A LINE SO THAT THEY GO IN ORDER FROM THE SET WITH THE MOST FISH AT ONE END TO THE SET WITH THE FEWEST FISH AT THE OTHER END?

If the child does not respond, do not repeat the question but go on to the next set of cards.

For Set 2, place the cards as indicated:

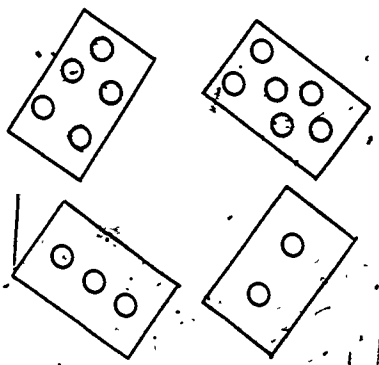
(Set 2)



HERE ARE FOUR CARDS. EACH CARD HAS A SET OF PICTURES OF FLOWER POTS ON IT. CAN YOU PUT THESE IN A LINE SO THAT THEY GO IN ORDER FROM THE SET WITH THE MOST FLOWER POTS AT ONE END TO THE SET WITH THE FEWEST FLOWER POTS AT THE OTHER END?

For Set 3, place the cards as indicated:

(Set 3)



HERE ARE FOUR CARDS. EACH CARD HAS A SET OF PICTURES OF FROGS ON IT. CAN YOU PUT THESE IN A LINE SO THAT THEY GO IN ORDER FROM THE SET WITH THE MOST FROGS AT ONE END TO THE SET WITH THE FEWEST FROGS AT THE OTHER END?

In scoring each of Sets 1, 2, and 3, note that there are four columns, of which one should be checked. The left-hand column indicates that the child ordered the sets correctly, either from most to fewest or from fewest to most. The second column indicates that the child got the two end sets correct but the middle one reversed. The third column is for the child who made an attempt but had no success, and the last column is for the child who makes no attempt at all.

TESTER'S SCORING GRID:

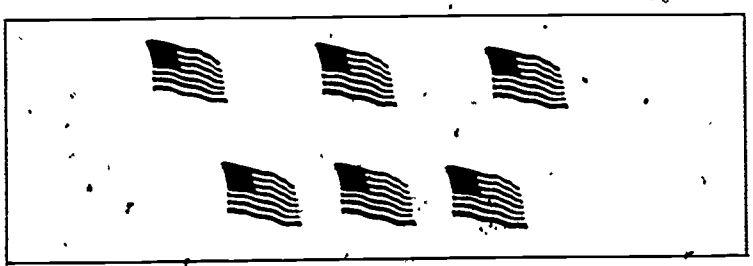
Item No.	Set No.	Ordered correctly (√) Most-fewest or Fewest-most	Both end sets ordered correctly Middle sets reversed (√)	Attempted, but unsuccessful (√)	No Attempt (√)
	Prac.				
19	1				
20	2				
21	3				

CONSERVATION - PICTURES

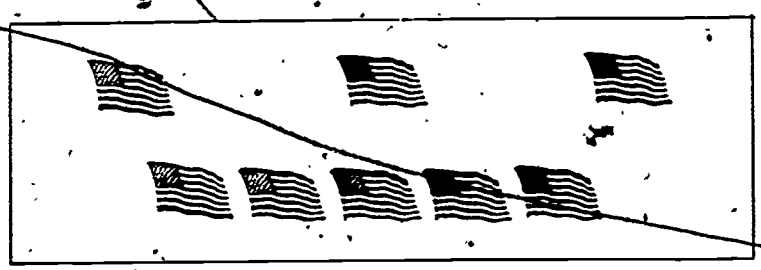
TEST MATERIALS:

6 8" x 2 1/2" cards with two rows of U. S. flags or shields on each card. On the back of each card at the top is printed "Conservation Pictures - Top of Card ..." (The cards are numbered 1 through 6 to indicate the order in which they are to be presented to the child.)

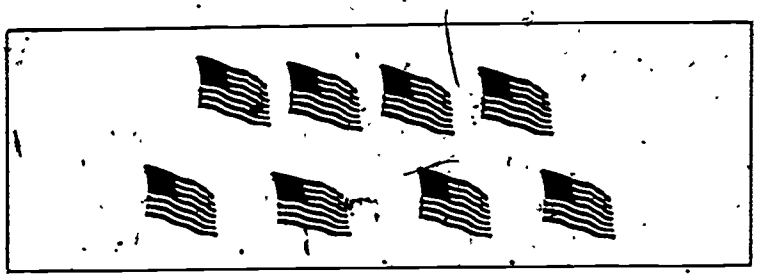
The cards are reproduced below.



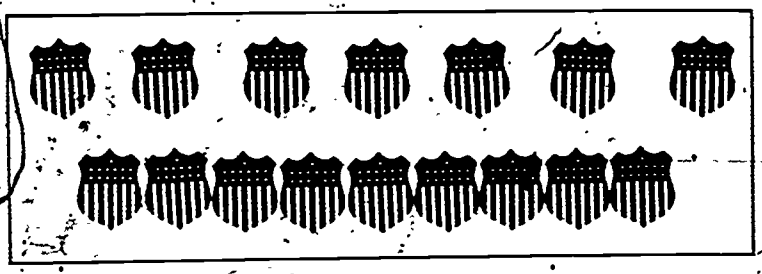
Card 1



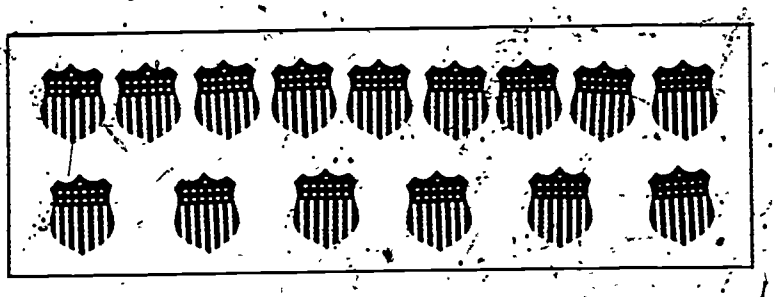
Card 2



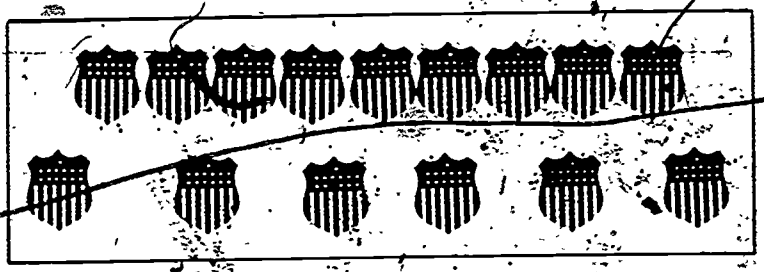
Card 3



Card 4



Card 5



Card 6

TEST DIRECTIONS:

Place Card 1 in front of the child. The top of the card, as noted on the back, should be on the tester's side.

Say to the child:

ON THIS CARD THERE ARE TWO ROWS OF FLAGS. HERE (running your finger along the row nearer you) IS THE TOP ROW, AND HERE (running your finger along the row nearer the child) IS THE BOTTOM ROW. ARE THERE MORE FLAGS IN THE TOP ROW, OR ARE THERE MORE FLAGS IN THE BOTTOM ROW, OR IS THERE THE SAME NUMBER OF FLAGS IN EACH ROW?

If the child does not respond, say:

ARE THERE MORE FLAGS IN THE TOP ROW, OR ARE THERE MORE FLAGS IN THE BOTTOM ROW, OR IS THERE THE SAME NUMBER OF FLAGS IN EACH ROW?

On this and the succeeding cards in this task, allow the child to point to his choice if he wishes to.

Replace Card 1 with Card 2, again making sure it is oriented correctly.

This time say:

WHICH ROW ON THIS CARD HAS MORE FLAGS? (pause) DOES THE TOP ROW HAVE MORE FLAGS, OR DOES THE BOTTOM ROW HAVE MORE FLAGS, OR DO THEY BOTH HAVE THE SAME NUMBER?

This time, if the child does not respond, go on to Card 3 and continue through Card 6 asking the same question each time, except that on Cards 4 through 6 the word FLAGS should be replaced by the word SHIELDS.

In scoring these items, put a check mark in the left-hand column if the child asserts that there are more in the top row than in the bottom row, a check mark in the second column if the child asserts that there are more in the bottom row, a check mark in the third column if the child asserts that there are the same number in each row, and a check mark in the last column if the child does not respond.

TESTER'S SCORING GRID:

Item No.	Card No.	Child asserts more (√) pictures in TOP row	Child asserts more pictures in BOTTOM row (√)	Child asserts same number pictures each row (√)	No Attempt (√)
22	1				
23	2				
24	3				
25	4				
26	5				
27	6				

Only the correct response for each item is scored as correct.

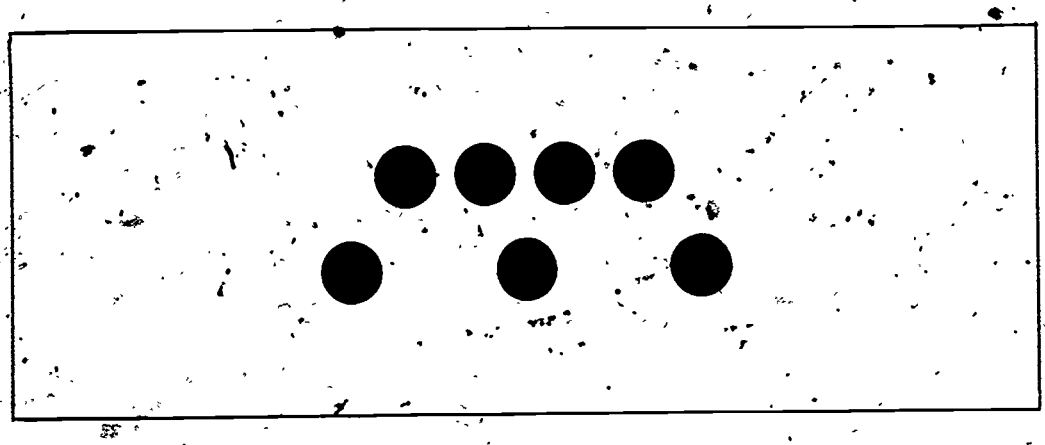
Z

CONSERVATION - DOTS

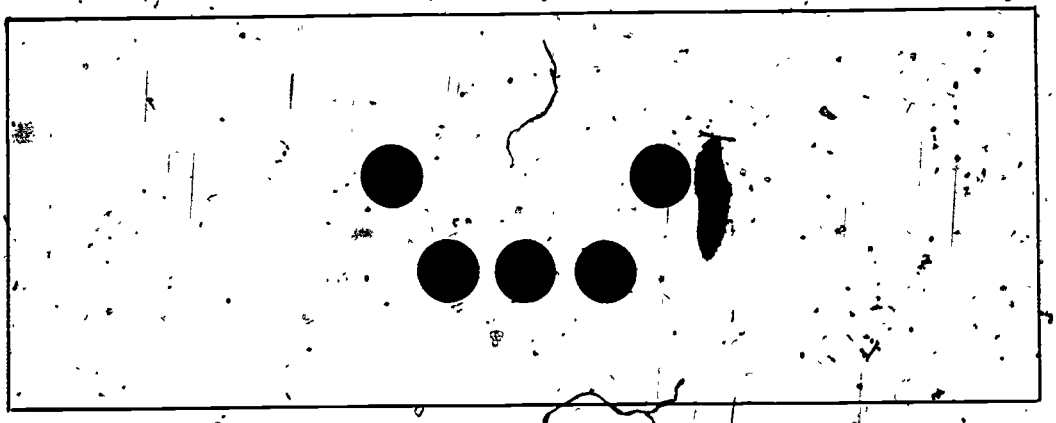
TEST MATERIALS:

6 11" x 4" cards with two rows of dots on each card. On the back of each card at the top is printed "Conservation Dots - Top of Card ..." (The cards are numbered 1 through 6 to indicate the order in which they are to be presented to the child.)

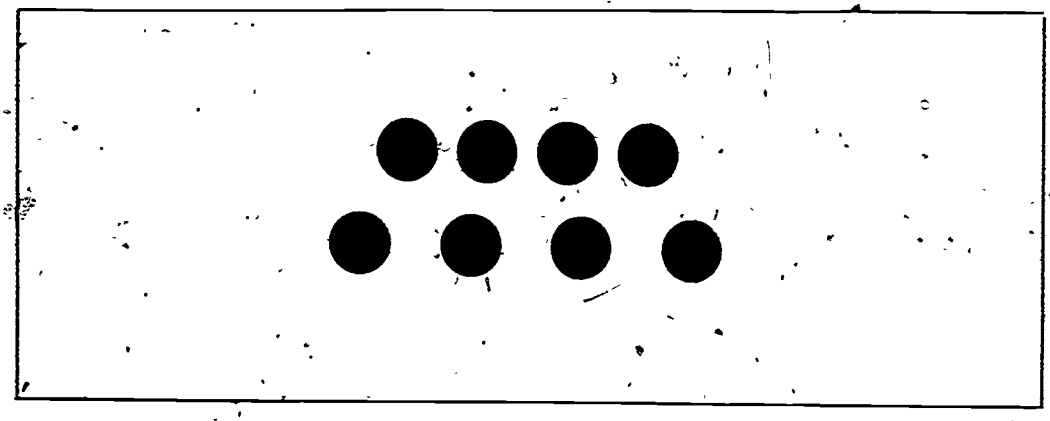
The cards are reproduced below.



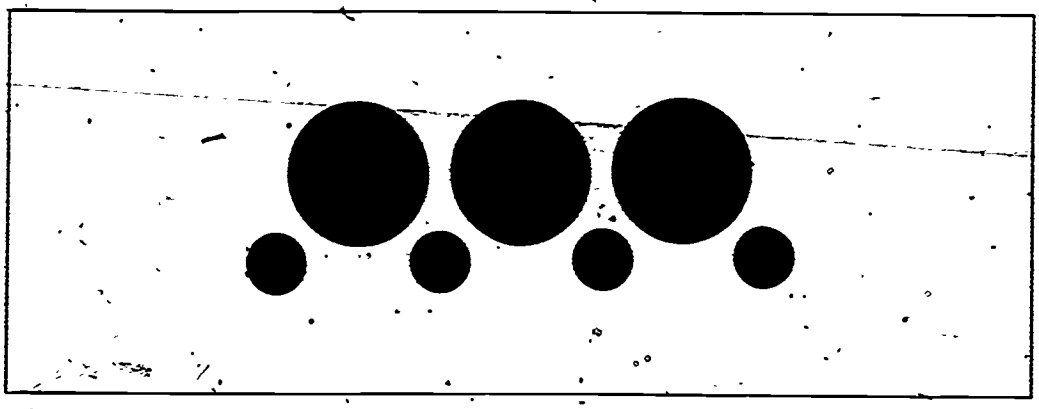
Card 1



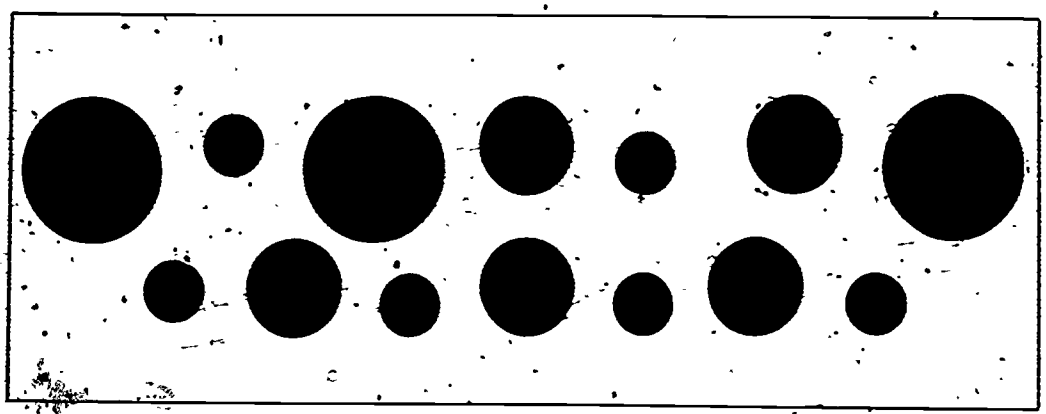
Card 2



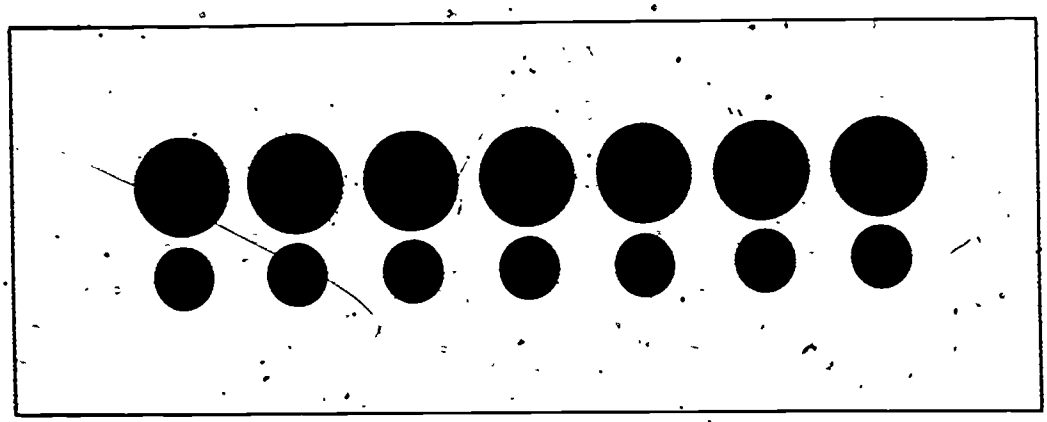
Card 3



Card 4



Card 5



Card 6

TEST DIRECTIONS:

Place Card 1 in front of the child. The top of the card, as noted on the back, should be on the tester's side.

Say to the child:

ON THIS CARD THERE ARE TWO ROWS OF DOTS. HERE (running your finger along the row nearer you) IS THE TOP ROW, AND HERE (running you finger along the row nearer the child) IS THE BOTTOM ROW. ARE THERE MORE DOTS IN THE TOP ROW, OR ARE THERE MORE DOTS IN THE BOTTOM ROW, OR IS THERE THE SAME NUMBER OF DOTS IN EACH ROW?

If the child does not respond, say:

WHICH ROW HAS MORE DOTS, THE ONE ON TOP OR THE ONE ON THE BOTTOM? (pause) POINT TO THE ROW WITH MORE DOTS.

On this and the succeeding cards in this task, allow the child to point to his choice if he wishes to.

Replace Card 1 with Card 2, again making sure it is oriented correctly.

This time say:

WHICH ROW ON THIS CARD HAS MORE DOTS? (pause) DOES THE TOP ROW HAVE MORE DOTS, OR DOES THE BOTTOM ROW HAVE MORE DOTS, OR DO THEY BOTH HAVE THE SAME NUMBER?

This time, if the child does not respond, go on to Card 3 and continue through Card 6 asking the same question each time.

In scoring these items, put a check mark in the left-hand column if the child asserts that there are more dots in the top row than in the bottom row, a check mark in the second column if the child asserts there are more dots in the bottom row than in the top row, a check mark in the third column if the child asserts there are the same number of dots in each row, and a check mark in the last column if the child does not respond.

TESTER'S SCORING GRID:

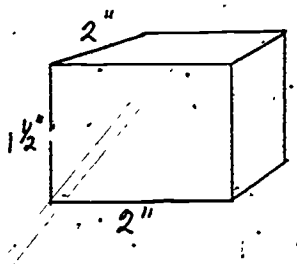
Item No.	Card No.	Child asserts more dots in TOP row (√)	Child asserts more dots in BOTTOM row (√)	Child asserts same number dots each row (√)	No Attempt (√)
28	1				
29	2				
30	3				
31	4				
32	5				
33	6				

Only the correct response for each item is scored as correct.

COMPREHENSION OF ADDITION AND SUBTRACTION

TEST MATERIALS:

12 wooden blocks



1 8 1/2" x 11" booklet labeled COMPREHENSION OF ADDITION AND SUBTRACTION

The booklet is reproduced on the following pages.

FORM 1-02

COMPREHENSION OF ADDITION AND SUBTRACTION

USE THE BLOCKS TO SHOW THIS SENTENCE.

4+3=7

USE THE BLOCKS TO SHOW THIS SENTENCE.

9-4=5

WHICH SENTENCE SHOWS WHAT I DID WITH THE BLOCKS?

$4+4=8$

$8-3=5$

$5+3=8$

$2+6=8$

WHICH SENTENCE SHOWS WHAT I DID WITH THE BLOCKS?

$9-4=5$

$9-3=6$

$2+7=9$

TEST DIRECTIONS:

Item 34

Place the set of 12 blocks on the table slightly to the child's right and open the booklet to page 2 which has the mathematical sentence, $4 + 3 = 7$.

Say:

USE THE BLOCKS TO SHOW WHAT THIS SENTENCE (tester points to sentence) MEANS.

If the child fails to respond, or just plays with the blocks, repeat the question once more but provide no additional cues. If there is still no response or the child says "I don't know," continue with the next item.

Record the child's response on the score sheet in the following manner:

1. Child counts out seven blocks from the pile of twelve.
2. Child counts out four blocks, then adds three more blocks to the original four, forming a set of seven blocks.
3. Child forms two separate sets of blocks: a set of three and a set of four. He then pushes the two sets together to form a set of seven.
4. Other. Child uses a strategy different from 1, 2, or 3 but which is relevant to the sentence. Specify in comments what child did.
5. Child plays with blocks without forming any relevant sets.
6. No attempt or child says, "I don't understand; I don't know."

Item 35

Return the blocks to the original pile after Item 34 has been completed. Turn the booklet to page 3 which has the sentence $9 - 4 = 5$.

Say:

USE THE BLOCKS TO SHOW WHAT THIS SENTENCE (point to sentence) MEANS.

Again, if there is no response or if the child plays with the blocks, repeat the question once and then continue with the next item after recording the child's response on the score sheet in the following manner:

1. Child counts out nine blocks, then removes four.
2. Child counts out nine blocks, then removes five.
3. Child counts out a set of four blocks and a separate set of five blocks. He may or may not push them together.
4. Child counts out a set of five blocks.
5. Other. Child uses a strategy different from 1, 2, 3, or 4 but which is relevant to the sentence. Specify in comments what child did.
6. Child plays with the blocks without forming any relevant sets.
7. No attempt or child says, "I don't understand; I don't know."

Item 36

Turn the booklet to page 4.

HERE ARE SOME SENTENCES. (Point to each of the four mathematical sentences.) I AM GOING TO USE THE BLOCKS TO SHOW ONE OF THESE SENTENCES (again pointing to the four sentences). WATCH WHAT I DO VERY CAREFULLY. THEN, TELL ME WHICH SENTENCE SHOWS WHAT I DID. (Pause) NOW WATCH.

Since this item is not repeated, it is necessary that you perform three deliberate and distinct actions:

1. Form a set of five blocks, clearly separated from the original pile of twelve.
2. Form a separate set of three blocks, keeping this set about 12 inches away from the set of five so that the child sees them as two distinct sets.
3. Push the two sets together to form one set of eight blocks.

WHICH SENTENCE (pointing to each of the four) SHOWS WHAT I JUST DID?

Do not repeat. Score child's response on the score sheet and return blocks to original pile.

If child points to one sentence and then a second, ask him which one sentence best shows what you did with the blocks.

Item 37

Turn the booklet to page 5.

HERE ARE SOME OTHER SENTENCES. (Point to each of the three mathematical sentences.)

I AM GOING TO USE THE BLOCKS TO SHOW ONE OF THESE SENTENCES (again pointing to each sentence).

WATCH WHAT I DO. THEN TELL ME WHICH SENTENCE SHOWS WHAT I DID. WATCH CAREFULLY.

Since this item is not repeated, it is necessary that you perform two deliberate and distinct actions:

1. Form a set of nine blocks, clearly separated from the original pile. Pause momentarily to allow the child to observe this set.

2. From the set of nine blocks, remove a set of three blocks about 12 inches away from the remaining blocks, but keeping them clearly within the child's perceptual field.

NOW, WHICH SENTENCE (pointing to each of the three) SHOWS WHAT I JUST DID WITH THE BLOCKS?

Do not repeat. Score the child's response on the score sheet.

If child points to one sentence and then another, ask him which one sentence best shows what you did with the blocks.

TESTER'S SCORING GRID:

Item No. 34

Check the statement which best describes child's response. If Other (No. 4), be sure to explain under Comments.

_____ 1. Counts out 7 blocks.

_____ 2. Counts out 4 blocks, adds 3 more, forming set of 7 blocks.

_____ 3. Forms 2 separate sets of blocks: a set of 3 and a set of 4. Pushes them together to form a set of 7.

_____ 4. Other relevant strategy. Describe:

_____

_____

_____

_____ 5. Plays with blocks without forming any relevant sets.

_____ 6. No Attempt, or "I don't know."

Item No. 35

Check the statement which best describes child's response. If Other (No. 5), be sure to explain under Comments.

_____ 1. Counts out 9 blocks, removes 4.

_____ 2. Counts out 9 blocks, removes 5.

_____ 3. Counts out set of 4 and separate set of 5. He may or may not push them together.

_____ 4. Counts out set of 5 blocks.

_____ 5. Other relevant strategy. Describe:

_____

_____

_____

_____ 6. Plays with blocks without forming any relevant sets.

_____ 7. No attempt, or "I don't know."

Item No. 36

Check the 1 mathematical sentence selected by the child.

____ 4 + 4 = 8

____ 8 - 3 = 5

____ 5 + 3 = 8

____ 2 + 6 = 8

____ No attempt, or "I don't know."

Comments:

Item No. 37

Check the 1 mathematical sentence selected by the child.

____ 9 - 4 = 5

____ 9 - 3 = 6

____ 2 + 7 = 9

____ No attempt, or "I don't know."

Comments:

SCHOOL MATHEMATICS STUDY GROUP

ELEMENTARY MATHEMATICS PROJECT

FORM 1-03

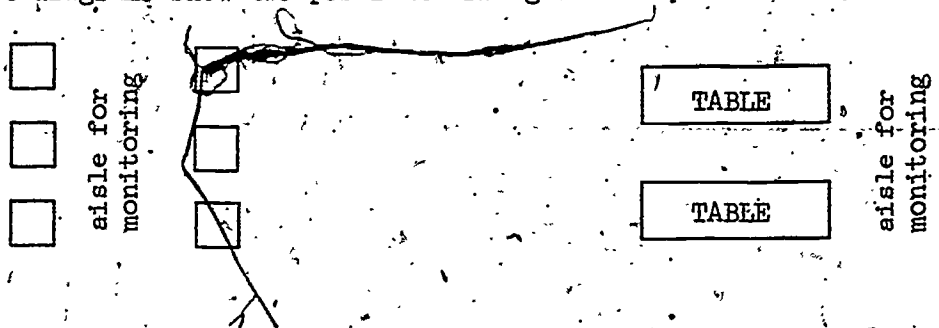
SPRING INVENTORY 1968 - GRADE 1

DIRECTIONS FOR GROUP TEST: FORM 1-03

1. Setting for Administration of Tests

As with the individual tests, you will need a separate room. Seating arrangements for the group test are especially important for several reasons: first, to eliminate possibilities for copying; second, to minimize one child's distracting another; and third, to permit you more easily to monitor all of the children in the group. You will need five (or six) separate desks at which the children may work. If separate desks are not available, one alternative is to carefully space children at several long tables.

These diagrams show two possible arrangements:



If the room is small and the children must work at tables, place standing folders or boxes between them as barriers. Do not have the children facing each other across tables.

Since we cannot foresee all possible problems in physical arrangements, we will rely on your ingenuity to make certain that each child's responses are independently arrived at.

2. Materials

Directions for administering Form 1-03

Sample sheets marked "Demonstration Sheet, Form 1-03"

Pupil answer booklets

Pencils (included with materials for individual test, Form 1-02)

3. Procedure

In general, administer this test to five children in a group. If the number of children in a given class is, for example, 32, then you can administer the test to four groups of five children each and to two groups of six children. However, in no instance give the test to a group larger than six.

In selecting the group of five children for testing, try to minimize disruption of the classroom activity. In San Francisco, take children by reading groups. This may be the best policy in Oakland also, but in all instances comply with the teacher's wishes in selecting the set of children to be taken for the group testing.

Read over, several times, the instructions for administering the test to become familiar with the items and the directions before you start testing.

Follow the written directions carefully. The instructions for you, as tester, are typed in lower case. What you actually say to the child is typed in capital letters.

4. Important Considerations

a) It is imperative that you adhere to the written directions as closely as possible.

b) It is imperative that you monitor the children in the group testing situation by walking around and making certain that each child understands, is on the right page and item, and is marking only one response to each item. Also, the monitoring will permit you to make sure that each child is working independently of the other children in the group.

c) At the end of each day of testing, record on your time sheet the number of group tests you have administered that day.

d) Administer the group tests within the school after you have given all of the individual tests within that school.

e) The final date by which all testing, group as well as individual, must be completed is April 26. Please let us know if you anticipate any difficulty.

5. Returning Materials

Since the answer booklets for Form 1-03 are too bulky for easy mailing, we have arranged for them to be left in the principal's office. We will pick them up after testing has been completed in

each school. It is, however, essential that you record accurately on your time sheet the number of group tests you have administered each day. This time sheet is to be mailed to School Mathematics Study Group in one of the return envelopes at the end of each week.

After the final test has been given in a school, please call us collect so that we can pick up the tests. Call: 321-2300, Extension 2681, and ask for Mrs. Terry Chay or Mrs. Diana Scheffler.

6. Instructions for Group Test

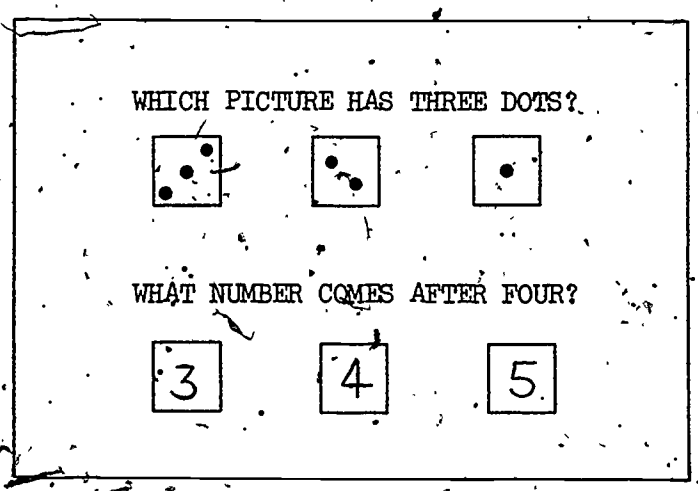
General: Atmosphere should be as anxiety-free as possible. Set the tone by talking to the children as they enter the examination room and are being seated at prearranged desks. With each instruction, circulate through the group to see that each child understands what is meant. After testing has begun, children do not usually look up to watch the tester's demonstrations, hence it may be necessary for you to point to the "top" and "bottom" of a child's paper when you find him recording answers in the wrong area.

Directions are to be read slowly and distinctly as the tester circulates among the children. You will note that each instruction is read at least twice so that the tester is able to detect those children who do not understand. Allow several seconds after the final item instruction for the child's response before saying TURN TO THE NEXT PAGE. Make sure that all children are on the correct page before beginning instructions for that page. If a child indicates that he does not know an answer, say: MARK THE ANSWER YOU THINK IS CORRECT. However, do not insist that the child make a response.

In the event a child wants to change his response, make sure he has erased the original response before marking another.

If a child talks during testing period the tester reminds him reassuringly that he is not to talk, that you will know which answer he thought was the correct one when you look at his booklet. Compulsive talkers may have to be tested individually.

After the children are seated pass out the sample sheet marked, "Demonstration Sheet, Form 1-03," and ask the children to write their first names at the top of the sheet. (This is simply a device for getting the children settled, hence it is not necessary that they write full names, etc.) The demonstration page is the single sheet which looks like this:



It is to be used for helping the children to understand the directions, vocabulary, and format of the test to follow. Try to make certain that any questions the children may have about "top" and "bottom," marking, etc., are answered in doing this demonstration sheet. Be sure that the child marks one item and only one in each row. Do not tell the child whether his answer is correct. The demonstration page is being used only to teach the child the method of marking his answers in his booklet.

Say: I AM GOING TO ASK YOU SOME QUESTIONS. YOU ARE TO MARK THE ONE THING ON YOUR SHEET THAT BEST ANSWERS THE QUESTION. DO YOU KNOW WHAT MARK MEANS? (Pause for responses and reinforce those responses offered by children. They may use any system of marking that is familiar to them, i.e., circle, cross, ex, underline, etc.) YES, YOU MAY (CIRCLE, CROSS, ETC.) THE ANSWER YOU THINK BEST ANSWERS THE QUESTION. LISTEN CAREFULLY TO THE QUESTION, THEN MARK THE ANSWER. ARE YOU READY?

THIS PAGE (show the demonstration page) HAS TWO QUESTIONS. LOOK AT THE PICTURES AT THE TOP OF THE PAGE. DO YOU KNOW WHAT I MEAN BY "TOP" OF THE PAGE? (Explain if there are children who do not know top.) LOOK AT THE PICTURES AT THE TOP AND LISTEN TO THE QUESTION. WHICH PICTURE HAS THREE DOTS? MARK THE PICTURE THAT HAS THREE DOTS. MAKE A BIG MARK THAT IS EASY TO SEE. (Pause while all children finish.)

NOW, LOOK AT THE NUMBERS AT THE BOTTOM OF THE PAGE. LISTEN TO THE QUESTION. WHEN YOU ARE COUNTING, WHAT NUMBER COMES AFTER FOUR? MARK THE NUMBER THAT COMES AFTER FOUR. (Pause while all children finish.) VERY GOOD.

NOW WE SHALL DO THE SAME THING WITH THESE BOOKLETS. (Point to booklet.) REMEMBER, LISTEN TO THE QUESTION; THEN MARK THE ANSWER ON THE BOOKLET. OPEN THE BOOKLET TO THE FIRST QUESTION (marked 3-1). (Make sure each pupil has page 3-1.) SEE THE NUMBERS ON THIS PAGE? WHICH NUMBER IS LARGEST? MARK THE NUMBER THAT IS LARGEST. (Pause.) TURN TO THE NEXT PAGE (marked 4-2).

LOOK AT THE PICTURE AT THE TOP OF THE PAGE. SEE THE PICTURE AT THE TOP? NOW WHICH PICTURE AT THE BOTTOM OF THE PAGE HAS FEWER DOTS THAN THE PICTURE AT THE TOP? MARK THE PICTURE WHICH HAS FEWER DOTS. (Pause.) TURN TO THE NEXT PAGE (marked 5-3,4).

THIS PAGE HAS TWO QUESTIONS. LOOK AT THE NUMBERS AT THE TOP OF THE PAGE. SEE THE NUMBERS AT THE TOP? WHICH NUMBER IS BETWEEN EIGHT AND FIVE? MARK THE NUMBER THAT IS BETWEEN EIGHT AND FIVE. (Pause.)

NOW LOOK AT THE NUMBERS AT THE BOTTOM OF THE PAGE. SEE THE NUMBERS AT THE BOTTOM? WHICH NUMBER IS BETWEEN FOUR AND SEVEN? MARK THE NUMBER THAT IS BETWEEN FOUR AND SEVEN. (Pause.)

TURN TO THE NEXT PAGE (marked 6-5). LOOK AT THE PICTURE AT THE TOP OF THE PAGE. SEE THE PICTURE AT THE TOP? WHICH PICTURE AT THE BOTTOM OF THE PAGE HAS MORE DOTS THAN THE PICTURE AT THE TOP? MARK THE PICTURE THAT HAS MORE DOTS THAN THE PICTURE AT THE TOP. (Pause.) TURN TO THE NEXT PAGE (marked 7-6,7).

LOOK AT THE NUMBERS AT THE TOP OF THE PAGE. SEE THE NUMBERS AT THE TOP? (Pause.) WHICH MEANS THE GREATEST NUMBER OF THINGS? MARK THE NUMBER THAT MEANS THE GREATEST NUMBER OF THINGS. (Pause.)

LOOK AT THE NUMBERS AT THE BOTTOM OF THE PAGE. WHICH MEANS THE LEAST NUMBER OF THINGS? MARK THE NUMBER THAT MEANS THE LEAST NUMBER OF THINGS. (Pause.) TURN TO THE NEXT PAGE (marked 8-8).

LOOK AT THE NUMBERS IN THE BOXES. WHICH ONE HAS A FIVE IN THE TENS PLACE? MARK THE NUMBER THAT HAS A FIVE IN THE TENS PLACE. (Pause.) TURN TO THE NEXT PAGE (marked 9-9).

LOOK AT THE PICTURES. WHICH PICTURE SHOWS 32 ? MARK THE PICTURE THAT SHOWS 32. (Pause.) TURN TO THE NEXT PAGE (marked 10-10).

THIS TIME YOU ARE TO WRITE A NUMBER IN THE BOX. WHICH NUMBER TELLS HOW MANY TENS ARE IN TWENTY-EIGHT? WRITE THE NUMBER THAT TELLS HOW MANY TENS. (Pause.) TURN TO THE NEXT PAGE (marked 11-11,12).

LOOK AT THE NUMBERS AT THE TOP OF THE PAGE. SEE THE NUMBERS AT THE TOP? WHICH NUMBER MEANS FIVE TENS AND TWO ONES? MARK THE NUMBER THAT MEANS FIVE TENS AND TWO ONES. (Pause.)

NOW, LOOK AT THE NUMBERS AT THE BOTTOM OF THE PAGE. SEE THE NUMBERS AT THE BOTTOM? WHICH NUMBER MEANS ONE TEN AND THREE ONES? MARK THE NUMBER THAT MEANS ONE TEN AND THREE ONES. (Pause.) TURN TO THE NEXT PAGE (marked 12-13).

LOOK AT THE PICTURE AT THE TOP OF THE PAGE. SEE THE PICTURE AT THE TOP? HOW MANY DOTS ARE IN THE PICTURE? MARK THE NUMBER AT THE BOTTOM THAT TELLS HOW MANY DOTS. (Pause, but not long enough for the children to count all the dots.) MARK THE NUMBER THAT TELLS HOW MANY DOTS ARE IN THE PICTURE. TURN TO THE NEXT PAGE (marked 13-14).

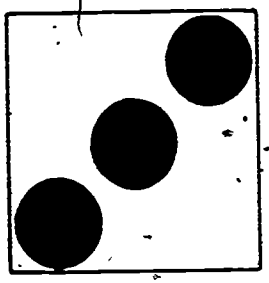
THIS TIME YOU ARE TO WRITE A NUMBER IN THE BOX. LOOK AT THE PICTURE. HOW MANY GROUPS OF TEN ARE IN THERE? WRITE THE NUMBER THAT TELLS HOW MANY TENS. (Pause.) TURN TO THE NEXT PAGE (marked 14-15).

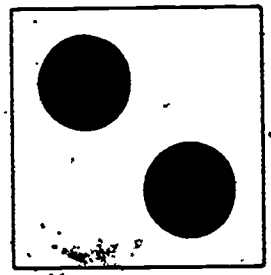
THIS TIME AGAIN, YOU ARE TO WRITE A NUMBER IN THE BOX. LOOK AT THE THIRTY-SEVEN. WHICH NUMBER IS IN THE ONES PLACE? WRITE THE NUMBER THAT TELLS HOW MANY ONES. (Pause.) TURN TO THE NEXT PAGE (marked 15-16).

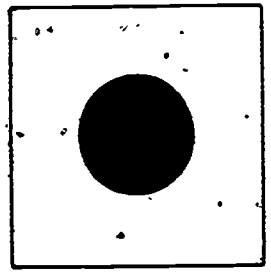
LOOK AT THE PICTURES ON THIS PAGE. MARK ALL THE TRIANGLES. LOOK AT ALL THE PICTURES, AND MARK ALL THE ONES THAT ARE TRIANGLES. (Pause.) TURN TO THE NEXT PAGE (marked 16-17).

HERE ARE SOME MORE PICTURES. THIS TIME YOU ARE TO MARK ALL THE RECTANGLES. LOOK AT ALL THE PICTURES AND MARK ALL THOSE THAT ARE RECTANGLES.

WHICH PICTURE HAS THREE DOTS?







99

WHAT NUMBER COMES AFTER FOUR?

3

4

5

SCHOOL
MATHEMATICS
STUDY GROUP

Grade 1
Spring

FORM 1-03

101

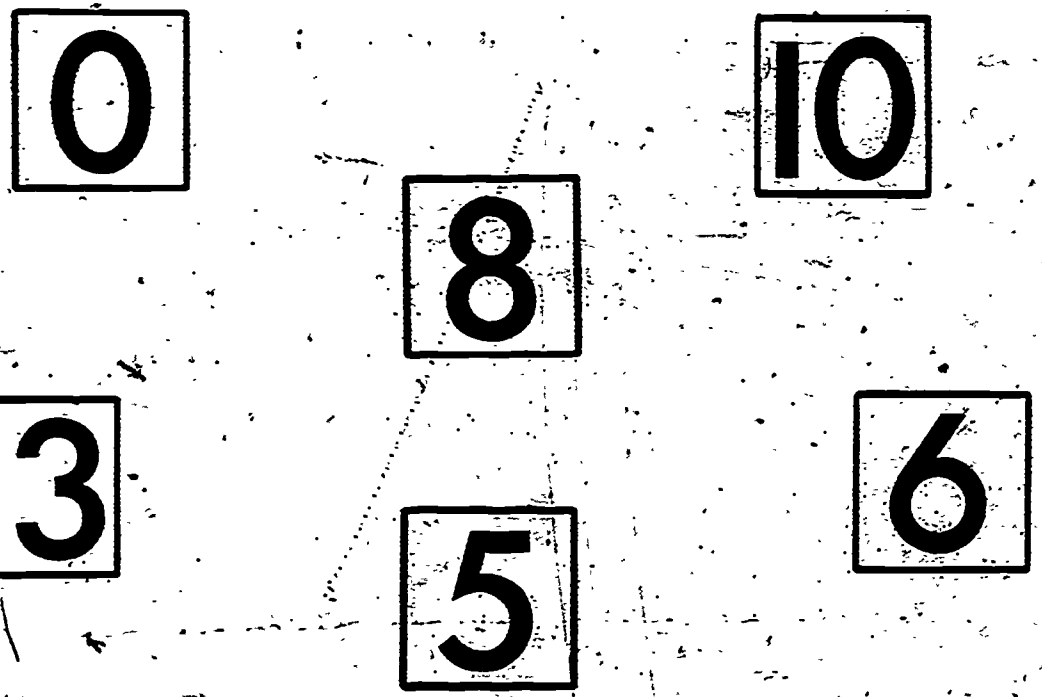
Name of tester _____

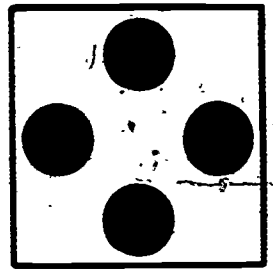
Date test given _____

Cedar Hall, Stanford University
Stanford, California

Form 1-03

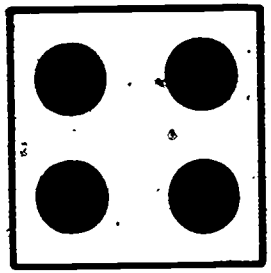
WHICH NUMBER IS LARGEST?

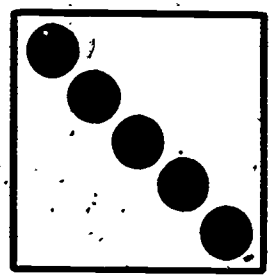


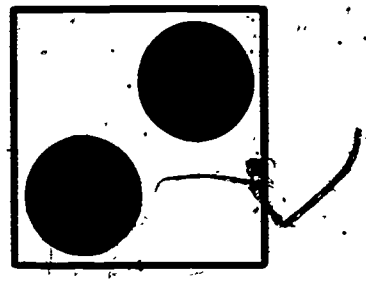


103

WHICH PICTURE BELOW HAS FEWER DOTS THAN THE PICTURE AT THE TOP?





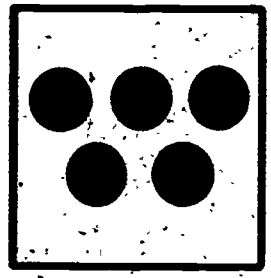


(3)

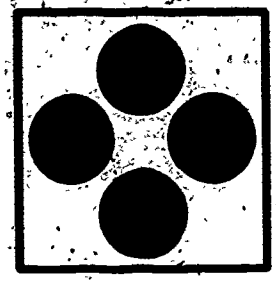
WHICH NUMBER IS BETWEEN EIGHT AND FIVE?

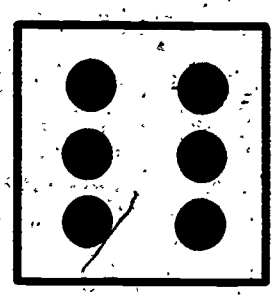
(4)

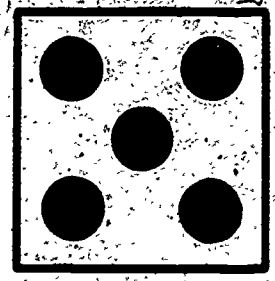
WHICH NUMBER IS BETWEEN FOUR AND SEVEN?



WHICH PICTURE BELOW HAS MORE DOTS THAN THE PICTURE AT THE TOP?

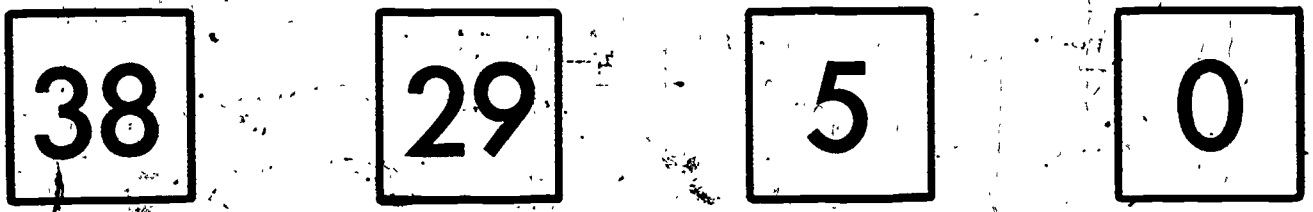






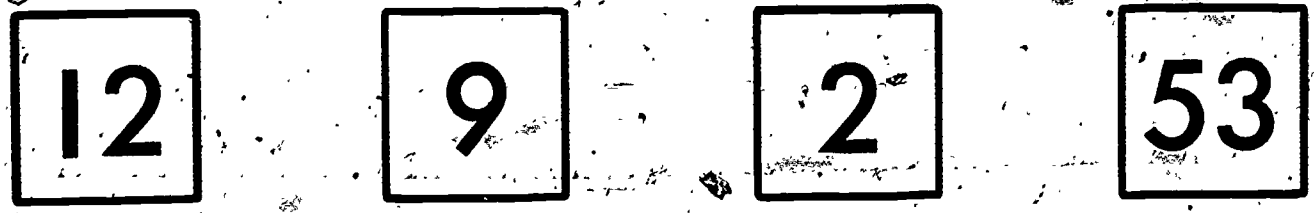
(6)

WHICH MEANS THE GREATEST NUMBER OF THINGS?



(7)

WHICH MEANS THE LEAST NUMBER OF THINGS?



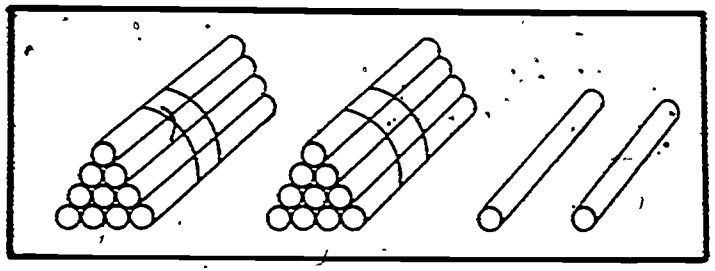
WHICH NUMBER HAS A FIVE IN THE TENS PLACE?

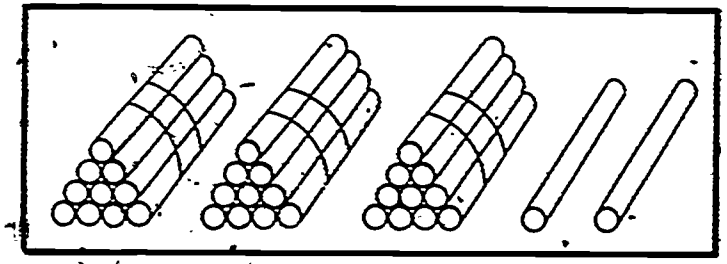
15

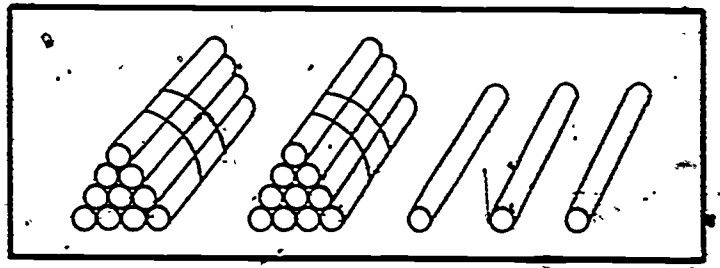
5

51

WHICH PICTURE SHOWS > 32 ?

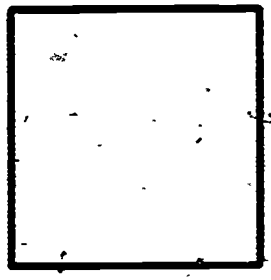






28

WHICH NUMBER TELLS HOW MANY TENS?



(11)

WHICH NUMBER MEANS FIVE TENS AND TWO ONES?

52	25	7

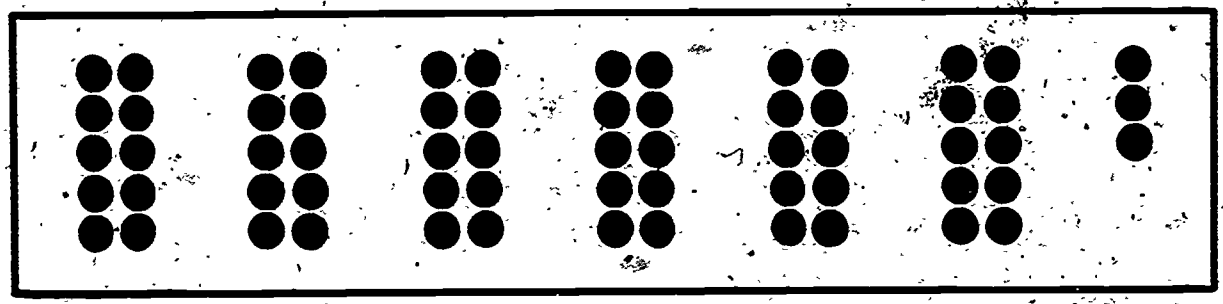
110

(12)

WHICH NUMBER MEANS ONE TEN AND THREE ONES?

4	13	31

140



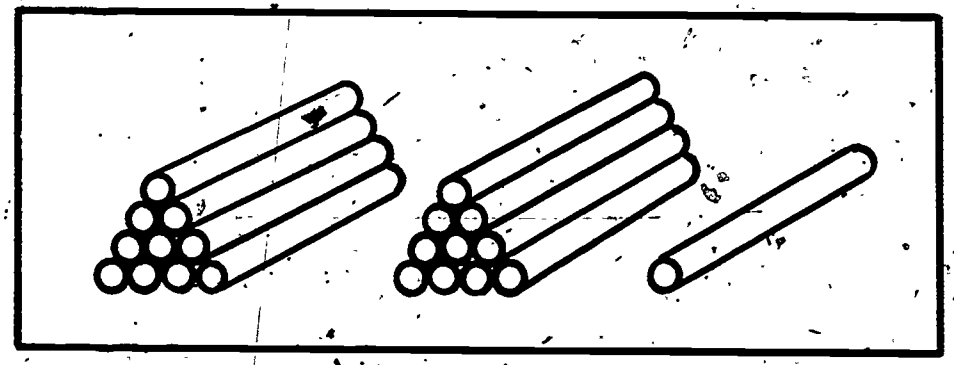
HOW MANY DOTS ARE IN THE PICTURE?

7

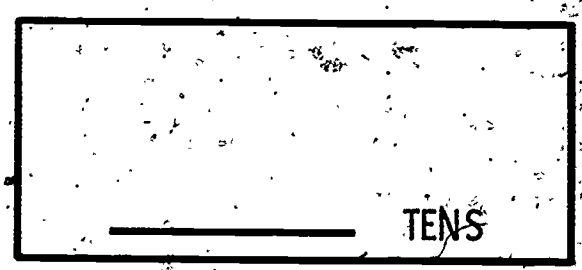
36

63

70



LOOK AT THE PICTURE. HOW MANY TENS ARE THERE?



37

WHICH NUMBER IS IN THE ONES PLACE?

MARK ALL THE TRIANGLES.

MARK ALL THE RECTANGLES.

SCHOOL MATHEMATICS STUDY GROUP

ELEMENTARY MATHEMATICS PROJECT

GENERAL DIRECTIONS FOR ADMINISTERING GROUP FORMS 1-04 and 1-05: First Grade, May, 1968. (Second round of spring testing)

The atmosphere should be as anxiety-free as possible. Set the tone by talking to the children as they enter the examination room and are being seated at prearranged desks.

In this testing session two tests (Forms 1-04 and 1-05) are to be administered to each child. Both these tests are group tests and will be given to small groups of children. For Form 1-04, the tester will read directions for each item. The second test, 1-05, requires the tester to read instructions for the first five items; but the remainder of the test, which consists of computation examples, will be done by the children by themselves.

1. Materials.

We are mailing these materials (General Directions, Instructions and Tester Manuals for Forms 1-04 and 1-05, sample answer booklets, time sheets, and return envelopes) directly to you in advance of the testing period to give you time to look the tests over and raise any questions. Please read the materials over carefully and phone us if you need any elarification of instructions, or if you anticipate any difficulties with any of the tests. Try to study the materials as soon as possible after you receive them so that we can notify all testers if any changes need to be made to conform to any suggestions you may have. If any more problems should arise after you begin testing, please phone us immediately. You may call collect (321-2300, Ext. 2681) and speak to either Mrs. Terry Chay or Mrs. Diana Scheffler.

By May 13, we will mail your specific school assignment for the May testing. In most cases this will be the same school in which you tested last month. We may, in a few cases, have to change this assignment so that the testing can be completed as quickly as possible in all schools.

All materials will be delivered directly to the office in each school prior to May 16. These will include answer booklets, for Forms 1-04 and 1-05, pencils, and sheets with dot games, which are to be given to the children after completing 1-05. For each student there will be two answer booklets (one for Form 1-04 and one for Form 1-05). Each answer booklet will have a label attached giving the name of the student, his school, and teacher. You should test only those students for whom you have answer booklets. No distinction in grouping need be made for students whose booklets are marked W, X, Y, or Z on Form 1-05; some individual items are different, but the directions for all are the same.

2. Testing Schedule.

Testing should begin in Oakland on May 16 and in San Francisco on May 20. The final date by which all testing should be completed is May 31. Please let us know if you anticipate any difficulty. If you will be unable to test on a given day for which you are scheduled, be sure to notify the school that you will not be there. If your time schedule changes unexpectedly, i.e., you will miss more than one day during the testing program, please notify us by phone immediately.

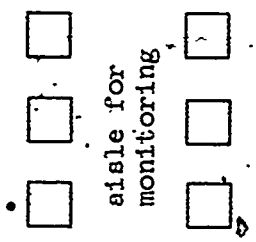
In so far as possible, the 1-04 tests should be administered to all students in a school before beginning the 1-05 administration. All testing should be completed in one school before beginning testing in another. If a child is absent for an extended period, however, you may have to begin testing 1-05 before completing all Forms 1-04. Children who have been absent should still have Form 1-04 before being given Form 1-05.

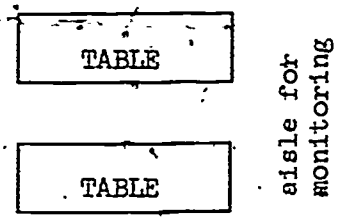
If a child is not in the class indicated on the label, check to see whether he has transferred to another class within the school. If told that he has moved from the school, please note this on both answer booklets.

3. Setting for Administration of Tests.

You will need a separate room. Seating arrangements for the group test are important for several reasons: first, to eliminate possibilities for copying; second, to minimize one child's distracting another; and third, to permit you to monitor easily all of the children in the group. You will need five (or six) separate desks at which the children may work. If separate desks are not available, one alternative is to space children carefully at several long tables.

These diagrams show two possible arrangements:





If the room is small and the children must work at tables, place standing folders or boxes between them as barriers. Do not have the children facing each other across tables.

Since we cannot foresee all possible problems in physical arrangements, we will rely on your ingenuity to make certain that each child responds independently.

4. Procedure.

In general, administer these tests to five children in a group. If the number of children in a given class is, for example, 32, then you can administer the test to four groups of five children each and to two groups of six children. However, in no instance give the test to a group larger than six.

In selecting the group of five children for testing, try to minimize disruption of the classroom activity. In San Francisco some teachers prefer that you take children by reading groups. This may be the best policy in Oakland also, but in all instances comply with the teacher's wishes in selecting the set of children to be taken for the group testing. When possible, try to have a group of children that are fairly homogeneous so that they will be working at about the same speed.

You should ask the principal at each school whether the children may return to the classroom by themselves or whether they should be accompanied by the tester. It is important that the children miss as little classroom time as possible, and should be taken or sent back to their classroom (depending upon school policy) immediately after the testing has been completed. Children may not leave the school grounds under any circumstances while under your supervision.

Read over, several times, the instructions for administering the tests to become familiar with the items and directions before you start testing.

Follow the written directions carefully. The instructions for you, as tester, are typed in lower case. What you actually say to the children is typed in capital letters. Sentences in somewhat larger type in your manual are the ones that are written in the children's booklets.

If a child seems really "stuck" on a problem, tell him to leave it and go on to the next one.

5. Important Considerations.

a) Do not change wording on any item. We are interested in determining if the children understand the terminology that we have used.

b) It is imperative that you monitor the children in the group testing situation by walking around and making certain that each child understands the instructions and is marking only one response to each item. Also, the monitoring will permit you to make sure that each child is working independently of the other children in the group.

c) Administer the 1-04 test within the school before you give Form 1-05.

d) On each answer booklet, fill in your name and date of testing.

e) At the end of each day of testing, record on your Weekly Time Sheet the number of group tests you have administered and the hours worked that day. It is essential that we have this information before payment can be made.

f) Mail time sheets at the end of each week in the envelopes provided. The final time sheet should be mailed whenever testing is completed.

g) After completion of testing, leave answer booklets in the office and we will pick them up. Phone Mrs. Chay or Mrs. Scheffler to let them know when your testing is completed.

TESTER'S MANUAL - FORM 1-04

After the children are seated, tell them "I AM GOING TO READ YOU SOME QUESTIONS. I WANT YOU TO ANSWER THEM BY PUTTING MARKS IN THE BOOKLETS THAT ARE IN FRONT OF YOU ON THE TABLE. PLEASE DON'T TURN ANY PAGES IN THE BOOKLETS UNTIL I TELL YOU TO DO SO."

"NOW, OPEN YOUR BOOKLETS." (Watch to be sure that each child has opened his booklet to the sample page.)

Say: "I AM GOING TO ASK YOU SOME QUESTIONS. YOU ARE TO MARK THE ONE THING ON YOUR SHEET THAT BEST ANSWERS THE QUESTION. DO YOU KNOW WHAT MARK MEANS?" (Pause for responses and reinforce those responses offered by children. They may use any system of marking that is familiar to them, i.e., circle, cross, ex, underline, etc.) "YES, YOU MAY (CIRCLE, CROSS, ETC.) THE ANSWER YOU THINK BEST ANSWERS THE QUESTION."

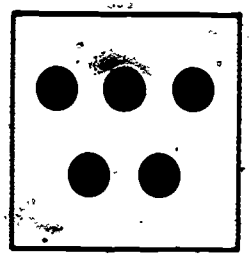
"IF YOU NEED THINGS TO COUNT, USE YOUR FINGERS, OR MAKE MARKS ON THE PAGE. LISTEN CAREFULLY TO THE QUESTION, THEN MARK THE ANSWER. ARE YOU READY?" (Tester reads the first of the sample questions given in the tester's manual and continues as indicated.)

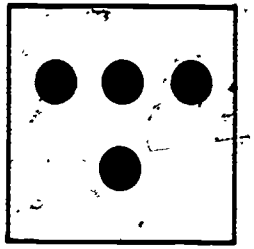
SAMPLE PAGE

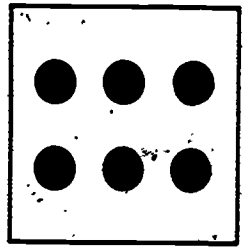
LOOK AT THE PICTURES AT THE TOP OF THE PAGE AND LISTEN TO THE QUESTION.

WHICH PICTURE HAS THREE DOTS AND ONE DOT? (Pause)

MARK THE PICTURE THAT HAS THREE DOTS AND ONE DOT.



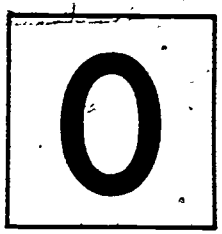


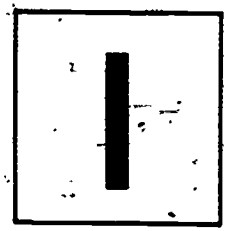


NOW LOOK AT THE NUMBERS AT THE BOTTOM OF THE PAGE AND LISTEN TO THE STORY.

JOHNNY HAS ONE PENCIL. IF HE LOSES THIS PENCIL, THEN HOW MANY PENCILS WILL HE HAVE? (Pause)

JOHNNY HAS ONE PENCIL. IF HE LOSES THIS PENCIL, THEN HOW MANY PENCILS WILL HE HAVE?
MARK THE NUMBER THAT TELLS HOW MANY PENCILS JOHNNY WILL HAVE.



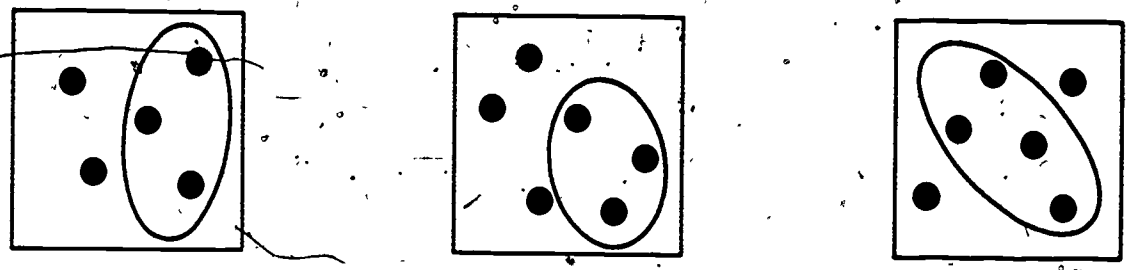


NOW, TURN TO THE NEXT PAGE.

LOOK AT THE PICTURES AT THE TOP OF THE PAGE.

WHICH PICTURE SHOWS FIVE MINUS THREE EQUALS TWO? (Pause)

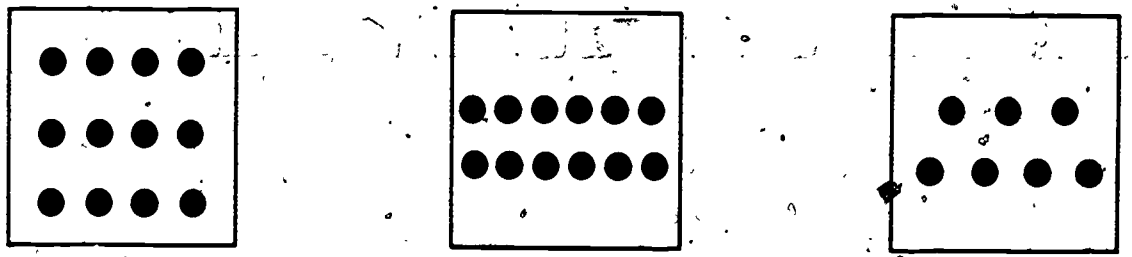
MARK THE PICTURE THAT SHOWS FIVE TAKE AWAY THREE EQUALS TWO.



NOW LOOK AT THE PICTURES AT THE BOTTOM OF THE PAGE. (Pause)

WHICH PICTURE SHOWS THREE TIMES FOUR? (Pause)

MARK THE PICTURE THAT SHOWS THREE TIMES FOUR.



NOW, TURN TO THE NEXT PAGE.

LISTEN TO THE STORY. THEN MARK THE NUMBER THAT ANSWERS THE QUESTION. LISTEN CAREFULLY.

TOM AND JIM SHARE A BAG OF MARBLES. ONE DAY TOM TAKES TWENTY-FIVE OF THE MARBLES TO SCHOOL AND JIM TAKES THE OTHER SEVENTEEN. THE NEXT DAY TOM TAKES SEVENTEEN MARBLES. HOW MANY MARBLES ARE THERE FOR JIM TO TAKE? (Pause)

TOM AND JIM SHARE A BAG OF MARBLES. ONE DAY TOM TAKES TWENTY-FIVE OF THE MARBLES TO SCHOOL AND JIM TAKES THE OTHER SEVENTEEN. THE NEXT DAY TOM TAKES SEVENTEEN MARBLES. HOW MANY MARBLES ARE THERE FOR JIM TO TAKE? MARK THE NUMBER THAT TELLS HOW MANY MARBLES THERE ARE FOR JIM TO TAKE.

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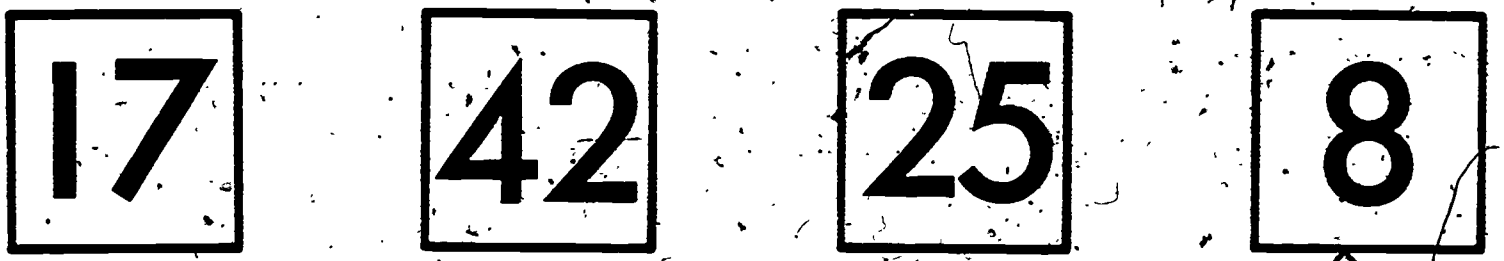
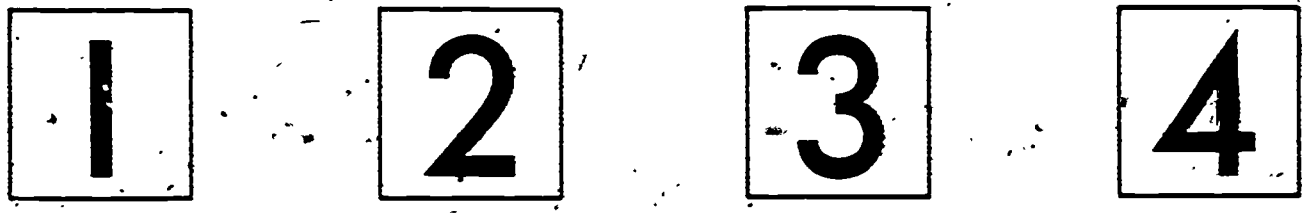


NOW, TURN TO THE NEXT PAGE.

LOOK AT THE NUMBERS AT THE TOP OF THE PAGE. LISTEN CAREFULLY TO THE STORY.

SUE HAD ONE CRAYON. MARY GAVE HER TWO MORE CRAYONS. HOW MANY CRAYONS DOES SUE HAVE NOW? (Pause)

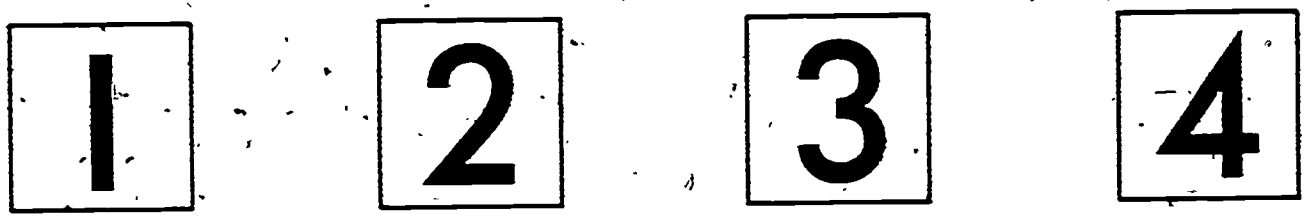
SUE HAD ONE CRAYON. MARY GAVE HER TWO MORE CRAYONS. HOW MANY CRAYONS DOES SUE HAVE NOW? MARK THE NUMBER THAT TELLS HOW MANY CRAYONS SUE HAS NOW.



NOW LOOK AT THE NUMBERS AT THE BOTTOM OF THE PAGE. LISTEN CAREFULLY TO THE STORY.

MARY HAD SOME MONEY. SHE SPENT THREE CENTS FOR CANDY AND ONE CENT FOR A GUM BALL. THEN HER MONEY WAS ALL GONE. HOW MUCH MONEY DID MARY HAVE BEFORE SHE SPENT ANY? (Pause)

MARY HAD SOME MONEY. SHE SPENT THREE PENNIES FOR CANDY AND ONE PENNY FOR A GUM BALL. THEN HER MONEY WAS ALL GONE. HOW MANY PENNIES DID MARY HAVE BEFORE SHE SPENT ANY? MARK THE NUMBER THAT TELLS HOW MANY PENNIES MARY HAD BEFORE SHE SPENT ANY.

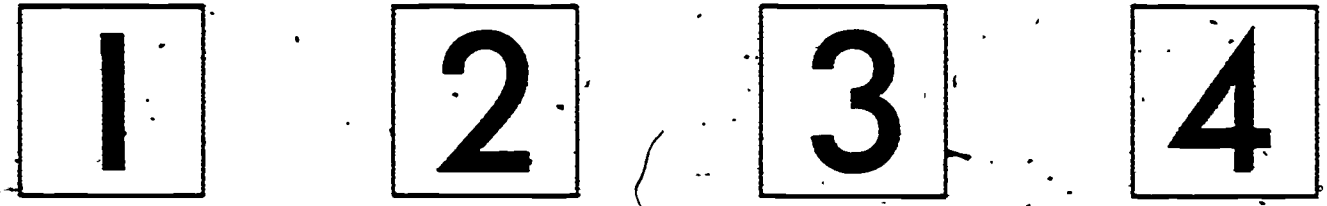


NOW, TURN TO THE NEXT PAGE.

LOOK AT THE NUMBERS AT THE TOP OF THE PAGE. HERE IS THE STORY.

PATTI HAS THREE COOKIES. IF SHE EATS ONE OF THEM, HOW MANY COOKIES WILL SHE HAVE LEFT? (Pause)

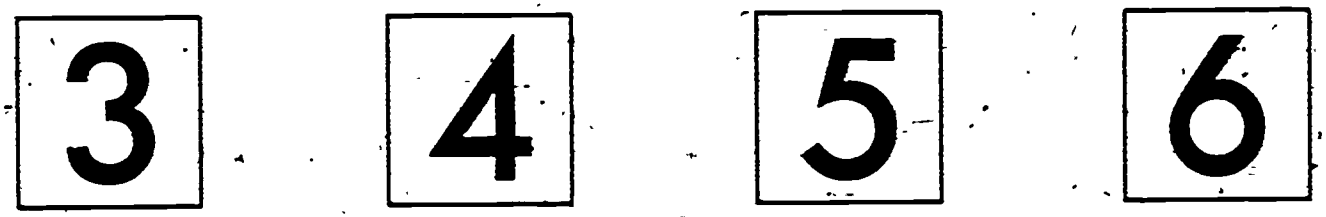
PATTI HAS THREE COOKIES. IF SHE EATS ONE OF THEM, HOW MANY COOKIES WILL SHE HAVE LEFT? MARK THE NUMBER THAT TELLS HOW MANY COOKIES ARE LEFT.



LOOK AT THE NUMBERS AT THE BOTTOM OF THE PAGE. NOW LISTEN TO THE STORY.

TONY HAD SOME BLOCKS. DAVID GAVE HIM FOUR MORE BLOCKS. NOW TONY HAS SEVEN BLOCKS. HOW MANY BLOCKS DID TONY HAVE BEFORE DAVID GAVE HIM MORE? (Pause)

TONY HAD SOME BLOCKS. DAVID GAVE HIM FOUR MORE BLOCKS. NOW TONY HAS SEVEN BLOCKS. HOW MANY BLOCKS DID TONY HAVE BEFORE DAVID GAVE HIM MORE? MARK THE NUMBER THAT TELLS HOW MANY BLOCKS TONY HAD BEFORE DAVID GAVE HIM MORE.



NOW, TURN TO THE NEXT PAGE.

LOOK AT THE NUMBERS AT THE TOP OF THE PAGE. NOW LISTEN TO THE STORY.

JOHN HAD SOME PENNIES. HE LOST THREE OF THEM. NOW HE HAS FOUR PENNIES. HOW MANY PENNIES DID JOHN HAVE BEFORE HE LOST ANY? (Pause)

JOHN HAD SOME PENNIES. HE LOST THREE OF THEM. NOW HE HAS FOUR PENNIES. HOW MANY PENNIES DID JOHN HAVE BEFORE HE LOST ANY? MARK THE NUMBER THAT TELLS HOW MANY PENNIES JOHN HAD BEFORE HE LOST ANY.

3	5	7	4

LOOK AT THE NUMBERS AT THE BOTTOM OF THE PAGE. NOW LISTEN TO THE STORY.

BILL HAS FIVE PENCILS. JOHN HAS THREE PENCILS. HOW MANY MORE PENCILS DOES BILL HAVE THAN JOHN? (Pause)

BILL HAS FIVE PENCILS. JOHN HAS THREE PENCILS. BILL HAS MORE PENCILS THAN JOHN. HOW MANY MORE PENCILS DOES BILL HAVE THAN JOHN? MARK THE NUMBER THAT TELLS HOW MANY MORE PENCILS BILL HAS THAN JOHN.

1	3	5	2

NOW TURN TO THE NEXT PAGE.

LISTEN CAREFULLY TO THE STORY.

MRS. JONES BOUGHT SIX EGGS. SHE USED ONE HALF THE EGGS TO MAKE A CAKE. HOW MANY EGGS DID SHE USE? (Pause)

MRS. JONES BOUGHT SIX EGGS. SHE USED ONE HALF THE EGGS TO MAKE A CAKE. HOW MANY EGGS DID SHE USE? MARK THE NUMBER THAT TELLS HOW MANY EGGS MRS. JONES USED.

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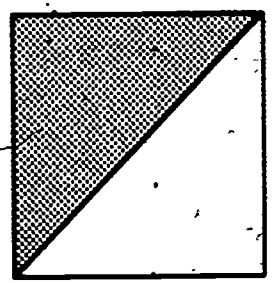
NOW, TURN TO THE NEXT PAGE.

LOOK AT THE PICTURE.



129

WHAT PART OF THE PICTURE IS SHADED?
ONE-HALF, ONE-THIRD, OR ONE-FOURTH? (Pause)

MARK THE NUMBER THAT TELLS WHAT PART OF THE PICTURE IS SHADED: ONE-HALF, ONE-THIRD, OR ONE-FOURTH.

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

NOW, TURN TO THE NEXT PAGE.

LOOK AT THE PICTURE.

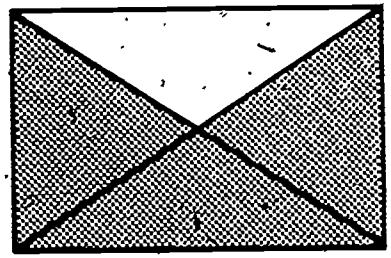
WHAT PART OF THE LINE IS SHADED?
ONE-THIRD, ONE-FOURTH, OR ONE-FIFTH (Pause)

MARK THE NUMBER THAT TELLS WHAT PART OF THE LINE IS SHADED: ONE-THIRD, ONE-FOURTH, OR ONE-FIFTH.

$\frac{1}{3}$ $\frac{1}{4}$ $\frac{1}{5}$

NOW, TURN TO THE NEXT PAGE.

LOOK AT THE PICTURE.



131

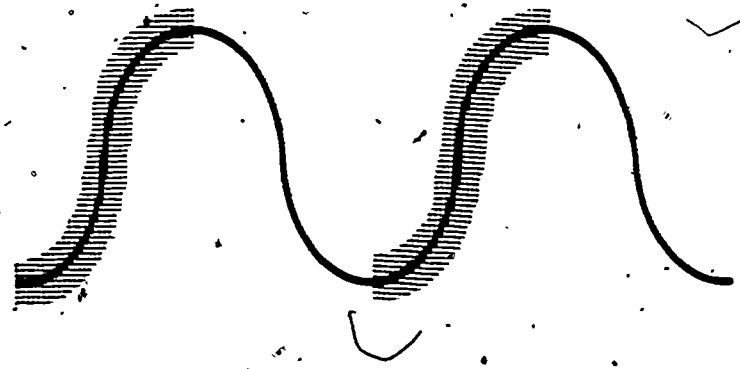
WHAT NUMBER GOES BEST WITH THE PICTURE?
ONE-THIRD, TWO-THIRDS, OR THREE-FOURTHS? (Pause)

MARK THE NUMBER THAT TELLS WHAT PART OF THE PICTURE IS SHADED.
ONE-THIRD, TWO-THIRDS, OR THREE-FOURTHS.

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

NOW, TURN TO THE NEXT PAGE.

LOOK AT THE PICTURE.



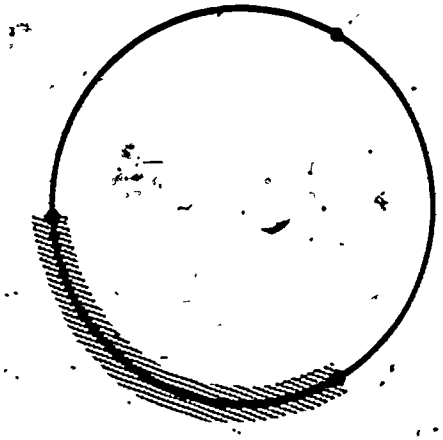
WHAT PART OF THE STRING IS SHADED?
ONE-HALF, ONE-THIRD, OR ONE-FOURTH? (Pause)

MARK THE NUMBER THAT TELLS WHAT PART OF THE STRING IS SHADED: ONE-HALF, ONE-THIRD, ONE-FOURTH.

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

NOW, TURN TO THE NEXT PAGE.

LOOK AT THE PICTURE.



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WHAT PART OF THE CIRCLE IS SHADED?
ONE-THIRD, ONE-HALF, OR ONE-FOURTH? (Pause)

MARK THE NUMBER THAT TELLS WHAT PART OF THE CIRCLE IS SHADED: ONE-THIRD, ONE-HALF, OR ONE-FOURTH.

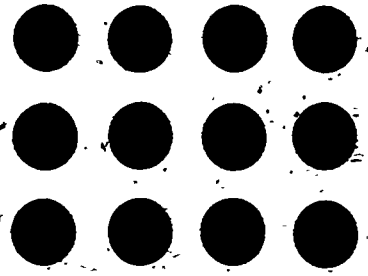
$\frac{1}{3}$ $\frac{1}{2}$ $\frac{1}{4}$

NOW, TURN TO THE NEXT PAGE.

LOOK AT THE DOTS AT THE TOP OF THE PAGE.

DRAW A RING AROUND ONE THIRD THE DOTS. (Pause)

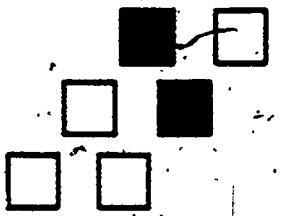
DRAW A RING AROUND ONE-THIRD OF THE DOTS.

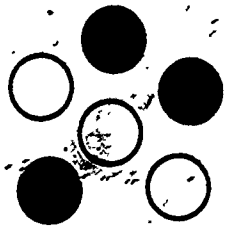


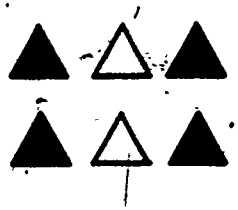
NOW LOOK AT THE PICTURES AT THE BOTTOM OF THE PAGE.

WHICH SET HAS ONE-HALF SHADED? (Pause)

MARK THE SET WITH ONE-HALF OF IT SHADED.





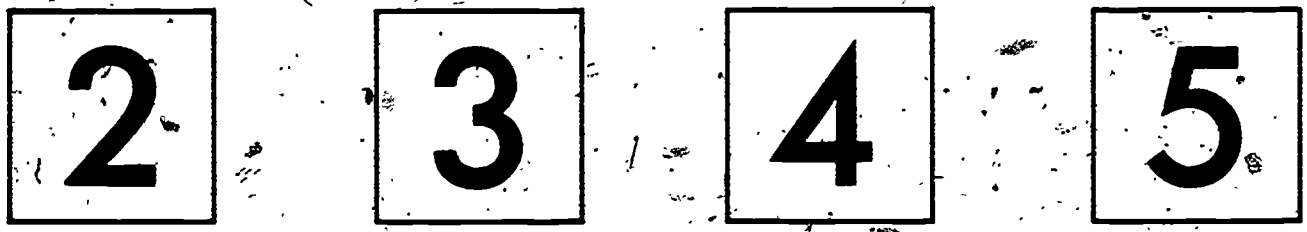


NOW, TURN TO THE NEXT PAGE.

LOOK AT THE NUMBERS AND LISTEN TO THE QUESTION.

WHEN SOMETHING IS CUT IN FOURTHS, HOW MANY PIECES ARE THERE? (Pause)

WHEN SOMETHING IS CUT IN FOURTHS, HOW MANY PIECES ARE THERE?
MARK THE NUMBER THAT TELLS HOW MANY PIECES.



NOW, PUT YOUR PENCILS DOWN.

SCHOOL
MATHEMATICS
STUDY GROUP

Grade 1
Spring

FORM 1-04

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Name of tester _____

Date test given _____

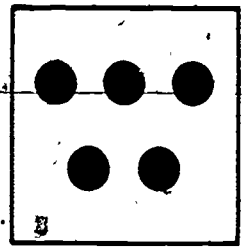
Cedar Hall, Stanford University
Stanford, California

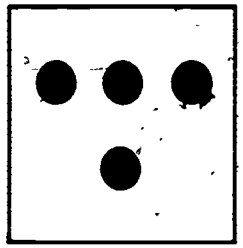
Form 1-04

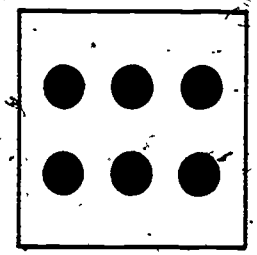
SAMPLE PAGE

(1)

WHICH PICTURE HAS THREE DOTS AND ONE DOT?

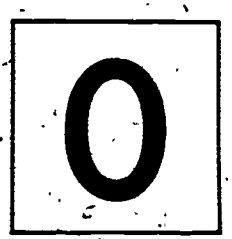






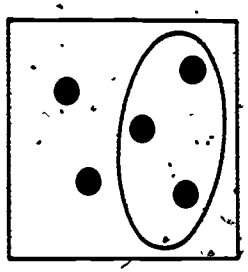
(2)

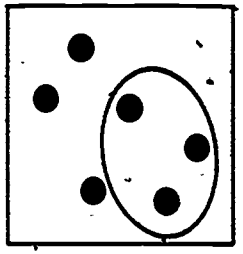
JOHNNY HAS ONE PENCIL. IF HE LOSES THIS PENCIL, THEN HOW MANY PENCILS WILL HE HAVE?

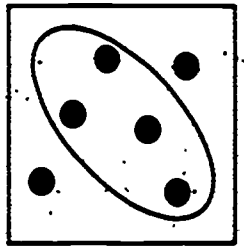


(3)

WHICH PICTURE SHOWS FIVE MINUS THREE EQUALS TWO?

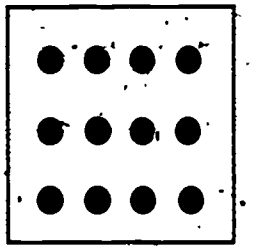


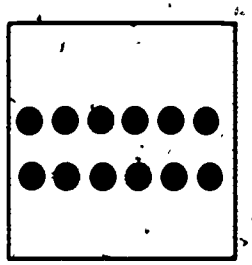


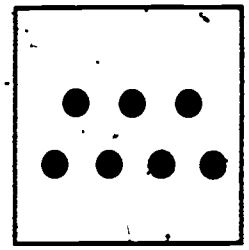


(4)

WHICH PICTURE SHOWS THREE TIMES FOUR?







TOM AND JIM SHARE A BAG OF MARBLES. ONE DAY TOM TAKES TWENTY-FIVE OF THE MARBLES TO SCHOOL AND JIM TAKES THE OTHER SEVENTEEN. THE NEXT DAY TOM TAKES SEVENTEEN MARBLES. HOW MANY MARBLES ARE THERE FOR JIM TO TAKE?

17

42

25

8

(6)

SUE HAD ONE CRAYON. MARY GAVE HER TWO MORE CRAYONS. HOW MANY CRAYONS DOES SUE HAVE NOW?

1 2 3 4

(7)

MARY HAD SOME MONEY. SHE SPENT THREE CENTS FOR CANDY AND ONE CENT FOR A GUM BALL. THEN HER MONEY WAS ALL GONE. HOW MUCH MONEY DID MARY HAVE BEFORE SHE SPENT ANY?

1 2 3 4

7-8;9

(8)

PATTI HAS THREE COOKIES. IF SHE EATS ONE OF THEM, HOW MANY COOKIES WILL SHE HAVE LEFT?

1	2	3	4

(9)

TONY HAD SOME BLOCKS. DAVID GAVE HIM FOUR MORE BLOCKS. NOW TONY HAS SEVEN BLOCKS. HOW MANY BLOCKS DID TONY HAVE BEFORE DAVID GAVE HIM MORE?

3	4	5	6

(10)

JOHN HAD SOME PENNIES. HE LOST THREE OF THEM. NOW HE HAS FOUR PENNIES. HOW MANY PENNIES DID JOHN HAVE BEFORE HE LOST ANY?

3 5 7 4

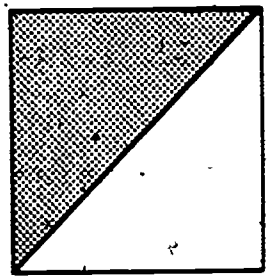
(11)

BILL HAS FIVE PENCILS. JOHN HAS THREE PENCILS. HOW MANY MORE PENCILS DOES BILL HAVE THAN JOHN?

1 3 5 2

MRS. JONES BOUGHT SIX EGGS. SHE USED ONE HALF THE EGGS TO MAKE A CAKE. HOW MANY EGGS DID SHE USE?

2	3	4

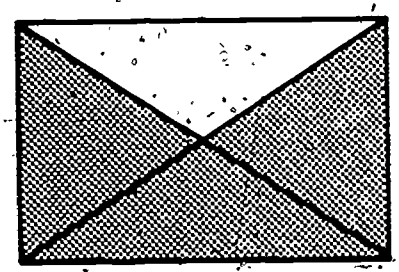


WHAT PART OF THE PICTURE IS SHADED?

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

WHAT PART OF THE LINE IS SHADED?

$\frac{1}{3}$ $\frac{1}{4}$ $\frac{1}{5}$



WHAT NUMBER GOES BEST WITH THE PICTURE?

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

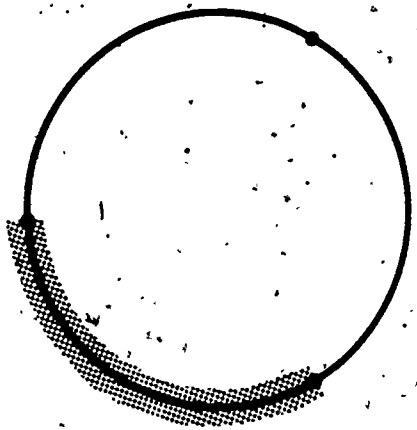
148

WHAT PART OF THE STRING IS SHADED?

$\frac{1}{2}$

$\frac{1}{3}$

$\frac{1}{4}$



149

WHAT PART OF THE CIRCLE IS SHADED?

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

(18)

DRAW A RING AROUND ONE THIRD THE DOTS.

(19)

WHICH SET HAS ONE-HALF SHADED?

WHEN SOMETHING IS CUT IN FOURTHS, HOW MANY PIECES ARE THERE?

151

2 3 4 5

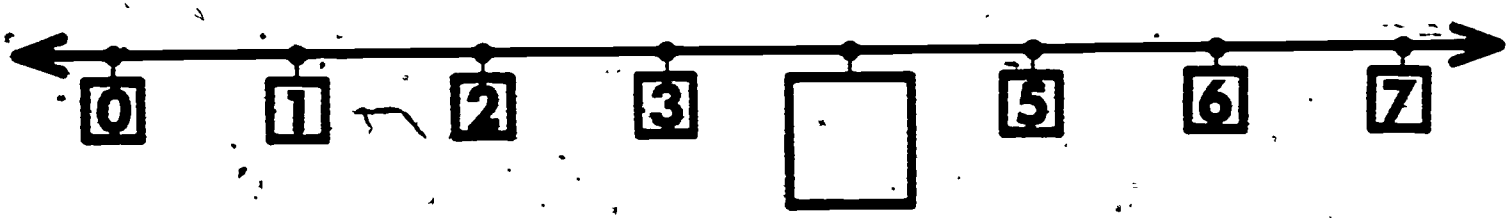
153

TESTER'S MANUAL - FORM 1-05

(W, X, Y, Z)

LOOK AT THE NUMBER LINE AT THE TOP OF THE PAGE. WHAT NUMBER GOES IN THE EMPTY BOX? (Pause)

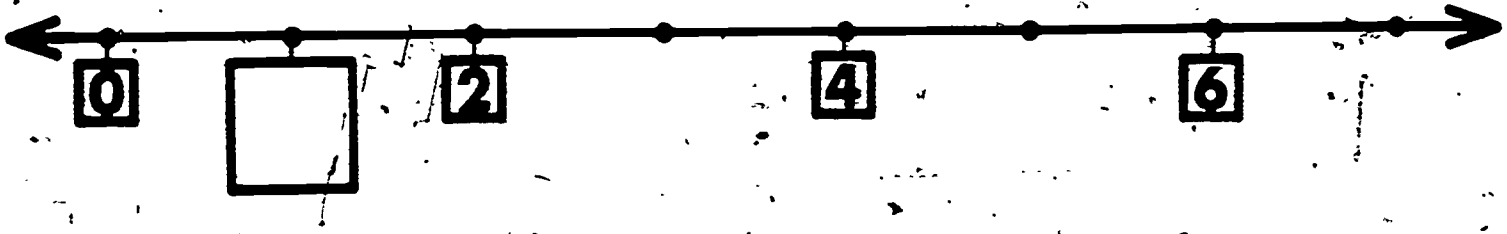
WRITE THE NUMBER THAT GOES IN THE EMPTY BOX. (Pause)



NOW LOOK AT THE NUMBER LINE AT THE BOTTOM OF THE PAGE.

WHAT NUMBERS GO IN THE EMPTY BOXES? (Pause)

WRITE THE NUMBER THAT GOES IN THE EMPTY BOX. (Pause)

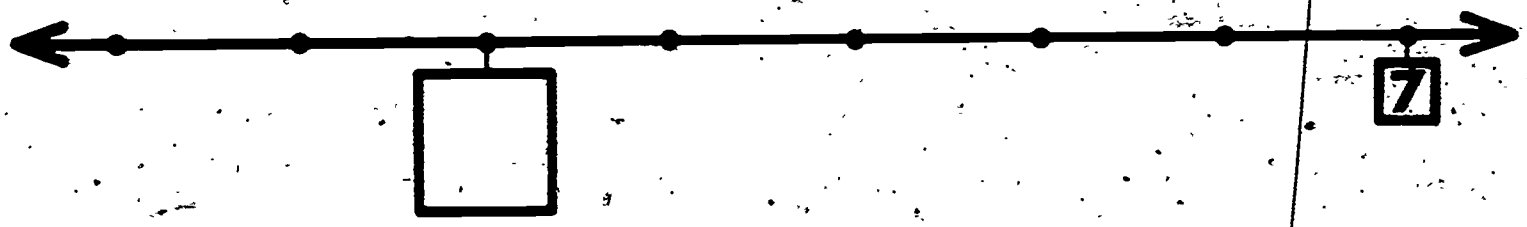


NOW, TURN TO THE NEXT PAGE.

LOOK CAREFULLY AT THE NUMBER LINE.

WHAT NUMBER GOES IN THE EMPTY BOX? (Pause)

WRITE THE NUMBER THAT GOES IN THE EMPTY BOX. (Pause)



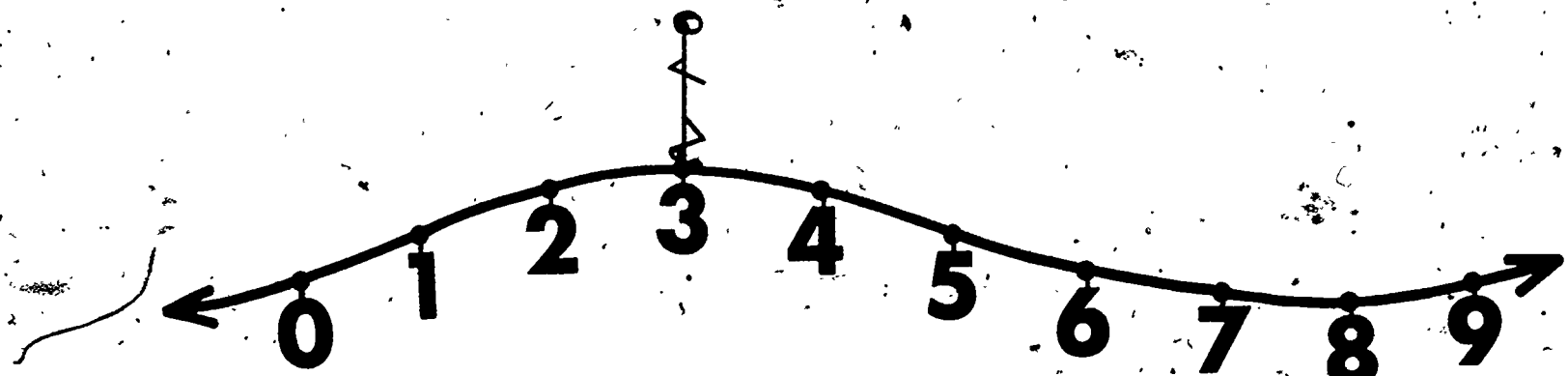
NOW, TURN TO THE NEXT PAGE.

LOOK AT THE NUMBER LINE, AND LISTEN CAREFULLY TO THE STORY.

PRETEND THAT YOU ARE PLAYING A GAME. YOU HOP ALONG THE NUMBER LINE FROM ONE NUMBER TO THE NEXT LARGER NUMBER. IF YOU START AT NUMBER THREE, TAKE THREE HOPS, THEN ONE MORE HOP, ON WHAT NUMBER DO YOU STOP? (Pause)

PRETEND THAT YOU ARE PLAYING A GAME. YOU HOP ALONG THE NUMBER LINE FROM ONE NUMBER TO THE NEXT LARGER NUMBER. IF YOU START AT NUMBER THREE, TAKE THREE HOPS, THEN ONE MORE HOP, ON WHAT NUMBER DO YOU STOP? (Pause)

MARK THE NUMBER THAT SHOWS WHERE YOU STOP. (Pause)

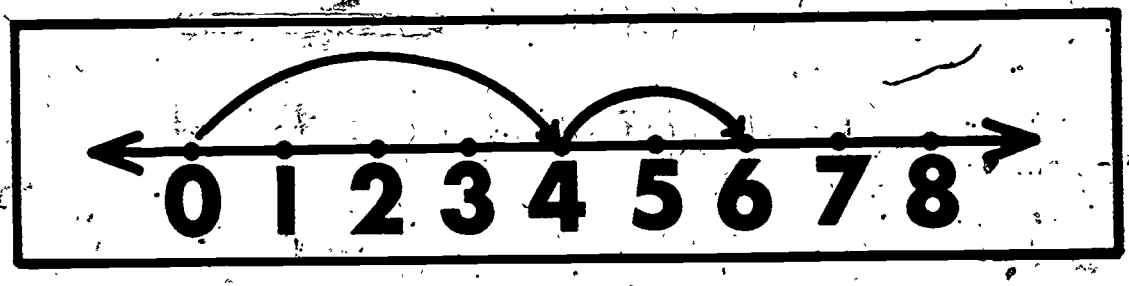


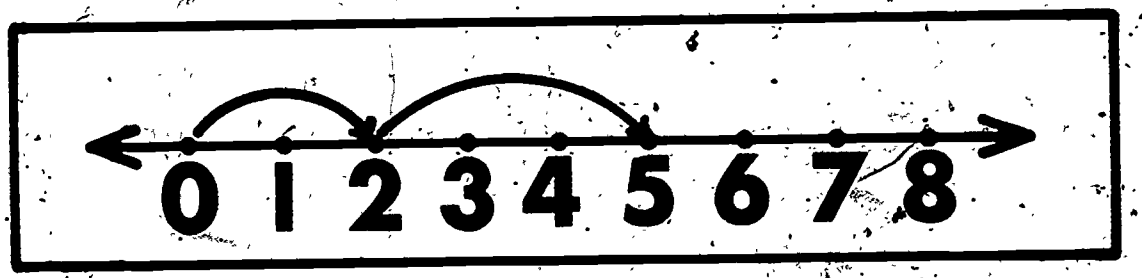
TURN TO THE NEXT PAGE.

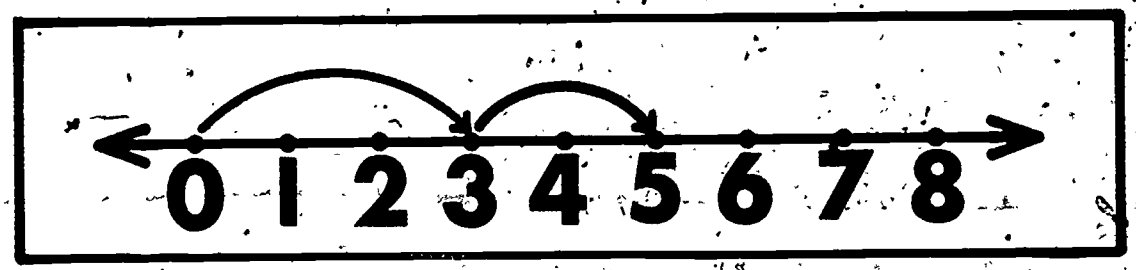
LOOK AT THE PICTURES OF THE NUMBER LINES. ONE OF THEM SHOWS THREE PLUS TWO EQUALS FIVE.

WHAT NUMBER LINE SHOWS THREE PLUS TWO EQUALS FIVE? (Pause)

MARK THE NUMBER LINE THAT SHOWS THREE PLUS TWO EQUALS FIVE. (Pause)







PUT YOUR PENCILS DOWN. Tester should now proceed to read the instructions in the tester's manual for the next portion of the test. (Children should not turn the page until tester has finished reading the instructions.)

Instructions for Form 1-05 to be read after the first five items (pages 3-6) have been completed:

YOU ARE GOING TO WORK THE REST OF THE BOOKLET BY YOURSELVES. YOU ARE TO WRITE THE MISSING NUMBER FOR EACH EXAMPLE. FINISH ALL THE EXAMPLES YOU KNOW HOW TO DO. IF YOU NEED THINGS TO COUNT, USE YOUR FINGERS OR MAKE MARKS ON THE PAGE. WHEN YOU HAVE FINISHED ONE PAGE, GO ON TO THE NEXT PAGE UNTIL YOU HAVE COMPLETED THE BOOKLET.

THERE ARE SOME EXAMPLES THAT YOU MAY NOT HAVE HAD. IF YOU COME TO EXAMPLES YOU DON'T KNOW HOW TO DO, GO ON TO THE NEXT PAGE. WORK CAREFULLY AND COMPLETE ALL EXAMPLES YOU KNOW HOW TO DO. ARE THERE ANY QUESTIONS?
(If there are questions, repeat any of the above instructions appropriate to the questions.)

REMEMBER, TAKE YOUR TIME AND COMPLETE ALL EXAMPLES YOU KNOW HOW TO DO. TURN TO THE NEXT PAGE IN YOUR BOOKLET. YOU MAY BEGIN.

In order to keep the children who may finish early from disturbing those who are still working, we have provided some dot-to-dot activity pages. These should be placed in an accessible spot in the examination room. When a child has finished his answer booklet, and you have checked to see that he has completed it, he may be allowed to take a set of the dot-to-dot activity pages to work on while the slower children are finishing their tests. The children may keep these pages, and the slower children should be given a set to take home when the testing has been completed.

SCHOOL
MATHEMATICS
STUDY GROUP

FORM 1-05

159

Name of tester _____

Date test given _____

Cedar Hall, Stanford University
Stanford, California

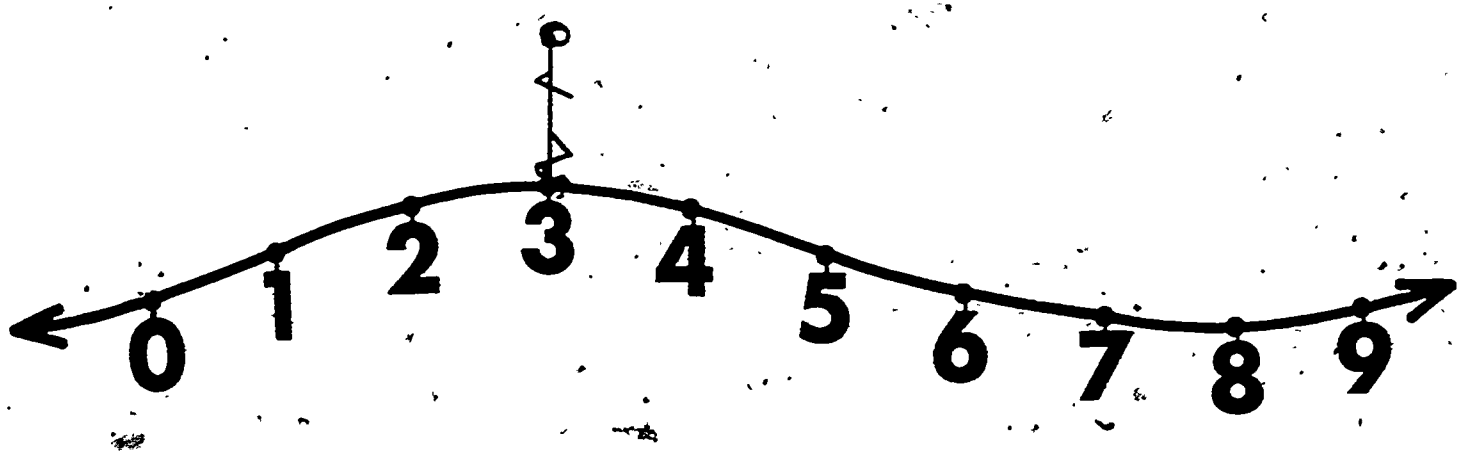
(1)

WHAT NUMBERS GO IN THE EMPTY BOXES?

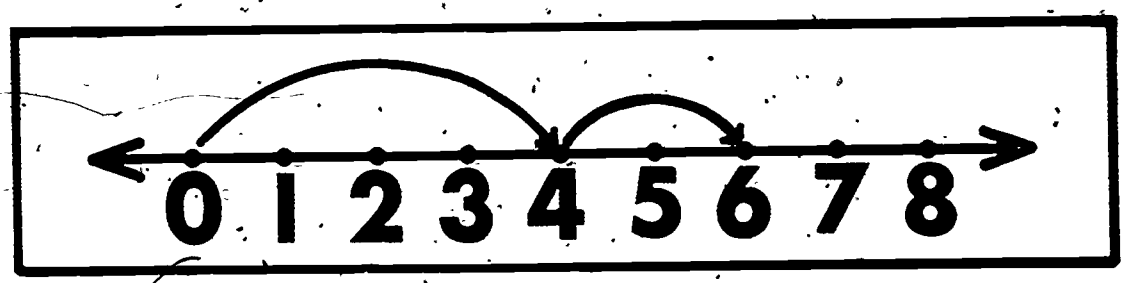
(2)

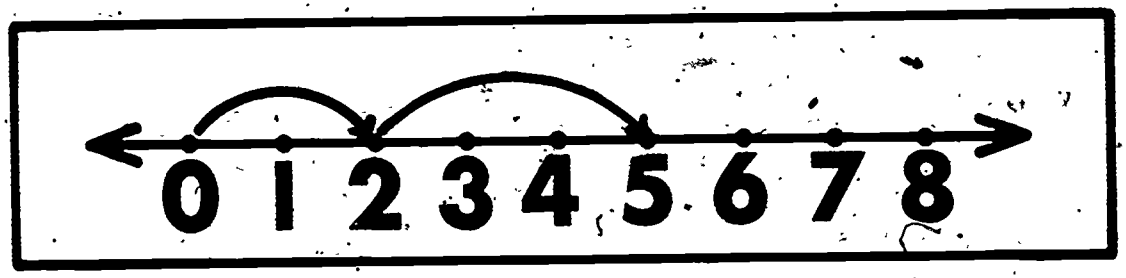
WHAT NUMBER GOES IN THE EMPTY BOX?

PRETEND THAT YOU ARE PLAYING A GAME. YOU HOP ALONG THE NUMBER LINE FROM ONE NUMBER TO THE NEXT LARGER NUMBER. IF YOU START AT NUMBER THREE, TAKE THREE HOPS, THEN ONE MORE HOP, ON WHAT NUMBER DO YOU STOP?



WHAT NUMBER LINE SHOWS THREE PLUS TWO EQUALS FIVE?





(6)

$3+3=\square$

(7)

$4+1=\square$

COMPLETE THE EQUATIONS.

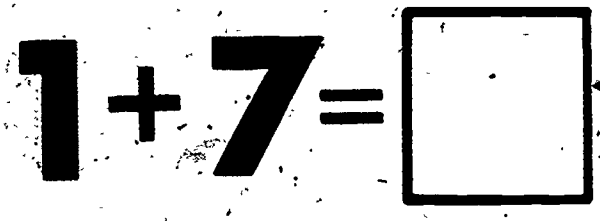
(8)

$0+9=\square$

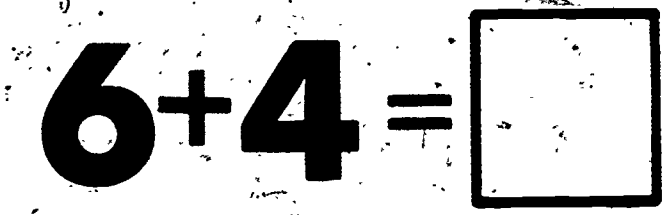
(9)

$2+5=\square$

(10)

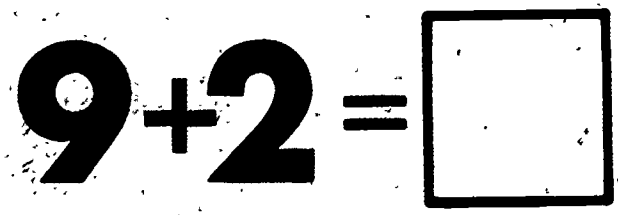


(11)

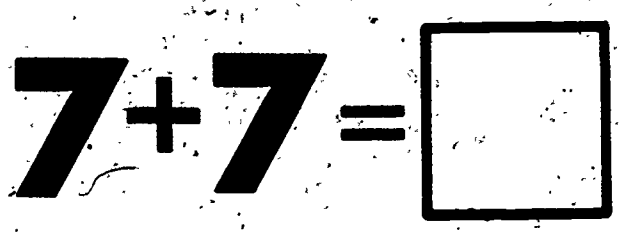


COMPLETE THE EQUATIONS.

(12)



(13)



(W, X,

FIND THE SUMS.

(14)

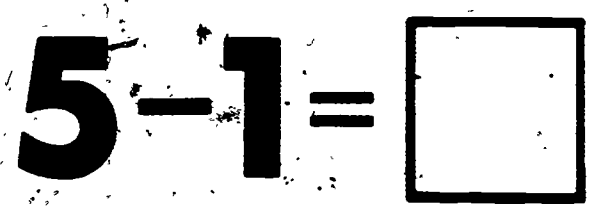
$$50 + 40 = \square$$

166

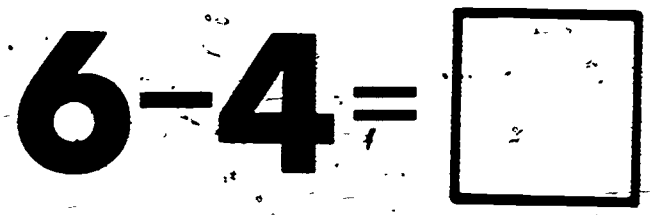
(15)

$$\begin{array}{r} 42 \\ +\ 23 \\ \hline \end{array}$$

(16)

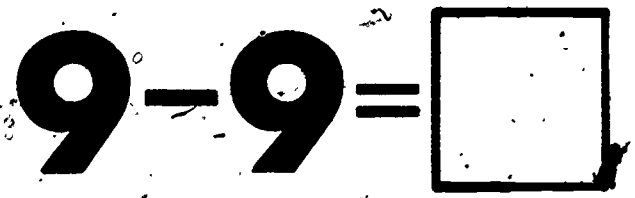


(17)

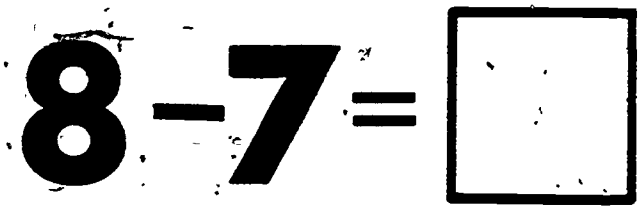


COMPLETE THE EQUATIONS.

(18)



(19)



(20)

$6 - 0 = \square$

(21)

$10 - 6 = \square$

COMPLETE THE EQUATIONS.

(22)

$11 - 3 = \square$

(23)

$13 - 5 = \square$

FIND THE DIFFERENCES.

(24)

$$80 - 20 = \square$$

(25)

$$\begin{array}{r} 76 \\ -\ 24 \\ \hline \end{array}$$

COMPLETE THE EQUATIONS.

(26)

$2 \times 3 = \square$

(27)

$3 \times 4 = \square$

COMPLETE THE EQUATIONS.

(28)

$$8 + 4 = \square$$

(29)

$$90 + 64 = \square$$

(W) 11 - 30, 31

FIND THE SUMS.

(30)

$$\begin{array}{r} 64 \\ +\ 28 \\ \hline \end{array}$$

(31)

$$\begin{array}{r} 547 \\ +\ 58 \\ \hline \end{array}$$

FIND THE DIFFERENCES.

(32)

$$15 - 8 = \square$$

(33)

$$59 - 36 = \square$$

(34)

$$\begin{array}{r} 46 \\ -\ 28 \\ \hline \end{array}$$

COMPLETE THE EQUATION.

$$9 \times 0 = \square$$

COMPLETE THE EQUATIONS.

(36)

$$9+6=\square$$

(37)

$$48+26=\square$$

FIND THE SUMS.

(38)

$$\begin{array}{r} 40 \\ +\,30 \\ \hline \end{array}$$

(39)

$$\begin{array}{r} 382 \\ +\,156 \\ \hline \end{array}$$

FIND THE DIFFERENCES.

(40)

$$18 - 9 = \square$$

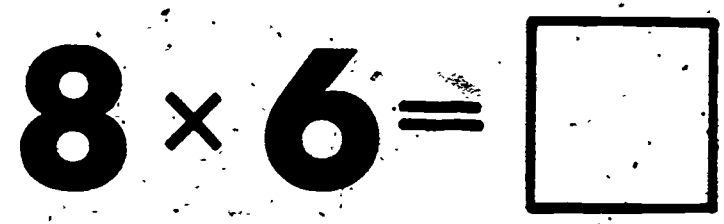
(41)

$$51 - 6 = \square$$

(42)

$$\begin{array}{r} 50 \\ -\ 40 \\ \hline \end{array}$$

COMPLETE THE EQUATION.



FIND THE SUMS.

(44)

$5+8=\square$

(45)

$84+72=\square$

(46)

$$\begin{array}{r} 6 \\ +47 \\ \hline \end{array}$$

(Y) 13 - 47, 48

Grade 1
Spring

COMPLETE THE EQUATIONS.

(47)

$12 - 7 = \square$

180

(48)

$83 - 60 = \square$

Form 1-05
Items 47 & 48

FIND THE DIFFERENCES.

(49)

$$\begin{array}{r} 64 \\ -\,15 \\ \hline \end{array}$$

(50)

$$\begin{array}{r} 152 \\ -\,67 \\ \hline \end{array}$$

Grade 1
Spring

COMPLETE THE EQUATION.

$$1 \times 12 = \square$$

(Z) 9 - 52, 53, 54

FIND THE SUMS.

(52)

$7 + 9 = \square$

(53)

$47 + 9 = \square$

183

(54)

$$\begin{array}{r} 62 \\ +\ 85 \\ \hline \end{array}$$

COMPLETE THE EQUATIONS.

(55)

$$17 - 8 = \square$$

(56)

$$82 - 38 = \square$$

FIND THE DIFFERENCES.

(57)

$$\begin{array}{r} 97 \\ -\,45 \\ \hline \end{array}$$

(58)

$$\begin{array}{r} 420 \\ -\,83 \\ \hline \end{array}$$

(Z) 17 - 59

Grade 1
Spring

COMPLETE THE EQUATION.

$3 \times 7 = \square$

186

Form L-05
Item 59

DESCRIPTION AND STATISTICAL PROPERTIES OF SCALES - FALL

SCORING THE GRADE 1 FALL SCALES

The coding scheme which was developed for the kindergarten scales was also used for the 1-01 battery. The categories used for coding were:

Incorrect Response

Some tests were to be stopped after the child made a total of three errors. Where testing was discontinued for this reason, all subsequent items for that child were scored as incorrect responses.

Correct Response

Omissions by Tester

Not checked by tester, or more than one response checked by tester, or incomplete information given by tester, or contradiction between score and comment by tester. A contradiction was not scored as an omission by tester if the tester's comment showed he misunderstood the scoring criteria and if it was possible to determine the appropriate score from the comments.

Multiple Responses Given by Child or Child was Confused

No Answer Given by Child

No attempt by child or child says he doesn't know, or verbal responses are given such as "no," "what does that mean," etc.

All response categories other than the correct response were grouped together and treated as incorrect for statistical analyses. (The category "multiple or confused response by child" occurred infrequently.)

For two of the scales, 206 Ordering Objects and 209 Ordering Geometric Shapes, codes were assigned for partially correct responses. The partially correct responses were used to construct weighted scores, but since these scores did not yield more information in statistical analyses than a simple score based on only a correct response, these data have been excluded from the scale descriptions.

Testers' comments for specific tests were used only to aid in determining the correct coding for an item. Thus, if a tester described a child's response but gave no score, the response was coded if the description was clear enough to permit the assignment of a code. Otherwise, the category "ommission by tester" was assigned. (See also the previous discussion of criteria for coding "omission

by tester.")

A validity code based on the tester's comments was assigned for each test. Only comments which applied to the whole test or most of the test) were used in determining the validity score. A two-point scale was used with "1" denoting a valid test. The score "2" was given to tests which had some comments indicating questionable validity but which were judged to provide an adequate measure of the child's knowledge. Ratings of questionable validity were usually based on comments that the child did not understand English or that the child had emotional problems which interfered with his performance during the test.

The actual scale score used in calculating the statistics in this report is the sum of correct responses for all items within the scale.

Grade 1
Fall

Form 1-01
Scale 201

201 GEOMETRIC SHAPES - IDENTIFYING S (4 items: 1/6 of population)

This scale includes selected items from 202. These items are 1, 2, 4, and 5. It is the same as 103 and 003 although a slightly different procedure of administration was used in 003.

SCALE STATISTICS:

[illegible]	=	230
[illegible]	=	4
[illegible]	=	3.409
[illegible]	=	0.917
[illegible]	=	0.604
[illegible]	=	0.577

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT
1	0.778	0.778	0.691	0.0
2	0.726	0.726	0.819	0.0
4	0.987	0.987	0.771	0.0
5	0.917	0.917	0.590	0.0

202 GEOMETRIC SHAPES - IDENTIFYING (5 items; 1/6 of population)

The child is required to identify and select a shape requested by name from a displayed set. This task demands, in addition to having the particular shape name attached to certain perceptual stimili, that the child "keep in mind" the requested object while scanning the present set to locate the appropriate object, whose only property differentiating it from the others is its shape. Scale 202 is the same as 104 and is an extension of 201.

The items which make up this scale come from Form 1-01 which is reproduced elsewhere in this report. The item numbers and page references are listed below.

Items 1 - 5 Pages 13, 14

SCALE STATISTICS:

NUMBER OF CASES	=	230
NUMBER OF ITEMS	=	5
MEAN TOTAL SCORE	=	4.404
STANDARD DEVIATION	=	0.931
CRONBACH'S ALPHA	=	0.580
ERROR OF MEASUREMENT	=	0.603

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
1	0.778	0.778	0.664	0.0
2	0.726	0.726	0.812	0.0
3	0.996	0.996	0.894	0.0
4	0.987	0.987	0.905	0.0
5	0.917	0.917	0.615	0.0

Grade 1
Fall

Form 1-01
Scale 203

203 COUNTING MEMBERS OF A GIVEN SET - PICTURE CARDS S-1 (8 items; 1/6 of population)

This scale includes selected items from 204. These items are 6 through 13. Scale 203 is the same as 006 and 109 and is an extension of 216.

SCALE STATISTICS:

NUMBER OF CASES	=	230
NUMBER OF ITEMS	=	8
MEAN TOTAL SCORE	=	6.026
STANDARD DEVIATION	=	2.134
CRONBACH'S ALPHA	=	0.793
ERROR OF MEASUREMENT	=	0.971

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
6	0.913	0.913	0.892	0.0
7	0.739	0.739	0.515	0.0
8	0.878	0.878	0.818	0.0
9	0.743	0.770	0.600	3.478
10	0.826	0.888	0.780	6.957
11	0.683	0.741	0.685	7.826
12	0.674	0.775	0.793	13.043
13	0.570	0.712	0.722	20.000

204 COUNTING MEMBERS OF A GIVEN SET - PICTURE CARDS (10 items; 1/6 of population)

Cardinal counting ability is assessed in this scale by requiring the child to count the number of members in a set (pictures of familiar objects on a card). The pictures are arranged in symmetric patterns on some cards and asymmetric patterns on others. It is the same as 110 and is an extension of 203, 216, and 217.

The items which make up this scale come from Form 1-01 which is reproduced elsewhere in this report. The item numbers and page references are listed below.

Items 6 - 15 Pages 15 - 21

SCALE STATISTICS:

NUMBER OF CASES	=	230
NUMBER OF ITEMS	=	10
MEAN TOTAL SCORE	=	6.730
STANDARD DEVIATION	=	2.660
CRONBACH'S ALPHA	=	0.823
ERROR OF MEASUREMENT	=	1.120

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
6	0.913	0.913	0.822	0.0
7	0.739	0.739	0.525	0.0
8	0.878	0.878	0.805	0.0
9	0.743	0.770	0.623	3.478
10	0.826	0.888	0.793	6.957
11	0.683	0.741	0.688	7.826
12	0.674	0.775	0.792	13.043
13	0.570	0.712	0.791	20.000
14	0.439	0.635	0.691	30.870
15	0.265	0.427	0.609	37.826

205 EQUIVALENT SETS - DOTS (6 items; 1/6 of population)

The concept of equivalence of sets is tested by requesting the child to form a set of buttons equivalent to that represented by a group of pictured dots on a card. Patterning of the dots is symmetrical on some cards and asymmetrical on others. Scale 205 is the same as 012 and 119.

The items which make up this scale come from Form 1-01 which is reproduced elsewhere in this report. The item numbers and page references are listed below.

Items 16 - 21 Pages 23 - 27

SCALE STATISTICS:

NUMBER OF CASES	=	230
NUMBER OF ITEMS	=	6
MEAN TOTAL SCORE	=	4.822
STANDARD DEVIATION	=	1.468
CRONBACH'S ALPHA	=	0.716
ERROR OF MEASUREMENT	=	0.782

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT.
16	0.813	0.813	0.696	0.0
17	0.970	0.970	0.997	0.0
18	0.839	0.839	0.556	0.0
19	0.730	0.743	0.641	1.739
20	0.865	0.921	1.008	6.087
21	0.604	0.665	0.571	9.130

206 ORDERING OBJECTS (3 items; 1/6 of population)

This scale measures ability to arrange sets of similar objects in order of size from the smallest to the largest and from the largest to the smallest. It is similar to scale 209 except that objects are used rather than shapes. Scale 206 is the same as 121.

The score for this scale is the number of items ordered correctly. A weighted score had also been constructed by assigning the following numbers: 2 - ordered correctly, 1 - ends ordered correctly, and 0 - randomly ordered or no attempt. This weighted score provided no more information than did the unweighted score and is, therefore, not reported.

The items which make up this scale come from Form 1-01 which is reproduced elsewhere in this report. The item numbers and page references are listed below.

Items 25, 27, 29 Pages 29 - 32

SCALE STATISTICS:

NUMBER OF CASES	=	230
NUMBER OF ITEMS	=	3
MEAN TOTAL SCORE	=	2.109
STANDARD DEVIATION	=	1.227
CRONBACH'S ALPHA	=	0.889
ERROR OF MEASUREMENT	=	0.426

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
25	0.730	0.730	1.067	0.0
27	0.726	0.726	1.030	0.0
29	0.652	0.652	0.955	0.0

208 ORDERING GEOMETRIC SHAPES S (2 items; 1/6 of population)

This scale includes selected items from 209. These items are 22 and 24. Scale 208 is the same as 014 and 125.

SCALE STATISTICS:

NUMBER OF CASES	=	230
NUMBER OF ITEMS	=	2
MEAN TOTAL SCORE	=	1.470
STANDARD DEVIATION	=	0.827
CRONBACH'S ALPHA	=	0.867
ERROR OF MEASUREMENT	=	0.301

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
22	0.770	0.770	1.064	0.0
24	0.700	0.700	1.013	0.0

209 ORDERING GEOMETIC SHAPES (3 items; 1/6 of population)

This scale measures the child's ability to arrange similar geometric shapes in order of size from the smallest to the largest and from the largest to the smallest. The scale is similar to 206 except that geometric shapes are used rather than objects. Scale 209 is the same as 126 and is an extension of 208.

The score for this scale is the number of items ordered correctly. A weighted score had also been constructed by assigning the following numbers: 2 - ordered correctly, 1 - ends ordered correctly, and 0 - randomly ordered or no attempt. This weighted score provided no more information than did the unweighted score and is, therefore, not reported.

The items which make up this scale come from Form 1-01 which is reproduced elsewhere in this report. The item numbers and page references are listed below.

Items 22, 24, 31 Pages 29-32

SCALE STATISTICS:

NUMBER OF CASES	=	230
NUMBER OF ITEMS	=	3
MEAN TOTAL SCORE	=	2.165
STANDARD DEVIATION	=	1.222
CRONBACH'S ALPHA	=	0.899
ERROR OF MEASUREMENT	=	0.389

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
22	0.770	0.770	1.094	0.0
24	0.700	0.700	1.089	0.0
31	0.696	0.696	1.035	0.0

211 CLASSIFYING (5 items; 1/6 of population)

This scale requires the child to form classes based on size (e.g., smallest circle, largest block). It is the same as 145.

The items which make up this scale come from Form 1-01 which is reproduced elsewhere in this report. The item numbers and page references are listed below.

Items 23, 26, 28, 30, 32 Pages 29 - 32

SCALE STATISTICS:

NUMBER OF CASES	=	230
NUMBER OF ITEMS	=	5
MEAN TOTAL SCORE	=	4.557
STANDARD DEVIATION	=	0.930
CRONBACH'S ALPHA	=	0.685
ERROR OF MEASUREMENT	=	0.522

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
23	0.948	0.948	1.214	0.0
26	0.939	0.939	1.211	0.0
28	0.835	0.835	0.626	0.0
30	0.865	0.865	0.736	0.0
32	0.970	0.970	0.586	0.0

212 RESPONSE TO VERBAL DIRECTIONS (1 item; 1/6 of population)

This scale is a tester rating based on the child's compliance or attempted compliance with the directions given by the tester. This scale is the same as 022, 143, and 317.

TESTER'S SCORING GRID:

Item No.		
33	(a) No compliance. Did not do what was asked.	☐
	(b) Little compliance. Did not do what was asked in most instances unless controls used.	☐
	(c) Some compliance. Did (or tried to do) what was asked in some tasks.	☐
	(d) Full compliance. Did exactly (or tried to do) what was asked on each task.	☐

TESTER RATING	PERCENT	SAMPLE SIZE
Some compliance	2.6	230
Full compliance	97.4	

213 ATTENTION TO TASKS (1 item; 1/6 of population)

This is a tester rating based on the child's attentiveness to the tasks presented in the test. This scale is the same as 023, 144, and 318.

TESTER'S SCORING GRID:

Item No.		
34	(a) Attended well to all tasks.	☐
	(b) Attended well to some tasks but not to all.	☐
	(c) Attention wandered periodically.	☐
	(d) Inattentive unless continually directed.	☐

TESTER RATING	PERCENT	SAMPLE SIZE
Attended well to all tasks	95.7	230
Attended well to some tasks	3.0	
Attention wandered periodically	1.3	

Grade 1
Fall

Form 1-01
Scale 216

216 COUNTING MEMBERS OF A GIVEN SET - PICTURE CARDS S-2 (6 items; 1/6 of population)

This scale includes selected items from 204. These items are 7 through 9 and 11 through 13. Scale 216 is the same as 026, 151, and 324.

SCALE STATISTICS:

NUMBER OF CASES	=	230
NUMBER OF ITEMS	=	6
MEAN TOTAL SCORE	=	4.287
STANDARD DEVIATION	=	1.761
CRONBACH'S ALPHA	=	0.746
ERROR OF MEASUREMENT	=	0.887

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
7	0.739	0.739	0.499	0.0
8	0.878	0.878	0.768	0.0
9	0.743	0.770	0.554	3.478
11	0.683	0.741	0.680	7.826
12	0.674	0.775	0.759	13.043
13	0.570	0.712	0.720	20.000

217 COUNTING MEMBERS OF A GIVEN SET - PICTURE CARDS S-3 (8 items; 1/6 of population)

This scale includes selected items from 204. These items are 7 through 9 and 11 through 15. Scale 217 is the same as 152 and 325 and is an extension of 216.

SCALE STATISTICS:

NUMBER OF CASES	=	230
NUMBER OF ITEMS	=	8
MEAN TOTAL SCORE	=	4.991
STANDARD DEVIATION	=	2.301
CRONBACH'S ALPHA	=	0.795
END OF PERIOD SAT	=	1.043

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
7	0.739	0.739	0.511	0.0
8	0.878	0.878	0.759	0.0
9	0.743	0.770	0.589	3.478
11	0.683	0.741	0.678	7.826
12	0.674	0.775	0.761	13.043
13	0.570	0.712	0.796	20.000
14	0.439	0.635	0.694	30.870
15	0.265	0.427	0.622	37.826

DESCRIPTION AND STATISTICAL PROPERTIES

OF SCALES - SPRING

SCORING THE GRADE 1 SPRING SCALES

The coding scheme used and the data analysis procedure for the repeated scales in Form 1-02 (Counting Members of a Given Set - Picture Cards, Counting Buttons, Ordering Pictured Sets, Conservation - Pictures, and Conservation - Dots) are exactly the same as that used for the 1-01 scales. Refer to pages 189 and 190 for this explanation.

Scale 329, Comprehension (Individual) from Form 1-02, the only new scale in that form, used a unique coding system which is explained with the description of the scale.

The actual scale score used in calculating the statistics in this report is the sum of correct responses for all items within the scale.

For all the scales from the group administered tests (Forms 1-03, 1-04, and 1-05), the items were scored as follows:

1	correct response
0	incorrect or multiple response
0	non-attempt

As with the individually administered scales, the scale score for all of the group administered scales is the sum of correct responses for all items within the scale.

The last 32 items in Form 1-05 (items 28-59) do not appear in any scale because statistical analysis indicated that they were too difficult for the students.

301 COUNTING MEMBERS OF A GIVEN SET - PICTURE CARDS (9 items; 1/2 of population; individually administered)

Cardinal counting is assessed in this scale by requiring the child to count the number of members in a set (pictures of familiar objects on a card). The pictures are arranged in symmetric patterns on some cards and asymmetric patterns on others. Another method of assessing cardinal counting is used for scale 302. Scale 301 is an extension of 324 and 325.

The items which make up this scale come from Form 1-02 which is reproduced elsewhere in this report. The item numbers and page references are listed below.

Items 1 - 9 Pages 57 - 62

SCALE STATISTICS:

NUMBER OF CASES	=	670
NUMBER OF ITEMS	=	9
MEAN TOTAL SCORE	=	6.828
STANDARD DEVIATION	=	2.341
CRONB CH'S ALPHA	=	0.818
ERROR OF MEASUREMENT	=	0.998

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. RIS	PERCENT NT
1	0.779	0.806	0.561	3.284
2	0.924	0.955	0.976	3.284
3	0.882	0.912	1.026	3.284
4	0.837	0.878	0.797	4.627
5	0.848	0.902	0.848	5.970
6	0.790	0.852	0.852	7.313
7	0.666	0.740	0.662	10.000
8	0.540	0.630	0.608	14.179
9	0.563	0.715	0.685	21.343

302 COUNTING BUTTONS (9 items; 1/4 of population; individually administered)

Cardinal counting is assessed in this scale by asking the child to count out a specified number of buttons from a larger set of buttons provided him. A different method of assessing cardinal counting is used in scale 301. Scale 302 is an extension of 326 and 327.

The items which make up this scale come from Form 1-02 which is reproduced elsewhere in this report. The item numbers and page references are listed below.

Items 10 - 18 Pages 63, 64

SCALE STATISTICS:

NUMBER OF CASES	=	365
NUMBER OF ITEMS	=	9
MEAN TOTAL SCORE	=	7.882
STANDARD DEVIATION	=	1.753
CRONBACH'S ALPHA	=	0.801
ERROR OF MEASUREMENT	=	0.782

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
10	0.978	0.992	1.252	1.370
11	0.945	0.958	1.292	1.370
12	0.948	0.961	1.138	1.370
13	0.929	0.944	0.854	1.644
14	0.901	0.919	1.059	1.918
15	0.879	0.909	0.850	3.288
16	0.901	0.945	1.104	4.658
17	0.759	0.803	0.665	5.479
18	0.641	0.688	0.542	6.849

303 ORDERING PICTURED SETS (INDIVIDUAL) (3 items; 1/4 of population; individually administered)

This scale is designed to measure ability to arrange sets of pictures in order of the set with the fewest members at one end and the set with the most members at the other end. It is the same as 139.

The items which make up this scale come from Form 1-02 which is reproduced elsewhere in this report. The item numbers and page references are listed below.

Items 19 - 21 Pages 65 - 71

SCALE STATISTICS:

NUMBER OF CASES	=	340
NUMBER OF ITEMS	=	3
MEAN TOTAL SCORE	=	2.141
STANDARD DEVIATION	=	1.224
CRONBACH'S ALPHA	=	0.887
ERROR OF MEASUREMENT	=	0.412

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
19	0.691	0.697	1.005	0.882
20	0.726	0.733	1.042	0.882
21	0.724	0.730	1.062	0.882

304 CONSERVATION COMPOSITE (12 items; 1/4 of population; individually administered)

This scale is a composite of 314 and 315: It is the same as 146.

The items which make up this scale come from Form 1-02 Z which is reproduced elswhere in this report. The item numbers and page references are listed below:

Items 22 - 33 Pages 73 - 80

SCALE STATISTICS:

NUMBER OF CASES	=	340
NUMBER OF ITEMS	=	12
MEAN TOTAL SCORE	=	10.144
STANDARD DEVIATION	=	2.437
CRONBACH'S ALPHA	=	0.822
ERROR OF MEASUREMENT	=	1.028

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
22	0.853	0.861	0.652	0.882
23	0.965	0.973	0.850	0.882
24	0.824	0.831	0.981	0.882
25	0.774	0.780	0.828	0.882
26	0.794	0.801	0.933	0.882
27	0.874	0.881	0.912	0.882
28	0.932	0.941	0.793	0.882
29	0.941	0.950	0.564	0.882
30	0.803	0.810	0.943	0.882
31	0.871	0.878	0.507	0.882
32	0.603	0.608	0.537	0.882
33	0.912	0.920	0.633	0.882

305 COMPREHENSION COMPOSITE (8 items; 4 individually administered and 4 group administered

This scale is a composite of 328 Comprehension (Group), and 329 Comprehension (Individual).

The items which make up this scale come from Forms 1-02 and 1-04 which are reproduced elsewhere in this report. The item numbers and page references are listed below.

Items 34 - 37 Pages 81 - 89
and
Items 3 - 5, 20 Pages 13, 140, 151

SCALE STATISTICS:

NUMBER OF CASES	=	1375
NUMBER OF ITEMS	=	8
MEAN TOTAL SCORE	=	3.711
STANDARD DEVIATION	=	1.887
CRONBACH'S ALPHA	=	0.569
ERROR OF MEASUREMENT	=	1.240

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
34	0.479	0.493	0.432	2.909
35	0.354	0.365	0.558	2.909
36	0.478	0.493	0.471	3.055
37	0.754	0.782	0.332	3.504
3	0.541	0.573	0.227	5.600
4	0.153	0.158	0.177	2.982
5	0.481	0.490	0.307	1.673
20	0.471	0.481	0.326	2.182

306 PLACE VALUE (8 items; group administered)

This scale is designed to measure the pupil's ability to interpret the meaning of symbols in the numeration system. The items are of three general types: identification of digits in the ones or tens place; identification of a numeral in terms of its numerical description; interpretation of a numeral in terms of a pictorial display and vice versa. This scale consists of five multiple choice items and three items requiring constructed responses. It is the same as 402 and is an extension of 331.

The items which make up this scale come from Form 1-03 which is reproduced elsewhere in this report. The item numbers and page references are listed below.

Items 8 - 15 Pages 107 - 113

SCALE STATISTICS:

NUMBER OF CASES	=	1375
NUMBER OF ITEMS	=	8
MEAN TOTAL SCORE	=	4.025
STANDARD DEVIATION	=	2.114
CRONBACH'S ALPHA	=	0.691
ERROR OF MEASUREMENT	=	1.175

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
8	0.299	0.306	0.276	2.473
9	0.633	0.685	0.326	7.491
10	0.354	0.398	0.681	10.900
11	0.729	0.750	0.535	2.691
12	0.776	0.804	0.533	3.491
13	0.393	0.456	0.399	13.673
14	0.436	0.459	0.581	4.945
15	0.404	0.427	0.649	5.527

307 NUMBER COMPARISON - ORDER (7 items; group administered)

The items in this scale are designed to assess the pupil's understanding of numerical order. The pupil is required to identify numerals or sets of dots which best illustrate the fundamental concepts of "largest," "fewer than," "between," "more than," "greatest," and "least." It is the same as 401, and is an extension of 330.

The items which make up this scale come from Form 1-03 which is reproduced elsewhere in this report. The item numbers and page references are listed below.

Items 1 - 7 - Pages 102 - 106

SCALE STATISTICS:

NUMBER OF CASES	=	1375
NUMBER OF ITEMS	=	7
MEAN TOTAL SCORE	=	4.885
STANDARD DEVIATION	=	1.692
CRONBACH'S ALPHA	=	0.609
ERROR OF MEASUREMENT	=	1.057

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
1	0.765	0.783	0.486	2.255
2	0.635	0.651	0.531	2.400
3	0.580	0.628	0.513	7.709
4	0.547	0.597	0.343	8.436
5	0.950	0.975	0.612	2.618
6	0.709	0.726	0.444	2.327
7	0.700	0.724	0.539	3.345

308 NUMBER LINE (5 items; group administered)

This scale is designed to test the pupil's ability to interpret a numerical system in terms of a geometric concept. Three of the items, each requiring constructed responses, deal with numerical order and the idea of correspondence, while the remaining two items (multiple choice) require a translation of addition in terms of actions performed on the number line. It is an extension of 332.

The items which make up this scale come from Form 1-05 which is reproduced elsewhere in this report. The item numbers and page references are listed below.

Items 1 - 5 Pages 160 - 163

SCALE STATISTICS:

NUMBER OF CASES	=	1375
NUMBER OF ITEMS	=	5
MEAN TOTAL SCORE	=	2.953
STANDARD DEVIATION	=	1.399
CRONBACH'S ALPHA	=	0.620
ERROR OF MEASUREMENT	=	0.862

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
1	0.846	0.867	0.821	2.400
2	0.841	0.865	0.807	2.836
3	0.367	0.374	0.430	2.109
4	0.503	0.516	0.354	2.545
5	0.397	0.419	0.350	5.236

309 APPLICATION (7 items; group administered)

This scale is composed of seven story problems which are designed to measure the pupil's ability to select and perform the relevant arithmetic operations. Six of the items involve either addition or subtraction, while the seventh deals with partitioning a set into two equivalent groups. The format for all the items in this scale is multiple choice. It is the same as 404 and is an extension of 333.

The items which make up this scale come from Form 1-04 which is reproduced elsewhere in this report. The item numbers and page references are listed below.

Items 6 - 12 Pages 141 - 144

SCALE STATISTICS:

NUMBER OF CASES	=	1375
NUMBER OF ITEMS	=	7
MEAN TOTAL SCORE	=	3.907
STANDARD DEVIATION	=	1.721
CRONBACH'S ALPHA	=	0.607
ERROR OF MEASUREMENT	=	1.079

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
6	0.812	0.825	0.488	1.600
7	0.669	0.684	0.475	2.109
8	0.876	0.890	0.429	1.527
9	0.400	0.414	0.435	3.273
10	0.468	0.479	0.437	2.255
11	0.337	0.345	0.518	2.400
12	0.345	0.352	0.267	2.182

310 RATIONALS (7 items; group administered)

The items in this scale are designed to measure the pupil's rudimentary concepts of rational numbers. In general, pupils are required to associate a fraction with its corresponding pictorial representation. Only one of the items requires a constructed response; the others are in multiple choice format. This scale is an extension of 334.

The items which make up this scale come from Form 1-04 which is reproduced elsewhere in this report. The item numbers and page references are listed below.

Items 13 - 19 Pages 145 - 150

SCALE STATISTICS:

NUMBER OF CASES	=	1375
NUMBER OF ITEMS	=	7
MEAN TOTAL SCORE	=	2.767
STANDARD DEVIATION	=	1.344
CRONBACH'S ALPHA	=	0.151
ERROR OF MEASUREMENT	=	1.238

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	R.S. BIS	PERCENT NT
13	0.615	0.639	0.084	3.709
14	0.331	0.340	0.058	2.691
15	0.364	0.374	0.049	2.691
16	0.543	0.559	0.024	2.764
17	0.298	0.306	0.192	2.545
18	0.293	0.303	0.019	3.418
19	0.322	0.335	0.105	3.855

311 COMPUTATION - ADDITION (10 items; group administered)

This scale is designed to assess the pupil's primary knowledge of addition facts. The first eight items are basic (1-digit) combinations requiring only simple recall or the process of counting. The last two items, addition of two 2-digit numbers with no regrouping, require knowledge of the addition algorithm. With the exception of one of the 2-digit items, all problems are presented in sentence format, e.g., 3 + 5 = ☐ ; and each item requires a constructed response. The scale is the same as 405 and is an extension of 335.

The items which make up this scale come from Form 1-05 which is reproduced elsewhere in this report. The item numbers and page references are listed below.

Items 6 - 15 Pages 164 - 166

SCALE STATISTICS:

NUMBER OF CASES	=	1375
NUMBER OF ITEMS	=	10
MEAN TOTAL SCORE	=	6.430
STANDARD DEVIATION	=	2.759
CRONBACH'S ALPHA	=	0.868
ERROR OF MEASUREMENT	=	1.003

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
6	0.852	0.883	0.372	3.491
7	0.868	0.902	1.028	3.855
8	0.801	0.841	0.302	4.727
9	0.801	0.843	0.377	5.018
10	0.821	0.855	0.968	3.927
11	0.697	0.742	0.887	5.964
12	0.699	0.747	0.905	6.475
13	0.537	0.589	0.734	8.800
14	0.203	0.302	0.518	32.727
15	0.151	0.332	0.470	54.691

312 COMPUTATION - SUBTRACTION (10 items; group administered)

The first eight items of this scale are inverses of basic (1-digit) addition combinations. The remaining two items, subtracting one 2-digit number from another without regrouping, require knowledge of the subtraction algorithm. With the exception of one of the 2-digit items, all problems are presented in sentence form, e.g., 7 - 5 = □ . Each of the ten items requires a constructed response. This scale is an extension of 336.

The items which make up this scale come from Form 1-05 which is reproduced elsewhere in this report. The item numbers and page references are listed below.

Items 16 - 25 Pages 167 - 169

SCALE STATISTICS:

NUMBER OF CASES	=	1375
NUMBER OF ITEMS	=	10
MEAN TOTAL SCORE	=	4.259
STANDARD DEVIATION	=	3.207
CRONBACH'S ALPHA	=	0.892
ERROR OF MEASUREMENT	=	1.050

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	B.S. BIS	PERCENT NT
16	0.607	0.647	0.949	6.109
17	0.545	0.597	0.961	8.727
18	0.591	0.660	0.878	10.545
19	0.529	0.608	1.004	12.945
20	0.704	0.793	0.681	11.273
21	0.471	0.566	0.964	19.564
22	0.353	0.466	0.836	24.073
23	0.263	0.384	0.753	31.709
24	0.127	0.220	0.658	42.545
25	0.069	0.203	0.627	65.564

313 COMPUTATION - MULTIPLICATION (2 items; group administered)

The two items in this scale (2 × 3, 3 × 4) were included in order to determine whether pupils had basic knowledge of multiplication as an operation. Both items are presented in sentence form and require constructed responses. The scale is the same as 520.

The items which make up this scale come from Form 1-05 which is reproduced elsewhere in this report. The item numbers and page references are listed below.

Items 26, 27 Page 170

SCALE STATISTICS:

NUMBER OF CASES	=	1375
NUMBER OF ITEMS	=	2
MEAN TOTAL SCORE	=	0.263
STAND ARD DEVIATION	=	0.617
CRONBACH'S ALPHA	=	0.803
ERROR OF MEASUREMENT	=	0.274

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	R.S. BIS	PERCENT NT
26	0.155	0.224	1.031	30.836
27	0.108	0.161	1.134	32.727

314 CONSERVATION - PICTURES (6 items; 1/4 of population; individually administered)

This scale measures the child's ability to recognize equalities and inequalities between two sets. To achieve correct answers, the child must disregard spatial arrangement which sometimes conflicts perceptually with number and to utilize number only. The task required of the child in this conservation-like scale is to determine in which of two rows on a card there are more pictures, or whether there is the same number in both rows. The test was modeled after one devised by Herbert Zimiles. (See "The Development of Conservation and Differentiation of Number" by Herbert Zimiles in Monographs of the Society for Research in Child Development, 1966, 31, No. 6, Serial No. 108.) Scale 314 is similar to 315 except that pictures are used here instead of dots. It is the same as 141 and is part of the composite scale 304.

The items which make up this scale come from Form 1-02 which is reproduced elsewhere in this report. The item numbers and page references are listed below.

Items 22 - 27 Pages 73 - 76

SCALE STATISTICS:

NUMBER OF CASES	=	340
NUMBER OF ITEMS	=	6
MEAN TOTAL SCORE	=	5.082
STANDARD DEVIATION	=	1.463
CRONBACH'S ALPHA	=	0.777
ERROR OF MEASUREMENT	=	0.690

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
22	0.853	0.861	0.633	0.882
23	0.965	0.973	0.659	0.882
24	0.824	0.831	0.906	0.882
25	0.774	0.780	0.820	0.882
26	0.794	0.801	0.987	0.882
27	0.874	0.881	0.895	0.882

315 CONSERVATION - DOTS (6 items; 1/4 of population; individually administered)

As in scale 314, this scale is designed to measure ability to recognize equalities and inequalities of sets when conflicting perceptual cues are present. It includes, however, a measure of the child's ability to disregard size as well as spatial arrangement and to utilize number only. In this scale, dots rather than flags and shields are used as test materials. It is the same as 142 and forms part of the composite scale 304.

The items which make up this scale come from Form 1-02 which is reproduced elsewhere in this report. The item numbers and page references are listed below.

Items 28 - 33 Pages 77 - 80

SCALE STATISTICS:

NUMBER OF CASES	=	340
NUMBER OF ITEMS	=	6
MEAN TOTAL SCORE	=	5.062
STANDARD DEVIATION	=	1.188
CRONBACH'S ALPHA	=	0.597
ERROR OF MEASUREMENT	=	0.754

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
28	0.932	0.941	0.623	0.882
29	0.941	0.950	0.508	0.882
30	0.803	0.810	0.622	0.882
31	0.871	0.878	0.444	0.882
32	0.603	0.608	0.465	0.882
33	0.912	0.920	0.712	0.882

317 RESPONSE TO VERBAL DIRECTIONS (1 item)

This scale is a tester rating based on the child's compliance or attempted compliance with the directions given by the tester. This scale is the same as 022, 143, and 212.

TESTER'S SCORING GRID:

Item No.		
38	(a) No compliance. Did not do what was asked.	☐
	(b) Little compliance: Did not do what was asked in most instances unless controls used.	☐
	(c) Some compliance. Did (or tried to do) what was asked in some tasks.	☐
	(d) Full compliance. Did exactly (or tried to do) what was asked on each task.	☐

TESTER RATING	PERCENT	SAMPLE SIZE
Little compliance	0.4	1375
Some compliance	9.2	
Full compliance	89.0	
No rating	1.4	

318 ATTENTION TO TASKS (1 item)

This scale is a tester rating based on the child's attentiveness to the tasks presented in the test. This scale is the same as 023, 144, and 213.

TESTER'S SCORING GRID:

Item No.		
39	(a) Attended well to all tasks.	☐
	(b) Attended well to some tasks but not to all.	☐
	(c) Attention wandered periodically.	☐
	(d) Inattentive unless continually directed.	☐

TESTER RATING	PERCENT	SAMPLE SIZE
Attended well to all tasks	77.7	1375
Attended well to some tasks	16.0	
Attention wandered periodically	4.7	
Inattentive	0.2	
No rating	1.4	

321 IDENTIFYING TRIANGLES (6 items; group administered)

This scale includes only those figures which are triangles in a display of 26 simple closed symmetric curves, including polygons, circles, ellipses and figures containing both straight and curved lines. It is designed to determine whether pupils can identify those distinctive features which distinguish triangles from other simple closed curves. The scale is the same as 523.

The items which make up this scale come from Form 1-03 which is reproduced elsewhere in this report. The item numbers and page references are listed below.

Items 17, 22, 23, 29, 34, 38 Page 114

SCALE STATISTICS:

NUMBER OF CASES	=	1375
NUMBER OF ITEMS	=	6
MEAN TOTAL SCORE	=	4.443
STANDARD DEVIATION	=	1.979
CRONBACH'S ALPHA	=	0.860
ERROR OF MEASUREMENT	=	0.741

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
17	0.872	0.889	0.859	1.891
22	0.781	0.796	0.939	1.891
23	0.808	0.824	0.876	1.891
29	0.665	0.678	0.804	1.891
34	0.668	0.681	0.846	1.891
38	0.649	0.661	0.887	1.891

322 IDENTIFYING RECTANGLES (4 items; group administered)

This scale includes only those figures which are rectangles in a display of 26 simple closed symmetric curves, including polygons, circles, ellipses and figures containing both straight and curved lines. It is designed to determine whether pupils can identify those distinctive features which distinguish rectangles from other simple closed curves, and whether squares are included in their concept of rectangles.

The items which make up this scale come from Form 1-03 which is reproduced elsewhere in this report. The item numbers and page references are listed below.

Items 45, 50, 59, 62 Page 115

SCALE STATISTICS:

NUMBER OF CASES	=	1375
NUMBER OF ITEMS	=	4
MEAN TOTAL SCORE	=	2.328
STANDARD DEVIATION	=	1.558
CRONBACH'S ALPHA	=	0.809
ERROR OF MEASUREMENT	=	0.681

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
45	0.645	0.658	1.032	1.891
50	0.623	0.635	1.005	1.891
59	0.591	0.602	0.931	1.891
62	0.469	0.478	0.523	1.891

323 CURVED FIGURES (5 items; group administered)

This scale is extracted from the same display of 26 geometric figures as scales 321 and 322. It consists of five simple closed figures having both straight and curved lines, but otherwise having the general configuration of either a triangle or rectangle. Scores are determined by pupils not identifying one of these aberrant figures as either triangles or rectangles.

The items which make up this scale come from Form 1-03 which is reproduced elsewhere in this report. The item numbers and page references are listed below.

Items 27, 52, 54, 58, 67 Pages 114, 115

SCALE STATISTICS:

NUMBER OF CASES	=	1375
NUMBER OF ITEMS	=	5
MEAN TOTAL SCORE	=	3.453
STANDARD DEVIATION	=	1.497
CRONBACH'S ALPHA	=	0.737
ERROR OF MEASUREMENT	=	0.768

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
27	0.434	0.443	0.452	1.891
52	0.747	0.761	0.839	1.891
54	0.568	0.579	0.751	1.891
58	0.931	0.949	0.651	1.891
67	0.773	0.788	0.892	1.891

Grade 1
Spring

Form 1-02W,Y
Scale 324

324 COUNTING MEMBERS OF A GIVEN SET - PICTURE CARDS S-1 (6 items; 1/2 of population; individually administered)

This scale includes selected items from scale 301. These items are 1 through 6. It is the same as 026, 151, and 216.

SCALE STATISTICS:

NUMBER OF CASES	=	670
NUMBER OF ITEMS	=	6
MEAN-TOTAL SCORE	=	5.060
STANDARD DEVIATION	=	1.496
CRONBACH'S ALPHA	=	0.783
ERROR OF MEASUREMENT	=	0.697

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
1	0.779	0.806	0.529	3.284
2	0.924	0.955	1.059	3.284
3	0.882	0.912	1.048	3.284
4	0.837	0.878	0.807	4.627
5	0.848	0.902	0.861	5.970
6	0.790	0.852	0.812	7.313

Grade 1
Spring

Form 1-02W,Y
Scale 325

325 COUNTING MEMBERS OF A GIVEN SET - PICTURE CARDS S-2 (8 items; 1/2 of population; individually administered)

This scale includes selected items from scale 301. These items are 1 through 8. It is the same as 152 and 217 and is an extension of 324.

SCALE STATISTICS:

NUMBER OF CASES	=	670
NUMBER OF ITEMS	=	8
MEAN TOTAL SCORE	=	6.266
STANDARD DEVIATION	=	2.034
CRONBACH'S ALPHA	=	0.798
ERROR OF MEASUREMENT	=	0.914

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
1	0.779	0.806	0.536	3.284
2	0.924	0.955	1.001	3.284
3	0.882	0.912	1.043	3.284
4	0.837	0.878	0.784	4.627
5	0.848	0.902	0.864	5.970
6	0.790	0.852	0.845	7.313
7	0.666	0.740	0.653	10.000
8	0.540	0.630	0.555	14.179

326- COUNTING BUTTONS S-1 (5 items; 1/4 of population; individually administered)

This scale includes selected items from scale 302. These items are 10 through 14. It is the same as 027 and 153.

SCALE STATISTICS:

NUMBER OF CASES	=	365
NUMBER OF ITEMS	=	5
MEAN TOTAL SCORE	=	4.701
STANDARD DEVIATION	=	0.845
CRONBACH'S ALPHA	=	0.764
ERROR OF MEASUREMENT	=	0.411

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
10	0.978	0.992	1.507	1.370
11	0.945	0.958	1.266	1.370
12	0.948	0.961	1.191	1.370
13	0.929	0.944	0.872	1.644
14	0.901	0.919	0.984	1.918

327 COUNTING BUTTONS S-2 (7 items; 1/4 of population; individually administered)

This scale includes selected items from scale 302. These items are 10 through 16. It is the same as 154 and is an extension of 326.

SCALE STATISTICS:

NUMBER OF CASES	=	365
NUMBER OF ITEMS	=	7
MEAN TOTAL SCORE	=	6.482
STANDARD DEVIATION	=	1.260
CRONBACH'S ALPHA	=	0.819
ERROR OF MEASUREMENT	=	0.536

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
10	0.978	0.992	1.423	1.370
11	0.945	0.958	1.368	1.370
12	0.948	0.961	1.251	1.370
13	0.929	0.944	0.870	1.644
14	0.901	0.919	1.079	1.918
15	0.879	0.909	0.860	3.288
16	0.901	0.945	1.097	4.658

Grade 1
Spring

Form 1-04
Scale 328

328 COMPREHENSION (GROUP) (4 items; group administered)

This scale is designed to measure the pupil's understanding of several basic mathematical concepts. The items were administered in booklet form (multiple choice format) to small groups of children. Each of these items is constructed to test a different concept: the commutative property of addition; a definition of fractions; an interpretation of subtraction in terms of set partitioning, and multiplication in terms of arrays. The scale is the same as 403; it forms part of composite scale 305.

The items which make up this scale come from Form 1-04 which is reproduced elsewhere in this report. The item numbers and page references are listed below.

Items 3-5, 20 Pages 139, 140, 151

SCALE STATISTICS:

NUMBER OF CASES	=	1375
NUMBER OF ITEMS	=	4
MEAN TOTAL SCORE	=	1.647
STANDARD DEVIATION	=	1.079
CRONBACH'S ALPHA	=	0.330
ERROR OF MEASUREMENT	=	0.884

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
3	0.541	0.573	0.181	5.600
4	0.153	0.158	0.199	2.982
5	0.481	0.490	0.254	1.673
20	0.471	0.481	0.269	2.182

329 COMPREHENSION (INDIVIDUAL) (4 items; individually administered)

This scale is designed to measure the pupil's understanding of the fundamental operations of addition and subtraction. The child is required to interpret symbolic expressions (mathematical sentences) in terms of manipulating concrete objects and vice versa. This scale forms part of composite scale 305.

The coding scheme used for this scale is as follows:

correct strategies

partially relevant sets or strategies

irrelevant strategies

graphic representation of sentence

no attempt

The scale score to be used in this report will be the sum of correct responses for all the items in the scale. The specific responses for each item which were considered "correct strategies" are described below.

Item 34:

Child counts out 4 blocks, adds 3 more, forming a set of 7 blocks.

Child forms two separate sets of 4 blocks and 3 blocks, then pushes them together to form a set of 7 blocks.

Child forms two separate sets of 4 blocks and 3 blocks, but does not push them together.

Item 35:

Child counts out 9 blocks, removes 4.

Child forms two sets, a set of 4 and a set of 5; he removes the set of 4.

Item 36:

Child points to sentence: $5 + 3 = 8$

Item 37:

Child points to sentence: $9 - 3 = 6$

328 COMPREHENSION (INDIVIDUAL) (continued)

The items which make up this scale come from Form 1-02 which is reproduced elsewhere in this report. The item numbers and page references are listed below.

Items 34 - 37 Pages 81 - 91

SCALE STATISTICS:

NUMBER OF CASES	=	1375
NUMBER OF ITEMS	=	4
MEAN TOTAL SCORE	=	2.065
STANDARD DEVIATION	=	1.280
CRONBACH'S ALPHA	=	0.598
ERROR OF MEASUREMENT	=	0.810

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	W.S. BIS	PERCENT NT
34	0.479	0.493	0.506	2.303
35	0.354	0.365	0.590	2.303
36	0.476	0.493	0.480	3.055
37	0.754	0.782	0.371	3.564

330 NUMBER COMPARISON – ORDER S-1 (3 items; group administered)

This scale includes selected items from scale 307. These items are 2, 4, and 7. It is the same as 406, 513 and 607, and is an extension of 337.

SCALE STATISTICS:

NUMBER OF CASES	=	1375
NUMBER OF ITEMS	=	3
MEAN TOTAL SCORE	=	1.881
STANDARD DEVIATION	=	1.024
CRONBACH'S ALPHA	=	0.513
ERROR OF MEASUREMENT	=	0.714

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	R.S. BIS	PERCENT NT
2	0.635	0.651	0.530	2.473
4	0.547	0.598	0.285	8.509
7	0.700	0.724	0.433	3.418

331 PLACE VALUE S (4 items; group administered)

This scale includes selected items from scale 306. These items are 8, 10, 14, and 15. It is the same as 407, 514, and 605.

SCALE STATISTICS:

NUMBER OF CASES	=	1375
NUMBER OF ITEMS	=	4
MEAN TOTAL SCORE	=	1.493
STANDARD DEVIATION	=	1.321
CRONBACH'S ALPHA	=	0.626
ERROR OF MEASUREMENT	=	0.807

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. B+S	PERCENT NT
8	0.299	0.307	0.272	2.545
10	0.354	0.398	0.666	10.982
14	0.436	0.459	0.544	5.018
15	0.404	0.428	0.614	5.600

332 NUMBER LINE S (3 items; group administered)

This scale includes selected items from scale 308. These items are 1 through 3. It is the same as 515.

SCALE STATISTICS:

NUMBER OF CASES	=	1375
NUMBER OF ITEMS	=	3
MEAN TOTAL SCORE	=	2.053
STANDARD DEVIATION	=	0.954
CRONBACH'S ALPHA	=	0.682
ERROR OF MEASUREMENT	=	0.538

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
1	0.846	0.867	0.975	2.473
2	0.841	0.866	0.956	2.909
3	0.367	0.375	0.376	2.182

333 APPLICATION S-1 (4 items; group administered)

This scale includes selected items from scale 309. These items are 9 through 12. It is the same as 408, 516 and 606, and is an extension of 338.

SCALE STATISTICS:

NUMBER OF CASES	=	1375
NUMBER OF ITEMS	=	4
MEAN TOTAL SCORE	=	1.550
STANDARD DEVIATION	=	1.232
CRONBACH'S ALPHA	=	0.509
ERROR OF MEASUREMENT	=	0.863

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
9	0.400	0.414	0.389	3.345
10	0.468	0.480	0.375	2.327
11	0.337	0.345	0.495	2.473
12	0.345	0.353	0.281	2.255

334 RATIONALS S (7 items; group administered)

This scale includes selected items from scale 310. These items are 13 through 19. It is the same as 517.

SCALE STATISTICS:

NUMBER OF CASES	=	1375
NUMBER OF ITEMS	=	7
MEAN TOTAL SCORE	=	2.767
STANDARD DEVIATION	=	1.344
CRONBACH'S ALPHA	=	0.151
ERROR OF MEASUREMENT	=	1.238

ITEM STATISTICS:

ITEM	R'S	ADJ. R'S	N.S. BIS	PERCENT NT
13	0.615	0.639	0.084	3.709
14	0.331	0.340	0.058	2.691
15	0.364	0.374	0.049	2.691
16	0.543	0.559	0.024	2.764
17	0.298	0.306	0.192	2.545
18	0.293	0.303	0.019	3.418
19	0.322	0.335	0.105	3.855

335 COMPUTATION – ADDITION S-1 (4 items; group administered)

This scale includes selected items from scale 311. These items are 12 through 15. It is the same as 409 and 518, and is an extension of 339.

SCALE STATISTICS:

NUMBER OF CASES	=	1375
NUMBER OF ITEMS	=	4
MEAN TOTAL SCORE	=	1.589
STANDARD DEVIATION	=	1.233
CRONBACH'S ALPHA	=	0.677
ERROR OF MEASUREMENT	=	0.701

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
12	0.699	0.747	0.633	6.473
13	0.537	0.589	0.674	8.800
14	0.203	0.302	0.646	32.727
15	0.151	0.332	0.580	54.691

336 COMPUTATION - SUBTRACTION S-1. (6 items; group administered)

This scale includes selected items from scale 312. These items are 20 through 25. It is the same as 509 and 608, and is an extension of 340.

SCALE STATISTICS:

NUMBER OF CASES	=	1375
NUMBER OF ITEMS	=	6
MEAN TOTAL SCORE	=	1.987
STANDARD DEVIATION	=	1.726
CRONBACH'S ALPHA	=	0.775
ERROR OF MEASUREMENT	=	0.818

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
20	0.704	0.793	0.595	11.273
21	0.471	0.586	0.824	19.564
22	0.353	0.466	0.846	24.073
23	0.263	0.384	0.800	31.709
24	0.127	0.220	0.699	42.545
25	0.069	0.203	0.685	65.964

337 NUMBER COMPARISON - ORDER S-2 (2 items; group administered)

This scale includes items from 307. These items are 4 and 7. Scale 337 is the same as 410, 526, 609, and 711.

SCALE STATISTICS:

NUMBER OF CASES	=	1375
NUMBER OF ITEMS	=	2
MEAN TOTAL SCORE	=	1.247
STANDARD DEVIATION	=	0.733
CRONBACH'S ALPHA	=	0.297
ERROR OF MEASUREMENT	=	0.615

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
4	0.547	0.598	0.220	8.509
7	0.700	0.724	0.230	3.418

338 APPLICATION S-2 (3 items; group administered)

This scale includes items from 309. These items are 9, 11, and 12. Scale 338 is the same as 411, 528, 611, and 714.

SCALE STATISTICS:

NUMBER OF CASES	=	1375
NUMBER OF ITEMS	=	3
MEAN TOTAL SCORE	=	1.081
STANDARD DEVIATION	=	0.987
CRONBACH'S ALPHA	=	0.438
ERROR OF MEASUREMENT	=	0.740

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
9	0.400	0.414	0.329	3.345
11	0.337	0.345	0.430	2.473
12	0.345	0.353	0.271	2.255

339 COMPUTATION - ADDITION S-2 (1 item; group administered)

This scale consists of item 15 from 311. Scale 339 is the same as 412, 530, and 717.

RESPONSE	PERCENT	SAMPLE SIZE
correct	15.1	1375
incorrect	30.2	
no attempt	54.7	

340 COMPUTATION - SUBTRACTION S-2 (4 items; group administered)

This scale includes items from 312. These items are 20, 22, 23, and 24. Scale 340 is the same as 532, 613, and 719.

SCALE STATISTICS:

NUMBER OF CASES	=	1375
NUMBER OF ITEMS	=	4
MEAN TOTAL SCORE	=	1.447
STANDARD DEVIATION	=	1.243
CRONBACH'S ALPHA	=	0.694
ERROR OF MEASUREMENT	=	0.688

ITEM STATISTICS:

ITEM	P'S	ADJ. P'S	N.S. BIS	PERCENT NT
20	0.704	0.793	0.514	11.273
22	0.353	0.466	0.767	24.073
23	0.263	0.384	0.778	31.709
24	0.127	0.220	0.598	42.545

APPENDICES

APPENDIX A

THE COLOURED PROGRESSIVE MATRICES

Sets A, Ab, B

The Coloured Progressive Matrices, Sets A, Ab, and B, are designed to assess mental development for children ages 5 through 11 or up to the stage when a person is sufficiently able to reason by analogy to adopt this way of thinking as a consistent method of inference. A minimum amount of verbal instruction is given and items have been arranged in order of difficulty so that subjects can learn about the nature of the test while doing the items. Each item consists of a design from which a part has been removed and a number of possible inserts from which to choose the piece that fits the pattern. The child is asked to choose the missing piece, from six alternative pieces, which would correctly complete the pattern.

The tests were administered only to students in one test center (3/4 of the ELMA population). They were administered by ELMA testers to each child individually during late winter of first grade.

M201 RAVEN - SET A (12 items)

This scale is the total number of correct responses on The Coloured Progressive Matrices, Set A. The test is designed to measure ability to complete a simple, continuous pattern and to complete a pattern showing progressive changes in one direction and in two directions. Scores for this scale are available for only one test center (3/4 of the ELMA population).

SCALE STATISTICS:

NUMBER OF CASES	=	776
TOTAL MEAN SCORE	=	7.481
STANDARD DEVIATION	=	1.473

M202 RAVEN - SET Ab (12 items)

This scale is the total number of correct responses on The Coloured Progressive Matrices, Set Ab. The test is designed to measure abilities to complete a set of discrete figures which form a repetitive pattern and to complete a set of discrete figures in which three figures are related as a whole pattern to be completed by a fourth figure. Scores for this scale are available for only one test center (3/4 of the ELMA population).

SCALE STATISTICS:

NUMBER OF CASES	=	776
TOTAL MEAN SCORE	=	4.933
STANDARD DEVIATION	=	2.119

M203 RAVEN - SET B (12 items)

This scale is the total number of correct responses on The Coloured Progressive Matrices, Set B. The test is designed to measure abilities to complete a set of discrete figures which form a repetitive pattern, to complete a set of discrete figures in which three figures are related as a whole pattern to be completed by a fourth figure, and to complete a set of discrete figures to form a pattern of analogous changes using both coherent and abstract reasoning. Scores for this scale are available for only one test center (3/4 of the ELMA population).

SCALE STATISTICS:

NUMBER OF CASES	=	776
TOTAL MEAN SCORE	=	3.943
STANDARD DEVIATION	=	1.765

M204 RAVEN - TOTAL SCORE (36 items)

This scale is the total number of correct responses for scales M201 - M203. Scores for this scale are available for only one test center (3/4 of the ELMA population).

SCALE STATISTICS:

NUMBER OF CASES	=	776
TOTAL MEAN SCORE	=	16.358
STANDARD DEVIATION	=	4.358

APPENDIX B

KUHLMANN-ANDERSON TEST

Seventh Edition, Booklet B

by Rose G. Anderson

The Kuhlmann-Anderson Test is a measure of academic potential. Booklet B (Seventh Edition) is designed for use in Grade 2; it contains eight subtests which are individually timed. No reading is required; all directions are read to the child and all items are non-reading. A total test score is obtained by adding the scores for the subtests.

The Kuhlmann-Anderson Test, Booklet B was administered by only one of the test centers (84 percent of the ELMA population) in October, 1968 (Grade 2.-fall). The test was given by classroom teachers in a group situation. The test center reported the I.Q.'s and chronological age for ELMA students, but not the raw score.

M324 KUHLMANN-ANDERSON I.Q.

This is the intelligence quotient obtained from tables in the manual for the Kuhlmann-Anderson Test, Booklet B by using the student's raw score and chronological age at the time of testing. Scores for this scale are available for only one test center (84 percent of the ELMA population).

SCALE STATISTICS:

NUMBER OF CASES	=	1042
TOTAL MEAN SCORE	=	107.340
STANDARD DEVIATION	=	14.555

APPENDIX C

STANFORD ACHIEVEMENT TEST

PRIMARY I BATTERY

FORM W

by Truman L Kelley
Richard Madden
Eric F. Gardner
Herbert C. Rudman

The Stanford Achievement Test, Primary I Battery, Form W is one of a series of tests intended to provide dependable measures of the important knowledges, skills, and understandings commonly accepted as desirable outcomes of the major branches of the elementary curriculum. The Primary I Battery is designed for use from the middle of Grade 1 to the middle of Grade 2 and includes six subtests.

Two subtests, Word Reading and Paragraph Meaning, were administered to the ELMA population by the school districts as part of a state-required testing program. The tests were administered by classroom teachers in a group situation in both centers in May, 1968 (spring of Grade 1). Both test centers provided grade score data for students participating in ELMA, and the center having the largest proportion of the sample also sent raw scores. Raw scores are converted to grade scores from tables printed in the test booklets. The grade score indicates the median score made by pupils in the norming sample at a specified grade placement.

A201 WORD READING: NUMBER RIGHT (35 items)

This scale is the total number of correct responses on the Stanford Achievement Primary I Battery, Form W, Word Reading Test. The test is graduated in difficulty and requires the child to look at a picture and then select from a group of four words the word which stands for the picture. This subtest is timed (15 minutes) and the child is to work alone after being given directions. Scores for this scale are available for only one test center (3/4 of the ELMA population).

SCALE STATISTICS:

NUMBER OF CASES	=	1442
TOTAL MEAN SCORE	=	19.265
STANDARD DEVIATION	=	7.918

A202 WORD READING: GRADE SCORE

This scale is derived from A201.

SCALE STATISTICS:

NUMBER OF CASES	=	1441
TOTAL MEAN SCORE	=	18.049
STANDARD DEVIATION	=	5.652

A205 PARAGRAPH MEANING: NUMBER RIGHT (38 items)

This scale is the total number of correct responses on the Stanford Achievement Primary I Battery, Form W, Paragraph Meaning Test. The test is graduated in difficulty and consists of a series of paragraphs from each of which one or more words have been omitted. The child is to select the proper word for each omission from four choices that are afforded him. This subtest is timed (25 minutes) and the child is to work alone after being given directions. Scores for this scale are available for only one test center (3/4 of the ELMA population).

SCALE STATISTICS:

NUMBER OF CASES	=	1439
TOTAL MEAN SCORE	=	18.178
STANDARD DEVIATION	=	9.698

A206 PARAGRAPH MEANING: GRADE SCORE

This scale is derived from A205.

SCALE STATISTICS:

NUMBER OF CASES	=	1430
TOTAL MEAN SCORE	=	18.322
STANDARD DEVIATION	=	6.004

A209 TOTAL READING: NUMBER RIGHT (73 items)

This is obtained by adding the raw scores on the Word Reading and the Paragraph Meaning tests. Scores for this scale are available for only one test center (3/4 of the ELMA population).

SCALE STATISTICS:

NUMBER OF CASES	=	1441
TOTAL MEAN SCORE	=	37.423
STANDARD DEVIATION	=	16.956

A210 TOTAL READING: GRADE SCORE

This is obtained by adding the raw scores on the Word Reading and the Paragraph Meaning tests and then using a conversion table provided by the publisher to determine the Total Reading Grade Score.

SCALE STATISTICS:

NUMBER OF CASES	=	1438
TOTAL MEAN SCORE	=	18.234
STANDARD DEVIATION	=	5.398

A214 VOCABULARY: NUMBER RIGHT

This is an optional test. It was administered to a very small proportion of the ELMA population and, therefore, is not utilized in any analyses.

A215 VOCABULARY: GRADE SCORE

See A214

APPENDIX D

Formulas for Item and Scale Statistics

The formulas for the statistics presented for each ELMA scale will be shown. The statistics were obtained from the SMSG Item Analysis Program[1]. This program handles only dichotomous items.

Let X_{ij} be the score for case j on item i.

The items were scored so that

$$X_{ij} = \begin{cases} 1, & \text{if case } j \text{ responds correctly to item } i \\ 0, & \text{otherwise.} \end{cases}$$

Let

n = total number of cases

n_i = the number who attempted item i

k = total number of items on the scale.

The Item Mean, P, is

$$\bar{X}_i = \frac{1}{n} \sum_{j=1}^{n} X_{ij}$$

and the Adjusted Item Mean, ADJ. P, is

$$\hat{\bar{X}}_i = \frac{1}{n_i} \sum_{j=1}^{n} X_{ij}$$

$$\text{PERCENT NT} = \frac{n - n_i}{n}$$

The non-spurious Biserial Correlation coefficient, N.S. BIS, is

$$r = \frac{r_{bis}\,\sigma - \frac{pq}{z}}{\sqrt{\sigma^2 + pq - 2r_{bis}\,\sigma z}},$$

[1] For a description of the computer program for the IBM 360/67, see the unpublished SMSG paper "Item Analysis Program" by W. E. Geeslin and Ed Cruz.

where

$p = \bar{X}_i$ = proportion of cases getting item correct

$q = 1 - \bar{X}_i$ = proportion of cases getting item incorrect

Z = ordinate for unit normal curve at point where proportion of cases cut off is p

Y_{ij} = the total scale score with item i removed for case j

σ = the standard deviation of the Y_{ij}'s

d = difference in mean score of the Y_{ij}'s for those cases with item i correct and those cases with item i incorrect

$$r_{bis} = \frac{pq}{Z}\left(\frac{d}{\sigma}\right) .$$

The scale score for case j is

$$S_j = \sum_{i=1}^{k} X_{ij} .$$

The scale MEAN TOTAL SCORE is

$$\bar{S} = \frac{1}{n}\sum_{j=1}^{n} S_j = \sum_{i=1}^{k} \bar{X}_i .$$

The total scale variance is

$$V_t = \frac{1}{n}\sum_{j=1}^{n} S_j^2 - \bar{S}^2 .$$

The total scale STANDARD DEVIATION is

$$S_t = \sqrt{V_t} .$$

The item variance for item i is

$$V_i = \frac{\Sigma X_i^2 - \frac{(\Sigma X_i)^2}{n}}{n} .$$

CRONBACH'S ALPHA (reliability) is

$$\alpha = \frac{k}{k-1}\left(1 - \frac{\sum_{i=1}^{k} V_i}{V_t}\right).$$

The standard ERROR OF MEASUREMENT is

$$S_e = \sqrt{V_t - \alpha V_t}$$

$$= S_t \sqrt{1 - \alpha}$$

ELMA REPORTS

No. 1. A Longitudinal Study of Mathematical Achievement in the Primary School Years: Description of Design, Sample, and Factor Analyses of Tests.

No. 2. A Longitudinal Study of Mathematical Achievement in the Primary School Years: Curriculum and Socio-Economic Comparisons and Predictions from Previous Achievement.

Single copies available from the School Mathematics Study Group, Cedar Hall, Stanford University, Stanford, Calif. 94305

ELMA TECHNICAL REPORTS

No. 1. Kindergarten Test Batteries, Description and Statistical Properties of Scales.

No. 2. Grade 1 Test Batteries, Description and Statistical Properties of Scales.

No. 3. Grade 2 Test Batteries, Description and Statistcial Properties of Scales.

No. 4. Grade 3 Test Batteries, Description and Statistical Properties of Scales.

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