THE DEVELOPMENT AND VALIDATION OF AN INSTRUMENT DESIGNED TO MEASURE A PRE-SCHOOL CHILDS ABILITY TO DISCERN RELATIONSHIPS IN SEVERAL PERCEPTUAL ARRAYS

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THE DEVELOPMENT AND VALIDATION OF AN INSTRUMENT DESIGNED TO MEASURE A PRE-SCHOOL CHILD'S ABILITY TO DISCERN RELATIONSHIPS IN SEVERAL PERCEPTUAL ARRAYS

by

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ABSTRACT

The purpose of this study was to determine the applicability of an instrument used to distinguish various levels of proficiency in concept formation of children at the pre-school level. This instrument as designed permits a child to distinguish a relationship in a given group of perceptual arrays and then to verbalize it. By this means the abstract notion of "conceptualizing" can be turned into an objective task.

The methodological constructs of the instrument were based on the conceptual process theories of Bolton, Bruner, Piaget, Polanyi, Rommetveit, Rommetveit and Kvale, and Taba. Without exception, all of these theorists hold that the ability to discern relationships in a perceptual array is an intimate aspect of initial conceptual processes.

Fifteen tasks were devised which allowed children to make distinctions in perceptual arrays. Each subject's responses to the tasks were tape-recorded and later transcribed. Each distinction was rated according to the three-stage conceptual process theory of Rommetveit. Responses to the 15 tasks were rated a total of four times, by the medium of Rommetveit's notion of three stages in concept formation. The Peabody Picture Vocabulary Test was also administered to the same children. The instrument was administered to 17 children in attendance at Memorial University Pre-School in St. John's, Newfoundland. (This was the largest available target population.)

Through the use of Pearson Product-Moment Coefficient Correlations, proficiency in rating the tasks using Rommetveit's three-stage concept formation theory was established. The statistics reflected a high correlation between the ratings of the task responses. Further, by the mechanics of Pearson Product-Moment Coefficients and factor analysis, a relationship was established between tested proficiency of the child and proficiency in the Peabody Picture Vocabulary Test. The results indicated that the instrument clearly showed the emergence of two orthogonal dimensions. In light of the immediate data, neither of these dimensions apparently relates to the Peabody.

It is suggested that further research be conducted to identify more specifically the dimensions in the designed instrument.

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CHAPTER I

INTRODUCTION

Purpose of the Study

The purpose of this study was twofold: to devise an instrument for use in measuring a pre-school child's ability to discern relationships in a perceptual array; and to conduct a validity study of the instrument.

Significance of Study

Concept learning would appear to be the basis by which man expands his perceptions and orders his experiences. If this be so, then it would be difficult indeed to overemphasize the importance of concept learning for education.

The way in which a school child goes about forming concepts is much too crucial a process to be left to chance (DiVesta & Thompson, 1970). They state:

> The learning of concepts is not a chance process. Pupils tend to follow strategies in selecting and testing the rule that defines a concept (p. 324).

Divesta and Thompson add:

> Concept attainment is not a hit-or-miss process. Rather, pupils use different ways of selecting attributes from positive instances of the concept and testing whether the attribute is relevant or not. This process is especially prevalent in teaching procedures where the pupil is guided to discover for himself the attributes that define a concept (p. 315).

Bolton (1977), moving further, suggests that the total classroom environment and method of instruction must be utilized to build upon the child's own discoveries. How such an integration might be achieved most expeditiously is a task for further research. Before any method of instruction can be devised, however, instruments which measure distinctions in conceptual abilities among pre-school children are needed.

It would appear that one critical index of a child's ability to conceptualize can be obtained by measuring his ability to discern relationships in a perceptual array.

A test was constructed to measure a child's proficiency in discerning relationships among groups of objects presented in the actual. This device is based on "conceptual process theory", as that theory is reviewed in the literature (Chapter II). The value of such an instrument is its potential in a method of analysis of the child's conceptual thinking.

Procedures of analysis, according to Hawkins (1977), must involve a kind of individual diagnostic picture which should be constructed in planning for the inevitable diversity of any given group of children. Such a diagnostic profile can be used to reflect the child's strengths and weaknesses and to identify those areas wherein the child is immature or seemingly not ready to learn. A method of analysis which measures the child's ability to discern relationships in a perceptual array seems to be the logical first step in a program designed to help children develop perceptual-conceptual awareness.

To date, though several tests have been constructed to measure cognitive (i.e. conceptual) abilities, these are probably too lengthy for classroom use. Laurendeau and Pinard (1968), for one, devised a very extensive battery of Piagetian-type tasks, which battery requires some 10 hours of testing. For another, Flavell (1963) reports that Inhelder and Vinh-Bang constructed a test consisting of 30 Piagetian tasks. Object: to create a standardized developmental scale of reasoning.

Robinson and Robinson (1965) conclude that the most valuable extensions of Piaget's work will be the development of new and more useful tests of intelligence. Most assessment techniques in current use deal with content rather than with the functioning of the intellect.

The proposed instrument attempts to assess level of conceptual ability by measuring pre-school children's ability to discern relationships in a perceptual array. This distinction in the conceptual process is quite in accordance with the theories of Bolton (1977), Bruner et al. (1966), Piaget (1962), Polanyi (1959, 1967), Rommetveit (1960, 1961, 1965), Rommetveit and Kvale (1965a, 1965b), Taba (1965). A validity study was conducted, in order to assess the potential of the instrument in helping the early childhood educator to determine a given child's level of ability. Hopefully, it will help the teacher to help the child, and is thus a partial fulfillment of Hawkin's call for a diagnostic profile. It will be offered as a means of analysing the child's level of conceptual thinking, relative to the processes involved. With this knowledge, the early childhood educator could be somewhat better prepared to devise a program which will foster con-

ceptual abilities.

Limitations of Study

This study was limited to children attending Memorial University Pre-School in St. John's, Newfoundland. These children will have entered kindergarten in September 1978.

The scope of this instrument was limited to the child's ability to discern relationships in a perceptual array, as these relationships are defined herein, and as these particular arrays were presented in certain specifit situations.

Definition of Terms

Concept: It is not very likely that we shall ever be able finally to resolve the question whether the human ability to form concepts is the result of our learning to talk or is a natural sequel to the forming of concepts. We can be sure that the two processes are closely linked to each other and that we should not be able to use language in the way that we do without developing conceptual thinking to an advanced stage (Fry, 1977, p. 2, underlining supplied).

Gagne (1965) suggests that symbolization increases for the individual as language is acquired and as the patterns of thought reach higher levels of abstraction. Lee (1973) reiterates this point, and offers the following explanation: that since a concept depends on a symbol, an "empty" concept would require a symbol that does not symbolize. Language is conceptual, hence the conceptual factor in post-language perceptions is more predominant than it is in pre-language perceptions.

Lee continues by offering the following definition of a concept: "Concepts are meanings and meanings are symbolic reference" (p. 61). It would seem, then, that the simplest kind of meaning is derived from intuitive data which become "low-grade" symbols of similarities in response. Intuitive data are assimilated into an implicit schema of action, and, in the assimilation, perception and conscious thought arise. Concepts seem to depend on perception. This is especially so in rudimentary cases, since simple concepts would appear to refer to direct experience with perceptible members-of-classes.

Process: For the purpose of this study, the term "process" is defined as an inference on mediational operations, by the consideration of products of performance (Levitt, 1968).

Early Childhood Education: Early childhood education encompasses children ages 3 to 8 (Prince, 1977). For the purposes of this study, the investigator tested a group of children whose ages ranged from 4 years 4 months to 5 years 3 months.

Test or Testing: Test or "testing" is defined as a "systematic and deliberate way of sampling a student's behavior or thinking" (Perrone, 1975, p. 14).

Perceptual Array: Wigner (1967) defines perceptual array as "'ultimate truth'--a picture which is a consistent fusion into a single unit of the little pictures, formed on the various aspects of nature" (p. 234).

CHAPTER II

REVIEW OF LITERATURE

In this chapter, some of the theoretical background and research findings which relate to conceptualization will be summarized. The chapter is broken down into two sections: "concept formation theory", and "classification theory".

Concept Formation Theory

Concepts develop as the individual attempts to organize the environment to which he responds; and reciprocally, he organizes the environment through developing concepts. Conceptualization is simultaneously an organization of the stimulus and an act of coordination (Bolton, 1977).

Concept formation requires abstraction, says Lee (1965), and it is from concrete experience that these abstractions are derived. The consequence of the abstraction is the identifying of common elements that give rise to a generality. Lee has termed this process "proto-generalization". The generality allows the present element in consciousness to stand for other previously experienced elements, and later to project these elements to anticipated events. Symbolization occurs when the perceiver grasps the common elements of the abstraction. Lee suggests that symbolized "common elements" are the basis for concepts.

Conceptualization begins deductively through the process of discovering classes, accumulating positive instances, and rejecting

negative ones. Early concepts are primitive, nonverbal, and of value to a particular child only in enabling him to direct and interpret his own activity (Huey, 1968; Nelson, 1974).

The movement in the child towards interpretation and comprehension is reflective of the emergence of consciousness. "Consciousness is a metaperception, the vindication of perception, the perception of perception," states Pankow (1976). In this context, and as it relates to conceptualization, Tinbergen (reported in Pankow) discusses the process of conceptualization. By way of illustration, he asks that we consider the circumstances, given a baby who crawls over a sand dune and is scratched by a thistle. It stops crawling, and in retracing its footsteps is scratched lightly again. Then it turns around and touches the thistle with its hand. To this point there has been perception of an object, brought about by coincidence. But now something decisive happens. The baby encounters another plant which is not prickly, and strokes it; in doing this, he has compared perceptions. Subsequently he returns to the thistle and validates his perception. By doing this the perception "prickly" becomes disposable for the future, partly separated from the concrete situation. Perception thus becomes consciousness.

This example is intended to illustrate the emergence of a concept. There is not yet any re-creation via language; rather, the concept of "prickly" has thus emerged from an action. In discovering that the condition "prickly" relates to an object, the baby's perception itself becomes, and therefore is, consciousness. As the origin of the perceived is being noted, the object becomes partially independent

of the context and thereby disposable for the future. "A concept is thus reified action" (p. 29).

Bolton (1977) suggests that the traditional theory of concept formation, the theory of abstraction, can be traced back to Aristotle through Locke and Hume. By the terms of this theory, concepts are formed through a process in which the person recognizes similarities in a perceptual array, and abstracts these similarities away from irrelevant properties of the set of objects.

There are three assumptions inherent in this theory of concept formation:

1) Concepts are formed through people recognizing resemblances among stimuli.
2) Progress in concept formation is from the particular to the general: the subject observes particular events, notes similarities among some of them, and on this basis groups them as instances of a class.
3) Concrete concepts are primary, in the sense that they lay the foundation for the development of abstract concepts.

Bolton (1977) continues by suggesting that these three assumptions need to be complemented. Since concepts, whatever the developmental differences, owe their existence to rules of relation, then it would follow that there is a need to understand how these rules develop and are utilized. He suggests that a psychological theory of the concept will be one that can encompass the following characteristics:

1) Concepts are the expression of ways in which experience has been organized.

2) All concepts are the result of particular instances becoming general by being treated as examples of a type or rule; further language stabilizes these general meanings in the process of social interaction.

3) Concepts are the result of acts of coordination.

4) From the point of view of the subject, a concept is "a disposition to organize events in a certain way" (p. 22). This definition implies the expectation that the organization is then capable of being applied to fresh instances.

5) Since a concept is a result of the application of a rule to particular elements, this can only mean that to study concept formation is to study the emerging correlation between such acts and the stimulus conditions to which the concept is related.

6) A concept may be defined, then, as a stable organization in the experience of reality, which organization is achieved through the utilization or rules of relation, and to which can be given a label.

Rommetveit (1960, 1961, 1965) and Rommetveit and Kvale (1965a, 1965b) suggest there is evidence of a process of concept formation which is initially intuitive but which expands into higher levels of cognitive organization. Rommetveit suggests that this process involves three separate stages. In the first, the "perceptual" stage, the defining attributes of objects in perceptual arrays acquire distinctiveness, although subjects are not yet able to sort objects into

appropriate conceptual categories. In the next stage, the "functional", subjects can sort stimulus patterns as if able to abstract and consciously to identify the defining properties, even though the subjects were completely unable to describe those properties. At the third stage, the "symbolic", the subject is able to represent symbolically the discrimination he has made.

The work of Polanyi (1959, 1967) would appear to confirm Rommetveit's first stage in the process of concept formation. In Polanyi's terminology, in the stage of "tacit" learning the defining attributes in a perceptual array gain distinctiveness.

Hunt (1969) in his "Conceptual Systems Theory", contends that a child is assumed to develop cognitively through a series of successive stages. As he moves to a higher conceptual level, he becomes more independent, more adaptive to environmental change, more capable of tolerating stress, and is generally more mature.

Taba (1965) believes thinking is sequential, that one proceeds from simple cognitive tasks to more complex ones, and that each step in the sequence is developed from mastery of the previous one. She developed a "Concept Learning Theory" postulating three distinct stages in the process of concept learning. The first is identifying and enumerating data, the second is grouping data, and the third stage is labelling the groups that have been formed. The process is considered an inductive one, and the child moves cognitively in a sequential manner through the three stages.

The theories on concept formation cited above seem to support two conclusions: 1) there is a distinct process involved in forming

concepts; and 2) the ability to perceive distinctions in perceptual arrays is an intimate aspect of this process.

Classification Theory

Bolton (1977) states that the discovery of new categories is an essential process in conceptualization. This can be accomplished by a subject who attends to stimuli that are not fully defined and articulated but exist nevertheless. This leads to more clearly articulated stimuli, and by this means the subject succeeds in advancing his conceptual understanding. The new concept thus emerges as an extension of existing knowledge.

Bolton further reports that there are two major methods by which the child's ability to classify objects may be studied. The first is to present the child with objects or pictures of objects of various kinds and ask him to put together those which are "alike" or "similar". By observing the criteria the child uses to classify the objects, the viewer can infer both the criteria the child is using and his mode of thinking. The second way is to present the child with class-inclusion problems, then to ask him to judge the relationship between various sub-classes and the class that contains them. By this means, one can grasp how the child understands the logical operations of classification.

Vygotsky (1962) was one of the first researchers to explore children's classification schemata. First published in Russia in 1934, his test on classification consisted of 22 wooden blocks--five different colors, six different shapes of a cross section, two different heights,

and two different cross-sectional areas. Subjects were asked to classify the blocks into four groups, according to the critical attributes of "cross-sectional area" and "height".

In interpreting test results, Vygotsky categorized three age-related stages of classificatory behavior. In the first stage, that of "syncretic grouping", children are not able to do any type of classification. In the next stage, called "thinking in complexes", the child can classify the test blocks in terms of their concrete characteristics. In the third stage, "concepts", the child can achieve logical modes of classification.

Bruner et al. (1966) reported two studies of the development of classification. In the first study, investigators used verbal stimuli in presenting the names of various common objects to subjects who were asked to indicate how they were "alike" and how they were "different". The authors examined the subjects' classifications for the characteristics of the objects used, or how the subject related these characteristics to himself. According to this analysis, five main modes of classification were distinguished:

1) Perceptual: The items are rendered equivalent on the basis of immediate phenomenal qualities.
2) Functional: Equivalence is based on use or function of the item.
3) Affective: Equivalence is based on the emotions the item arouses.
4) Nominal: Items are grouped by involving an existing name in the particular language system.

5) Fiat equivalence: Judgement states merely that items are alike without stating why.

Using this mode, the findings revealed that six-year-olds group more often according to perceptual properties of objects than do older children. From age six on, an increase is found in the identifying of functional properties of objects.

Bruner et al. further distinguish three "general structures" in their subjects' classifications:

1) Superordinate groupings: based on common feature or features characterizing the items in a class.

2) Complexive structures: formed by using attributes of an array to form local rules for grouping. Five kinds of complexive groupings were noted:

   a) Collections
   b) Edge matchings
   c) Key rings
   d) Associations
   e) Multiple groupings

3) Thematic groupings: formed on the basis of how the items fit into a story.

Results demonstrated that, for the six-year-old child, half the classifications made were complexive and half superordinate, but for the nine-year-old, three-quarters were superordinate. By age 19, the complexive grouping had virtually disappeared.

In the second task, subjects were asked to group pictures of objects. Results indicated that subjects of all ages made greater use of perceptible attributes and a lesser use of functional attributes.

The Conceptual Style Test by Kagan et al. (1964) has been offered as a means of analysing the development of classification skills. The test consists of a set of 30 cards, each containing three black-and-white drawings of familiar objects. Subjects are instructed to pick out two pictures that are "alike" (or which "go together in some way"), and to state the reason for the grouping. Kagan suggested that this test measures three types of classification:

1) Analytic Concepts: Involved pairings based upon similarity in an object attribute that is a differentiated part of the total stimulus. This seems to be equivalent to Bruner's "perceptible" classification.
2) Relational Concepts: Involves pairings based on a functional relationship between two stimuli. This classification is similar to Bruner's "functional" classification.
3) Inferential Concepts: Includes pairings based on similarity in some inferred quality and pairs involving a conventional name. This category is seemingly like Bruner's "nominal" grouping. Despite the apparent similarity between Bruner's and Kagan's categories of classifications, Kagan's results differed from Bruner's. Kagan found the emergence of analytic concepts to increase between the subject-ages of five and 12 years.

Piaget (1962) believes that through manipulation, touching, lifting, holding, arranging, sorting, and so on, the child begins to

notice similarities and differences in and among objects. Eventually, the child can classify an array of objects into groups having similar attributes, or order them on the basis of their differences. In these activities, Piaget sees the beginnings of conceptual thinking. Such behavior implies the existence of a system whereby the individual can identify the defining attributes of a concept.

There are two large-scale projects which have used Piagetian tasks to derive standardized tests on intellectual behavior.

The first was conducted by Laurendeau and Pinard (1968) at the Institute de Psychologie of the University of Montreal. Their work consisted of a very extensive battery which requires some 10 hours of testing of each subject. The aims of the project were a systematic replication of Piaget's work and the construction of a scale of mental development which would have a coherent theoretical rationale. About 30 tasks drawn from various content areas (number, quantity, space, geometry, movement, velocity, etc.) were individually administered in standardized form to some 1,500 French Canadian children, 4-12 years of age. Results supported the conclusion that Piagetian tasks do scale satisfactorily. Piaget's previous conclusions abqut the existence of developmental stages were confirmed.

Flavell (1963) reported a test construction project under the direction of Inhelder and Vinh-Bang in 1957. The test consisted of 30 Piagetian tasks drawn from various content areas (number, quantity, space, geometry, movement, velocity, time, chance, and others). The intent of the project was to create a standardized developmental scale of reasoning, and in doing this to assess the validity of Piaget's

conclusions about developmental stages. The results indicate that Piagetian tasks do appear to scale satisfactorily.

CHAPTER III

INSTRUMENTATION

The purpose of this chapter is to describe the procedures which were followed in the study. The chapter is organized as follows: 1) general design of the study; 2) instrument development--which covers tasks, rating and form; 3) the sample; and 4) administration procedures.

General Design of the Study

The following is an outline of the steps taken in carrying out the project:

1) Fifteen tasks were constructed, which were intended to allow measurement of the child's stage in the process of intuitive concept formation. The items were generated from a review of the literature and from consultation with graduate students and professors at Memorial University.
2) The tasks were administered to 17 children age 4 years 4 months to 5 years 3 months at the Memorial University Pre-School in May 1978. (This was the largest appropriate population available in Newfoundland.)
3) The children's verbal responses to the 15 tasks were tape-recorded and later transcribed (see Appendix A).
4) The Peabody Picture Vocabulary Test was administered to the 17 children at the Memorial University Pre-School

in May 1978 in order to obtain percentile rank and I.Q. scores.

5) Each task response was rated a total of four times by the researcher, according to the criteria of Rommetveit (1960, 1961, 1965) and Rommetveit and Kvale (1965a, 1965b). For use in task analysis, the researcher's first ratings (designated I) and final ratings (designated IR) were used.

6) A researcher was trained to rate the task responses according to Rommetveit's criteria. For use in task analysis, the trained researcher's final ratings (designated IE) were used.

7) Pearson Product-Moment Correlation Coefficients were computed between the researcher's first and final ratings. The same were computed between these ratings and those of a trained assistant's ratings. Correlation coefficients were computed for each composite score: age, I.Q., and percentile rank as established by the Peabody. Next, a factor analysis using a principal factor procedure was calculated on the 15 items, in order to extract any existing factors. Following this, correlation coefficients were calculated between the existing factors (as identified), age, I.Q., and percentile rank to establish the relationship between the Peabody and the testing instrument.

Instrument Development

a) Tasks

In developing the instrument, tasks had to be formulated which would allow measurement of various stages in a child's ability to discern relationships in several perceptual arrays. These tasks were generated from various sources:

1) through experience and educational background of the researcher;
2) through conversations with teachers, graduate students, and professors;
3) through the inspection of certain other conceptual ability measures, some of which have been noted in the literature review;
4) through the reading of related literature on concept formation.

These sources have been noted in the review of literature.

b) Rating

Each child's task response was rated by the researcher as belonging to one of Rommetveit's three stages in concept learning (see Table 1). The number 1 was assigned to any response belonging to the first stage. In this stage, the "perceptual", defining attributes of perceptual arrays acquire distinctiveness, although subjects are not yet able to group objects into an appropriate conceptual category.

The number 2 was assigned to any response fitting Rommetveit's second or "functional" stage in concept formation. In this stage,

TABLE 1

Researcher and Trained Assistant's Ratings of Children's Perceptual Task Response on Three Stages of Concept Formation

		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7	Task 8	Task 9	Task 10	Task 11	Task 12	Task 13	Task 14	Task 15
Child 1	IOI	3	3	3	3	2	3	2	3	3	2	3	3	2	3	2
	IROI	3	3	3	3	3	3	3	3	2	2	3	3	2	3	2
	IEOI	3	3	3	3	3	3	3	3	2	2	3	3	2	3	2
Child 2	IO2	2	2	3	3	1	3	3	1	1	1	3	2	1	1	1
	IRO2	2	2	3	3	1	3	3	1	1	2	2	2	1	1	1
	IEO2	2	2	3	3	2	3	3	1	1	1	2	2	1	1	1
Child 3	IO3	2	2	2	2	2	2	3	3	3	3	3	3	9	1	2
	IRO3	2	2	2	2	2	2	3	3	3	2	3	3	9	1	2
	IEO3	2	2	2	2	2	2	3	3	3	2	3	3	9	1	2
Child 4	IO4	2	3	2	3	2	3	3	3	1	3	3	3	1	1	1
	IRO4	2	3	2	3	3	3	3	3	2	2	3	3	1	1	1
	IEO4	2	2	2	3	3	3	3	3	2	2	3	3	1	1	1
Child 5	IO5	3	2	3	3	3	3	3	3	3	3	3	3	1	1	1
	IRO5	3	2	3	3	3	3	3	3	1	3	3	3	1	1	1
	IEO5	3	2	3	3	3	3	3	3	1	3	3	3	1	1	1

Key: I = Researcher's first ratings
IR = Researcher's final ratings
IE = Trained researcher's final ratings

(cont'd.)

Table 1 (cont'd.)

		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7	Task 8	Task 9	Task 10	Task 11	Task 12	Task 13	Task 14	Task 15
Child 6	I06	2	2	2	3	3	3	3	2	2	3	2	3	1	1	1
	IR06	2	2	3	3	3	3	3	3	2	2	2	2	1	1	1
	IE06	2	2	3	3	3	3	3	3	2	2	2	2	1	1	1
Child 7	I07	1	3	2	2	2	3	2	3	3	2	2	3	1	1	3
	IR07	1	2	2	2	2	3	2	3	3	2	2	3	1	1	3
	IE07	1	2	2	2	2	3	2	3	3	2	2	3	1	1	3
Child 8	I08	2	2	2	2	2	3	3	3	3	3	3	3	9	2	2
	IR08	2	2	2	2	2	3	3	3	3	3	2	2	9	2	2
	IE08	2	2	2	2	2	3	3	3	3	3	2	2	9	2	2
Child 9	I09	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2
	IR09	3	3	3	3	3	3	3	3	3	3	2	3	3	2	2
	IE09	3	3	3	3	3	3	3	3	3	3	2	3	3	2	2
Child 10	I10	3	3	3	3	3	3	3	3	3	3	3	3	1	1	1
	IR10	3	3	2	3	3	3	3	3	3	3	3	3	1	1	1
	IE10	3	3	3	3	3	3	3	3	3	3	3	3	1	1	1
Child 11	I11	3	3	3	3	3	3	3	3	3	3	3	3	1	1	3
	IR11	3	3	3	3	3	3	3	3	3	3	3	3	1	1	3
	IE11	3	3	3	3	3	3	3	3	3	3	3	3	1	1	3

(cont'd.)

Table 1 (cont'd.)

		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7	Task 8	Task 9	Task 10	Task 11	Task 12	Task 13	Task 14	Task 15
Child 12	I12	3	3	3	3	3	3	3	3	3	3	3	3	1	1	1
	IR12	3	3	3	3	3	3	3	3	3	3	3	3	1	1	1
	LE12	3	3	3	3	3	3	3	3	3	3	3	3	1	1	1
Child 13	I13	3	3	3	3	3	3	3	3	3	3	3	1	1	2	2
	IR13	3	3	3	3	3	3	3	3	3	3	3	1	1	2	2
	IE13	3	3	3	3	3	3	3	3	3	3	3	1	1	2	2
Child 14	I14	3	3	3	3	3	3	3	3	3	3	3	3	1	1	2
	IR14	3	3	3	3	3	3	3	3	3	3	2	3	1	2	2
	IE14	3	3	3	3	3	3	3	3	3	3	2	3	1	2	2
Child 15	I15	3	3	3	3	3	3	3	3	3	2	3	3	1	2	1
	IR15	3	3	3	3	3	3	3	3	3	2	3	3	1	2	2
	IE15	3	3	3	3	3	3	3	3	3	2	3	3	1	2	2
Child 16	I16	3	2	2	2	3	2	2	3	3	3	3	3	2	2	1
	IR16	3	2	2	2	3	2	2	3	3	3	2	3	2	2	1
	IE16	3	2	2	2	3	2	2	3	3	3	2	3	2	2	1
Child 17	I17	3	1	1	3	3	3	3	3	3	2	2	3	1	1	1
	IR17	3	1	1	3	3	3	3	3	3	3	3	3	1	1	1
	IE17	3	1	1	3	3	3	3	3	3	3	3	3	1	1	1

the child can sort stimulus patterns as if he were able to abstract and consciously to identify the defining properties, although he is demonstrably unable to describe those properties.

Any response fitting Rommetveit's third stage, the "symbolic", was assigned the number 3. In this stage, the child is able to verbalize the discrimination he had made in distinguishing a group.

The number 9 was used for any response which did not fit into any of the three categories above.

The scoring for the Peabody Picture Vocabulary Test was done in accordance with the standards set in the manual.

c) Form

The test consisted of 15 separate tasks. Each task 1 to 12 contained a set of four tangible concrete objects which the child was directed to group (see Appendix B). The tasks were arranged in an assumed scale of increasing difficulty. Tasks 13 to 15 were seriation tasks. Each was a set of four tangible concrete objects which the child was asked to order.

The Sample

The subject sample consisted of 17 children attending Memorial University Pre-School. This pre-school was selected because it provides the largest available group of pre-school children in St. John's, Newfoundland.

All children enrolled in the pre-school, who would be attending kindergarten in September 1978, were included in the study. Their ages ranged from 4 years 4 months to 5 years 3 months.

Administrative Procedures

The test was administered by the researcher and a trained assistant acting in conjunction. All the children's verbal responses were tape-recorded, and the distinctions the children made in the perceptual arrays were duplicated on a scoring sheet (see Appendix A and Appendix B).

Each child was tested individually in a separate room with the researcher and the trained assistant. Two buckets were placed on the table in front of the child. Each group of objects was randomly placed in front of the child. For tasks 1 to 12, the following instructions were given to the child:

Researcher: "Can you put those things that go together in some way in the buckets for me?"

Child: (Completes task)

Researcher: "Can you tell me why you put those things together?"

For the seriation tasks 13 to 15, the buckets were removed from the table. The instructions given to the child were:

Researcher: "Can you look at those things carefully and put them in order for me?"

Child: (Completes task)

Researcher: "Why did you put those things like that?"

If the child asked the question, "What is 'order'?", the researcher responded, "Order is how they go: 1, 2, 3, 4."

Directions were repeated for children who were hesitant to respond. After a reasonable time lapse (15 seconds), if the given child still was not able, (or willing) to respond, the researcher moved on

to the next task (see Appendix A for complete text of responses).

The Peabody Picture Vocabulary Test was administered to each child individually during the same week as the designed test. The test was administered according to the directions given in the test manual.

CHAPTER IV

VALIDITY STUDY

Validity of the Instrument

Construct validation, according to Nunnally (1959) "consists of defining a measure in terms of numerous research findings" (p. 65). The designed instrument examines the potential of using Rommetveit's Conceptual Stage Theory (1960, 1961, 1965, 1965a, 1965b) as a methodological device.

Both the researcher and a trained assistant rated children's responses to designed tasks, according to Rommetveit's criteria. (This procedure was previously outlined in Chapter III in the section on rating.) The purpose of rating each task numerous times by both the researcher and the trained assistant was to insure consistency in the identification of the given behavior. If the correlation between the ratings was high, there must indeed to some descriptive value in the stage distinctions. The results of these ratings are shown in Table 1.

Correlations were computed between the researcher's first and final ratings (.97 level), between the researcher's first ratings and the trained assistant's ratings (.97 level), and between the researcher's final ratings and the trained assistant's ratings (.99 level). These composite score results can be seen in Table 2.

The individual scores on the Peabody Picture Vocabulary Test were derived from the norms prescribed in the Manual. These scores are

TABLE 2

Correlation Coefficients of Composite Score Responses

	Comp 1	Comp 2	Comp 3	Age	I.Q.	P Rank
Comp 1	1.0000 (0) S = .001	.9723 (15) S = .001	.9776 (15) S = .001	.0651 (15) S = .818	.3906 (15) S = .150	.4075 (15) S = .132
Comp 2		1.0000 (0) S = .001	.9955 (15) S = .001	.1595 (15) S = .570	.3345 (15) S = .223	.3352 (15) S = .222
Comp 3			1.0000 (0) S = .001	.1298 (15) S = .645	.3483 (15) S = .203	.3573 (15) S = .191
Age				1.0000 (0) S = .001	-.2935 (17) S = .253	-.2697 (17) S = .295
I.Q.					1.0000 (0) S = .001	.9508 (17) S = .001
P Rank						1.0000 (0) S = .001

reported in Table 3. Table 2 also reflects the correlation between these scores and the composite scores.

The experimental instrument was validated against the results which the children achieved on the Peabody Picture Vocabulary Test.

The first step in this analysis was to calculate Pearson Product-Moment Correlation Coefficients for each child's response to the 15 tasks; for the total composite score of those responses; and for age, I.Q., and percentile rank as established by the Peabody. These operations were performed a total of three times: first, for the researcher's first ratings; second, for the researcher's final ratings; and third, for the trained researcher's final ratings. The results are shown in Tables 4, 5, and 6, respectively.

The 15-item instrument was factor analyzed using a principal factor procedure, specifying the extraction of two factors. (The researcher's final responses (IR items) were used.) Out of the total of 15 items, 11 loaded on either Factor #1, or Factor #2. Items omitted for further analysis because of insufficient loadings were IR06, IR10, IR12, IR15. The resulting factor solution and communalities are shown in Table 7.

The next step in the procedure was to establish the relationship between the analysed factors and the results on the Peabody Picture Vocabulary Test. Correlation coefficients were calculated between Composite 1, Dimension 1, Dimension 2, Age, I.Q., and Percentile Rank. Results of this analysis are shown in Table 8.

It can be seen that the significance level of .15 reflected no relationship between the Composite 1 scores and I.Q. When the more

TABLE 3

Scores on Peabody Picture Vocabulary Test

	Raw Score	Chronological Age - May 1978 (In Months)	Mental Age (In Months)	I.Q.	Percentile
Child 1	48	61	58	96	33
Child 2	47	57	56	94	53
Child 3	53	62	67	105	60
Child 4	51	62	62	101	51
Child 5	46	63	55	93	44
Child 6	53	57	67	105	60
Child 7	67	52	99	137	99
Child 8	38	57	44	78	9
Child 9	64	58	92	125	97
Child 10	55	55	71	116	88
Child 11	67	59	99	131	99
Child 12	61	62	85	120	93
Child 13	55	54	71	116	88
Child 14	56	52	73	118	89
Child 15	55	63	71	109	71
Child 16	52	54	65	111	80
Child 17	45	53	53	99	38

Table 4

Correlation Coefficients of Item Responses - (Researcher's First Scores).

Item	I01	I02	I03	I04	I05	I06	I07	I08	I09	I10	I11	I12	I13	I14	I15	Comp 1	Age	I.Q.	P. Rank
I01	1.0000 (0) S=.001	.1143 (17) S=.662	.4381 (17) S=.079	.5629 (17) S=.024	.5731 (17) S=.003	.0537 (17) S=.838	.1967 (17) S=.449	.3374 (17) S=.185	.4334 (17) S=.082	.2550 (17) S=.323	.6619 (17) S=.004	-.0450 (17) S=.864	.2599 (15) S=.349	-.3077 (17) S=.230	-.2671 (17) S=.300	.7043 (15) S=.003	-.0210 (17) S=.936	.0430 (17) S=.870	.1627 (17) S=.533
I02		1.0000 (0) S=.001	.6792 (17) S=.003	.4559 (17) S=.327	.1143 (17) S=.662	.3192 (17) S=.212	-.1049 (17) S=.689	.3008 (17) S=.241	.0944 (17) S=.718	.1943 (17) S=.455	-.1943 (17) S=.455	-.3780 (17) S=.766	.1142 (15) S=.685	.2093 (17) S=.420	.3803 (17) S=.132	.5460 (15) S=.035	-.0078 (17) S=.976	.5877 (17) S=.013	.5952 (17) S=.012
I03			1.0000 (0) S=.001	.6469 (17) S=.049	.1143 (17) S=.662	.3192 (17) S=.212	.1499 (17) S=.566	-.0790 (17) S=.766	.1944 (17) S=.718	.0291 (17) S=.912	-.2185 (17) S=.399	-.2674 (17) S=.299	.1142 (15) S=.685	.2095 (17) S=.420	.0992 (17) S=.705	.5169 (15) S=.048	-.1406 (17) S=.590	.2489 (17) S=.335	.3982 (17) S=.113
I04				1.0000 (0) S=.001	.3128 (17) S=.222	.6583 (17) S=.004	.4708 (17) S=.056	-.1908 (17) S=.463	-.2451 (17) S=.343	-.3371 (17) S=.711	.4597 (17) S=.069	-.1539 (17) S= 463	-.1596 (15) S=.570	-.0816 (17) S=.756	-.3305 (17) S=.195	.4749 (15) S= 121	.2583 (17) S=.317	.0496 (17) S=.850	.1224 (17) S=.640
I05					1.0000 (0) S=.001	.0537 (17) S= 838	.1967 (17) S=.449	.5287 (17) S= 029	.5307 (17) S= 218	.5483 (17) S=.013	.2451 (17) S= 343	.1462 (17) S=.575	-.0850 (15) S= 916	-.0192 (17) S= 942	-.1252 (17) S=.632	.3745 (15) S=.006	.0013 (17) S= 996	.3917 (17) S=.120	.4367 (17) S=.080
I06						1.0000 (0) S=.001	.3099 (17) S=.226	-.1357 (17) S= 631	-.1614 (17) S=.536	-.3191 (17) S= 198	-.3013 (17) S= 728	-.1257 (17) S=.631	.3476 (15) S=.212	-.1537 (17) S=.838	.0468 (17) S=.859	.1906 (15) S= 375	.0245 (17) S= 926	.1256 (17) S=.920	-.0212 (17) S=.905
I07							1.0000 (0) S=.001	-.1593 (17) S= 541	-.2046 (17) S=.431	.2469 (17) S= 339	.5601 (17) S=.025	-.1591 (17) S=.541	-.3487 (15) S=.203	-.4539 (17) S=.067	-.2758 (17) S=.284	.1385 (15) S= 706	.2771 (17) S= 282	-.1775 (17) S=.495	-.3514 (17) S=.345
I08								1.0000 (0) S= 001	.7093 (17) S=.001	.5735 (17) S=.016	.3860 (17) S= 743	.3289 (17) S=.197	.1717 (15) S= 541	.2362 (17) S= 361	.2929 (17) S=.254	.7011 (15) S=.004	-.1599 (17) S= 540	.3681 (17) S=.298	.3637 (17) S= 530
I09									1.0000 (0) S=.001	.3359 (17) S=.187	-.1109 (17) S= 673	.1926 (17) S=.459	.2217 (15) S=.427	.3334 (17) S=.237	.3762 (17) S= 137	.7021 (15) S= 004	-.2724 (17) S=.290	.3040 (17) S=.235	.2396 (17) S=.354
I10										1.0000 (0) S=.001	.2750 (17) S=.285	.1835 (17) S=.481	.3142 (15) S=.685	-.0883 (17) S=.738	.1766 (17) S= 770	.6081 (15) S=.017	.1541 (17) S=.555	.1754 (17) S= 506	.2291 (17) S=.379
I11											1.0000 (0) S=.001	-.0860 (17) S=.743	.1243 (15) S=.659	.1716 (17) S=.510	-.0208 (17) S= 038	.2940 (15) S=.287	.3585 (17) S=.158	-.4777 (17) S=.052	-.2689 (17) S=.244
I12												1.0000 (0) S=.001	.1717 (15) S=.541	-.1462 (17) S= 575	-.0391 (17) S=.332	.1769 (15) S=.528	.2583 (17) S=.317	.0092 (17) S=.972	-.1129 (17) S=.666
I13													1.0000 (0) S=.001	.5469 (15) S=.029	.1433 (15) S=.618	.4167 (15) S=.122	-.3391 (15) S=.390	.1012 (15) S= 720	.0928 (15) S=.742
I14														1.0000 (0) S=.001	.1252 (17) S=.632	.4126 (15) S=.127	-.0013 (17) S=.996	-.2174 (17) S=.402	-.2378 (17) S=.358
I15															1.0000 (0) S=.001	.3196 (15) S=.246	-.3286 (17) S=.198	.0956 (17) S=.648	.3674 (17) S=.330
Comp 1																1.0000 (0) S=.001	.0051 (15) S= 818	-.2006 (15) S=.150	.1975 (15) S=.132
Age																	1.0000 (0) S=.001	-.2935 (17) S=.253	-.2697 (17) S=.295
I.Q.																		1.0000 (0) S=.001	.9508 (17) S=.001
P. Rank																			1.0000 (0) S=.001

Table 5

Correlation Coefficients of Item Responses - (Researcher's Final Score)

Item	IR01	IR02	IR03	IR04	IR05	IR06	IR07	IR08	IR09	IR10	IR11	IR12	IR13	IR14	IR15	Comp 2	Age	I.Q.	P. Rank
IR01	1.0000 (0) S=.001	.3714 (17) S=.142	.2782 (17) S=.283	.5439 (17) S=.024	.6778 (17) S=.003	.0537 (17) S=.836	.1581 (17) S=.158	.2451 (17) S=.343	.1586 (17) S=.543	.6212 (17) S=.008	.2227 (17) S=.390	.3634 (17) S=.809	.2599 (15) S=.349	.3714 (17) S=.142	-.2118 (17) S=.415	.6840 (15) S=.005	-.0210 (17) S=.936	.0435 (17) S=.870	.1657 (17) S=.533
IR02		1.0000 (0) S=.001	.6038 (17) S=.010	.6310 (17) S=.084	.4007 (17) S=.111	.2837 (17) S=.270	.2837 (17) S=.270	.1943 (17) S=.455	.1319 (17) S=.615	.0580 (17) S=.825	.4528 (17) S=.068	-.0209 (17) S=.936	.1830 (15) S=.882	.3585 (17) S=.188	.2601 (17) S=.313	.7121 (15) S=.003	.1471 (17) S=.573	.4021 (17) S=.110	.4791 (17) S=.052
IR03			1.0000 (0) S=.001	.4849 (17) S=.049	.1192 (17) S=.874	.1192 (17) S=.212	.1192 (17) S=.212	-.1943 (17) S=.455	-.3225 (17) S=.207	-.0580 (17) S=.825	.3367 (17) S=.186	-.1571 (17) S=.547	.1142 (15) S=.685	.2830 (17) S=.271	.1678 (17) S=.520	.4063 (15) S=.133	.4061 (17) S=.106	.1758 (17) S=.500	.2941 (17) S=.252
IR04				1.0000 (0) S=.001	.4434 (17) S=.075	.6583 (17) S=.004	.6583 (17) S=.004	-.1387 (17) S=.596	-.3305 (17) S=.195	.0994 (17) S=.704	.3812 (17) S=.131	.0150 (17) S=.955	-.1596 (15) S=.570	-.0269 (17) S=.918	-.2875 (17) S=.263	.3852 (15) S=.161	.2583 (17) S=.317	.0496 (17) S=.850	.1224 (17) S=.640
IR05					1.0000 (0) S=.001	.1318 (17) S=.614	.1318 (17) S=.614	.7478 (17) S=.001	.2397 (17) S=.259	.4068 (17) S=.105	.4068 (17) S=.105	.3448 (17) S=.175	.1717 (15) S=.541	.2304 (17) S=.374	-.1158 (17) S=.558	.7531 (15) S=.001	.1520 (17) S=.560	.2631 (17) S=.308	.2559 (17) S=.322
IR06						1.0000 (17) S=.001	.4333 (17) S=.085	-.0913 (17) S=.728	-.2173 (17) S=.402	.0655 (17) S=.803	.4868 (17) S=.603	-.1575 (17) S=.546	-.2418 (15) S=.212	-.0177 (17) S=.946	.0789 (17) S=.764	.1422 (15) S=.613	.0245 (17) S=.926	.0264 (17) S=.920	-.0312 (17) S=.905
IR07							1.0000 (0) S=.001	-.0913 (17) S=.728	-.2176 (17) S=.402	.0655 (17) S=.803	.4394 (17) S=.080	-.1575 (17) S=.546	-.1596 (15) S=.570	-.0177 (17) S=.946	-.1893 (17) S=.467	.3652 (15) S=.181	.2404 (17) S=.077	-.3781 (17) S=.140	-.3028 (17) S=.236
IR08								1.0000 (0) S=.001	.1746 (17) S=.016	.2988 (17) S=.244	.2988 (17) S=.244	.3505 (17) S=.168	.1243 (15) S=.659	.1943 (17) S=.455	.2376 (17) S=.359	.5398 (15) S=.010	.0737 (17) S=.779	.2525 (17) S=.318	.1413 (17) S=.589
IR09									1.0000 (0) S=.001	.3663 (17) S=.148	-.1528 (17) S=.559	.0551 (17) S=.834	.1403 (15) S=.618	.1819 (17) S=.485	.4412 (17) S=.076	.4639 (15) S=.061	-.4255 (17) S=.089	.5089 (17) S=.037	.4442 (17) S=.074
IR10										1.0000 (0) S=.001	-.2143 (17) S=.407	-.1638 (17) S=.587	.1424 (15) S=.613	.0580 (17) S=.825	-.0926 (17) S=.753	.3882 (15) S=.142	-.4341 (17) S=.082	.1341 (17) S=.608	.2166 (17) S=.404
IR11											1.0000 (17) S=.001	.3773 (17) S=.768	-.3322 (15) S=.226	-.1393 (17) S=.594	-.0826 (17) S=.753	.3892 (15) S=.142	.6824 (17) S=.003	.0115 (17) S=.968	.0428 (17) S=.870
IR12												1.0000 (0) S=.001	.1717 (15) S=.541	-.1090 (17) S=.444	-.0652 (17) S=.804	.1637 (15) S=.560	.2746 (17) S=.286	.2377 (17) S=.358	.1364 (17) S=.602
IR13													1.0000 (0) S=.001	.5892 (17) S=.021	.0980 (17) S=.728	.3711 (15) S=.173	-.0391 (15) S=.890	.1012 (15) S=.720	.0928 (15) S=.742
IR14														1.0000 (17) S=.001	.2601 (17) S=.313	.5450 (15) S=.036	-.1406 (17) S=.590	-.1559 (17) S=.550	-.1566 (17) S=.548
IR15															1.0000 (0) S=.001	.3737 (15) S=.170	-.2408 (17) S=.352	.4984 (17) S=.048	.3227 (17) S=.207
Comp 2																1.0000 (0) S=.001	.1595 (19) S=.570	.1345 (15) S=.223	.1352 (15) S=.222
Age																	1.0000 (0) S=.001	-.2935 (17) S=.253	-.2697 (17) S=.295
I.Q.																		1.0000 (0) S=.001	.9508 (17) S=.001
P. Rank																			1.0000 (0) S=.001

Table 6

Correlation Coefficients of Item Responses (Trained Researcher's Final Scores)

Item	IE01	IE02	IE03	IE04	IE05	IE06	IE07	IE08	IE09	IE10	IE11	IE12	IE13	IE14	IE15	Comp 3	Age	I.Q.	P Rank
IE01	1.0000 (0) S=.001	.4712 (.17) S=.056	.3462 (.17) S=.174	.5439 (.17) S=.024	.2751 (.17) S=.301	.0537 (.17) S=.838	.3581 (.17) S=.168	.2451 (.17) S=.343	.1526 (.17) S=.542	.8000 (.17) S=.011	.2227 (.17) S=.390	.0634 (.17) S=.809	.2599 (.15) S=.349	.3774 (.17) S=.142	-.2118 (.17) S=.415	.7006 (.15) S=.004	-.3210 (.17) S=.936	.0430 (.17) S=.970	.1627 (.17) S=.533
IE02		1.0000 (0) S=.001	.7981 (.17) S=.001	.3607 (.17) S=.132	.3807 (.17) S=.132	.1506 (.17) S=.332	.2506 (.15) S=.332	.1716 (.17) S=.510	.2671 (.17) S=.300	.2095 (.17) S=.420	.3750 (.17) S=.128	-.3634 (.17) S=.809	.2131 (.15) S=.446	.4381 (.17) S=.079	.3558 (.17) S=.161	.7884 (.15) S=.001	.0657 (.17) S=.802	.4599 (.17) S=.063	.5466 (.17) S=.023
IE03			1.0000 (0) S=.001	.5439 (.17) S=.324	.3128 (.17) S=.222	.2581 (.17) S=.158	.3581 (.17) S=.168	-.1716 (.17) S=.510	-.2671 (.17) S=.300	-.2476 (.17) S=.356	.4219 (.17) S=.092	-.3163 (.17) S=.857	.0650 (.15) S=.818	.2795 (.17) S=.420	.0762 (.17) S=.771	.4671 (.15) S=.079	.3364 (.17) S=.187	.2241 (.17) S=.387	.3729 (.17) S=.140	
IE04				1.0000 (0) S=.001	.6731 (.17) S=.003	.6585 (.17) S=.004	.6583 (.17) S=.004	-.1387 (.17) S=.596	-.3305 (.17) S=.195	-.0269 (.17) S=.918	.3812 (.17) S=.131	.0150 (.17) S=.955	-.1398 (.15) S=.570	-.3269 (.17) S=.918	-.2875 (.17) S=.263	.3585 (.15) S=.190	.2583 (.17) S=.317	.0496 (.17) S=.850	.1224 (.17) S=.640	
IE05					1.0000 (0) S=.001	.3279 (.17) S=.379	.2279 (.17) S=.379	.4507 (.17) S=.069	.0138 (.17) S=.787	.4040 (.17) S=.049	.3612 (.17) S=.131	.2592 (.17) S=.296	.1924 (.15) S=.515	.2020 (.17) S=.437	-.2875 (.17) S=.263	.7169 (.15) S=.003	.1635 (.17) S=.551	.2139 (.17) S=.417	.2697 (.17) S=.303	
IE06						1.0000 (0) S=.001	.4333 (.17) S=.382	-.3913 (.17) S=.728	-.2176 (.17) S=.402	.0177 (.17) S=.946	.0655 (.17) S=.803	-.1575 (.17) S=.546	-.3418 (.15) S=.212	-.2077 (.17) S=.448	.0789 (.17) S=.764	.1396 (.15) S=.620	.3245 (.17) S=.926	.0264 (.17) S=.920	-.0312 (.17) S=.905	
IE07							1.0000 (0) S=.001	-.3913 (.17) S=.728	-.2176 (.17) S=.402	.0177 (.17) S=.946	.4364 (.17) S=.080	-.1575 (.17) S=.546	-.1896 (.15) S=.570	-.0177 (.17) S=.946	-.1893 (.17) S=.467	.3585 (.15) S=.190	.4404 (.17) S=.077	-.3731 (.17) S=.140	-.3038 (.17) S=.236	
IE08								1.0000 (0) S=.001	.5746 (.17) S=.016	.4313 (.17) S=.007	.2988 (.17) S=.244	.3505 (.17) S=.168	.1243 (.15) S=.659	.1943 (.17) S=.455	.2376 (.17) S=.359	.6281 (.15) S=.012	.0737 (.17) S=.779	.2575 (.17) S=.318	.1413 (.17) S=.589	
IE09									1.0000 (0) S=.001	.5209 (.17) S=.032	-.1526 (.17) S=.559	.0551 (.17) S=.834	.1403 (.15) S=.618	.1819 (.17) S=.485	.4412 (.17) S=.076	.5091 (.15) S=.053	-.4285 (.17) S=.089	.5089 (.17) S=.037	.4342 (.17) S=.074	
IE10										1.0000 (0) S=.001	-.0580 (.17) S=.825	.0209 (.17) S=.936	.1930 (.15) S=.562	.1226 (.17) S=.639	.0252 (.17) S=.924	.5913 (.15) S=.020	-.3241 (.17) S=.204	.2090 (.17) S=.421	.2309 (.17) S=.373	
IE11											1.0000 (0) S=.001	.0773 (.17) S=.768	-.1322 (.15) S=.226	-.1393 (.17) S=.594	-.0826 (.17) S=.753	.3909 (.15) S=.150	.5824 (.17) S=.003	.0115 (.17) S=.965	.0428 (.17) S=.870	
IE12												1.0000 (0) S=.001	.1717 (.15) S=.541	-.1990 (.17) S=.444	-.3652 (.17) S=.804	.1607 (.15) S=.567	.2746 (.17) S=.286	.2377 (.17) S=.358	.1364 (.17) S=.602	
IE13													1.0000 (0) S=.001	.5892 (.15) S=.021	.0980 (.15) S=.728	.3643 (.15) S=.182	-.3391 (.15) S=.890	.1072 (.15) S=.720	.0928 (.15) S=.742	
IE14														1.0000 (0) S=.001	.2601 (.17) S=.313	.5350 (.15) S=.040	-.1406 (.17) S=.590	-.1559 (.17) S=.550	-.1666 (.17) S=.548	
IE15															1.0000 (0) S=.001	.3668 (.15) S=.179	-.2408 (.17) S=.352	.4924 (.17) S=.048	.3227 (.17) S=.207	
Comp 3																1.0000 (0) S=.001	.1298 (.15) S=.645	.3483 (.15) S=.203	.3873 (.15) S=.191	
Age																	1.0000 (0) S=.001	-.2935 (.17) S=.253	-.2697 (.17) S=.295	
I.Q.																		1.0000 (0) S=.001	.9508 (.17) S=.001	
P Rank																			1.0000 (0) S=.001	

TABLE 7

Factor Analysis of the Items Composing the Test

Items	Loadings on Principal Factor #1	Factor Scores	Loadings on Principal Factor #2	Factor Scores	h^2
IR01	.764	.159	.192	.173	.620
IR02	.751	.183	.040	.119	.566
IR03	.593	.214	-.368	-.046	.487
IR04	.726	.270	-.498	-.070	.776
IR05	.750	.116	.421	.250	.740
IR07	.563	.229	-.500	-.093	.567
IR08	.361	-.031	.698	.290	.618
IR09	.049	-.121	.761	.268	.582
IR11	.601	.203	-.297	-.018	.449
IR13	.149	-.056	.538	.206	.312
IR14	.370	.009	.481	.217	.368
Eigenvalue	3.559		2.526		

TABLE 8

Correlation Coefficients Between Composite 1, Dimension 1, Dimension 2, Age, I.Q., Percentile Rank

	Comp 1	D1	D2	Age	I.Q.	P Rank
Comp 1	1.0000 (0) S = .001	.5022 (15) S = .056	.8025 (15) S = .001	.0651 (15) S = .818	.3906 (15) S = .150	.4075 (15) S = .132
D1		1.0000 (0) S = .001	-.3483 (17) S = .171	.4124 (17) S = .100	.0976 (17) S = .709	.2025 (17) S = .436
D2			1.0000 (0) S = .001	-.0612 (17) S = .815	-.0409 (17) S = .876	-.0921 (17) S = .725
Age				1.0000 (0) S = .001	-.2935 (17) S = .253	-.2697 (17) S = .295
I.Q.					1.0000 (0) S = .001	.9508 (17) S = .001
P Rank						1.0000 (0) S = .001

refined factors were analysed, the significance level between Dimension 1 and I.Q. was .709, and between Dimension 2 and I.Q. was .876. Neither of these constitutes a significant relationship.

According to the stated statistical analysis performed, it can be concluded that the designed instrument under investigation does not relate significantly to the Peabody Picture Vocabulary Test.

CHAPTER V

SUMMARY, DISCUSSION, IMPLICATIONS, AND RECOMMENDATIONS FOR FURTHER RESEARCH

The purpose of this chapter is to present the main findings of the study, to discuss these findings, to suggest some practical implications that arise from the findings, and to offer recommendations for further research.

Summary

The principal findings of the investigation may be summarized as follows:

1) There is a highly significant relationship between the researcher's first and final ratings, using Rommetveit's criteria, on the designed tasks.
2) There is a highly significant relationship between these ratings and a trained assistant's ratings, using the same criteria with the same tasks.
3) Out of 15 total items, 11 clearly emerged as having two distinct orthogonal dimensions.
4) There is no significant relationship between the devised instrument and I.Q. scores on the Peabody Picture Vocabulary Test.

Discussion and Implications

The primary concern of this study was to examine the feasibility of constructing an instrument which measures distinctions in conceptual abilities of pre-school children ages 4 years 4 months to 5 years 3 months. The validation of the said instrument was the second concern. Such an instrument could be used to detect areas of strengths and weaknesses a child already possesses in his ability to discern relationships in a perceptual array.

The individual's ability to conceptualize symbols is fundamental, if a reaction to a stimulus which is not present is to take place. This is expressed by Lee (1973) in these terms:

> Past reaction and anticipation, in so far as they are relevant within the present response, become the meaning of the symbol, and concepts arise. By means of concepts, delineation and definition of the environment take place. Conceptualization is cognition, and there is knowledge (p. 9).

The beginning processes of conceptualization involve direct experience with perceptible members-of-classes. Discerning relationships in perceptual arrays is one aspect of this process, as delineated by Bolton, Bruner, Piaget, Polanyi, Rommetveit, and Taba (see Chapter II).

For the purpose of this study, the theory of Rommetveit (1960, 1961, 1965) and Rommetveit and Kvale (1965a, 1965b) was used in identifying and defining the stages in initial concept learning. This theory was chosen for a variety of reasons. It clearly defines the stages involved in the conceptual process and identifies the behavior of each subject in these stages. Rommetveit's work has been

tested and re-tested, and his notions supported. Polanyi (1959, 1967) confirms Rommetveit's first stage in the conceptual process with his own findings.

The first of Rommetveit's phases in the process of concept learning is the pre-functional or perceptual. In this stage, the defining attributes of perceptual arrays acquire distinctiveness, although at this level subjects are not yet able to sort members into conceptual categories. In the second phase, the functional, the subject is able to sort stimulus patterns as if he were able to abstract and consciously to identify the defining properties, even though the subject is completely unable to describe those properties. In the third stage, the symbolic, the subject is able to verbalize the particular discriminations he has made in a group of perceptual arrays.

Subjects were presented with 15 groups of perceptual arrays and--in each case--asked to put those things that go together in a group. They were instructed to verbalize their reasons for grouping the items as they did. It was at this point that Rommetveit's theory was utilized as an instrument for rating the conceptual level of the responses. The children's groupings were scored as belonging to either Stage 1, Stage 2, or Stage 3 of Rommetveit's Conceptual Stage Theory. It was hoped that proficiency in these type-tasks (i.e. Stage 3 scorings in the main) would correlate with a measure of intellectual achievement, since--again, as previously stated by Lee--conceptualization and cognition are to be considered two interdependent processes.

The Peabody Picture Vocabulary Test was chosen as a means of measuring intellectual level, for a number of reasons. It purports to

measure I.Q. level. It is an instrument which is readily available, and can be administered by the investigator without any special training. The test requires little time to implement, which is a primary concern when one is attempting to achieve a valid score on a test for this age group. (Short attention span is, of course, a material factor.)

It was anticipated by the researcher that 1) Rommetveit's schemata could be utilized as a measure of level in the stages of concept development; and 2) that proficiency on Rommetveit's stages would relate to proficiency as measured by the Peabody Picture Vocabulary Test.

It can be concluded, given the significant relationship between the researcher's first and final ratings on the tasks and between these ratings and those of a trained assistant's, that Rommetveit's theory of stages in concept learning can be used successfully to rate tasks.

It can also be concluded, by inspection of the statistics as generated, that there is no relationship between the designed instrument and the Peabody Picture Vocabulary Test.

Statistical analysis revealed that the designed test reflected two orthogonal dimensions. Of the 15 tasks, 11 loaded on either Dimension 1 or Dimension 2. This finding suggests that--given the particular pre-school children tested--some may be proficient along the first dimension but somewhat less proficient along the second dimension. When these two dimensions were correlated with the Peabody Picture Vocabulary Test, it was found that they were unrelated both in raw scores and percentile rank.

At this point, four possible interpretations can be entertained:

1) The designed instrument is valid, and the Peabody invalid;

2) The designed test is invalid, and the Peabody is valid;

3) Both measures are valid, but each is measuring different variables;

4) Neither test is valid.

It would seem highly unlikely that the designed instrument is valid and the Peabody totally invalid. Included with the Peabody Picture Vocabulary Manual are research findings on its reliability (1959-64) and research findings on its validity (1959-64) (pp. 31-34). The Peabody Picture Vocabulary Test is a test which has been widely used during the past 10 years.

It would seem unlikely that the designed instrument is totally invalid, and the Peabody valid. The factor analysis procedure calculated on the items clearly showed two dimensions emerging in the designed instrument. In view of the relatively small sample used, unstable coefficients are likely to be generated; this fact alone might account for the lack of significant results.

It seems likely that both measures are valid, but that each directs itself to different variables. The designed instrument has taken the 3 Stage concept learning notion of Rommetveit and tested it, and found that two orthogonal dimensions exist. Presumably, students could be high on one dimension and low on the other--yet neither of these dimensions is related to the Peabody.

The Peabody Picture Vocabulary Test is designed to measure a subject's verbal intelligence. Since neither of the two dimensions identified in the designed instrument correlated with the Peabody, it might well be assumed that neither was a measure of verbal intelligence.

If it can be said that the two dimensions of the instrument do not represent verbal intelligence, then what is being measured? Analysis of the data does not permit definitive identification; only assumptions can be made.

Nunnally (1972) states that intelligence measures tend to concentrate on the factors of "verbal comprehension", "general reasoning", "seeing relationships", and "numerical facility". By this, the possibility exists that the two emerging dimensions could be measures of "general reasoning" and "seeing relationships".

Bourne (1968) suggests that any concept has two critical features. First, there are the "defining attributes", the physical characteristics which represent the necessary distinctions among things. The second feature, according to Bourne, is the "rule". He defines this as "a relation between or an operation on relevant attributes which elaborates a two-class partition of stimulus objects" (p. 231). To solve a problem, then, the student must attend to <u>both</u> the relevant attributes <u>and</u> the rule of the concept.

It could be concluded that there is a relationship between Bourne's two critical features of a concept and the factors of "general reasoning" and "seeing relationships". If a child is able to distinguish the relevant features in a group of perceptual arrays, and then define the respective rule of the relation, it would seem that he is utilizing these two factors to accomplish this. More investigation is needed to bolster the validity potential of this assumption.

Recommendations for Further Research

The following recommendations are directed in the main toward the limitations of the present study.

1) The target population should be expanded to include at least 200 pre-school children from Newfoundland.
2) The WPPSI (Wechsler Preschool and Primary Scale of Intelligence) should be used to conduct further validity studies on the devised instrument. (The unexpected lack of correspondence with the Peabody Picture Vocabulary Test might thus be mitigated--besides, some further contributing element might be uncovered. Admittedly, use of the WPPSI would require a certified administrator.)
3) Using the results obtained on the WPPSI, Dimension 1 and Dimension 2 of the devised instrument should be further identified.
4) Should the dimensions be identified, additional task items need to be constructed, not merely to lay the ground for reliability studies.
5) A study of stability (of the two dimensions in question) over time should be made.
6) The theory of Rommetveit should be correlated against other conceptual stage theories, when they are used as means of determining the stage of a subject's response.
7) Further investigation of the applicability of conceptual attainment theory is needed.

* * *

Conceptualization is quite possibly the principal process by which man expands his perceptions and orders his experiences. The sustaining conviction throughout the present study has been the belief that the ability to discern a relationship in a perceptual array is a vital aspect of this same conceptualizing process. If so, the question for the educator becomes: "If a child were to 'see' a relationship in a given array, how could we know it?"

By the investigative process described in this study, that of constructing a task-oriented instrument which allows a child to signal (or not) a relationship (i.e. "concept") and then to verbalize it (or not) it would seem that "the abstract concept . . . has been turned into an objective thing", to borrow the language of Jacob Bronowski (1977). Within the limitations of the present study, it has been demonstrated that the conceptual stage theory of Rommetveit can be used to rate several levels of relation-discernment in a group of perceptual arrays; given this, it is possible to draw distinctions between the performance of one child and another. The devised instrument would seem to be worth refining further, then to be incorporated into a systematic instructional program for promoting conceptual abilities.

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APPENDIX A

Presented with Tasks 1 - 12

Researcher: Can you put those things that go together in some way in the buckets for me?

(Child completes task)

Can you tell me why you put those together?

Presented with Tasks 13 - 15

Researcher: Can you look at those things carefully and put them in order for me?

(Child completes task)

Why did you put those things like that?

CHILD 1 - SUSAN (S)

Task 1

S: Because they belong together.

R: O.K. Why do they belong together?

S: Because they're squares, and that's the shape of a triangle, but I don't know what it's called.

R: Can you think of any other reason, or put them together in a different way? (Child fumbles with objects, makes a figure, but does not respond verbally).

Task 2

R: Can you tell me why you put them in the buckets like that?

S: Because they're squares and that's not.

R: Can you think of any other reason, Susan, or put them together in a different way? (Child again attempts to manipulate figures).

Task 3

R: Can you tell me why, Susan, you put those two things in one bucket and those two things in the other bucket?

S: Because that's a triangle and that's a line and that's a square and that's a square.

R: O.K. Susan, but why? Why did you put those two together, and those two together?

S: Because they don't belong together.

R: Why don't they belong together?

S: Because they're different shapes.

R: Anything else, any other reason?

S: I can make something with those.

R: Maybe after; I have some more things for you to do now.

Task 4

R: O.K. Let's see what you did. You put them all in the same bucket. Why Susan? Why did you put them all in one bucket?

S: Because they all belong together.

R: Why do they all belong together?

S: Because they're all triangles.

R: O.K. Can you think of any other reason they belong together, or can you put them together in some other way?

S: Because they all belong together.

Task 5

R: O.K. Why Susan? Why did you put those things together in the bucket?

S: Because they're all lines.

R: They're all lines, and that's why you put them all together in the bucket. Any other reason?

S: Yep, because I can make something with them.

R: Can you put them together in some other way, Susan?

(Susan does not respond).

Task 6

R: Very good. Can you tell me why, Susan, you put those things together in the buckets?

S: Because they belong together - they're squares, and they're rectangles.

R: O.K. Any other reason, Susan? Can you think of any other reason you put them together in the buckets like that, Susan? (No response) Can you think of any other way to put them in the bucket, Susan?

S: I can make something with them.

Task 7

R: O.K., you put them all in the same bucket. Why Susan?

S: Because they're all lines.

R: Because they're all lines, that's why you put them all together?

S: (Affirmative nod)

R: Any other reason, Susan?

S: No.

Task 8

R: O.K. Susan, why did you put those things together?

S: Because those belong together and that belong together.

R: Why do they belong together, Susan?

S: Because these are porcupines and that's a butterfly.

R: Very good. Any other reasons, Susan, that you can see?

S: No.

R: Can you see any other way these things might go together?

S: (Shakes head no).

Task 9

R: You put them all together, did you? O.K. Can you tell me why, Susan? Why did you pull all of them together?

S: Cause they're all squirrels.

R: Because they're all squirrels. O.K. Can you think of any other reasons, Susan? (Shakes head no). Can you think of any other way you can put them together.

S: No.

Task 10

R: O.K. Susan, tell me why. Why did you put those things together?

S: Because those three bears belong together and that don't because that's a baby deer, that a giraffe, that's a Newfoundland dog.

R: O.K., and those three belong together. Why do they belong together?

S: Because they're not scaredy and they aren't.

R: Is that the only reason?

S: (Nods head yes)

R: Can you think of any other way you can put these things together?

S: (Shakes head no).

Task 11

R: O.K. Susan. Can you tell me why you put these two together, and why you put these two together,

S: Because, those are dogs and those are not.

R: Any other reason, Susan?

S: Because those are scaredy (the dogs) and those aren't.

R: Why did you say that?

S: Because dogs don't, sometimes dogs bite and sometimes dogs, dogs barks. But those, the lion growls, and bulls don't make a noise. And they (the buffalo and lion) can eat.

R: O.K. Anything else?

S: (Shakes head no).

R: Can you put them together in some other way?

S: No.

Task 12

R: O.K. Susan, you put them all together. Can you tell me why you put them all together?

S: Cause they all know how to swim.

R: Because they all know how to swim; any other reason?

S: Because fish can swim, and they all can swim.

R: Can you put them together in some other way, Susan?

S: No.

Task 13

S: What's order?

R: Put them on the table how they go - 1, 2, 3, 4

S: (Orders objects)

R: Very good, Susan. Why did you do that?

S: (No response)

R: Why did you put them like that, Susan?

S: (No response)

R: O.K. That was good, honey.

Task 14

S: (Orders objects)

R: Why did you do that, Susan?

S: Cause they're all lines.

R: O.K. But why did you put them like that? That one first, that one second, that third, and that fourth?

S: Cause that's the way it's suppose to be.

R: O.K. I have one more for you to do.

Task 15

S: (Orders objects)

R: O.K. Why did you put them like that, Susan?

S: Because, they look nice like that.

R: But why did you put that one first, that second, third, and fourth?

S: Because I like it that way.

R: O.K. Very good.

CHILD 2 - ENID (E)

Task 1

R: Can you tell me why you put those things together in the bucket like that?

E: I don't know.

R: You don't know why. (Points to squares) Why did you put these objects together, Enid?

E: Um (long pause) Um

R: You put all these three objects in this bucket, and you put this one in this bucket. Why, Enid? Do you know why you think these three go together?

E: (No response).

R: O.K. Let's try the next group.

Task 2

R: O.K. Enid, very good. Can you tell me why you put these things together in the bucket?

E: Well, because, um (pause)

R: Can you tell me why, sweetheart, you put them like that?

E: Um (long pause).

R: You put all these three objects in one bucket, Enid, and this object in another bucket. Why, Enid? (pause) Do you know why?

E: (Shakes head no).

R: O.K. Enid. Let's try some more. You doing a fine job.

Task 3

R: O.K. Can you tell me why? You put those things in that bucket, didn't you, and you put these two objects together in this bucket. Why, Enid?

E: Well, it's because these are the big things and these are little. The little ones are so little we put them in this one, and we put the big ones in this one.

R: That's very good, Enid. O.K. Can you think of any other reason?

E: (Shakes head no)

R: Can you think of any other way to put them together in the buckets?

E: No.

R: O.K. Let's go on.

Task 4

R: Can you tell me why, Enid, you put those objects together?

E: Well, because they're all squares, um, I mean triangles.

R: O.K., you put these three together because they're all triangles. But what about this other one, Enid, you put it in the other bucket. Why?

E: Well, because, it's a triangle too.

R: O.K., why did you put it in the other bucket?

E: (No response).

R: You put these three together in one bucket, didn't you; and then you put this one in another bucket. How come?

E: This one's big, because it goes in there (points to bucket), and this one's are small and they go in there.

R: I see. Can you think of any other reason why you put them together like that?

E: (No response)

R: Can you think of any other way to put them together? (Shakes head no). O.K. Let's go on.

Task 5

R: O.K. Enid, tell me why you did that. You put two of them in one bucket, and two of them in the other bucket.

E: Well, it's because they're the same and that (pause) right?

R: O.K., and you put two of them in this bucket and two of them in the other bucket. Why? Do you know why?

E: (Shakes head no)

R: O.K.

Task 6

R: Can you tell me why you put them like that?

E: Because these are little squares, and these are red triangles.

R: And that's why you put them in the buckets like that. Can you think of any other reason?

E: (Shakes head no)

R: Can you think of any other way to group them? Any other way to put them in the buckets?

E: (Picks up objects and groups them in buckets in the same way).

R: You put them in the same as before. That's how you think they go together, right?

Task 7

R: O.K. Enid, can you tell me why? Why did you put those things together?

E: 'Cause these are little, this one's little, and this one's little, these are both little, and this ones are big, so I put them in there.

R: Can you think of any other reason?

E: Yes, because this is the same color as that.

R: O.K. That's very good. Can you think of any other way to group them, put them together in the buckets?

Task 8

R: O.K. Can you tell me why, Enid, why did you put them like that? You put those two in the bucket gether, and you put these two in the bucket together. Why, Enid?

E: Because those are both the same (points to two porcupines).

R: What about the other two?

E: These are both the same (butterfly and porcupine).

R: O.K. Can you think of any other reason, Enid? Can you think of any other way to put them in the buckets?

E: (Shakes head no).

R: O.K. We'll go on.

Task 9

R: Can you tell me why? Why, Enid, did you put those two together and why did you put these two together in the buckets?

E: Well, these two are both the same things (squirrel and beaver), and these are too.

R: These two are the same and these two are the same (Enid nods head yes). Can you think of any other reason, Enid? (No response). Can you think of any other way to put them in the bucket?

E: (Puts objects in the buckets the same way as before).

R: You put them together the same way again, didn't you? O.K. I have some more for you to do.

Task 10

R: O.K. Enid, can you tell me why? Why did you put these two things together and why did you put these two things together?

E: Because these are like a pretty color and black and brown (the giraffe and the dog).

R: O.K., and why did you put these other two things together?

E: 'Cause they're both brown and black.

R: O.K., can you think of any other reason? (No response). Can you think of some other way to group them together in the buckets?

E: No.

Task 11

R: O.K., you put these two together and you put those two together, can you tell me why, Enid?

E: 'Cause these are the same animals.

R: They're the same? They look alike, do they?

E: Yes.

R: They look the same. What about the other two? Why did you put them together?

E: These are both the same animals (pointing to dogs), but these don't look the same.

R: What kind of animals are the other two?

E: They're dogs.

R: Can you think of any other reason, Enid? (No response). Can you put them together in some other way?

E: (Puts objects in same groups in the buckets).

R: You put them together the same way as you did before, didn't you? Why, Enid?

E: I don't know.

Task 12

R: O.K., can you tell me why? Why did you put these things together and why did you put these things together?

E: Because these are the same color (frog, lizard) and these two go together (fish, turtle).

R: How do they go together?

E: (Shrugs shoulders).

R: Can you think of any other reason why you put them together like that? (No response).
Can you think of any other way to put them in the buckets, Enid? (Enid regroups objects).

R: Oh, you put them in the buckets in a different way. Can you tell me why, Enid? Why did you put those two things together (frog turtle)

E: It's because this one and this one go together 'cause they go in water (frog and turtle) and those one goes in a cage some time (lizard) and this one goes in the water (fish).

R: Can you think of any other reason?

E: No response.

Task 13

E: (Manipulates objects).

R: Enid, why did you put them like that?

E: 'Cause they tried to fit together.

R: Are they in order?

E: I don't know.

R: O.K. Fine.

Task 14

E: (Manipulates objects).

R: Why did you put those things like that, Enid?

E: 'Cause they're the same thing.

R: Any other reason?

E: (Shakes head no).

R: Are they in order:

E: I don't know.

R: O.K. Let's go on.

Task 15

E: (Manipulates objects).

R: Are you finished?

E: Yes.

R: Why did you put them like that, Enid?

E. 'Cause they make a fort.

R: Oh, I see. Are they in order?

E: (No response)

R: Any other reason why you put them like that?

E: I don't know.

R: O.K. Fine.

CHILD 3 - KIM (K)

Task 1

R: You put those three things in one bucket, Kim; can you tell me why?

K: Um, um, I don't know why.

R: You put these three things together in the bucket. How come?

K: Um, 'cause you told me to.

R: I asked you to put those things that go together in the bucket, but I didn't tell you which things to put in the bucket. You chose to put those three things in the bucket. Can you tell me why?

K: Um, I don't know.

R: O.K., we'll try some more.

Task 2

R: O.K., you put those things together in the buckets, right? Can you tell me why you put those two things together in the buckets?

K: (No response)

R: Can you think of a reason why, Kim?

K: (No response)

R: O.K. I have some more things for you to do, Kim.

Task 3

R: Fine, Kim. You put these two things in one bucket, and you put these two things in the other bucket. Why, Kim? Why did you do that?

K: (Shrugs shoulders)

R: O.K., let's go on to the next ones.

Task 4

R: Can you tell me why, Kim, you put these three things together in one bucket and you put this one all by itself? Why, Kim?

K: I don't know why.

R: You did a good job, Kim. You look at these three things real carefully. You put them together in one bucket. Why, Kim?

K: (No response).

R: Let's go on, Kim.

Task 5

R: You put them all together, didn't you Kim. That was very good. Can you tell me why, Kim, you put all those things in the same bucket. Why, can you tell me why?

K: I, um, because you, um, 'cause, I ..., I did it.

R: You did a good job, you did a super good job. I asked you to put those things that go together in the buckets. Why did you put them in the buckets like that, Kim?

K: 'Cause, 'cause you told me to. I, I

R: O.K. You did a real good job of putting them in the buckets. I have some more things for you to do.

Task 6

R: O.K., Kim. You're doing a real good job. Can you tell me why this time, Kim, you put those things in one bucket, didn't you, and you put these things in another bucket? Why, Kim, why did you put them in the buckets like that?

K: I still don't know.

R: O.K. honey.

K: I can't help it.

R: Let's look at some more, Kim. You're doing a fine job.

Task 7

R: That's very, very good, Kim. You put these two things in one bucket, didn't you, and you put those two things in the other bucket. Why did you do that, Kim? How come? Why do you think these two go together, and why did you put these two in the other bucket?

K: Because these two are small, and these two are big.

R: That's very, very good. And that's why you put these two together in one bucket, and these in the other. O.K. Can you think of any other reason.

K: No.

R: I have some more things for you to do.

Task 8

R: Very good, Kim. You put those three things in one bucket. Why, Kim? Why did you put them together in the bucket?

K: 'Cause those three things are the same size and this one thing is the same.

R: Can you think of any other reason why you put them together? Why else did you put them together like that in the bucket?

K: 'Cause you told me to.

R: Did I tell you to? I asked you to put them in the buckets, but I left it up to you on how to put them together. You could put them any way you like. Let's look at some more, Kim.

Task 9

R: Very good, Kim. You're doing a fine job. Why did you put these three together and why did you think this one was different?

K: 'Cause that never had a long tail like those.

R: O.K., very good. These three all have long tails and this one doesn't. That's real good, Kim. Can you think of any other reasons?

K: Nope.

R: Can you think of any other way to put them together in the buckets?

K: Nope.

Task 10

R: Why did you put those two (dog, deer) together, Kim?

K: Because they were both dogs.

R: O.K., and why did you put the other two together (three bears, giraffe)?

K: 'Cause they were both dogs, and they're bears and a giraffe, and they, um, both belong to the zoo.

R: Oh, that's a real good reason, Kim. Can you think of any other reason?

K: I don't think so.

R: Can you think of any other way to put them together?

K: Nope.

Task 11

R: O.K., you put these together in one bucket, and you put these together in another bucket; can you tell me why?

K: 'Cause those two are dogs, and those two are a bull and a dog; but those belong to a house and those belong to a zoo.

R: O.K., that's very good. Can you think of any other reason?

K: Um, I don't know.

R: Can you think of any other way to put them together?

K: 'Cause those two have a yellow back (buffalo, lion).

R: O.K. Can you think of any other way you can put them together in the buckets?

K: Nope.

Task 12

R: O.K., Kim, very good. Can you tell me why you put these two things in one bucket and you put these two things in another bucket?

K: 'Cause those two things belong in the water (frog, fish) and those two things belong in to the sand.

R: Oh, those two things belong in the sand and these two things belong in the water. Can you think of any other reason?

K: Nope.

R: Can you think of any other way you can put them in the bucket?

K: I don't think so.

Task 13

(After four proddings with the instructions, child could not complete task).

Task 14

(Child manipulates objects).

K: No, I don't know.

R: O.K. Let's go on.

Task 15

K: (Orders objects)

R: O.K., Kim, very good. Can you tell me why you put them like that? Do you know why you put them like that?

K: No.

CHILD 4 - MARK (M)

Task 1

R: Q.K. Mark, very good. Can you tell me why you put those things together in the buckets?

M: 'Cause you told me to.

R: You're part right. I asked you to put those things that go together in the buckets. But why, Mark, do those things go together? Can you tell me why? Why did you choose to put these three things together in the buckets?

M: I don't know.

Task 2

R: O.K. Mark, why did you put those things together in the buckets? You put these two things in the bucket (medium square, large square) and you kept these two things out. Why, Mark?

M: 'Cause I know about these two (small square, trapezoid). They aren't exactly alike.

R: Those two, they're not alike. What about these two, Mark (medium square, large square). What about these two that you put in the bucket?

M: They were exactly alike, like a square.

R: O.K., they're exactly alike. Are they exactly alike?

M: (No response)

R: Can you think of any other reason, Mark?

M: (Shakes head no)

R: Can you think of any other way to put them in the buckets?

M: (Shakes head no)

R: O.K., let's go on.

Task 3

R: (After prompting the child three times to do the task)

M: These two things look together.

R: Those two things go together?

M: They look together.

R: How do they look together, Mark?

M: Because, 'cause, 'cause they, 'cause they fits together, and (small square, long rectangle)

R: And these two things, they don't go together at all (triangle, rectangle). Can you think of any other reason, Mark?

M: (Shakes head no)

R: O.K. Mark, you look at them again. Can you think of any other way you can put them together?

M: (Manipulates objects, places large rectangle, long rectangle in bucket).

R: Oh, you put those two things together. How come, Mark? Why did you put those two things together?

M: They almost look the same.

R: They almost look the same? How do they almost look the same?

M: 'Cause that almost fits there.

R: O.K. Can you think of any other reasons, Mark?

M: (Shakes head no)

R: O.K., let's go on.

Task 4

R: O.K. You're putting these three things in the bucket. You're saying they go together, are you, Mark?

M: (Nods head yes)

R: Why, why do they go together, Mark?

M: 'Cause they look together.

R: How do they look together?

M: They're all triangles, small ones.

R: Oh, what about the other one?

M: That one's too big.

R: It's too big, so that one doesn't go with the other ones, is that right?

M: Yep.

R: O.K., can you think of any other way you might put them in the buckets?

M: Nope.

R: I have some more for you to do.

Task 5

R: O.K., Mark, that's very good. Why did you put them all in the bucket together?

M: 'Cause they look together. There's four and four.

R: Oh, they're all the same then, is that right?

M: (shakes head)

R: Is that a yes?

M: Yes

R: O.K. Can you think of any other reason?

M: No:

R: Can you think of any other way you can put them together?

M: (Shakes head no).

Task 6

R: O.K. Mark, why did you put those in the buckets?

M: They look together.

R: They look like they go together?

M: Ya

R: Why?

M: 'Cause they're the same color and the same shape.

R: Any other reason that you can think of?

M: (Shakes head no)

R: Can you put them together in another way?

M: (Shakes head no)

R: O.K., that's very good.

Task 7

R: O.K., in one bucket you put these two things together. Why, Mark?

M: 'Cause they look the same and these two don't.

R: How do they look the same?

M: 'Cause they're, they're the same shape and the same color.

R: And what about those two.

M: They're not the same; one's long and one's short and they're not the same color.

R: Can you think of any other way you can put them together? No? O.K., I have some more for you to do.

Task 8

R: O.K., you put these three together. Why, Mark?

M: 'Cause they look the same.

M: And that one didn't.

R: Can you think of any other reason why? Can you think of any other way to put them together? We'll go on and do the next ones.

Task 9

M: They look the same.

R: O.K., you're going to put those two together (squirrel, squirrel) because they look the same. What about these other two (squirrel, beaver)?

M: They don't look the same.

R: Why, Mark, why do these two look the same? Can you tell me why?

M: The two tails are sticking up, and the two heads are the same, and the ears are the same.

R: And what about these other two, Mark?

M: They don't look the same.

R: Those two don't look the same. Can you think of any other reason, Mark? (Shakes head no). Can you think of any other way you can put them together? No? O.K., let's go on.

Task 10

R: Why, Mark, did you put these two (dog, bears) in the buckets together?

M: 'Cause that's black, and that's black, and that's black, and black and got a black nose.

R: O.K., and why did you put those two (giraffe, deer) together, Mark?

M: 'Cause his eyes almost looks like black, and black, and black and his ears black.

R: Can you think of any other reason, Mark? No? O.K., can you think of any other way to put them in the buckets? No? I have some more for you to do.

Task 11

R: Why did you put those two things (buffalo, lion) together, Mark?

M: They look the same.

R: Those two things, they look the same, do they?

M: Yep.

R: O.K. then, why did you put these two things (dog, dog) in the bucket?

M: 'Cause they're both dogs.

R: And the other two, they look the same, do they?

M: Yep.

R: How do they look the same? (No response) Are they the same thing?

M: Ya, a little bit. But this one's not (buffalo). It looks like a different tiger.

R: O.K., can you think of any other reason, Mark?

M: Nope

R: Can you think of any other way to group them together?

M: Nope

R: I have one more for you to do.

Task 12

R: You put these three things in the bucket together. Why, Mark?

M: 'Cause, I got that one 'cause it's green, and green, and there's green in there.

R: So you put all those in the bucket together because they're green. What about this other one?

M: Not green.

R: Can you think of any other reason? Can you think of any other way to put them together?

M: Nope.

R: Thank you, Mark, very much.

Task 13

M: (Manipulates objects)

R: Fine. Are you finished?

M: (Nods head yes)

R: Why did you put those like that, Mark?

M: 'Cause they go like that.

R: Are they in order?

M: (Shrugs shoulders).

R: O.K., let's go on.

Task 14

M: (Manipulates objects)

R: Why did you put those like that, Mark?

M: They're sort of the same, but not the same.

R: O.K. But are they in order?

M: I don't know.

R: O.K., fine.

Task 15

M: (Manipulates objects)

R: Why did you put them next to each other like that, Mark?

M: 'Cause they go next to each other.

R: Are they in order?

M: I don't know.

R: O.K.

CHILD 5 - NADINE (N)

Task 1

R: (After three promptings with instructions)

O.K., Nadine, you put those three things together in the buckets. Why? Why did you put those three together in the buckets?

N: 'Cause they look alike.

R: How do they look alike?

N: Because they're shaped like a square.

R: O.K., and what about this one? You didn't put that in with it, how come?

N: 'Cause it don't look alike.

R: O.K. Any other reason?

N: No.

R: Can you think of any other way to put those things in the bucket together?

N: (Shakes head no).

Task 2

R: You put those two things together in the bucket, why, Nadine? Why did you put those two things together in the bucket?

N: 'Cause they look alike.

R: They look alike, do they? Any other reason why?

N: 'Cause they look alike.

R: You didn't put these two things in the bucket. Why?

N: Because they don't look alike.

R: They don't go together with any of these? No? O.K. Can you think of any other reason? No? O.K., let's go on.

Task 3

N: These two go together.

R: Those two go together, do they? What about the other two?

N: They don't belong.

R: Why do those other two things go together, Nadine?

N: I don't know. 'Cause they look alike.

R: How do they look alike? Do you know how they look alike?

N: 'Cause they're shaped like a square.

R: What about these two things?

N: This one's a triangle rectangle

R: O.K. Can you think of any other reason? No? Can you think of any other way to put them together? O.K., how about the next ones I have for you?

Task 4

N: These four go together.

R: They all go together, do they?

N: Ya.

R: Why do they all go together, Nadine?

N: 'Cause they're shaped like triangles.

R: O.K. Can you think of any other way you can put them together?

N: (Reputs the objects in bucket in same way)

R: O.K., you put them all together in the buckets again. Can you think of any other reason why?

N: No.

R: Fine. I have more for you to do.

Task 5

R: You put them all together in the buckets, didn't you? Why, Nadine? Why did you put those things all together in the buckets?

N: 'Cause they're shaped like a rectangle.

R: Any other reason?

N: 'Cause they're all the same kind.

R: Can you think of any other way to put them together in the buckets? No? Let's go on.

Task 6

R: You put these two in the buckets. Why, Nadine? Why did you put them together in the buckets (red objects).

N: 'Cause they're shaped like a rectangle.

R: What about these two?

N: 'Cause they're shaped like a square.

R: So they go together, then, do they?

N: Yes.

R: Any other reason why?

N: 'Cause they aren't like these.

R: O.K., can you think of any other reason?

N: 'Cause they're red, but these are not red color like those.

R: O.K. Can you think of any other reason?

N: I don't know

R: Can you think of any other way to put them together in the buckets?

N: I don't know.

R: I have more for you to do.

Task 7

R: You put those two things together. Why, Nadine?

N: 'Cause they look alike.

R: Why did you put the other two together?

N: 'Cause they look alike, except this one's red but this one's green, and this one's small, but they still look alike.

R: Can you think of any other way to put them together in the buckets? Any other way they go together?

N: No.

R: O.K., that's very good.

Task 8

R: O.K., you put these three things together. Why, Nadine?

N: Because they are brown and they look alike.

R: And what about this one?

N: 'Cause that one don't look alike, that's just a butterfly.

R: Can you think of any other reason? No? Can you think of any other way to put them together in the buckets?

N: No.

Task 9

N: These all go together, see. These are chipmunks, all of these are chipmunks.

R: Do they all go together?

N: Yep.

R: Can you think of any other reason why?

N: No.

R: Can you think of any other way to put them together in the buckets?

N: (Puts them all together in the bucket again) 'Cause they're all chipmunks and chipmunks again.

R: O.K., that's very good.

Task 10

N: Only one thing goes together.

R: Oh, are you saying all these go together?

N: No.

R: I'm sorry. You're saying that none of them go together.

N: That one goes in there, and that one in there, and in there and there (all separate).

R: Why?

N: 'Cause they don't look alike.

R: Any other reason?

N: 'Cause this is a giraffe, and this a tiger and this is a deer and this is, I don't know what you call it.

R: So none of them go together.

N: No.

R: O.K. That was very good. Let's go on.

Task 11

N: These two go together and these two go together.

R: O.K. Can you tell me why, Nadine, you put those two together?

N: 'Cause those two look alike and these two look alike, 'cause these are two dogs and these are two tigers.

R: O.K., can you look at them real carefully and put them together any other way?

N: These are dangerous (2 tigers), but these are dangerous too 'cause they might bite you.

R: So they're all alike in that way.

N: Ya

R: Any other reason.

N: No.

R: I have one more for you to do.

Task 12

N: These are green, so they go in the bucket (fish, lizard, frog).

R: O.K. Any other reason?

N: No.

R: Can you put them together in the bucket in some other way?

N: No.

R: Fine. We're finished now.

Task 13

N: That's the father (large triangle), and that's the baby (small triangle), and that's the big sister (first medium triangle), and that's the mother (second medium triangle), and they look alike. (Child then manipulates objects into a shape).

R: Why did you put them together like that?

N: 'Cause they look alike.

R: O.K.

Task 14

N: (Manipulates objects)

R: Why did you put them together like that?

N: Because, see, they look like together. See?

R: O.K. Any other reason?

N: (Shakes head no)

R: O.K. What about these last ones I have for you to do?

Task 15

N: (Manipulates objects)

R: Why did you put them like that, Nadine?

N: 'Cause this is the mommy (brown rod), this is the big sister (black rod), this is the baby (dark green rod), and this is the daddy (blue rod).

R: Can you put those things together in some other way, Nadine?

N: (No response)

R: Fine.

CHILD 6 - JOHN (J)

Task 1

R: You put these three things all together in the bucket. Why?

J: I don't know.

R: Do they go together somehow? How do they go together?

J: (Shrugs shoulders)

R: You don't know? O.K., let's try another one.

Task 2

R: O.K. John, very good. Can you tell me why you think those things go together? Why?

J: I don't know.

R: O.K., what about these two things. You didn't put them in the bucket, how come? Do they go together? Can you look at them. You put these two things in the bucket, didn't you? Can you think of a reason why?

J: No.

R: O.K., let's go on.

Task 3

R: O.K., they go together, so you put them in the same bucket, didn't you? How come, John? Why do they go together?

J: 'Cause they're the same shape.

R: 'Cause they're the same shape. What about these two? You didn't put them in the bucket; how come?

J: (No response)

R: Can you think of any other reason why you put those together in the bucket?

J: No.

R: Can you think of any other way you might put them in the bucket together?

J: (Nods head yes)

R: O.K. If you can, let's see. You put the same two in the bucket again, didn't you? Let's go on to the next one.

Task 4

(After being prompted with the directions three times)

R: You put them all in the same bucket, didn't you? How come? Why did you put them all in the same bucket, John?

J: 'Cause, they're the same thing.

R: Oh, any other reason?

J: No.

R: Can you think of any other way they might go together?

J: (Nods head yes)

R: Fine. Put them in the buckets if you think there is any other way they might go together.
You put them all in the same bucket again. That's how you think they go together, do you? O.K.

Task 5

R: You put them all in the same bucket. Why, John?

J: 'Cause they're the same shape.

R: 'Cause they're the same shape. Any other reason?

J: No.

R: Can you think of any other reason you put them all together in the same bucket? Why else might they go together?

J: Same color.

R: 'Cause they're the same color. O.K. Can you put them together in the bucket in a different way? Do they go together in a different way?

J: (Reputs objects in bucket)

R: You put them in the same bucket again, didn't you?

Task 6

R: You put these two in one bucket and you put these two in another bucket. Why, John? Why did you put these two in one bucket and these two in another?

J: 'Cause these are the same and these are the same, and these are red.

R: O.K. Any other reason?

J: No.

R: Can you think of some other way to put them in the buckets? You put them all together in the buckets this time. How come?

J: 'Cause.

R: Do they go together like that? Do they somehow go together?

J: Ya, these 2 (red rectangles) go together and these two (neutral squares) go together.

R: Fine.

Task 7

R: You put these two together in the buckets, didn't you? How come, John?

J: 'Cause they're the same shape.

R: 'Cause they're the same shape. Any other reason?

J: (Shakes head no).

R: Can you think of some other way they might go together? How else do they go together?
Oh, you put them in the buckets in the same way again. Fine.

Task 8

R: You put these three together in the bucket, didn't you? Why, John?

J: 'Cause they're the same shape.

R: Any other reason?

J: No.

R: Can you think of any other way they might go together in the buckets?
You put them all together again in the same way.

Task 9

R: Why did you put these two (brown squirrel, brown squirrel) in the buckets together?

J: 'Cause they're the same thing.

R: Because they're the same thing, are they?

J: Ya.

R: And what about these two, John? Why did you put them in the buckets together?

J: 'Cause they're the same thing, too.

R: You look at them real carefully. Any other reason why you put them in the buckets together?

J: No.

R: Can you think of any other way you might put them in the buckets together?

J: Yep.

R: Oh, you put them in the buckets in the same way again.

Task 10

R: Why did you put these (three bears, dog) together in the buckets?

J: 'Cause they're both standing up.

R: 'Cause they're both standing up. Are they both standing up?

J: No.

R: Why did you put these two (giraffe, deer) together?

J: 'Cause they're lying down.

R: Any other reason?

J: No.

R: Can you look at them real carefully and think of any other way they might belong together?
You put them in the buckets in the same way again, didn't you?
O.K.

Task 11

R: Why did you put these two things together, John? And why did you put these two things together?

J: 'Cause these are puppies and these are lions.

R: Are they both lions?

J: Yep.

R: Are they the same thing?

J: No.

R: What's different about them?

J: They have the same hair all over them, right here.

R: And these other two, how are they the same?

J: 'Cause they're the same color.

R: Any other reason? Can you think of any other way you might put them together in the buckets?
You did the same thing again, didn't you? That's how you think they belong together.

Task 12

R: You put these two in the buckets together, and you put these two in the buckets together. Why, John? Why did you put these two (fish, turtle) together?

J: 'Cause this is a little flat, and this is.

R: And what about these two, why did you put those in the bucket together?

J: Because they're the same color green.

R: Are they the same color green?

J: Yes.

R: Can you think of any other reason you put them together? No? Can you think of any other way these things might belong together? No? That's fine. Thank you, John.

Task 13

J: (Manipulates objects)

R: Why did you put them like that, John?

J: 'Cause it looks like, shape.

R: O.K., let's go on.

Task 14

J: (Put purple and yellow rods next to each other, then a distance away put red and light green rods next to each other).

R: Can you tell me why you put them like that?

J: 'Cause they're the same shape.

R: O.K., fine. Any other reason?

J: (No response)

R: Let's go on.

Task 15

J: (Put blue and brown rods next to each other; then a distance away put black and dark green rods next to each other).

R: Why did you put them like that, John?

J: Because they're the same shape.

R: Any other reason?

J: (Shakes head no)

R: O.K. Fine.

CHILD 7 - PETER (P)

Task 1

R: You put them all in the same bucket, did you? Do they all go together?

P: (Nods head yes)

R: Is that a yes? They all go together. Do you know how they all go together? You look at them real carefully. Can you tell me how they all go together? Why do they go together?

P: (Shrugs shoulders)

R: You don't know. O.K. Let's go on and look at some others real carefully.

Task 2

(After two attempts)

R: O.K., that was very good. Can you tell me why? Why, Peter, did you put these two in the buckets, and why did you put those two together in the buckets? Can you tell me why?

P: (Nods head yes)

R: O.K., you tell me why.

P: 'Cause these two are square, and this one is a little square (large square and medium square).

R: O.K., and why did you put these other two together?

P: (No response)

R: Can you think of a reason why you put these two together?

P: (Shakes head no).

R: O.K. Can you think of any other way you might put them together in the buckets?

P: (Shakes head no).

R: O.K.

Task 3

R: O.K., that was fine. Why, Peter, did you put these two things in one bucket and these two things in another bucket? Can you think of a reason why?

P: (Shakes head no)

R: No? O.K.

Task 4

R: You put them all in the same bucket, did you? That was really fast. Why, Peter? Why did you put all of those together in the same bucket?

P: (Shrugs shoulders)

R: You don't know? There must have been a reason. You looked at all of them and you put them together in the bucket. Why, Peter?

P: (Shrugs shoulders)

R: No? O.K.

Task 5

R: You put them all in the same bucket again, didn't you? Why, Peter? Why did you put them all in the same bucket? Why do you think they go together? There must be a reason.

P: (Shakes head no)

R: No reason? What is it about these, Peter, that makes them the same?

P: (Shrugs shoulders)

R: O.K. Let's go on.

Task 6

R: O.K. You put these two together in the buckets (red rectangles). Why, Peter?

P: 'Cause they're the same.

R: How are they the same?

P: (Shrugs shoulders)

R: Don't know? O.K. What about these other two? Why did you put them together in the bucket?

P: (Shrugs shoulders)

R: You don't know? What about them, why did you put them together?

P: 'Cause they're the same too.

R: 'Cause they're the same too. Can you think of another reason?

P: (Shakes head no)

R: Can you think of some other way to put them together in the buckets?

P: (Shakes head no)

R: O.K.

Task 7

R: You put these two in one bucket, and you put these two in another. Why, Peter?

P: (No response)

R: You put these two together. Can you think of a reason why? (dark green rectangle, dark green rectangle)

P: No.

R: What about these two? Why did you put them together?

P: (Shrugs shoulders)

R: O.K., let's go on.

Task 8

R: Why did you put these three in one bucket, Peter?

P: 'Cause they're all the same.

R: O.K., 'cause they're all the same. Any other reason?

P: No.

R: And what about this one? Why didn't you put that in the bucket, Peter?

P: It's not the same.

R: How is it different?

P: (Shrugs shoulders)

R: Can you think of any other reason why you put them together in the bucket?

P: (Shakes head no)

R: Can you think of another way these things might go together?

P: No.

Task 9

R: You put these two in one bucket, and you put these two in another bucket. Why, Peter?

P: 'Cause that one is like that one (green squirrel, beaver).

R: And what about the other two, Peter?

P: That one is the same as that one (brown squirrel, brown squirrel).

R: Can you think of any other reason why you put them in the buckets together?

P: No.

R: Can you look at them again and put them in the buckets in another way?

P: (Manipulates objects)

R: O.K. This time you put the three of these in one bucket, didn't you?

P: 'Cause they're all the same.

R: Because they're all the same. And this one you put in another bucket.

P: 'Cause that's not the same.

R: O.K., very good. Any other reason?

P: No.

Task 10

R: You put these two (giraffe, 3 bears) in one bucket. Why, Peter?

P: 'Cause they're not the same.

R: What about these two? You put them together in a bucket; why, Peter?

P: I don't know.

R: Can you think of any other way these things might go together?

P: (Shakes head no)

R: O.K.

Task 11

R: You put these two together in one bucket, didn't you? And you put these two together in another bucket. Why?

P: I don't know.

R: Look at them real carefully. Why did you put these two together, and why did you put these two together?

P: I don't know.

R: O.K. I have one more for you to do.

Task 12

R: You put these two things (fish, turtle) together. Why, Peter?

P: They go under water.

R: O.K. They go under water. And why did you put these two things together?

P: 'Cause they don't go under water.

R: They don't go under water. Any other reason?

P: (Shakes head no).

R: Can you think of any other way these things might belong together?

P: No.

Task 13

P: (Manipulates objects)

R: Are those in order, Peter?

P: (Shakes head no)

R: How do they go in order? Can you put them in order?

P: (No response)

R: Why did you put them like that?

P: (No response)

R: O.K. Fine.

Task 14

P: (Manipulates objects)

R: O.K. Why did you put them like that, Peter?

P: (No response)

R: Are they in order?

P: (Shakes head no)

R: Then why did you put them like that?

P: (No response)

R: O.K. Fine

Task 15

P: (Manipulates objects)

R: Why did you put them like that?

P: I don't know.

R: Are they in order?

P: No.

R: What does it mean to put something in order, Peter?

P: (No response)

R: Peter, put them next to each other in order - 1, 2, 3, 4.

P: (Orders objects)

R: Why did you put them like that?

P: They're in order.

R: O.K. That was good.

CHILD 8 - JASON K. (J)

Task 1

(After being prompted six times with the instructions)

R: That's a fine job, Jason. You put this one in one bucket, didn't you, Jason? And you put these three together in another bucket. Why, Jason?

J: I don't know.

R: Why did you put these three all together? Can you think of a reason?

J: (Nods head yes)

R: Why?

J: (No response)

R: You look at them. You put them all together in the bucket. Can you think of a reason why?

J: (Shakes head no)

R: O.K. Let's go on then.

Task 2

R: You put this one in one bucket, didn't you? And you put all these in another bucket. Why, Jason?

J: (No response)

R: Why did you put these three in one bucket. How do they go together?

J: (No response)

R: How are those three alike? Can you think of a reason? You look at them real carefully. You put these three in one bucket, and this one all by itself. Why, Jason?

J: (Shrugs shoulders)

R: You don't know? O.K., let's look at some more.

Task 3

R: You put this one all by itself, and you put these three in the bucket together. Why, Jason?

J: (No response)

R: Can you think of a reason? Why did you put these three in one bucket and this one all by itself in another bucket?

J: (Shrugs shoulders)

R: You look at them real carefully. You put all of them together. Why? Do they belong together somehow?

J: (Nods head yes)

R: O.K. How do they belong together?

J: (No response)

R: You put this one all by itself; it does not belong with the others. Why, Jason?

J: (No response)

R: O.K., let's go on.

Task 4

R: You put them all in one bucket, didn't you? Why, Jason? Why did you put them all in one bucket?

J: (No response)

R: All these things go together, do they?

J: (Nods head yes)

R: Why do they go together?

J: (No response)

R: Can you think of a reason why they go together?

J: (No response)

R: Something about them makes them all alike. What makes them all alike?

J: (No response)

R: O.K. Let's go on to the next one.

Task 5

R: You put them all in the same bucket, didn't you? Why, Jason? Why did you put all of them together in the same bucket?

J: (No response)

R: All of them go together somehow, don't they?

J: (No response)

R: Can you think of a reason why? Why do they go together?

J: (No response)

R: You don't know? O.K., let's go on.

Task 6

R: You put these two in one bucket, didn't you? And you put these two in another bucket, right? Why, Jason?

J: (No response)

R: Why do these two things go together,

J: 'Cause they're red.

R: Because they're red. That's very good. What about these two, Jason?

J: (No response)

R: Why do they go together?

J: Because they're white.

R: Good. Any other reason?

J: (Shakes head no)

R: O.K., let's go on.

Task 7

R: You put these two in one bucket and these two in another. Why, Jason?

J: 'Cause they're green.

R: Because they're green. And what about these two?

J: Red and green and blue.

R: O.K., any other reason why you put them in the bucket together?

J: (Shakes head no)

R: O.K. Any other way you can think of that those things might go together?

J: (Shakes head no)

R: No? O.K.

Task 8

R: You put all these things in one bucket, didn't you? And you put this one in another bucket. Why, Jason?

J: 'Cause these are the same and that don't.

R: Fine. Because all these are the same and that one isn't. Can you think of any other reason?

J: (No response)

R: How are these the same, Jason?

J: 'Cause it has black nose.

R: O.K. Can you think of any other way you can put them together?

J: (Shakes head no)

R: O.K.

Task 9

R: You put these three things together in one bucket, didn't you? Why, Jason?

J: They're all the same.

R: And you put this one in another bucket. Why, Jason?

J: It's not the same.

R: Can you think of any other reason why you put all those things together in one bucket?

J: (Shakes head no)

R: Can you think of any other way those things might go together?

J: (Shakes head no)

R: O.K., fine.

Task 10

R: You put all these three things together in one bucket, didn't you, Jason? And you put that one in another bucket. Why, Jason?

J: This (dog) is black, and this is not.

R: Oh, very good. Any other reason?

J: (No response)

R: Can you think of any other way you might put them together in the buckets?

J: (Shakes head no)

R: O.K.,

Task 11

R: You put this one all by itself in the buckets, and you put these three all together. Why, Jason?

J: 'Cause they're all the same and the other one's not.

R: These are all the same? How are they the same, Jason?

J: 'Cause they're all dogs, and this one is not.

R: O.K. All of these are dogs, are they?

J: Ya.

R: And this one's not.

J: (Nods head yes)

R: Can you think of any other reason?

J: (Shakes head no)

R: Can you think of any other way you might put them in the buckets together?

J: (Shakes head no)

R: O.K. I have one more for you to do.

Task 12.

R: You put all those things in the bucket together, didn't you? Why, Jason? Why did you put these three together?

J: Because these (fish, lizard, frog) are right and this (turtle) is wrong.

R: Because these are right and this is wrong. Why, Jason?

J: 'Cause these are all the same.

R: How are they the same, Jason?

J: 'Cause they're crocodile, fish and frog.

R: And how are they the same?

J: 'Cause they're all blue, and that is not.

R: Any other reason?

J: (Shakes head no).

R: Can you think of any other way your can put those things together?

J: No.

R: O.K. Fine.

Task 13

(After five promptings with the instructions, child could not complete task).

Task 14

J: (Orders objects)

R: O.K. Jason, why did you put them like that?

J: (No response)

R: Do you know why?

J: (Shakes head no)

Task 15

J: (Orders objects)

R: Fine. Why did you put them like that, Jason? Do you know why?

J: (Shakes head no)

R: O.K. Fine.

CHILD 9 - JENNY K. (J)

Task 1

R: (After two promptings with instructions)
These three go together, do they? Who do they go together, Jenny?

J: Because they're squares.

R: O.K. Any other reason?

J: Because, um, they are the same size.

R: Oh, O.K. Any other reason?

J: Because they are little squares and they can't match with big squares.

R: O.K. Can you think of any other way these things might go together?

J: (Manipulates objects)

R: You put them in the bucket the same way, didn't you? That was very good. Let's go on and do the next ones.

Task 2

R: (After two promptings with instructions)
You put all these three in the buckets together, didn't you Jenny?

J: Right

R: Why?

J: Because they were three squares.

R: Any other reason why?

J: Because they are almost the same but that one is bigger than the other one and one is bigger than the other one.

R: Oh, I see.

J: But they're the same size.

R: Any other reason?

J: Because (long pause).

R: Can you put them in the bucket in some other way?

J: (Manipulates objects)

R: You're putting them in the bucket in the same way, aren't you? That was very good, Jenny.

Task 3

J: (Looking at large rectangle) That isn't a square, I know it isn't. I can't find a way to turn it into a square.

R: O.K. Can you look at those things real carefully and put those things that in some way go together in the buckets?
(Two more promptings with instructions. Child would (could) not complete task)
(R. points to small square and large rectangle).
Those two, Jenny, do they go together in some way?

J: But I don't know what they means.

R: Are they alike in some way?

J: No.

R: No?

J: 'Cause that's a rectangle, a different kind of rectangle, and that's a square.

R: So none of these things are alike? Are they?

J: No.

R: O.K., fine. We'll try some other ones, Jenny.

Task 4

R: You put those three together in the bucket, didn't you Jenny?

J: Yes.

R: Why did you put those three in the bucket together?

J: 'Cause this one (large triangle) was bigger.

R: What about these three? Why did you put them together in the bucket?

J: Because they are small; they match.

R: O.K. Any other reason?

J: Because the big one is bigger than, and it didn't look good.

R: Can you think of any other way you might put them together in the buckets?

J: No.

R: O.K., fine.

Task 5

R: You put them all together in one bucket. Why, Jenny?

J: Because they are all the same size, and they are the same color, and they are the same, and the rectangles.

R: Can you think of any other reason why, Jenny?

J: Because they are all the same.

R: Can you think of any other way you might put them in the buckets together?

J: (Manipulates objects)

R: You put them in the bucket in the same way again, didn't you? O.K. That was good, Jenny. I have some more for you.

Task 6

R: You put those two (red rectangles) together in the buckets. How come, Jenny?

J: Because they are both the same size and they aren't like these. These are squares and these are rectangles.

R: O.K. Any other reason?

J: Because these, they're not the same thing.

R: O.K. Very good. Can you think of any other way you might be able to put those things that go together in the bucket?

J: No.

R: So there's no other way those things go together. Fine. That was good, Jenny.

Task 7

R: You put these two things in the bucket together. Why, Jenny?

J: Because they are both the same things - 2 rectangles. And these are two other rectangles and can't fit.

R: O.K., so these two are the same, are they?

J: Right.

R: And these two, they're not the same?

J: No.

R: Can you think of any other reason why, Jenny?

J: Because these are bigger than those, and those are smaller than those.

R: Can you think of any other reason?

J: 'Cause they're all rectangles; but some are smaller than

R: Is there any other way those things could go together, Jenny?

J: There is just, um, no.

R: O.K. We'll go on to the next one. That was good, Jenny.

Task 8

R: Those three go together. Why, Jenny? Why do they go together?

J: Because they are the same animals, and they go together, and they are the same.

R: O.K. Can you think of any other reason why, Jenny?

J: 'Cause they are animals that can, um, I can't remember what I was going to say.

R: O.K. That's fine, Jenny. Can you think of any other way these things might go together, Jenny?

J: No.

R: O.K. That was good.

Task 9

R: Those three things, they go together, do they?

J: Ya

R: Why, Jenny?

J: Because they're squirrels and they can, I forget what they do.

R: Can you think of any other reason why, Jenny, they all go together?

J: No.

R: Can you think of any other way these things might go together?

J: (Manipulates objects)

R: You put them in the bucket the same way, didn't you? O.K.

Task 10

R: O.K. You put this one (three bears) in the bucket, Jenny. Why?

J: Because they are bears and they can bite and scratch and they are furry animals and you can shoot them and I like them and I have a book about them at home.

R: O.K. So none of them go together. You didn't put any of them together with the bear, did you?

J: No.

R: O.K. Why, Jenny?

J: Cause they don't look the same.

R: Can you think of any other way these things might go together, Jenny?

J: (Manipulates objects)

R: Oh, you put the giraffe in the bucket this time. Why, Jenny?

J: Because giraffes are tall and they can, they are wild animals but they don't bite, and people can get grass and put up in their mouth.

R: So none of these go together?

J: No.

R: O.K.

Task 11

R: You put these two things (buffalo, lion) in the bucket, Jenny. Why?

J: 'Cause they are lions and they are both the same.

R: What about these two, Jenny?

J: They are two dogs and they are almost the same.

R: Any other reason?

J: Because they are, um, I can't remember.

R: Fine, Jenny. Can you think of any other way these things might go together?

J: No.

R: O.K. I've got one more for you to do.

Task 12

R: You put this (frog) in the bucket. Why, Jenny?

J: Because I like frogs, and one day when we went to the shore and we saw a little toad we brang it home and buried it in the sand box and then unburied it and it wasn't dead.

R: I see. You didn't put any of these in the bucket together. None of them go together?

J: No.

R: O.K. Fine. We're done, Jenny.

Task 13

J: (Orders objects)

R: Very good. Why did you put them like that, Jenny?

J: 'Cause they all are triangles and the match and almost the same size. But two of them are smaller then the other two of them.

R: Any other reason?

J: I can't remember.

Task 14

J: (Orders objects)

R: Very good. Why did you put them like that?

J: 'Cause they, um, sometimes there are things you can make with them.

R: Any other reason, Jenny?

J: No.

R: O.K. Fine.

Task 15

J: (Orders objects)

R: Why did you put them like that?

J: Because sometimes you can make the same thing out of the other thing that you made.

R: Oh, and you made the same thing out of this as you did with the others.

J: Right.

R: O.K. Very good. Any other reason, Jenny?

J: I don't remember.

R: Fine.

CHILD 10 - JASON M. (J)

Task 1

R: (After three promptings with instructions)
You put all those things together in the bucket, didn't you? Why?

J: Because they're all the same.

R: O.K. How are they the same?

J: Because they all got the same edges and all got the same stripes on the edges.

R: Can you think of any other reason?

J: No.

R: Can you think of any other way some of those things might go together?

J: I don't know.

R: O.K. That was very good.

Task 2

R: You put these three things together in the bucket, Jason. Why?

J: Because they're all the same.

R: How are they the same?

J: 'Cause there are three of them at the same time. There's a little one and a big one, they're all the same.

R: O.K. Any other reason?

J: Because they got the same stripes around the corners.

R: Can you think of any other way you might put those that go together in the buckets?

J: No.

Task 3

R: You put these two things in the bucket together, didn't you? Why, Jason?

J: Because, see, that's the big square (points to large rectangle), and that's the little square. And that's the triangle and that's the rectangle.

R: O.K. So these two things (square and large rectangle) go together, do they?

J: (Nods head yes)

R: Any other reason why they go together?

J: I don't think so.

R: Any other way some of these things might belong together?

J: I don't think so.

Task 4

R: You put them all together in the same bucket, didn't you? Why, Jason?

J: Because they're all the same.

R: How are they all the same?

J: Because they're all triangles.

R: O.K. Any other reason?

J: Because they all got the same shapes.

R: Any other reason?

J: And they all got the same corners.

R: O.K. Can you think of any other way any of these things go together?

J: No.

R: O.K.

Task 5

R: Why do they all go together, Jason?

J: 'Cause they're all the same too.

R: How are they the same?

J: 'Cause they all got short lines and long lines.

R: Can you think of any other reason?

J: Jep. Because, see, these are green and green and they got stripes.

R: Can you think of any other way some of these things might go together?

J: No.

Task 6

R: Why did you put those two (red rectangles) together?

J: 'Cause they're the same.

R: And why did you put those two (neutral squares) together?

J: 'Cause they're the same.

R: How are they the same?

J: 'Cause they're squares. Because they got edges. And they (red rectangles) got edges, that's why they're rectangles.

R: Any other reason?

J: I don't think so.

R: Can you think of any other way they might go together in the buckets?

J: No.

Task 7

R: You put those two things (dark green rectangles) in the buckets together. Why, Jason?

J: Because these are long lines. These (light green rectangle) are short and this (red rectangle) is a little more shorter.

R: O.K. Can you think of any other reason?

J: Ya se these got edges (dark green rectangles) and these got edges but they're not very long.

R: Any other reason?

J: Yep. Because, see, they're not longer as this.

R: Can you think of any other way any of these things might go together?

J: No.

Task 8

R: You put these two (two porcupines) together in the buckets. Why, Jason?

J: 'Cause they're the same.

R: O.K. Any other reason why?

J: 'Cause, see, they got the black noses and the same hair.

R: What about these other two, Jason? You didn't put them in the bucket. Why?

J: Um, I forgot this one (3rd porcupine). I didn't know that one was the same as those.

R: I see.

J: I didn't see that one.

R: O.K. So these three now are the same, are they?

J: Yep.

R: Any other reason?

J: I don't know.

R: Can you put them together in some other way?

J: Um, I don't want to talk about it now.

R: O.K.

Task 9

R: You put these two (brown squirrels) in the bucket together. Why, Jason?

J: 'Cause they're the same.

R: What about these two (green squirrel, beaver)?

J: They're the same colors.

R: Any other reason?

J: 'Cause they (two squirrels) got the same tails and the same chipmunks.

R: Any other reason?

J: I don't think so.

R: Can you think of any other way they might go together?

J: No.

R: O.K.

Task 10

J: I don't think any of these go in the same bucket.

R: You don't think any of them go together, do you?

J: (Shakes head no)

R: O.K. Fine, Jason.

J: 'Cause they're all different.

Task 11

R: These two (two dogs) go together, do they? Why do they go together?

J: Because they're dogs.

R: Any other reason?

J: 'Cause they got the same noses.

R: Any other reason?

J: I don't think so.

R: Any other way any of these things might go together?

J: Ya, 'Cause they got the same paws.

R: Any other reason?

J: I don't think so.

R: I have one more for you to do.

Task 12

J: I don't think none of them do.

R: O.K. None of them go together?

J: Because they're all different.

R: O.K. Fine, Jason.

Task 13

J: What's an order?

R: Order is how they go - 1, 2, 3, 4. You put them in order for me.

J: (Manipulates objects)

R: Are you finished? Why did you put them like that, Jason?

J: Because the got all edges.

R: I see, so you put all the edges together, did you?

J: Ya.

R: O.K.

Task 14

J: (Manipulates objects)

R: Why did you put them like that, Jason?

J: Because, see, they're the same and they got the same edges too.

R: Any other reason?

J: No.

Task 15

J: (Manipulates objects)

R: You finished?

J: Ya.

R: Why did you put them like that, Jason?

J: Because they're the same things and they got the same stripes.

R: O.K. Any other reason?

J: No.

R: Fine.

CHILD 11 - STEVEN P. (S)

Task 1

(After two promptings)

R: Can you tell me why, Steven, you put all those things together in one bucket?

S: I don't know why.

R: You put them all together in one bucket because they go together, didn't you? Why do they go together, Steven?

S: 'Cause they match.

R: They match. How do they match?

S: 'Cause they're all, they're all, squares.

R: Oh, that's very good. Any other reason?

S: No.

R: Can you think of any other way they might go together?

S: (Shakes head no)

R: O.K. That was very good.

Task 2

R: You put these three things together in the bucket, didn't you? Why?

S: Because they're squares.

R: Because they're all squares. Any other reason?

S: (Shakes head no)

R: Can you think of any other way you might be able to put them together? Any other way you may go together?

S: I don't know.

R: O.K. That was very good, Steven.

Task 3

R: Can you tell me why you put those two (large rectangle, long rectangle) together?

S: 'Cause they're both rectangles.

R: O.K. That's very good. Any other reason why, Steven?

S: (Shakes head no)

R: Can you think of any other way you might put those things that go together in the bucket?

S: No.

R: O.K. That was very good.

Task 4

R: You put them all in one bucket, didn't you? Why, Steven?

S: 'Cause they all match the same.

R: O.K. Any other reason?

S: No.

R: Any other way you might put them together?

S: (Shakes head no)

R: No? O.K. You did a real good job.

Task 5

R: That was real good. Can you tell me why? Why did you put all those things -

S: 'Cause they all match.

R: O.K. How do they match?

S: 'Cause they're all green and they're all rectangles.

R: O.K. Very good. Any other reason why, Steven?

S: (Shakes head no)

R: Can you think of any other way you might be able to put those things that go together in the buckets?

S: (Shakes head no)

R: O.K. That was real good, Steven. You did a good job.

Task 6

R: You put them all in the same bucket, did you?

S: (Takes out two neutral squares and places them in the other bucket).

R: Oh, that's good. Why did you put them in the same bucket, Steven?

S: 'Cause they're both red and they're both rectangles, and those (points to neutral colored squares) are both squares.

R: O.K. Any other reason, Steven?

S: (Shakes head no)

R: Could you think of any other way any of those things might go together?

S: Put those in that one, and put these in that one.

R: Oh, you just switch the buckets around, did you?

S: (Nods head yes)

R: O.K. That was very good, Steven.

Task 7

R: O.K. Steven. You put these two things together in the buckets. Why, Steven?

S: Because they're both the same thing.

R: O.K. Any other reason?

S: Ya. 'Cause they're both green.

R: O.K. Very good. Can you look at them again and put those things that go together in some way in the bucket?

S: (Shakes head no)

R: O.K. Very good, Steven.

Task 8

R: O.K. You put these three things together in the bucket, didn't you?

S: 'Cause they're all the same.

R: O.K. How are they the same?

S: 'Cause they both got those things (points to animals fur) on them.

R: O.K. Any other reason why, Steven?

S: (Shakes head no)

R: Can you think of any other way these things might go together?

S: (Shakes head no)

R: O.K. That's fine.

Task 9

R: You put those two things (brown squirrels) together in the bucket, didn't you? Why, Steven?

S: Because they're both the same.

R: O.K. Any other reason why?

S: (Shakes head no)

R: And what about these other two?

S: They're not the same.

R: O.K., not the same as what?

S: (No response)

R: O.K. Can you look at these things real carefully again and put those that go together in some other way in the bucket?

S: No.

R: O.K.

Task 10

S: (Looking at objects, points to three bears) They go together, don't they?

R: O.K. Anything else?

S: No.

R: Why did you put those (three bears) in the bucket, Steven?

S: 'Cause they're a family.

R: Oh, I see. Any other reason?

S: No.

R: Can you think of any other way some of these things might go together?

S: (Shakes head no)

R: O.K. That was real good, Steven.

Task 11

R: Why did you put these two things together in the bucket?

S: 'Cause they're both dogs.

R: O.K. Any other reason, Steven?

S: Um (shakes head no).

R: Can you look at them real carefully? Is there any other way some of them might go together?

S: (Shakes head no)

R: O.K. I have one more for you to do.

Task 12

R: Why did you put those three (fish, turtle, frog) together, Steven?

S: 'Cause they're both sea animals and they go in water.

R: I see. Any other reason, Steven?

S: No. Ya, 'cause they're all fish. No they're not.

R: Any other reason?

S: (Shakes head no)

R: Can you think of any other way some of these things might go together?

S: (Shakes head no)

R: O.K. That was very good, Steven.

Task 13

S: What's order?

R: Put them in order - 1, 2, 3, 4.

S: (Manipulates objects)

R: O.K. Are you finished?

S: (Nods head yes)

R: O.K. Why did you do that, Steven?

S: They're in order, kind of

R: Any other reason?

S: No.

Task 14

S: (Manipulates objects)

R: Why did you put them like that, Steven?

S: Um, they're on top of each other like this.

R: O.K. Any other reason?

S: No.

Task 15

S: (Orders objects)

R: O.K., very good. Why did you put them together like that?

S: Um, there's two reasons. They look like bricks and sides on them.

R: They do look a bit like bricks. But why did you put them next to each other like that?

S: 'Cause they're in order.

R: O.K. honey, that was very good. Any other reason?

S: (Shakes head no).

CHILD 12 - TYAN (T)

Task 1

R: Why, Tyan? Why did you put those three things together in the bucket?

T: 'Cause they look the same.

R: O.K. Any other reason?

T: Well, I know they are the same.

R: How do you know they're the same?

T: (Piles one block on top of the other)

R: O.K. Any other reason?

T: Nope.

R: Any other way these things might go together?

T: (Shakes head no)

R: O.K.

Task 2

R: O.K. That was real good. You put these two things in one bucket and you put these two things in another bucket. Can you tell me why? Why did you put these two things (medium square, large square) in one bucket?

T: Well, 'cause they're both the same things.

R: O.K., and what about these two things (small square, trapezoid), Tyan?

T: Well, I don't know about them. Um, they're both small.

R: O.K. Can you think of any other reason why you put these together in the bucket?

T: Nope.

R: Can you think of any other reason why you put those together in the bucket?

T: Nope.

R: Can you think of any other way any of these things might go together?

T: (Manipulates objects)

R: O.K. That was good, Tyan. Let's go on.

Task 3

R: Why did you put these two things in one bucket and these two things in another bucket? Can you tell me why? Why did you put these two things (square, triangle) together?

T: Well, 'cause they're both small, and they can fit like a house.

R: O.K., and what about these two things (large rectangle, long rectangle), Tyan? Why did you put them together in the bucket?

T: 'Cause they fit like a T (manipulates rectangles to make a T).

R: Any other reason, Tyan?

T: (No response)

R: Any other reason why you put them in the buckets like you did?

T: (Shakes head no)

R: Can you think of any other way these things go together.

T: (Manipulates objects)

R: Can you think of any other way these objects are similar and put them in the bucket?

T: No.

R: O.K. That was real good.

Task 4

R: You put these three things in one bucket and you put this one in the other bucket. Why? Why, Tyan, did you put these three things in one bucket?

T: Well, 'cause they're both the same size and this isn't.

R: O.K. Any other reason, Tyan?

T: (Shakes head no)

R: Any other way some of those things might go together?

T: (Shakes head no)

R: No. O.K.

Task 5

R: You put them all together in one bucket, didn't you? Why?

T: They're both the same.

R: O.K. Any other reason, Tyan?

T: They're both the same color.

R: Any other reason?

T: (Shakes head no)

R: Can you think of any other way, Tyan, they go together?

T: (Shakes head no)

R: O.K. That was real good.

Task 6

R: You put these two things in one bucket, and you put these two things in another bucket. Can you tell me why, Tyan. Why did you put these two things (red rectangles) in the bucket?

T: 'Cause they're alike.

R: How are they alike?

T: 'Cause they're both the same color and they're both the same size.

R: O.K., and what about the other ones (neutral squares)?

T: Well, 'cause they're both the same color and both the same size.

R: O.K. Any other reason?

T: No.

R: Can you think of any other way that these things go together? Any other way that they're similar?

T: Nope. Only that way.

R: O.K. That was real good.

Task 7

R: You put them all together in the same bucket didn't you, Tyan? Why? Why did you put them all together in the same bucket?

T: Because they're both the same.

R: How are they the same?

T: They're all straight.

R: Oh, any other reason?

T: (Shakes head no)

R: Is there any other way, Tyan, any of these things go together?

T: (No response)

R: Is there any other way?

T: (Shakes head no)

R: O.K. That was real good, Tyan.

Task 8

R: You put this one all by itself, and you put these three together in another bucket. Why, Tyan? Why did you do that?

T: 'Cause they're both the same (porcupines) and this one's the same (butterfly).

R: Any other reason, Tyan?

T: (Shakes head no)

R: Any other way, Tyan, any of these things might go together?

T: (Shakes head no)

R: O.K. That was a real good job.

Task 9

R: You put this one all by itself, and you put these three things together in the bucket. Why Tyan, why did you put them (three squirrels) together in the buckets?

T: 'Cause they're all squirrels and that's rat.

R: O.K. Any other reason, Tyan?

T: (Shakes head no)

R: Can you think of any other way any of these things might go together?

T: No.

R: That was real good.

Task 10

T: There aren't enough buckets. (Child puts one object in each bucket, and one next to each bucket).

R: O.K. Fine.

T: There's not enough buckets.

R: You want to put them all separately, do you?

T: (Nods head yes)

R: Tell me why, Tyan. You want to put them all separately; why?

T: Well, so they'll go right.

R: O.K. So none of them are alike?

T: (Shakes head no)

R: You can't look at them and think of a way they might go together?

T: (Manipulates objects. Groups giraffe and three bears, deer and dog).

R: O.K. Tell me why, Tyan. You put these two things (giraffe, three bears) in the bucket, didn't you?

T: 'Cause they're the same size, and they're both the same size (deer and dog).

R: O.K. Any other reason, Tyan?

T: (Shakes head no)

R: Any other way, Tyan, any of those things might go together?

T: (Shakes head no)

R: O.K. That was real good, Tyan.

Task 11

R: You put these two together in one bucket, didn't you? And you put these two together in another bucket. Why, Tyan?

T: 'Cause they're both dogs and they're both lions.

R: O.K. Any other reason?

T: (Shakes head no)

R: Any other way, Tyan, any of these things might go together?

T: (Manipulates objects, puts buffalo and dog together, cocker spaniel and lion together).

R: O.K. You put these two together this time (buffalo, dog). Why, Tyan?

T: Well, 'cause they're the same color.

R: And what about those two (cocker spaniel, lion),

T: They're both the same color too.

R: O.K. Any other reason?

T: (Shakes head no)

R: Any other way you might be able to put them together?

T: Nope.

Task 12

R: How about these things (fish, turtle, lizard), Tyan? Can you tell me why you put them all together?

T: Well, 'cause they go in the water and that (frog) doesn't.

R: Any other reason?

T: Nope.

R: Any other way any of those things go together?

T: (Manipulates figures; puts fish and turtle together; frog and lizard)

R: Why did you put these two together this time (fish and turtle)?

T: Well, 'cause they're both the same color.

R: Oh, 'cause they're both the same color. And what about the others, Tyan? Why did you put these together?

T: 'Cause they're both the same color.

R: Any other reason?

T: Nope.

R: Can you think of any other way any of those things might go together?

T: (Manipulates figures; puts them all separately)

R: Oh, you put them all separately. Why?

T: Well, 'cause that's the only other way I can see.

R: O.K. That was very good, Tyan. Thank you.

Task 13

T: (Manipulates objects)

R: Are you finished?

T: (Nods head yes)

R: Why did you put them like that?

T: Well, 'cause that's like a dog.

R: O.K. And they're in order?

T: (No response)

R: O.K. How about these next ones?

Task 14

T: (Manipulates objects)

R: Are you finished?

T: (Nods head yes)

R: Why did you put them like that, Tyan?

T: 'Cause that's like a real dog.

R: Any other reason?

T: (Shakes head no)

R: O.K. What about these last ones, Tyan?

Task 15

T: (Manipulates objects)

R: Are you finished?

T: (Nods head yes)

R: Why did you put them like that, Tyan?

T: 'Cause that's like a walrus.

R: Any other reason?

T: (Shakes head no)

R: O.K. Fine.

CHILD 13 - MONICA (M)

Task 1

R: You put all those three things together in one bucket, didn't you? Why, Monica? Why did you do that?

M: Because they were squares.

R: O.K. Any other reason?

M: Um (shakes head no)

R: Is there any other way any of these things go together?

M: (After a long time) No.

R: O.K. We'll go on to the next one.

Task 2

R: O.K. Monica. You put these two things in the bucket (medium square, large square). Why?

M: Because, um, um

R: Can you think of a reason why, Monica?

M: Because they were two squares.

R: O.K. That was very good, Monica. And what about these other things?

M: (No response)

R: You didn't put them together in the bucket, did you?

M: Nope.

R: Why?

M: Because they weren't the same shape.

R: Any other reason?

M: Um, um (shakes head no).

R: Is there any other way, Monica, any of those things might go together?

M: I don't know.

R: O.K. That was real good.

Task 3

R: Oh, O.K. You only put one thing (long rectangle) in the bucket. Why, Monica?

M: 'Cause this one was not the same shape as this one.

R: What about the other things?

M: These weren't the same shape either.

R: Any other reason?

M: I don't know.

R: Any other way, Monica, any of these things might go together?

M: I don't know.

R: O.K. That was real good, Monica.

Task 4

R: Why, Monica? Why did you put all those things together in the bucket?

M: Because they were the same shape.

R: O.K. Any other reason, Monica?

M: Because, um, I don't know.

R: Any other way, Monica, those things might go together?

M: I don't know.

R: O.K. That's fine, Monica.

Task 5

R: You put them all in the same bucket, didn't you Monica? Why?

M: Because they were the same shape and they were small and they were the same color.

R: Any other reason why, Monica?

M: I don't know.

R: Any other way any of these things might go together?

M: I don't know.

R: O.K. That's good.

Task 6

R: You put these two things (red rectangles) in the bucket, Monica. Why?

M: Because these were lines, and these were squares (neutral squares) and they weren't the same color and they weren't the same shape.

R: O.K., but you put these two things (red rectangles) together. Why?

M: 'Cause they were lines, and it was red and these weren't.

R: O.K. Any other reason?

M: (Shakes head no)

R: Any other way, Monica, you could put those things that go together in the bucket?

M: I don't know.

R: O.K. That was good.

Task 7

R: You put these two things in the bucket, didn't you?

M: Yep.

R: Why?

M: Because they were tall and they were green and they were lines.

R: Any other reason?

M: I don't know.

R: Any other way, Monica, some of these things might go together? You could put them in the buckets in a different way?

M: I don't know.

R: O.K. That's fine.

Task 8

R: You put these three things together in one bucket, didn't you? Why?

M: Because, um, they were the same ones, and they were small, and they were the same size.

R: O.K. Any other reason why, Monica?

M: I don't know.

R: Is there any other way, Monica, some of these things might go together?

M: I don't know.

R: O.K. Fine.

Task 9

R: You put all these three together in one bucket, didn't you? Why, Monica?

M: Because, because, these were the same, and the same size, and they got a nut on them, and they were small.

R: Any other reason?

M: And they got a tail.

R: O.K. Any other reason?

M: I don't know.

R: Any other way any of those things go together?

M: I don't know.

R: O.K. You did a fine job.

Task 10

R: You put this one (three bears) in the bucket, didn't you? Why, Monica?

M: Because, because, I don't know.

R: O.K. And none of these go together, is that right?

M: (Nods head yes)

R: You only put this one in the bucket?

M: Yep, 'cause there were only three bears.

R: Any other reason, Monica?

M: I don't know.

R: Any other way, Monica, any of these might go together?

M: I don't know.

R: O.K.

Task 11

R: You put those two things in the bucket, didn't you?

M: Yep.

R: Why?

M: 'Cause they were dogs, and they were small and they were the same size.

R: Any other reason, Monica?

M: I don't know.

R: Can you look at these real carefully and can you see any other way those things might belong together?

M: I don't know.

R: O.K., that's fine, Monica. I have one more for you to do.

Task 12

R: (After waiting two minutes) Do they go together, Monica?

M: I don't know.

R: Can you look at them real carefully and see if some of those things go together?

M: I don't know.

R: O.K. Fine.

Task 13

M: (Manipulates objects)

R: Are you finished?

M: Finished.

R: O.K. Why did you put them like that?

M: Because, this one (large triangle) is the same size as these.

R: O.K. Any other reason?

M: Nope.

R: Fine. Let's go on.

Task 14

M: (Orders objects)

R: O.K. Monica. Why did you put them like that?

M: Because, um, because these were the same things.

R: Any other reason?

M: No.

R: O.K. Good, Monica.

Task 15

M: (Orders objects)

R: Are you finished?

M: (Nods head yes)

R: That was very good, Monica. Why did you do that?

M: Because these were the same shape.

R: Any other reason?

M: Nope.

R: And that's why you put them like that, is it?

M: Yes.

R: O.K. Fine.

CHILD 14 - FERGUS (F)

Task 1

R: You put this one all by itself, didn't you? And you put these three things together in one bucket. Why, Fergus? Why did you put those together in one bucket?

F: 'Cause they're the same.

R: How are they the same?

F: 'Cause they're triangles.

R: Any other reason?

F: No.

R: Is there some other way, Fergus, these things might go together?

F: These three go together and this don't.

R: O.K. That's fine.

Task 2

R: Why did you put this one by itself, and why did you put these three together?

F: 'Cause they're matching.

R: Any other reason, Fergus?

F: 'Cause that one don't match.

R: O.K. Any other way, Fergus, any of these things might go together?

F: 'Cause these are squares, and this is not.

R: O.K. Is there any other way, Fergus, that these things are similar?

F: (Shakes head no)

R: No? O.K., that's fine.

Task 3

R: You put this one by itself in this bucket, and you put this one by itself in the other bucket. Why, Fergus?

F: This one's not matching or this one.

R: O.K. What about these?

F: They're not matching either.

R: Any other reason?

F: 'Cause this one's a rectangle (large rectangle) and this one's not and this one's not and this one's not.

R: O.K. Is there any other way, Fergus, you might look at these things and some of them might go together?

F: (Shakes head no)

R: O.K. That's fine. You did a good job.

Task 4

R: You put them all in the same bucket, didn't you? Why, Fergus?

F: 'Cause they're matching.

R: Any other reason?

F: 'Cause they're matching.

R: Any other way, Fergus, that any of these things might go together?

F: All of them do.

R: O.K. That's fine.

Task 5

R: You put them all together in the same bucket, didn't you? Why, Fergus?

F: 'Cause they're matching.

R: Any other reason?

F: 'Cause they're straight like a cigarette.

R: O.K. Any other reason?

F: 'Cause they're so long.

R: Any other reason?

F: (Shakes head no)

R: Is there any other way, Fergus, any of those things might go together?

F: Because they all go together.

R: O.K. Fine.

Task 6

R: You put these two in one bucket and you put these two in another bucket. Why, Fergus?

F: 'Cause these are tiny and these are big.

R: Any other reason?

F: This sort of look like little tiny boxes and these like big boxes.

R: Any other reason?

F: White and red.

R: Any other reason?

F: (Shakes head no)

R: Any other way that any of these things might go together?

F: 'Cause these are white and these are red.

R: O.K. Fine.

Task 7

R: You put them all together in the same bucket, didn't you? Why, Fergus?

F: 'Cause they're all straights.

R: O.K. Any other reason?

F: 'Cause that one's red, and that one's green and that's light green and that one's not.

R: O.K. And that's how they all go together, is it?

F: (Nods head yes)

R: Is there any other reason, Fergus?

F: (Shakes head no)

R: Is there any other way that you might be able to put any of those things that go together in the bucket?

F: (Manipulates objects)

R: O.K. You put them all in the same bucket again, didn't you? That's fine.

Task 8

R: You put this one all by itself and you put these three together. Can you tell me why, Fergus?

F: 'Cause these, I don't know what these are.

R: O.K., but why did you put them together?

F: 'Cause these look like the same, and this one don't.

R: O.K. Any other reason?

F: This is a butterfly. It's all colors. These are the same, black.

R: Any other reason, Fergus?

F: (Shakes head no)

R: Is there some other way that any of those things might go together?

F: These are matching and this one's not.

R: O.K. That's fine.

Task 9

R: You put these three all together in one bucket, and you put this one all by itself. Why, Fergus?

F: 'Cause this one don't match, and it's holding on to a branch and these are not.

R: O.K. Any other reason?

F: Because these got big tails and this got little tail.

R: Any other reasons?

F: Little feet and big feet?

R: Any other reason?

F: (Shakes head no)

R: Any other way, Fergus, that any of these things might go together?

F: Squirrel and squirrel and squirrel and not a squirrel.

R: O.K. That's fine.

Task 10

R: You didn't put any of them together. Why?

F: Because that one's a black sheep (Newfoundland dog) and these are not. These are three brown bears.

R. And what about these others?

F: This is brown and white (giraffe).

R: And what about the other?

F: It's brown and white and black (deer).

R: O.K. Any way that any of those things go together?

F: All these don't.

R: O.K. Fine.

Task 11

R: You put these two in the buckets together, and these two. Why?

F: 'Cause these match 'cause they're two dogs and these match 'cause they're two lions.

R: O.K. Fergus. Any other reason?

F: 'Cause, no.

R: Any other way any of these things might go together?

F: 'Cause two dogs and two lions.

R: O.K.

Task 12

R: Why, Fergus? You didn't put any of them together?

F: Because that's a turtle and that's a crocodile and that's a fish and that's a frog.

R: O.K., so none of them go together?

F: (Shakes head no)

R: There isn't some way some of these things might go together?

F: Well that's green?

R: What's green?

F: (Picks up fish, frog, lizard)

R: Any other reason?

F: That's brown (turtle).

R: Any other reason?

F: No.

R: O.K. That's very good.

Task 13

F: (Manipulates objects)

R: O.K. Are you finished? Why did you put them like that, Fergus?

F: 'Cause they're triangles.

R: O.K. But why did you put them like that (points to objects)?

F: I don't know.

R: O.K. Let's go on.

Task 14

F: (Manipulates objects)

R: Why did you put them like that, Fergus?

F: 'Cause these two are big and these two are small.

R: Oh, I see. Any other reason?

F: 'Cause all the tiny ones go with the tiny ones and the big ones go with the big ones.

R: O.K. Fine.

Task 15

F: (Orders objects)

R: Very good. Why did you do that, Fergus?

F: 'Cause they're all big.

R: Any other reason?

F: No.

R: O.K. Good, Fergus.

CHILD 15 - SOPHIE (S)

Task 1

R: You put these three in the bucket, didn't you? Why, Sophie? Do you know why?

S: (No response)

R: O.K. You didn't put this one in the bucket, Sophie. Why? You put all these three together and you left this one out.

S: Because that one ain't the same as those.

R: O.K. Any other reason?

S: (Shakes head no)

R: Is there any other way, Sophie, any of these things go together?

S: No.

R: O.K. That was good.

Task 2

R: You put all these three together in one bucket, didn't you Sophie? Why?

S: Because that one isn't the same as those either.

R: I see. Any other reason, Sophie?

S: No.

R: Is there any other way that they go together? Any other way they belong together?

S: (Manipulates objects)

R: You put the same three in again, didn't you? O.K., that was good, Sophie.

Task 3

R: You put these two in the buckets together, didn't you? Why?

S: Because this is a rectangle (long rectangle) and this is a triangle and these two are squares (small square, large rectangle).

R: O.K. Any other reason?

S: No.

R: Is there any other way, Sophie, any of these things might go together?

S: No.

R: O.K. That was good.

Task 4

R: You put those three together, Sophie. Why?

S: Because they're smaller and this one's bigger.

R: O.K. Any other reason?

S: (Shakes head no)

R: Any other way, Sophie, that any of those things go together?

S: (Shakes head no)

R: O.K. That was good, Sophie.

Task 5

R: You just put those three in the bucket, Sophie. Why?

S: Because that green is darker then the other other greens.

(The child left out one of the identical objects, which when examined closely had one side that was a shade darker than the others).

R: O.K. Any other reason?

S: (Shakes head no)

R: How else might those things go together, Sophie?

S: I don't know.

R: O.K.

Task 6

R: You put those two in the one bucket. Why, Sophie?

S: Because these are square and those are rectangles.

R: O.K. Any other reason?

S: (Shakes head no)

R: Any other way that any of those things might belong together, Sophie?

S: (Shakes head no)

R: O.K. That was good.

Task 7

R: Why did you do that?

S: Because those are all green and this is a red one.

R: O.K. Any other reason?

S: (Shakes head no)

R: Is there any other way, Sophie, that some of these things belong together?

S: No.

R: O.K. Very good.

Task 8

R: You put all these three in the same bucket. Why?

S: 'Cause they're all hedgehogs and this is a butterfly.

R: Any other reason?

S: Ya. Because there's three of these and only one butterfly.

R: O.K. Any other reason?

S: (Shakes head no)

R: Is there any other way, Sophie, that you could put any of those that belong together in the bucket?

S: (Shakes head no)

Task 9

R: You put all these three in one bucket. Why, Sophie?

S: Because this is a beaver, and these are all squirrels.

R: Any other reason?

S: Ya, 'cause there's three of these and this goes in water (beaver) and these go up in trees.

R: Any other reason?

S: (Shakes head no)

R: Is there any other way, Sophie, that any of these belong together?

S: (Shakes head no)

R: O.K.

Task 10

R: O.K. Sophie. You put all those three (giraffe, deer, dog) in a bucket together. Why?

S: Because the bear lives in the woods, and the bambi lives in the forest.

R: O.K., but you put these two (dog, giraffe) with that also. Why?

S: Because they go in cages.

R: Any other reason?

S: No.

R: Any other way any of those things go together?

S: (Shakes head no)

R: O.K. Fine.

Task 11

R: O.K. Sophie, you put all these three together.

S: Because they got yellow faces (lion, dog, dog) and this one (buffalo) got all brown face.

R: Any other reason, Sophie?

S: Ya, because that (buffalo) lives in Africa.

R: Any other reason?

S: No.

R: Any other way, Sophie, that any of these belong together.

S: (Shakes head no)

R: O.K. Fine.

Task 12

R: You put those three (fish, lizard, frog) together in one bucket. Why?

S: Because they go in water.

R: What about this (turtle)?

S: That stays on ground.

R: Any other reason?

S: (Shakes head no)

R: Any other way any of these might belong together?

S: These (frog, lizard) go on land too. But the turtle doesn't go in water.

R: O.K. Any other reason?

S: (Shakes head no)

R: O.K. That was real good, Sophie.

Task 13

S: (Manipulates objects)

R: O.K. That's very interesting. Why did you put them like that, Sophie?

S: 'Cause, because it looks like Santa.

R: Oh, I see.

Task 14

S: (Orders objects)

R: Are you finished?

S: Yes.

R: Very good. Why did you put them like that?

S: 'Cause it looks like a boat.

R: Oh, so it does. Any other reason?

S: No.

Task 15

S: (Manipulates objects, orders them with the brown and the black transposed with the brown lower at the bottom)

R: Are they in order, Sophie? Why did you put them like that?

S: Because they look like an army camp.

R: I see. Any other reason?

S: No.

R: O.K. We're done.

CHILD 16 - JAMIE (J)

Task 1

R: O.K. Jamie, you put these two things in one bucket, didn't you? And you put these two in another bucket. Why did you put these two (two squares) together, Jamie? Do you know why?

J: (No response)

R: And what about these two (square, trapezoid), Jamie? Why did you put them together?

J: (No response)

R: O.K. You look at all these again real carefully. Do some of them go together? You show me which ones go together.

J: (Regroups objects - three squares together, trapezoid by itself)

R: O.K. How are those alike?

J: Because they're all the same.

R: Any other reason?

J: (No response)

R: O.K. I have some more for you to do.

Task 2

R: O.K. Jamie. You put these two in one bucket, and you put these two in another bucket. Why Jamie? Why did you put these two (medium square, large square) together?

J: (No response)

R: How are they similar, Jamie? How do they go together?

J: (No response)

R: Do you know how?

J: Ya, they're round.

R: And what about these two (small square, trapezoid), Jamie? Why did you put them together?

J: That's round too (trapezoid).

R: O.K. Jamie, but what is it about these that make them belong together?

J: These belong together (picks up three squares).

R: Oh. So now you're saying these three belong together, do they?

J: (Nods head yes)

R: And why do they belong together?

J: Because that belong together.

R: Any other reason, Jamie?

J: (Shakes head no)

R: O.K. Fine.

Task 3

R: You put these two (long rectangle, triangle) in the one bucket. How do they go together, Jamie?

J: They don't go together; that's why didn't put them in this bucket.

R: O.K. They don't go together. But you put these two together, why Jamie?

J: Because they belong together.

R: How do they belong together?

J: That goes there (manipulates figures).

R: Any other reason?

J: No.

R: Can you think of any other way any of these things might belong together?

J: (Manipulates figures, puts them in bucket, same as before).

R: O.K. You put them in the bucket the same way, didn't you? O.K. Jamie, that was good.

Task 4

R: You put them all in one bucket. Why, Jamie?

J: Because they all belong.

R: O.K. How do they belong together?

J: All go together.

R: They all go together? Is that what you said?

J: (Nods head yes)

R: Any other reason?

J: (Shakes head no)

R: Is there any other way that you could put those things that somehow go together in the bucket?

J: (Manipulates objects)

R: You did the same thing again. You put them all in the same bucket. O.K. Jamie.

Task 5

R: You put all those in one bucket. Why, Jamie?

J: All belong.

R: They all belong. How do they all belong?

J: All green.

R: Any other reason, Jamie?

J: (Shakes head no)

R: Is there any other way, Jamie, any of these things belong together.

J: (No response)

R: O.K. Jamie. I have a couple more for you to do.

Task 6

R: You put these two in one bucket, and you put these two in another bucket. Why did you put these two (red rectangles) together?

J: These two go together, and these two go together.

R: O.K. Those two go together and these two go together. Why, Jamie? Why do these two (red rectangles) go together?

J: 'Cause they don't belong with them.

R: O.K. But what is it about them that make them go together?

J: Um, 'cause they go together, belong like that. (Child manipulates objects) Make something out of it.

R: You can make something out of it. O.K. I see. Is there any other way, Jamie, that you can see that any of those things go together?

J: (Nods head yes).

R: O.K.

J: (Manipulates objects)

R: Oh, you put them in the buckets in the same way again, didn't you Jamie? O.K. that was fine.

Task 7

R: Oh, you put them all in the same bucket, didn't you? You put all those things in the same bucket. Why do they all go together, Jamie?

J: All go together. They all belong.

R: They all belong, is that what you said?

J: (Nods head yes)

R: How do they all belong, Jamie?

J: You can put them on each other.

R: Is there any other reason?

J: (Shakes head no)

R: Is there any other way, Jamie, you can look at these things and see if some of them belong together?

J: (Shakes head no)

R: No? O.K.

Task 8

R: O.K. That was good, Jamie. You put these three in one bucket, didn't you? And you put this one in the other bucket. Why do these three go together, Jamie?

J: This ones are all wolves, and they go together.

R: O.K. Any other reason, Jamie?

J: (Shakes head no)

R: Is there any other way you can think of that any of these things go together?

J: (Shakes head no)

R: O.K.

Task 9

R: You put them all together in one bucket, didn't you. Why, Jamie? Why did you put all those things in one bucket? How do they go together?

J: 'Cause they all belong.

R: They all belong. How do they belong, Jamie?

J: This don't belong (points to beaver). All them belong.

R: This one doesn't belong? O.K. Why, Jamie?

J: It doesn't have no tail like that.

R: Oh, it doesn't have a tail like those do. O.K., any other reason, Jamie?

J: (Shakes head no)

R: Can you think of some other way, Jamie, some of those things to together?

J: (Manipulates figures)

R: O.K. That's what you did this time. You put these three together, and you put this one by itself. That was real good, Jamie.

Task 10

R: You put them all in one bucket, didn't you? Why, Jamie?

J: They all belong.

R: They all belong.

J: All them belong.

R: O.K. How do they belong, Jamie?

J: They belong, this one don't (dog).

R: O.K. These three belong, and this one doesn't. O.K. How do these three belong together, Jamie?

J: This one, these have ears, and this one doesn't have ears that go up, no ears.

R: No ears. And these all have ears that go up, do they?

J: (Nods head yes)

R: Oh, O.K. Any other reason, Jamie?

J: This one, the hair is standing up on that.

R: Any other reason, Jamie?

J: (Shakes head no)

R: Any other way, Jamie, some of those things go together?

J: (Shakes head no)

R: O.K. Fine.

Task 11

R: You put these two things in one bucket, and you put these two things in another bucket. Why, Jamie?

J: These two are tigers (buffalo, lion) and these are dogs and they belong.

R: O.K., these belong together and these belong together. Any other reason, Jamie?

J: (Shakes head no)

R: No? Is there any other way, Jamie, that you can think of that any of those things belong together?

J: (Shakes head no)

R: O.K. Fine.

Task 12

R: O.K. You put these two together in one bucket, and you put those two together in another bucket. Why, Jamie?

J: 'Cause he got no eyes and no eyes (turtle, lizard) and got eyes (fish, frog).

R: They don't belong 'cause they don't have any eyes? Is that what you're saying?

J: (Nods head yes)

R: O.K. Any other reason, Jamie?

J: (Shakes head no)

R: Is there any other way you can look at those things, Jamie, and maybe they might belong together in some other way?

J: (Shakes head no)

R: O.K. That was real good.

Task 13

J: (Reached over, grabbed the scoring sheet researcher was using, and placed triangles over diagram of triangles)

R: My goodness! Why did you do that, Jamie?

J: (No response)

R: It was o.k., but why did you do that?

J: Don't know.

R: Are they in order?

J: (No response)

R: O.K. Next time let's do it without my paper. This paper's just for me.

Task 14

J: (Orders objects)

R: Very good. Why did you do that, Jamie?

J: Um, I don't know.

R: Are they in order?

J; I don't know.

R: O.K. Fine.

Task 15

J: (Manipulates objects)

R: Are they in order, Jamie?

J: Yep.

R: Why did you put them like that?

J: I don't know.

R: O.K. Fine.

CHILD 17 - KIKA (K)

Task 1

R: You said these two things (two squares) went together, did you Kika?

K: Ya.

R: Why?

K: Because they are the same.

R: Because they're the same ; is that what you said?

K: Ya.

R: Any other reason, Kika?

K: Look here (picks up other square).

R: Oh, what about that one?

K: (Puts it with other two squares)

R: Is that another one?

K: Ya.

R: Why do all those belong together, Kika?

K: 'Cause all are the same

R: And what about the other one?

K: That's gonna just be like this.

R: Oh, so that's going to stay by itself?

K: Ya.

R: Is there any other way, Kika, that you might be able to see if any of these go together in a different way?

K: (Puts all three squares in bucket)

R: Oh, so you put all three together this time, didn't you?

K: Ya, 'cause they're all the same.

R: That was real good, Kika.

Task 2

(Could not complete task)

R: You look at those things real carefully. Somehow there is something about some of those objects that make them belong together.

K: These two (medium square, large square)? They're not the same. Look.

R: Well, do they belong together?

K: (No response)

R: Is there some way that they belong together? Is there some way that they are similar?

K: I don't know.

R: O.K., let's go on.

Task 3

(Could not complete task)

R: You look at them real carefully. Do, somehow, some of these things belong together? There's something about them that makes them similar.

K: That one and that one (square, triangle) make a house.

R: Can you think of any other way, Kika, some of these things are similar? Some of them belong together.

K: I don't know.

R: O.K. We'll go on and do some more.

Task 4

(Could not complete task)

R: Do some of these go together?

K: These go together.

R: Which ones?

K: (Points to three small triangles)

R: O.K. Why do they belong together?

K: 'Cause they're the same.

R: How are they the same?

K: 'Cause look (manipulates objects, puts them next to each other to make a design).

R: What is it about all these that is the same?

K: Just look (manipulates objects again).

R: What about them, Kika? Tell me. Tell me what it is about them that is the same.

K: I don't know.

R: O.K. Fine.

Task 5

K: They all belong together.

R: O.K. Why do they all belong together?

K: Because they're all like this (lines them up next to each other).

R: Tell me. How are they alike? How are they similar?

K: I don't know.

R: O.K. Fine.

Task 6

K: Just look, they all belong together.

R: How do they belong together?

K: Like this (puts two red rectangles next to each other, two neutral squares next to each other).

R: So these two belong together, do they?

K: Ya.

R: And these two belong together, do they?

K: Ya.

R: O.K. Why do these two (red rectangles) belong together, Kika?

K: Because they go like this (puts them next to each other).

R: Any other reason?

K: I don't know.

R: What about these, Kika? They belong together, do they (neutral squares)?

K: Ya.

R: What is it about them, Kika, that makes them belong together?

K: Because they're both little squares.

R: O.K., any other reason?

K: No.

R: O.K. That was good.

Task 7

K: This one here doesn't belong (red rectangle).

R: O.K. Then you put it to one side.

K: O.K.

R: Tell me why. Why did you put all these three together?

K: The two are the same (dark green rectangles), but this one (light green rectangle) is the, green too.

R: O.K., and what about this one, Kika?

K: It's just red.

R: Any other reason, Kika, why these go together?

K: I don't know.

R: Is there any other way, Kika, some of these things might belong together?

K: I don't know.

R: O.K. That was good.

Task 8

R: Now you tell me why those three belong together.

K: 'Cause they're all the same.

R: O.K. How are they the same?

K: I don't know.

R: Can you think of any other reason why they belong together?

K: 'Cause they look the same.

R: O.K., any other reason?

K: I don't know any other reason.

R: Is there any other way some of these things go together?

K: No.

R: O.K. That's fine.

Task 9

R: Why did you put these three together, Kika?

K: 'Cause they're all the same.

R: What about this one (beaver)?

K: This one is just not the same.

R: What is it about these three that make them all the same?

K: They just look the same.

R: Any other reason?

K: I don't know.

R: Is there any other way, Kika, any of these things go together?

K: These three

R: O.K. You think those same three belong together. Fine.

Task 10

K: All don't belong.

R: All of them don't belong together, is that what you said?

K: Ya, look.

R: What about them, Kika?

K: This is a furry black sheep (dog).

R: O.K., and none of them belong together, don't they?

K: No.

R: O.K.

Task 11

R: Why are these two alike, Kika (dog, dog)?

K: Because they're both dogs.

R: And what about these two?

K: They're both lions.

R: Any other reason why those things belong together?

K: No.

R: Is there any other way, Kika, you can look at these things and some of them go together?

K: I don't know.

R: O.K. Fine.

Task 12

K: None are the same.

R: Is there any other way they might belong together?

K: They all don't belong together.

R: Why don't they belong?

K: 'Cause they're not the same.

R: There's nothing about any of them that makes them go together.

K: I don't know.

R: O.K. Fine.

Task 13

K: (Manipulates objects) Look.

R: O.K. Are those things in order, Kika?

K: They're all triangles.

R: They're all triangles, are they? Are they in order?

K: What is an order?

R: Order is how they go together - 1, 2, 3, 4. Why did you put them like that?

K: You wanted me to put them together.

R: O.K. Let's go on.

Task 14

K: (Manipulates objects)

R: O.K. Are you finished?

K: Yes.

R: Why did you put them like that, Kika?

K: Because, 'cause, um, they're order.

R: Any other reason?

K: No.

R: O.K.

Task 15

K: (Manipulates objects)

R: Are they in order, Kika?

K: They're not the same.

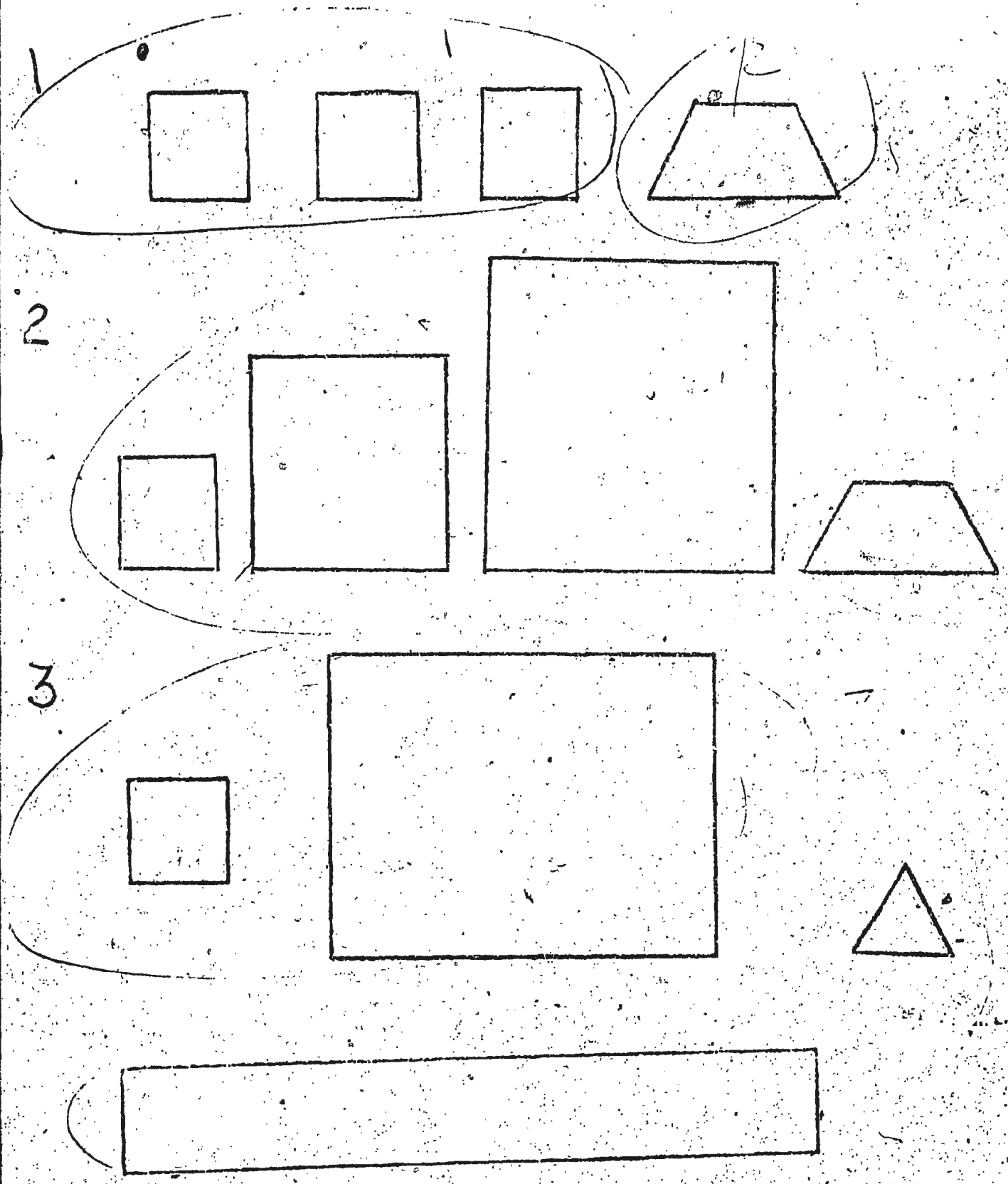
R: Why did you put them like that?

K: 'Cause I just wanted to.

R: O.K. Fine, Kika.

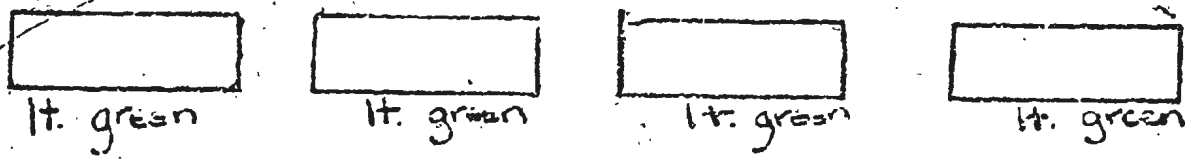
APPENDIX B

Grouping (Child 1) 170

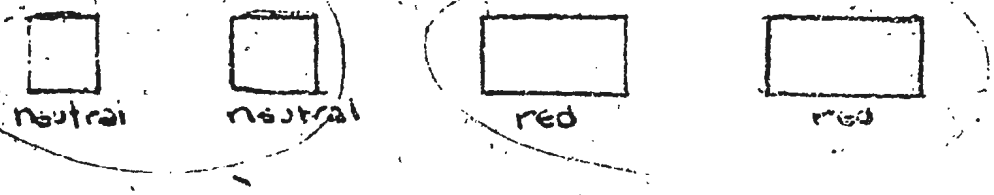


4.

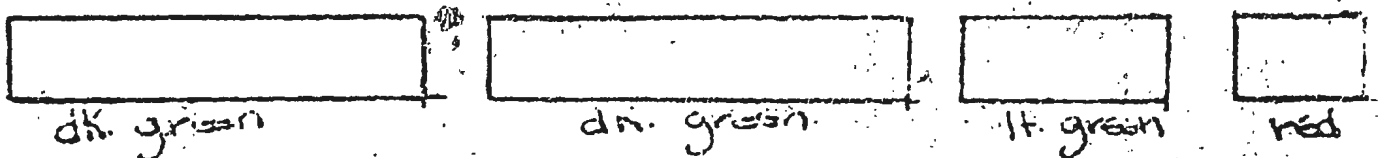
5.


lt. green
lt. green
lt. green
lt. green

6.


neutral
neutral
red
red

7.


dk. green
dk. green
lt. green
red

8. porcupine porcupine porcupine butterfly

9. squirrel squirrel squirrel beaver

10. giraffe deer bear dog

10 lion dog dog buffalo

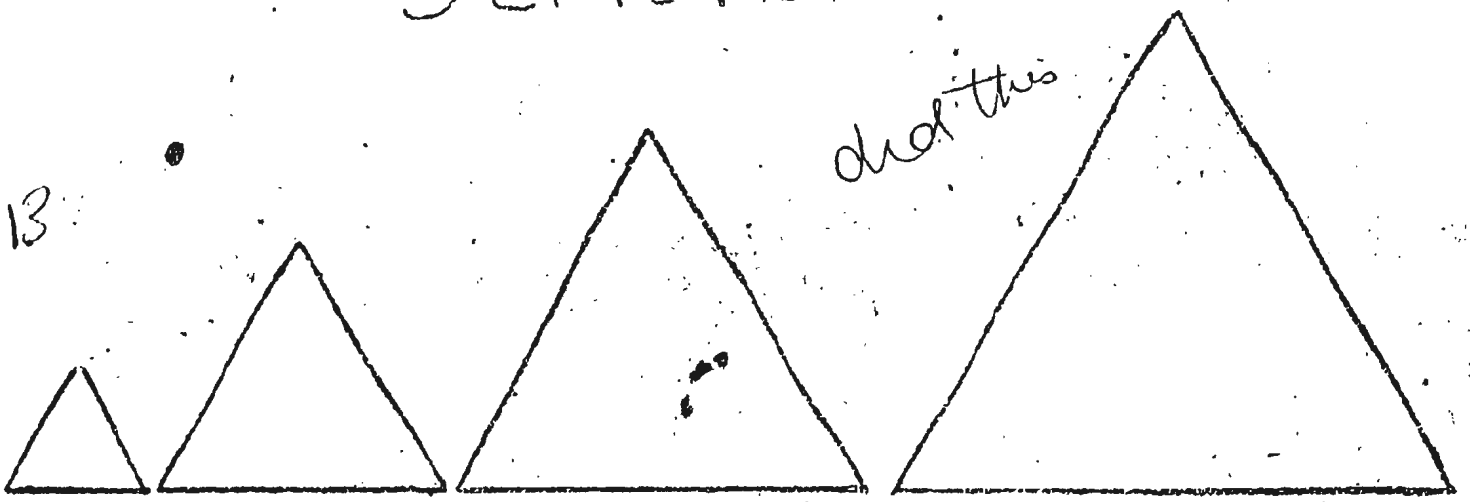
12. fish turtle lizard frog

swim

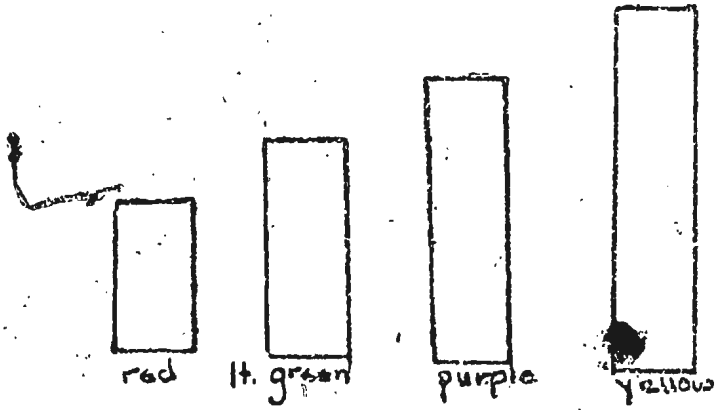
Seriation

13

did this

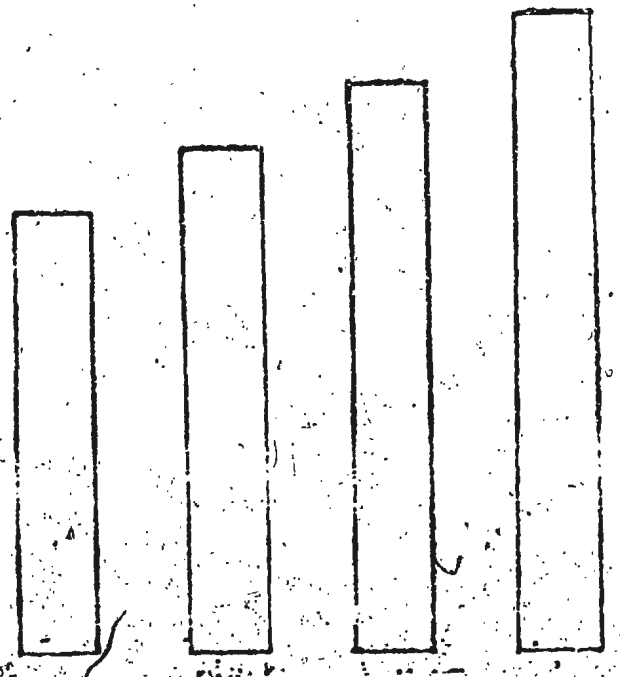


2/4



did this

3/5

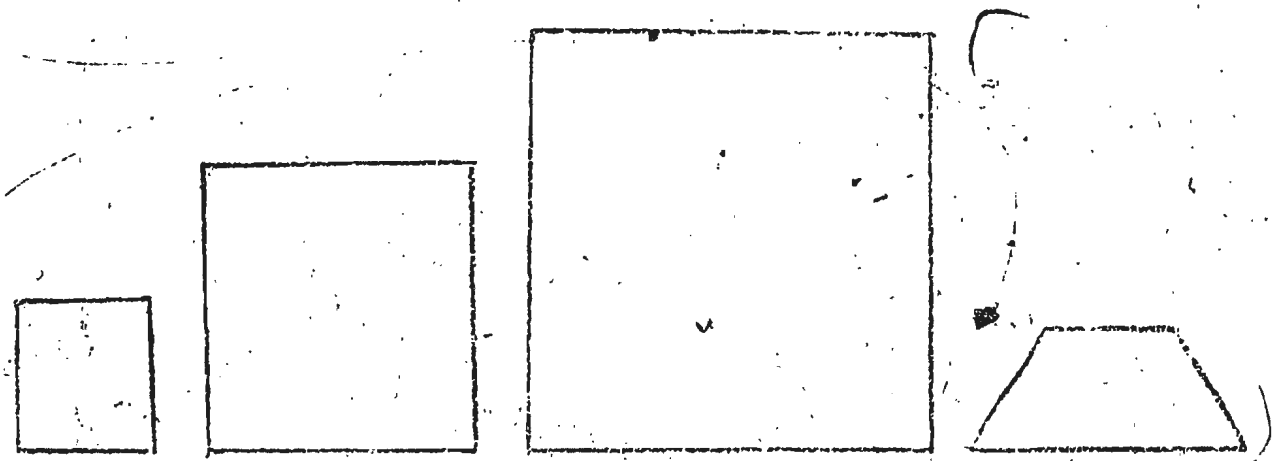


did this

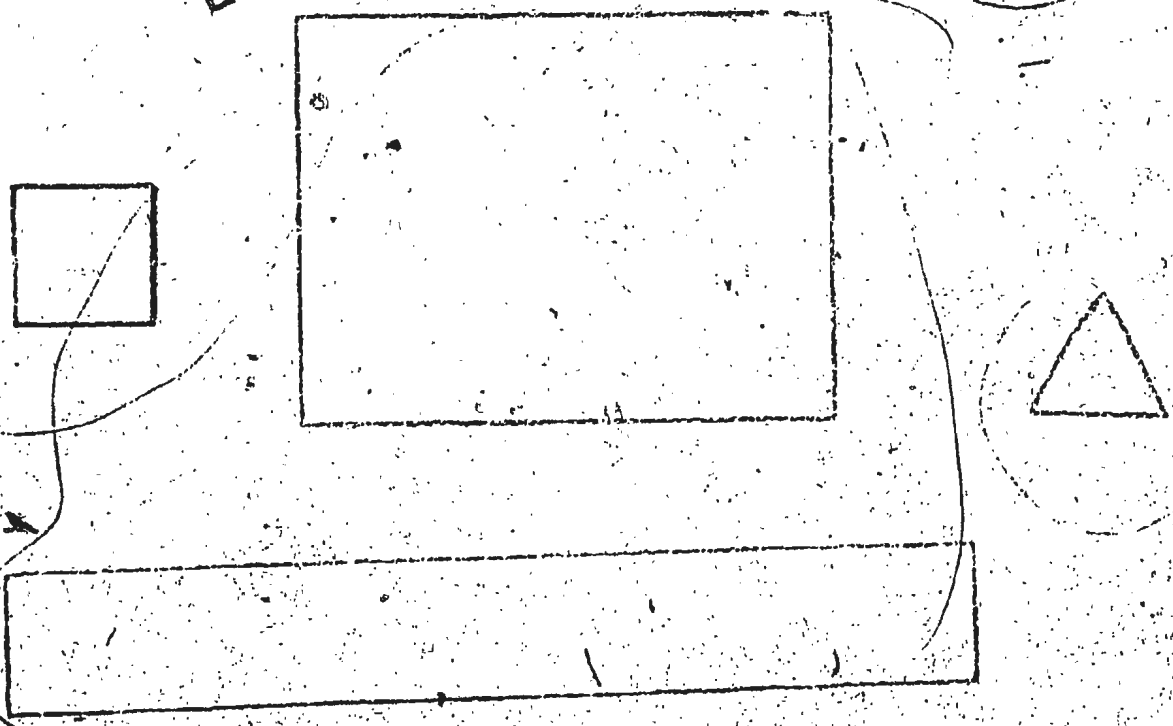
Grouping (Child 2) 174

1

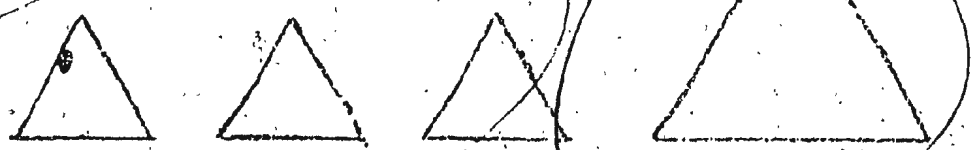
2



3



4.



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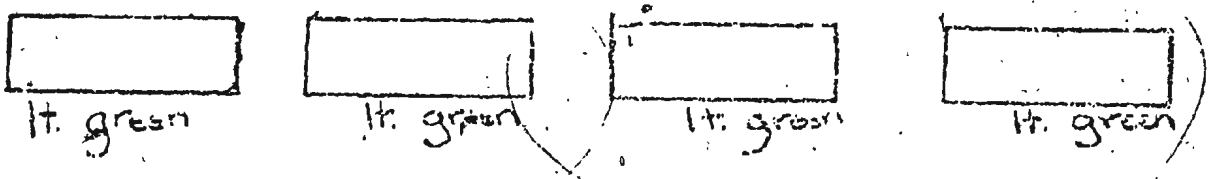
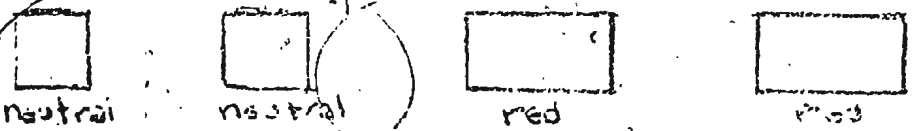
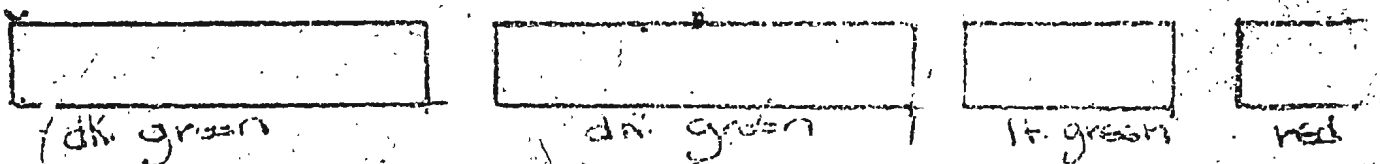

lt. green
lt. green
lt. green
lt. green

6.


neutral
neutral
red

7.


dk. green
dk. green
lt. green
red

8. porcupine porcupine porcupine butterfl

9. squirrel squirrel squirrel beaver

10. giraffe deer bears dog

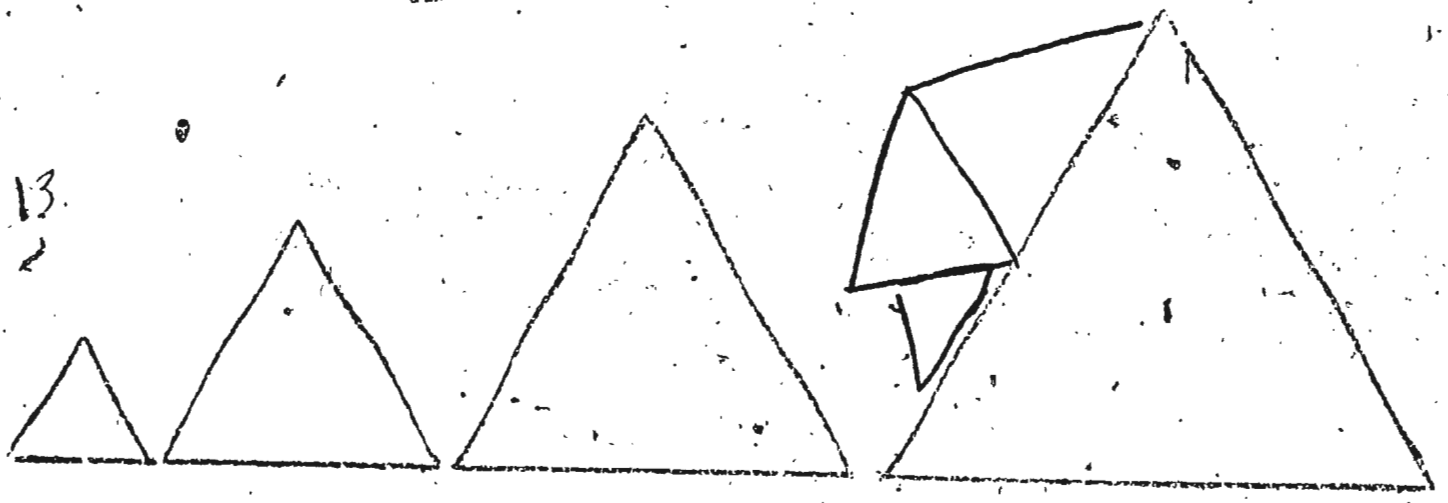
11. lion dog dog buffalo

12. fish turtle lizard frog

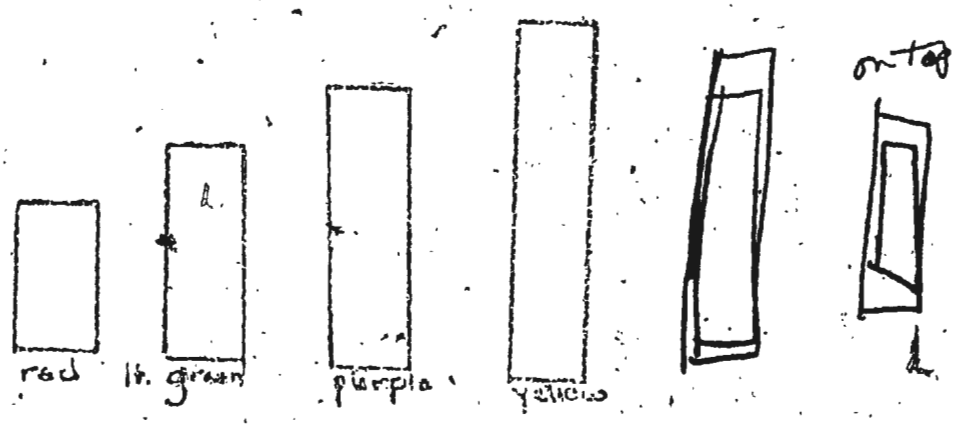
frog turtle

Seriation

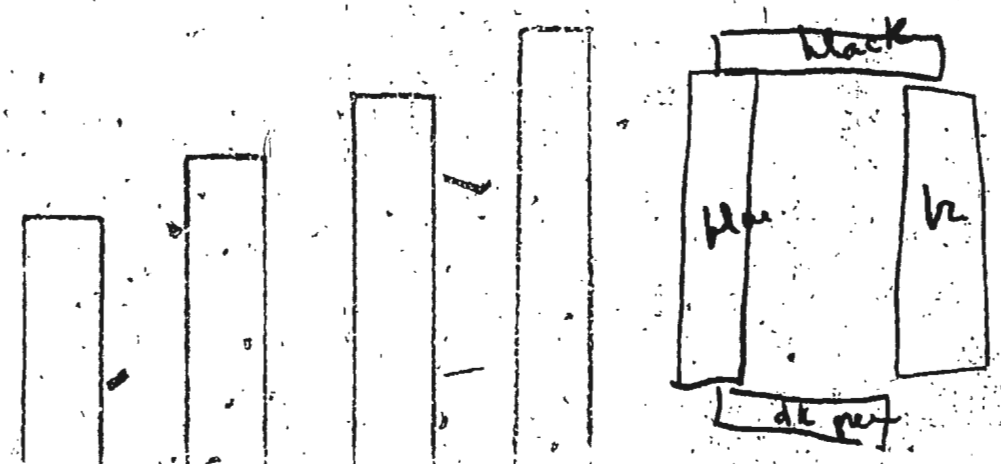
13.



14.

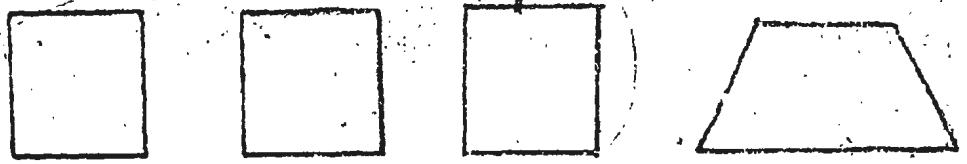


15.

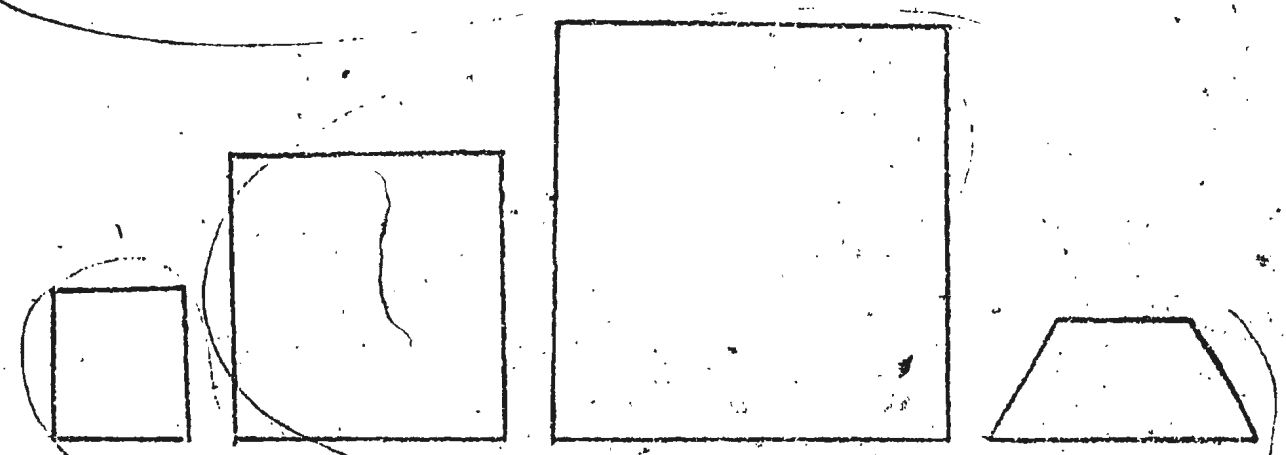


Grouping (Child 3)

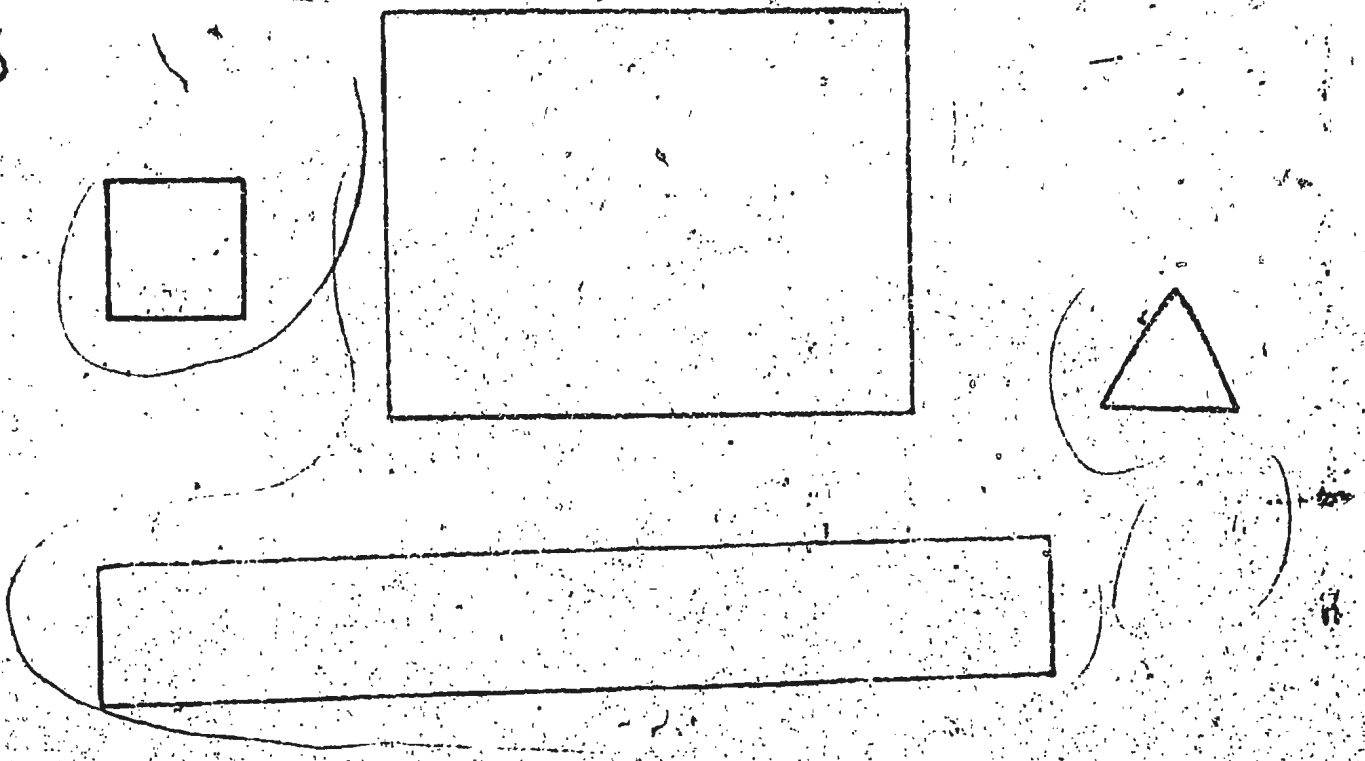
1



2

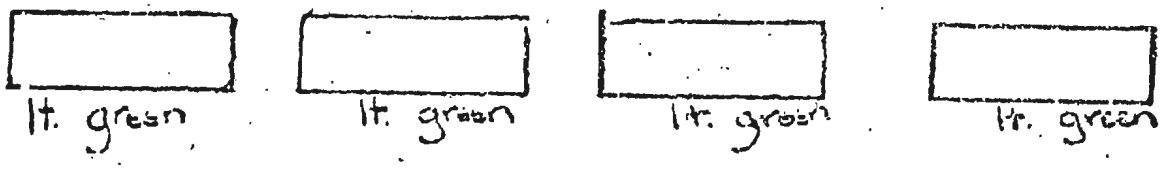


3

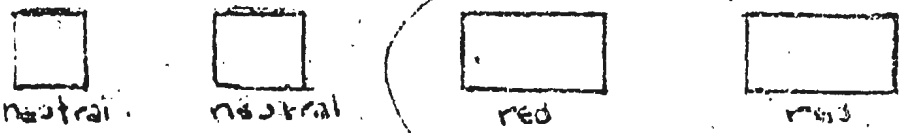


4.

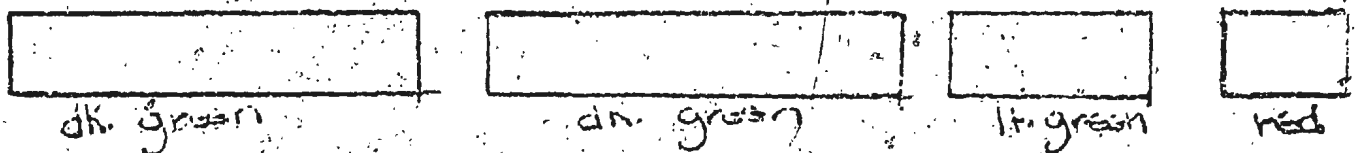
5.


lt. green
lt. green
lt. green
lt. green

6.


neutral
neutral
red
red

7.


dk. green
dk. green
lt. green
red

8. porcupine porcupine porcupine butterfly

9. squirrel squirrel squirrel beaver

10. giraffe deer 3 bears dog

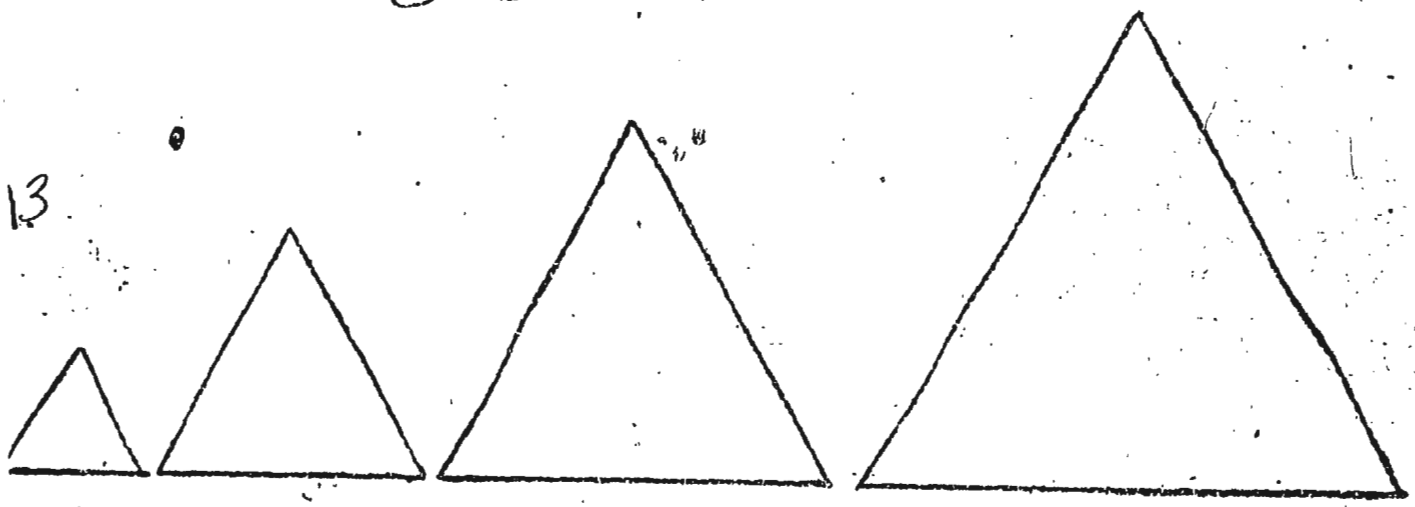
11. lion dog dog buffalo

12. fish turtle lizard frog

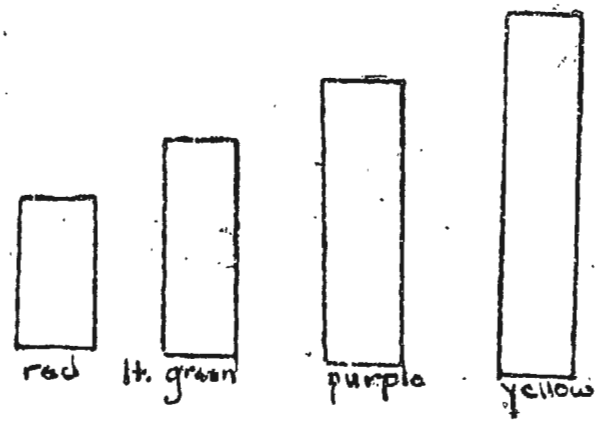
water
green

Seriation

13.

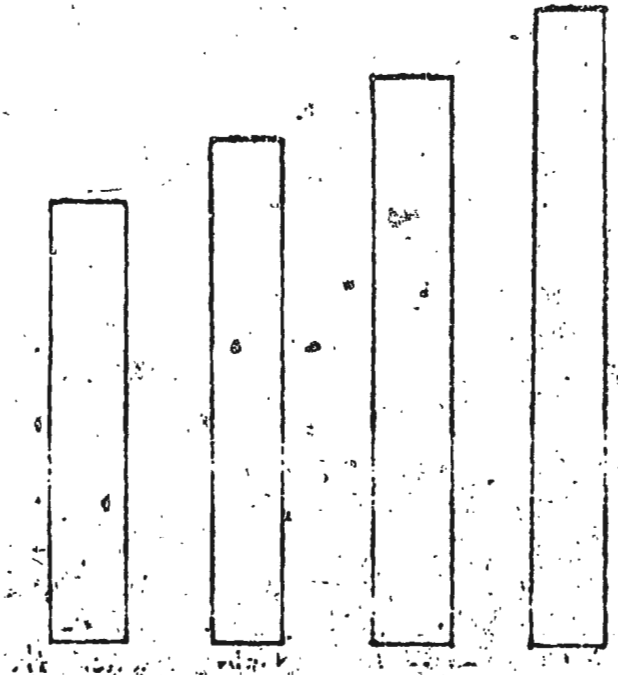


14.



then photos with all figure

15.



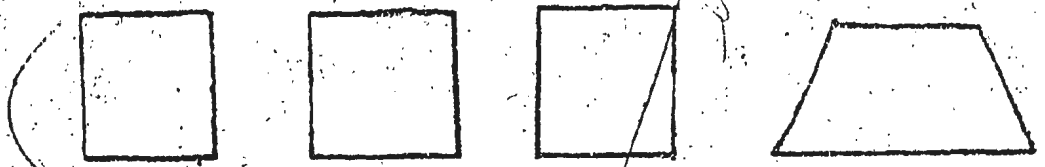
(ordered) then accords to size

children know why

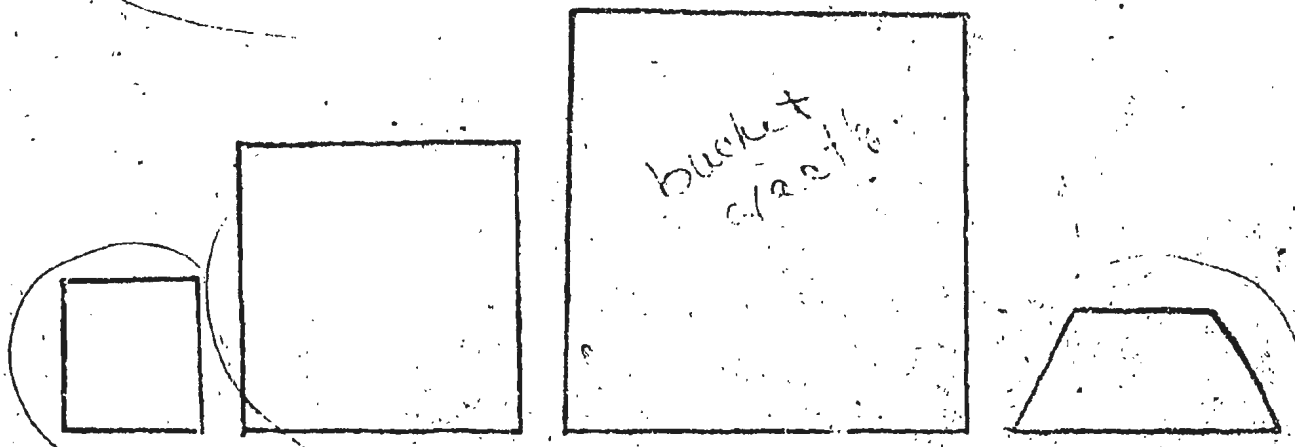
Grouping

✓ track (child 4)

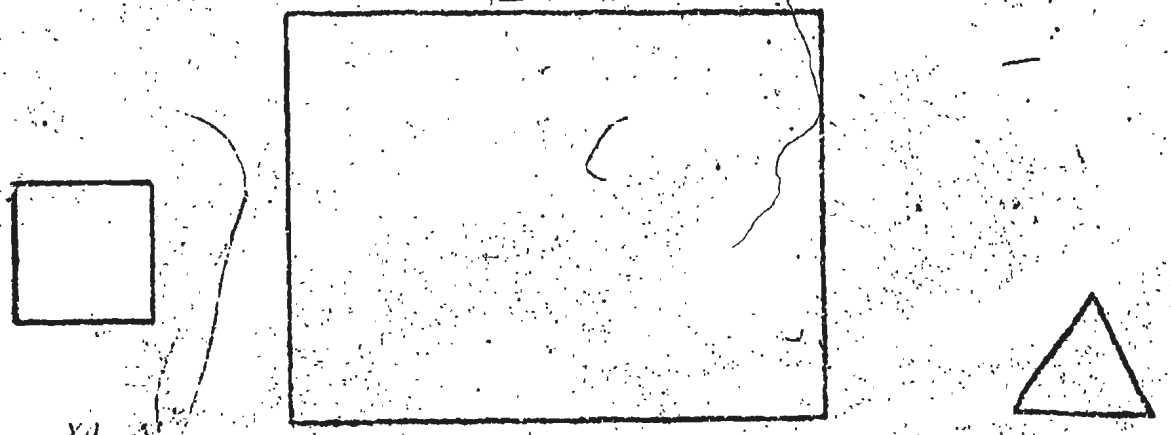
1



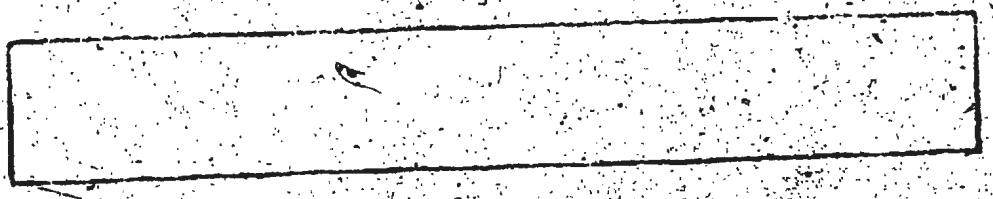
2



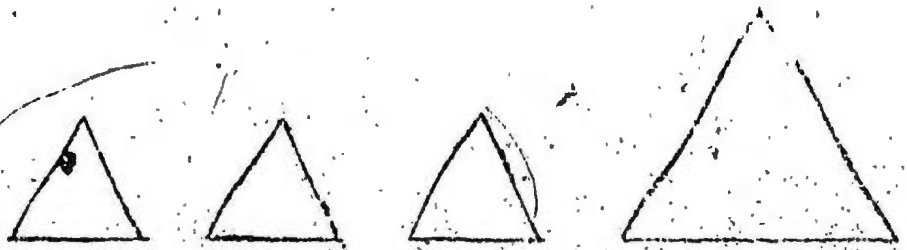
3



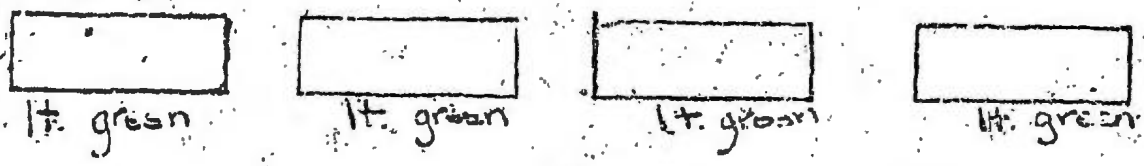
(1)



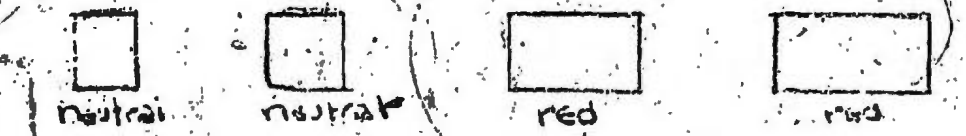
4.



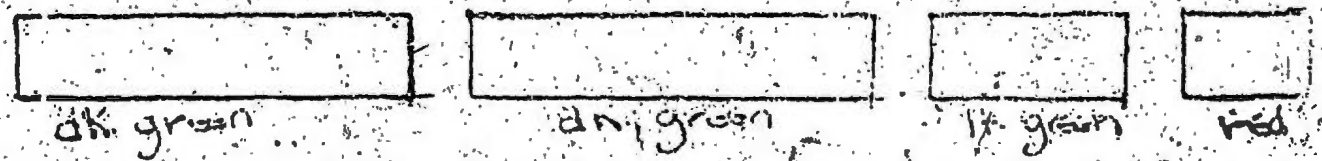
5.


lt. green
lt. green
lt. green
lt. green

6.


neutral
neutral
red
red

7


dk. green
dk. green
lt. green
red

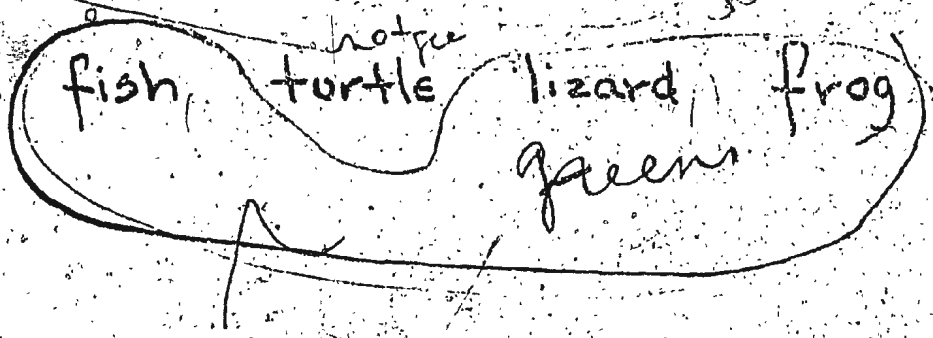
8. porcupine porcupine porcupine butterfly

9. squirrel squirrel squirrel beaver

10. giraffe deer 3 bears dog

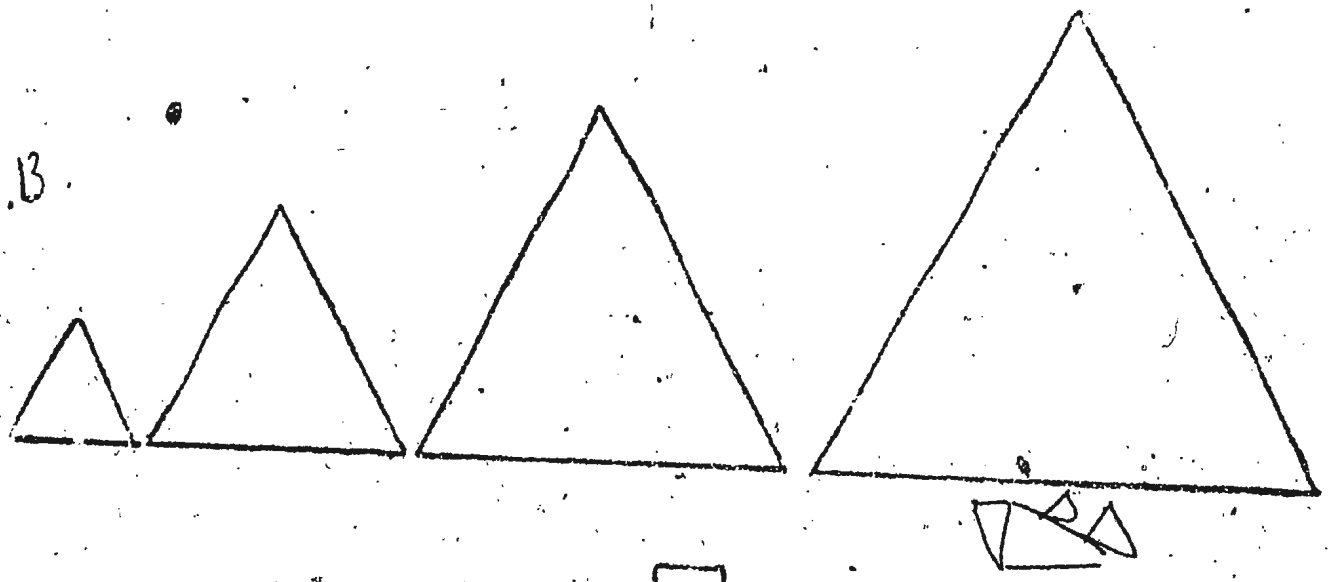
11. lion dog dog buffalo

12. fish turtle lizard frog

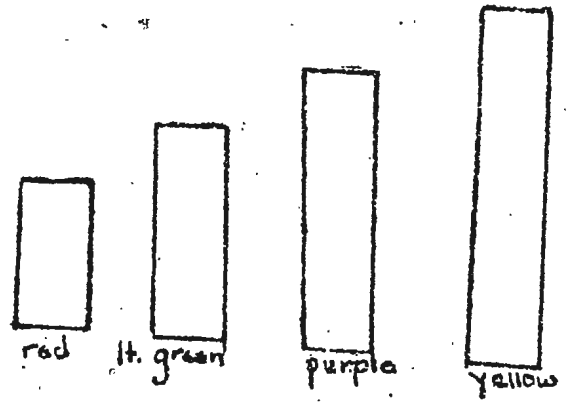


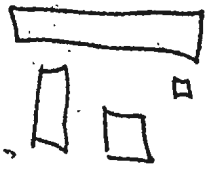
Seriation

13.

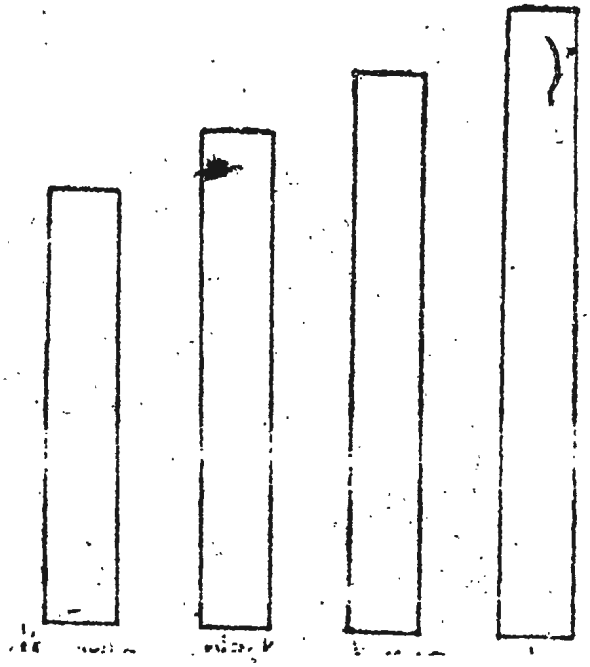


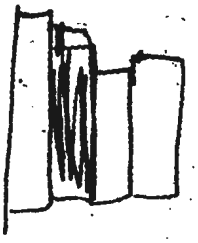
14.





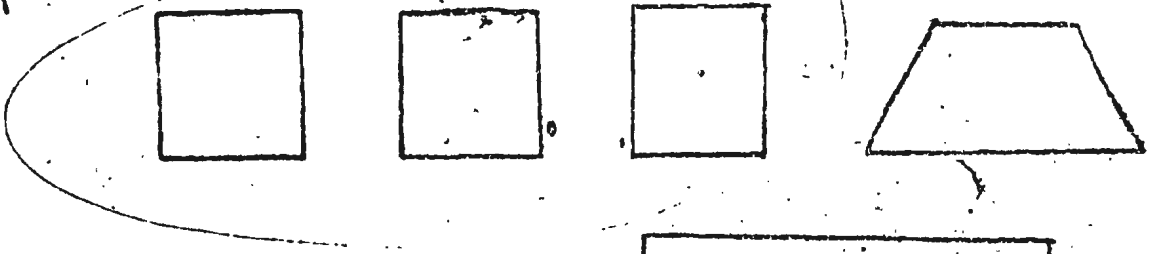
15.



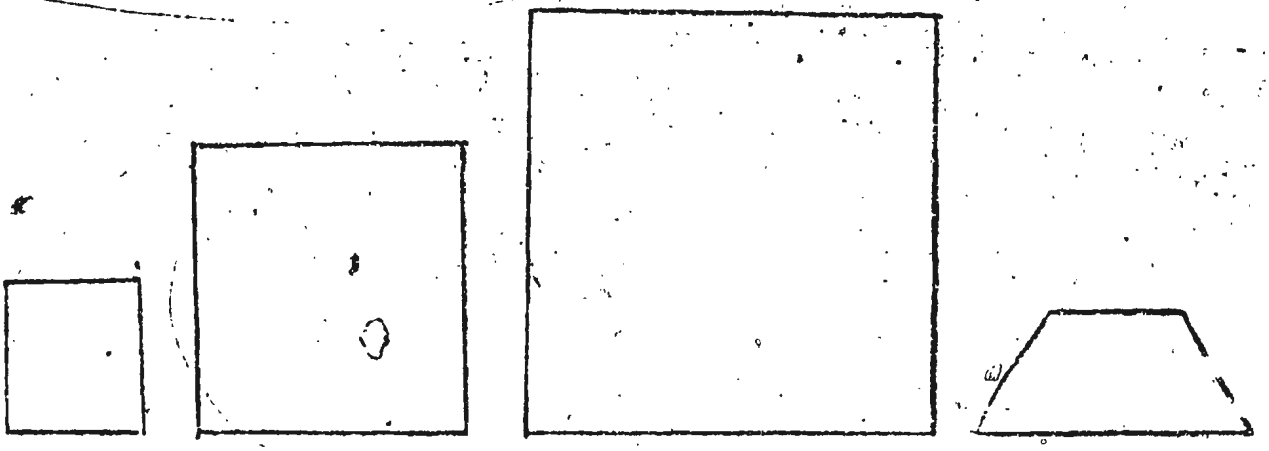


Grouping (child 5)

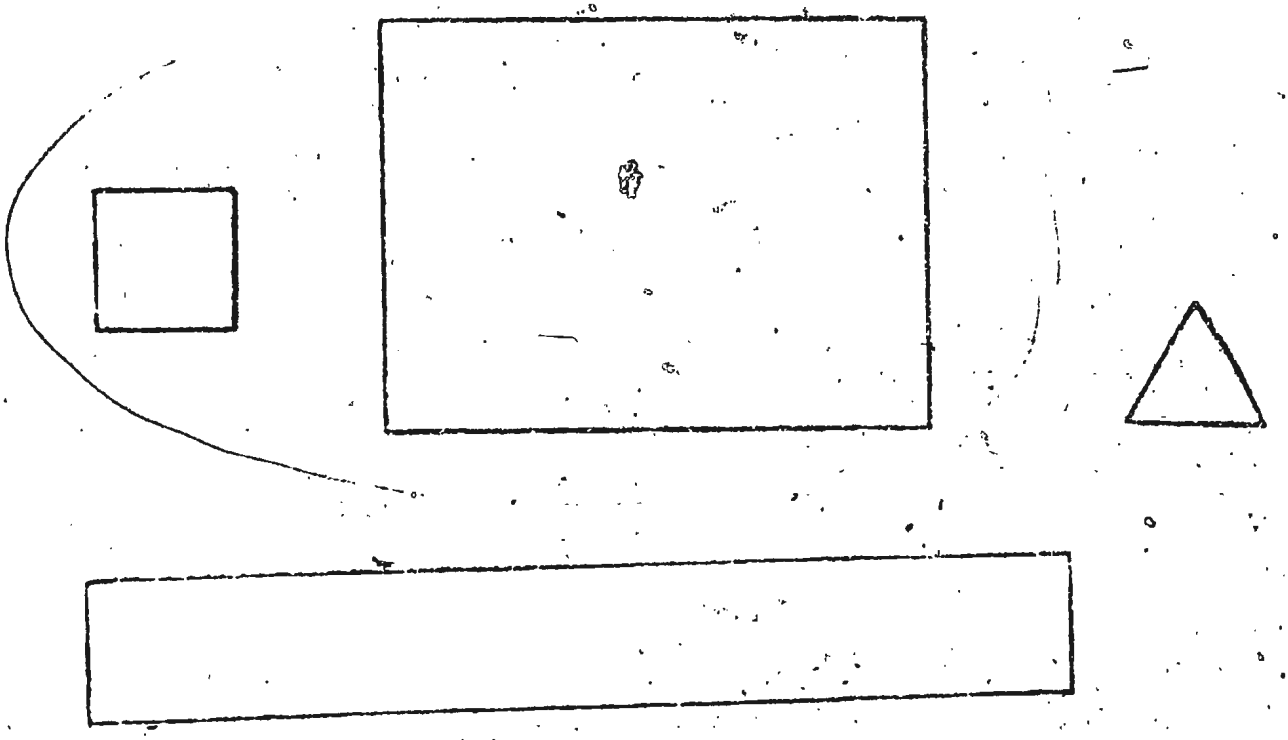
1



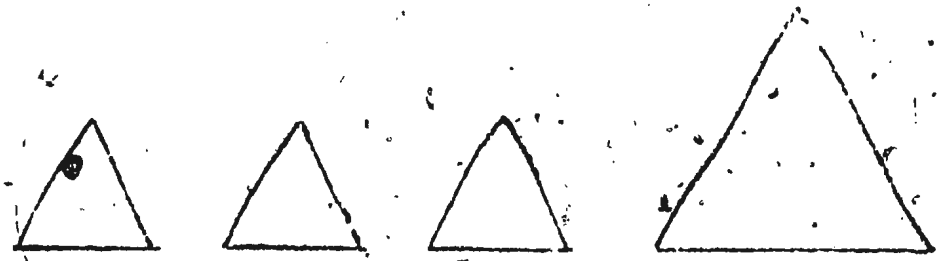
2



3



4.



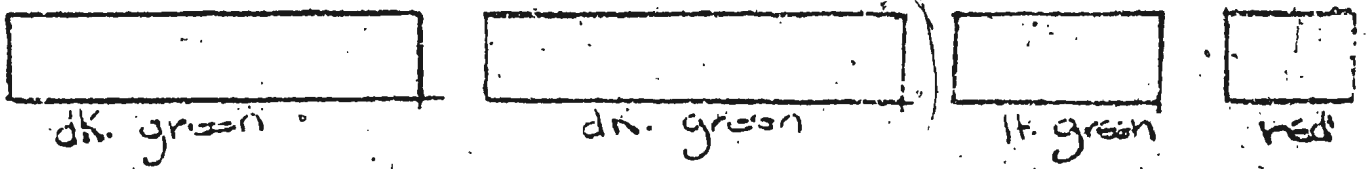
5.


lt. green
lt. green
lt. green
lt. green.

6.


neutral
neutral
red
red

7.


dk. green
dk. green
lt. green
red

8. porcupine porcupine porcupine butterfly

9. squirrel squirrel squirrel beaver

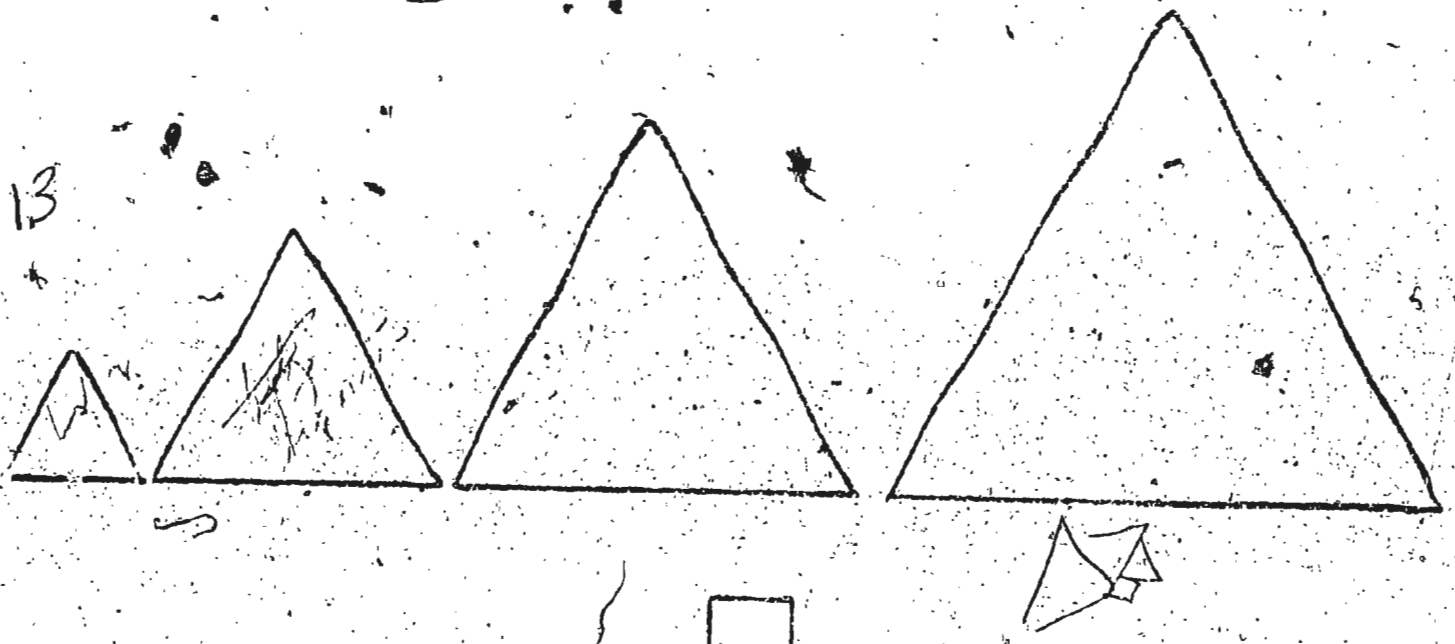
10. giraffe deer 3 bears dog horse

11. lion dog dog buffalo

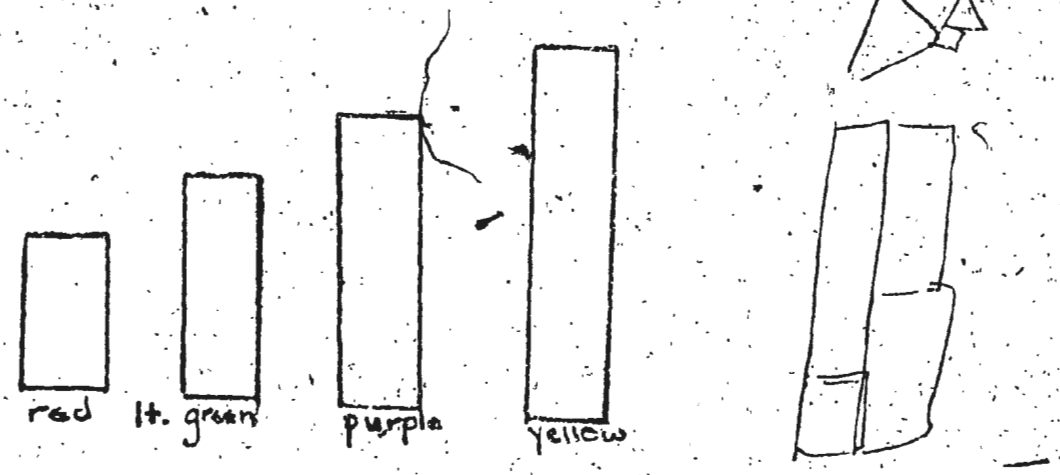
12. fish turtle lizard frog

Seriation

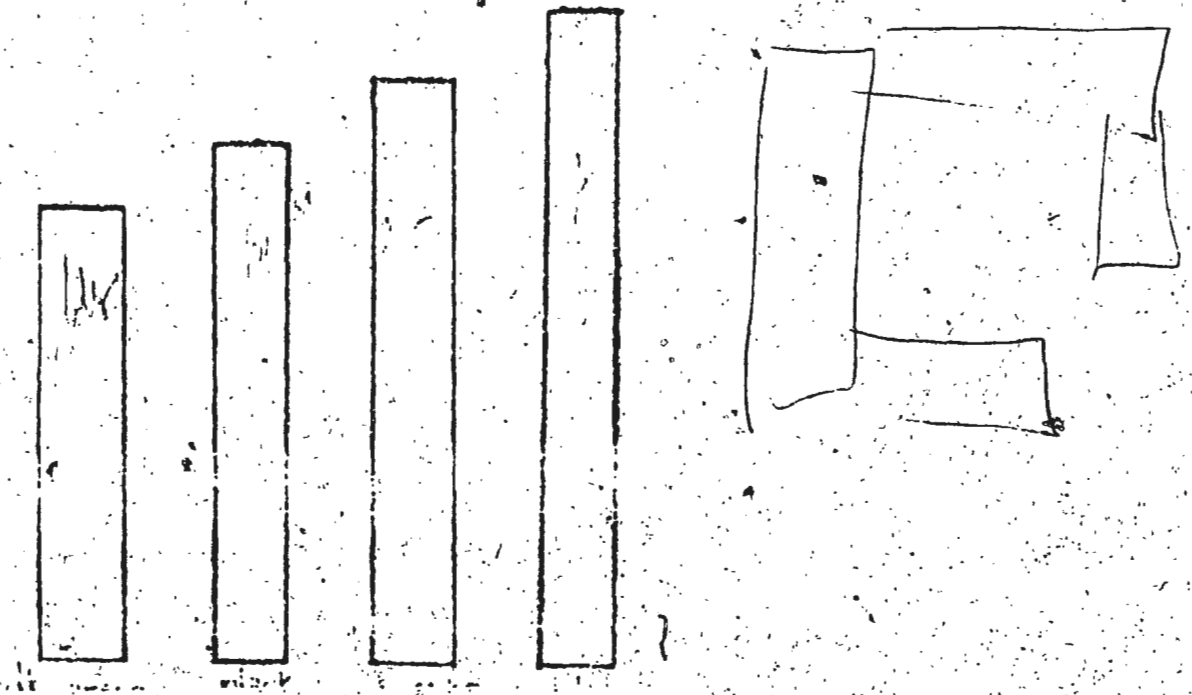
13



14



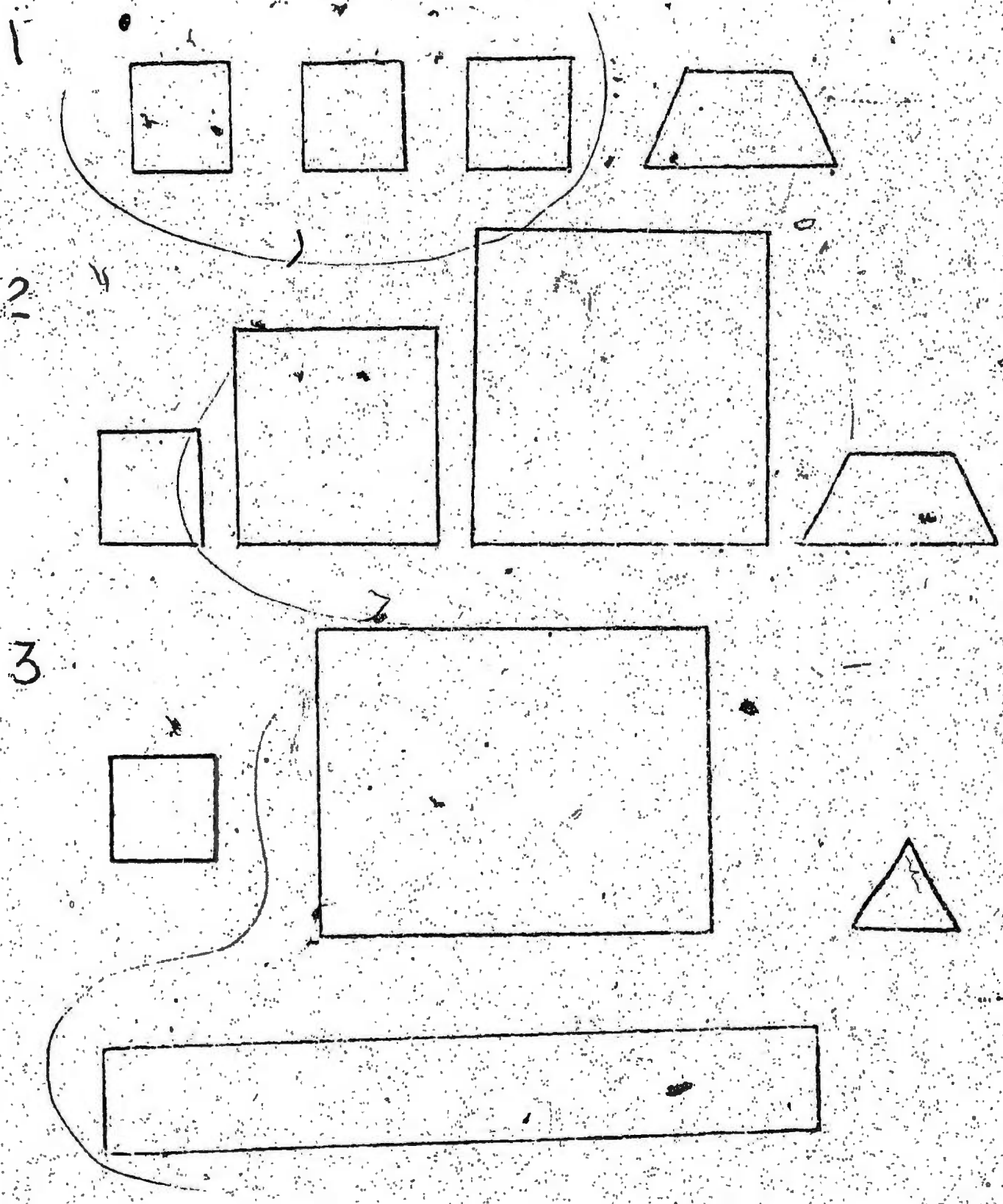
15



Grouping - (Child 6)

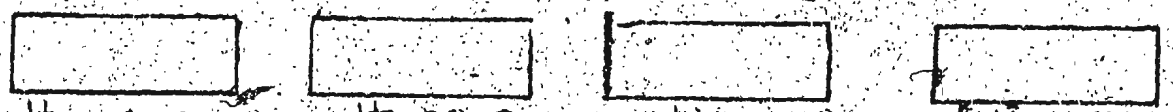
John C.

190

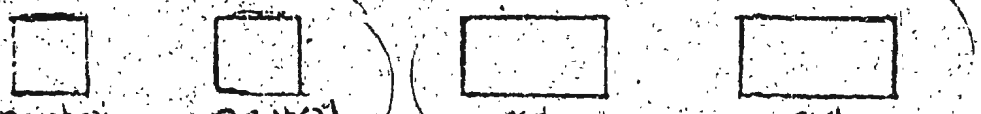


4.

5.

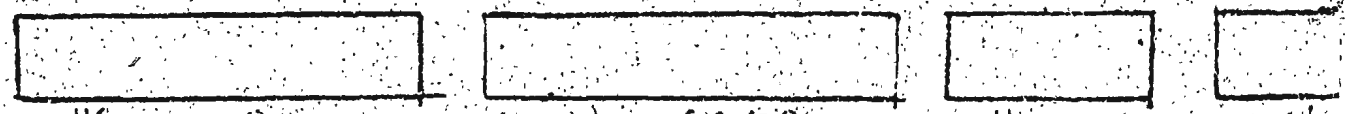


6.



all 1 pair

7.



8. porcupine porcupine porcupine butterfly

9. squirrel squirrel squirrel beaver

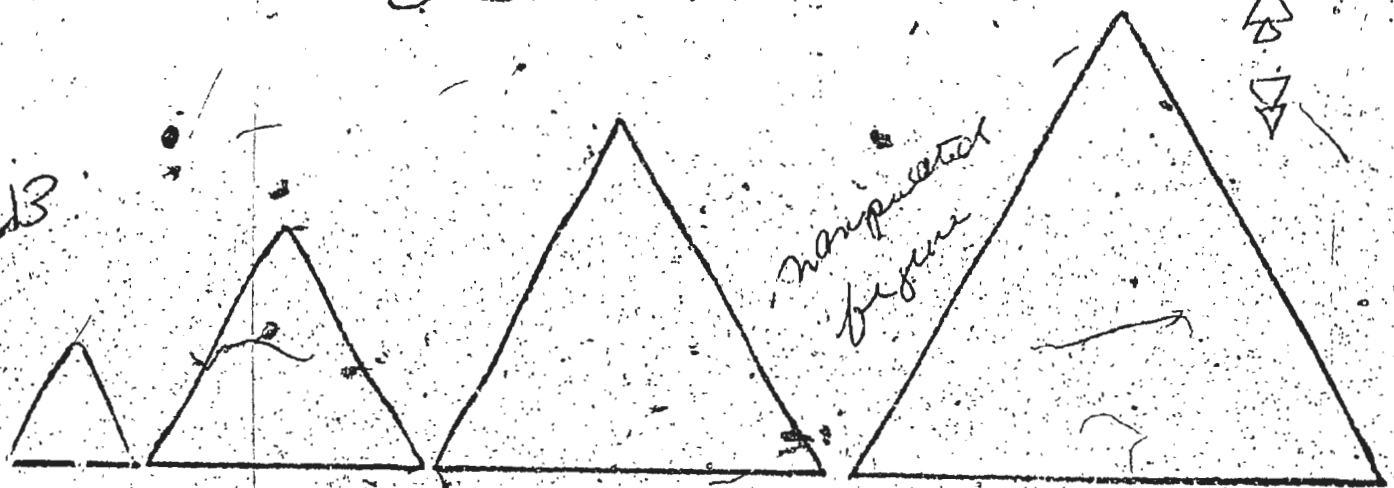
10. giraffe deer 3 bears dog

11. lion dog dog buffalo

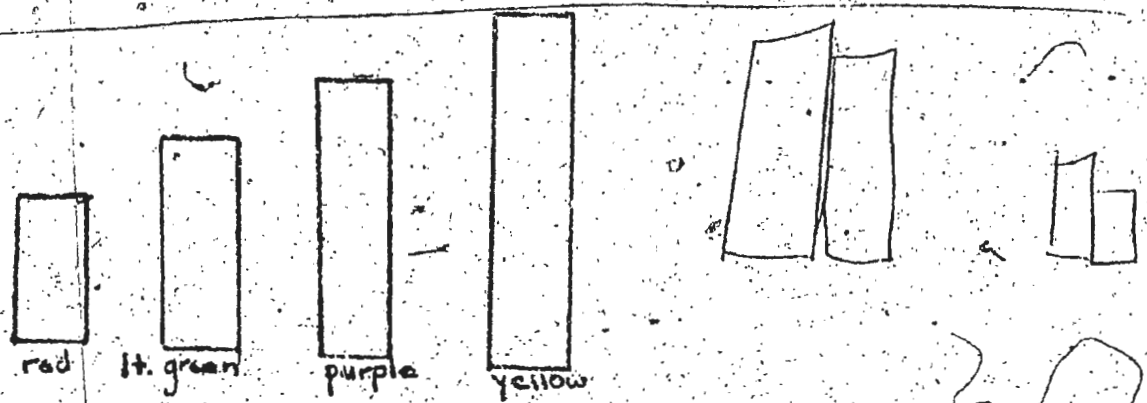
12. fish turtle lizard frog

Seriation

13.

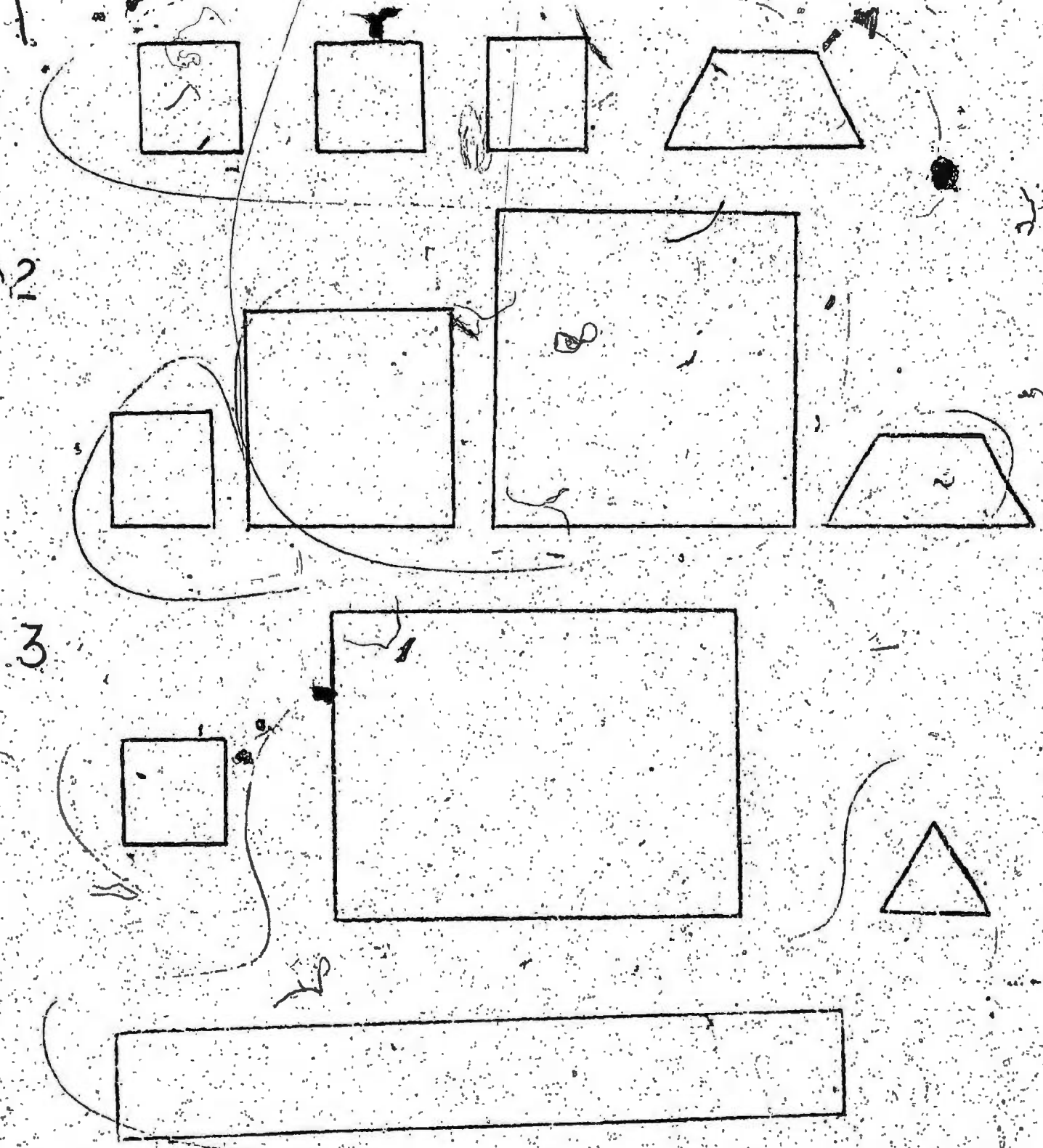


14.



15.

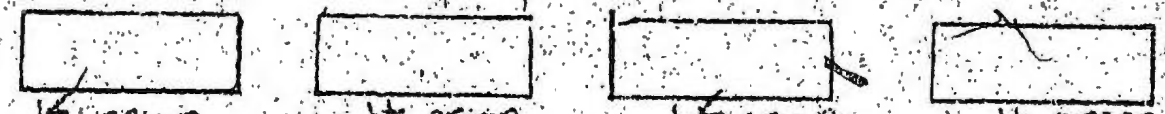
Grouping (Child 7)



4.


C

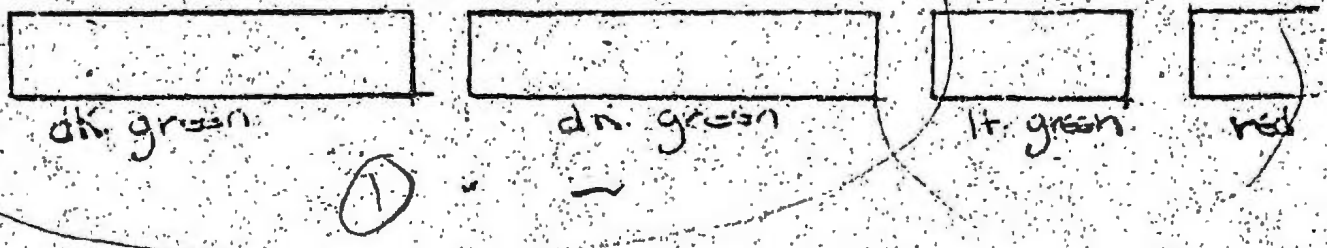
5.


lt. green
lt. green
lt. green
lt. green

6.


2
1
neutral
neutral
red
red

7.


dk. green
dk. green
lt. green
red
1

8. porcupine porcupine porcupine butterfly

9. bsquirrel bsquirrel gsquirrel beaver

10. giraffe deer 3 bears dog

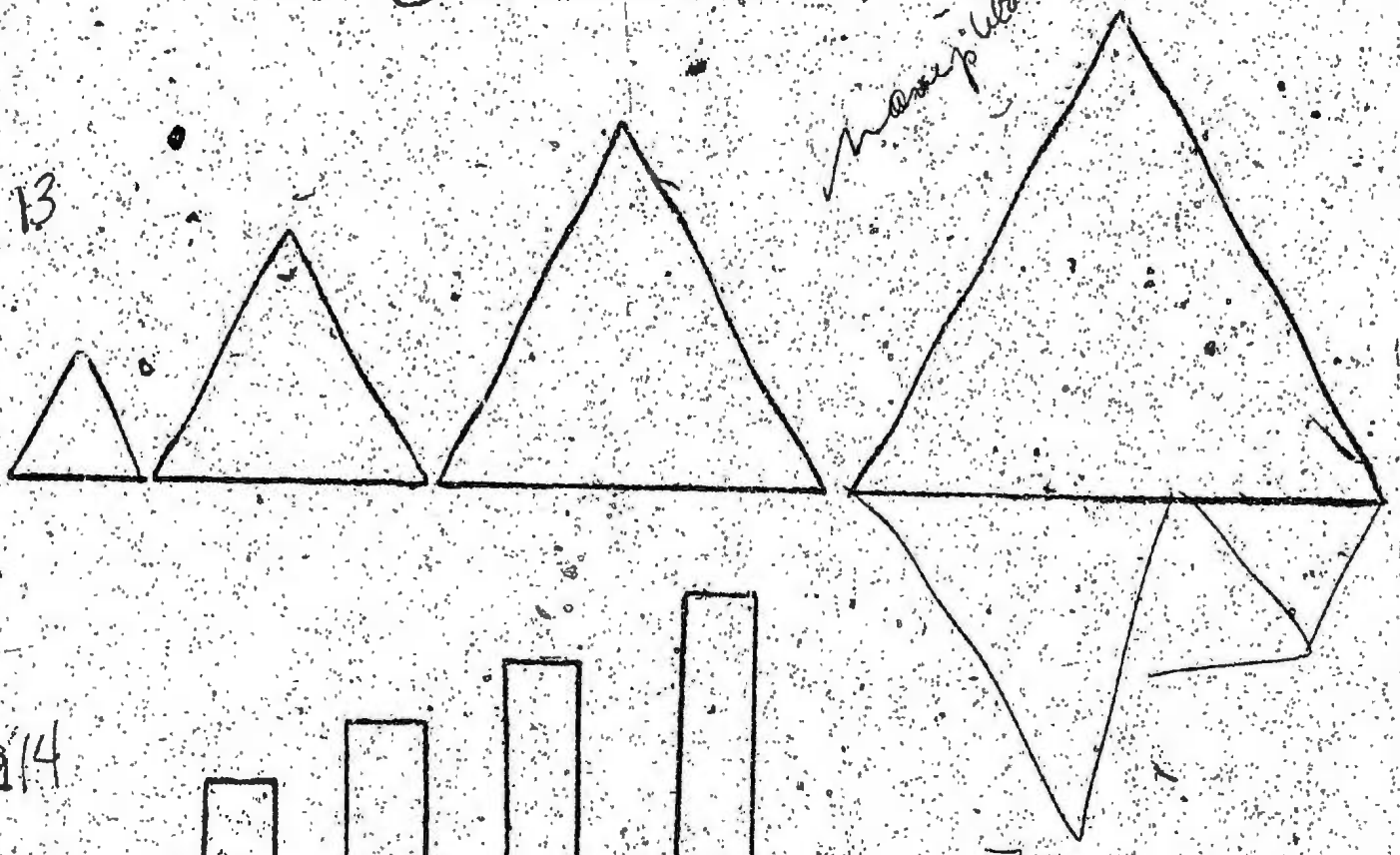
11. lion dog dog buffalo

12. fish turtle lizard frog

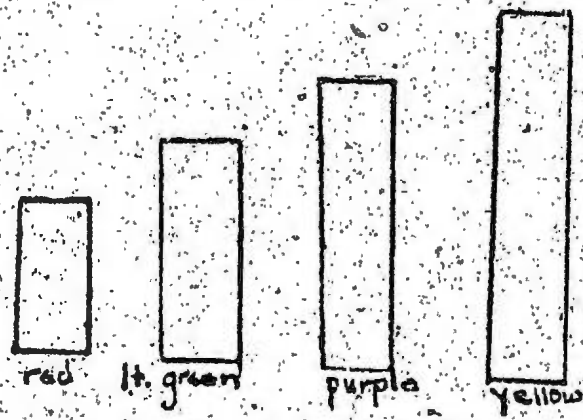
Variation

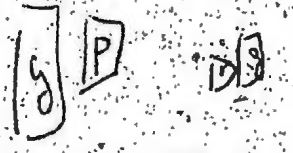
manipulate fx

1.3

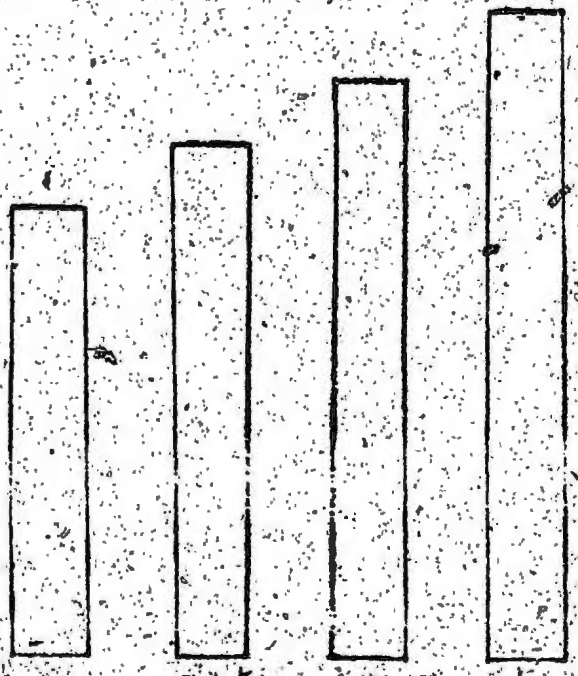


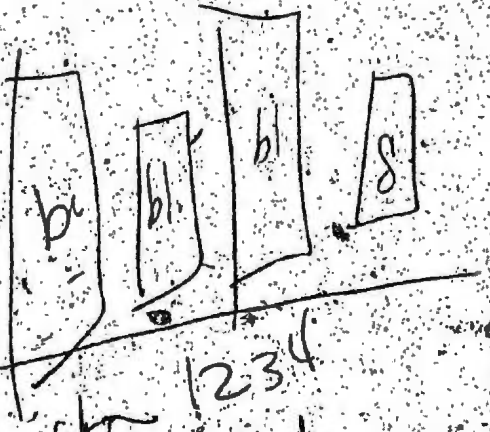
2.4





3.5



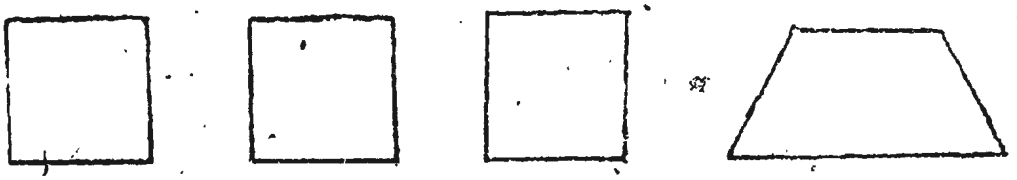


for 1234

this did

Grouping (Child 5)

1



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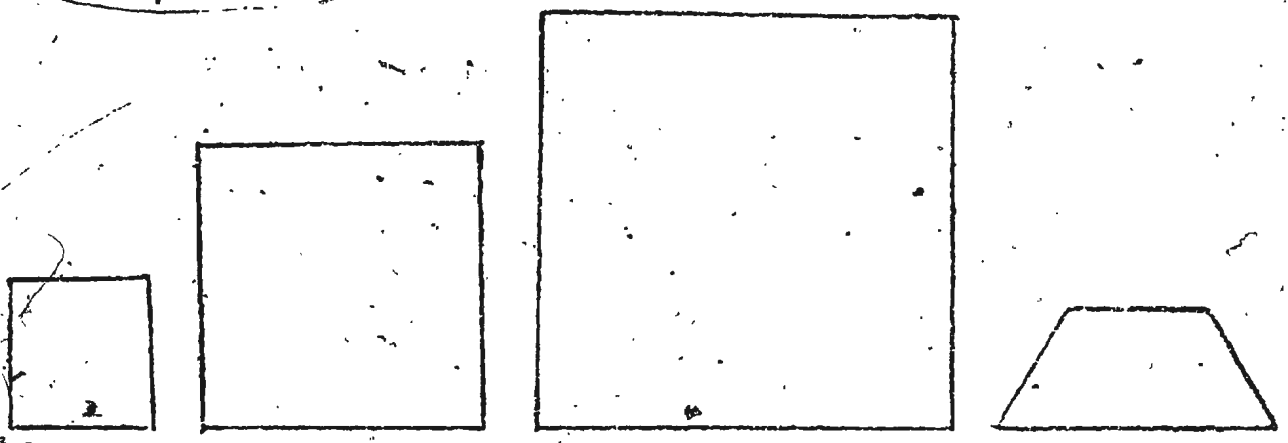
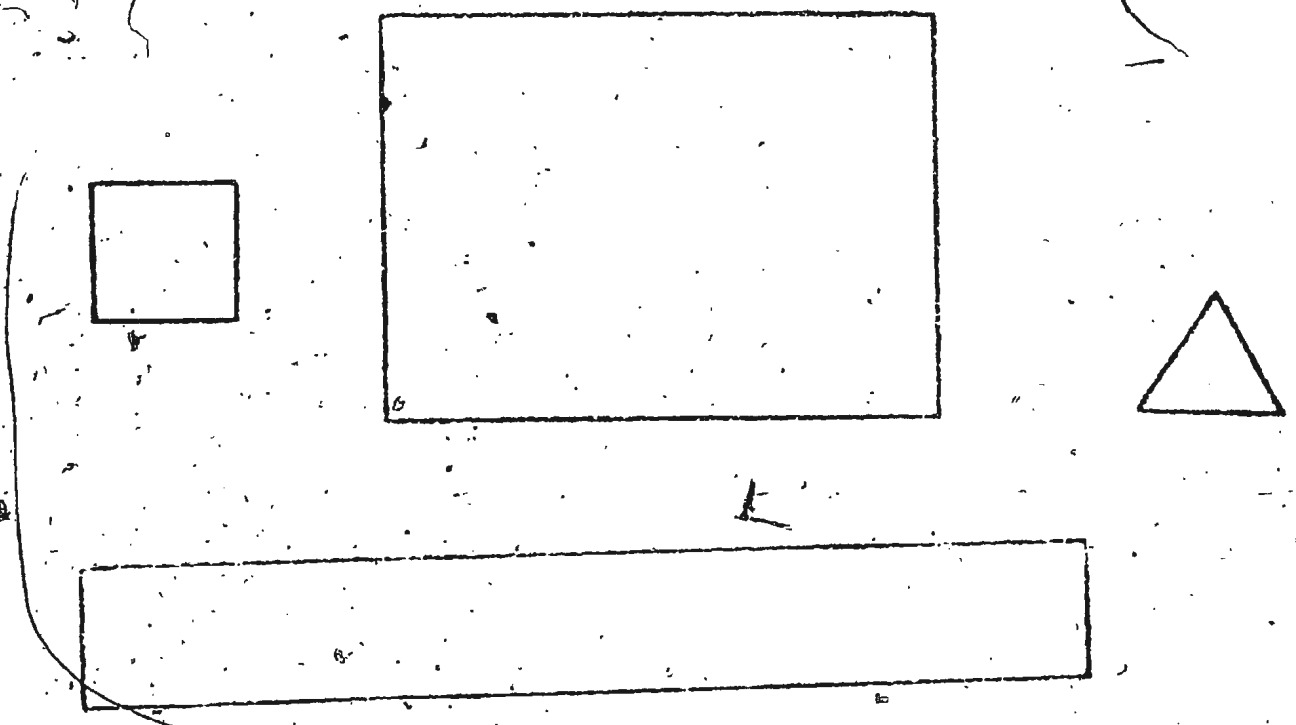
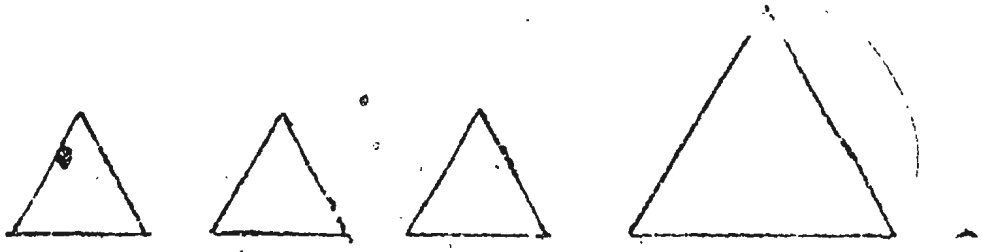


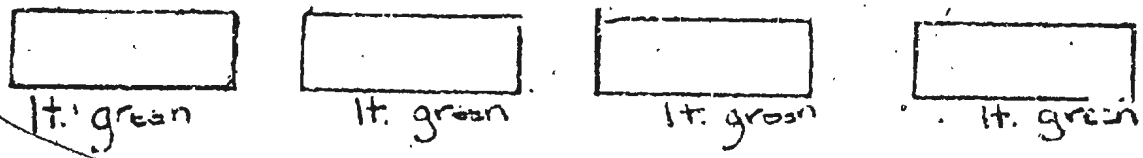
3



4.



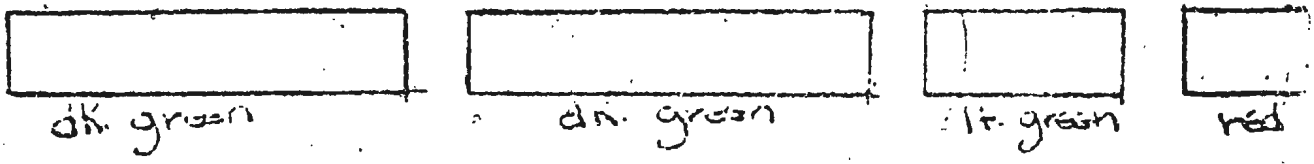
5.


lt. green
lt. green
lt. green
lt. green

6.


neutral
neutral
red
red

7


dk. green
dk. green
lt. green
red

8. porcupine porcupine porcupine butterfly

9. squirrel squirrel squirrel beaver

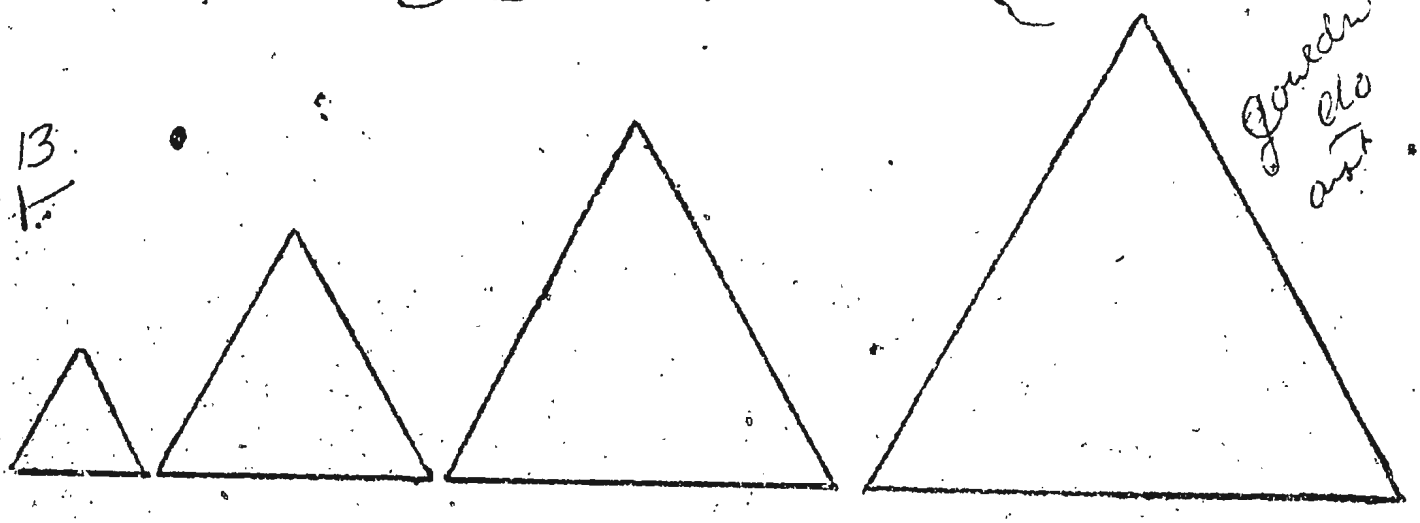
10. giraffe deer 3 bears dog

11. lion dog dog buffalo

12. fish turtle lizard frog

Seriation

13.



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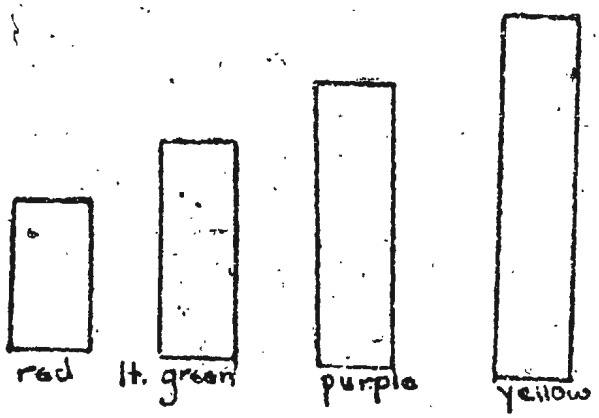

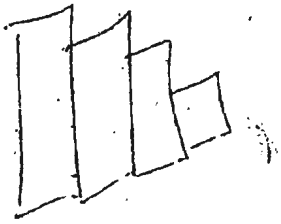

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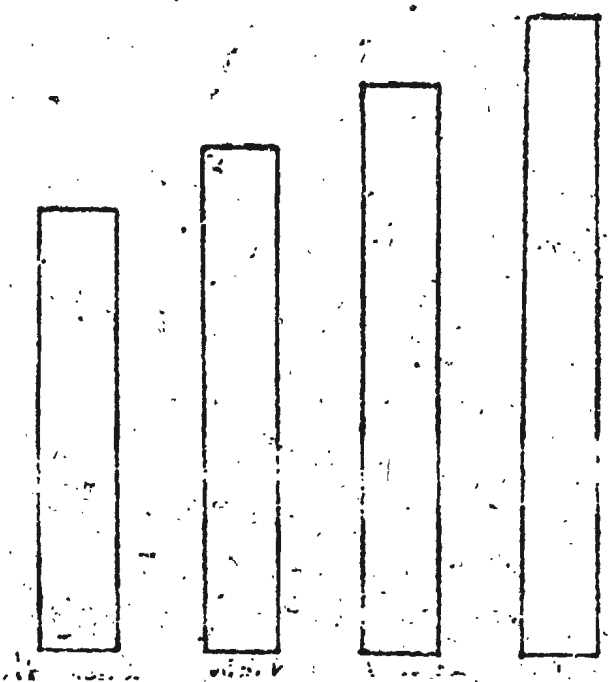

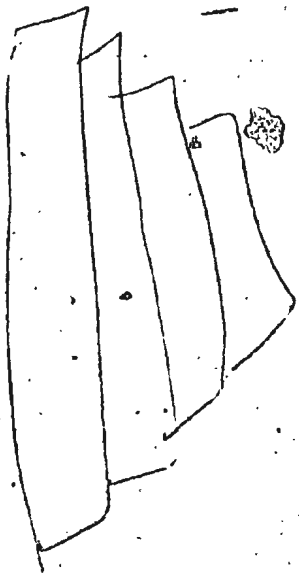

Grouping (child 9)

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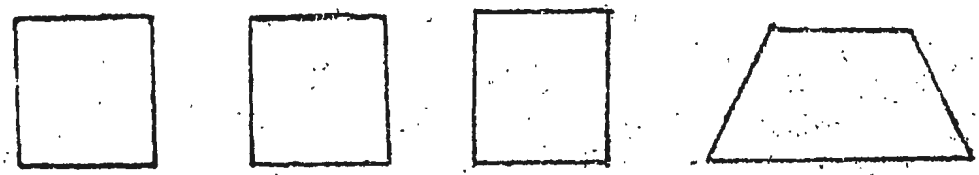
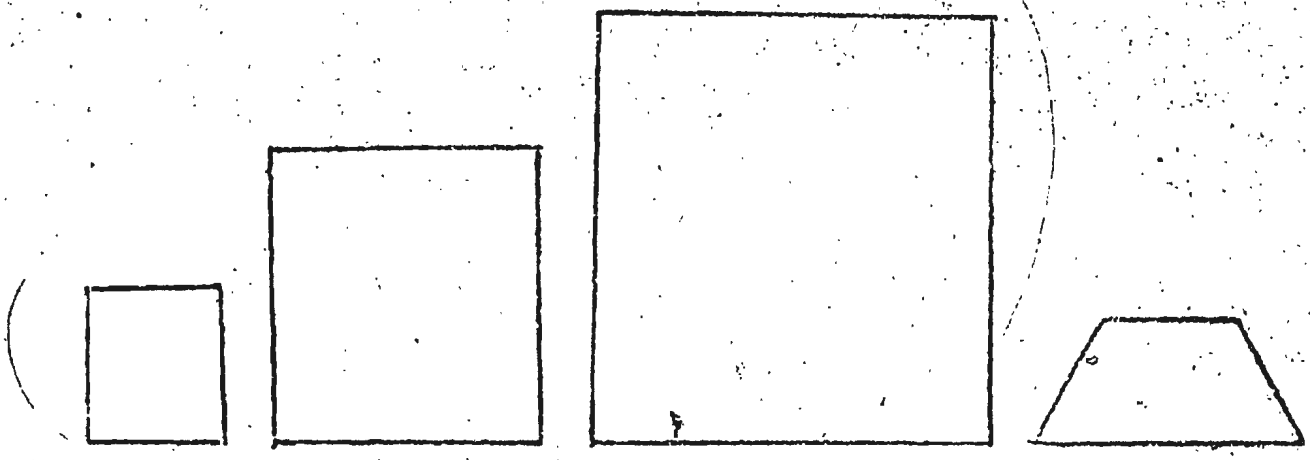
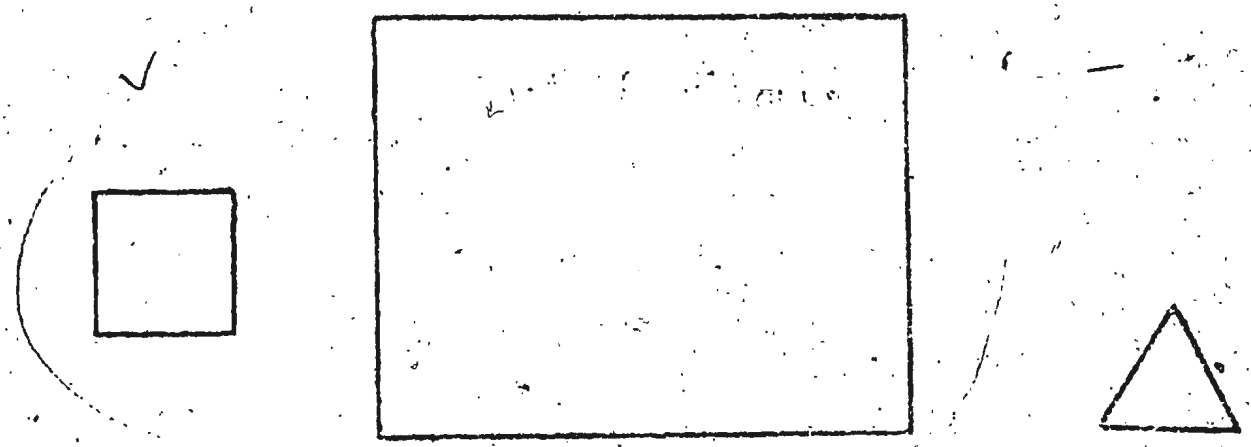
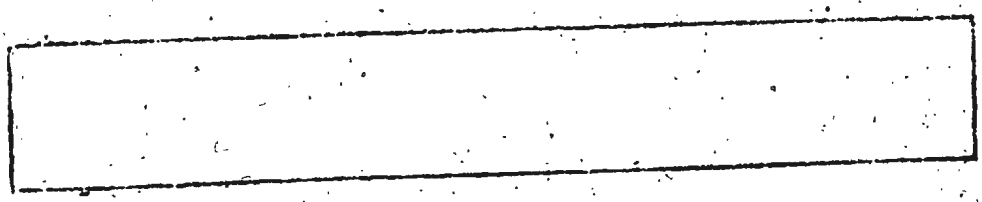


2

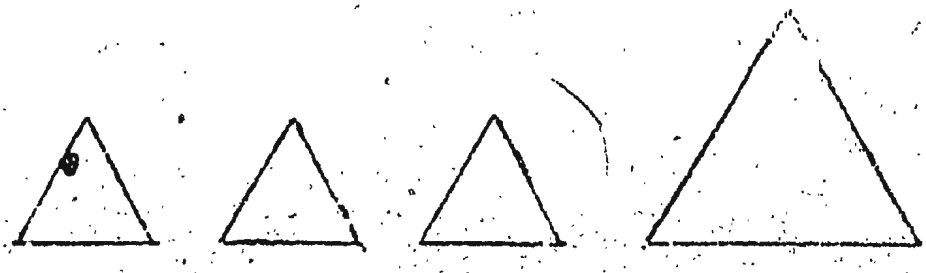


3

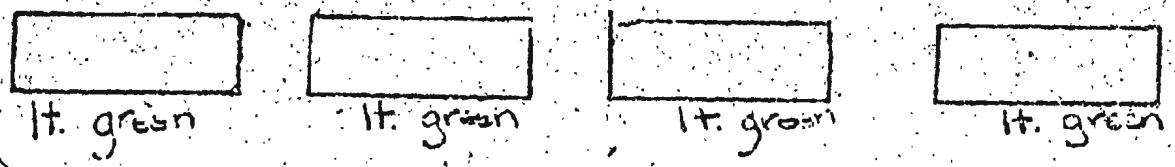




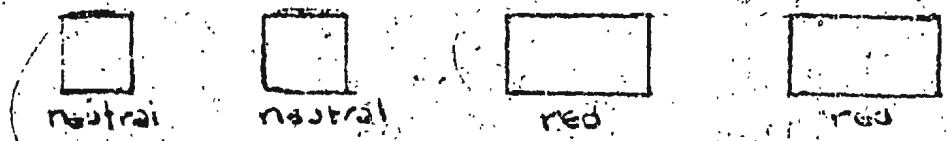
4.



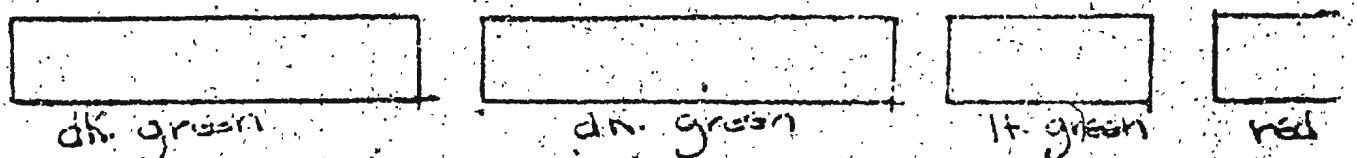
5.


lt. green
lt. green
lt. green
lt. green

6.


neutral
neutral
red
red

7.


dk. green
dk. green
lt. green
red

8. porcupine porcupine porcupine butterfly

9. bsquirrel bsquirrel gsquirrel beaver

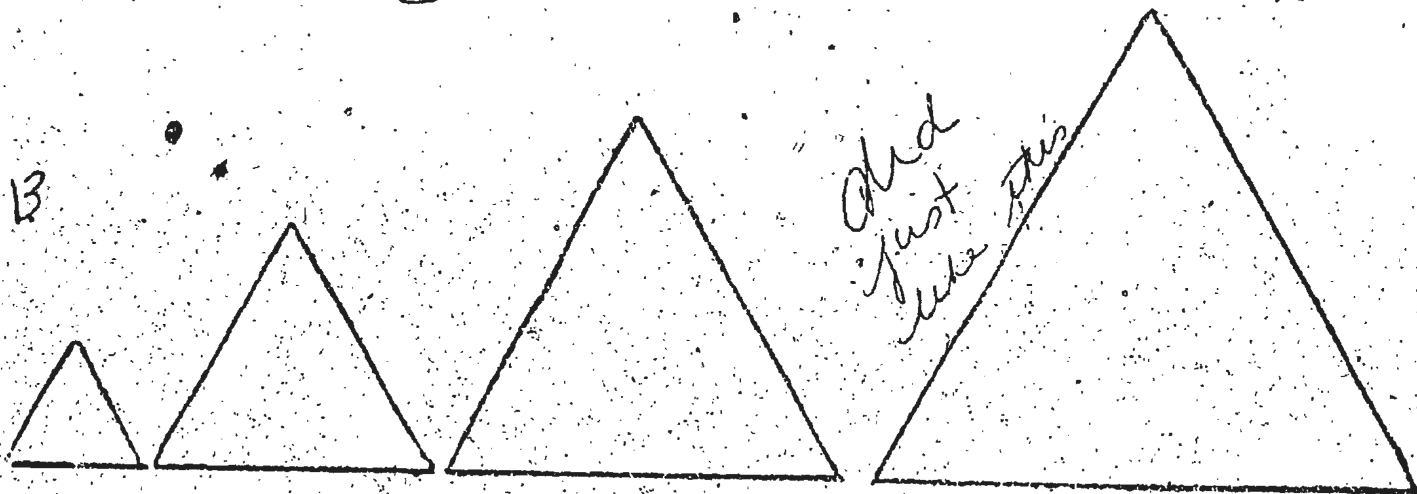
10. giraffe deer 3 bears dog

11. lion dog dog buffalo

12. fish turtle lizard frog

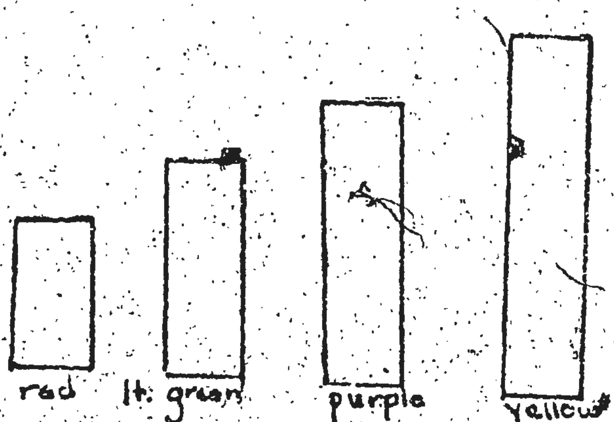
Seriation

13



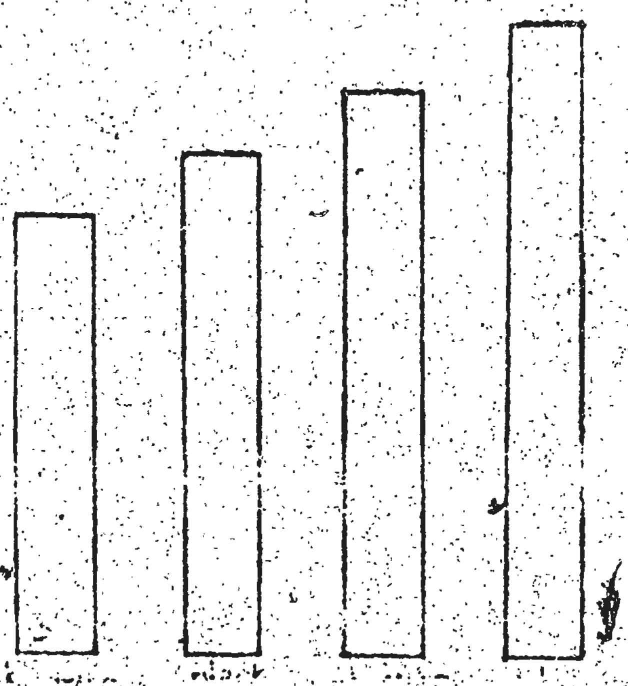
did just like this

14



did exactly like this

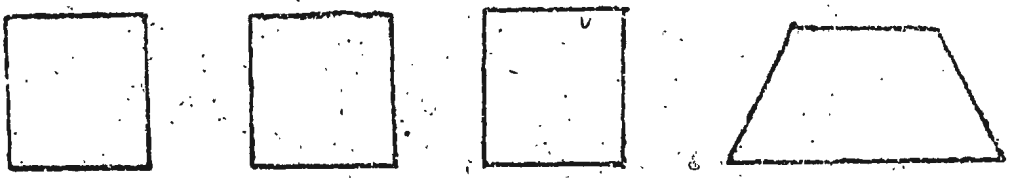
15



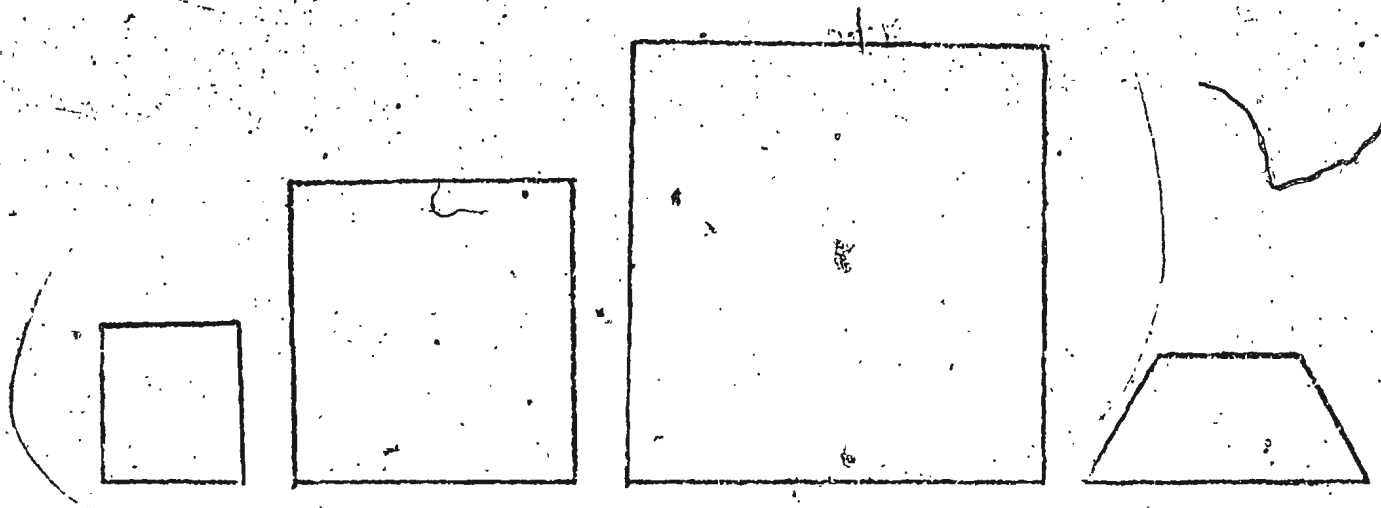
did exactly this

Grouping (Child 10)

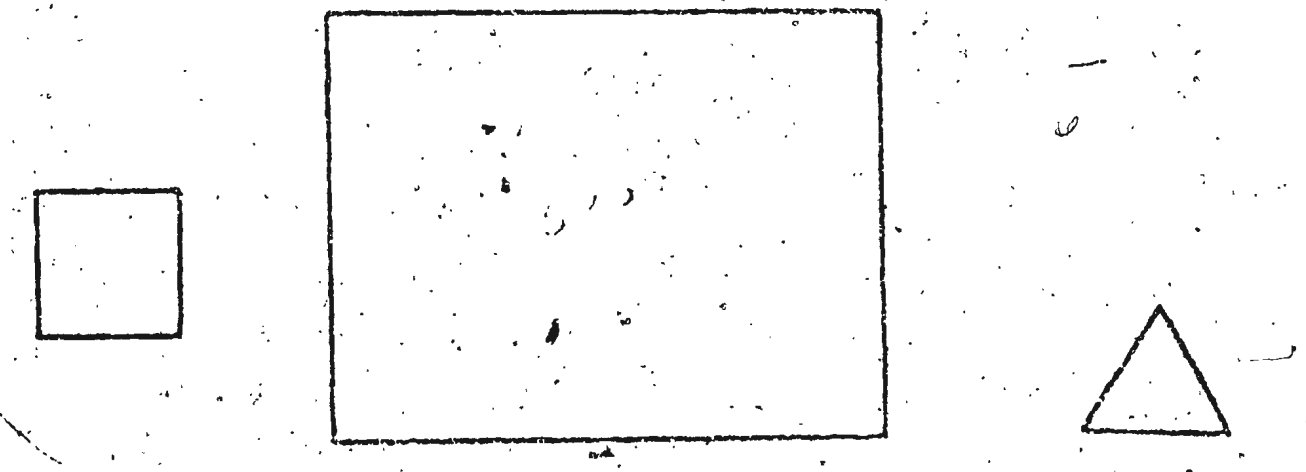
1

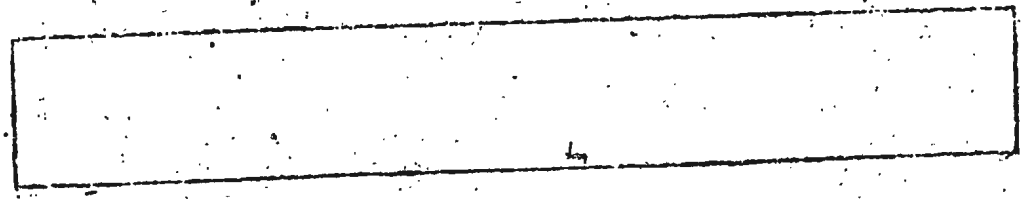


2

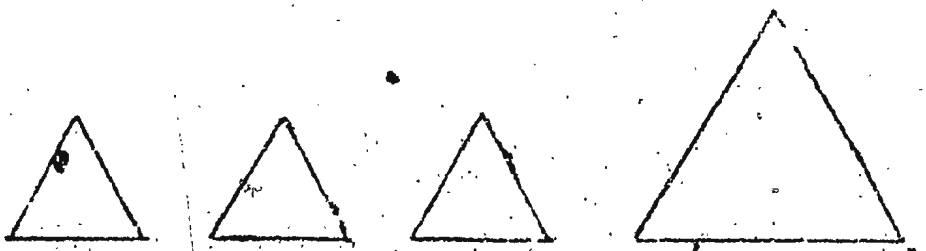


3

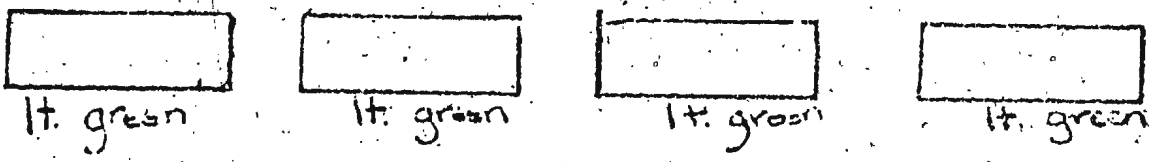




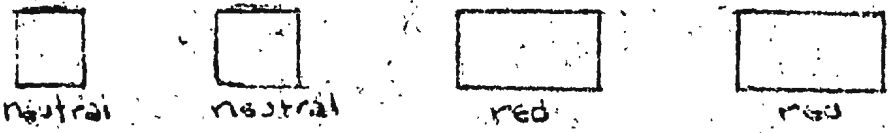
4.



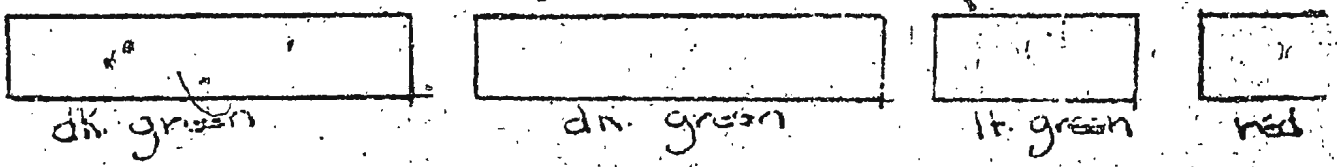
5.


lt. green
lt. green
lt. green
lt. green

6.


neutral
neutral
red
red

7.


dk. green
dk. green
lt. green
red

8. porcupine porcupine porcupine butterfly

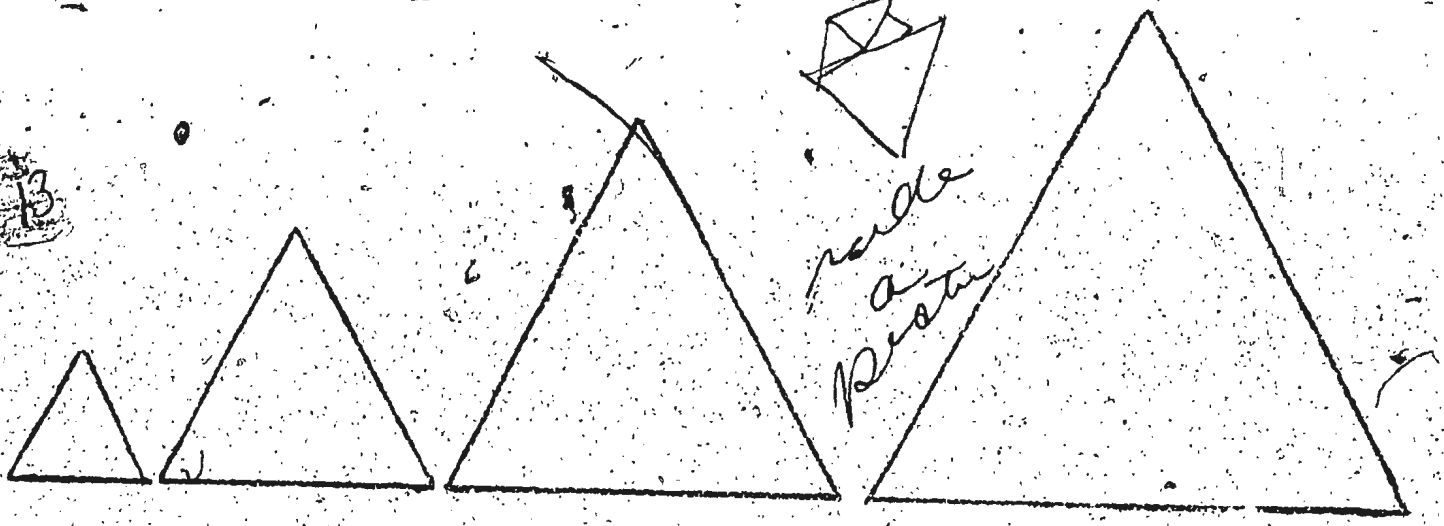
9. squirrel squirrel squirrel beaver

10. giraffe deer 3 bears dog

11. lion dog dog buffalo

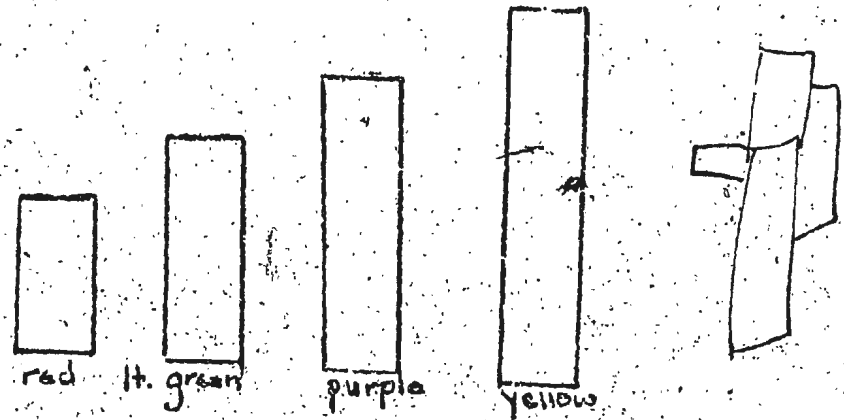
12. fish turtle lizard frog

Iteration

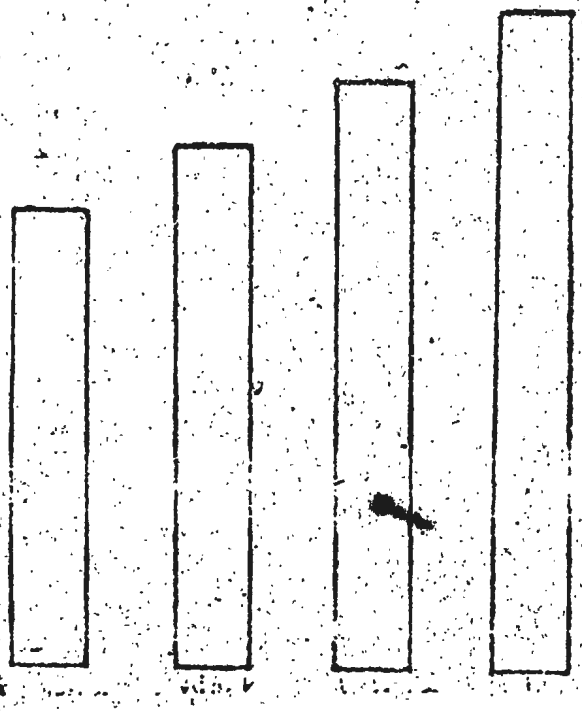


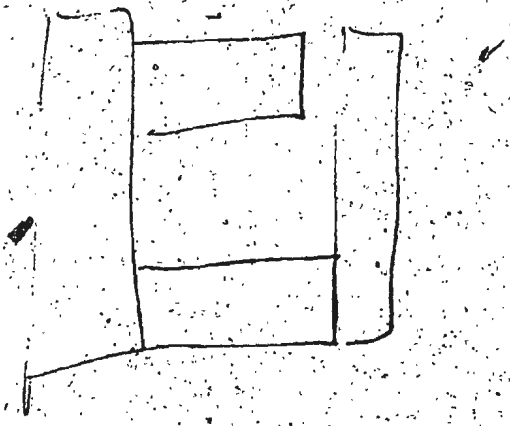
#13

#14



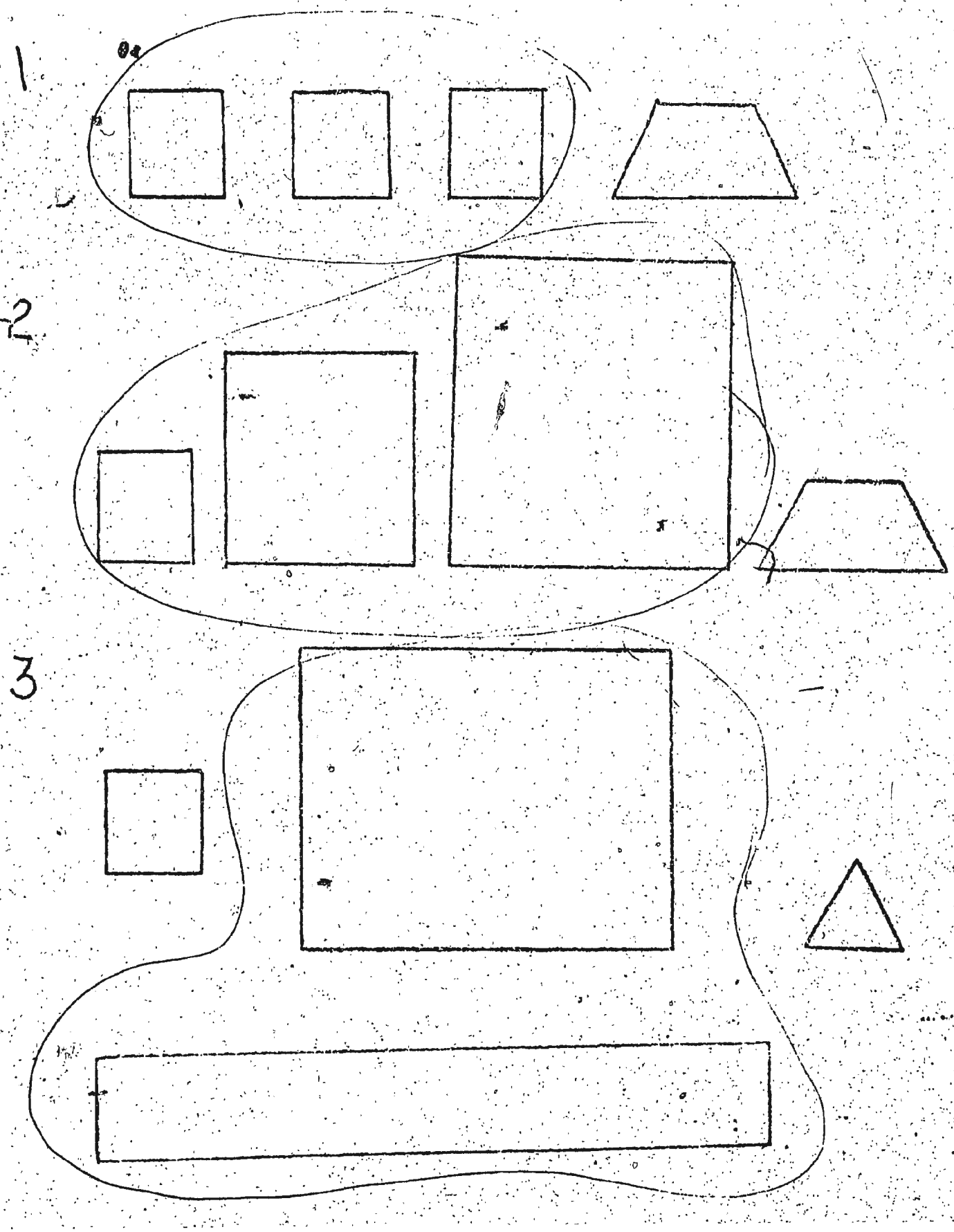
#15



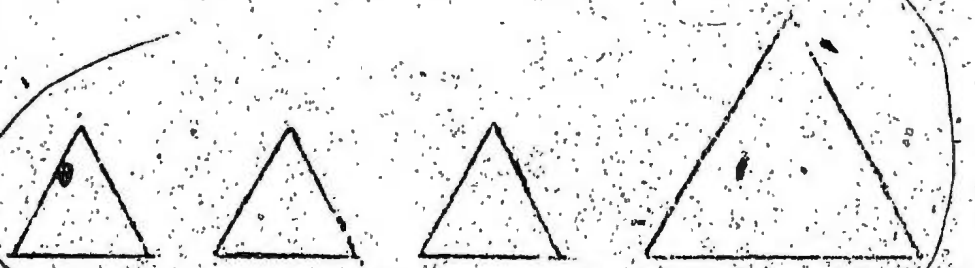


Grouping

Stephen 210
(Child 11)



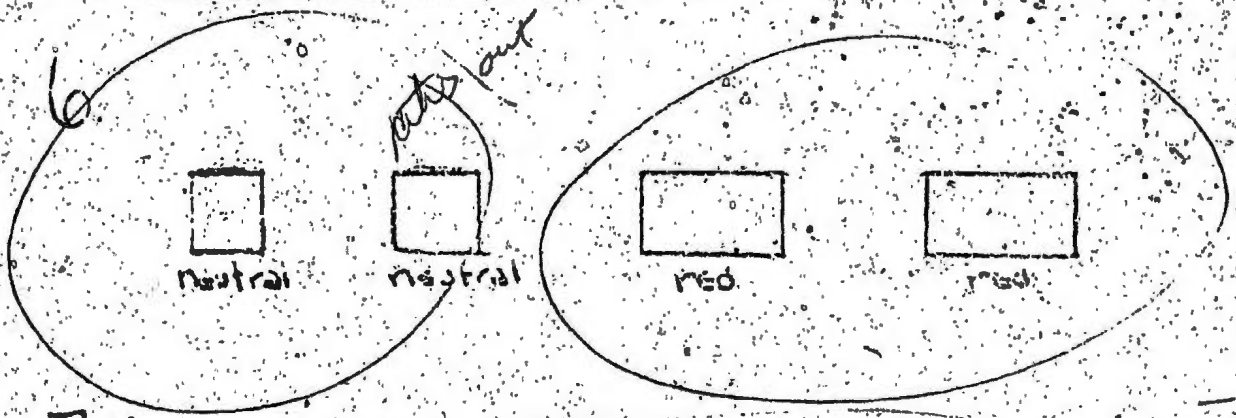
4.



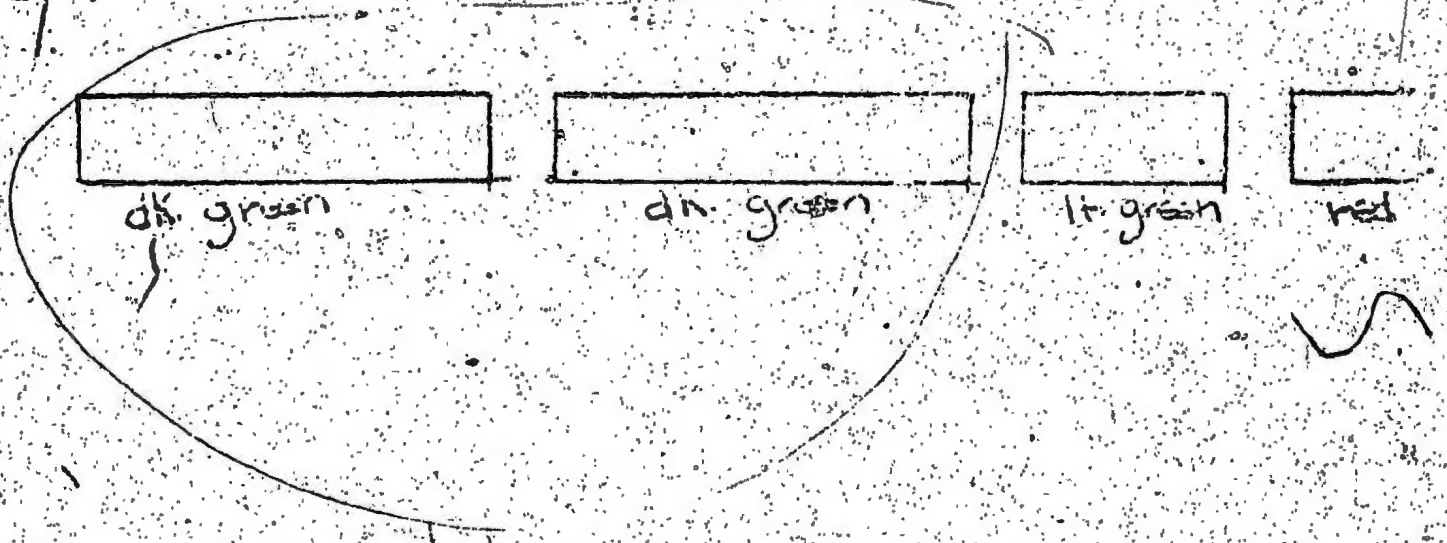
5.


lt. green
lt. green
lt. green
lt. green

6.


neutral
neutral
red
red

7.


dk. green
dk. green
lt. green
red

8. porcupine porcupine porcupine butterfly

9. b.squirrel b.squirrel g.squirrel beaver not the same

10. giraffe deer 3 bears family dog

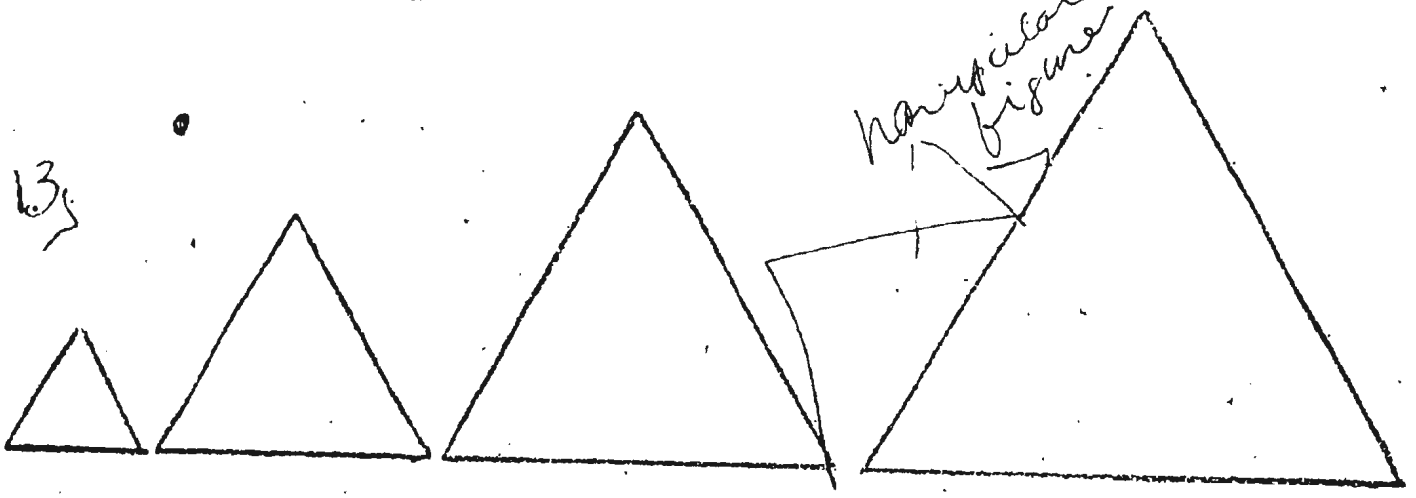
11. lion cocker dog dog buffalo

12. fish turtle lizard frog

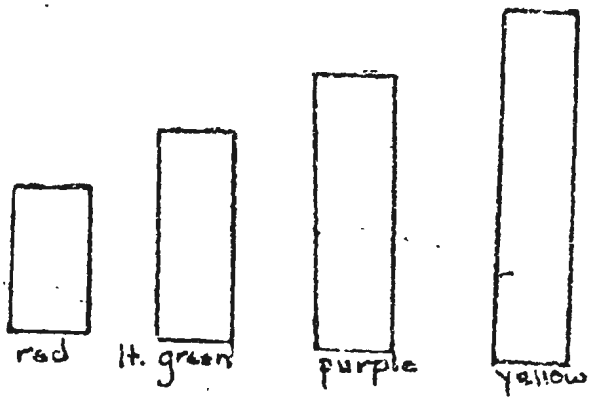
Seriation

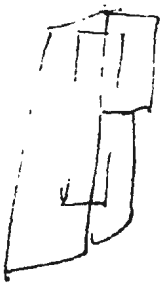
manipulatives figures

13.

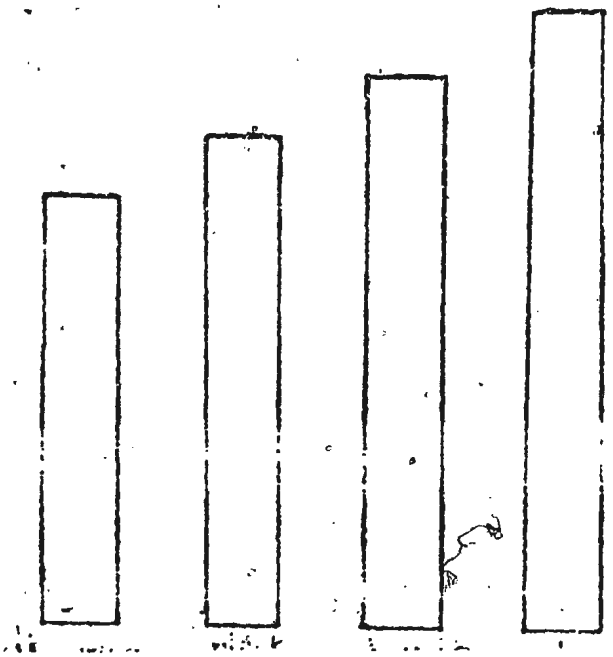


14.



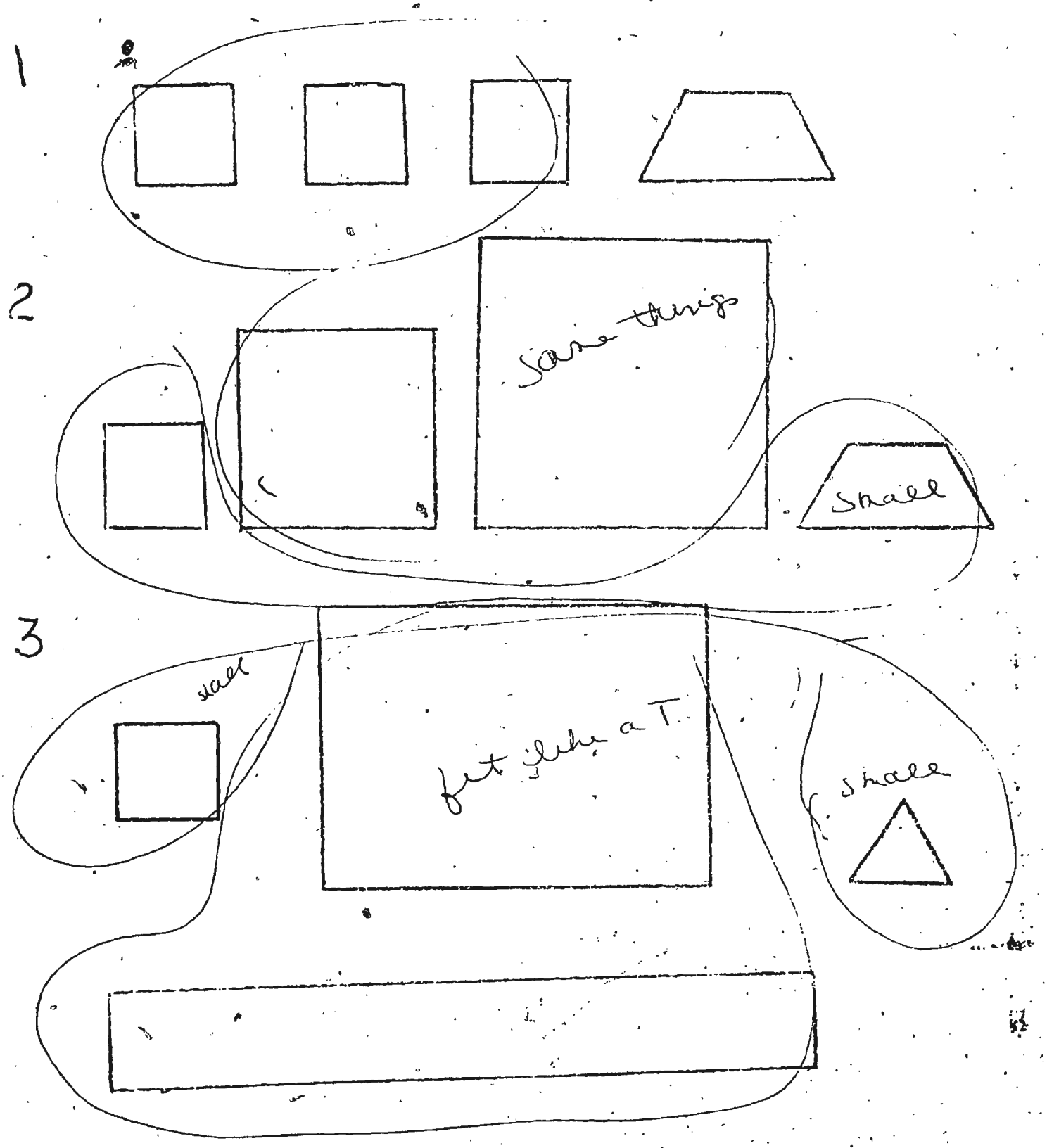


15.

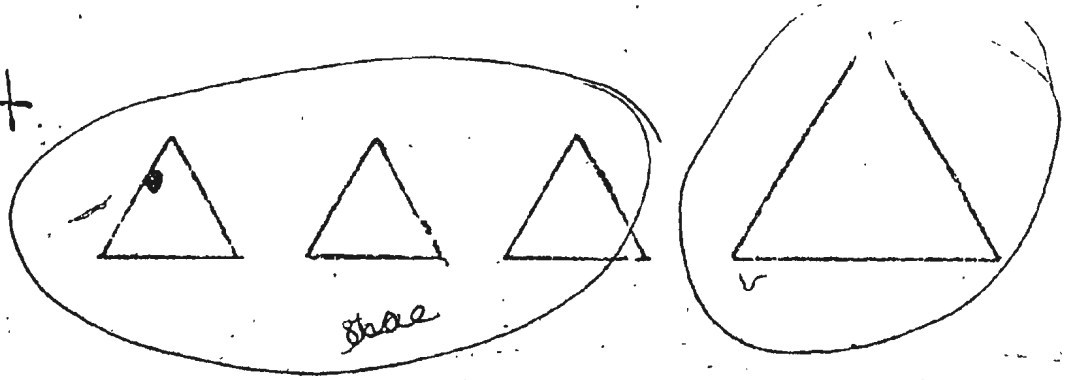


I did this

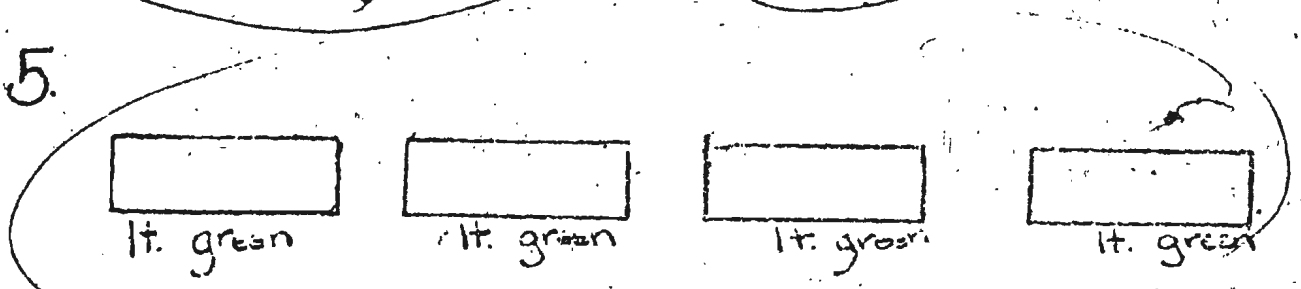
Grouping Tyan
(Child 12)



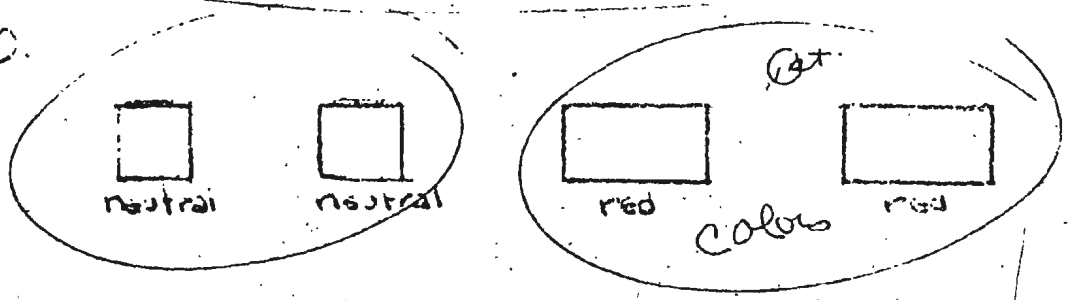
4.


shape

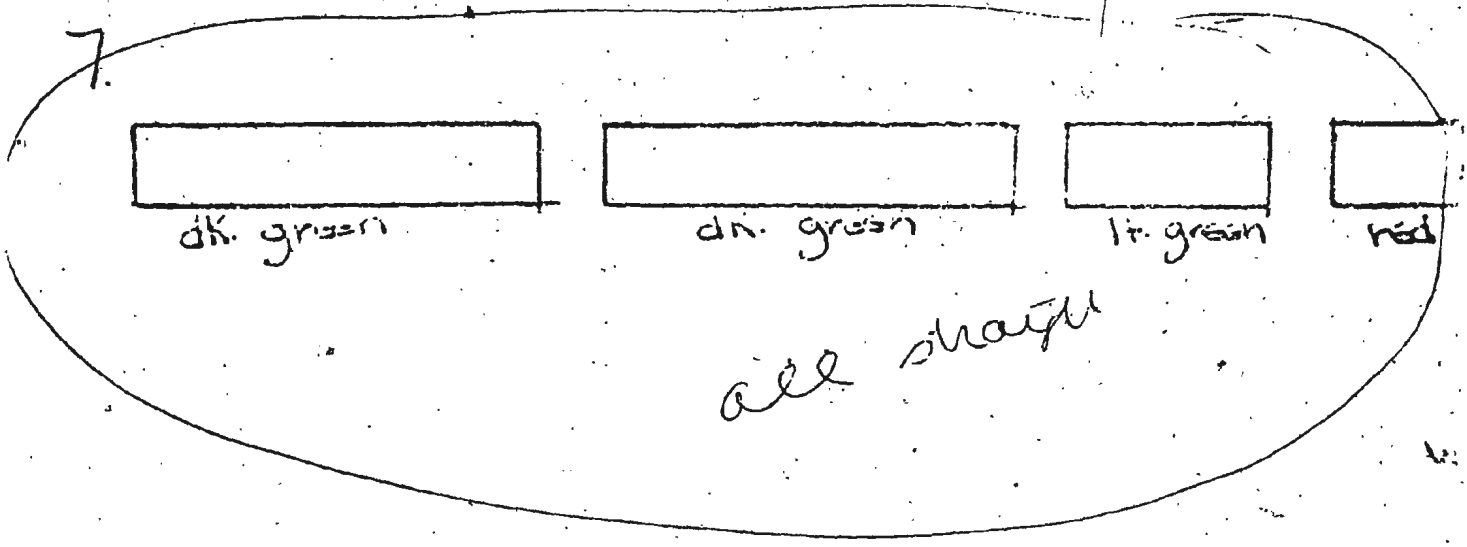
5.


lt. green
lt. green
lt. green
lt. green

6.


neutral
neutral
red
red
color

7.


dk. green
dk. green
lt. green
red
all shapes

8. porcupine porcupine porcupine butterfly

9. b. squirrel b. squirrel g. squirrel beaver

10. giraffe deer 3 bears dog

giraffe bear

deer dog

11. lion dog (cocker) dog buffalo

buffalo dog one color

cocker lion one color

12. fish turtle lizard frog

water

fish turtle one color

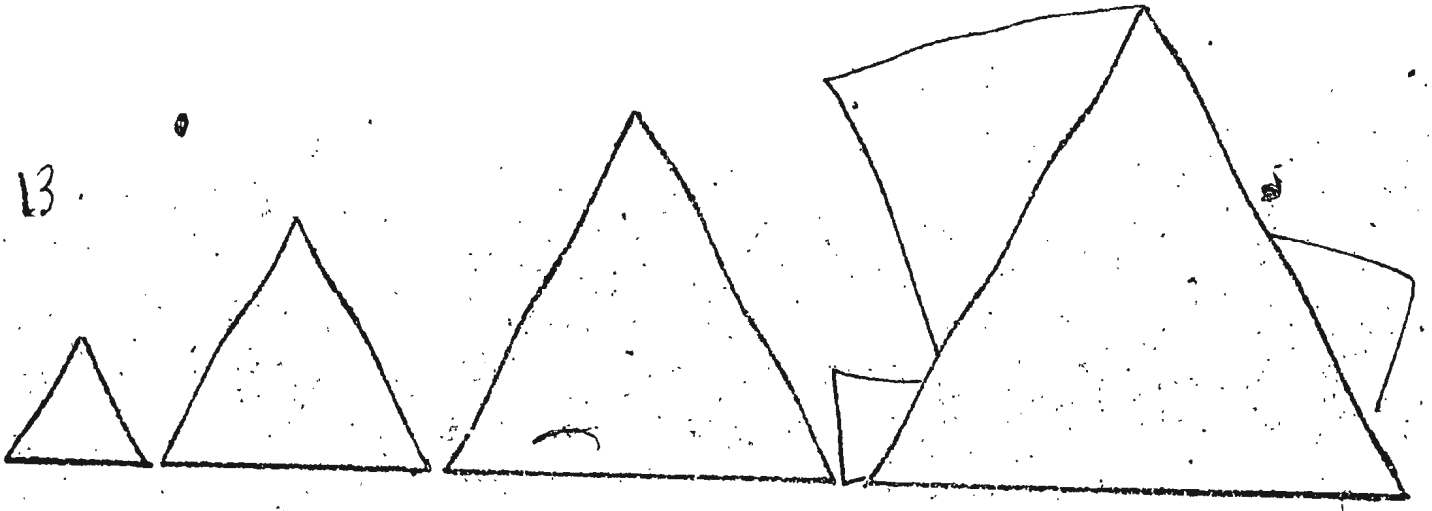
frog lizard — one color

frog

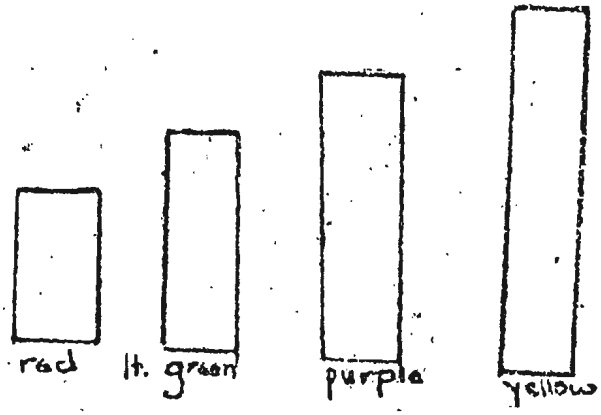
fish

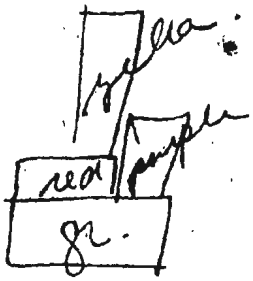
Seriation

13.

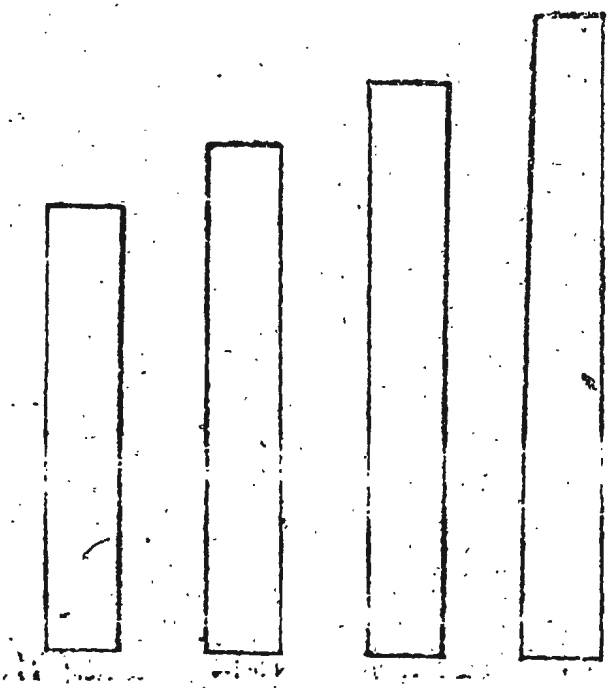


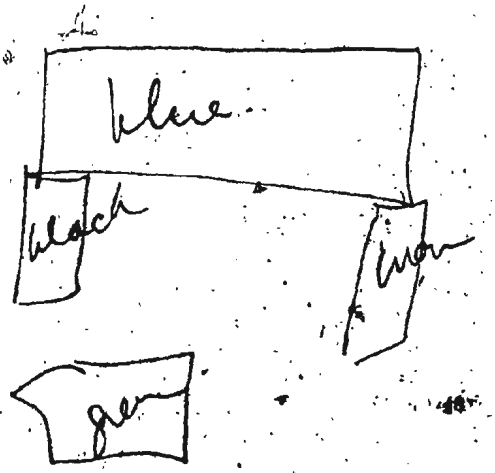
2.14





3.15

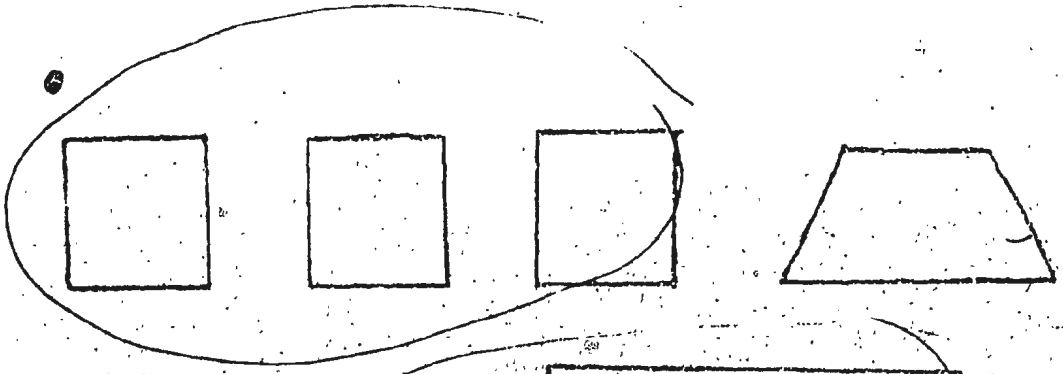




Grouping

Monica 218
(Child 13)

1



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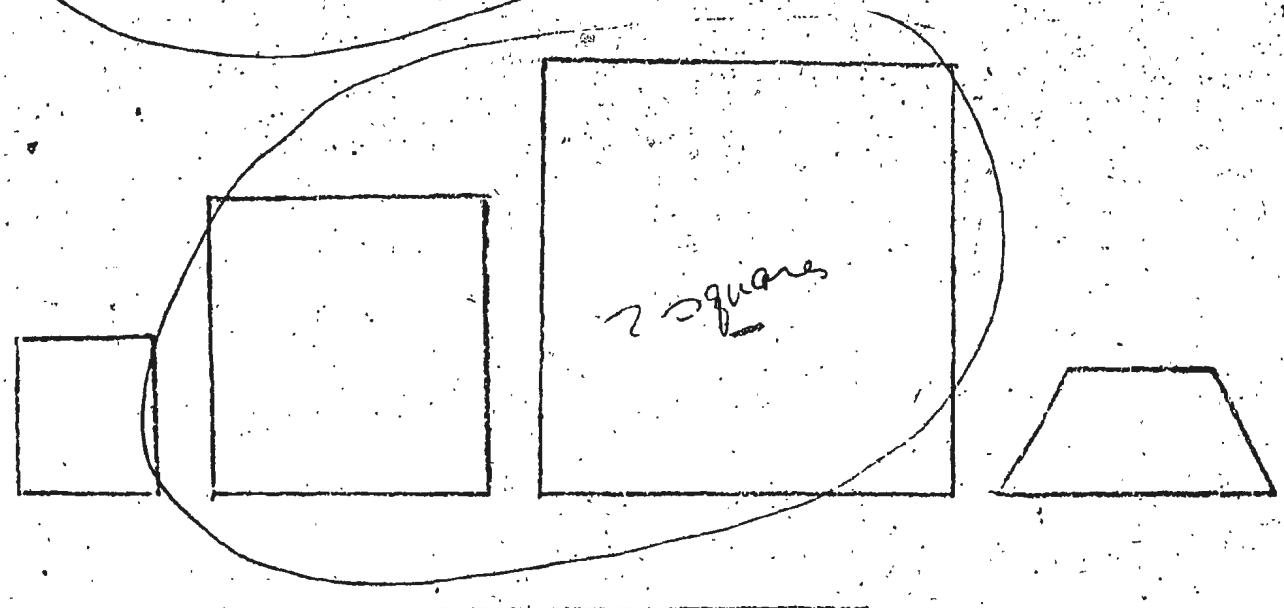

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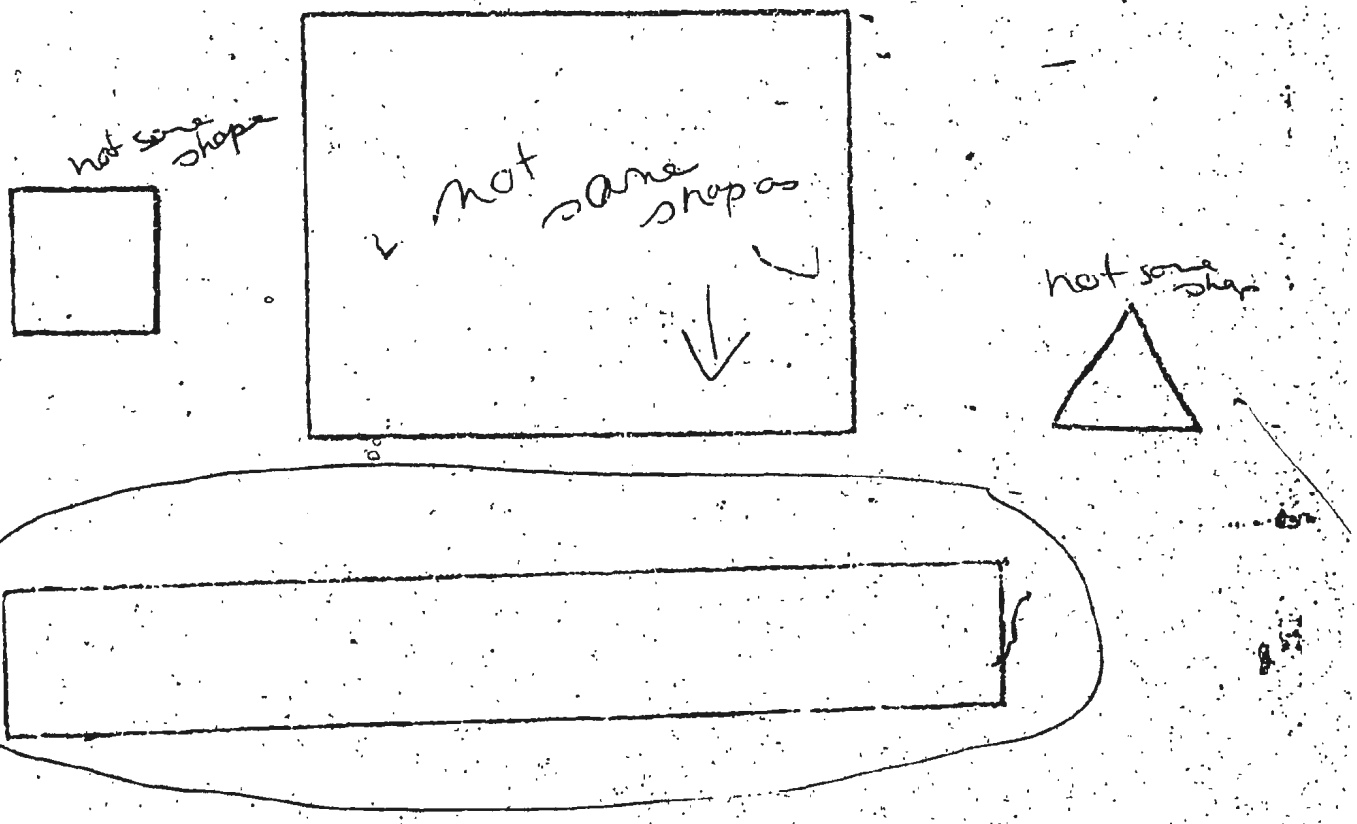

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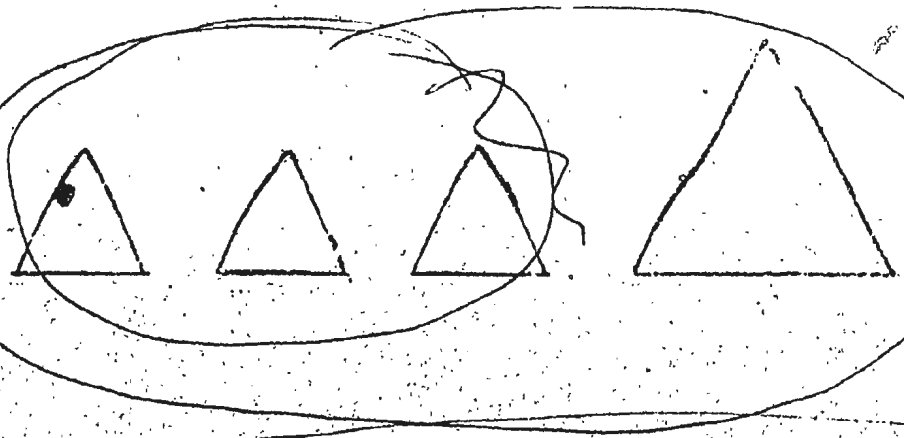

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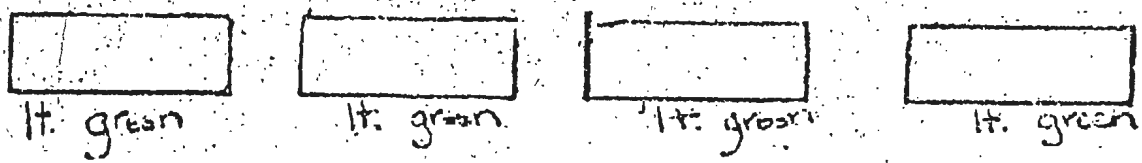
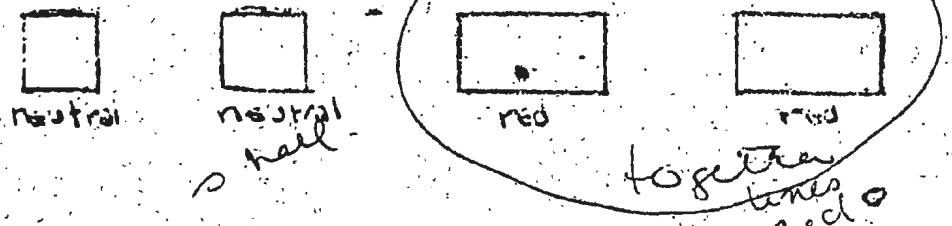


6.

squares → not same color

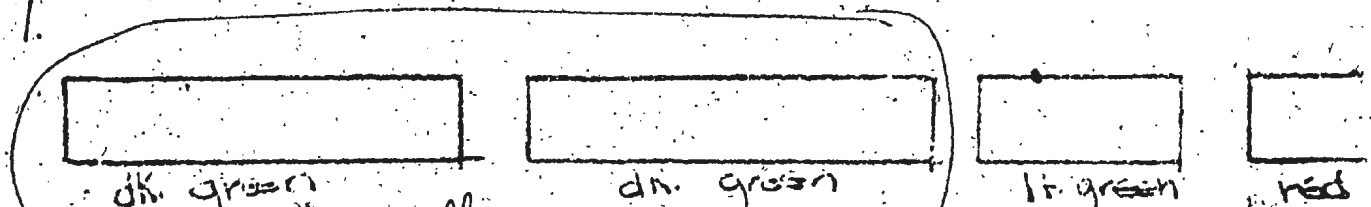


lines

tall

together lines red

7.



tall green line

8. porcupine porcupine porcupine butterfly

9. squirrel squirrel squirrel beaver
(a pair)

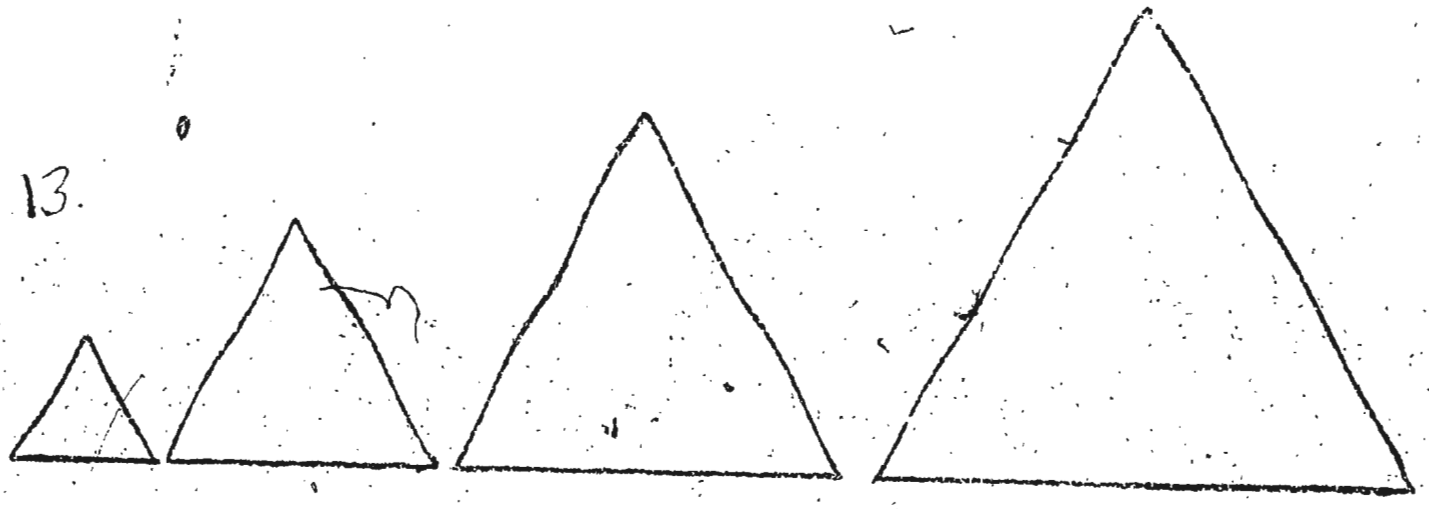
10. giraffe deer 3 bears dog
(only three)

11. lion dog dog buffalo
(locker)

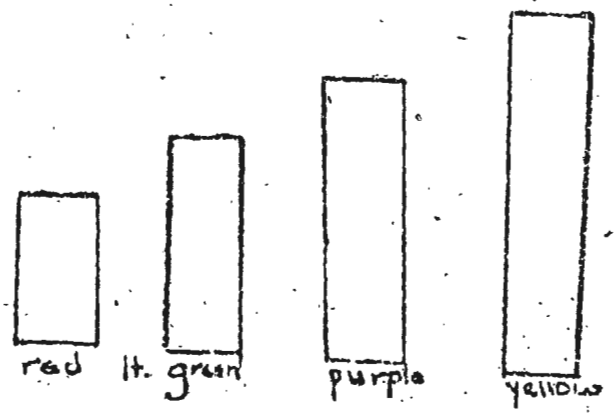
12. fish turtle lizard frog
don't go together

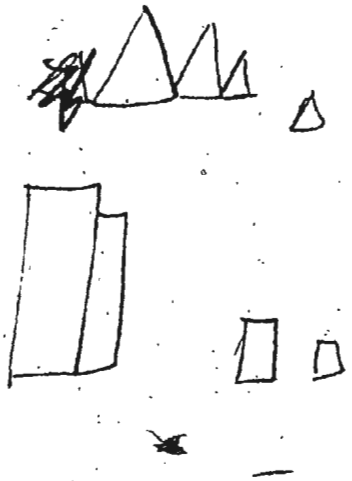
Seriation

13.



14.





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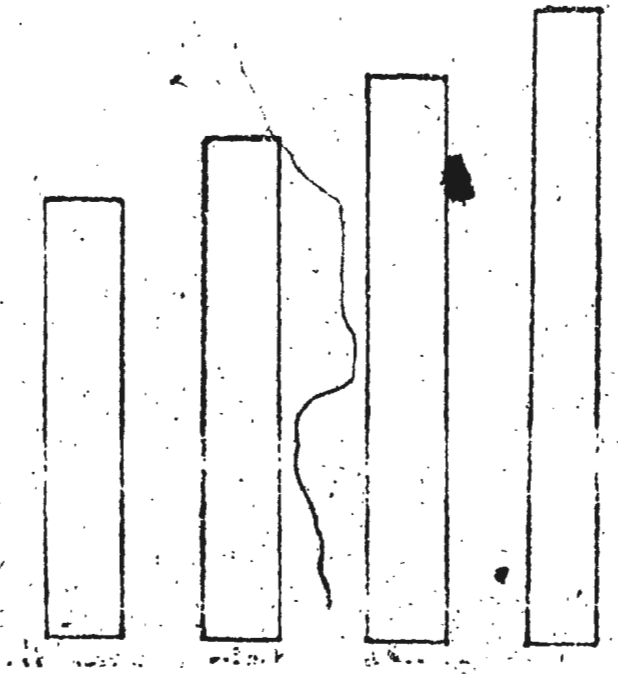
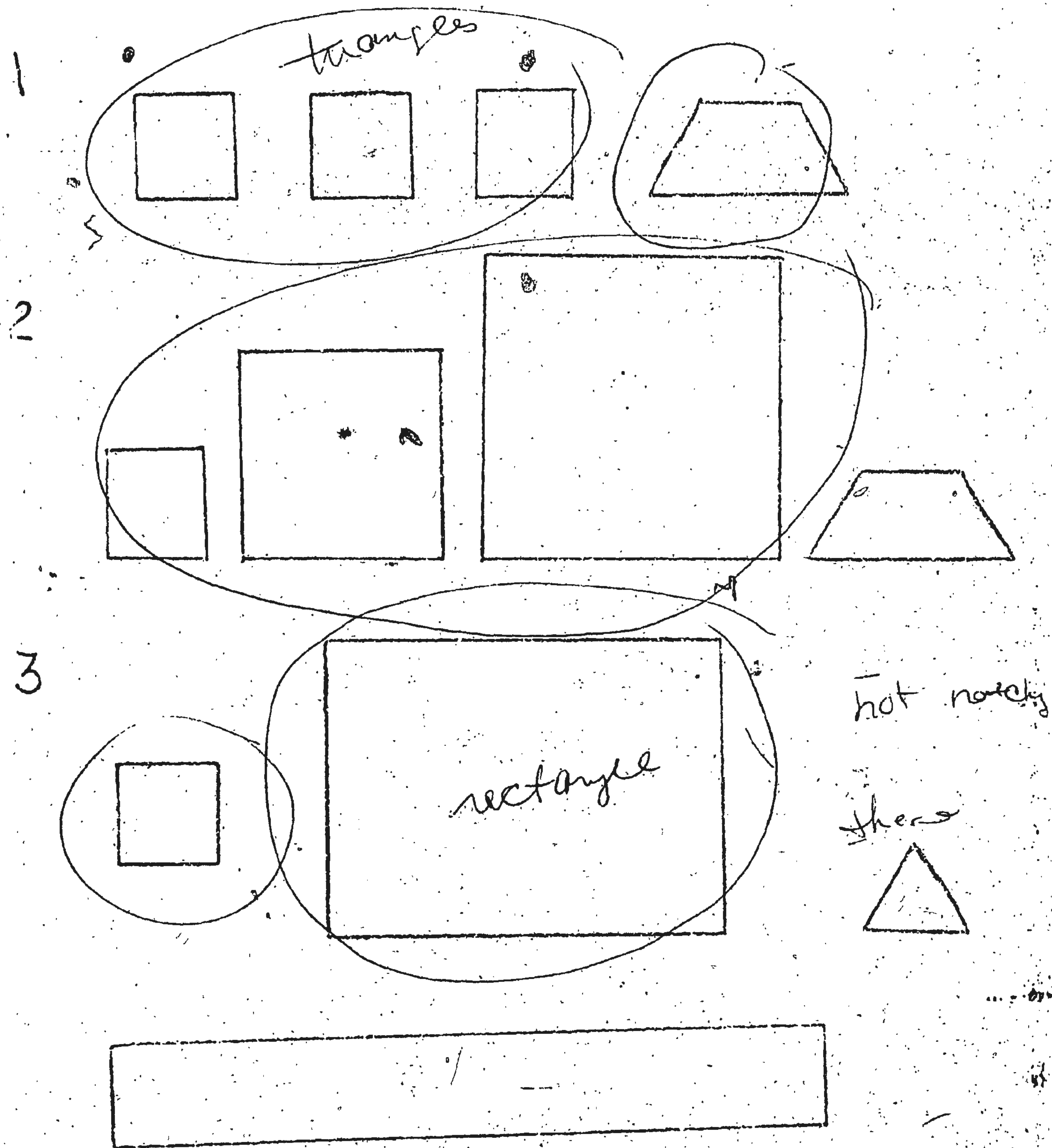


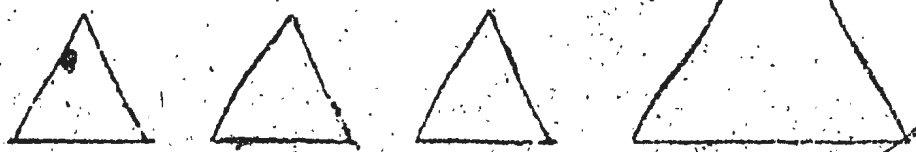
did this oh

Grouping

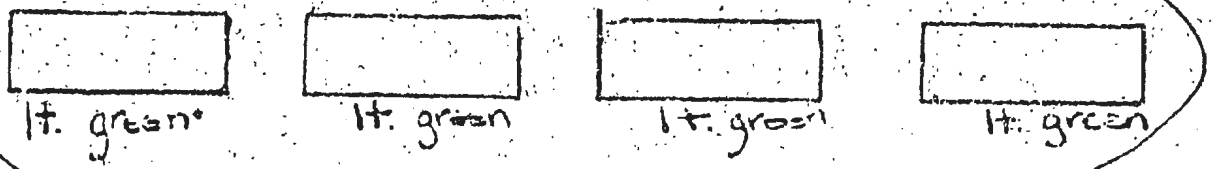
Fergus[222]
(Child 14)



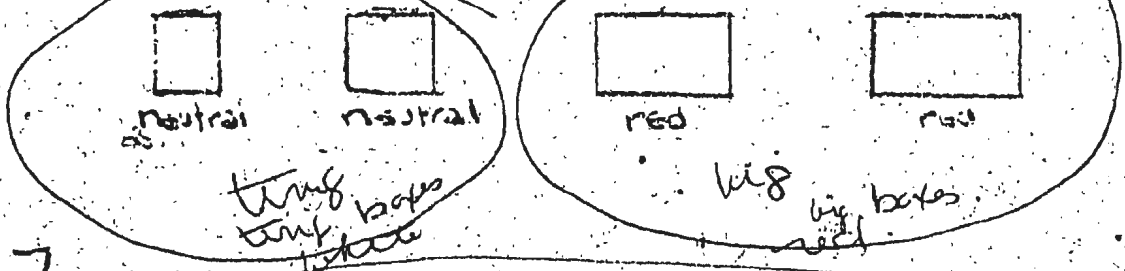
4. hatching



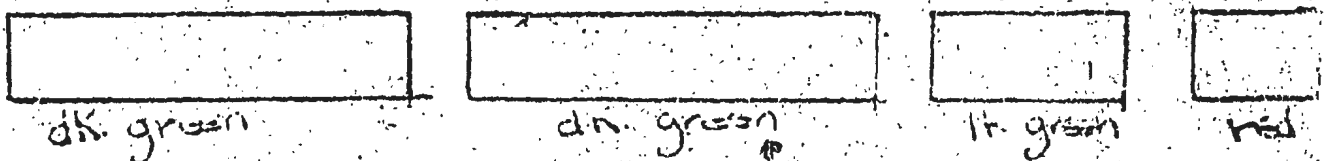
5. tons



6.



7. straights



8. porcupine porcupine porcupine butter-fly all colors

9. bsquirrel bsquirrel gsquirrel beaver
they go munch branch

10. giraffe deer 3 bears dog
brown white brown brown black

11. lion dog dog buffalo
cocker
brown

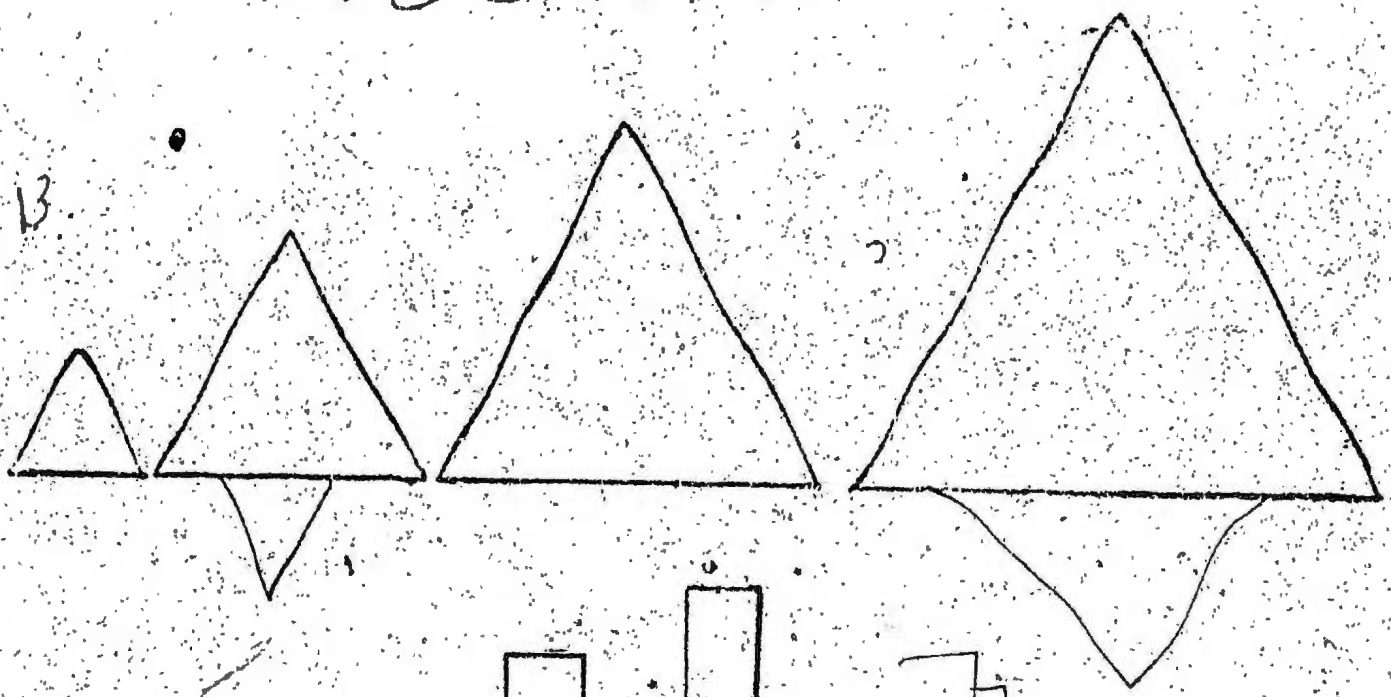
12. fish turtle lizard frog
cracker

fish
frog
lizard } green

turtle - brown

Seriation

13



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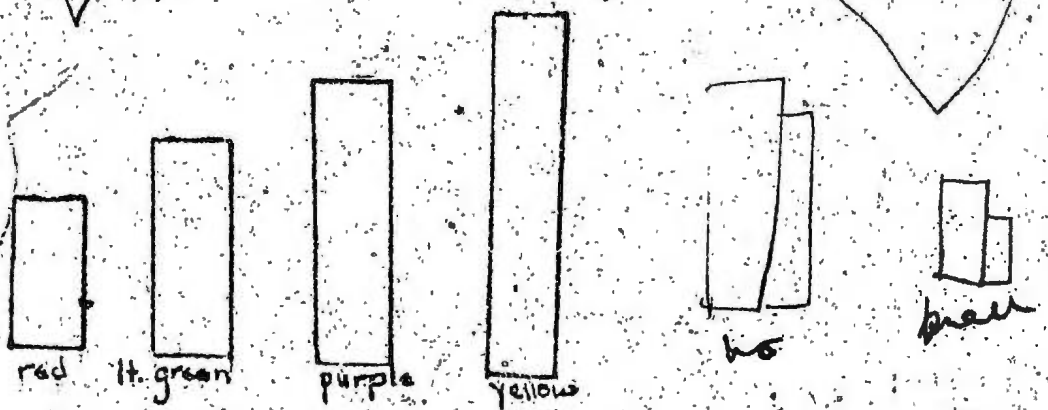

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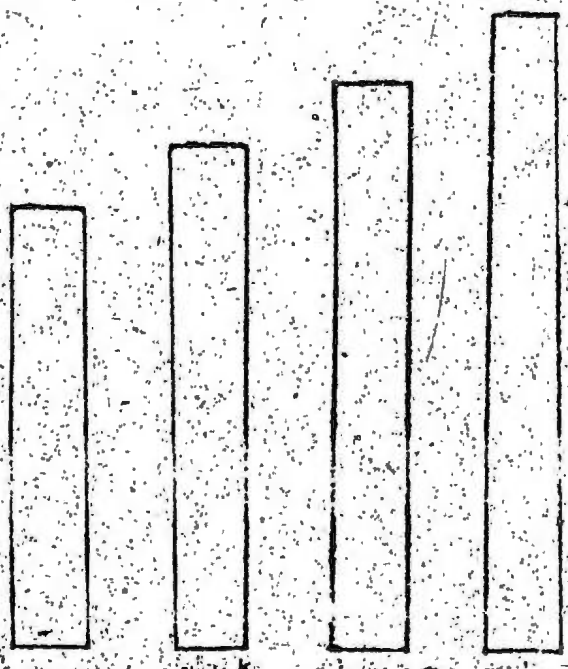
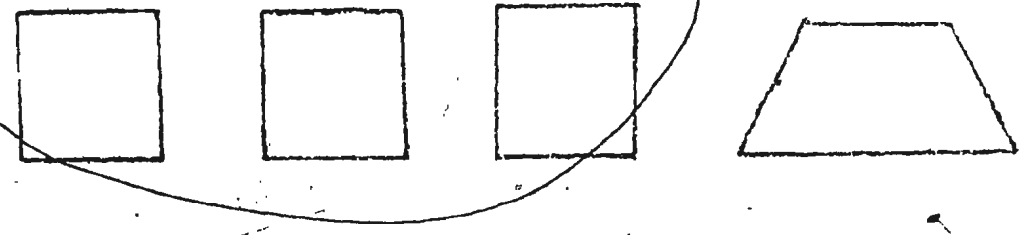


Add this

Grouping

Sophie 226
(Child 15)

1



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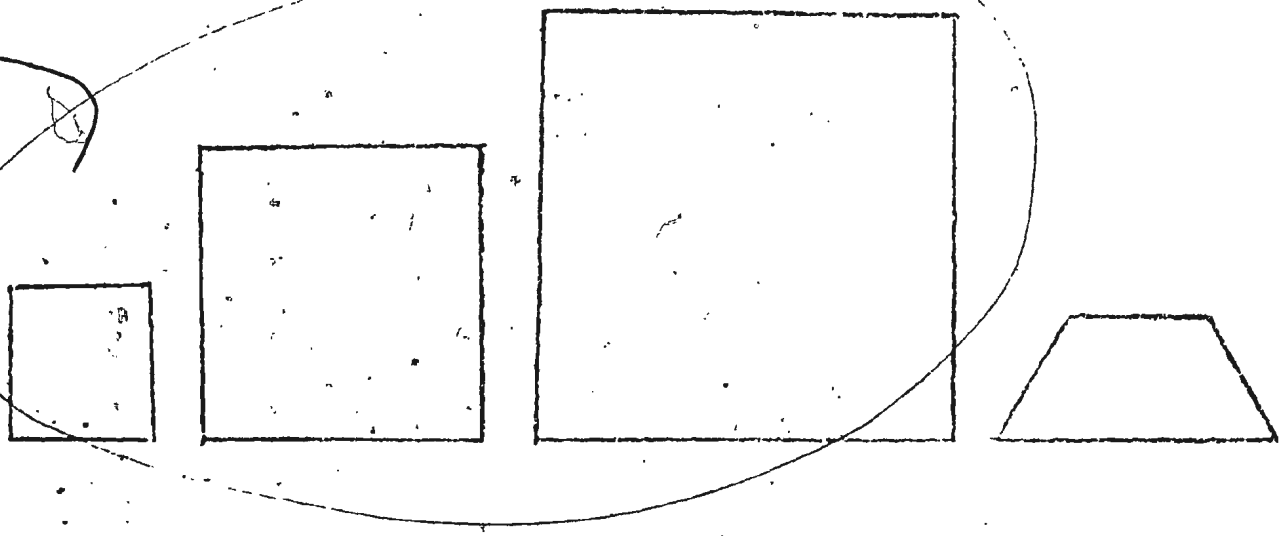
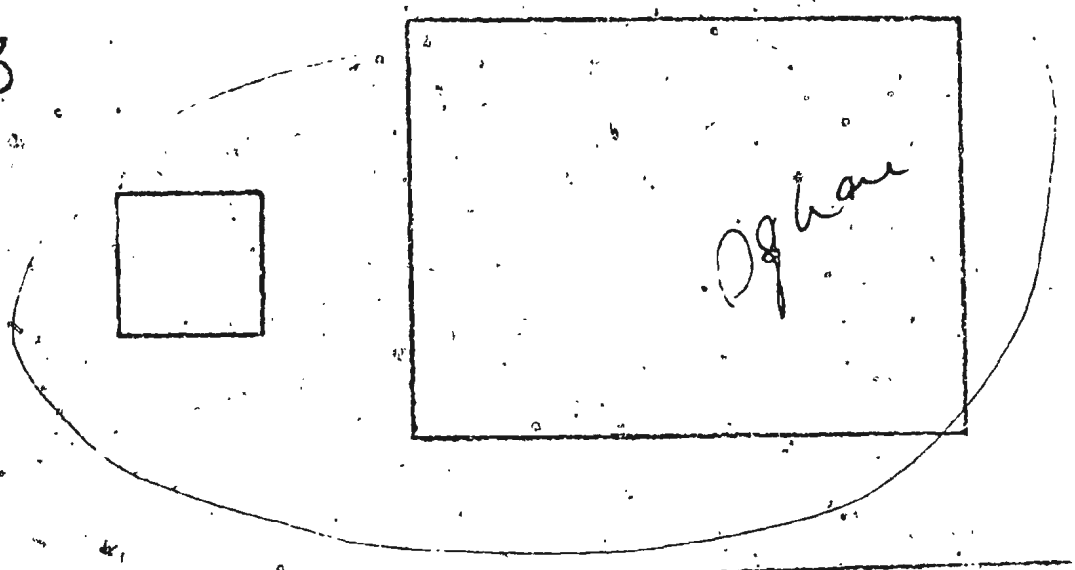
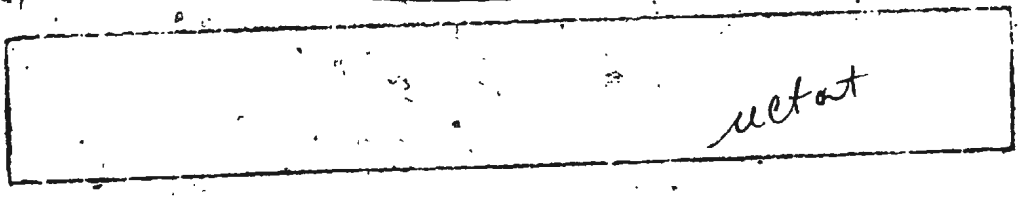
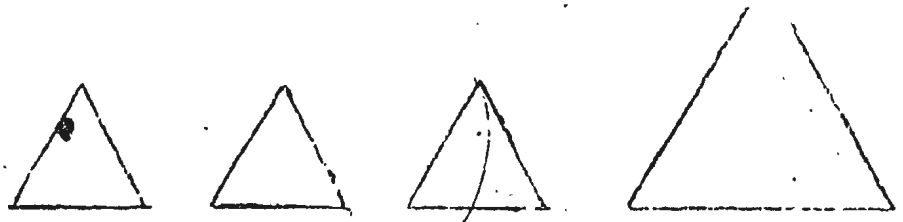


3





4.



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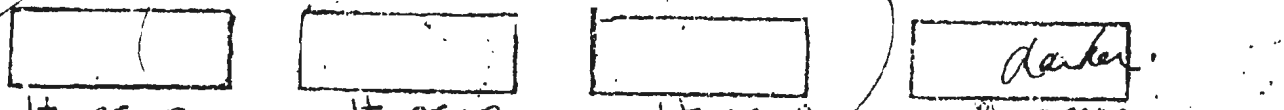
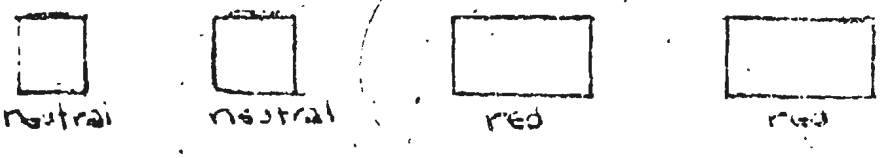
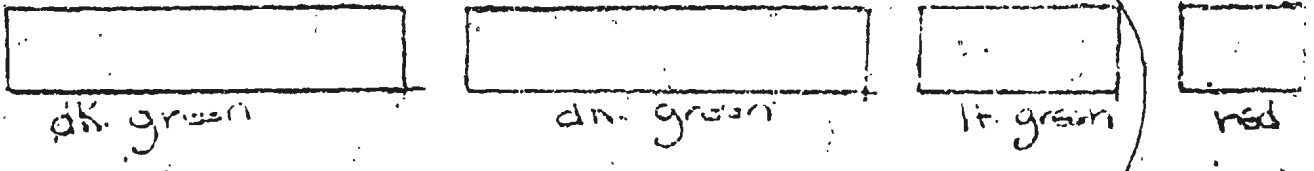

lt. green
lt. green
lt. green
darker
lt. green
(it is a little

6.


neutral
neutral
red
red

7.


dk. green
dk. green
lt. green
red

8. porcupine porcupine porcupine butterfly

9. b.squirrel b.squirrel g.squirrel beaver
tree water

10. giraffe deer 3 bears cage dog

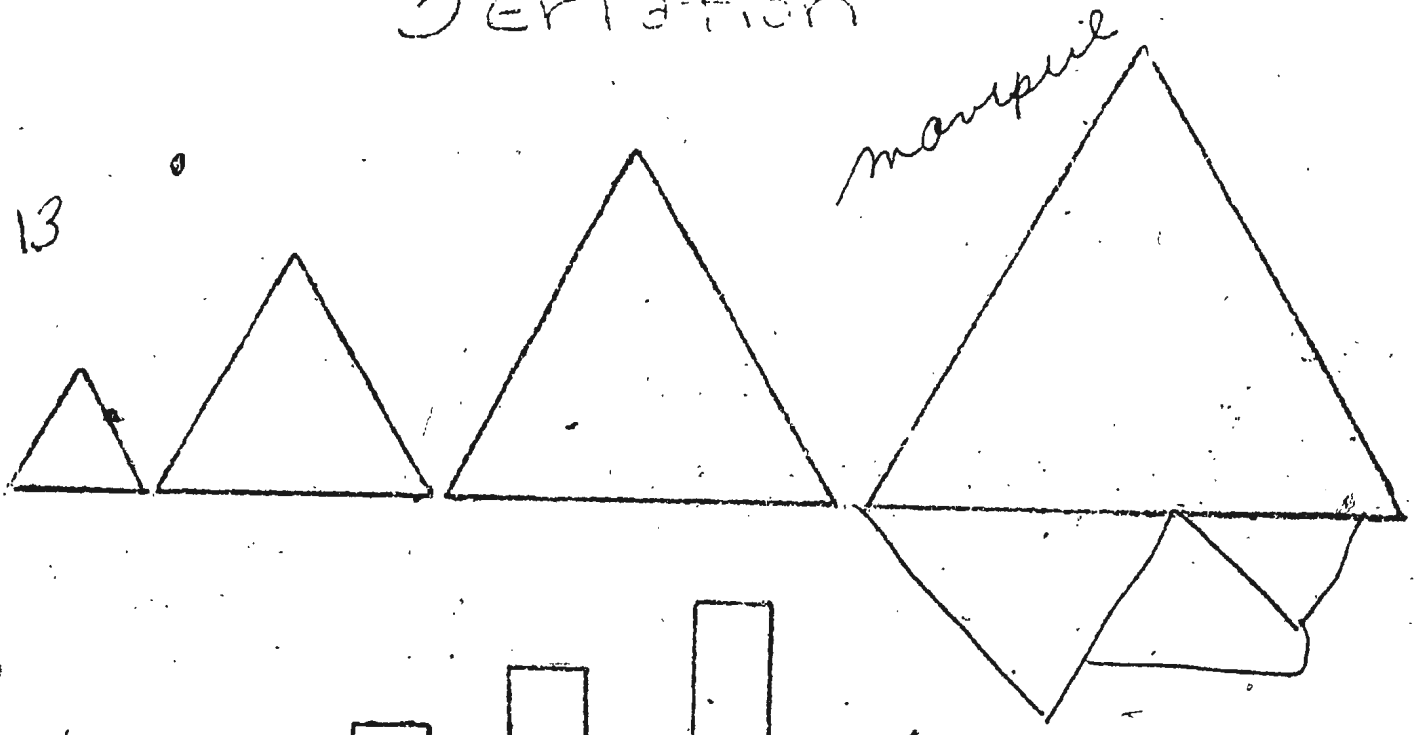
11. lion dog cat dog buffalo - afraid
yellow faces brown face

12. fish turtle lizard frog
ground water

has legs > land too

Seriation

13



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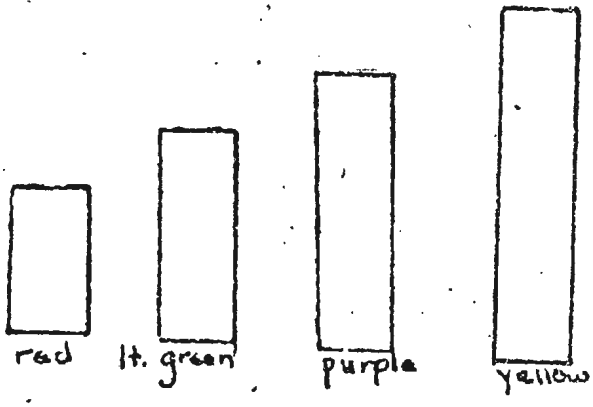
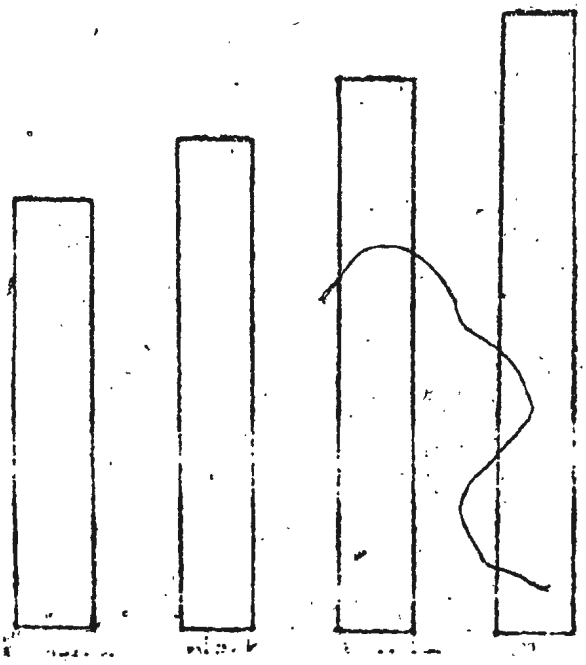


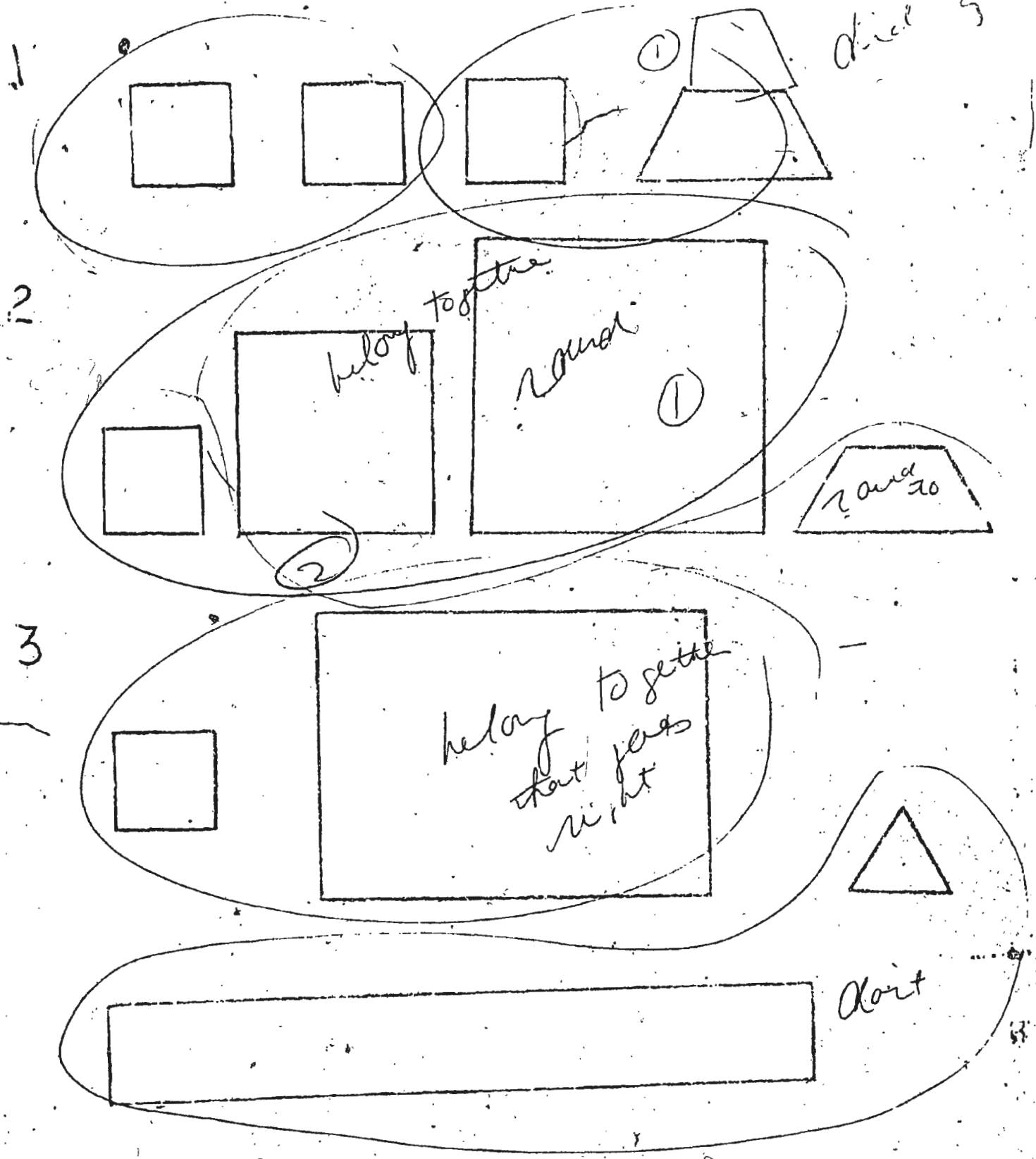
← did this

15.

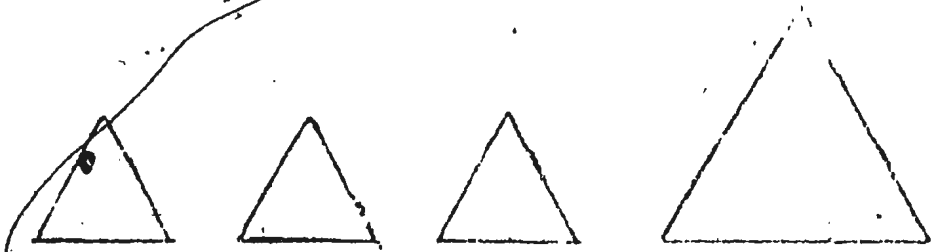


Grouping

Jamie (child 16)

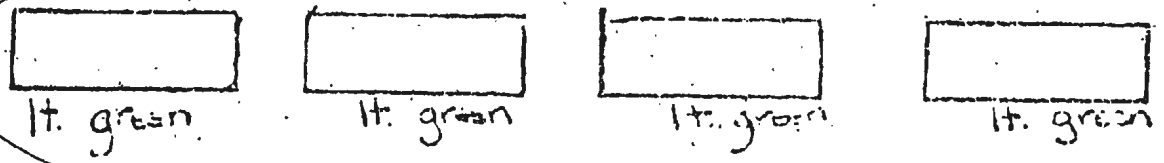


4.

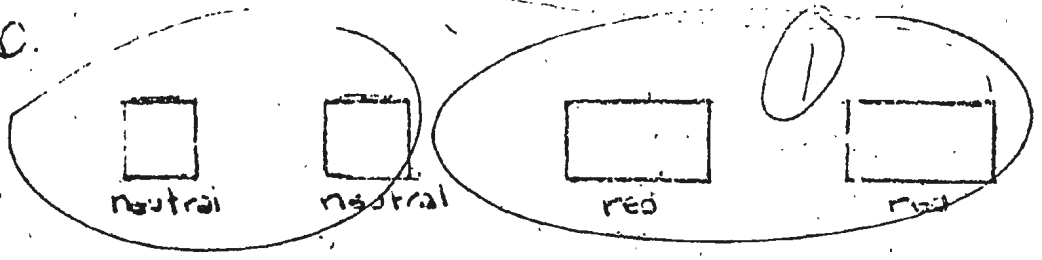


all belong

5.



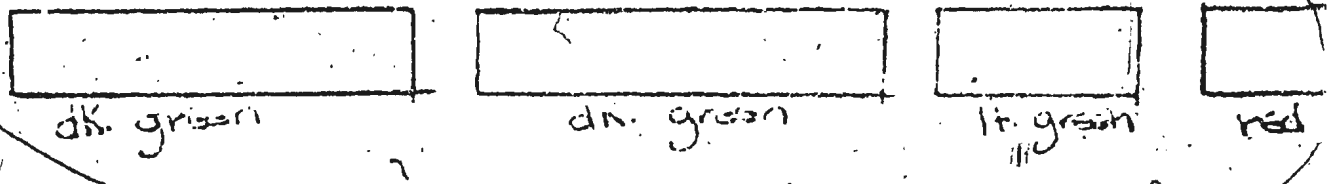
6.



they don't belong

make someth

7



they all belong

can put them on each other

8. porcupine porcupine porcupine butterfly
all wolves
doesn't belong

9. b squirrel b squirrel g squirrel beaver
They all belong
no tail
they sss b

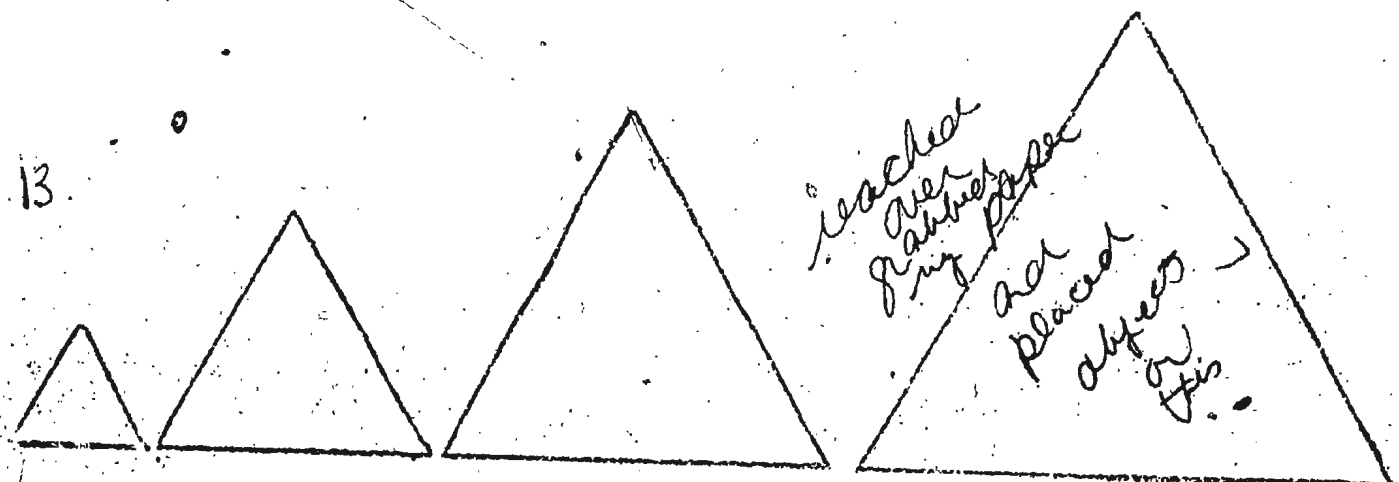
10. giraffe deer 3 bears dog
They belong
have ears that them belong
go up.
bears standing up

11. lion dog cocker dog buffalo
belong
Tigers

12. fish turtle lizard frog
no eyes
eyes

Variations

13.



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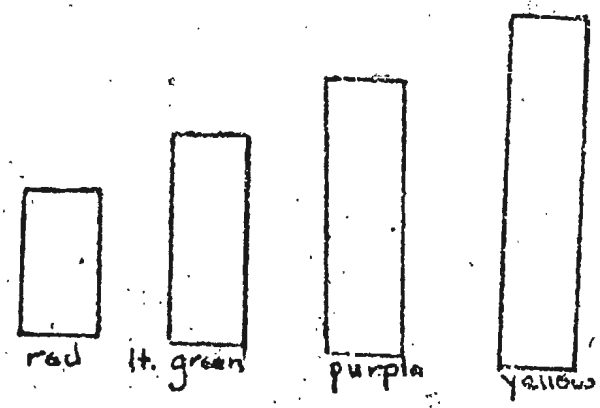
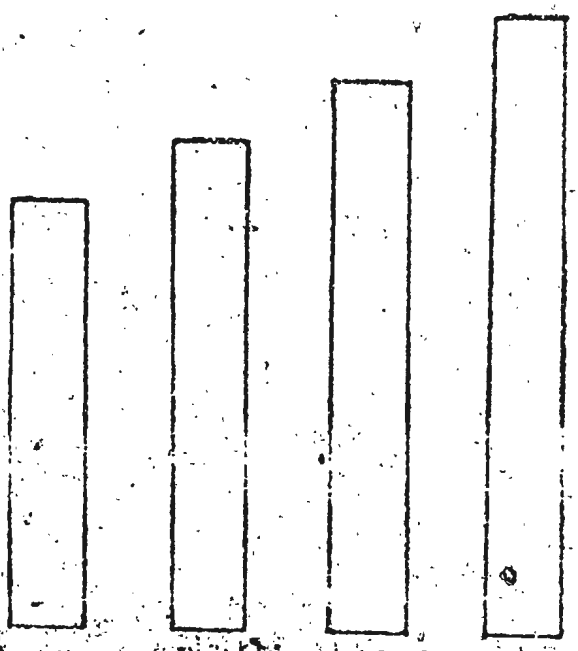
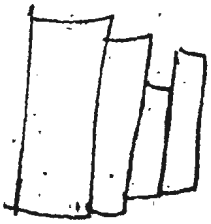


← child this.

15.



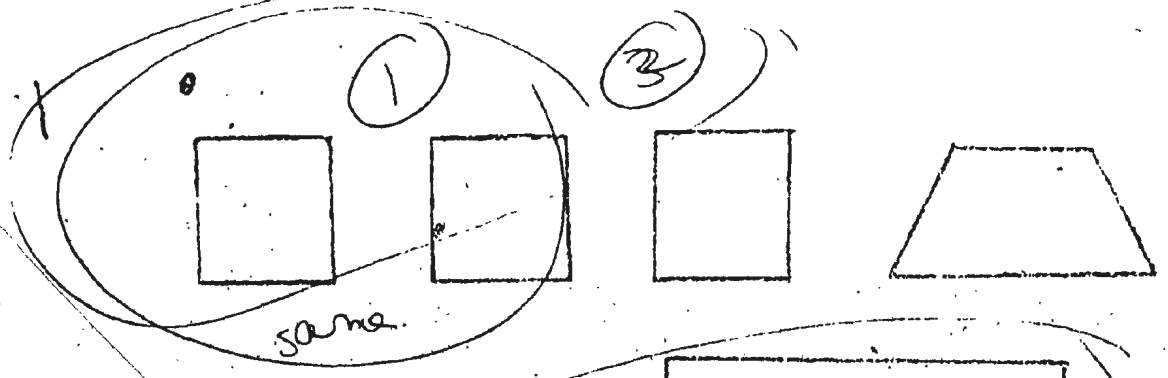
child this.



kika 234
(child 17)

Grouping

1



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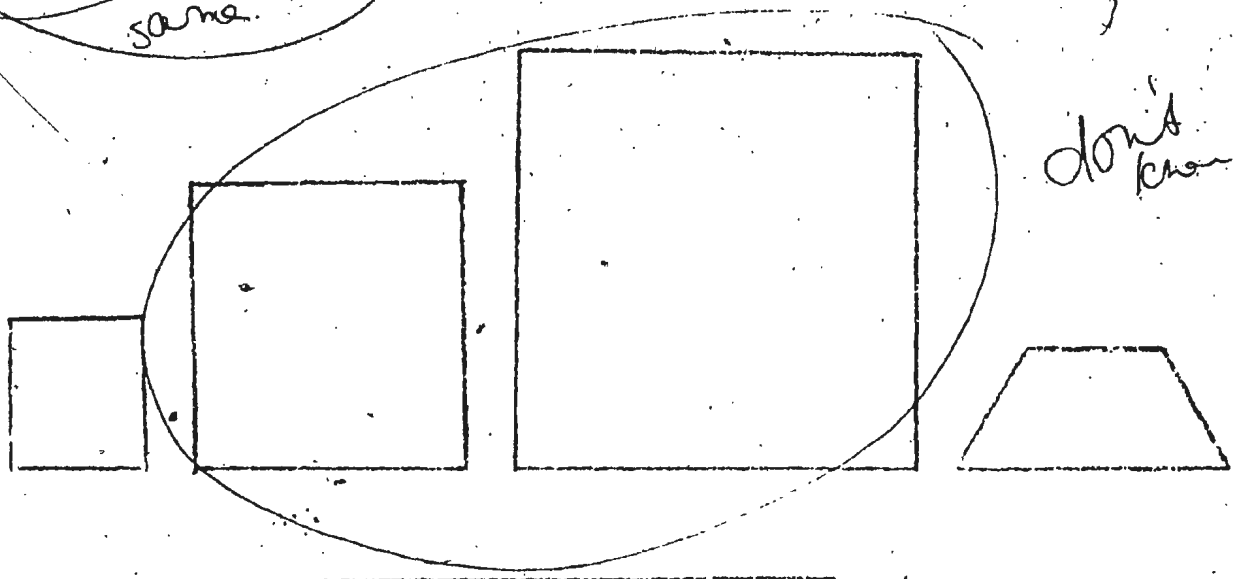
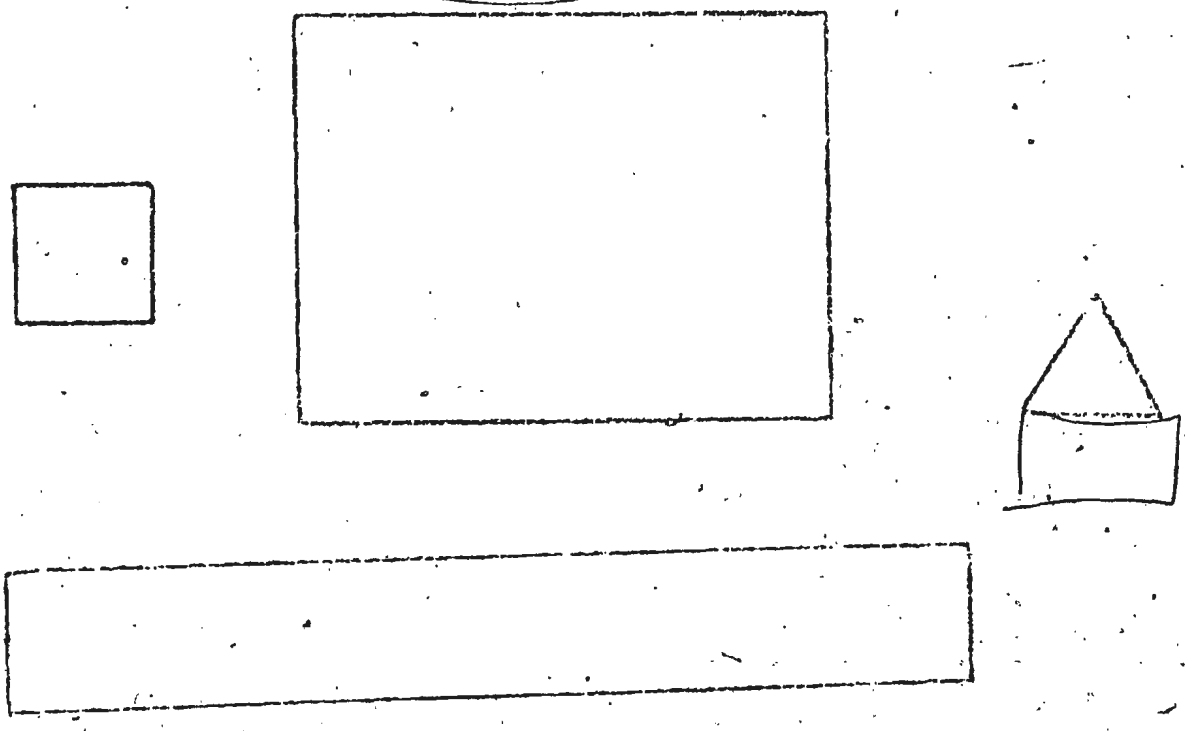
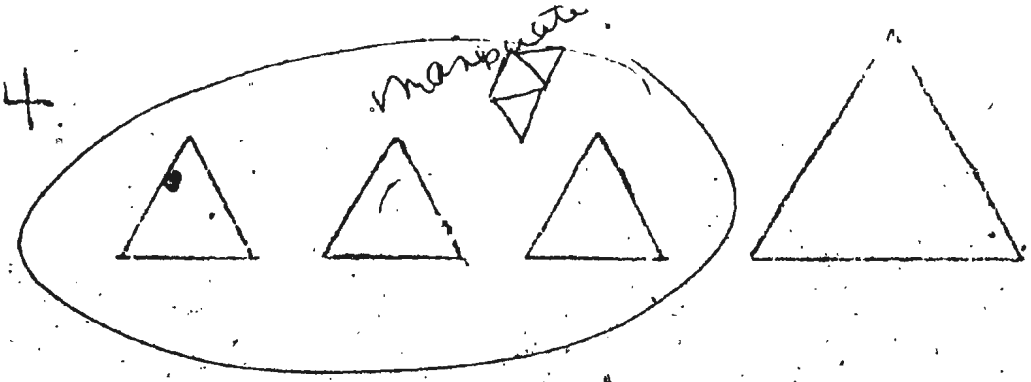


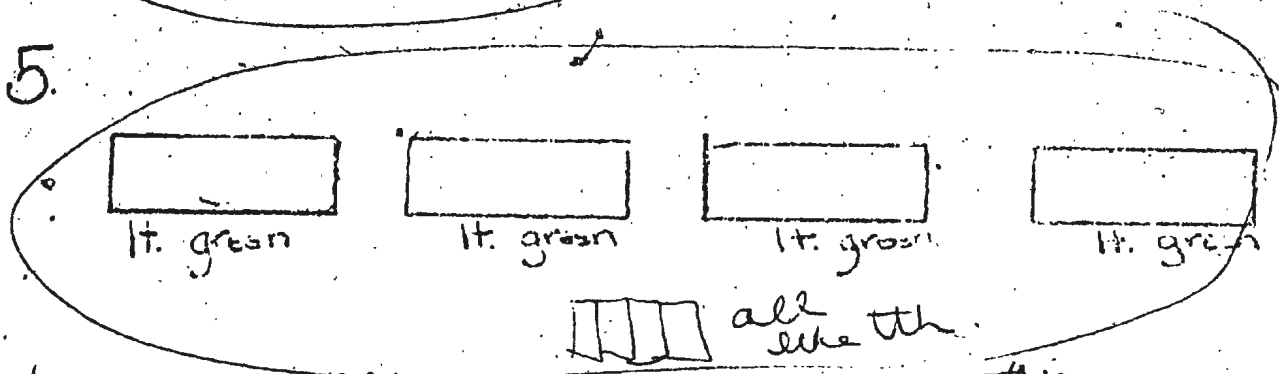
3



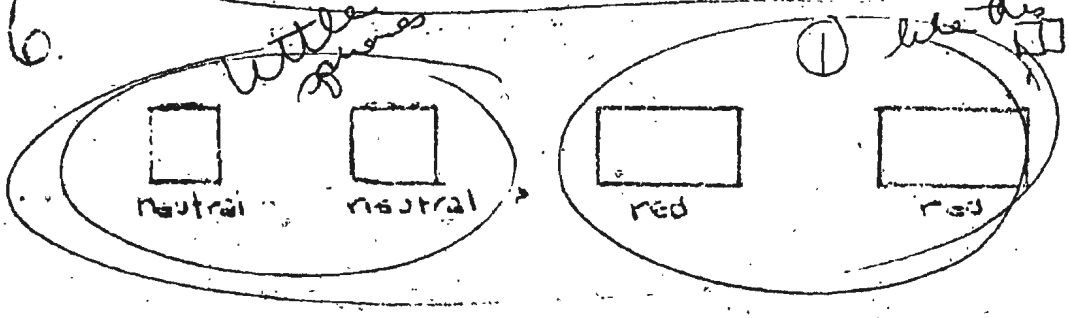
4.


manipulate

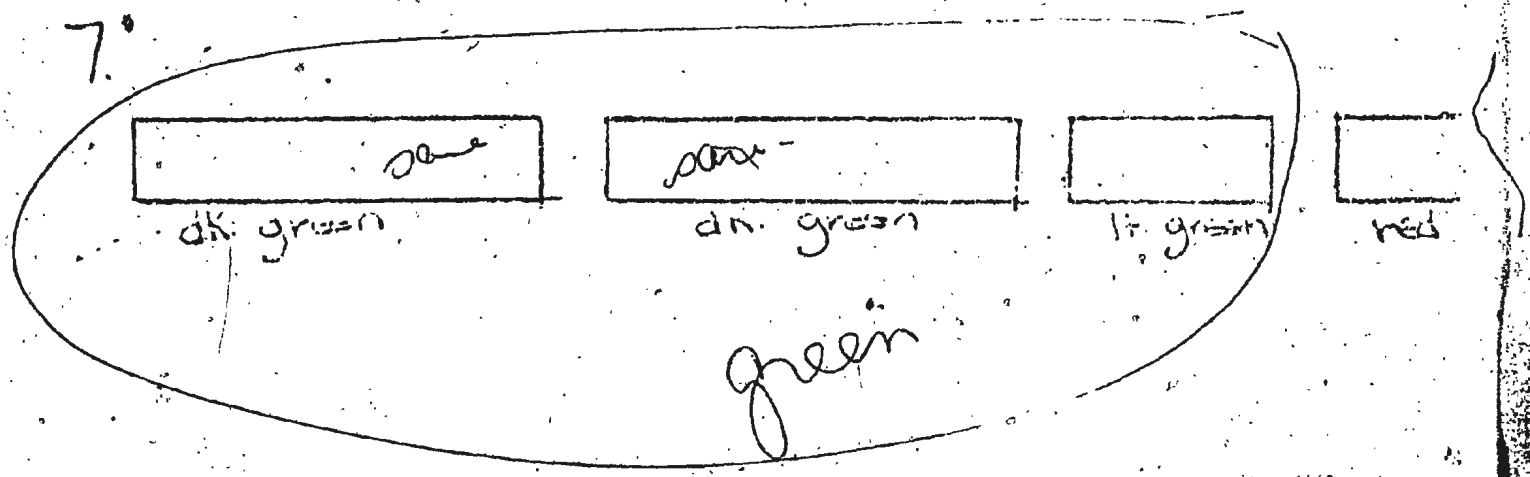
5.


lt. green
lt. green
lt. green
lt. green
all like th.

6.


neutral
neutral
red
red

7.


same
dk. green
dk. green
lt. green
red
green

8. porcupine porcupine porcupine butterfly
same

9. squirrel squirrel squirrel beaver
look the same not same

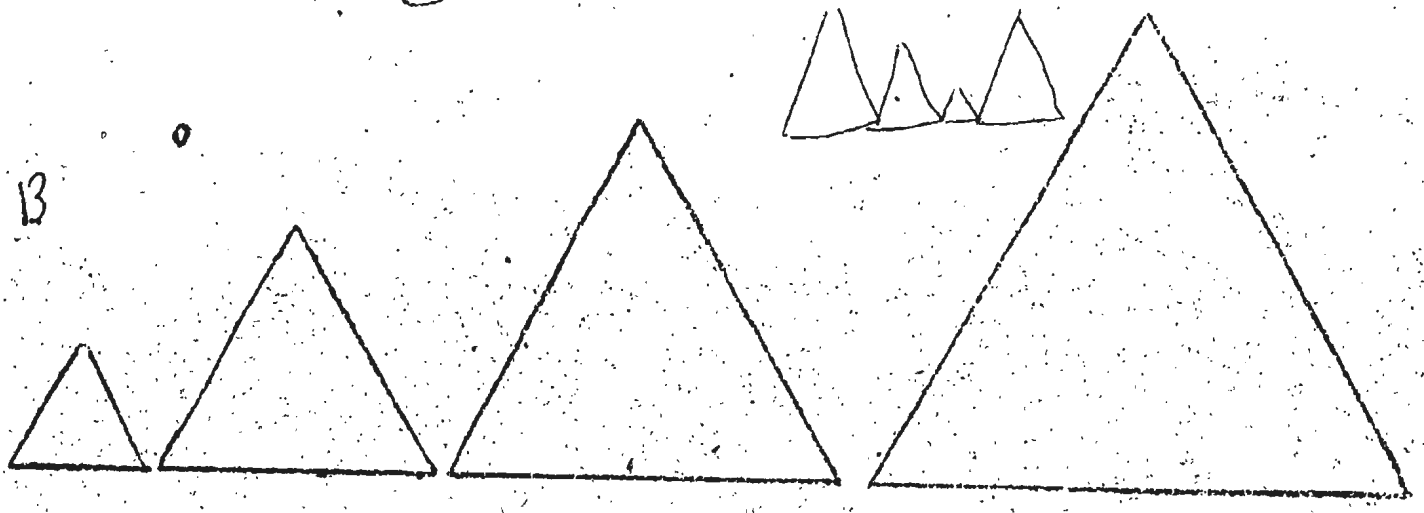
10. giraffe deer 3 bears dog horse help.
fence block sheep

11. lion dog cocker dog buffalo
lions

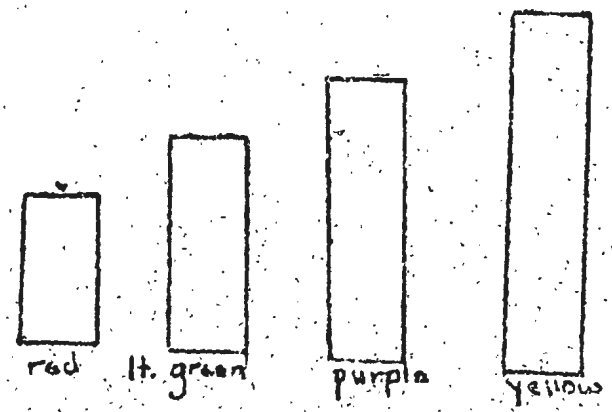
12. fish turtle lizard frog
all don't help. not same

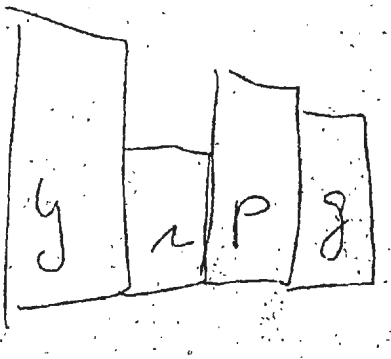
Seriation

13



14.





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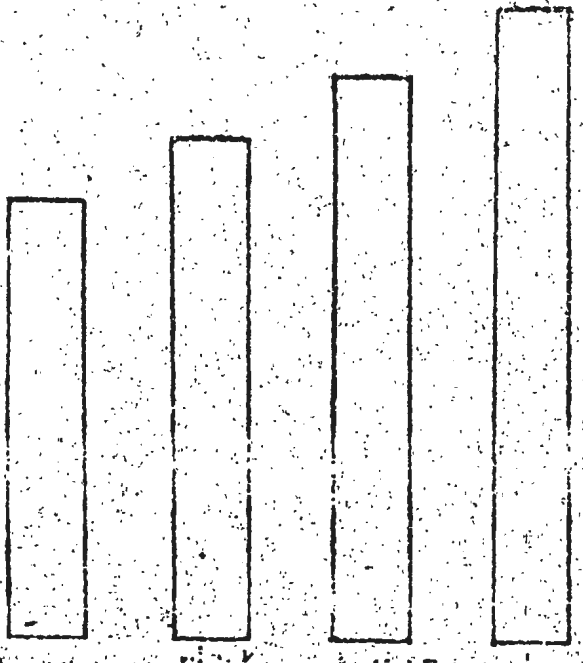
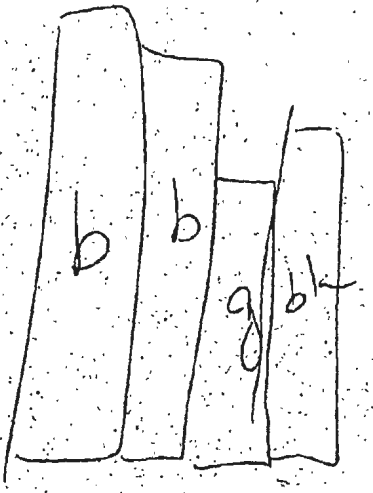
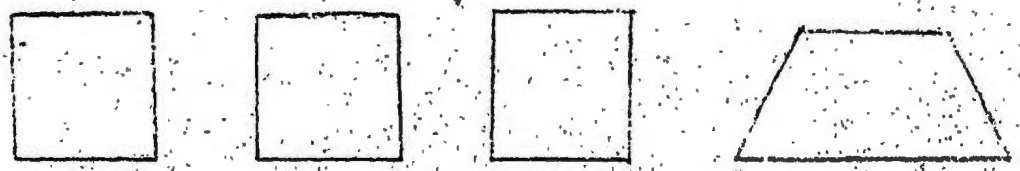


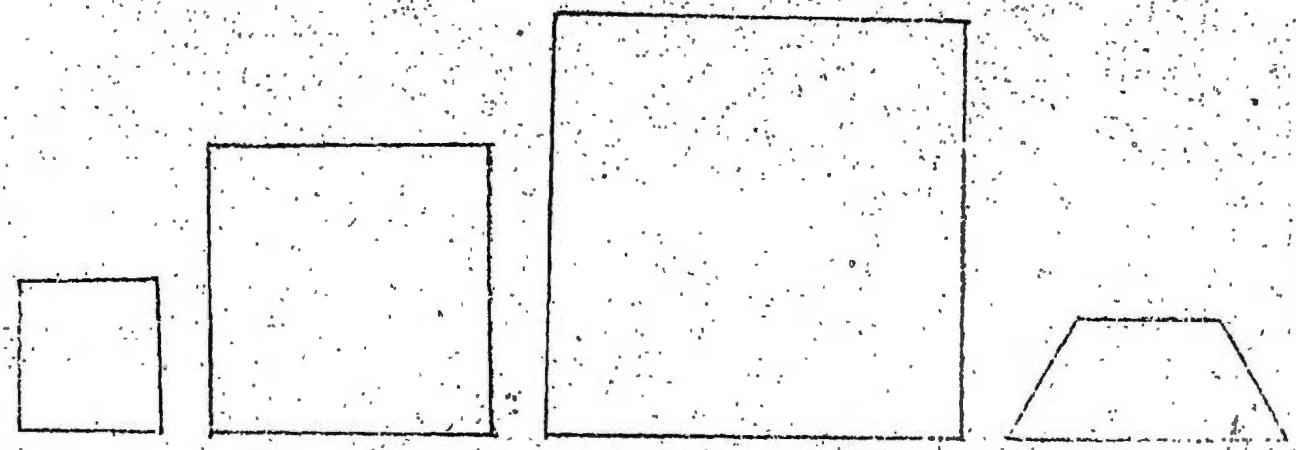


Grouping

1



2



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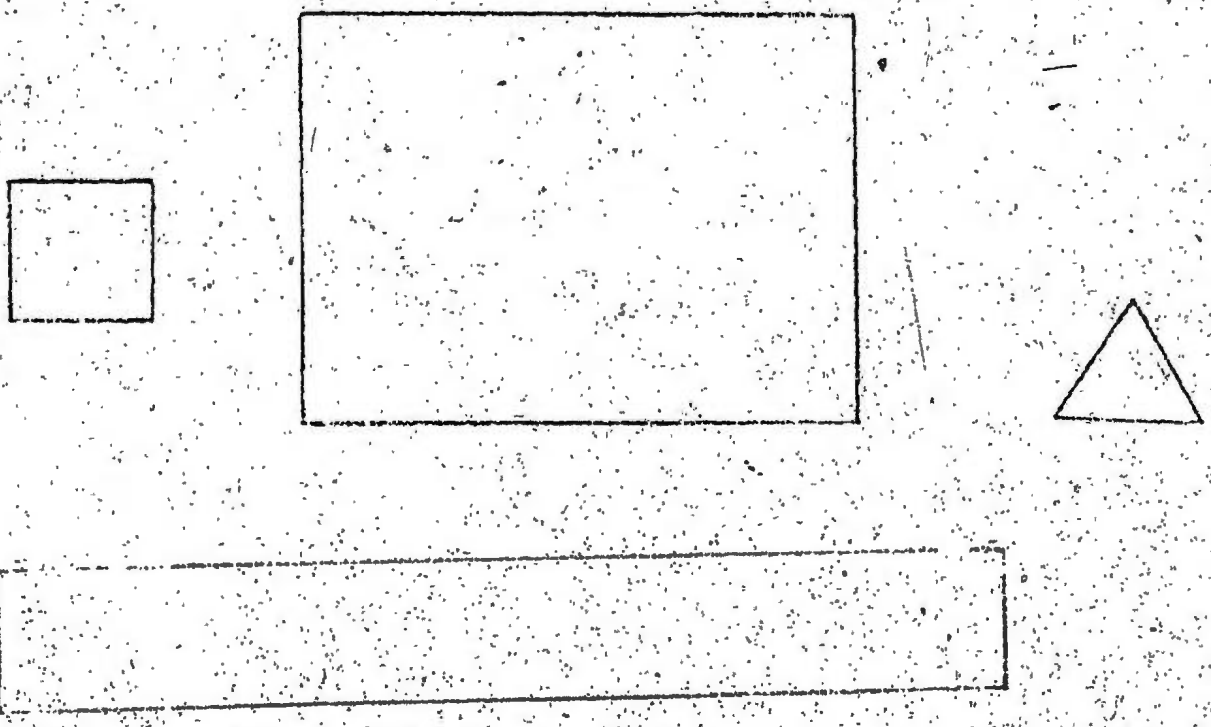
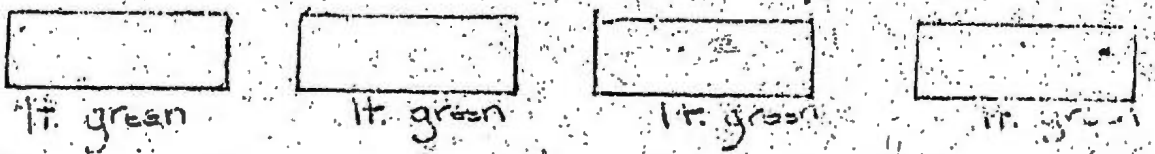


4.

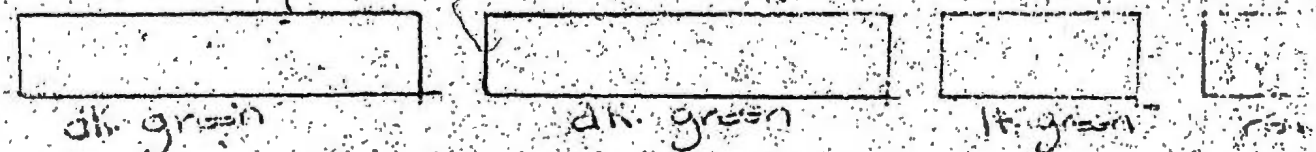
5.


lt. green
lt. green
lt. green

6.


neutral
neutral
red
red

7.


dk. green
dk. green
lt. green

8. porcupine porcupine porcupine butterfl,

9. squirrel squirrel squirrel beaver

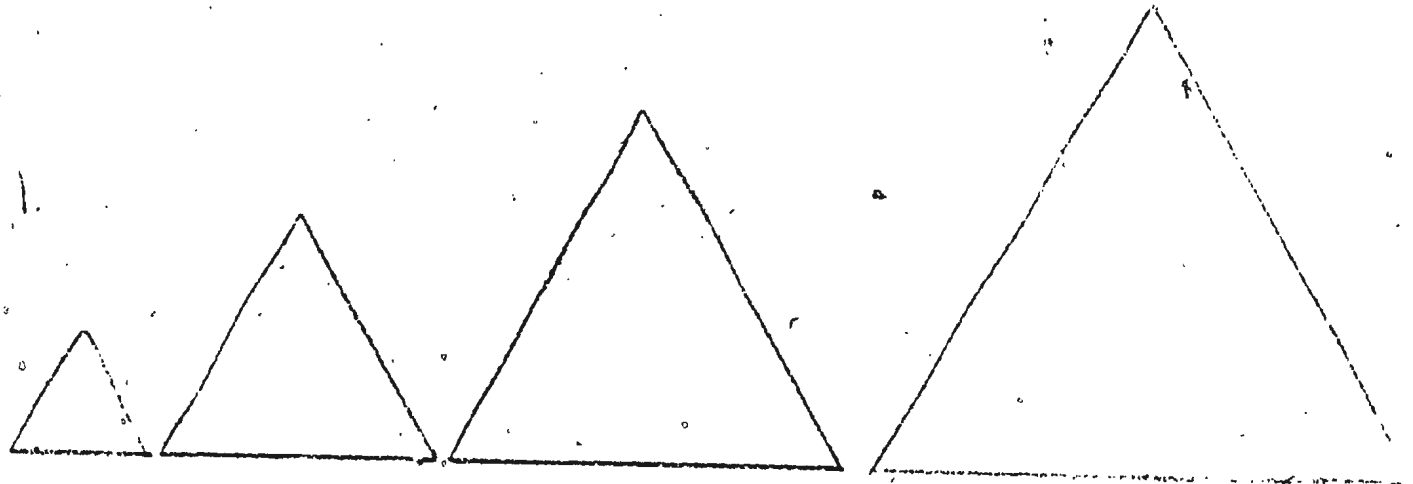
10. giraffe deer 3 bears dog

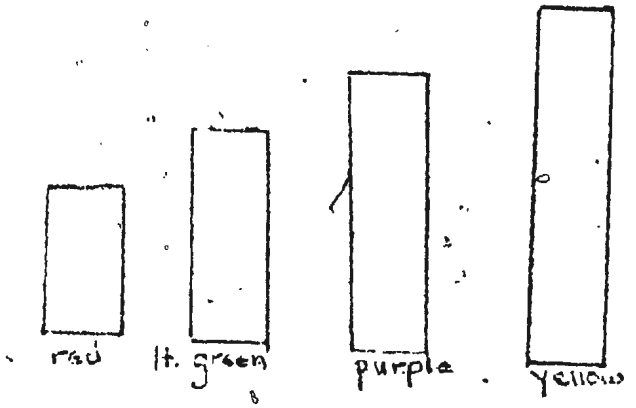
11. lion dog dog buffalo

12. fish turtle lizard frog

Seriation

1.





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