

AN ATTEMPT TO STANDARDIZE A
VOCALULARY TEST TO MEASURE THE
INTELLIGENCE OF CHILDREN BETWEEN
THE AGES OF 7 - 8 YEARS IN
SOUTH AFRICA.

BY

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A C K N O W L E D G E M E N T .

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The University of Cape Town

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CHAPTER 1.

INTRODUCTION.

THE IMPORTANCE OF LANGUAGE IN THE LIFE OF AN INDIVIDUAL.

Language plays a most vital part in the life of every individual. His prepotent needs are satisfied by the use of vocal expression. In the infant, we observe that he cries in order to have his needs satisfied, usually by his mother.

Neal E. Miller and John Dollard in their study of Social Learning and Imitation state:-
"Because of the extreme importance of language as a product of social learning which, in turn influences the course of subsequent social learning some of the significant steps in the process of learning to speak will be briefly sketched.

A child's first vocal behaviour is crying....
Crying is frequently rewarded by the appearance of an adult who covers the cold child with a warm blanket, feeds the hungry child or removes a stabbing pin.

The child is given meticulous training in connecting words to objects and connecting acts to words. He is also given careful training in connecting words to other words, in combing words into sequences of stimulus-producing responses.

The child is given careful training in responding to the spoken word as a cue; he is taught to follow directions. He is also given meticulous training in producing the appropriate word as a response. The child first learns to respond with a different word to each of many simple stimulus situations, then he is taught to combine words into larger patterns paralleling complex relationships and sequences of events in the environment. In this way, he accumulates a store of different stimulus-producing responses which he can use later in guiding his own behaviour. Speaking comes to play an important role in thinking and reasoning".

Floyd Henry Allport states in his study on Social Psychology:- "In the child the conditioned word habits are the legacy of social inheritance. Brought into service of the perpetual needs, the use of words rapidly extended from mere nomenclature to demanding and controlling others with respect to objects and situations

and situations denoted. The control of others in the service of such needs is clearly the drive behind the original acquisition of language.

"Language helped primitive man to learn to think and to develop a practical and scientific culture." And again Allport states :- "Language becomes for the child the vehicle of thought".

In this connection too, Margaret Wooster Curti states in her study on child Psychology :- "We may continue to gather data on children's thinking through the study of their speech and written language Through the study of this we shall increasingly be given a useful understanding of childish thought".

Jean Piaget, in his exceptional treatise on the Language and Thought of the Child, utilized for his study of the thought of the child, the language of the child.

It is thus evident that throughout life the child requires the use of language to satisfy his needs. With the increase of the child's age, it is obvious that there should be an increase in his needs, and accordingly an increase in his vocabulary to meet those needs, both in his individual life and his social life.

Again we may quote from Curti's abovementioned study, that, "the widening of the child's world of interests is through his use of, and understanding of language".

Allport states :- "We can scarcely conceive what human culture, or even human nature itself, would be without this function. The institutions upon which the social order rests are really systems of traditional and recorded language. Education is the socialization and training of the individual through language symbols"; and further : "In the more personal relations language retains in a subtle form its pristine functions of control. In conversation we strive to impress upon others our experiences, attitudes and feelings.

"Language is no longer regarded as a coercion but as a form of intercourse through which human nature finds its fullest expression.

"The spoken word has a more profound effect upon the human organism than is commonly recognized."

Thus in view of the vital role which language plays in the life of an individual and the importance

attached to it by other psychologists as Preyer, Moore, Shinn, Bateman, Brandenburg, Pelsma and Clara and Wilhelm Stern, it would seem fitting to utilise the vocabulary of a child to measure his intelligence.

Quoting Curti again, she mentions that, "In France, Alice Descourdes devised elaborate Tests of Language by which may be obtained fairly accurately a child's vocabulary at various ages. Her tests have proved significant also as intelligence tests In America, vocabulary tests have been developed by Kirkpatrick, Starch and Terman".

In this connection the present investigation has been undertaken with a view to the Standardization of a Vocabulary Test to Measure the Intelligence of Children Between the Ages of Seven to Eight Years in South Africa.

As this investigation is to test the intelligence of the child, it must be kept in mind that intelligence can only be measured indirectly, by measuring the product of the intelligence, that is by comparing it with a "norm" which is a standard normal intelligence. Also, it will be assumed that the intelligence of a child is his prestige due to intelligence (native capacity), experience and environment.

CHAPTER II

THE MATERIAL OF THE TEST.

The material of the test consists of 495 drawings, pictures and diagrams, an inch square, which illustrate both animate and inanimate objects and modes of behaviour of both animals and human beings which the normal child would be expected to contact in the environment of his home and family circle, as well as in his environment outside the immediate precincts of his home. The pictures are drawn to illustrate and indicate distinctly one object, impression, or mode of behaviour in order to obviate any confusion.

The drawings may be further classified into the following divisions and sub-divisions giving greater detail to their representation :-

A. HUMAN LIFE.

- (1) The stages of growth and development in an individual, e.g. infant - youth - aged.
- (2) The human body:
 - (a) Portions of the body, e.g. a hand, a head, a leg, etc.
 - (b) Greater detail of the body : an eye, an eyelash, the pupil of the eye, finger-nail, an elbow-joint.
 - (c) Type of hair: plaits, curls, and short-hair.
- (3) The modes of behaviour of an individual, e.g. eating, drinking, playing, sleeping, walking, sitting, etc., etc.
- (4) The interests of an individual: different types of sport, music, reading, writing, gardening, working, pets.
- (5) Clothes: A shirt, a pair of trousers, a dress.
 - (a) Details of clothes: a collar, a cuff, pleats of a dress.
 - (b) Jewellery: a necklace, a pin, a ring.
- (6) The home and its environment :-
 - (a) The house: Portions of the house: a gable, a door.
 - (b).....

(b) The contents of the home:

- (i) furniture, household utensils, e.g. crockery, china, etc.,
 - (ii) Details of crockery: the handle of a teapot, a latch-key of a door, a hinge of a door.
 - (iii) Common tools used in the home, as a saw, a screw-driver, etc.
- (c) The garden and gardening tools: a hose, a spade, etc. Flowers, birds and common insects found in a garden.
- (d) Pets: dogs, cats, birds and the modes of their behaviour.

B. ANIMAL LIFE:

(1) Animals:-

- (a) Tame animals: Horses, dogs, cats etc.
- (b) Common wild animals: e.g. an elephant, a camel.
- (c) Portions of the body of an animal, e.g. the head, the hoof.
- (d) The modes of behaviour of an animal, e.g. sleeping, standing, lying down etc.

(2) BIRDS:

- (a) Tame birds: Canaries, fowls, ducks, etc.
- (b) Common wild birds: penguin, ostrich.
- (c) The portions of the body of a bird: a head, a beak, a claw.

(3) FISH:

(4) INSECTS:

Common insects, e.g. a spider, common garden insects.

C. VEGETABLE LIFE:

- (1) Fruit, vegetables, etc.
- (2) Flowers. Detail of flowers: a bud, a leaf.

(3) Trees:

- (a) Kinds of trees.
- (b) Leaves of trees.
- (c) Fruit of trees.

The drawings which have been carefully selected, are thus as wide and near a representation of human, animal and vegetable life as the normal child would be expected to contact in his daily environment. The drawings also indicate that the psychological factors of perception and discrimination will play a great part in the test, and also, that the environment of the child may affect the result obtained.

THE TEST.

The Test is a series of items considered as a group, that is, 495 items (drawings) compose the group.

AN ITEM:

An item is a set of five separate drawings in a row.

THE FORM OF THE TEST:

The form of the test is, the question form. The subject is asked to point to a particular drawing in a set of five drawings which are displayed to the subject at one and the same time.

THE NUMBER OF ITEMS IN THE TEST:

The test consists of 95 items.

THE METHOD ADOPTED IN THE SELECTION OF DRAWINGS TO FORM

AN ITEM:

Five separate drawings were selected to form a row, that is, an item. The following are examples to demonstrate the principle on which the selection of drawings per item, has been based:-

- (1) Two or more objects which have similar word-symbols but which are distinctly different from one another, e.g. a fence with a gate, and a man fencing (sport), or, the legs of a human being, and a pair of leggings (putties).
- (2) Two or more objects with almost similar sounding word-symbols but distinctly different from each

other/....

other in meaning, e.g. a skirt and a shirt, or a lable and a gable.

- (3) Two or more objects which appear to be like but which are distinctly different from each other, e.g. an umbrella and a toadstool, or, a tennis racquet and a badminton racquet.
- (4) Two or more drawings which represent the same object but which accentuates different aspects of the object, e.g. the eye with eye-lashes, a pair of eyes with eye-brows, and the pupil of an eye.
- (5) Two or more objects with the same word symbol as part of the compound noun which distinguishes one from the other, e.g. pudding-bowl and a gravy-bowl.
- (6) Two or more objects of the same species but differing distinctly in size, e.g. a dwarf and a gaint.
- (7) Two or more objects of the same species but differing in gender e.g. a boy and a girl.
- (8) Two or more objects of the same class but distinctly different from one another in details e.g. two different kinds of flowers, or two different kinds of leaves.
- (9) Two or more drawings of the same object e.g. the head, but depicting different anatomical parts thereof, that is the skull, and a head of hair to represent the scalp.
- (10) Two or more drawings representing patterns which are different from each other, e.g. a floral pattern, a striped pattern and a spotted pattern,
- (11) Two or more drawings which convey the same impression but which are represented by distinctly different word symbols e.g. a skirt with pleats (creases), and a pair of trousers with creases.
- (12) Two or more drawings depicting different types of the same kind of object e.g. a webbed foot, a claw of a bird or animal and a hoof of a horse, all of which indicate a foot.
- (13) Two or more drawings of similar sounding words, except that one is the diminutive of the other e.g. a boot (a man's boot) and a bootee (a baby's boot).
- (14) Two or more objects used for indicating the same thing e.g. time, but distinctly different from one/.....

one another, that is, a sundial and a clock.

- (15) Two or more drawings of the same object but indicating different positions of the object e.g. a fist (clenched hand) and the palm of a hand (open hand).
- (16) Two or more drawings denoted by words of the same root but with a different prefix e.g. telephone and microphone.
- (17) Two or more drawings depicting different objects of the same class e.g. a piano, a trumpet, a violin.
- (18) Two or more objects of different shape e.g. a hexagon, and a triangle.
- (19) Two or more objects which are described by words of the same sound and spelling (homonyms), but differing in use and meaning e.g. a bow (a bow and arrow) and the bow of a violin.
- (20) Two or more articles (objects) which are used for the same purpose but which differ from one another in appearance e.g. a satchel (school-bag) and an attache-case (school-case).
- (21) Two or more articles (objects) made from the same material but which differ from one another in use e.g. a leather belt, a bridle, a saddle.
- (22) Two or more articles used for the same purpose for instance, to measure, but which differ from one another in use, e.g. a pipette (used to measure small quantities of liquid) and a thermometer (used to measure temperature).
- (23) Two or more articles used by the same subject (baby) e.g. feeding bottle and a baby's dummy.
- (24) Two or more articles used for similar purposes, but which differ in use e.g. a flask (to contain liquid), a cup (for tea) and a tumbler (for water etc.).
- (25) Two or more articles which are used for the same purpose but which differ in degree of intensity and in appearance e.g. a match (provides light), a candle (provides light) and an electric light bulb (provides light).
- (26) Two or more objects represented by the same noun except that one object is represented by a compound noun to distinguish it from the other e.g. a toad-stool and a toad.

- (27) Two or more articles used for the same purpose, for instance, clothes, but different from one another in shape, size and pattern e.g. a hat, a blouse, a frock, a shirt and a skirt.
- (28) Two or more articles used for the same type of work but on different objects e.g. an axe (to cut wood) and a bread-knife, (to cut bread).
- (29) Two or more drawings depicting the same species (human beings) but portraying different actions e.g. a boy swinging, a girl drinking, a baby asleep.
- (30) Two or more articles used for the same kind of work but with different uses e.g. a pitch-fork and a rake.

THE LIST OF TEST WORDS.

When the drawings were selected to form a row, that is, an item, then one drawing (object) with its appropriate word symbol was chosen to be the stimulus word for that particular item, e.g. in the first item which consisted of five drawings, the drawing of an eagle was selected and the stimulus word-symbol "eagle" used for that item.

The following is a list of the word symbols and hence the stimulus words compiled from the ninety-five items which form the group of the test (495 drawings), namely :-

L I S T I

- | | | |
|-----------------|----------------|------------------|
| 1 Eagle | 18 Skirt | 34 Crooked |
| 2 Blossom | 19 Ear of corn | 35 Necklace |
| 3 Hide | 20 Slipper | 36 Eyelash |
| 4 Stretcher | 21 Boomerang | 37 Goose |
| 5 Acacia | 22 Quives | 38 Tortoise |
| 6 Seal | 23 Notch | 39 Basket |
| 7 Reims | 24 Dial | 40 Leach |
| 8 Eyebrow | 25 Anvil | 41 Signal (verb) |
| 9 Thistle | 26 Slice | 42 Bound |
| 10 Strawberry | 27 China | 43 Striped |
| 11 Watering Can | 28 Parrot | 44 Spout |
| 12 Bellows | 29 Hound | 45 Propeller |
| 13 Toadstool | 30 Violin | 46 Grasshopper |
| 14 Flask | 31 Sandwich | 47 Saucepan |
| 15 Sundial | 32 Slumbering | 48 Number |
| 16 Thermometer | 33 Carriage | 49 Arrow |
| 17 Skull | | |

- | | | |
|----------------|-----------------|---------------|
| 50 Shelves | 63 Wire pliers | 76 Frying pan |
| 51 Fierce | 64 Mule | 77 Circle |
| 52 Drawing pin | 65 Bow | 78 Stooping |
| 53 Rake | 66 Oar | 79 Knuckle |
| 54 Hinge | 67 Crescent | 80 Armchair |
| 55 Spider-web | 68 Claw | 81 Fist |
| 56 Dummy | 69 Canary | 82 Butterfly |
| 57 Paper-bag | 70 Screw-driver | 83 Racquet |
| 58 Scarecrow | 71 Dwarf | 84 Leaping |
| 59 Signal post | 72 Buckle | 85 Collar |
| 60 Pitch fork | 73 Cuff | 86 Candle |
| 61 Collar | 74 Solitary | 87 Animal |
| 62 Boot | 75 Label | 88 Shooting |
| | | 89 Fencing |
| | | 90 Young |
| | | 91 Bald |
| | | 92 Telephone |
| | | 93 Cupboard |
| | | 94 Bandage |
| | | 95 Copper. |

The Items of List I in an unclassified order, were then numbered from one to ninety-five.

THE TYPE OF TEST.

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The test is an Individual Test. One subject is tested at a time.

CHAPTER III

I. The Preliminary Investigation.

To obtain an idea as to the procedure to be adopted for the test and the time taken by the test when applied, a preliminary investigation was undertaken by the Experimenter by applying the test to a small number of subjects individually.

The Subjects.

Six subjects (four girls and two boys) varying in ages from seven years to nine years, were chosen for this investigation. The school standard ranged from Sub B to Standard II. The children were from four different schools as follows :-

Three children were from the Ellerton Primary School, Sea Point.

One child was from the Upton Villa Primary School.

One child was from the St. George's Grammar School.

One child was from Christian Brothers College.

The average age of the six children was seven years and one month.

The Preliminary Test.

The Material.

The material consisted of the first sixty-one items, (that is, stimulus words), of the ninety-five items mentioned in List I, and were presented to the subject in the order in which they had been drawn up.

The Procedure Adopted.

In view of the fact that young children are usually nervous of strangers, the experimenter endeavoured to gain the confidence of the subject before the test was applied. To accomplish this the subject was involved in a brief conversation pertaining to him-(her) self.

The experimenter then told the subject that she would shew him some pictures and that he would be required to point to only one particular picture in a

row, at a time, according as he was asked to do.

The Application of the Test.

One row of five pictures, that is, an item, was then exposed in front of, and in view of the subject. A practical demonstration of what would be required of the subject was then given by the experimenter for instance, the experimenter said; "I want you to point to only one picture at a time. If I ask you to shew me the 'pig', you must point to the drawing of the 'pig', like this," (the experimenter here demonstrating the point in question practically). "Now can you shew me in that row (the first row displayed in front of the subject) which is the 'eagle'" (the first stimulus word symbol). When the subject pointed to a picture which according to him, represented this particular word symbol (stimulus word), the experimenter exposed the next row of five pictures to the subject and presented the following stimulus word, for example, "blossom."

This procedure was adopted throughout the test.

The Method adopted in Scoring.

If, a subject pointed to the correct picture represented by the stimulus word symbol, the experimenter made a 'tick' (i.e. ✓); if, the subject pointed to an incorrect picture, the experimenter wrote down the number of the item. A 'tick' represented one mark per correct item.

The scores were written on a sheet of paper on the left of the experimenter. This was done to prevent the subject from seeing the results obtained as his score may be influenced by the idea of being tested.

The Results Obtained from the Preliminary Investigation.

- (1) The average age of the six subjects, who were chosen at random was seven years and one month.
- (2) The mean number of errors obtained in the test of sixty-one stimulus words (List I), = 13.66
- (3) The test revealed that with an increase in age there was a slight decrease in the errors obtained in the test, or, that with an increase in age there was a slight increase in the scores obtained on the test, as indicated by the following figures:-

Age.	School Standard	Number of items Incorrect	Number of items Correct.
7 years	Sub B	29	32
7 years	Std. I	13	48
7 years	Std. I	14	47
7½ years	Std. I	13	48
8 years	Std. II	9	52
9 years	Std. I	4	57

As a result of an enquiry made by the experimenter, it was found that the subject of nine years of age in Standard I, with four errors on the test, had been retarded at school due to a severe illness over a period of months.

Comments on the Preliminary Investigation.

From this investigation the experimenter realized that :-

- (1) The hypothesis of the test should be based on the fact that normally with an increase in age in an individual, there should be a steady decrease in errors on the test, or, that with an increase in age in an individual, there should be an increase of scores obtained on the test.
- (2) The environment of the subject may affect the results of the test.
- (3) The physical and mental state of health of a subject would affect the results obtained by him on the test.
- (4) In view of (2) and (3) it was felt that the case history of a subject would be of great assistance in the interpretation of the results obtained by a subject on the test.
- (5) The stimulus words would have to be scaled in order of difficulty, that is, from the easiest to the most difficult word, after a greater number of children, selected at random from an average school, had been tested.
- (6) The time required for the test would be increased if ninety-five stimulus words, i.e. the whole group, were presented to a subject.

- (7) Some of the stimulus words of the test appeared too easy for the subjects, and in view of this, other stimulus words may have to be substituted in the test, after a greater number of subjects had been tested.
- (8) If in scoring the total number of incorrect responses obtained on the test by a subject was used instead of the correct responses, the resulting statistical calculations would be simplified.

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CHAPTER IV

II THE SECOND INVESTIGATION.

The material used for this Investigation.

A second list of ninety-five words was drawn up by the experimenter in accordance with the principle adopted for the arrangement of the drawings in an item, vide Chapter II.

The list of stimulus words was then numbered from one to ninety-five in the unscalled order in which they had originally been compiled.

The following is the list of ninety-five stimulus words selected for this investigation:-

THE STIMULUS WORDS (LIST II)

1 Ostrich	33 Yacht	64 Elephant
2 Leaf	34 Panel	65 Arrow
3 Rondavel	35 Ring	66 Hammer
4 Satchel	36 Eyelash	67 Circle
5 Leek	37 Peacock	68 Finger
6 Envelope	38 Pelican	69 Parrot
7 Bridle	39 Fruit	70 Whip
8 Pupil (of an eye)	40 Lock	71 Giant
9 Ear of Corn	41 Sweeping	72 Necklace
10 Carrot	42 Buckle	73 Collar
11 Pudding-Bowl	43 Spotted	74 Swinging
12 Trumpet	44 Handle	75 Gable
13 Umbrella	45 Screwdriver	76 Square
14 Tumbler	46 Lizard	77 Stool
15 Cube	47 Gravy-bowl	78 Golf-stick
16 Label	48 Triangle	79 Creccent
17 Dagger	49 Shield	80 Shooting
18 Skirt	50 Cupboard	81 Plaits
19 Strawberry	51 Resting	82 Ambulance
20 Leggings	52 Safety-pin	83 Running
21 Hooter	53 Spade	84 Fist
22 Harp	54 Latch-key	85 Playing
23 Knot	55 Spider	86 Bugle
24 Signpost	56 Infant	87 Fencing
25 Barrel	57 Handbag	88 Time piece
26 Corkscrew	58 Walking	89 China
27 Saucepan	59 Pouring	90 Elbow
28 Duck	60 Pitch-fork	91 Snail
29 Penguin	61 Pleats	92 Apple
30 Bow (of a violin)	62 Slipper	93 Egg-cup
31 Dunce Cap	63 Saw	94 Carrying
32 Drinking		95 Picture.

THE TEST:

The experimenter selected the first sixty of the ninety-five stimulus words of List II to form the test.

THE SUBJECTS:

The subjects consisted of sixty-one children (forty-two girls and nineteen boys) of two Standard I classes of the Ellerton Primary School, Sea Point. According to the Principal of the school, these children were considered to be of average intelligence.

THE APPLICATION OF THE TEST:

The experimenter adopted the same procedure in applying the test, as was used in the preliminary investigation.

THE RESULTS:

The following results were obtained from this investigation on sixty-one children (forty-two girls and nineteen boys) of two Standard I classes :-

1. THE STATISTICAL CALCULATIONS:-

The Mean Number of Errors obtained on the Test by the Subjects (Boys and Girls) :-

- (i) The Formula used for the calculation of the Arithmetic Mean = the mid-point of the range + the correction, where the correction = $\frac{\sum FD}{N}$ x the step-interval.

The Range of errors on the test = 4 - 22
A.M. = 12.66 errors.

- (ii) The Formula used for obtaining the Standard Deviation :-

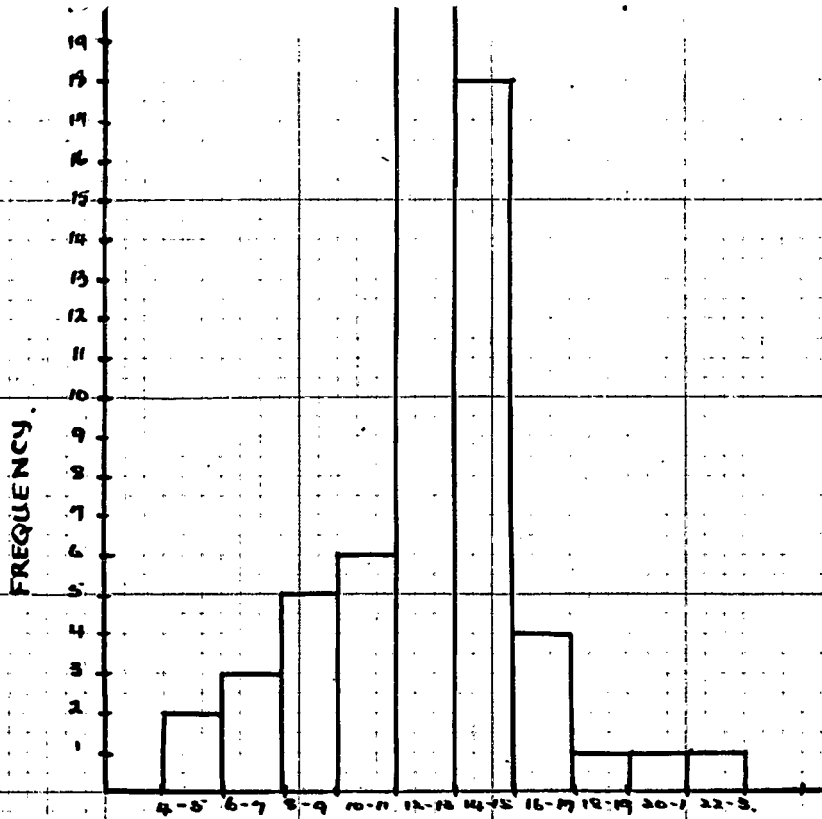
$$\sqrt{\frac{\sum FD^2}{N} - C^2} \times \text{step-interval}$$

where, C = the correction.

S.D. of Errors = 2.898.

- (iii) The Formula of P.E. of S.D. = $\frac{.6745 \cdot \text{S.D.}}{\sqrt{2N}}$

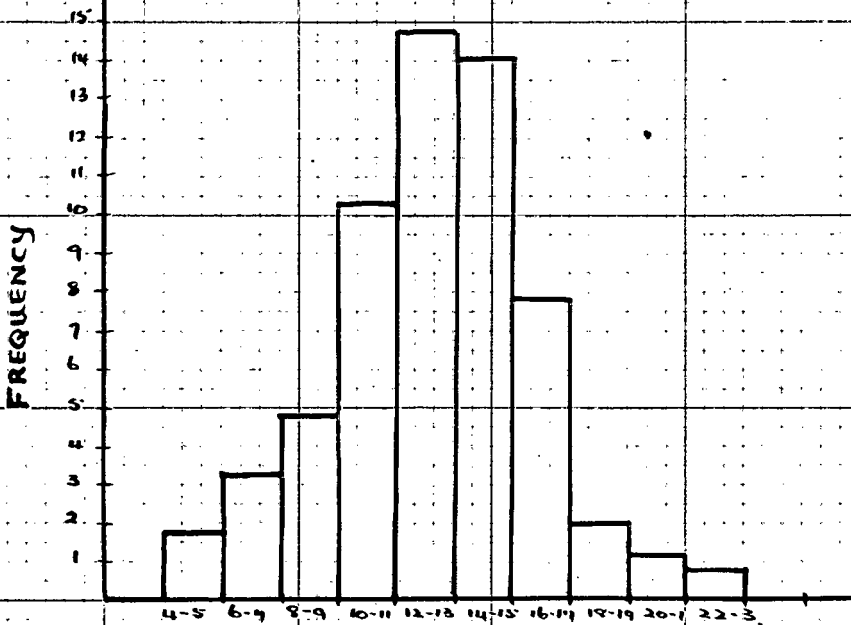
S.D. of P.E. = .177



RANGE IN ERRORS.

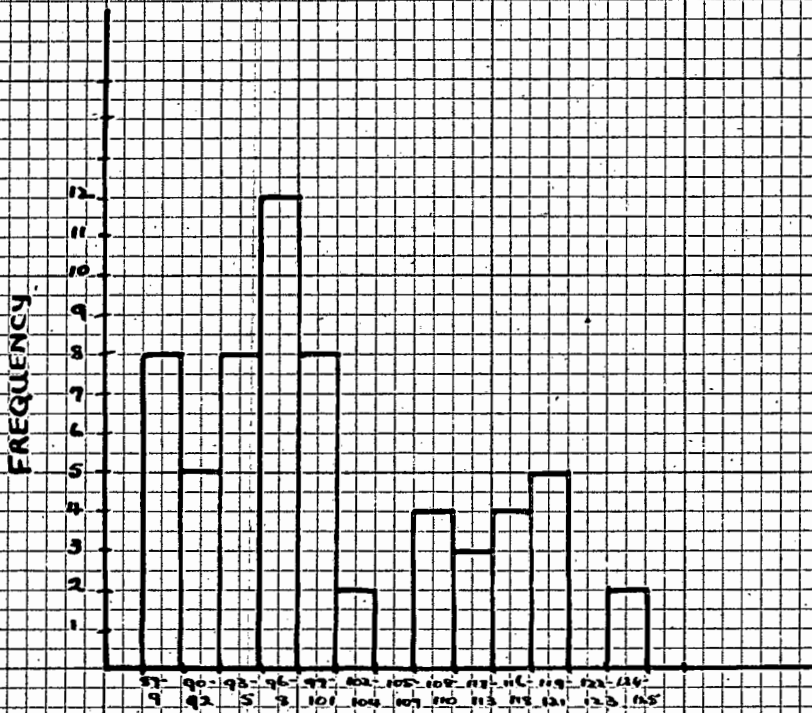
GRAPH 1 : 2 STANDARD 1 CLASSES. BOYS AND GIRLS
 DISTRIBUTION OF ERRORS ON VOCABULARY TEST (60 WORDS)
 61 CHILDREN (42 GIRLS AND 19 BOYS)

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RANGE IN ERRORS

GRAPH 1a : 2 STANDARD 1 CLASSES. (BOYS AND GIRLS).
 DISTRIBUTION OF ERRORS ON VOCABULARY TEST (60 WORDS)
 61 CHILDREN (42 GIRLS AND 19 BOYS)
 (HISTOGRAM AFTER SMOOTHING)



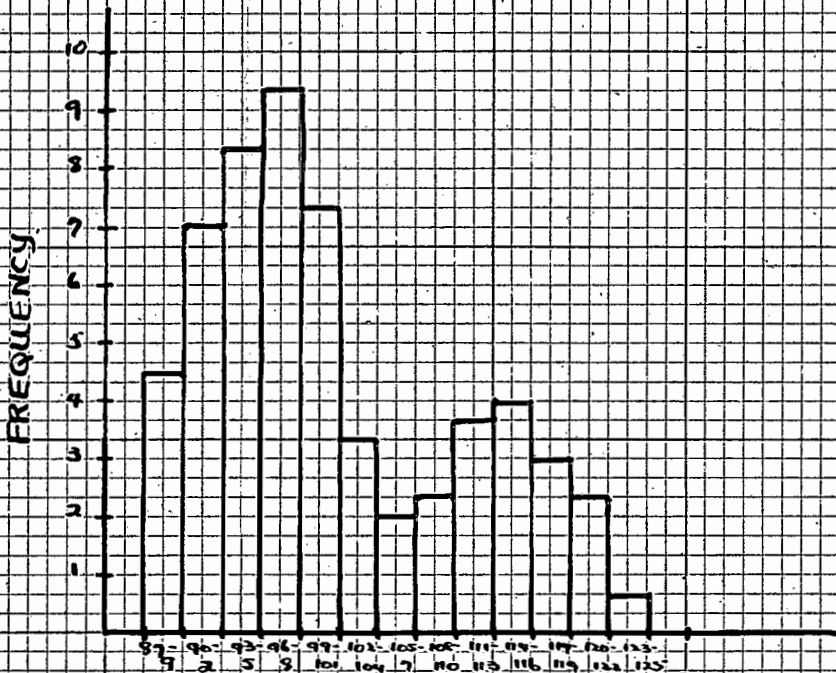
87-92-93-94-95-96-97-102-103-104-105-111-112-113-114-119-122-124-
 9 9 9 9 10 10 10 10 11 11 11 11 12 12 13 13

AGE IN MONTHS.

GRAPH I : 2 STANDARD 1 CLASSES (BOYS AND GIRLS)

AGE DISTRIBUTION IN MONTHS.

67 CHILDREN (42 GIRLS AND 25 BOYS).



87-92-93-94-95-96-97-102-103-104-105-111-112-113-114-119-122-124-
 9 9 9 9 10 10 10 10 11 11 11 11 12 12 13 13

AGE IN MONTHS.

GRAPH IIa : 2 STANDARD 1 CLASSES. BOYS AND GIRLS

AGE DISTRIBUTION IN MONTHS.

67 CHILDREN (42 GIRLS AND 25 BOYS).

(HISTOGRAM AFTER SMOOTHING).

(iv) The Formula of P.E. of M. - $\frac{.6745 \text{ S.D.}}{\sqrt{N}}$

$$\text{P.E. of M.} = \underline{.249}$$

The same statistical formulae mentioned above were used to obtain the following statistical results in regard to age of the subjects tested :-

The Range in age = 87 months to 124½ months.

	A.M. = 100.834 (months)
	S.D. = 10.206 (months)
P.E. of S.D. =	.6232
P.E. of A.M. =	.8814

In connection with the above results obtained in this investigation see graphic representation of :-

(i) The frequency distribution of errors obtained by the subjects in the 60 item test, vide graphs I and Ia.

(ii) The frequency distribution of age of the subjects tested, vide graphs II and IIa.

2. THE INTERPRETATION OF THE STATISTICAL RESULTS.

(a) According to the above results the average normal age of the Standard I child is 100.834 months. In both the Orange Free State and the Transvaal the normal average age of a Standard I child is between the age of 8 - 9 years and the above results corroborate this statement.

(b) The average error obtained for these Standard I groups is 12.66 errors and therefore this will be considered as the 'norm' for the combined group.

(c) The investigation confirmed the findings of the preliminary investigation, namely that :-

(i) With an increase in age there was a definite decrease in errors, or, with an increase in age there is an increase in scores obtained on the test.

(ii) If there was an increase in age and an increase in errors above the average 'norm' obtained, the results may be due to factors other than intellectual. In such cases of apparent retardation the case history of the subject was obtained from the Principal of the School.

Of eighteen subjects ranging in age from 109 - 124½ months, that is, above the age for the normal average Standard I child, with the exception of three cases in which the errors were below the 'norm', the errors in each case were above the average number of errors for Standard I. This indicates that if a child above the average for Standard I is still in that class, retardation must be due either to lack of intellect or to factors other than intellectual.

THE INTERPRETATION OF THE RESULTS OF THREE SUBJECTS OF THE AGE GREATER THAN THE NORMAL AVERAGE STANDARD I AGE, BUT WITH LESS ERRORS THAN THE 'NORM'.

Two of the subjects had errors just below the 'norm' for the Standard I age group, that is 11 and 11 errors respectively, and one subject had 8 errors in the test, which indicates that retardation in school work must have been caused by factors other than intellectual. This conjecture was verified and confirmed by the case history of each subject.

3. THE CASE HISTORIES OF THE SUBJECTS:

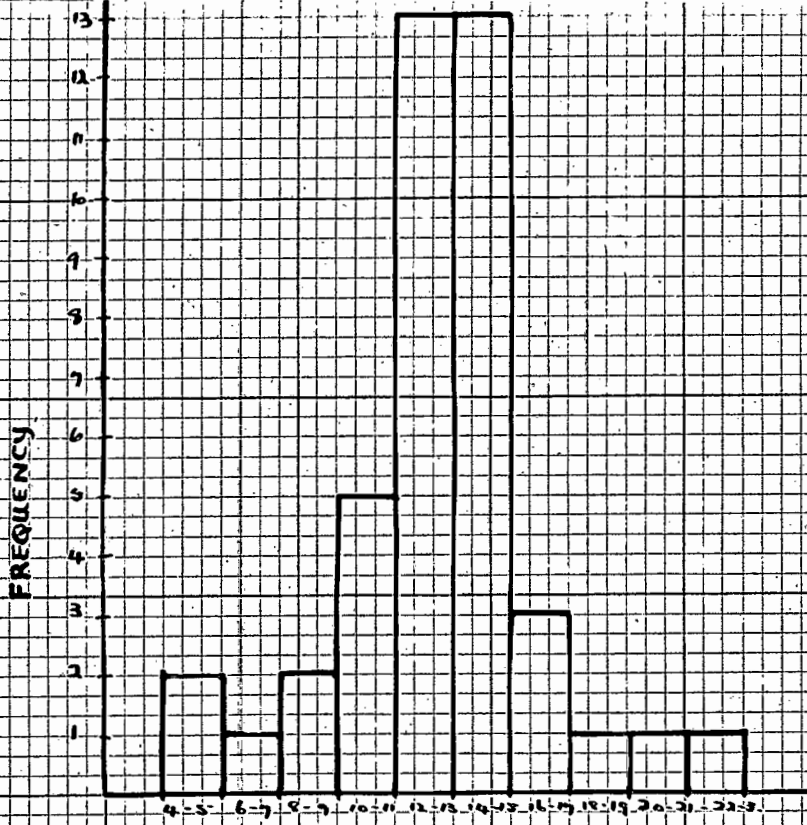
A.

- (i) Subject A: Age 115½ months. Errors obtained in the test = 11. This subject comes from a poor home and has had several changes of school.
- (ii) Subject B: Age 117½ months. Errors obtained in the test = 11. This subject comes from a poor home. The mother has no conception where the father is. The mother works and the home conditions are not at all satisfactory. The subject is of a nervous temperament and has missed a great deal of schooling through ill-health.
- (iii) Subject C: Age 118 months. Errors obtained in the test = 8. This subject first of all attended school regularly then the attendance at school became very irregular. The mother had a nervous break-down and went off her mind. The three children, (the subject included) were then sent to an Institution.

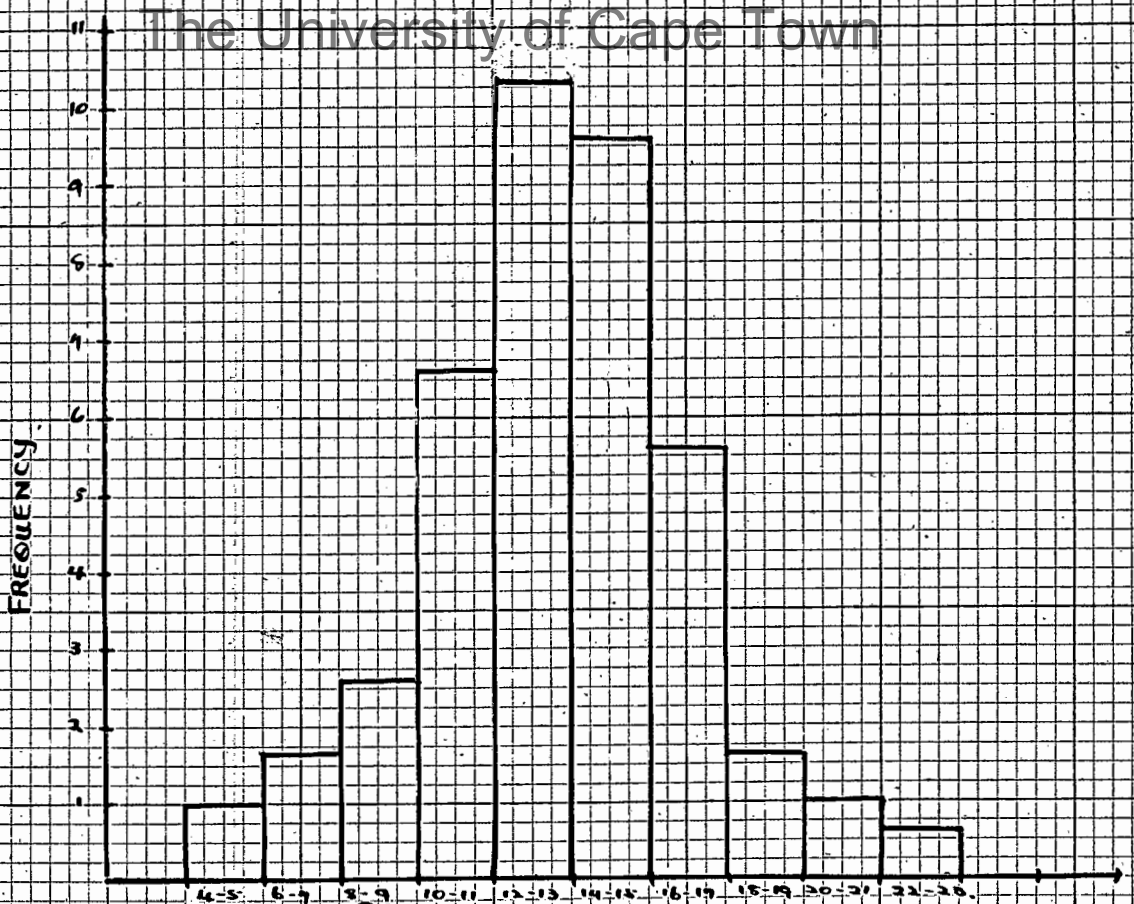
B.

The study of the case histories of the other fifteen children of ages ranging from 109 - 124½ months, and with errors in the test, above the 'norm', reveal the following facts which indicate the causes of their apparent retardation, namely, physical ill-health,

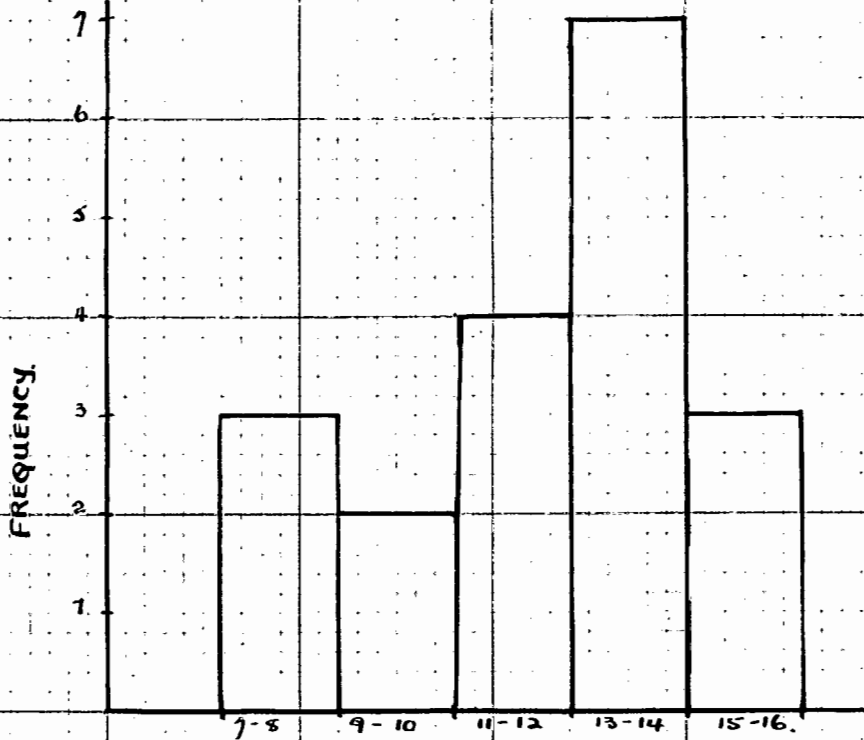
environment/.....



RANGE IN ERRORS
 GRAPH II : 2 STANDARD 1 CLASSES GIRLS ONLY (42).
 DISTRIBUTION OF ERRORS ON VOCABULARY TEST (60 WORDS)

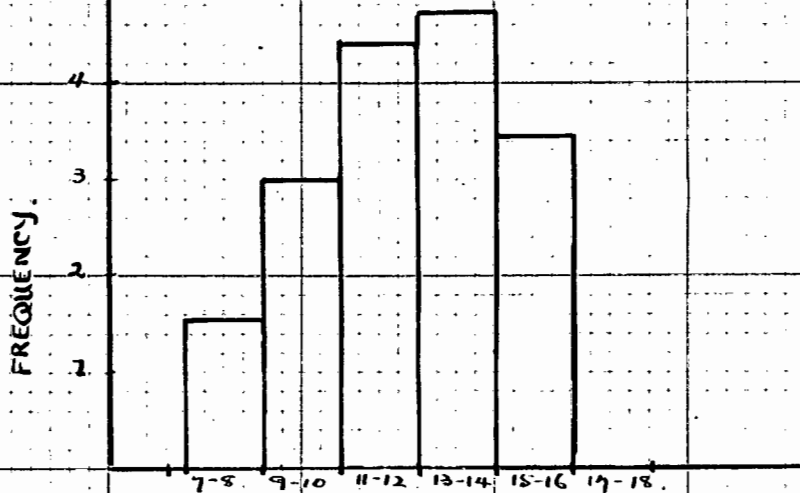


RANGE IN ERRORS
 GRAPH III : 2 STANDARD 1 CLASSES GIRLS ONLY (42).
 DISTRIBUTION OF ERRORS ON VOCABULARY TEST (60 WORDS)
 (HISTOGRAM AFTER SMOOTHING)



GRAPH IV : RANGE IN ERRORS. 2 STD'S 1: Boys only (14) DISTRIBUTION OF ERRORS ON VOCABULARY TEST (60 WORDS).

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GRAPH IVa : RANGE IN ERRORS. 2 STD'S 1: Boys only (14) DISTRIBUTION OF ERRORS ON VOCABULARY TEST (60 WORDS). (HISTOGRAM AFTER SMOOTHING).

<u>Girls.</u>	<u>Boys.</u>
Range in Errors = 4-22	Range in Errors = 7-16
A.M. = 13.0238	A.M. = 11.9446
S.D. = 3.4416	S.D. = 2.534
P.E. of S.D. = .229	P.E. of S.D. = .277
P.E. of M. = .324	P.E. of M. = .392

MEAN NUMBER OF ERRORS IN TEST.

	A.M.	<u>S.D.</u>
Girls	13.0238	3.446
Boys	11.9446	2.534
Difference	1.0792 (errors).	

$$\text{Girls } PE_{M_1} = \frac{.6745 \times 3.4416}{\sqrt{42}} = .324$$

$$\text{Boys } PE_{M_2} = \frac{.6745 \times 2.534}{\sqrt{19}} = .392$$

$$PE_D = \frac{1.0792}{\sqrt{(.324)^2 + (.392)^2}} = .508$$

$$\frac{D}{PE_D} = \frac{1.0792}{.508} = 2.124 \quad (\text{the critical Ratio}).$$

In connection with the above results see graphic representation in regard to the frequency distribution of errors obtained in the vocabulary test by both the girls and the boys of the two Standard I classes respectively, vide graphs III, IIIa, IV and IVa.

THE INTERPRETATION OF THE STATISTICAL RESULTS OBTAINED.

A critical ratio of 2.124 means that there are 96 chances in a 100 that the obtained difference is significant, namely that the true difference is somewhat greater than zero, but as it is customary to take a D/PE_D of 4 as evidence of significant superiority, a critical ratio of 2.124 is thus not considered to be sufficient evidence of being significant.

In spite of this there appears to be some systematic factor at work other than the ordinary law of distribution, and, in this case, it may be attributed to the fact that the boys are brought up, socially, different to the girls and the slight degree of superiority in the knowledge of words on the vocabulary test may be ascribed to this factor, or, that the use of vocabulary in testing the intelligence of a child is not a reliable measure, in view of the fact that it has been proved by psychologists that there is no significant difference between the intelligence of boys and girls.

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CHAPTER V

III THE THIRD INVESTIGATION.

In view of the results obtained on the two Standard I classes, the experimenter then applied the whole test consisting of ninety-five items (list II) to a lower age group, that is, to a Sub B class, and, scaled the stimulus words, that is, the items, in order of degree of difficulty, that is from the easiest word to the most difficult word on the results obtained from this investigation.

THE TEST.

The Test consisted of 95 items, that is, the group as a whole (List II).

THE SUBJECTS.

Thirty subjects (twenty-two girls and eight boys) of the Sub B class of the Ellerton Primary School, Sea Point, were tested individually.

THE APPLICATION OF THE TEST.

The experimenter used the same procedure as was adopted in the previous two investigations, except that in this instance, 95 items were used for the test.

THE RESULTS.

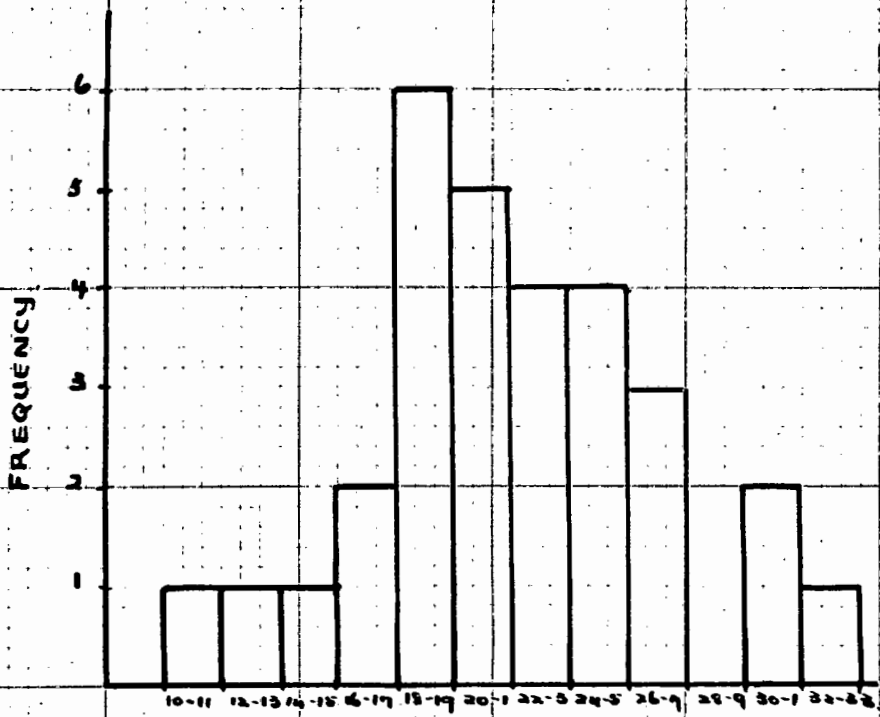
THE STATISTICAL CALCULATIONS OF THE RESULTS OBTAINED:-

The formulae used for the calculation of the Arithmetic mean and the S.D. in the previous investigation were used by the experimenter in the calculation of these statistical results.

THE SUB B CLASS: THIRTY SUBJECTS (BOYS AND GIRLS).

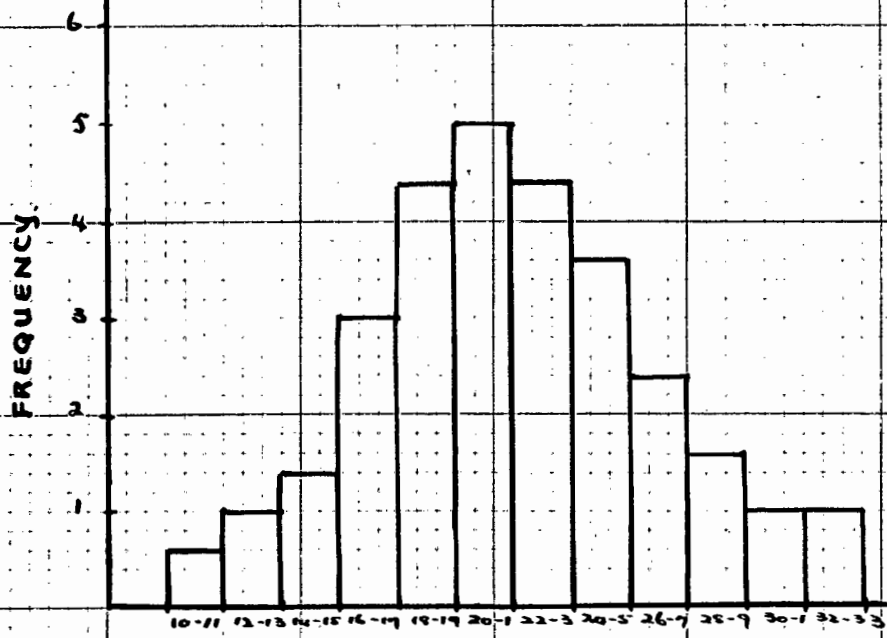
Statistical calculation of the mean and of the S.D. of the number of errors obtained in the test.

Class-range in errors	=	10 - 32
A.M. (errors)	=	21.5
S.D.	=	5.026
P.E. of S.D.	=	.437
P.E. of M	=	.618

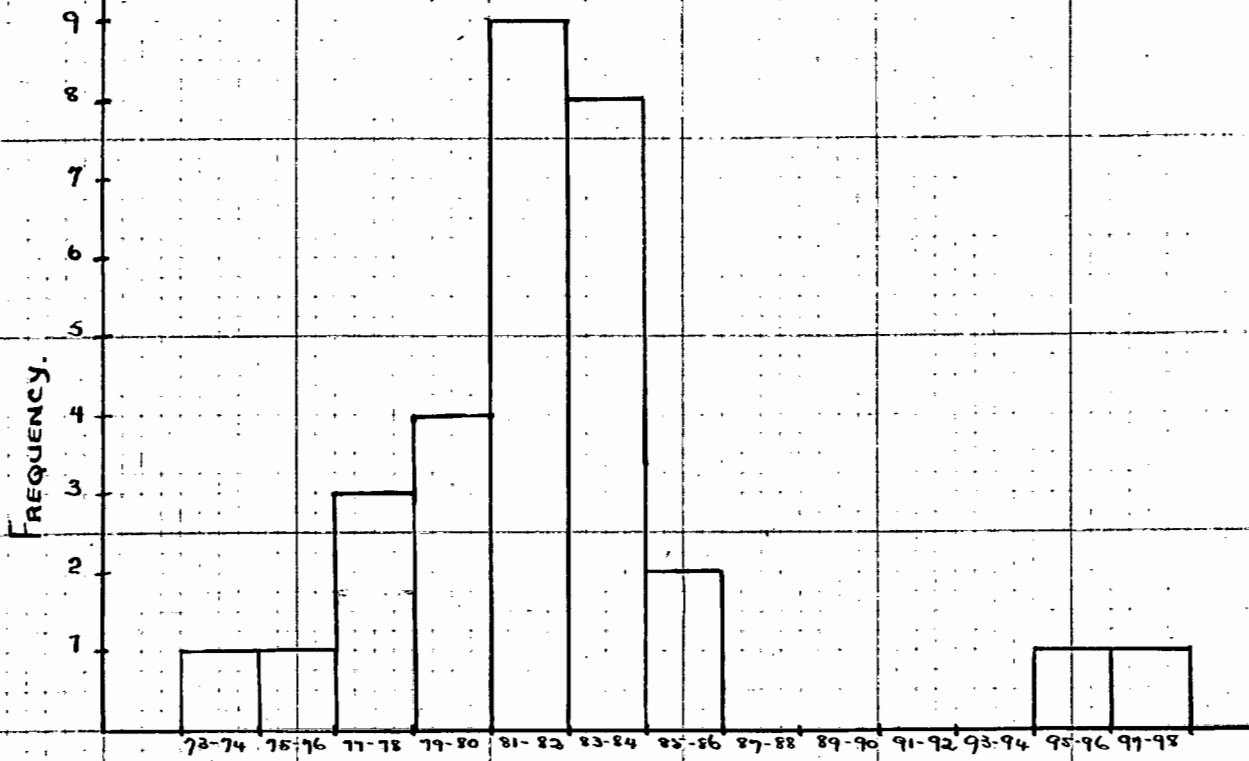


RANGE IN ERRORS.
GRAPH V: Sub B GRADE. DISTRIBUTION OF ERRORS
 ON VOCABULARY TEST (95 WORDS).
 30 CHILDREN (22 GIRLS AND 8 BOYS).

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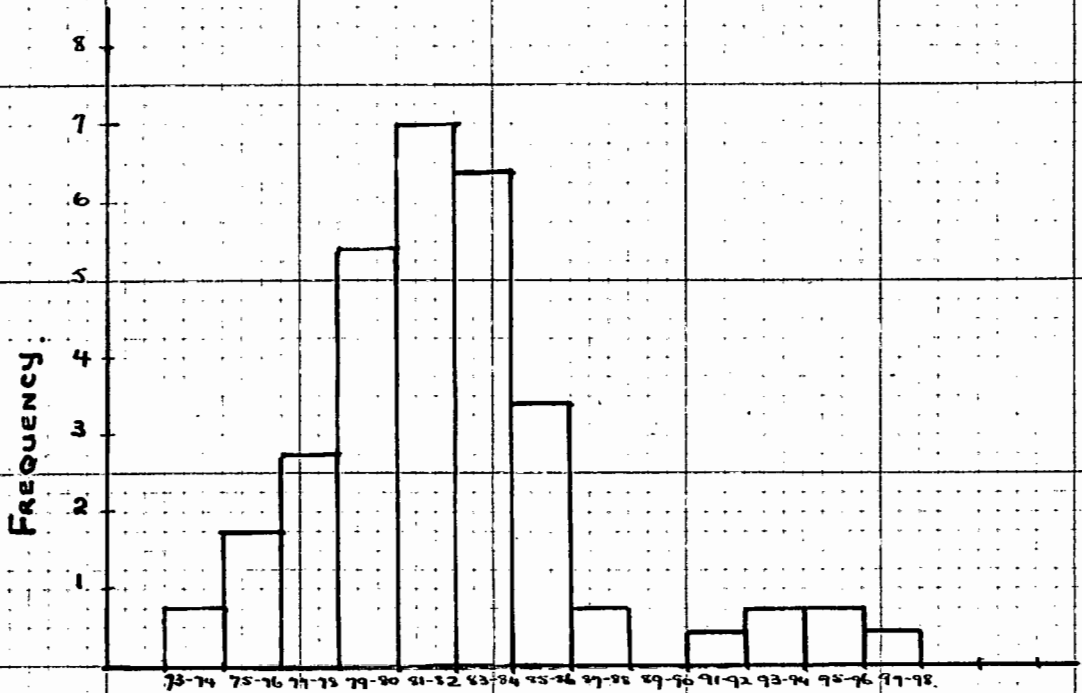


RANGE IN ERRORS.
GRAPH Va: Sub B GRADE. DISTRIBUTION OF ERRORS
 ON VOCABULARY TEST (95 WORDS).
 30 CHILDREN (22 GIRLS AND 8 BOYS).
 (HISTOGRAM AFTER SMOOTHING).

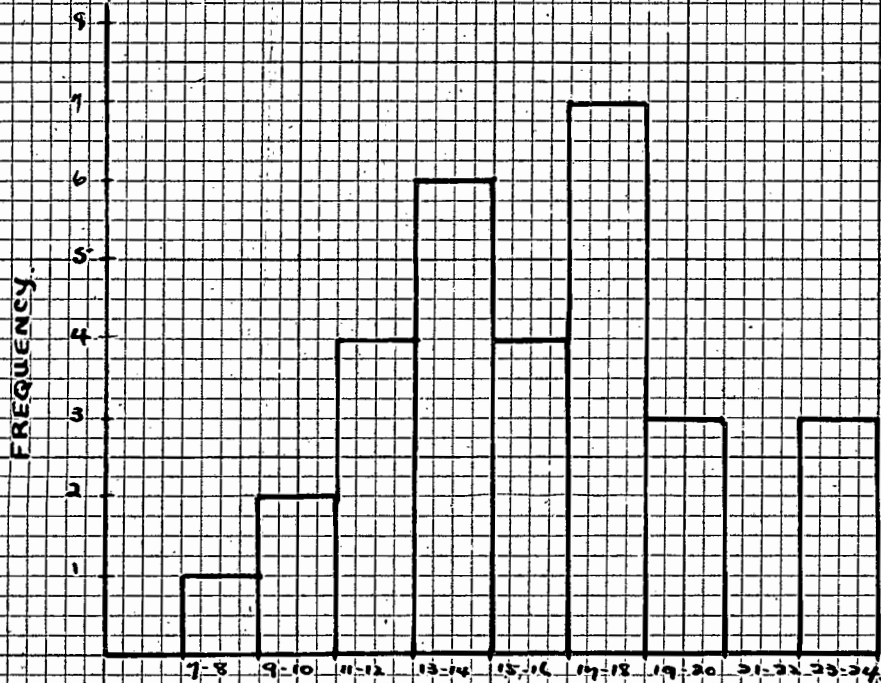


AGE IN MONTHS.
GRAPH V: Sub B GRADE : AGE DISTRIBUTION IN MONTHS.
 30 CHILDREN (22 GIRLS AND 8 BOYS).

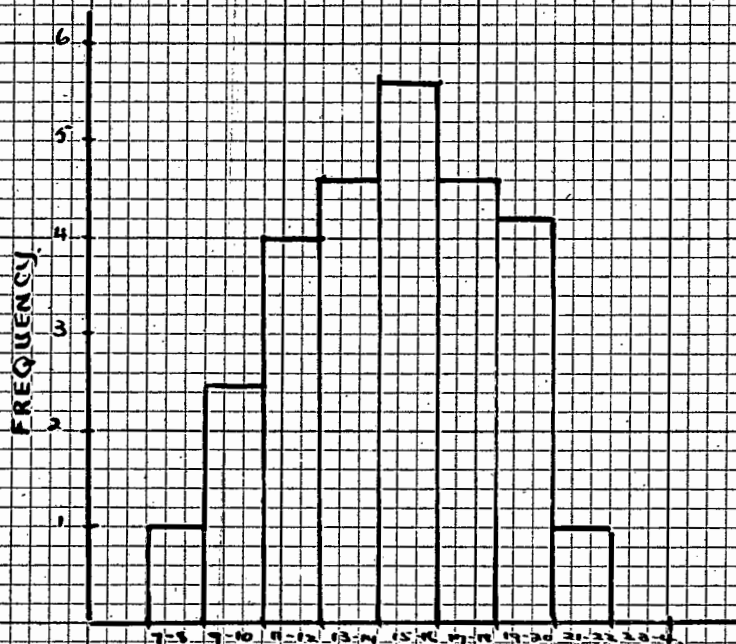
The University of Cape Town



AGE IN MONTHS.
GRAPH VI: Sub B GRADE : AGE DISTRIBUTION IN MONTHS.
 (HISTOGRAM AFTER SMOOTHING)
 30 CHILDREN (22 GIRLS AND 8 BOYS)



RANGE IN ERRORS.
GRAPH VII: Sub B GRADE. DISTRIBUTION OF ERRORS
 ON VOCABULARY TEST (60 WORDS)
 30 CHILDREN (22 GIRLS AND 8 BOYS)



RANGE IN ERRORS.
GRAPH VIIa: Sub B GRADE. DISTRIBUTION OF ERRORS.
 ON VOCABULARY TEST (60 WORDS)
 30 CHILDREN (22 GIRLS AND 8 BOYS)
 (HISTOGRAM AFTER SMOOTHING)

The Statistical calculation of the Mean and the S.D. of the ages of the Subjects (Boys and Girls)

Class range in age	=	93 - 98 months.
A.M. Age	=	82.166 months
S.D.	=	4.67 months
P.E. of S.D.	=	.406
P.E. of M	=	.575

In connection with the above see graphic representation of the frequency distribution of the number of errors obtained in the test by the subjects, as well as the frequency distribution of the age (in months) of the subjects tested, vide graphs V, Va, VI, and VIa.

THE COMPARISON OF THE RESULTS BETWEEN THE SUB B CLASS AND THE TWO STANDARD I CLASSES.

In order to compare the results obtained by the Sub B class with the results obtained the two Standard I classes, the experimenter used the results obtained by the subjects of the Sub B class on the first 60 items (i.e. the stimulus words) of the 95 items (stimulus words) applied to the subjects in the test.

STATISTICAL CALCULATIONS OF THE RESULTS OBTAINED.

Sub B Class : Boys and Girls.

Sixty of 95 items used for the Test.

Range in the number of errors in the test of 60 items = 7 - 24

A.M. Errors	=	15.5668
S.D.	=	4.516
P.E. of S.D.	=	.3932
P.E. of M.	=	.556

In connection with the above results, see graphic representation of the frequency distribution of errors obtained by the subjects in the test of 60 items, vide graphs VII and VIIa.

The Statistical calculations of the results of the two Standard I classes and the Sub B class, compared:

The/.....

The Two Standard I
Classes.

Total number of
Children = 61
A.M. number of Errors ob-
tained in the test of 60
items = 12.6638
A.M. Age (boys and girls)
= 100.834 (months)

The Sub B class.

Total number of Children -
30
A.M. number of Errors ob-
tained in the test of 60
items = 15.5668
A.M. Age (boys and girls) =
82.1666.

COMMENTS ON THE COMPARISON OF THE RESULTS OF THE
STANDARD I CLASS WITH THE RESULTS OF THE SUB B
CLASS.

1. The comparison of the results obtained by the Standard I class with the results obtained by the Sub B class clearly indicate that with an increase in age there is a decrease in the number of errors obtained by a subject in the test, on the average.

2. In the Sub B group, it was found that three of the subjects with ages $80\frac{1}{2}$, 82 and $82\frac{1}{2}$ months respectively, had 10, 7 and 10 errors in the test respectively, and in view of the 'norm' for Standard I namely 12.66 (errors), the prestige of these three children would be considered very superior. According to the Principal of the School, the first two children are "slow" and "average" and the third child is "intelligent". Referring to the first two results, either (i) the results obtained may indicate specific language ability, or (ii) that the teacher's opinion of the child's prestige is not always an accurate criterion, a fact which has been proved by psychologists as F.N. Freeman, L.M. Terman and C. Burt.

In this connection A.F. Payne states in his study on "The Organization of Vocational Guidance", that "The teacher's impression should be collected but not accepted as of great importance. It has been proved beyond doubt that teachers are poor judges of intelligence and that the impressions of effort and industriousness are based entirely upon the results accomplished rather than the effort put forth."

3. According to the Principal of the School, this Sub B class is taught by one of the most experienced and best teachers in that school, a fact which may partly have contributed to the high average scores obtained on the test by this particular class, as compared with the average score of the two Standard I classes.

4. The time required for the ninety-five item.

test was 20 - 25 minutes. The younger subjects, that is, the Sub B class, took a longer period of time to complete the test than was taken by the subjects of the Standard I class.

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THE SCALING OF THE TEST ITEMS.

TO DETERMINE THE RELATIVE DIFFICULTY OF THE TEST ITEMS
(i.e. STIMULUS WORDS)

(1) 95 Items i.e. stimulus words of the test were used. These items varied in difficulty from very easy to very difficult and were representative of the field covered by the test.

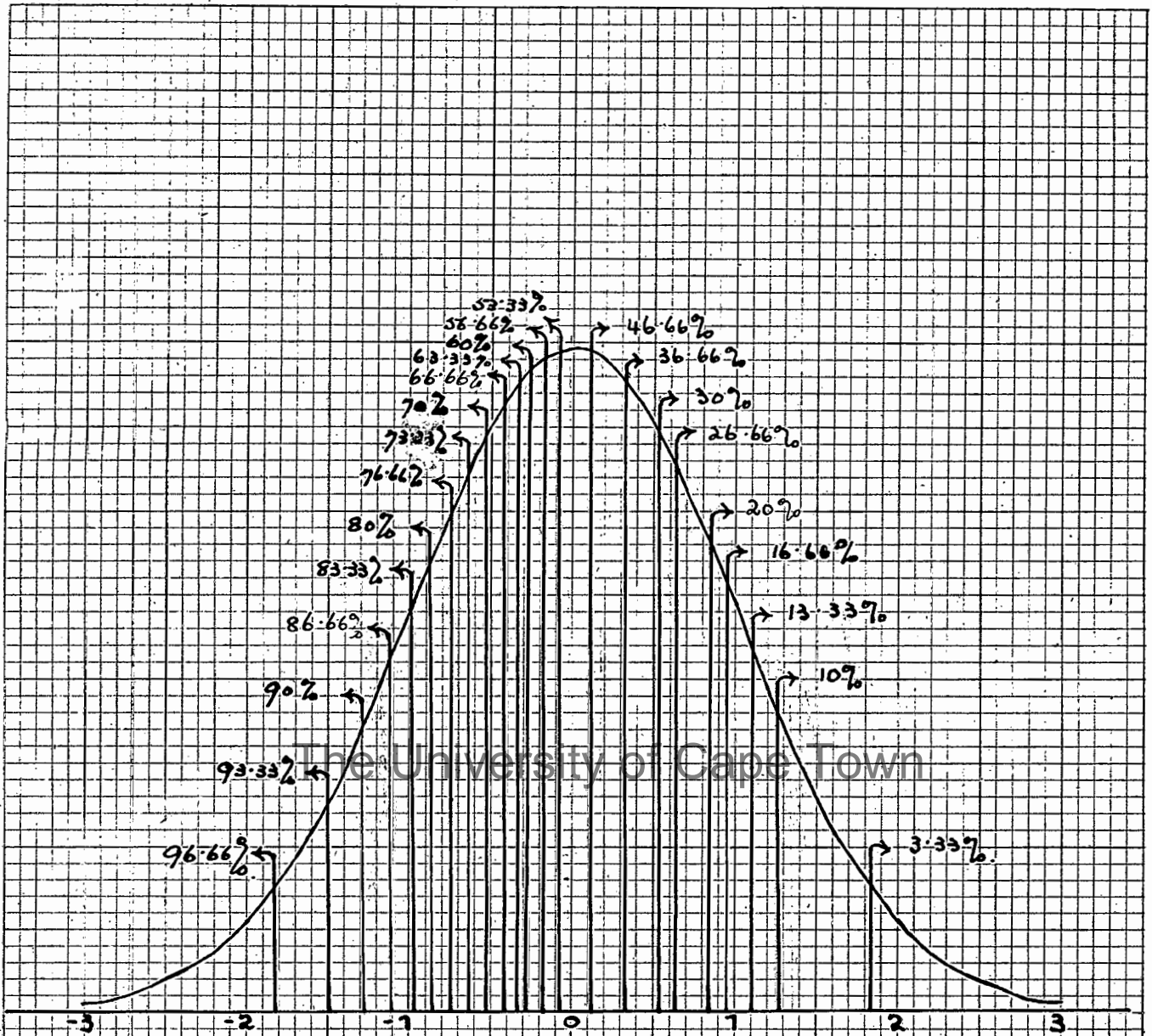
(2) 30 Subjects that is, 8 boys and 22 girls of the Sub B class were then tested individually with the 95 items (Stimulus words) of the test.

(3) The percentage of the group solving each item (stimulus word) correctly was then computed. An item solved by 96.6% of the subjects of the group is obviously less difficult than one solved correctly by 93.3%, while the second item is less difficult than an item solved correctly by 90%. The greater the percentage passing an item, the lower the position of this item in a scale of difficulty.

(4) The percentage solving each item is converted into S.D. distances above or below the mean. The procedure is, e.g., an item solved correctly by 96.66% of the group is 46.66% or 1.83 S.D. below the mean.

The results of the test are then tabulated as follows :-

Items.	% Solving.	Distance from Mean in % terms.	Distance from M. in S.D.
1 Ostrich	100%	50%	- 5.0
2 Leaf			
3 Carrot			
4 Umbrella			
5 Shirt			
6 Corkscrew			
7 Drinking			
8 Yacht			
9 Sweeping			
10 Spade			
11 Spider			
12 Handbag			
13 Walking			
14 Elephant			
15 Hammer			
16 Whip			
17 Necklace			
18 Collar			
19 Swinging			
20 Shooting			



GRAPH VIII. THE SCALING OF THE 95 TEST ITEMS

J

In connection with the scaling of the test items (95 words) based on the results obtained by the Sub B class, see the graphic representation of the probability curve (graph VIII).

COMMENTS ON THE SCALING OF THE TEST.

Items (95 Stimulus words):-

As the items were scaled on the results obtained by the Sub B class, the scaling proved that :-

- (1) 27 Of the items were solved by 100% of the subjects.
- (2) The items were not evenly or equally spaced, that is, the items did not rise in an ascending order of difficulty in equal steps of degree of difficulty.
- (3) A child of average age 6 years and 10 months (i.e. the average age of the Sub B class) had difficulty in recognizing items as :- satchel, gable, Pupil (of an eye) cube, leggings, bridle, label, rondavel, infant, tumbler (glass), china (cup and saucer), panel (of a door) crescent, fencing (sport).

The above-stated items ranged from 36.6% to 3.3% in the number of subjects solving them correctly, that is, 36.6% of the subjects solved the items "satchel" and "gable" and 3.3% solved the items "panel", "crescent" and "fencing", (vide the scale of the test items).

4. There were no subjects in the Sub B class who did not obtain any score on the test. In view of this an arbitrary "zero - point" could not at this stage be determined.

Discussion on the Results of the Scaling of the 95 Test Items.

(1) The fact that 27 of the items in the scale were solved by 100% of the subjects, seemed to indicate that these items were too easy for this age group of subjects and that if the scale were to be used exclusively for this age group, some of these 27 items would have to be rejected for more suitable items in a higher degree of difficulty.

(2) The scaling of the test items gave the experimenter an idea of the degree of difficulty of each test item. Of the 27 items, it should be noted that items as "yacht" and "umbrella" were solved by 100% of the subjects. This would not have been the case had the test been applied to a child residing up-country and who had never been to the sea. This then indicates that environment seems to play a prominent part in the type of word acquired by the child. In the case of the item, "yacht", the child/...

child at the coast sees yachts daily and in the case of the item "umbrella", the inclement weather of the Cape Winters necessitates the use of this article in daily life.

(3) 46.6% Of the subjects solved 81 of the 95 items correctly. This may be due to the fact that this class was considered above the average in intelligence, or, that the items of the test as a whole were too easy.

In view of the above facts the experimenter felt that it would be better to apply the scaled items to another Standard I class and to a Sub A class before rejecting or substituting any of the items in the test.

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CHAPTER VI.

IV. THE FOURTH INVESTIGATION.

After the scaling of the 95 test items based on the results of the Sub B class, the experimenter applied the scaled test to another Standard 1 class.

THE TEST.

The test consisted of 95 items (stimulus words) scaled in order of difficulty from the easiest to the most difficult in Standard Deviation distances above and below the Mean.

THE SUBJECTS:

The subjects consisted of 23 children (15 girls and 8 boys) of another Standard 1 class at the Ellerton Primary School, Seapoint.

THE APPLICATION OF THE TEST

The experimenter used the same procedure in applying the test as was adopted in the previous investigations.

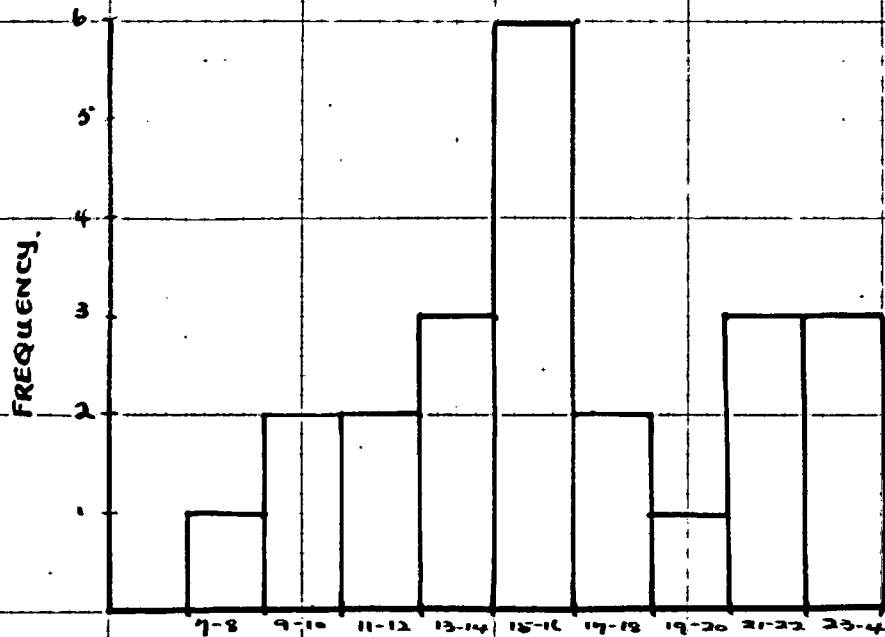
THE RESULTS.

The Statistical Calculations of the Results Obtained in the Test.

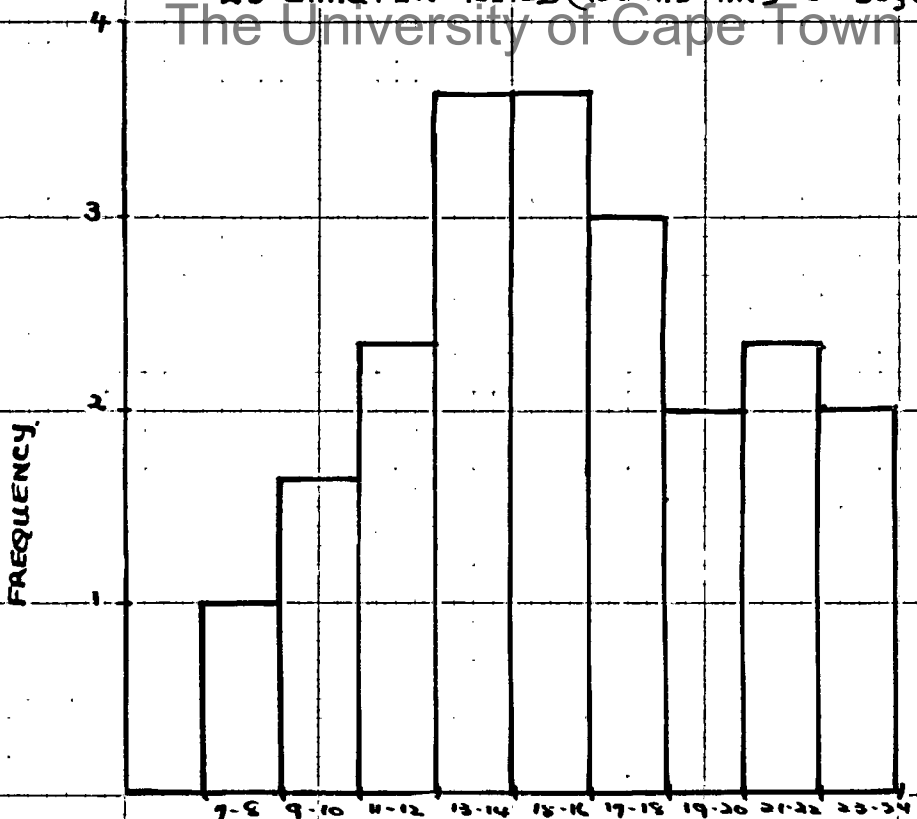
The formulae, used for the calculation of the Arithmetic Mean, the S.D., the P.E. of the S.D. and the P.E. of the M., in the previous investigations, were used by the experimenter in the calculation of the following statistical results:-

The Statistical Calculations of the Mean and the S.D. of the Number of Errors obtained in the Test by the Subjects:

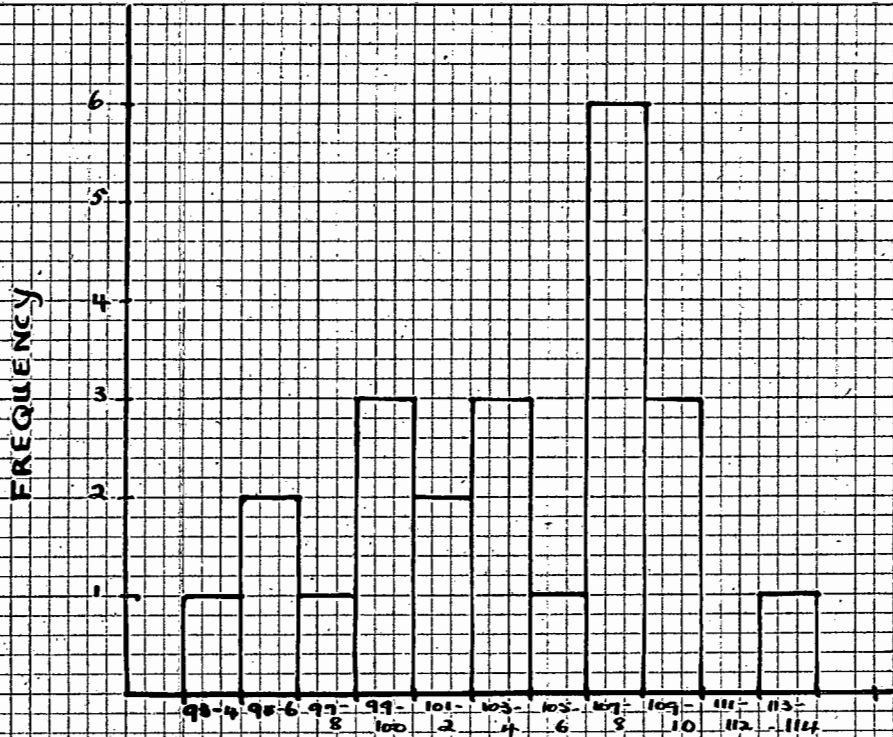
Class Range in Errors	=	7 - 24.
A.M. Errors	=	16.1956.
S.D.	=	4.628.
P.E. of S.D.	=	.459.
P.E. of M.	=	.65



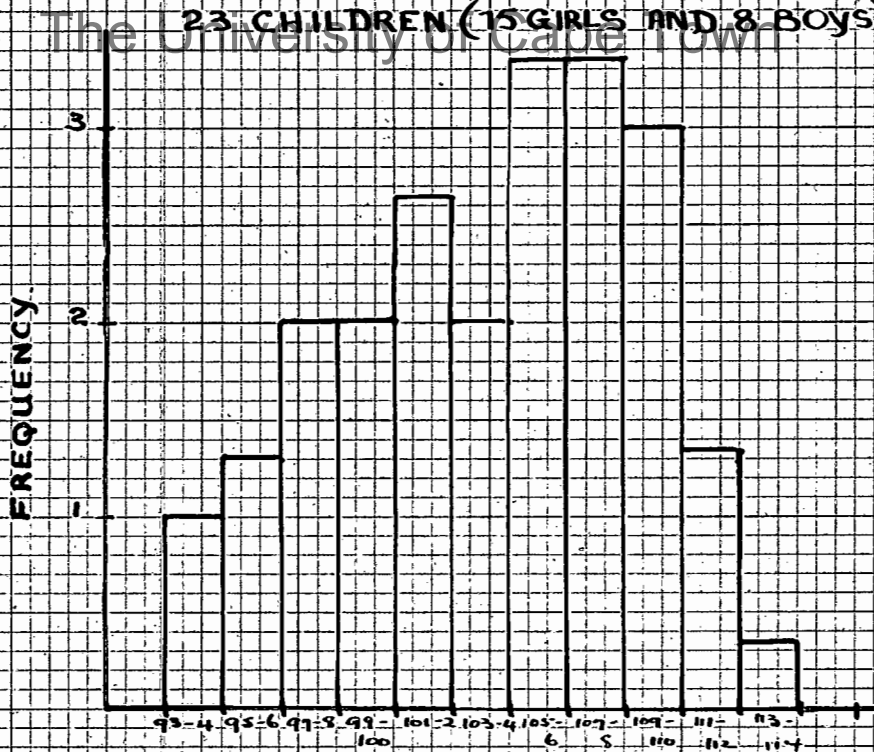
RANGE IN ERRORS.
GRAPH IX : STANDARD 1 CLASS BOYS AND GIRLS (SLIGHTLY BACKWARD).
 DISTRIBUTION OF ERRORS ON VOCABULARY TEST (95 WORDS).
 23 CHILDREN TESTED (15 GIRLS AND 8 BOYS).



RANGE IN ERRORS.
GRAPH IXa : STANDARD 1 CLASS BOYS AND GIRLS (SLIGHTLY BACKWARD).
 DISTRIBUTION OF ERRORS ON VOCABULARY TEST (95 WORDS).
 23 CHILDREN TESTED (15 GIRLS AND 8 BOYS).
 (HISTOGRAM AFTER SMOOTHING).



AGE IN MONTHS
GRAPH X: STANDARD 1 class (slightly backward)
 AGE DISTRIBUTION IN MONTHS
 23 CHILDREN (15 GIRLS AND 8 BOYS)



AGE IN MONTHS
GRAPH Xa: STANDARD 1 class (slightly backward)
 AGE DISTRIBUTION IN MONTHS
 23 CHILDREN (15 GIRLS AND 8 BOYS)

Subjects who knew the objects represented by the stimulus-words, usually corroborated their result by further comment, for example, a subject was asked by the experimenter to point to the 'infant' (baby), which he did and then said; "My mother always says, "Do not tease the infant"". Here is thus proof that the subject in question continually heard the word 'infant' in the home, instead of the more common word 'baby'.

In connection with the above the following quotation from Curti is of interest :-

"Maggie Smith's results were not in accord with those of some other investigators, Descourdes e. g., in suggesting that social status is not an important factor in influencing size of vocabulary. Descourdes, not eliminating differences of intelligence, had found greater superiority in vocabulary among children of higher social status. H.M. Williams and Mary L. McFarland in making a revision of the Smith test, matched 31 orphanage children in mental age and I.Q. with 31 children in the original Smith study and found that for children at every mental age the vocabulary of the orphanage children was decidedly inferior to that of the Iowa City School children studied by Smith".

3. RACIAL DIFFERENCES.

In the present research it was found by the experimenter through obtaining the case histories of the children, that the subjects consisted of different races, for example, English, Afrikaans, Jewish, Greek, German, Portuguese, etc.

The subjects could all understand English, the language in which the test was applied, but it was found in numerous cases that where the mother-tongue was not English, the subjects' score on the test was usually below that of the average score obtained on the vocabulary test, for example:-

- (a) Subject A: Nationality Afrikaans, Sub A; age 82.5 months, obtained 41 errors in the 95 item test. The average age for this class being 80.9 months and the average number of errors in the test being 22.3.
- (b) Subject B: Nationality Greek, age 83.25 months, Sub A class, obtained 25 errors in the 95 item test; the average age for this class 82.1 months and the average errors obtained by the subjects in the test = 21.5.
- (c) Subject C: Nationality German; age 85 months; Sub/.....

The Statistical Calculation of the Mean and the S.D. of
The Ages of the Subjects.

Class range in age	=	93 - 114	(months).
A.M. age	=	103.761	(months).
S.D.	=	5.256	(months).
P.E. of S.D.	=	.507	
P.E. of M	=	.716	

In connection with the above results see the graphic representation in regard to the frequency distribution of errors obtained by the subjects (Standard I class) in the test, as well as the frequency distribution in age, of the subjects tested, vide graphs IX, IXa, X, and Xa.

A COMPARISON OF THE RESULTS OBTAINED BY THE SUB B CLASS
AND THE THIRD STANDARD I CLASS IN THE 95 ITEM TEST.

The Statistical Calculations of the Sub B Class and the Standard I class compared:-

	<u>Mean Age.</u>	<u>Mean Errors.</u>
Sub B Class	82.166 months	21.5
Standard I	103.76 months	16.19

COMMENTS ON THIS INVESTIGATION.

- (1) According to the Principal of the School, the average standard of work of this Standard I class, is below that of the previous two Standard I classes tested by the experimenter. The average age of this class is 103.76 months, which is slightly above the average age of the previous Standard I classes (i.e. 100.8 months). The average number of errors obtained in the test of 95 scaled items by these subjects was 16.1956 errors. This average could not be compared with the 'norm', namely 12.66 errors obtained by the subjects of the previous Standard I classes, as the latter 'norm' was calculated on 60 unscaled items.
- (2) The comparison of these results with the Sub B class results obtained in 95 items of the test, indicated that :-
 - (a) There is a slight increase in the vocabulary of a child with an increase in the age.
 - (b) There was a difference of 21.6 months in the average age of the two groups and that there was a difference of 5.35 errors between these

two groups. This comparative small increase in vocabulary as compared with the great increase in age of the Standard I class, may be interpreted by the fact that this class is above the average normal age for Standard I while the Sub B class was considered exceptionally bright and hence the small increase in vocabulary.

V. THE FIFTH INVESTIGATION.

To obtain a still better idea of the rate of increase of vocabulary with the rate of increase in age, the experimenter applied the test consisting of 95 scaled items to a still lower age group of subjects than had been previously tested in this research, hence the test was applied to a Sub A class.

THE TEST:

The test consisted of 95 items (stimulus words) of List II, scaled in order of difficulty according to the results obtained by the subjects of the Sub B class on the 95 stimulus word test, vide Chapter V.

THE SUBJECTS:

A total of 18 subjects were tested, that is, 10 girls and 8 boys, of the Sub A class of the Ellerton Primary School, Sea Point.

THE APPLICATION OF THE TEST:

The experimenter used the same procedure in applying the test, as was adopted in the previous investigations.

THE RESULTS:

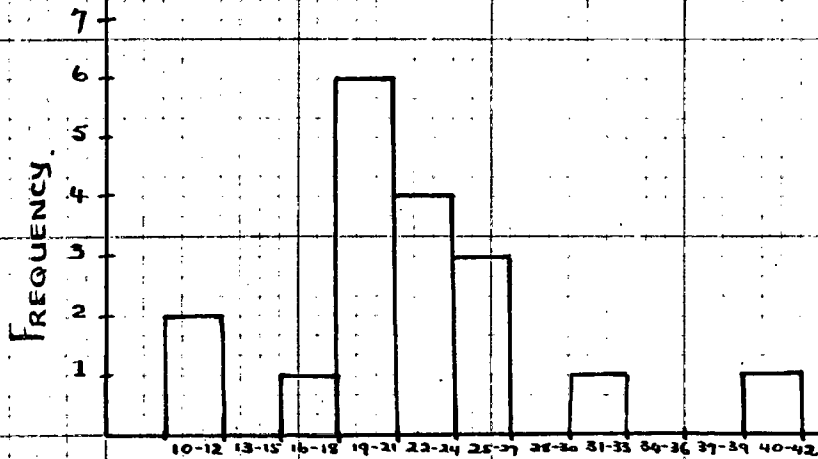
The Statistical Calculations of the Results Obtained on the Test.

The formulae used by the experimenter in the calculation of the A.M. and the S.D. etc., etc., in the previous investigation, was used in the calculation of the following statistical results :-

THE SUB A CLASS: 18 SUBJECTS (BOYS AND GIRLS).

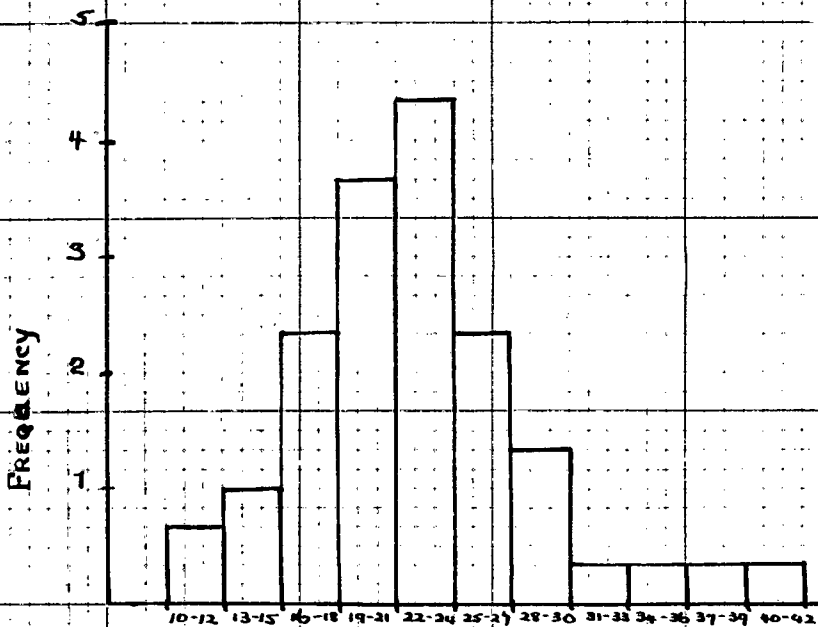
The statistical calculation of the A.M. and the S.D. etc., of the number of errors obtained in the test:-

Class/...

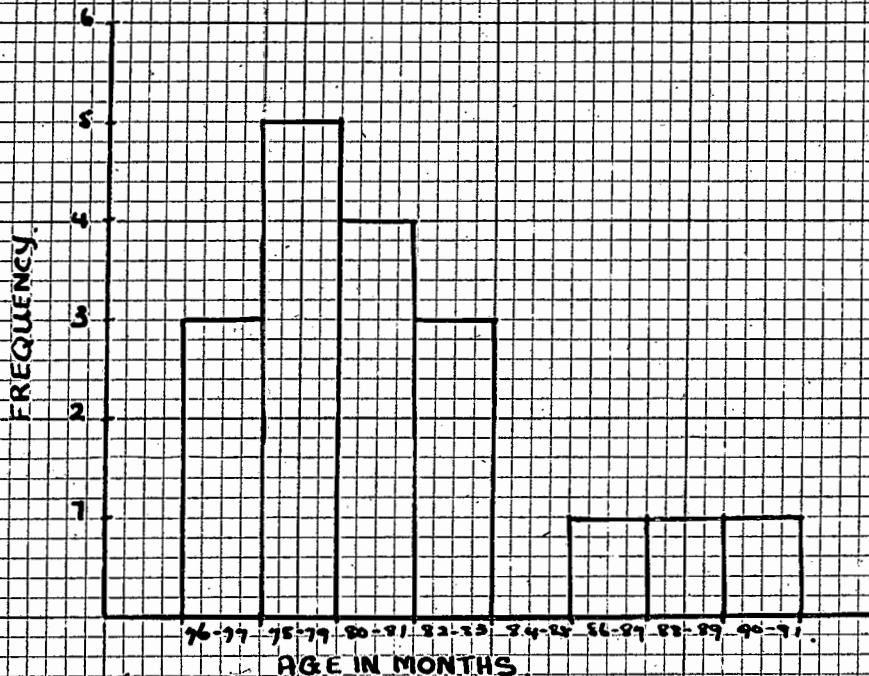


RANGE IN ERRORS.
 GRAPH XI: Sub A GRADE DISTRIBUTION OF ERRORS ON
 VOCABULARY TEST (95 WORDS).
 18 CHILDREN TESTED (10 GIRLS AND 8 BOYS).

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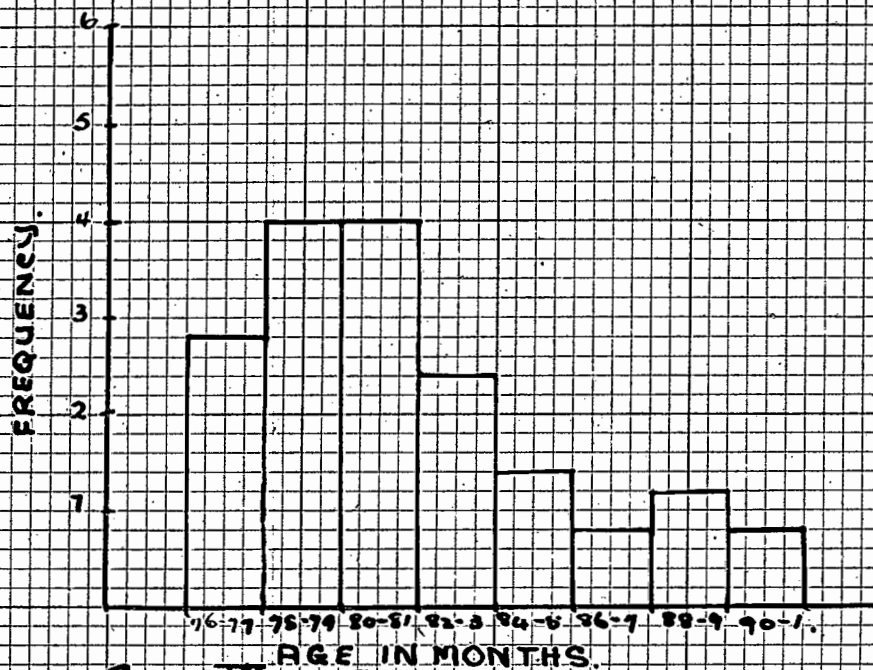


RANGE IN ERRORS.
 GRAPH XII: Sub A GRADE DISTRIBUTION OF ERRORS ON
 VOCABULARY TEST (95 WORDS).
 18 CHILDREN TESTED (10 GIRLS AND 8 BOYS).
 (HISTOGRAM AFTER SMOOTHING)



AGE IN MONTHS.
GRAPH XII: SUB A GRADE: AGE DISTRIBUTION IN MONTHS.
 18 CHILDREN (10 GIRLS AND 8 BOYS).

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AGE IN MONTHS.
GRAPH XIIa: SUB A GRADE: AGE DISTRIBUTION IN MONTHS.
 18 CHILDREN (10 GIRLS AND 8 BOYS).
 (HISTOGRAM AFTER SMOOTHING)

Class range in errors	=	10 - 42
A.M. errors	=	22.331
S.D. errors	=	6.675
P.E. of S.D.	=	.7504
P.E. of M	=	1.011

The Statistical Calculation of the A.M. and the S.D. etc., etc., in age of the subjects tested.

Range in age in months	=	76 - 90
A.M. in months	=	80.944
S.D. in months	=	3.918
P.E. of S.D.	=	.4404
P.E. of M	=	.622

In connection with the above investigation, see graphs XI, XIa, XII, and XIIa in regard to the frequency distribution of the number of errors obtained by the subjects in the test, as well as the frequency distribution of the age of the subjects tested.

COMMENTS ON THE RESULTS OBTAINED IN THIS
INVESTIGATION.

By applying the test to this lower age group of subjects, the experimenter found that there was a further slight increase in errors obtained by the subjects in the test with a decrease in age, on the average, as compared with the results obtained by the Sub B class.

A COMPARISON OF THE RESULTS OBTAINED IN INVESTIGATIONS
III, IV, AND V.

To obtain a better impression of the rate of increase in vocabulary with the rate of increase in age of the subjects, on the 95 item test, the experimenter compared the results of investigations III, IV and V, that is the results obtained on the average by the Sub A class, the Sub B class and the Standard I class on the 95 item test, as follows :-

The Statistical Calculations obtained on the results of the Sub A, the Sub B and the Standard I classes compared :-

Class	Total Number of Subjects.	Mean Number of Errors.	Mean Age in Months.
1. Sub A	18	22.331	80.944
2. Sub B	31	21.5	82.1666
3. Standard I	23	16.1956	103.7610

The Statistical Calculation of the Mean and the S.D./.....

S.D. of the number of errors obtained in the test of 95 scaled items, by the 71 subjects, i.e. the subjects of the Sub A, the Sub B and the Standard I classes, taken as a group:-

Range in the number of errors obtained by the subjects in the test = 7 - 41

A.M.	=	19.9169
S.D.	=	1.6543
P.E. of S.D.	=	.093
P.E. of M	=	.131

THE SECOND SCALING OF THE 95 TEST ITEMS.

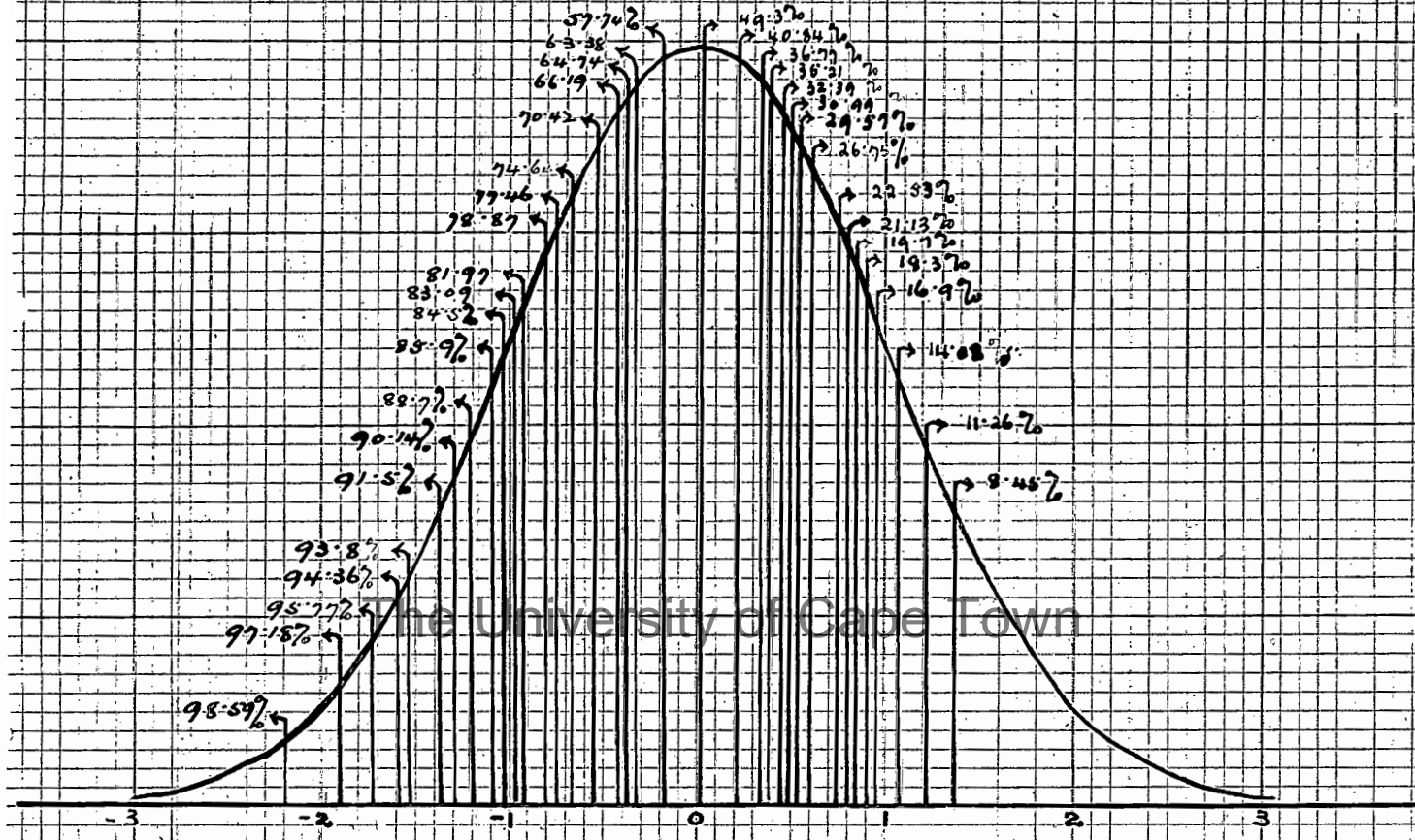
The second scaling of the test items, namely 95 stimulus words, was based on the results obtained by the subjects of the Sub A, the Sub B and the Standard I classes taken as a group. The experimenter scaled the items according to these results in order to obtain an idea as to the following :-

- (i) Which items should be rejected from the test because of their being either too easy or too difficult.
- (ii) Which items should be substituted in the place of those items rejected in order of the degree of difficulty.
- (iii) The degree of difficulty of the 95 items of the test, ranging from the easiest to the most difficult, for subjects ranging in age from 6 years and 8 months (the average age of the Sub A class) to 8 years and 6 months (the average age of the Standard I class), especially in view of the fact that the vocabulary test is intended for subjects between the age of 7 - 8 years.

THE DETERMINING OF THE RELATIVE DIFFICULTY OF THE 95 TEST ITEMS.

1. 95 Items (stimulus words) of the test were used. These items varied in difficulty from very easy to very difficult and were representative of the field covered by the test.
2. 71 Subjects, that is 47 girls and 24 boys of the Sub A, the Sub B and the Standard I classes were tested individually with the 95 items (stimulus words) of the test.
3. The percentage of the group solving each item (stimulus word) correctly, was then computed, vide method used in previous computing of test items.

Item.	% Solving	Distance from Mean in % Terms	Distance from Mean in S.D. Terms.
44 Yacht	93.817%	43.817%	- 1.54
45 Envelope			
46 Penguin			
47 Plaits			
48 Lizard			
49 Pouring			
50 Knot			
51 Safety-pin	91.55%	41.55%	- 1.38
52 Lock			
53 Ear of Corn	90.141%	40.141%	- 1.29
54 Spotted			
55 Pelican	88.733%	38.733%	- 1.21
56 Ring			
57 Parrot			
58 Finger	85.916	35.916	- 1.08
59 Slipper			
60 Trumpet	84.508	34.508	- 1.02
61 Duck	83.098	33.098	- .96
62 Buckle			
63 Dunce Cap			
64 Fist			
65 Elbow	81.9719	31.9719	- .91
66 pleata			
67 Stool	78.874	28.874	- .80
68 Sign-post			
69 Peacock	77.465	27.465	- .75
70 Arrow			
71 Harp			
72 Screwdriver	74.648	24.648	- .66
73 Time piece	70.423	20.423	- .54
74 Saucepan	66.198	16.198	- .42
75 Pitch-fork	64.789	14.789	- .38
76 Latch-key	63.381	13.381	- .34
77 Shield			
78 Strawberry	57.747	7.747	- .19
79 Bow (violin)			



GRAPH XIII : The Scaling of the 95 TEST ITEMS

Items	% Solving	Distance from Mean in % Terms	Distance from Mean in S.D. Terms.
80 Triangle	49.3	.7	.00
81 Leek	40.84	9.16	.23
82 Gable	36.77	13.77	.35
83 Label	35.212	14.79	.38
84 Bridle	32.395	17.605	.46
85 Cube	30.99	19.01	.50
86 Satchel	29.578	20.422	.54
87 Pupil (eye)	26.76	23.24	.62
88 Leggings (Putties)	22.536	27.464	.75
89 Infant	21.13	28.87	.80
90 Rondavel	19.719	30.281	.85
91 China (Cup and saucer)	18.31	31.69	.90
92 Tumbler	16.902	33.098	.96
93 Panel	14.08	35.69	1.07
94 Fencing (Sport)	11.268	38.732	1.21
95 Crescent	8.45	41.45	1.37

In connection with the above scaling of the 95 test items, see graphic representation, vide graph XIII of the probability curve.

The 95 drawings utilized in the test are represented at the end of the thesis.

RESULTS OF THE SCALING OF THE TEST ITEMS.

As a result of the scaling of the test items according to the results obtained by the subjects in investigations III, IV and V, the experimenter found that :-

1. 21 Items (stimulus words) of 95 items were solved by 100% of the subjects, that is by 71 subjects.
2. The items were not equally spaced, that is, the items did/.....

did not rise in an ascending order of difficulty in equal steps of degree of difficulty.

3. There were no items in the test that were not solved by any of the 71 subjects, that is, an arbitrary "zero point" of ability in the test could not be calculated.

4. In view of (1), (2) and (3) above, some of the items would have to be rejected as they were too easy, and more suitable items in degree of difficulty should be substituted.

The items should be spaced more equally.

RESULTS OF THE COMPARISON OF THE RESULTS OBTAINED BY THE
SUBJECTS OF THE SUB A, SUB B AND THE STANDARD I
CLASSES.

The results of investigations III, IV and V do prove a steady decrease in errors obtained in the test, with an increase in age, or, that there is an increase in scores with an increase in age.

The increase in scores with the increase in age, on the average, is very small in degree, as follows:-

- (a) A difference of .8 errors on the average between the Sub A class (average age 80.9 months) and the Sub B class (average age 82.1 months).
- (b) A difference of 5.4 errors on the average between the Sub B class (average age 82.1 months) and the Standard I class (average age 103.7 months).
- (c) A difference of 6.14 errors on the average, between the Sub A class (average age 80.9 months) and the Standard I class (average age 103.7 months).

Sub B class; 22 errors obtained on the 95 item test. The average age for this class being 82.1 months and the average errors = 21.5.

- (d) Subject D: Nationality Jewish, age 108.75 months Standard I class, obtained 21 errors in 95 item test, the average age of this class being 103.7 months and the average errors being 16.1.

4. OTHER FACTORS.

A. The following interesting study of the case history of a subject tested by the experimenter, revealed that factors other than social status, racial differences or intelligence, may result in retardation in vocabulary in a subject :-

The Case History of Subject E:

Sub A class, age 88 months; obtained 31 errors in the 95 item test. The average age for this class = 80.9 months and the average errors in the 95 item test = 22.3.

The subject is the youngest of three children. Both parents are deaf and dumb. They were not born deaf and dumb but in each case it was due to an accident. A deaf and dumb maid is employed on the premises. An aunt lives with the family and assists the child with a speech defect. The elder two children have no speech defects at all. The subject's progress at school is "slow" according to the Principal.

B. In this research, it was found by the experimenter that when the subject's physical state of health was affected, the results obtained by the subjects concerned, were below the average, for example :-

- (a) Subject E: Age 114 months; Standard I class; obtained 9 errors on the 95 item test. The average age for this Standard I class is 103.7 months and the average errors obtained by the subjects in the test are 16.1.

The subject has spastic paralysis of both legs and feet. In this case retardation at school would thus seem to be due to illness and absence from school. The small number of errors obtained by the subject in the test, as compared with the average errors of the class (16.1), would be due to the fact that this subject is chronologically older than the average subject for this Standard.

According to medical prognosis, the intellect
of/.....

of the subject would be impaired in course of time, according to the results obtained, however, up to the date of testing, this does not seem to be the case.

Subject G: Age 84.25 months; Sub B class; obtained 32 errors on the 95 item test. The average age for this class = 82.1 months and the average errors obtained by the class in the test = 21.5.

The subject is of a nervous, timid, temperament. When a child of two years, he had a terrible fright one evening in regard to a cat on the roof of a house.

The results obtained by this subject would indicate that the subject is either intellectually retarded or that factors other than intellectual are the cause of his apparent retardation in vocabulary, and, in this case, his nervous, timid temperament, which does not readily lend itself to adjustment to a new set of conditions, may have been the cause of the large number of errors obtained by him in the test.

5. PSYCHOLOGICAL FACTORS.

As a result of the present research and as a result of the scaling of the test items in degree of difficulty, the following psychological factors were clearly brought to view :-

- (i) Perceptual development in childhood: Curti says, "Perceptions tend to become more analytical as the child grows older. The perceptions of early childhood which are thus likely to depend upon general patterns or schemas inhering in total situations may be said to be syncretistic i.e. the objective situations touches off natural interpretations according to the child's experience without reference to conflicting details which the child has not yet learned to respond

"By the analysis of wholes, the first development in perception proceeds"

- (ii) "Since there is this development with age from the general to the specific, perceptual growth is marked also by the progress from juxtaposition towards synthesis. Perceptions of young children are likely to be still further distorted by the influence of the personal factor, or, using Piagets' term, his 'egocentrism'."

"The fact that children's perceptions tend to become, as they grow older, increasingly analytical, more logically organized and more impersonal, may be expressed in the statement that with increase in age comes increase in accuracy

(iii) "The child learns to make finer and more accurate discrimination in proportion to the richness of his experience

(iv) Jean Piaget says in his study on "Language and Thought of the Child" that "because intelligence undergoes a gradual process of socialization, it is enabled through the bond established by language between thoughts and words, to make an increasing use of concepts" and further that ; "Between the age of 3 - 7 years, it was discovered in the drawings of children, that a child draws what he sees around him, men, houses, etc. But instead of drawing them as he sees them he reduces them to a fixed schematic type; he draws them as he knows them to be. In this sense his realism is not visual, but intellectual. The child sees only what he knows and what he anticipates....."

(v) Furthermore Piaget states: "Claparede has shown that consciousness of resemblance appears earlier in the child than consciousness of difference."

In the present research it was found that the child could not discriminate between two drawings e.g. one representing a pair of human legs and the other representing a pair of leggings (putties). This latter item ranked high in the scale, only 22.5% of 71 subjects of the Sub A, Sub and Standard I classes, solving it correctly.

(vi) Piaget also states that "the child has difficulty in realizing that a part or a fraction is relative to a whole; these difficulties shew on the verbal plain between 7 - 11 years, whereas on the plain of action they have ceased to exist....."

This statement is corroborated by the present investigation, for example, the subjects ranging in average age from 6 years 8 months to 8 years 6 months, found great difficulty in solving the item "pupil" (of an eye). This item too, ranked high in the scale, 26.7% of 71 subjects solving it correctly.

6. THE SCALING OF THE TEST ITEMS.

In order to obtain a more satisfactory scale of the test items the following factors should be kept in mind:-

- (a) The rate of increase of vocabulary with an increase in age.
- (b) The social status and the environment of the subject.
- (c) That perceptions tend to become more analytical as the child grows older.
- (d) That with increase in age comes increase in accuracy.
- (e) That finer and more accurate discrimination is made by the child in proportion to the richness of his experience.
- (f) That consciousness of resemblance appears earlier in the child than consciousness of difference (Claparède).
- (g) That the child finds difficulty in realizing that a part or a fraction is relative to a whole; these difficulties shew on the verbal plain between 7 - 11 years (Piaget).

Preliminary conclusions on the Research.

The results obtained in the present research indicate that social status, environment, racial differences, physical ill-health and psychological factors seem to effect the results obtained by the subjects in the vocabulary test. The experimenter thus considers:-

- (a) That in view of these findings in regard to the above-mentioned factors, further research would seem to be indicated to substantiate these statements.
- (b) Further research is indicated in regard to obtaining a more satisfactory scale of the test items.

C H A P T E R VIII

THE VALIDITY OF THE VOCABULARY TEST.

In order to obtain an idea as to the validity of the vocabulary test as a means for measuring the intelligence of children between the ages of 7 - 8 years in South Africa, the test results, that is, scores obtained by the subjects on the vocabulary test, were correlated with the scores obtained by the same subjects on the Sleight Non-Verbal Intelligence Test (Standardized).

1. THE SUBJECTS.

- (a) The Sleight Non-verbal Intelligence Test was given to 30 subjects (boys and girls) of a Standard I class. The average age of the subjects = 103.7 months.
- (b) The Vocabulary Test of 95 items (list II) was applied to the same 30 subjects stated in i(a).

The scores obtained by the subjects in each test were then correlated by the experimenter, using the formula for the calculation of the Coefficient of Correlation by the Product - Moment Method.

The Statistical Formula used and the results Obtained.

$$r = \left(\frac{\sum xy}{N} - \sqrt{ix} \sqrt{ly} \right) \frac{1}{\sqrt{xy}} = \underline{.373}$$

$$E = \frac{.6745 (1 - 2)}{\sqrt{N}} = \underline{.133}$$

2. THE SUBJECTS.

- (a) The Sleight Non-Verbal Intelligence Test was given to 61 subjects (boys and girls) of two Standard I classes. The average mean age of these classes, being, 100.8 months.
- (b) The Vocabulary Test consisting of 60 of 95 items (list II), was applied individually to the same subjects stated in 2(a).

The scores obtained in the two different tests were then correlated by the experimenter, using the formula for the Calculation of the Coefficient of Correlation by the Product Moment Method stated in 1(a).

THE RESULTS:

$$= \underline{.3449}$$

$$= \underline{.083}$$

Discussion on the Results Obtained in 1 and 2.

The small positive correlations of .373 and .3449 obtained in both cases, namely 1 and 2, may be due to the fact that the one test is a Vocabulary Test and the other test is a Non-Verbal Intelligence Test, or it may be due to the fact that vocabulary is not a reliable measure of intelligence as so many other factors seem to affect the results obtained in the test.

THE RELIABILITY OF THE TEST.

In order to obtain an estimate of the probable amount by which the scores obtained by the subjects in the Vocabulary Test, varies from the subjects' true scores, the reliability of the Vocabulary Test was determined.

THE SUBJECTS.

The scores of 61 subjects of two Standard I classes, with average mean age of 100.8 months, were obtained.

THE DETERMINATION OF RELIABILITY OF THE VOCABULARY TEST.

The Split-Half method was used by the experimenter in determining the Reliability of the Vocabulary Test, that is, the test results (scores) obtained by the 61 subjects (boys and girls) were divided into two equivalent parts and the correlation of these half-tests was computed.

The Formula Used and the Results Obtained.

$$r = \frac{(\sum xy - \frac{1}{N} \sum x \sum y)}{\sqrt{\sum x^2} \sqrt{\sum y^2}} = \underline{\underline{.026}}$$
$$E = \frac{.6745 (1 - r^2)}{\sqrt{N}} = \underline{\underline{.074}}$$

Comments on the Reliability of the Vocabulary Test.

Due to the exceptionally low correlation obtained on the reliability of the test scores of 61 subjects (Standard I class) the result indicates that vocabulary is not a reliable measure of intelligence. This may be ascribed to the fact that too many factors play a part in determining the extent of the vocabulary of a child.

CHAPTER IX

CONCLUSION.

As a result of this research the experimenter has come to the following conclusions:-

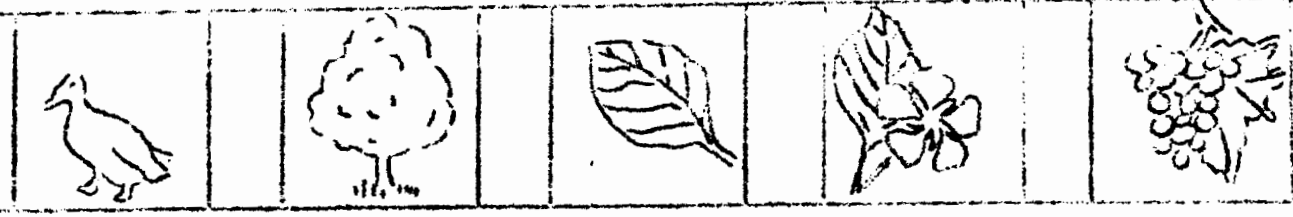
1. That vocabulary is not an accurate means of measuring the intelligence of a child. This is proved by the low correlation with a standardized intelligence test, namely, the Sleight Non-Verbal Intelligence Test, ($r = .344$); as well as the practically negligible correlation obtained in the Reliability of the Vocabulary Test, ($r = .026$).

The investigation has proved that social status, experience, environment, racial differences, physical and neural health obviously affect the results of a subject in the Vocabulary Test, negatively or positively.

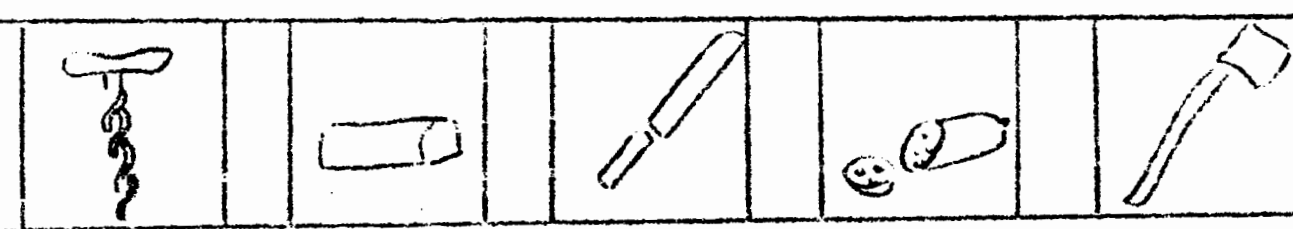
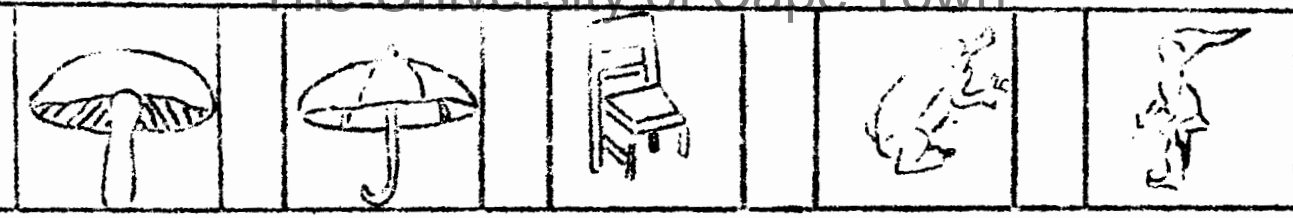
2. In this research a child's vocabulary has been found to be dependent upon learning capacity plus other factors. The correlation of the Vocabulary Test with the Sleight Non-Verbal Intelligence Test, proves that to some extent an intellectual factor is present, ($r = .344$). It would thus seem to be more appropriate to utilize vocabulary as an item in a Scale for measuring Intelligence, than to use it exclusively as a Test for measuring the intelligence of a child.

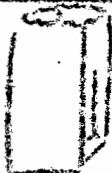
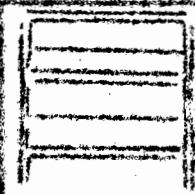
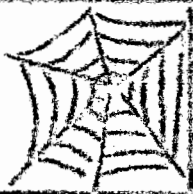
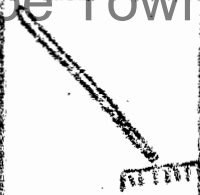
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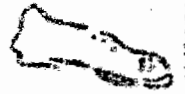
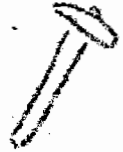
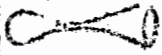


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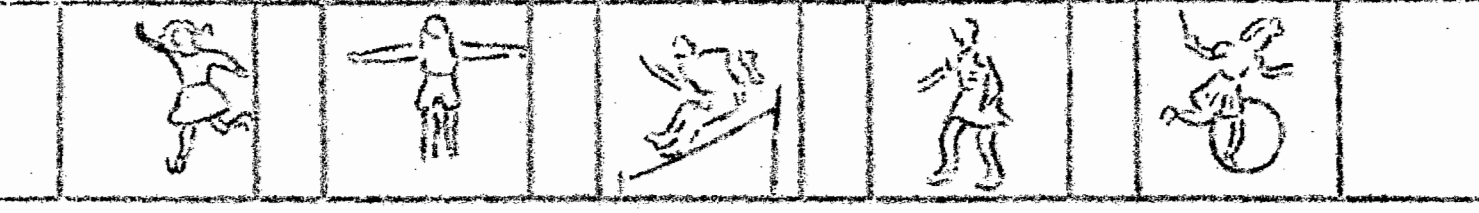


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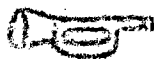
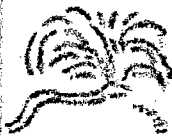


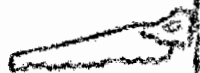
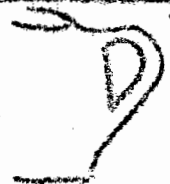
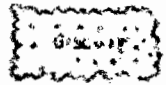
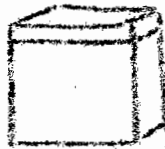
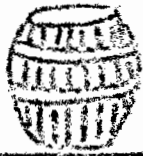
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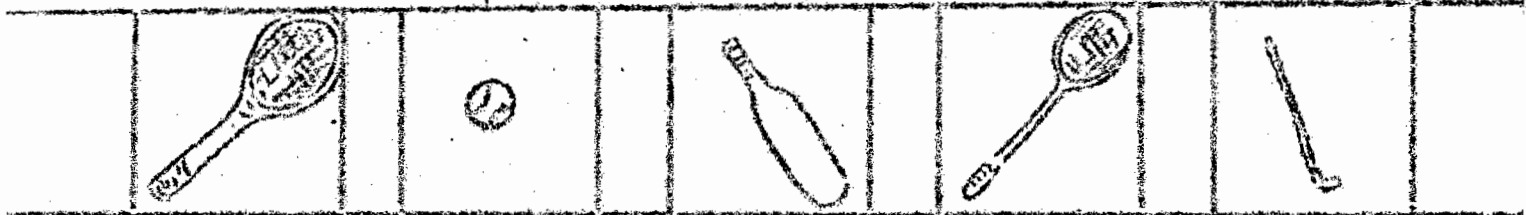
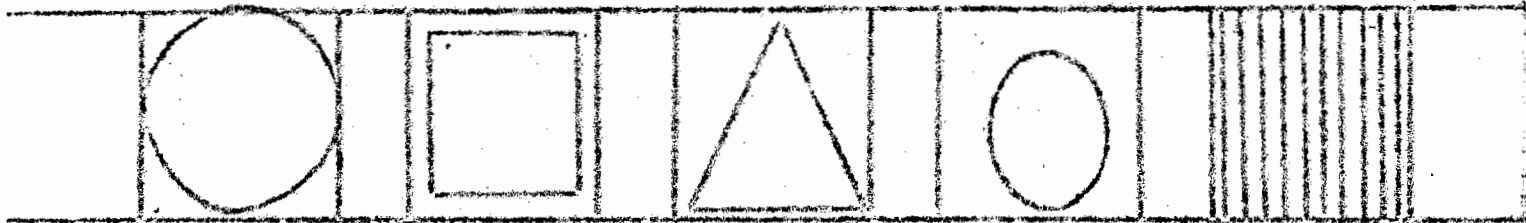


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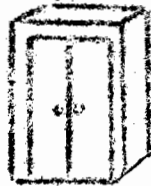
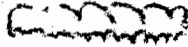


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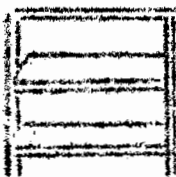
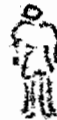
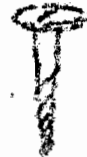
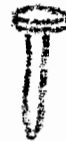
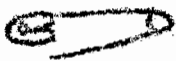


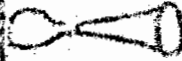
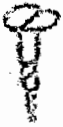
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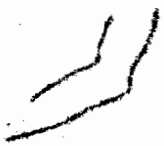
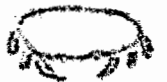


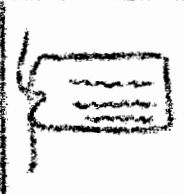
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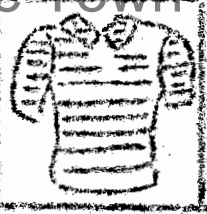


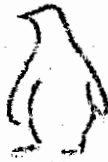
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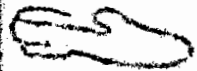
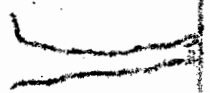


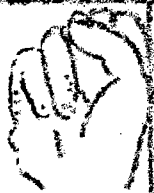
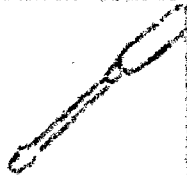
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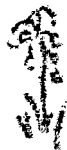
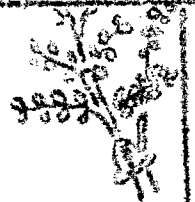
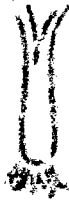
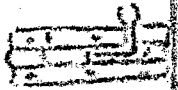


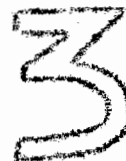
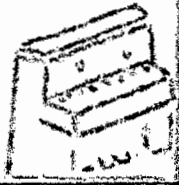


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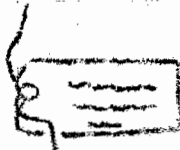
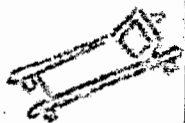


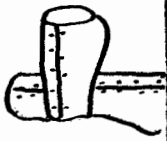
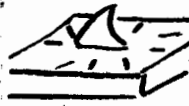
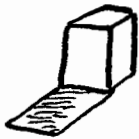
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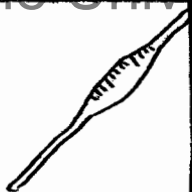


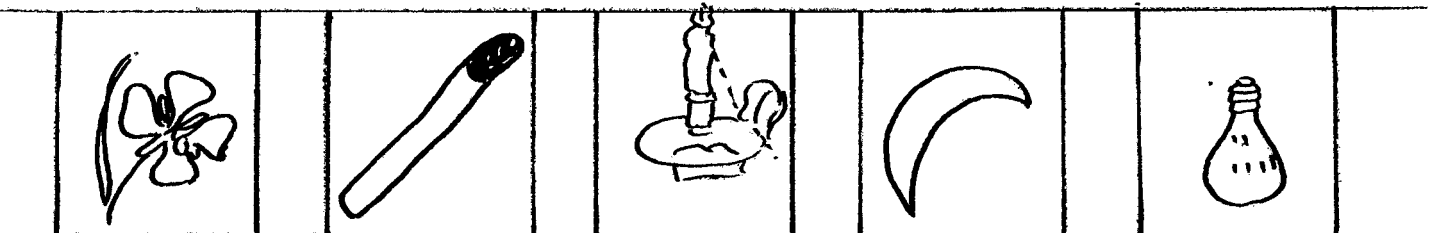
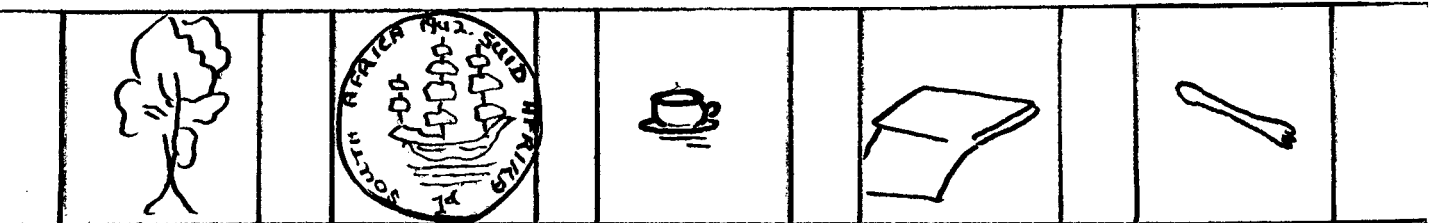
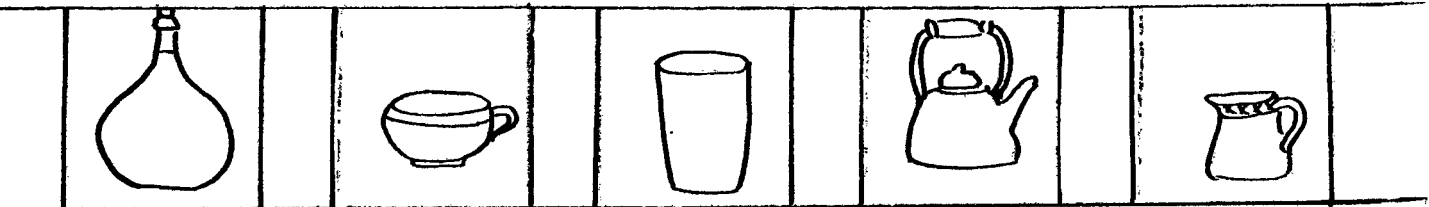
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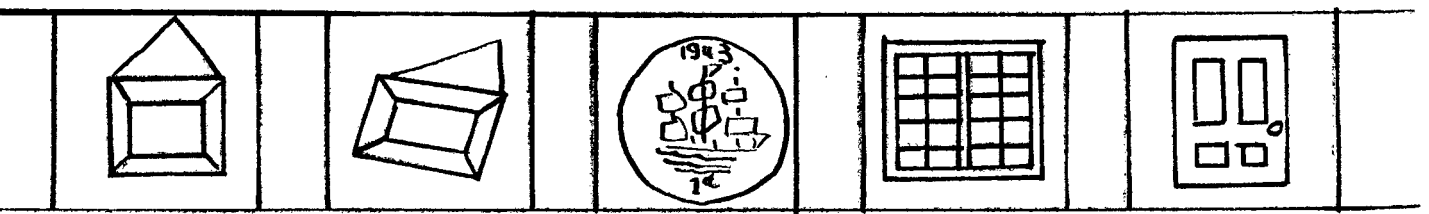


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Sleight Non-verbal Intelligence Test

Prepared by GEORGE F. SLEIGHT, M.A., Ph.D. (Lond.)

My name is

I am a School

(Write 'Boy' or 'Girl')

Date Standard or Form

TEST	SCORE	REMARKS
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Total		

Date of birth Intelligence quotient

Chronological age Mental age

GEORGE G. HARRAP & COMPANY LTD., LONDON, TORONTO, BOMBAY, AND SYDNEY

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GENERAL REPORT

PARENT	NATIONALITY	OCCUPATION
Father		
Mother		<i>(If any)</i>

Type of home.....

General care of the child.....

Physical condition.....

Attendance.....

Age when child commenced school.....

Educational attainment

Reading.....

Arithmetic.....

Handwork.....

Further remarks.....

Note of any irregularity in promotion.....

Conduct and temperament.....

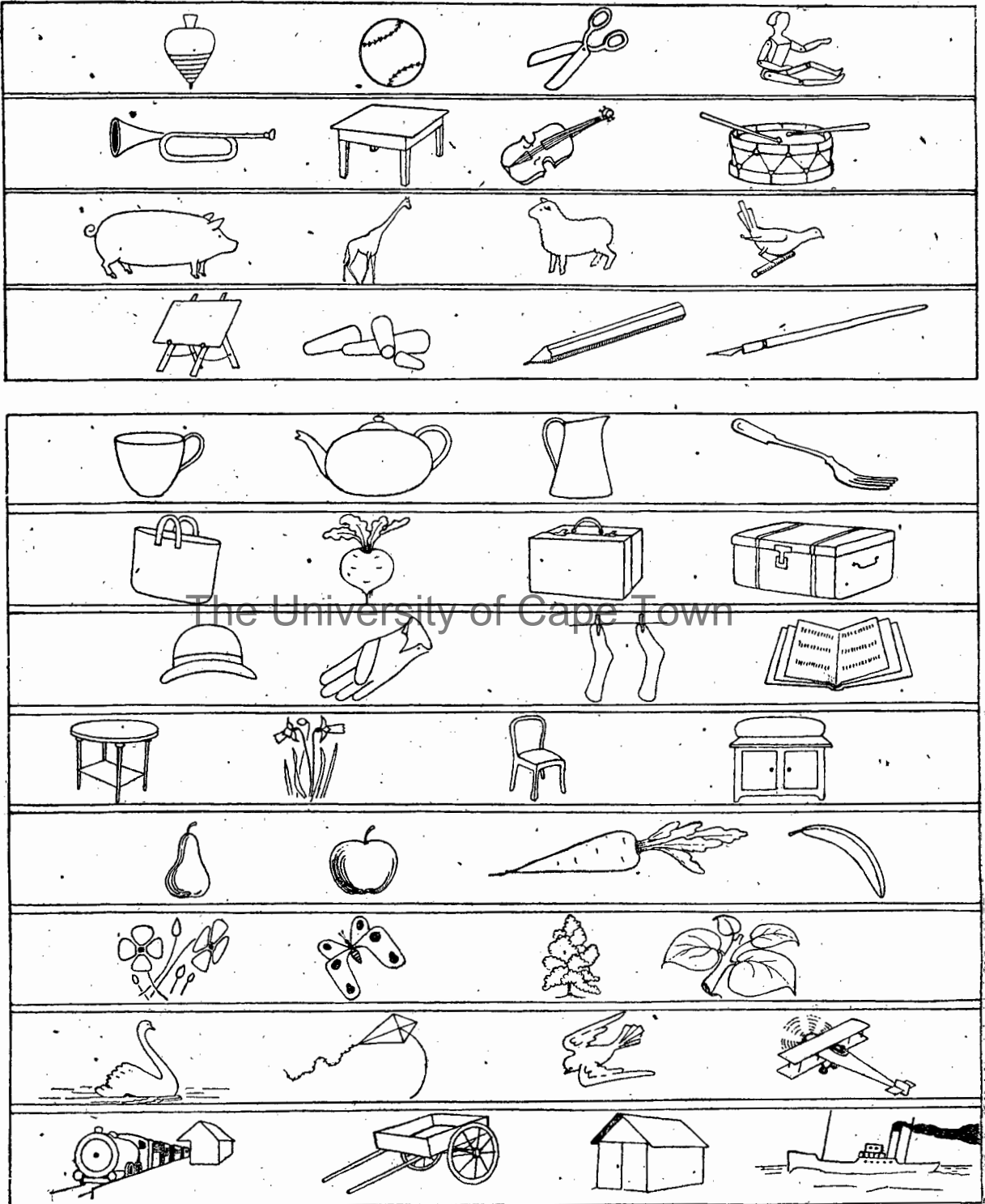
RESULTS OF PREVIOUS MENTAL TESTS

TEST USED	CHRONOLOGICAL AGE WHEN TESTED	MENTAL AGE	INTELLIGENCE QUOTIENT

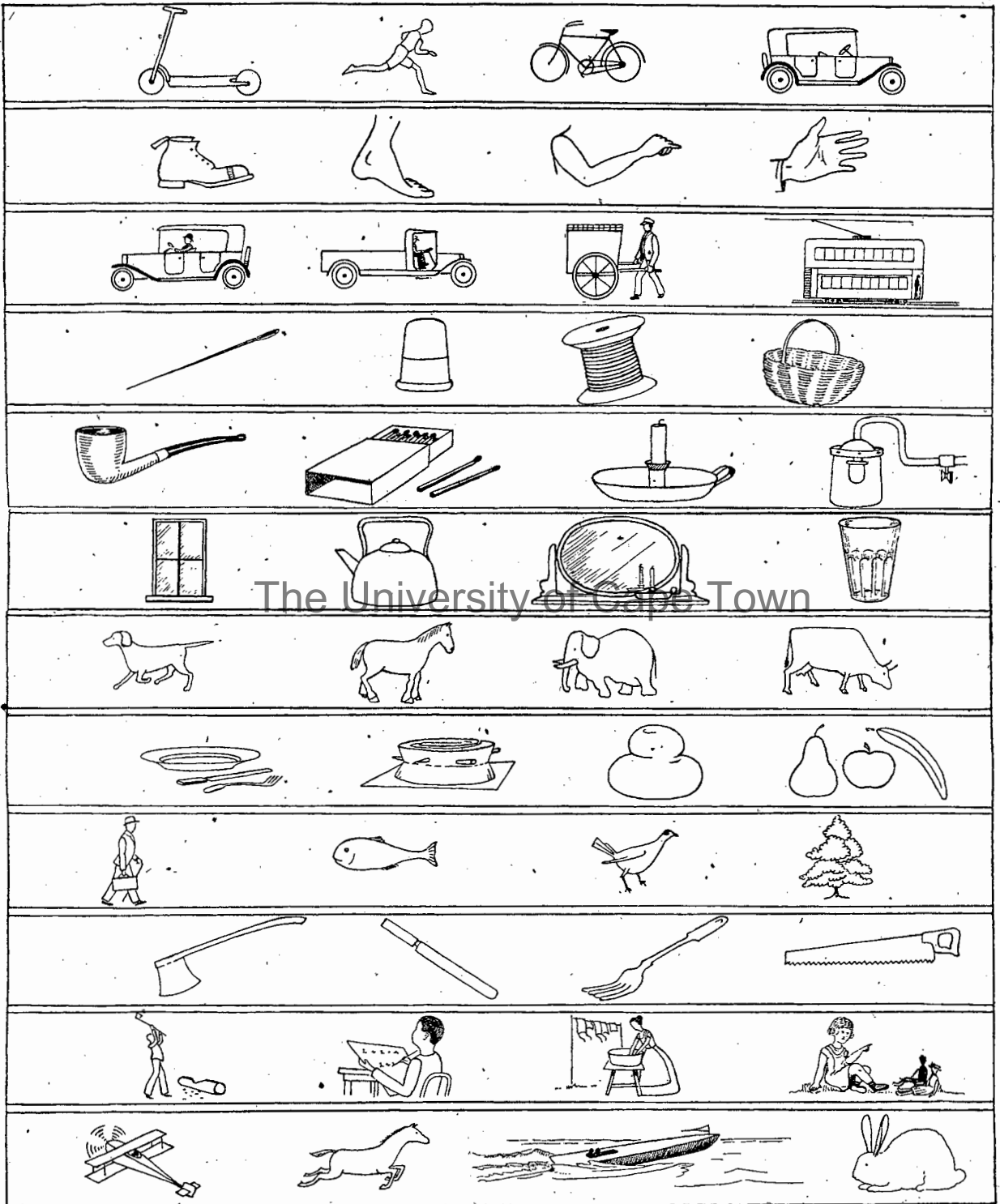
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1	2	3	4	5					
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×	☆	△	□	○	☆	○	△	×	□
☆	□	×	○	△	□	☆	○	△	×
△	○	□	☆	×	△	×	□	☆	○
○	☆	×	□	△	☆	○	△	×	□
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Score.....

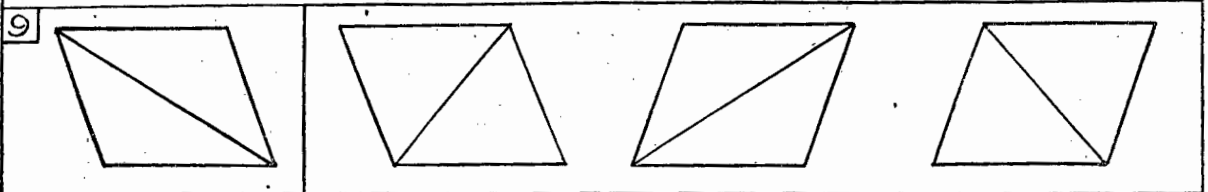
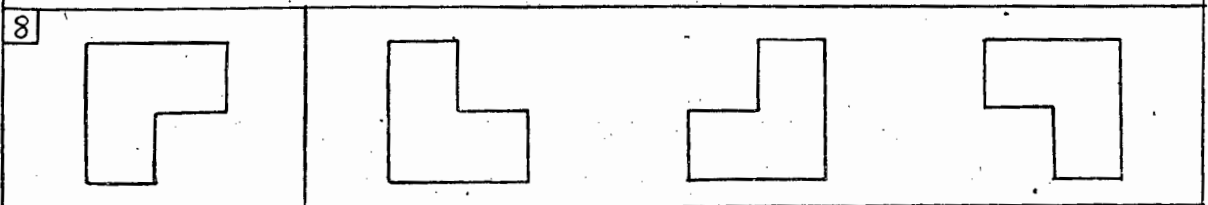
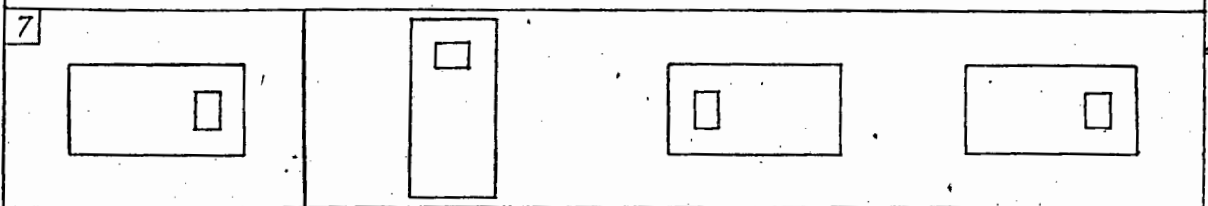
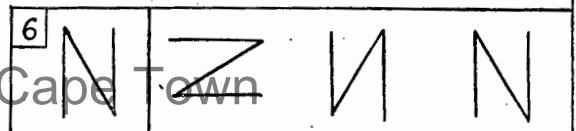
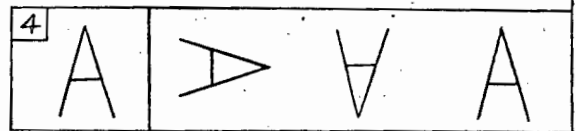
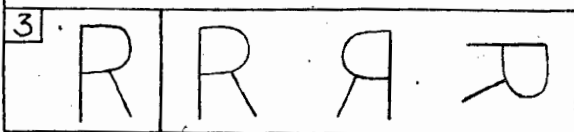
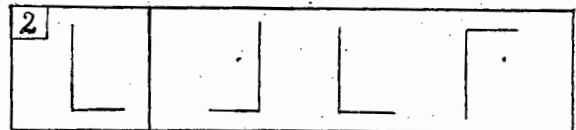
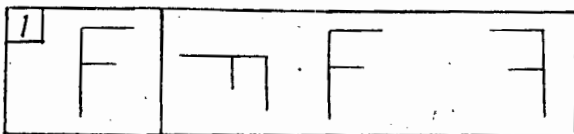
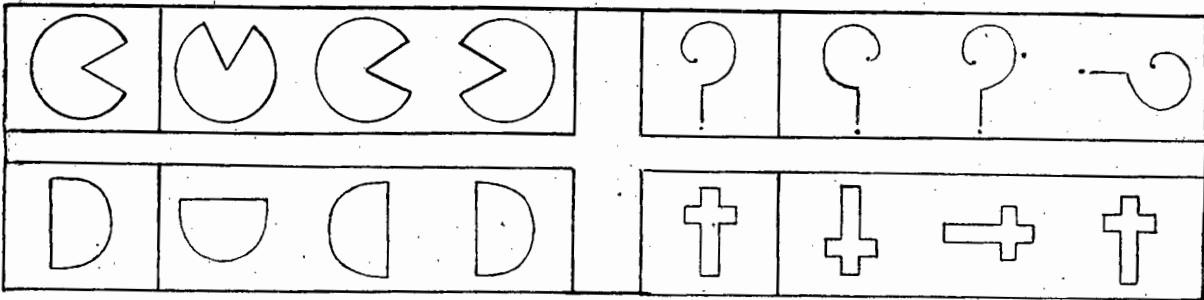


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Score.....



10

CODE TEST

a e i l o p s t w y
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8 1. 8 2 3 3. 6 2 7. 6 7 2 3 3
w e w i l l

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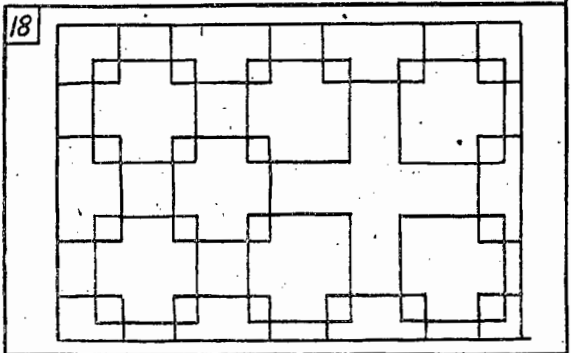
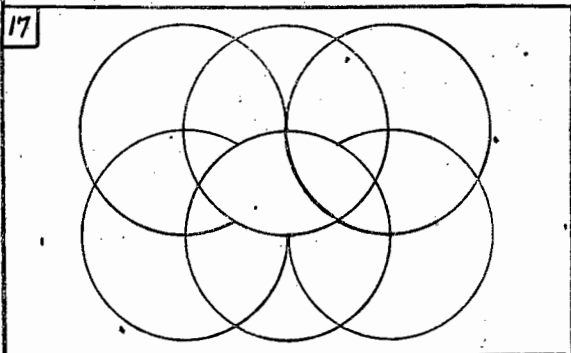
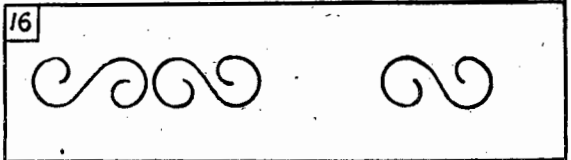
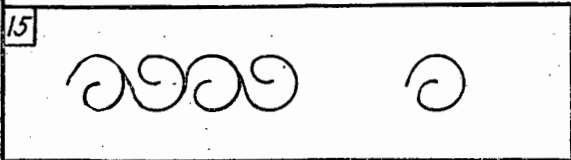
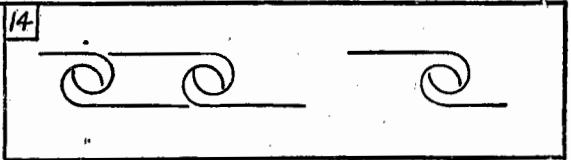
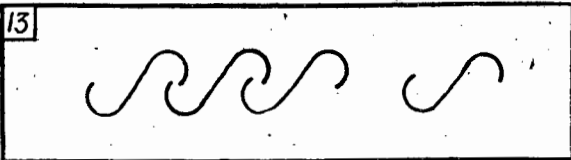
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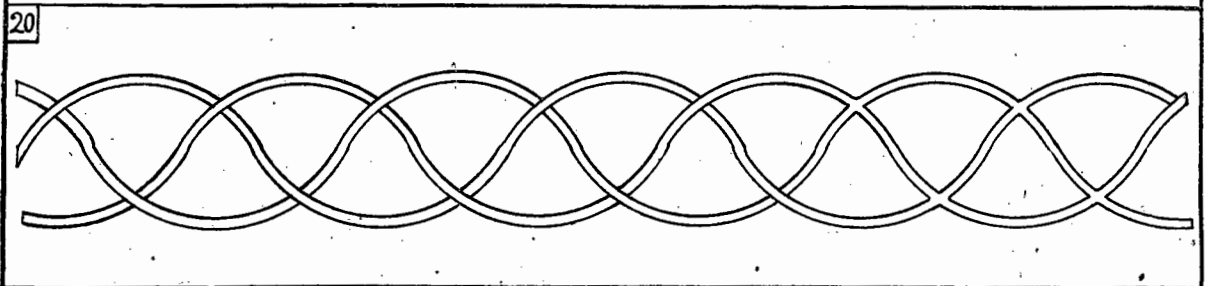
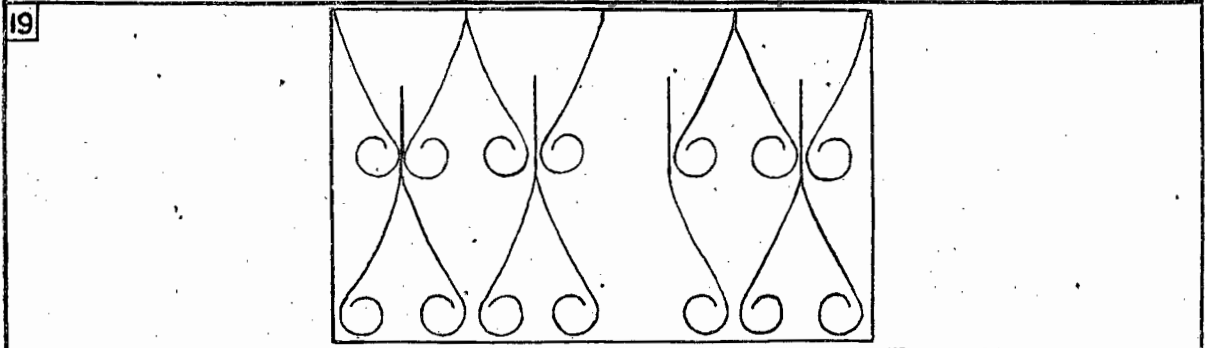
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*First published February 1931
Reprinted: January 1934; February 1936;
November 1936; March 1938; January 1939; May 1940;
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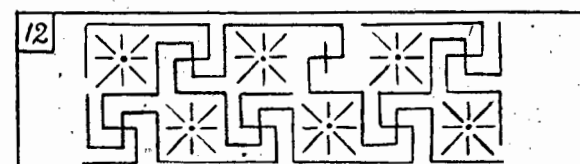
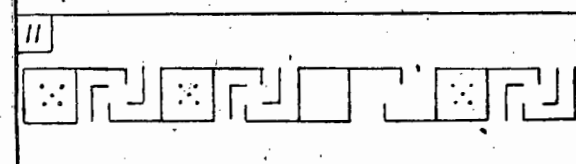
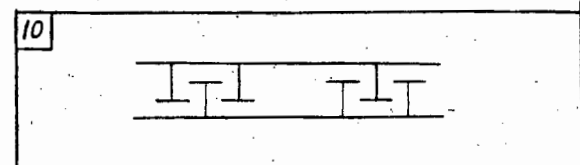
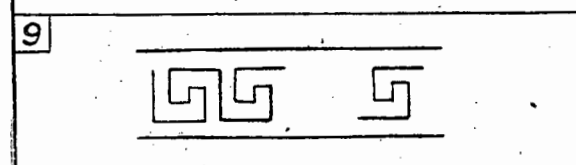
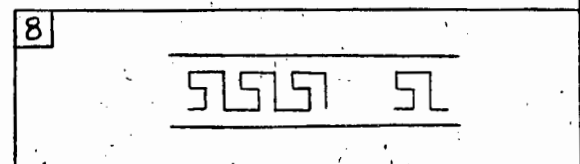
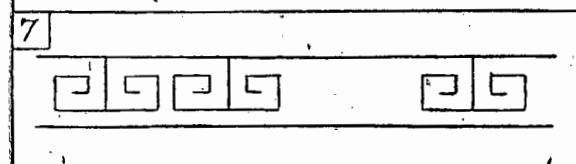
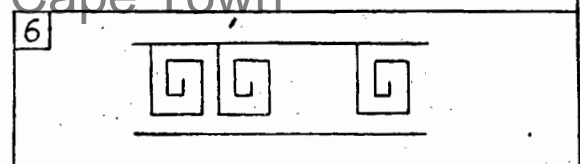
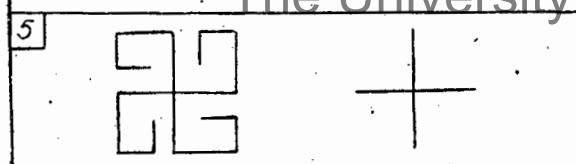
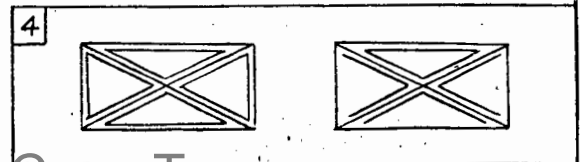
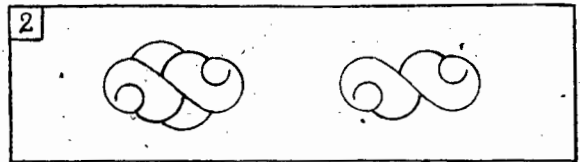
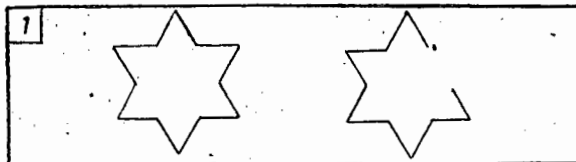
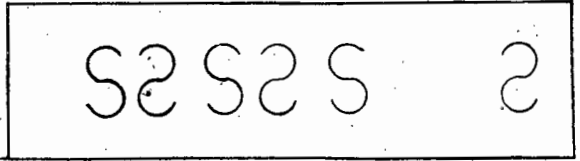
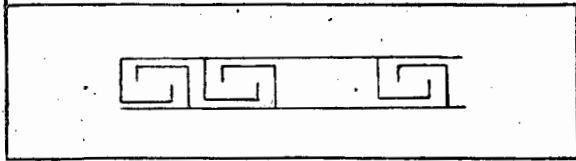
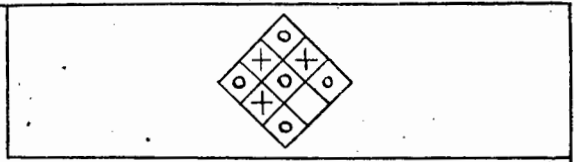
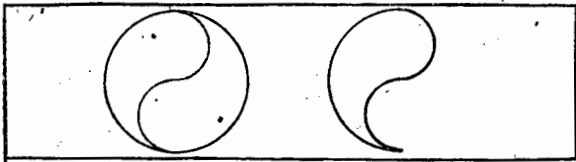
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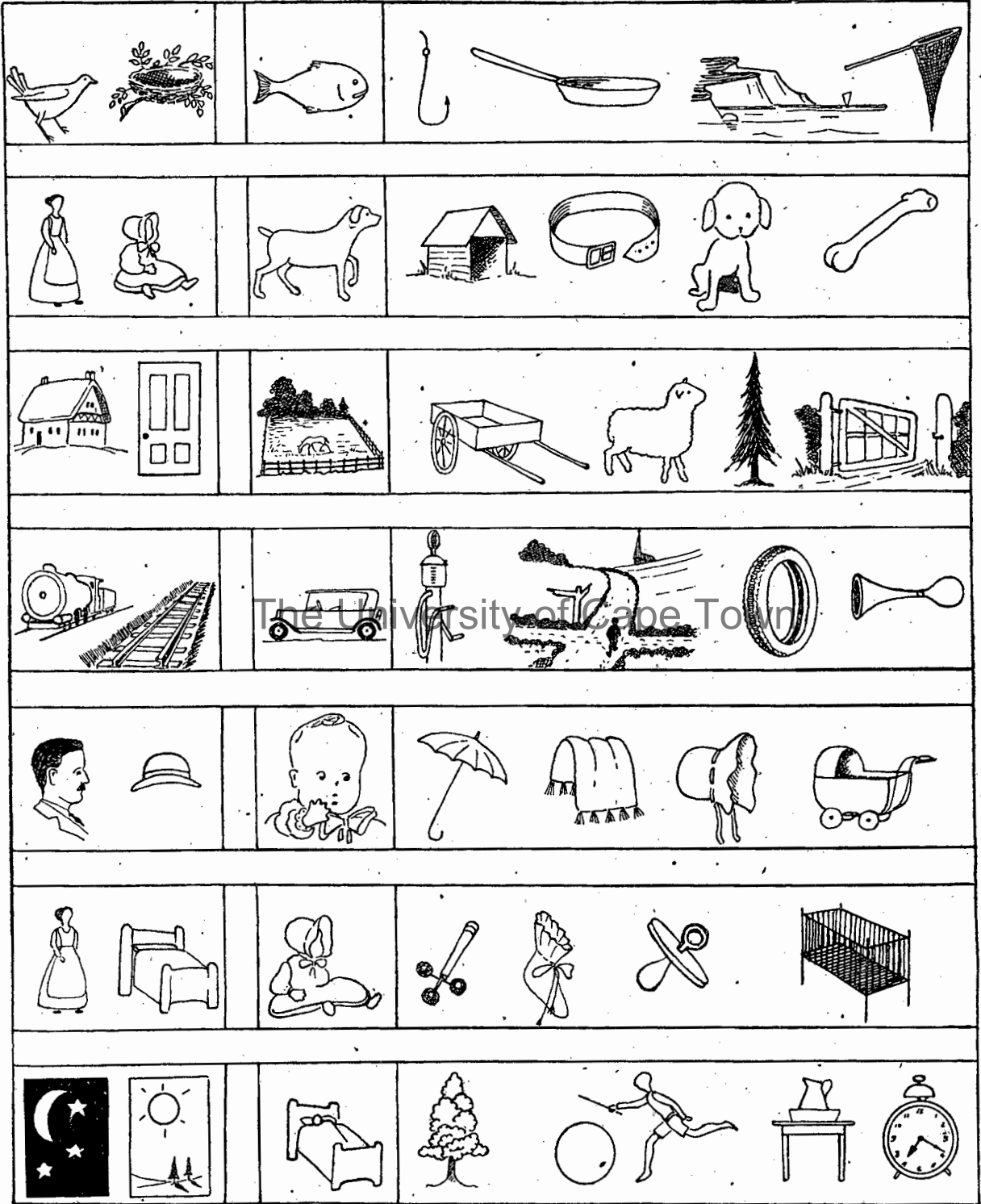
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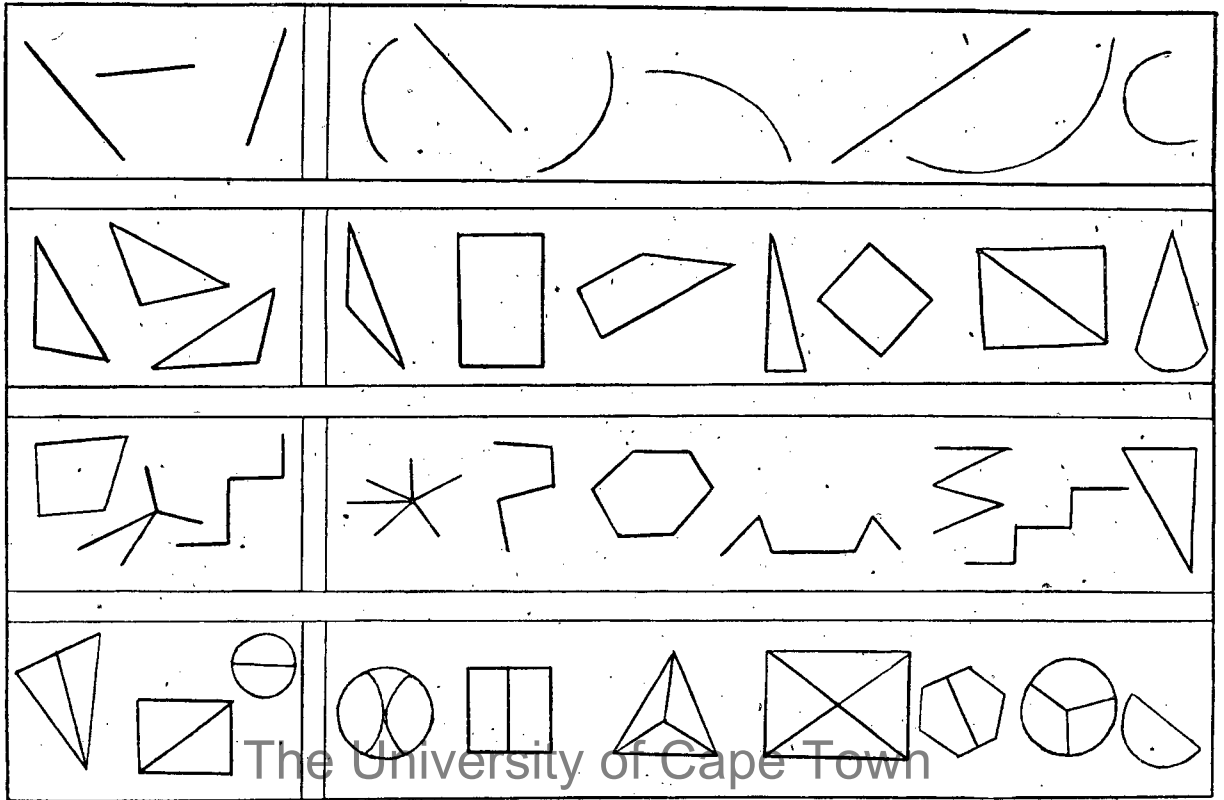
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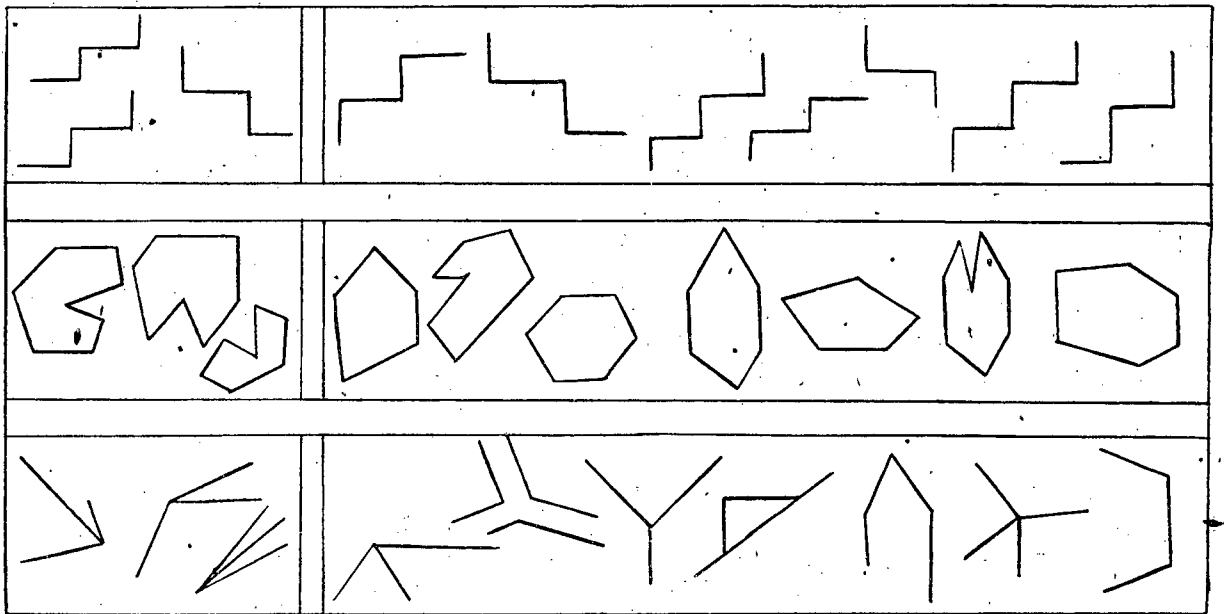
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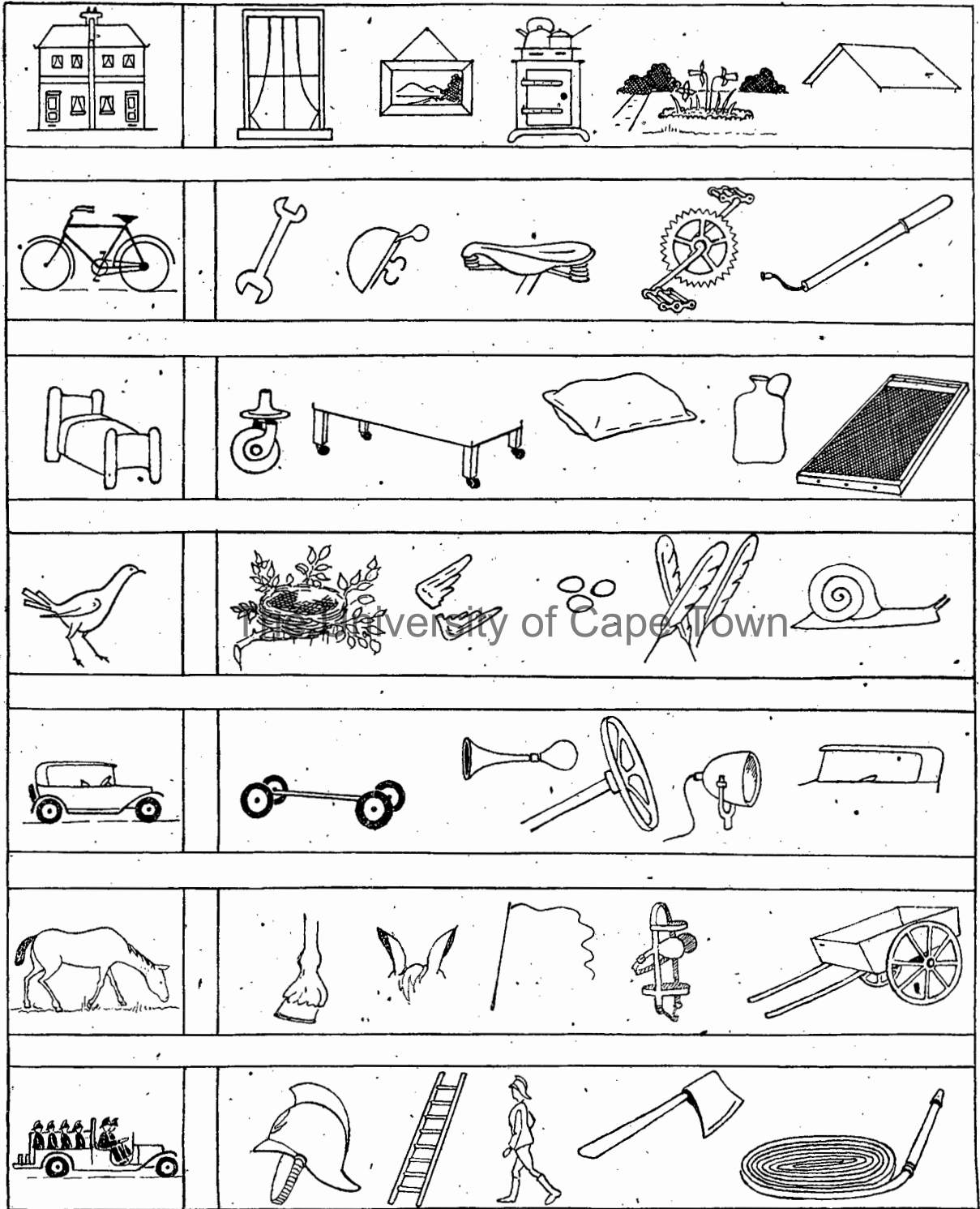


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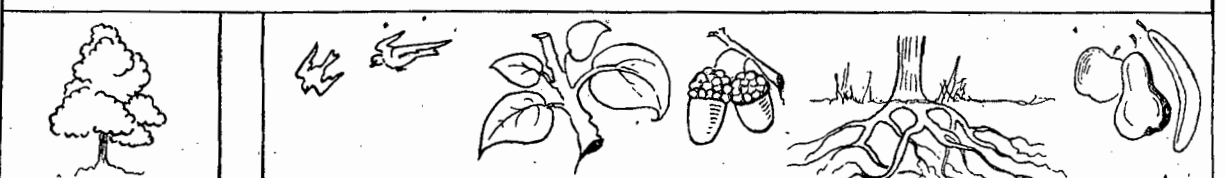
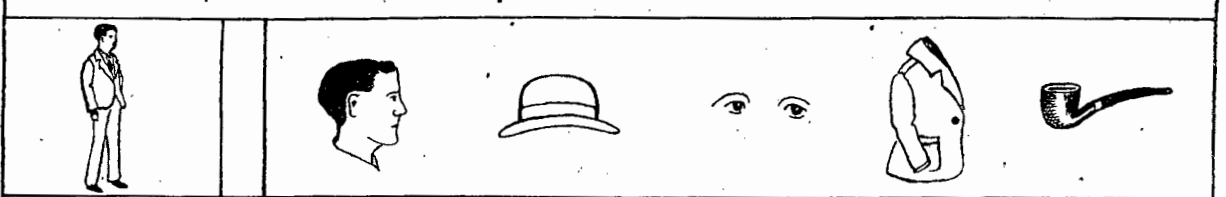
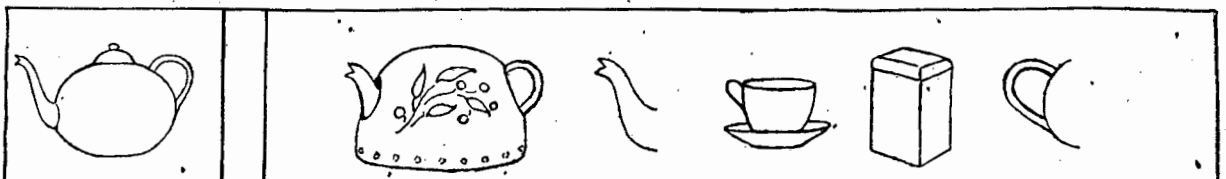
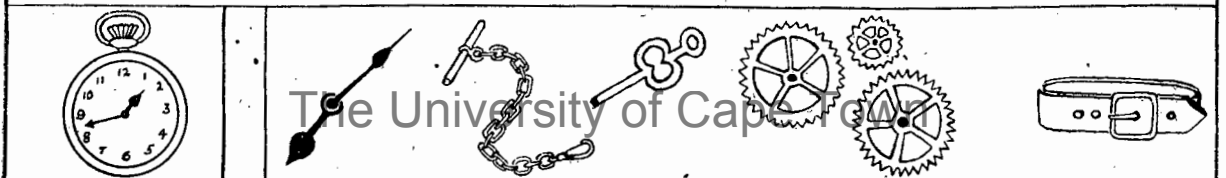
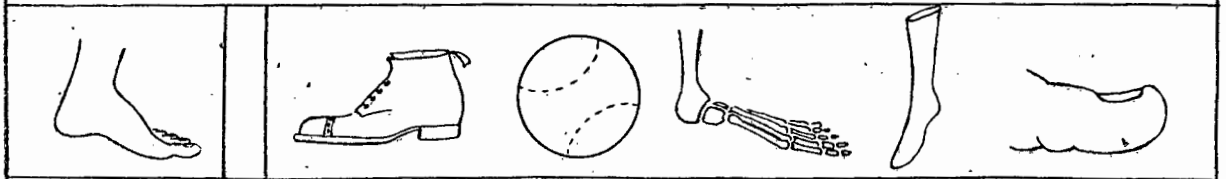
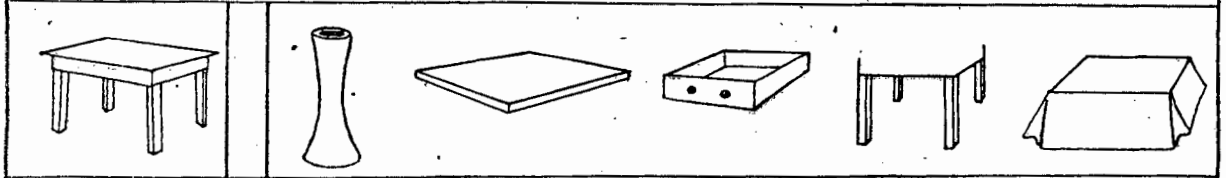
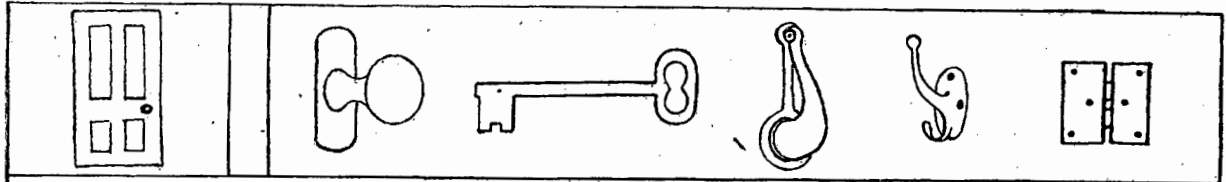


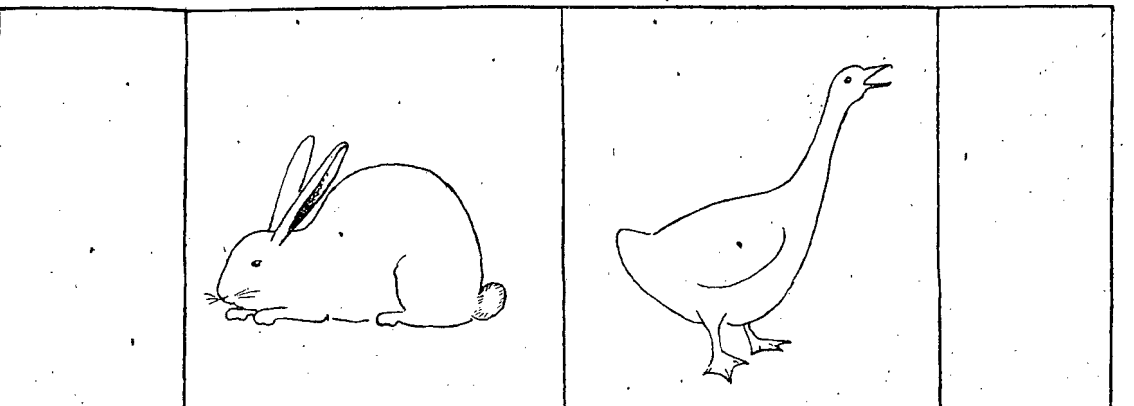
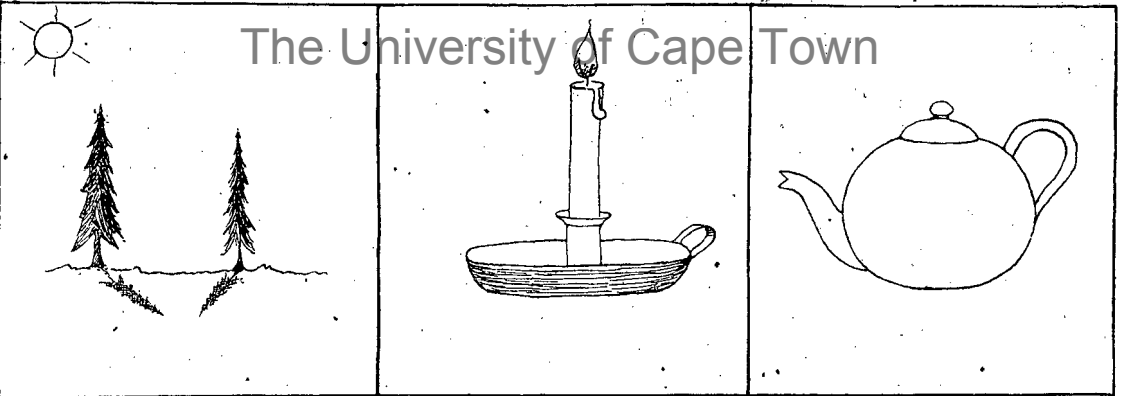
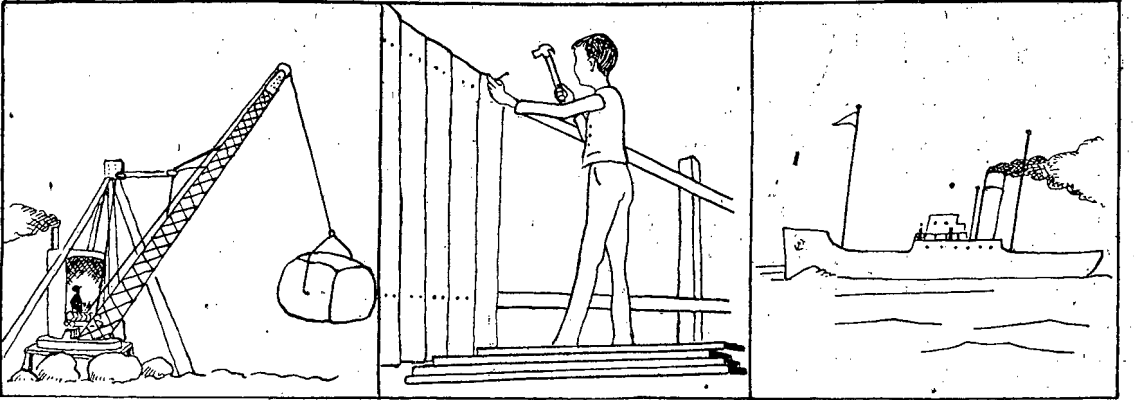
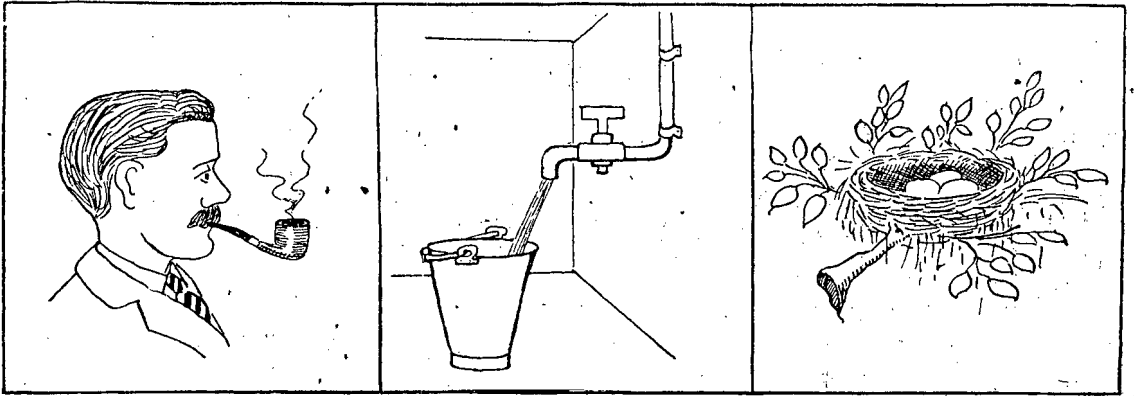
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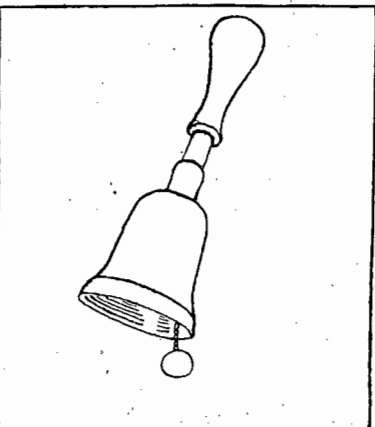
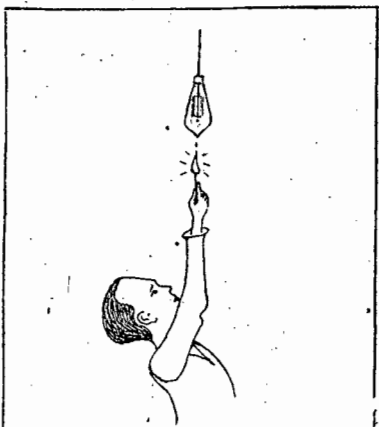
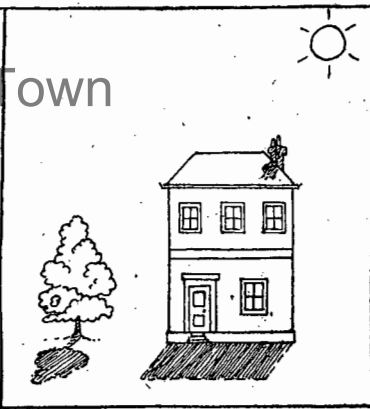
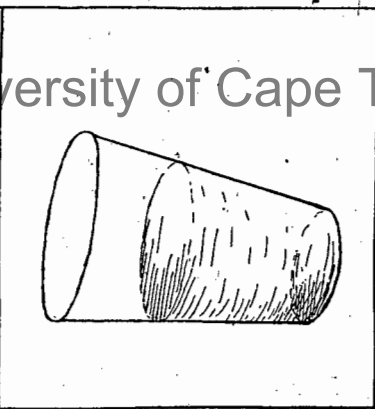
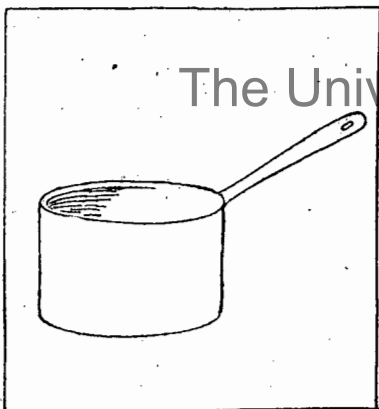
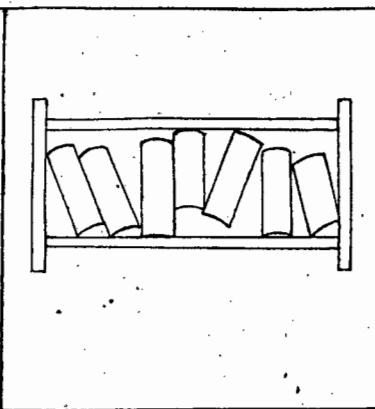
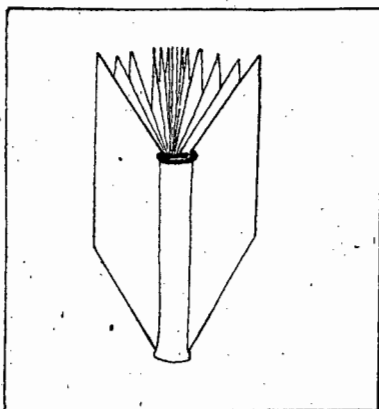
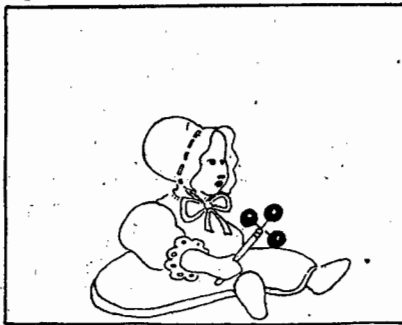
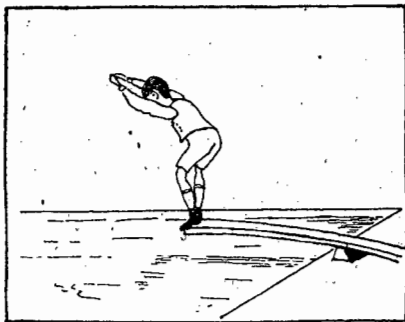


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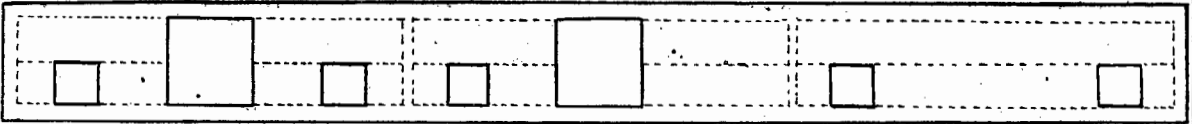
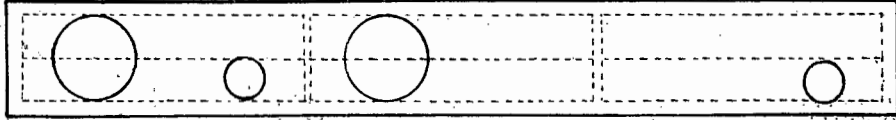
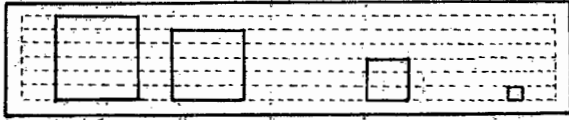




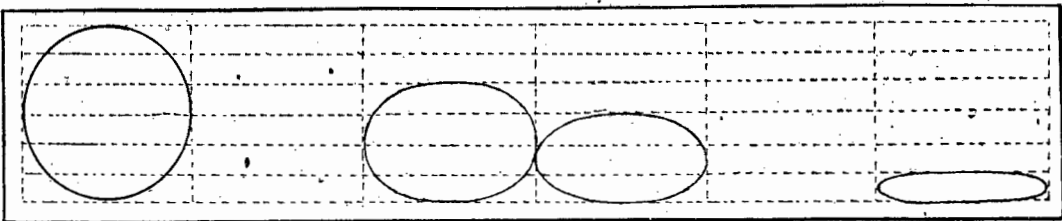
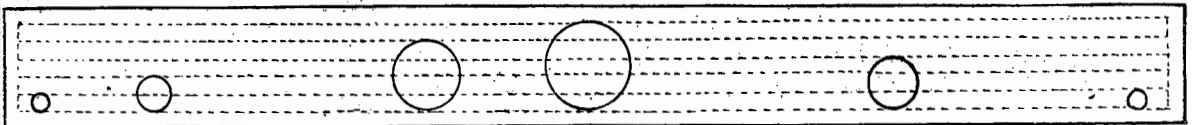
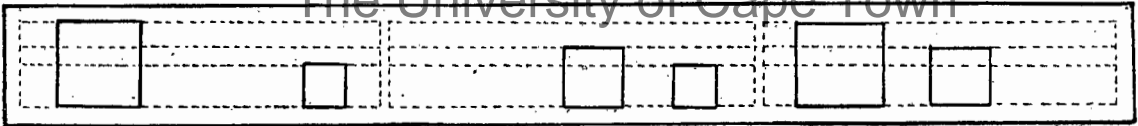
Score.....



The University of Cape Town



The University of Cape Town



Score.....

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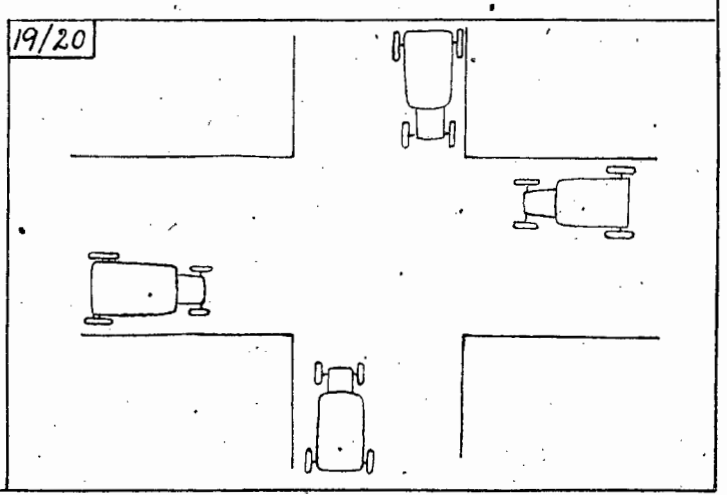
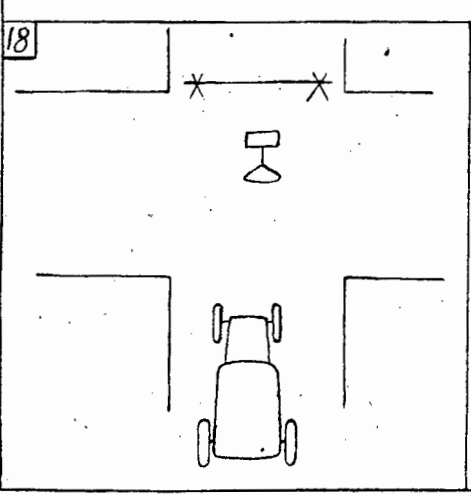
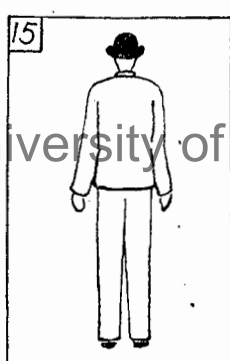
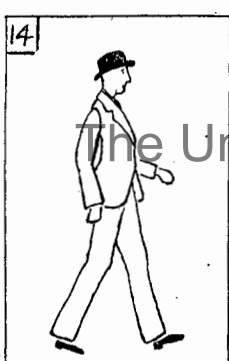
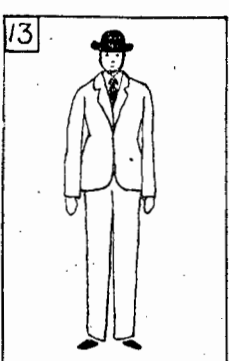
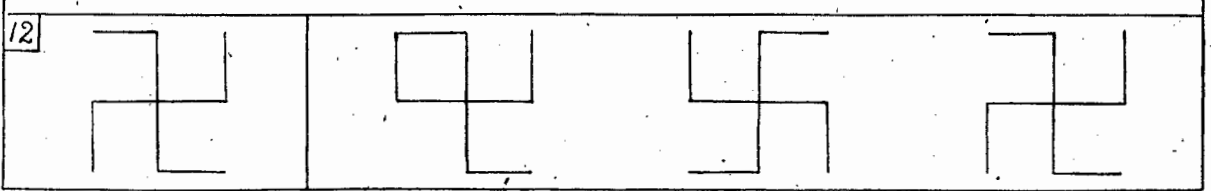
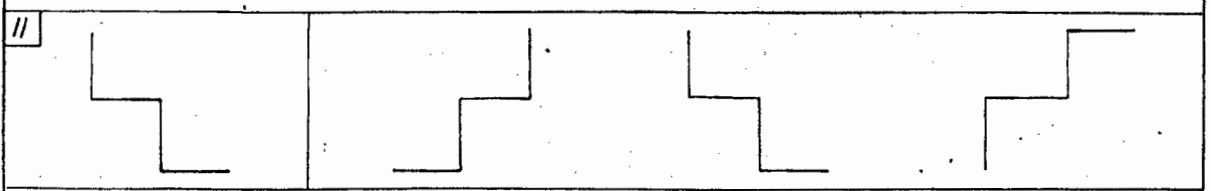
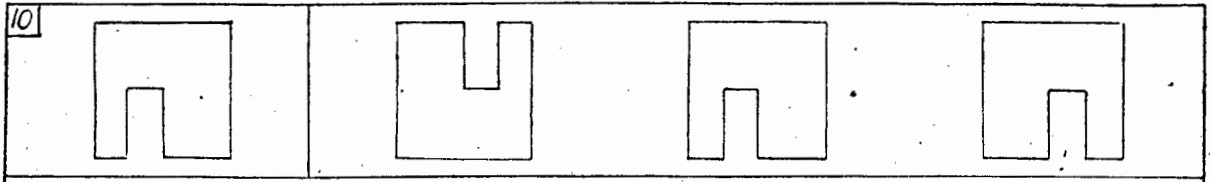
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Score.....