

- ① (Min) Manisha Igle: Concept of Primitives in Major Indian Scripts (North & South)
- ② (Min) Arati Mainkar: Audio Visual on color patterns & forms on Banaras Ghats
- ③ (Min) Dipti Vaidya: Bilingual Typography
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- ⑤ Ajay D. Kulkarni: Meaning in architectural & environmental elements.
- ⑥ (Min) Shilpa Raje: Space & time in Theatre.
- ⑦ Deepak G. Patel: Models of Info. retrieval using Hypercard.
- ⑧ J. Vijay Kumar: Computer as self instructing tool.
- ⑨ Saligram N. Vikas: Ergonomic Studies of Telugu Script. (kept ~~out~~ the end in the cover ^{very late} in loose condition as it received ^{only} after binding was done.) 2

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14

Parental Form combining four characters [Devanagari]



Parental Form combining five characters [Oriya]



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THE STUDY OF PRIMITIVES IN INDIAN LANGUAGES

Submitted in Partial fulfillment of the requirement for the Degree
of Master of Design in Visual Communication

By
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876121

Guide:
Prof. R. K. JOSHI

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I.I.T., Powai,
Bombay. 400 076
March 1989.

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SPECIAL PROJECT

CONCEPT OF PRIMITIVES IN MAJOR INDIAN SCRIPTS (NORTH AND SOUTH)

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APPROVAL SHEET

Special Project titled 'Concept of Primitives in Major Indian Scripts (North & South)' by Manisha P. Lele is approved in partial fulfillment of the requirements for a Master's Degree in Visual Communication

Guide

ACKNOWLEDGEMENTS

Prof. R.K.Joshi's guidance in this project has helped in clearing innumerable doubts regarding the Devanagari script.

Shri S.K.Mohanty has extended a kind help in generation of the skeleton for the Oriya Script.

I sincerely express gratitude to the above for their contribution to the completion of my project.

C O N T E N T S :

1. INTRODUCTION
2. CHAPTER ONE
THE SKELETON APPROACH TO LETTER FORMS
3. CHAPTER TWO
THE PRIMITIVE LEVEL
4. CHAPTER THREE
THE PROJECT UNDERTAKEN
5. CHAPTER FOUR
REDUCTION IN THE NUMBER OF PRIMITIVES
6. CHAPTER FIVE
FURTHER STUDIES

I N T R O D U C T I O N

- // The study of primitives in Indian Scripts is not the study of the historical evolution of the letter forms nor its primitive symbology but, the study of the elements constituting the physical shape of the letter form, i.e. the curves, lines, circle segments, the manner in which they join so beautifully. //
- // This project is a step towards generating 'a' system of the different Indian scripts rather than setting them as individual scripts. In the process also tracing out similarities in a single script. The research will also broaden my understanding in the scripts undertaken for study with respect to their form and their joinery norms. //

1. THE SKELETON APPROACH TO LETTER FORMS

The human figure is muscles beautifully woven on the skeleton of bones over layed with skin outlining the form structured by the skeleton. Letter forms too are designed on the same lines.

Shredding the outward decorations of the serifs and strokes, there will emerge an core form; the structure or the SKELETON OF THE ALPHABET, stable and proportionate.

// 'TO EXPRESS THE OUTWARD FORM CORRECTLY ONE REQUIRES A KNOWLEDGE OF THE INTERNAL STRUCTURE; THAT IS, OF BONES WHICH COMPOSE THE FRAMEWORK AND DEFINE ITS PROPORTIONS AND OF THE MUSCLES AND TENDONS WHICH DIRECT ACTION'.

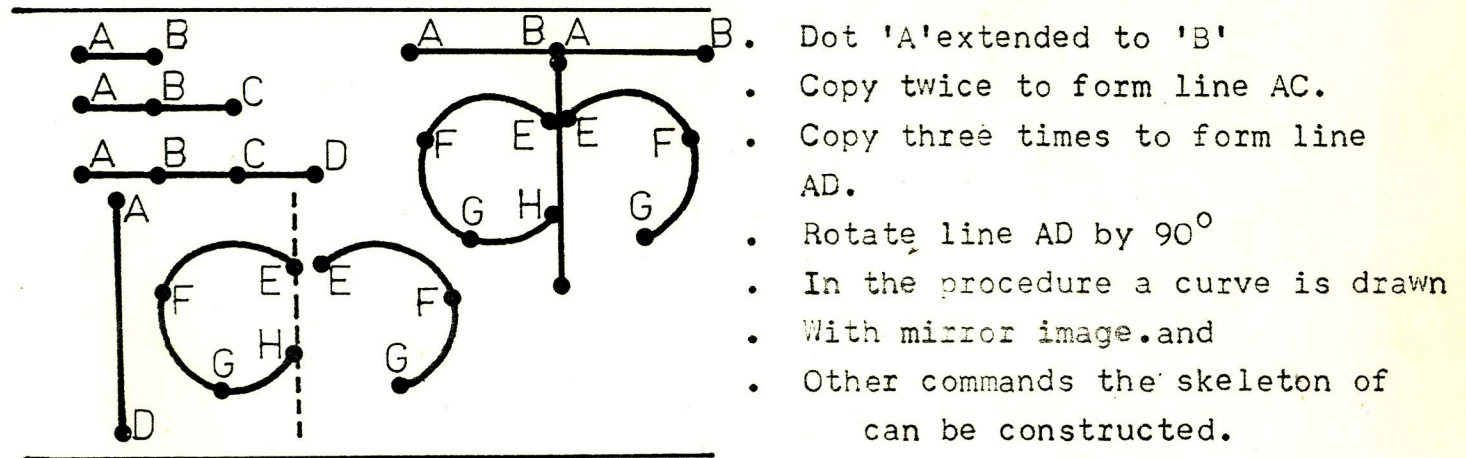
So aptly put by Victor Perard in his book; Anatomy and drawing.

The skeleton approach to letter forms allows the study of the CORE FORM minus decisive layers of the style. Variations in type design can be possible only with a fair background of the structure and anatomy of the letter forms.

Today, the Type design activity has oriented itself to the use of computer technology. Computer aided type design has proved to complement the design and its process.

Moving with the age, skeleton approach to letterforms is an ideal guide to Type designers. The skeleton approach is creating letter

forms with lines and curves. The sophistication in software today allows the facility to change the size, angle and placement of the lines and curves thus simplifying the evolution of the skeleton

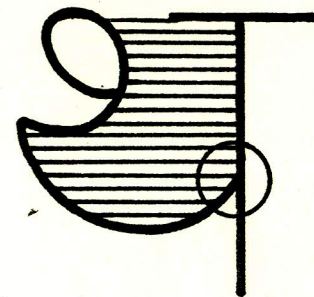
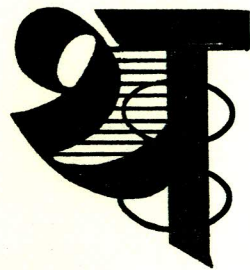


Change in the size or style of stroke is possible on the same skeleton . In contrast, if the letter form is drawn directly with the brush, any change to be made, involves erasing of the pre-concieved form, i.e. starting work from level one.

// A SKELETON IS NECESSARY; BUT, NOT JUST ANY SKELETON BUT AN IDEAL ONE, WHICH IS THE CONSOLIDATION OF A THOROUGH ANALYSIS OF THE SCRIPT //

// It would serve as a guideline to type designers to further build their characters by designing forms on the basic structure. //

/ Understanding of correct forms of the characters can be insured by providing an ideal skeleton. Curvature of shapes, joinery, widths can be scrutinised by applying the skeleton approach. /



2. THE PRIMITIVE LEVEL

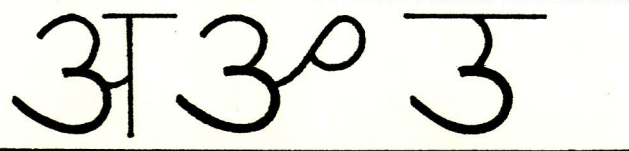
The need and justification of the skeleton approach is discussed in the earlier chapter. But, the path does not end there.

The skeleton approach is justified, but unlike Roman script which consists of only twenty six characters, Indian scripts exceed tremendously in the number of characters. As such, it is cumbersome to store Skeletons of a large set of characters in the computer memory or even other wise. A probable solution to this is working to the primitive level.

// ON THE BASIC LEVEL, THE PRIMITIVE LEVEL OF LETTER FORMS INVOLVES FURTHER BREAKING DOWN OF THE SKELETON TO FIND COMMON DENOMINATORS IN THE FORMS. //

This assists the type designer to group common structured characters, thus simplifying the design process. He designs the specific shape and combines it with primitives to form a number of characters.

In case of children, it helps them to percieve the similarities of forms. example -



. This primitive of अ is the same as that of ॐ, ॐ .

Thus, reducing the memorising of the total graphic form, as now merely remembers the primitive and the place and norm of joinery. ✓

Another aspect to be considered is the number of languages in our country and correspondingly the number of scripts.

INDIA, HAS ABOUT FIFTEEN LANGUAGES WITH THEIR INDIVIDUAL SCRIPTS

Calculating the number of characters in each script is subsequently a large number.

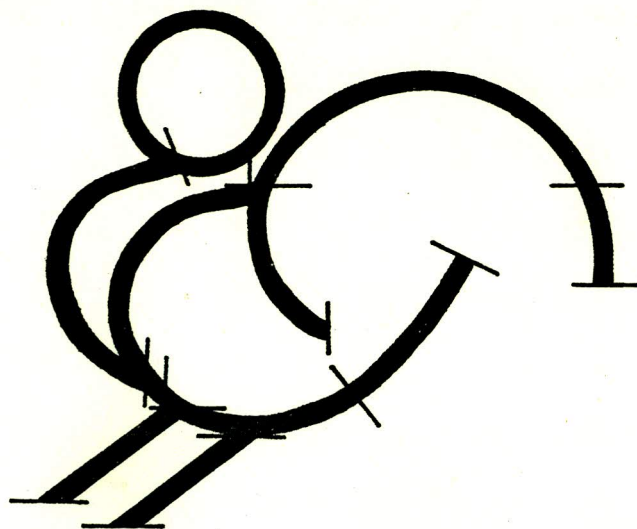
The primitive approach to letter forms can to a certain extent answer these large figures. Work can be undertaken to come to a Primitive level for all Indian scripts by deciphering common denominators in the elements that constitute the letter form, to arrive on a set of Primitives for all Indian scripts.

TO SUMMARISE, THE PRIMITIVE APPROACH CATERES TO FORMING A DICTIONARY OF CURVES, LINES AND POINT WHICH COULD BE CALLED UPON AS THE NEED BE.)

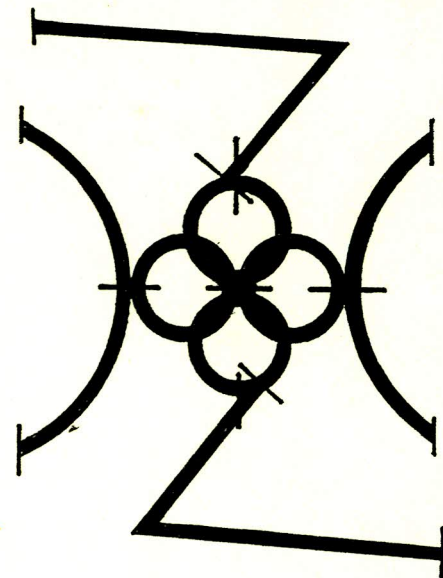
It involves two-fold work.

1. A set of primitives
2. The formulae giving which Primitive to be joined to which other Primitive, to form the desired character.

The scope of the approach cannot be limited to forming characters, but the same primitives could also form beautiful patterns or even illustrative natural forms given overleaf.



Bird Form



Geometrical Pattern

3. THE PROJECT UNDERTAKEN

The project undertaken for research narrows down the broad sphere of language scripts to two scripts namely

1. Oriya
2. Devanagari

DERIVATION OF THE IDEAL SKELETON FOR THE ABOVE LANGUAGES AND FURTHER GOING TO THE PRIMITIVE LEVEL AND STATING THE COMBINATIONS NEED TO FORM A SPECIFIC CHARACTER CONSTITUTES THE SCOPE OF THE PROJECT.

THE IDEAL SKELETON

As mentioned in the first chapter, the ideal skeleton is the conclusion of detailed analysis of the Type characters. This detail analysis was conducted with respect to two languages.script.

The result assigned dimensions codes of joinery to forms constituting the character. A framework was devised to work out the ideal skeleton.

The structural analysis concluded in forming a group of characters following a definite structure.

The horizontal width analysis resulted in 18 groups of varied width in case of Devanagari script.

The characters of the Oriya script generally fit into a square leaving

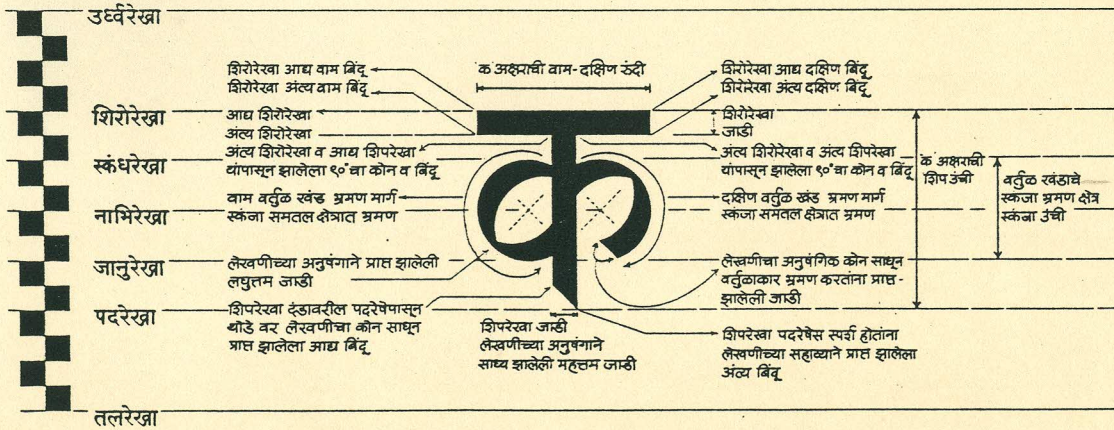
[illegible]

out a few exceptions.

The vertical analysis found out termination points of curves and lines with respect to the horizontal grid in both the scripts.

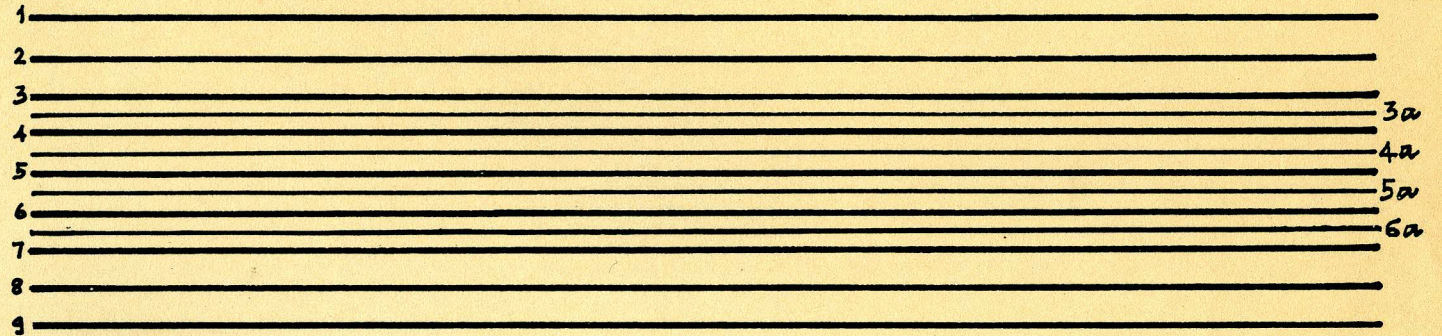
THE IDEAL SKELETON OF DEVANAGARI :

The guidelines suggested Shri Mukund Gokhale in his article 'Design parameters of Devanagari' in the 1983 issue of 'Caltis' state 6 horizontal divisions with 7 lines including ascenders, descenders and 'x' height, which are required for reasonable clarity of basic characters.



In course of the work, further addition of divisions are made to standardise dimensions and achieve accuracy in terms of curvatures of forms in specific characters like क्ष, श्र etc.

THE GRID FORMULATED

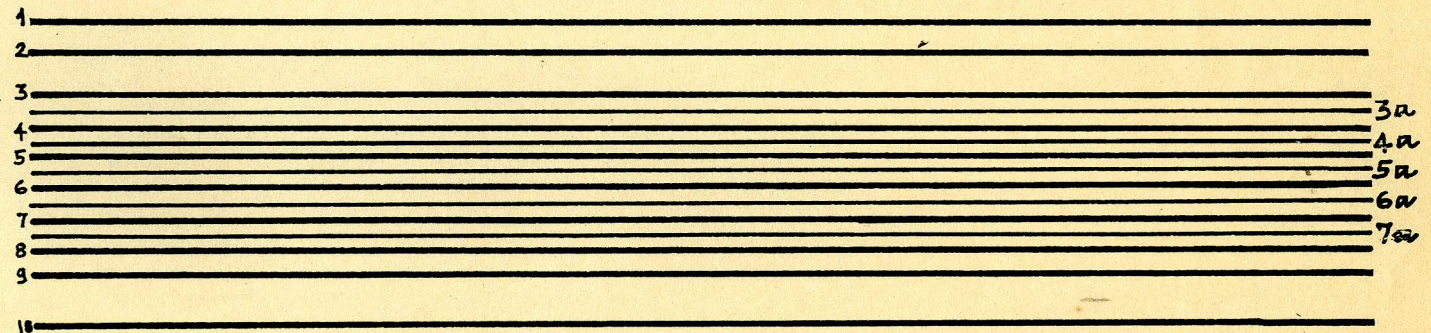


THE DIVISIONS NOW NUMBER TWELVE WITH THIRTEEN HORIZONTAL LINES

The Niranya Sagar font is taken as a reference for the above studies.

THE IDEAL SKELETON OF ORIYA

The divisions were set as per the requirements of the letter forms, Fifteen lines here make fourteen divisions. But here, the sub-divisions in the descenders and ascenders area are unequal. The Oriya script is worked out on the basis of segments of the circle in keeping with its circular forms.



The 'x' height for both the script measures 2 cms.

The priorities set for designing of the ideal skeleton are

1. To allow tracing over by mono line only.
2. Primarily serve to be an ideal skeleton for children to learn the correct script forms.

3. Aesthetic beauty of the forms.
4. The dimensions set by the analysis conducted.

The skeleton primarily aims at

1. Serving as a teaching aid to children
2. A Guide for the type designers leaving options for various as per the design requirements.

Expanding on this, every type designer as per his pen stroke and design, needs to make certain judgements with reference to the counter form, form; readability and legibility of the character. Hence, the skeleton will be the parameter from which he can deviate, alter to suit expanded condensed, circular etc. design of his Type face.

There is also a view put forth that such skeletons can be formulated by a set of primitives from circles, ellipses and lines. The view is not totally rejectable but, it calls for a rigorous process of trial and error in finding which is 'the' segment for 'a' character, Resulting in putting in of unrecordable time and hazardous effect on the beautiful joinery of Indian scripts. This rather justifies the need of a skeleton to be conceived to further break down to 'specific' primitives.

Further study and experimentations during the course of the project

has narrowed down to primitives in case of Devanagari,
primitives for the Oriya script.

The joinery of the Primitives and the set of Primitives are provided
at the end.

The primitives are numbered and the end points are named to enable
specific, flawless joinery.

4. REDUCTION IN THE NUMBER OF PRIMITIVES

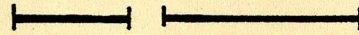
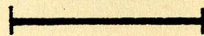
The Primitives derieved can be joined in a simple addition method with an additional function of mirror image.

The sophistication in software can provide additional functions like

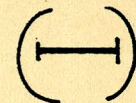
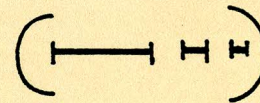
1. Contraction
2. Specification of angle of joining
3. Rotation
4. Variable arc lengths
5. Stretch

Which can considerable reduce the number of Primitives.

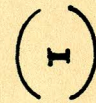
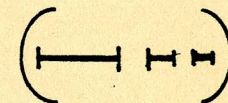
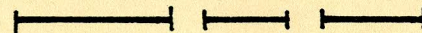
PRIMITIVE



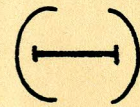
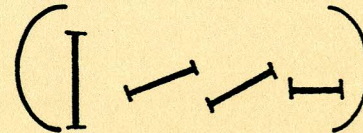
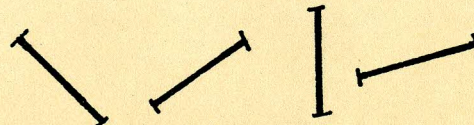
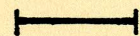
REDUCTION IN PRIMITIVES



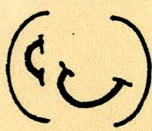
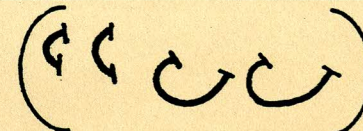
CONTRACT



STRETCH



ROTATE



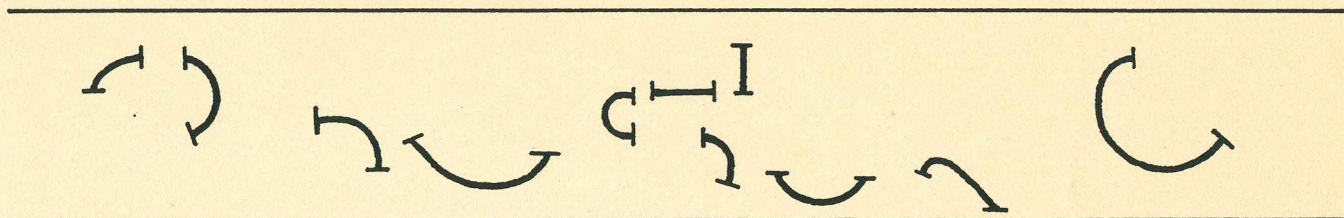
ARC LENGTHS

SUCH PROGRAMMES ALLOW MANY PERMUTATION, AND COMBINATIONS OF THE PRIMITIVES
THEREBY CONCISING THE DICTIONARY OF PRIMITIVES SPECIFIED.

The specification of joinery in this case will have to be more
precise and accurate.

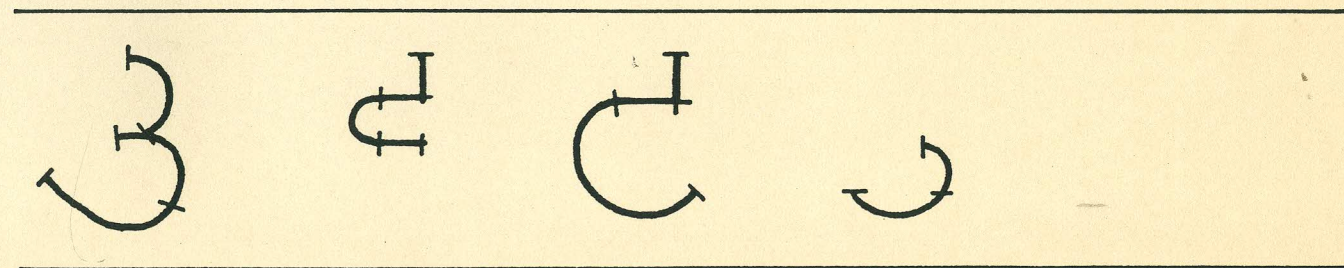
5. FURTHER STUDIES

The primitives derieved in the course of the project are in level one.
LEVEL ONE :



These could further form an instance according to the frequency of their requirement.

LEVEL TWO :



This will reduce the elaborate specification needed to form a character अ, इ, ए where अ, इ, ए can form an instance, or उ can form another instance.

The above work could be carried out in all Indian scripts, the resultant would be a complete, exhaustive dictionary of Primitives along with formlaes of joinery to form the desired character from

desired language. This software could be a great help to Type designers in Indian script, alongside reduce a considerable amount of homework needed on the part of the designer before he commences the actual designing.

B I B L I O G R A P H Y

- . L.S. WAKANKAR EDITOR, CALTIS 83,
Article : Design parameters of Devanagari by Shri Mukund Gokhale
Oriya Script By K.Bhanumurti, Baroda

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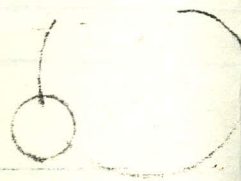
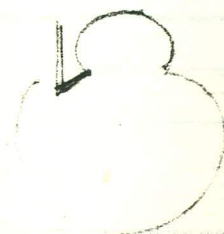
3 3 3 3 3

Handwritten cursive letters 'r', 'o', 'o', 'e' on a four-line grid. The 'r' is on the top two lines. The first 'o' has a diagonal slash and spans the middle two lines. The second 'o' also spans the middle two lines. The 'e' is on the bottom two lines.

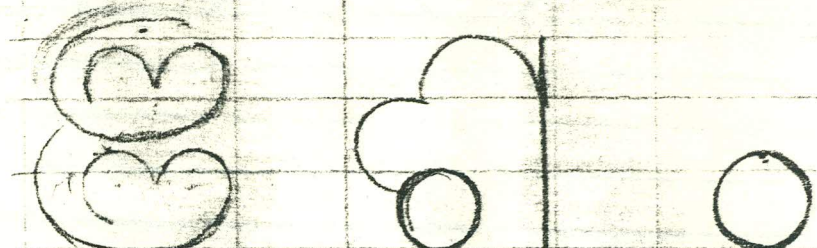
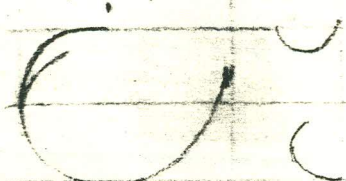
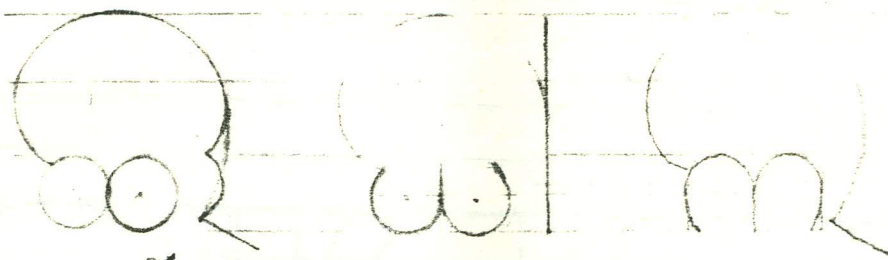
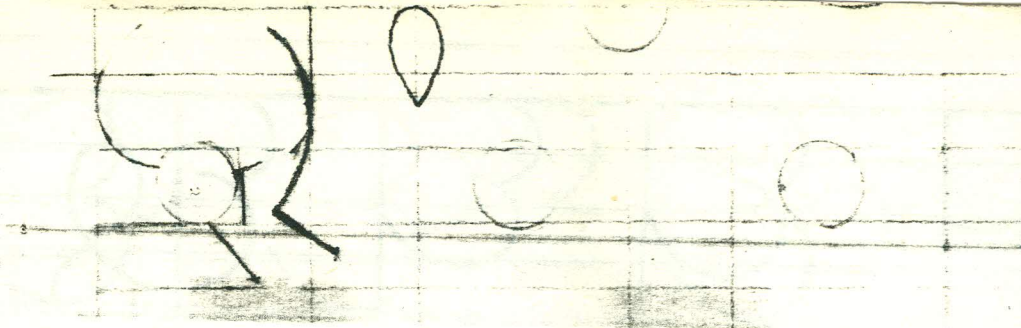
Handwritten cursive letters 'o', 'r', 'o', 'r' on a four-line grid. The 'o' is on the top two lines. The 'r' is on the top two lines. The 'o' is on the middle two lines. The 'r' is on the bottom two lines.

Handwritten cursive letters 'r', 'r', 'o', 'r' on a four-line grid. The 'r' is on the top two lines. The 'r' is on the top two lines. The 'o' is on the middle two lines. The 'r' is on the bottom two lines.

Handwritten cursive letters 'o', 'o', 'o', 'o' on a four-line grid. The 'o' is on the top two lines. The 'o' is on the top two lines. The 'o' is on the middle two lines. The 'o' is on the middle two lines.



Final



o n p u

ra sa

2 3 4 5 6

7 8 9

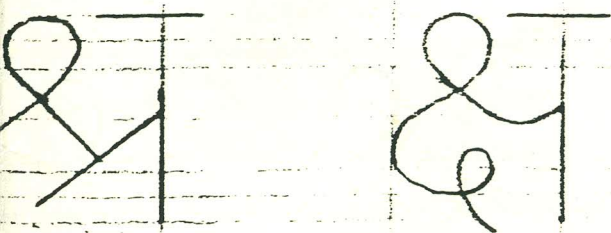
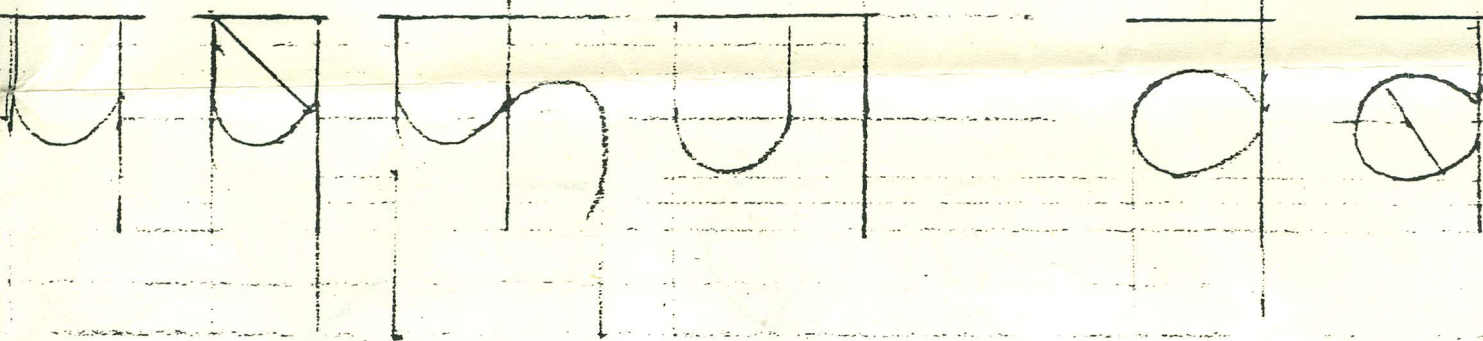
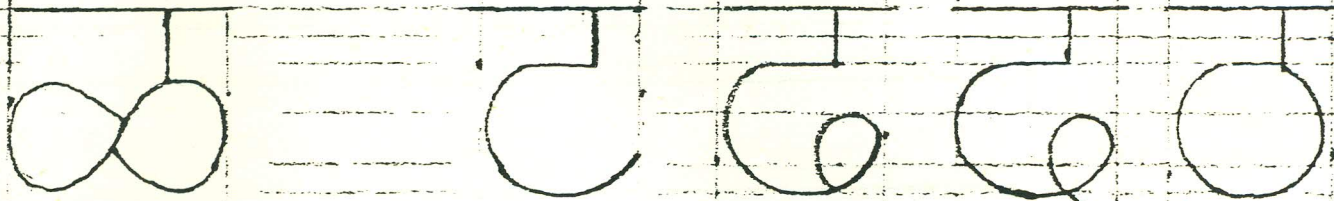
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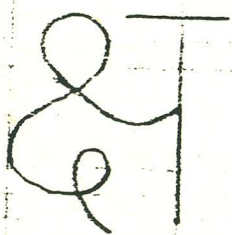
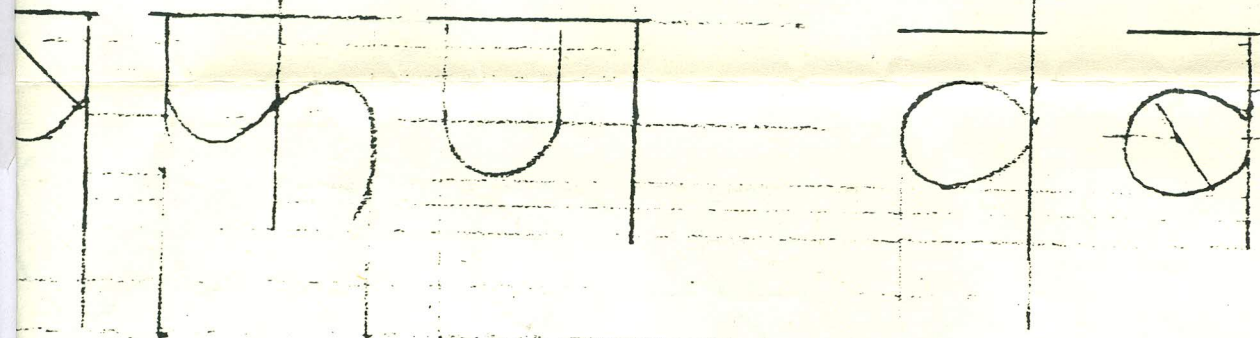
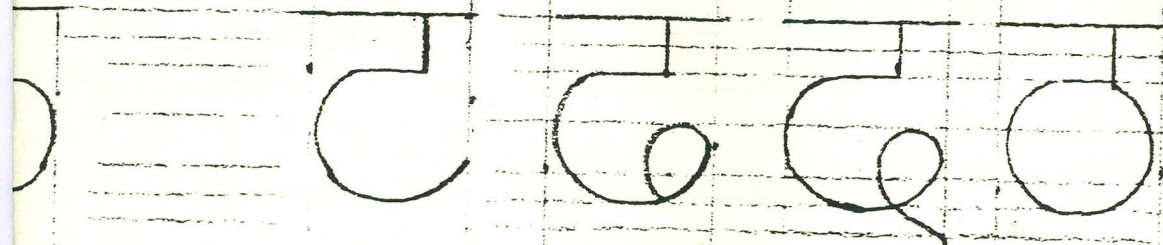
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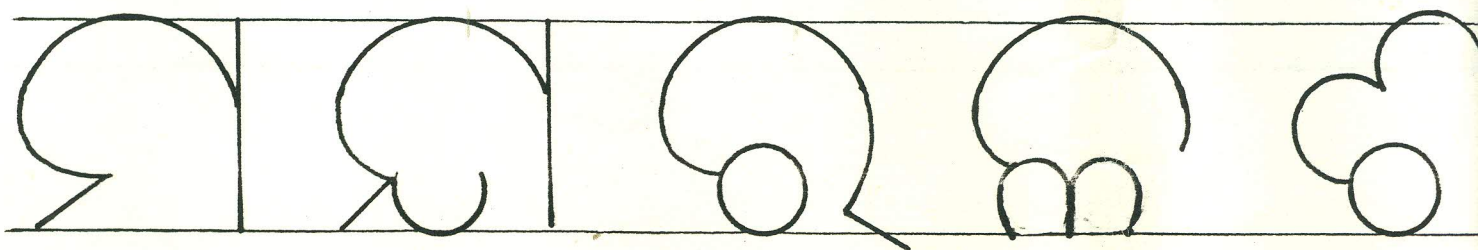
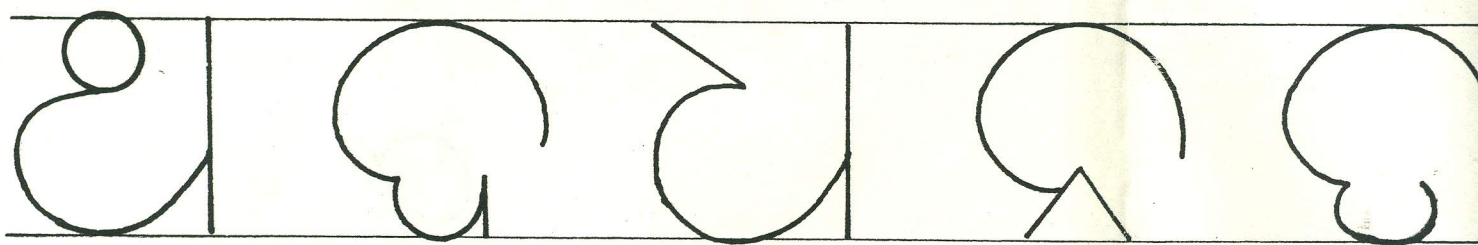
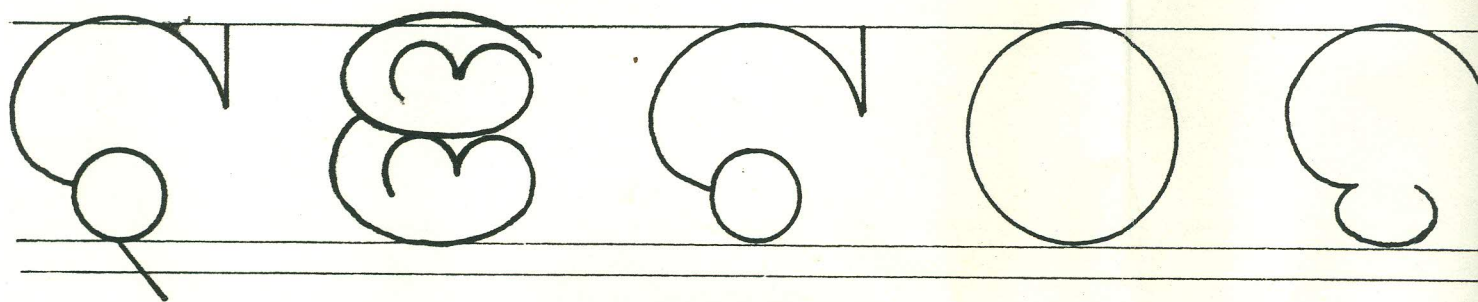
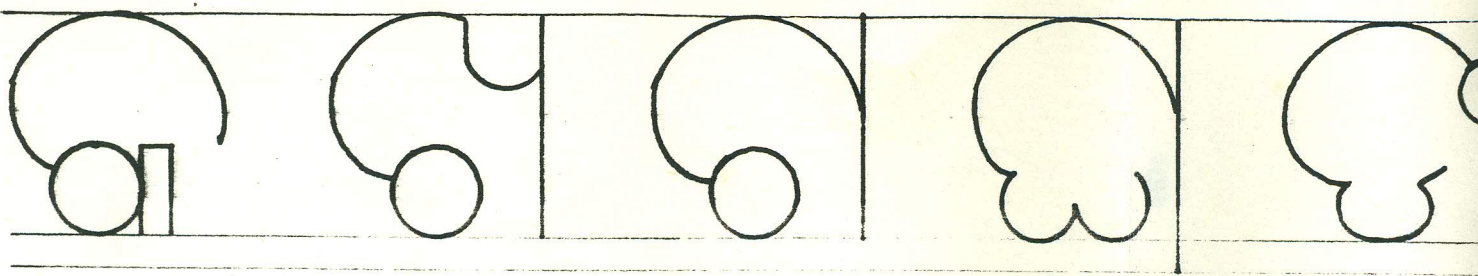
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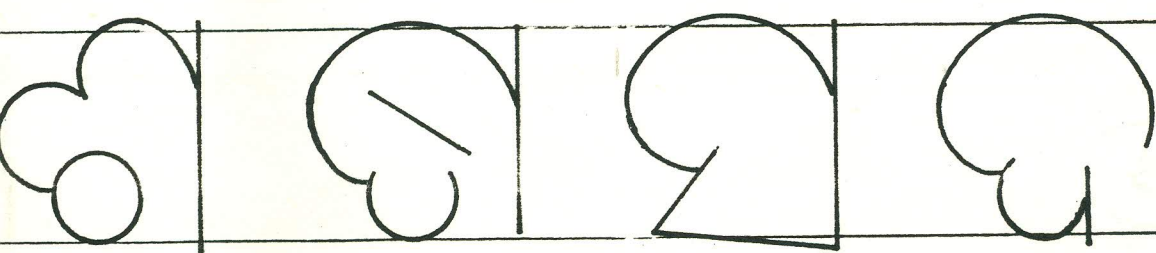
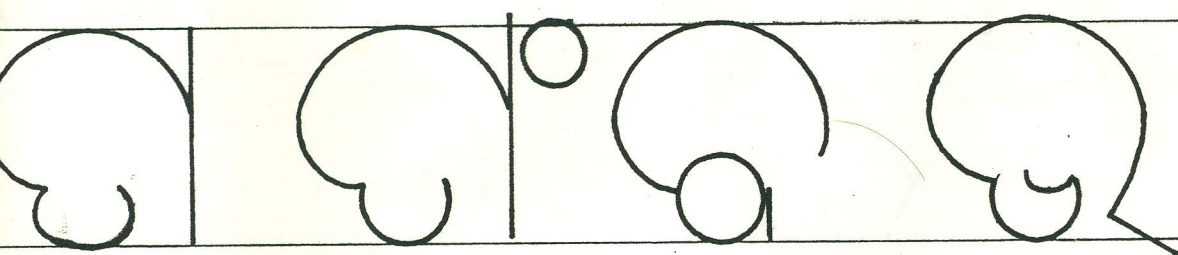
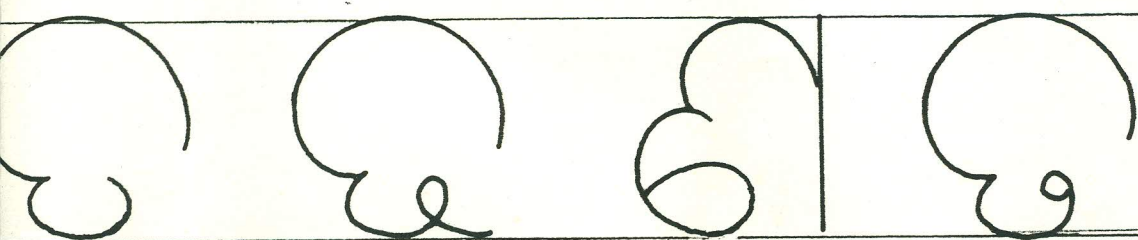
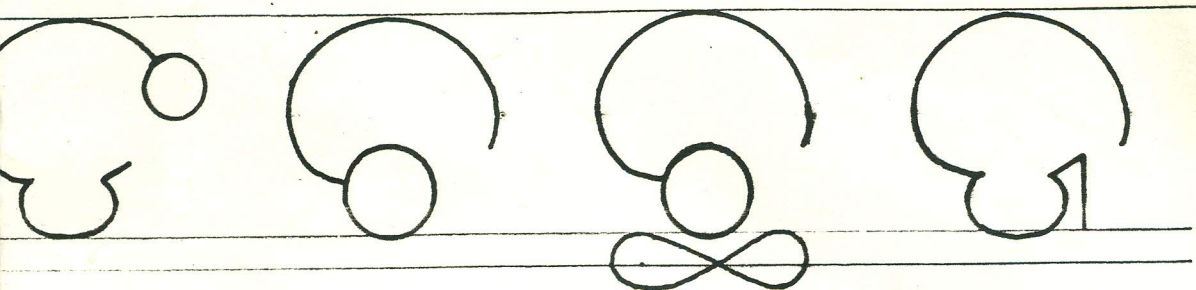
Hand

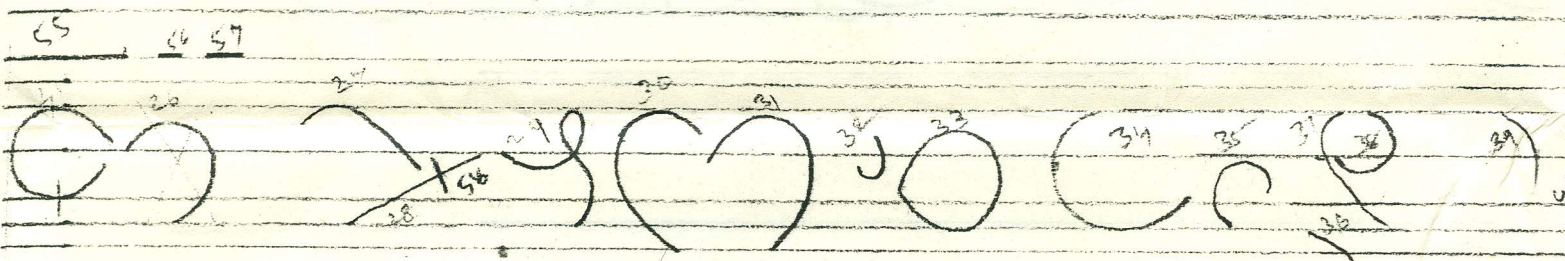
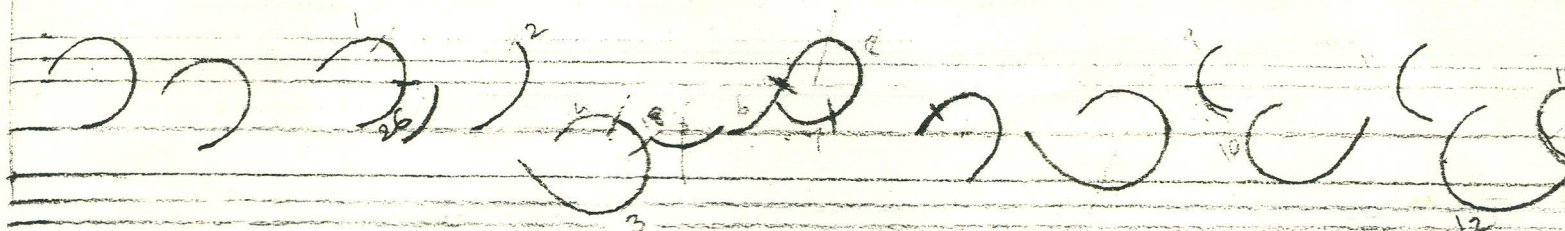


Handwritten word, possibly "Hand" or "Handwritten", written vertically.



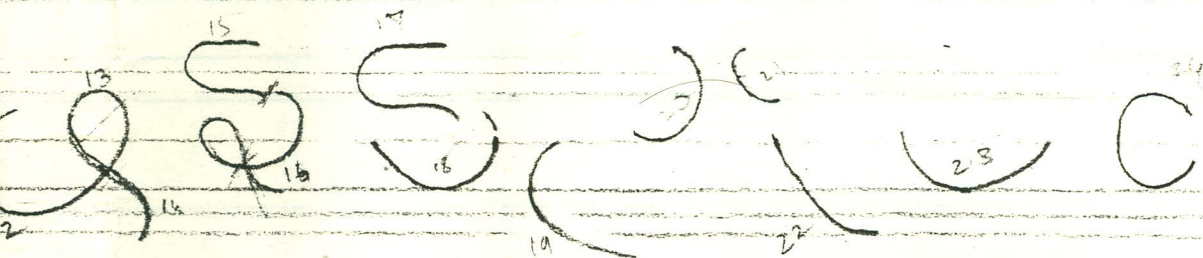




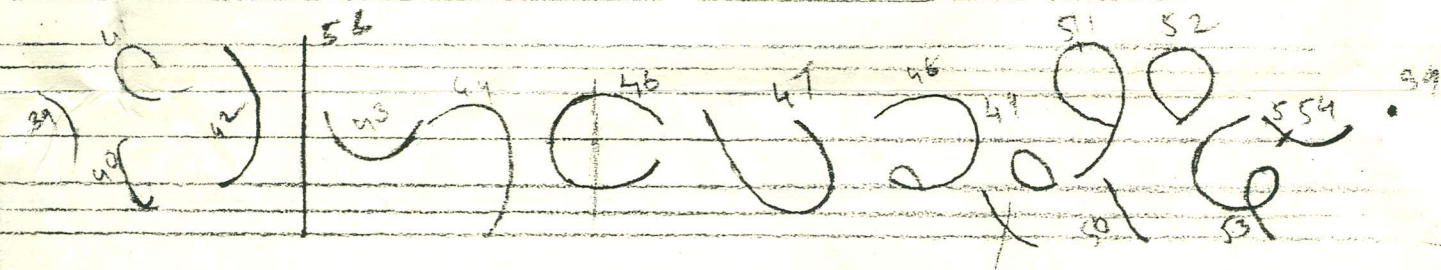


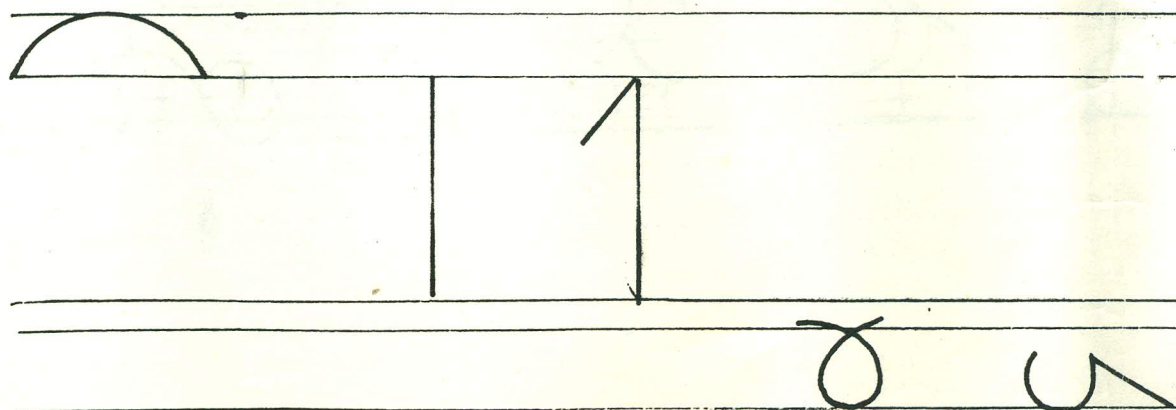
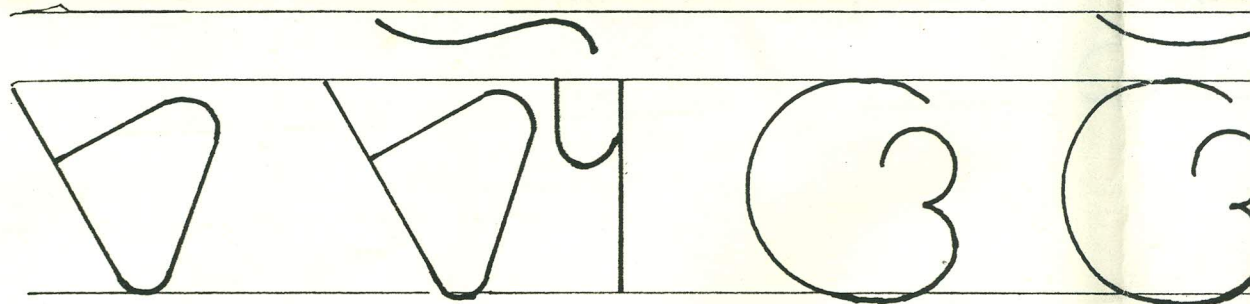
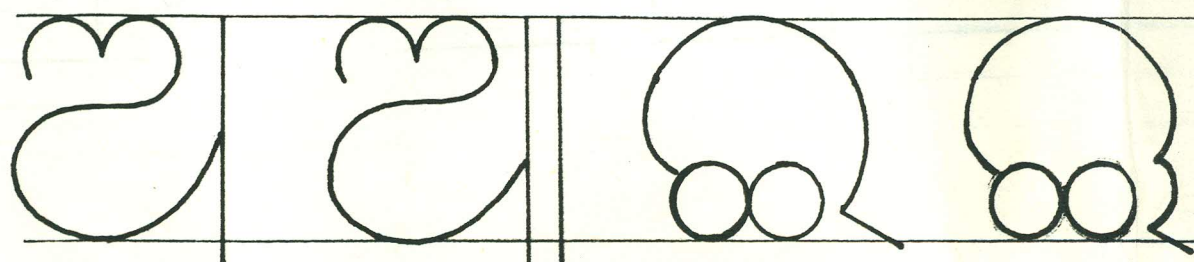
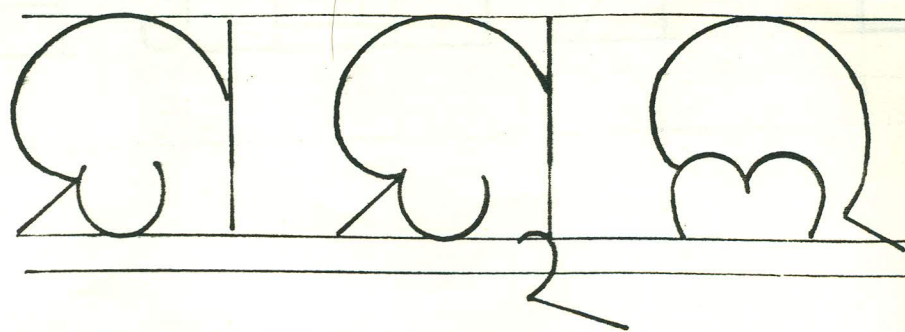
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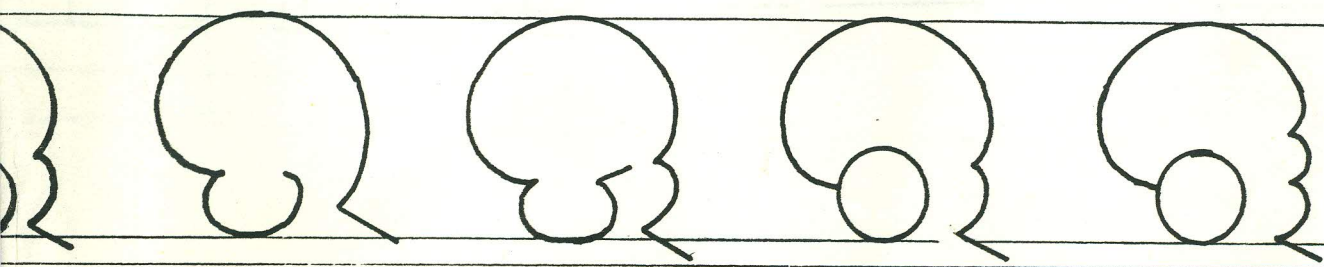
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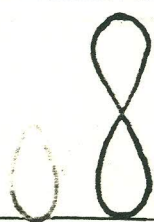
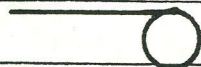




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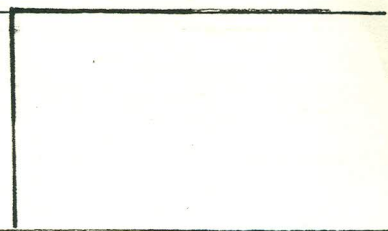
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