



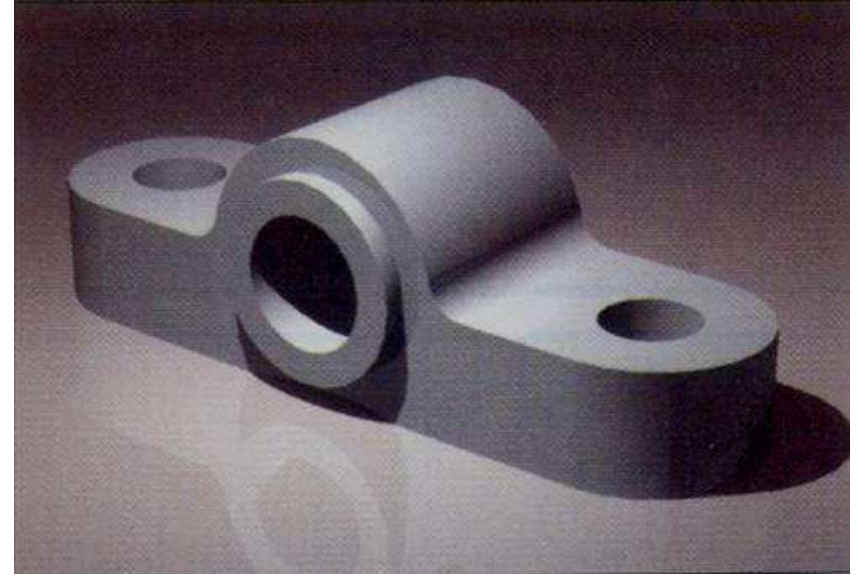
INTRODUCTION TO ENGINEERING DRAWING

**Engineering Graphics and Design
(BTME-101-21)**



GRAPHICS LANGUAGE

Effectiveness of Graphics Language



You can easily understand that ...

The word languages are inadequate for describing the **size**, **shape** and **features** completely as well as concisely.

Composition of Graphic Language

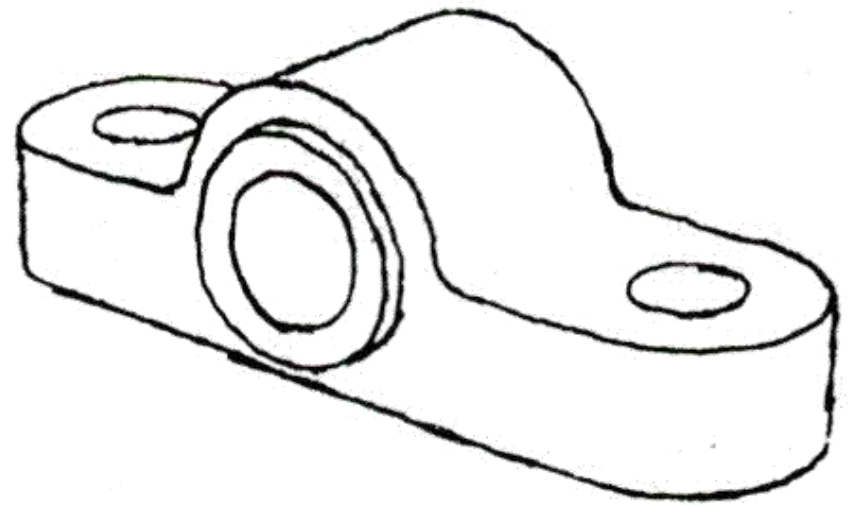
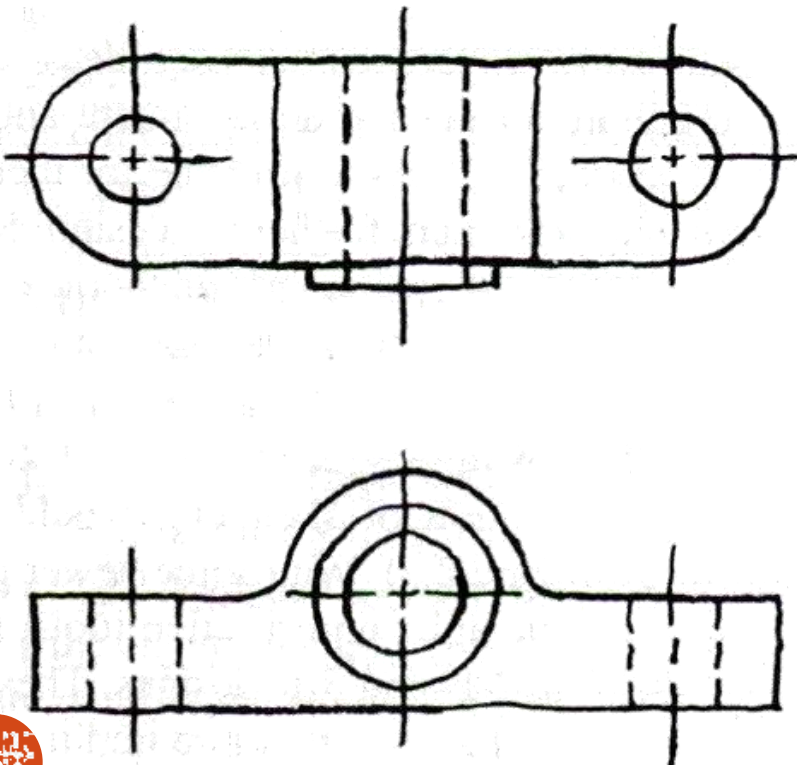
Graphic language in “**engineering application**” use **lines** to represent the **surfaces**, **edges** and **contours** of objects.

- The language is known as “**drawing**” or “**drafting**” .
- A drawing can be done using **freehand**, **instruments** or **computer** methods.

Freehand drawing

The lines are sketched without using instruments other than pencils and erasers.

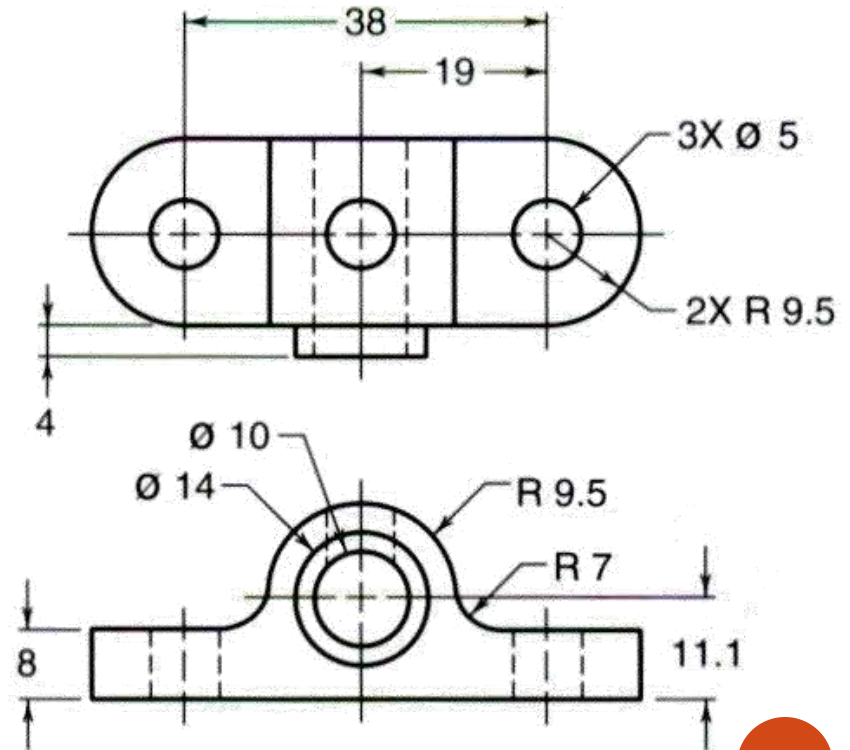
Example



Instrument drawing

Instruments are used to draw straight lines, circles, and curves concisely and accurately. Thus, the drawings are usually made to scale.

Example



Computer drawing

The drawings are usually made by commercial software such as AutoCAD, solid works etc.

Example



Engineering Drawing



Elements of Engineering Drawing

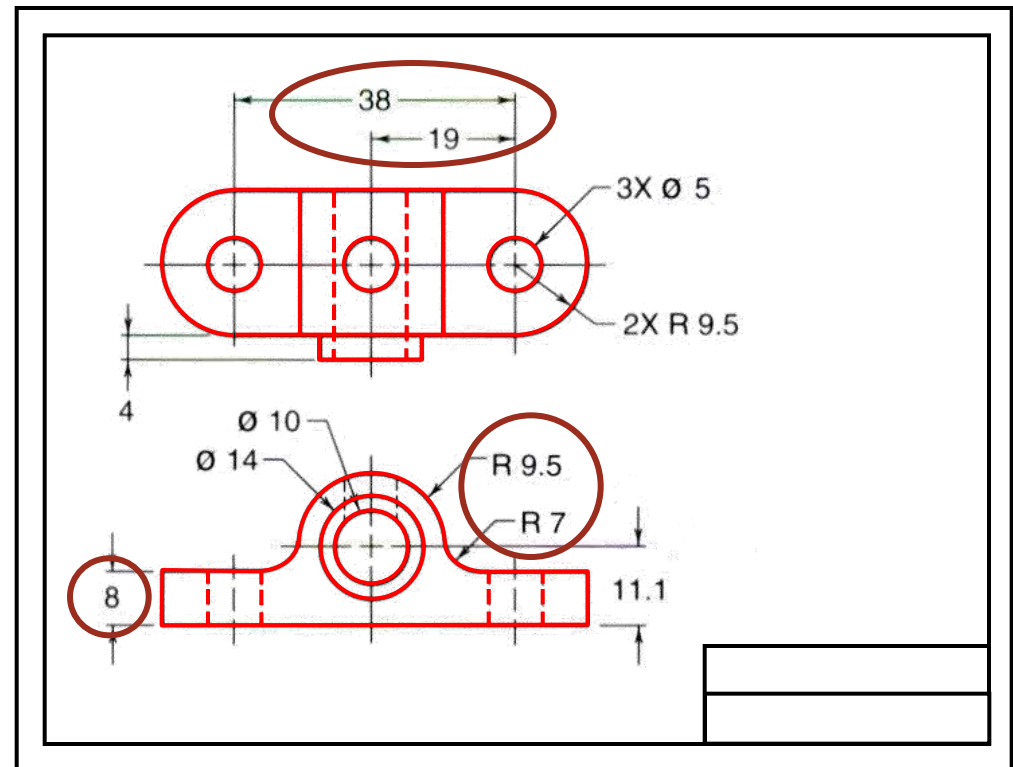
Engineering drawing are made up of **graphics language** and **word language**.

Graphics language

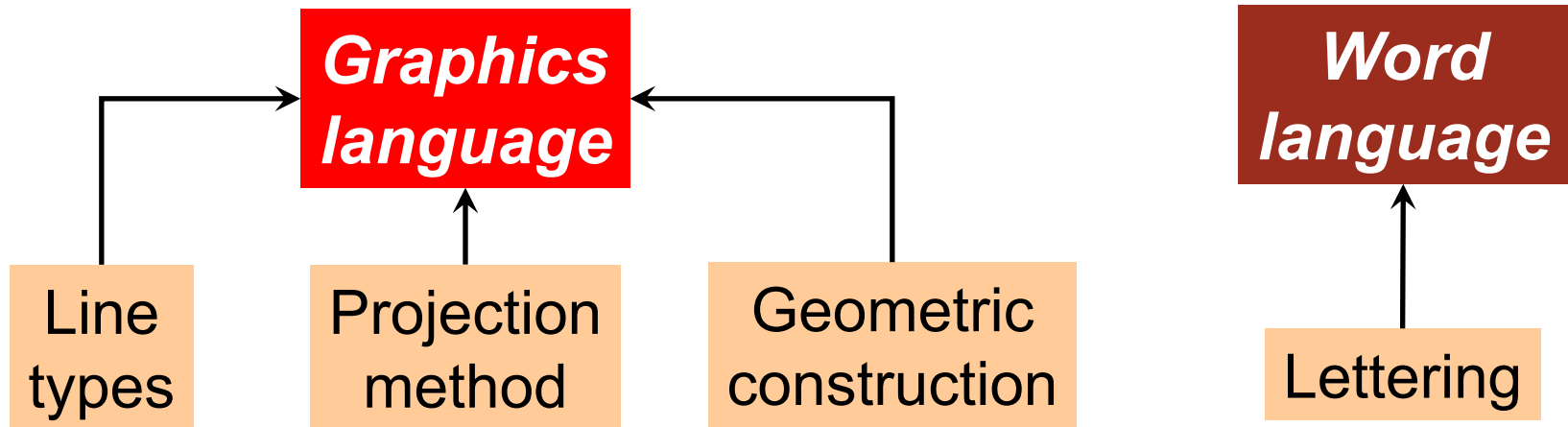
Describe a shape (mainly).

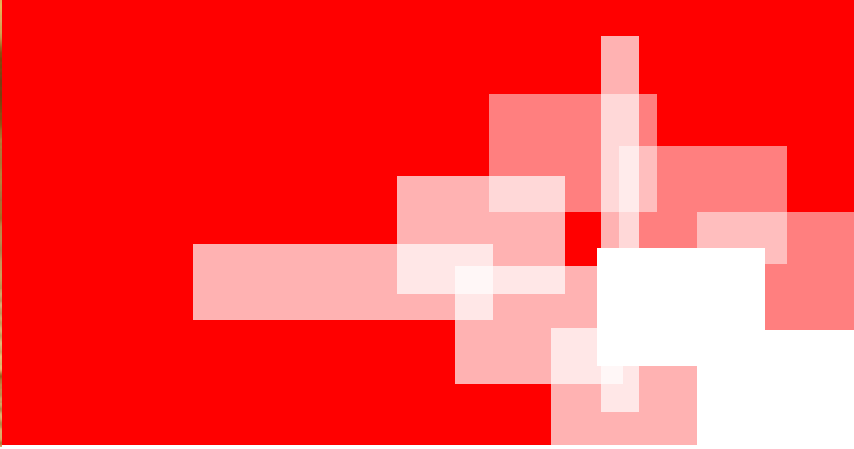
Word language

Describe size, location and specification of the object.



Basic Knowledge for Drafting





Drawing Standard



Introduction

Standards are set of rules that govern how technical drawings are represented.

- Drawing standards are used so that drawings **convey the same meaning to everyone** who reads them.

Standard Code

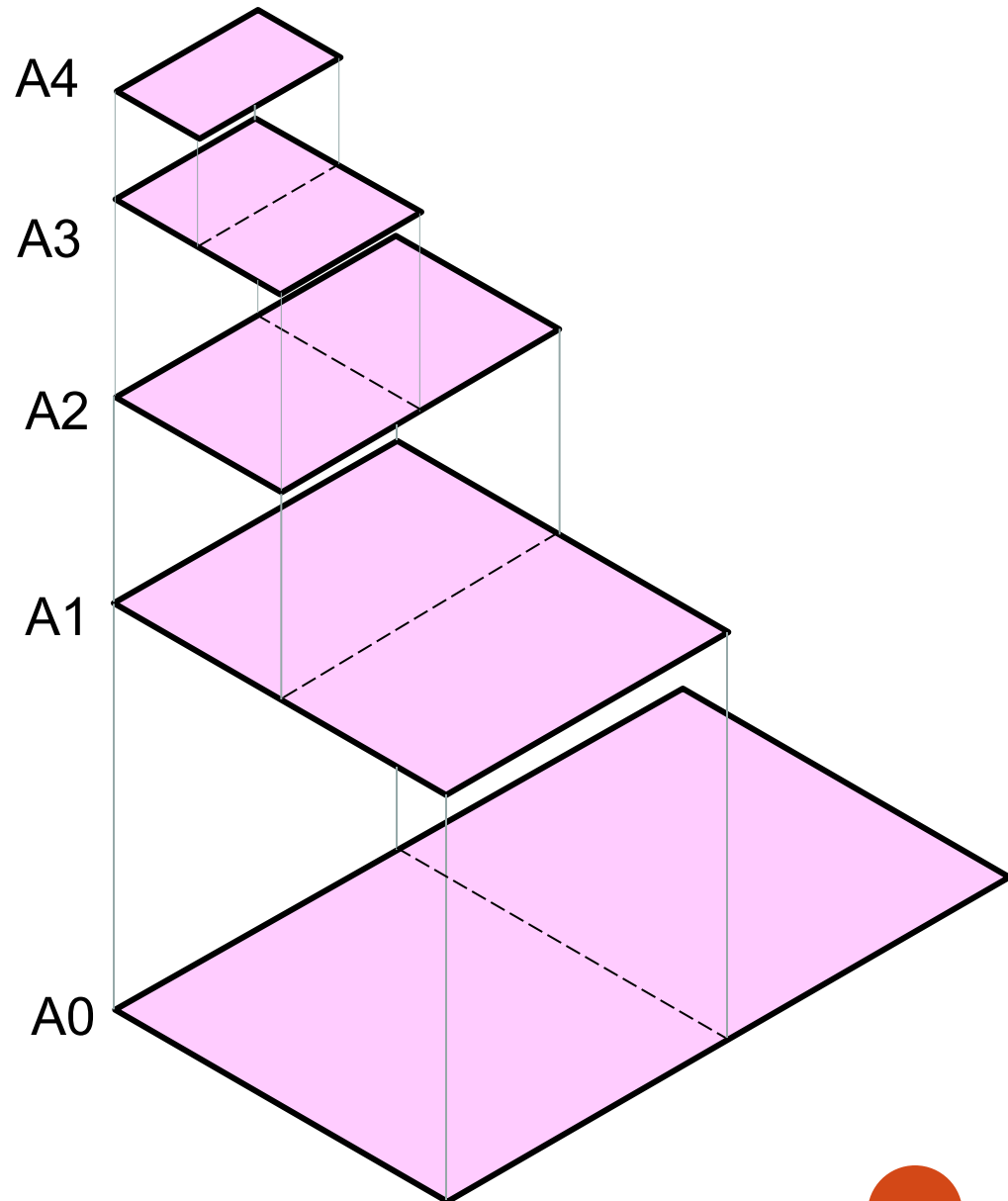
Country	Code	Full name
USA	ANSI	A merican N ational S tandard I nstitute
Japan	JIS	J apanese I ndustrial S tandard
UK	BS	B ritish S tandard
Australia	AS	A ustralian S tandard
Germany	DIN	D eutsches I nstitut für N ormung
	ISO	I nternational S tandards O rganization
India	BIS	B ureau of I ndian S tandard

Drawing Sheet

- Trimmed paper of a size A0 ~ A4.
- Standard sheet size (**BIS**)

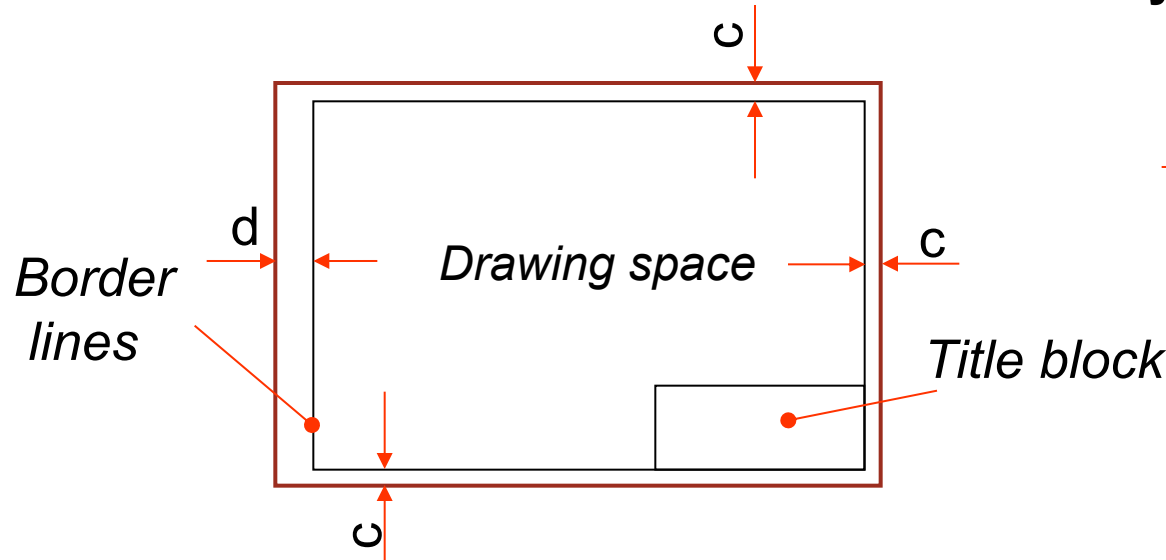
A4	210 x 297
A3	297 x 420
A2	420 x 594
A1	594 x 841
A0	841 x 1189

(Dimensions in millimeters)

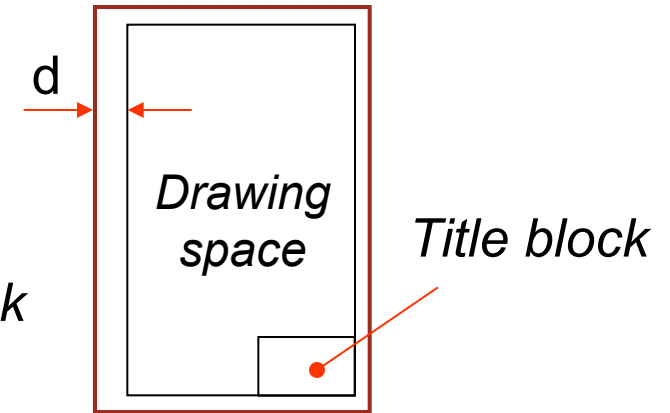


Orientation of drawing sheet

1. Type X (A0~A4)



2. Type Y (A4 only)



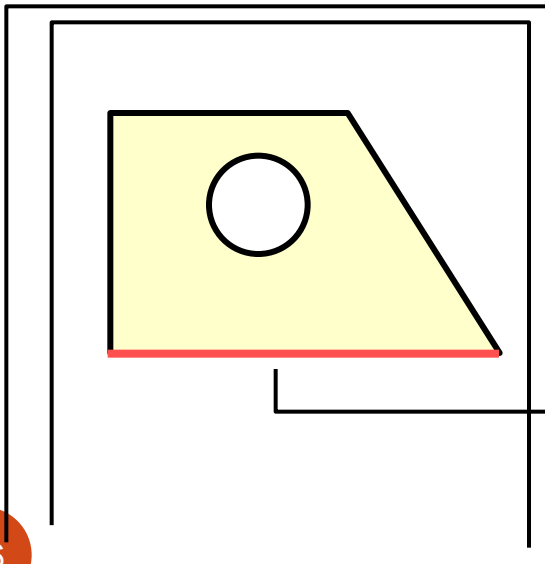
Sheet size	c (min)	d (min)
A4	10	25
A3	10	25
A2	10	25
A1	20	25
A0	20	25

Drawing Scales

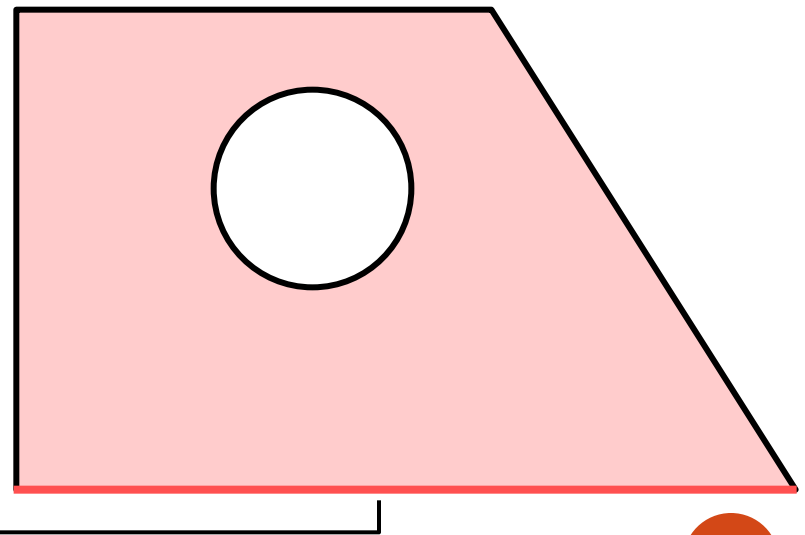
Length, size

Scale is the ratio of the linear dimension of an element of an object shown in the drawing to the real linear dimension of the same element of the object.

Size in drawing



Actual size



— : —

Drawing Scales

- Designation of a scale consists of the word “**SCALE**” followed by the indication of its **ratio**, as follow

SCALE 1:1 for full size

SCALE **X**:1 for **enlargement** scales ($X > 1$)

SCALE 1:**X** for **reduction** scales ($X > 1$)

- Dimension numbers shown in the drawing are correspond to “**true size**” of the object and they are **independent** of the scale used in creating that drawing.

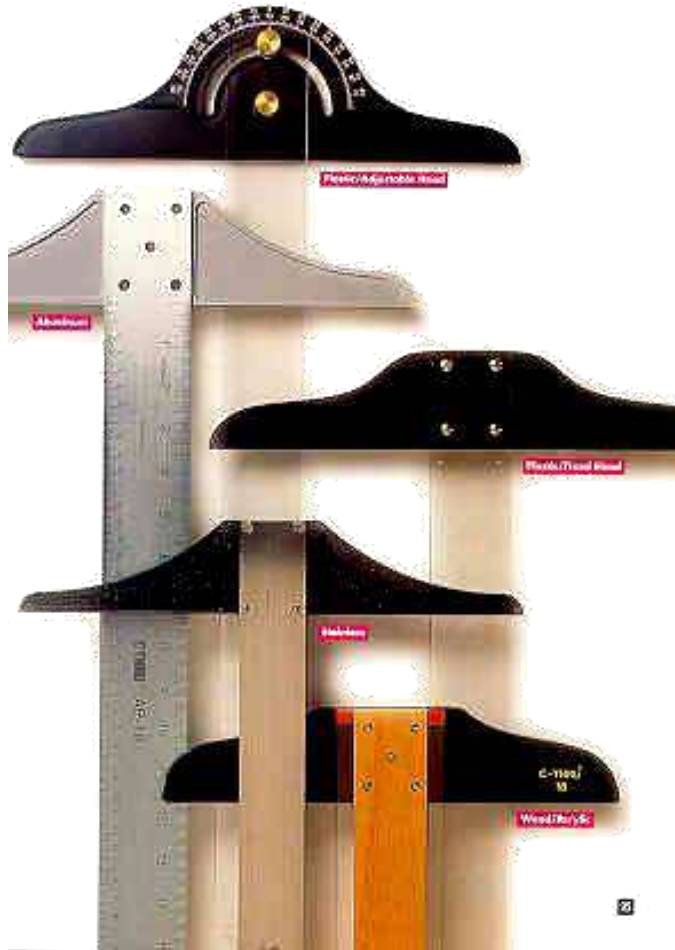


Traditional Drawing Tools

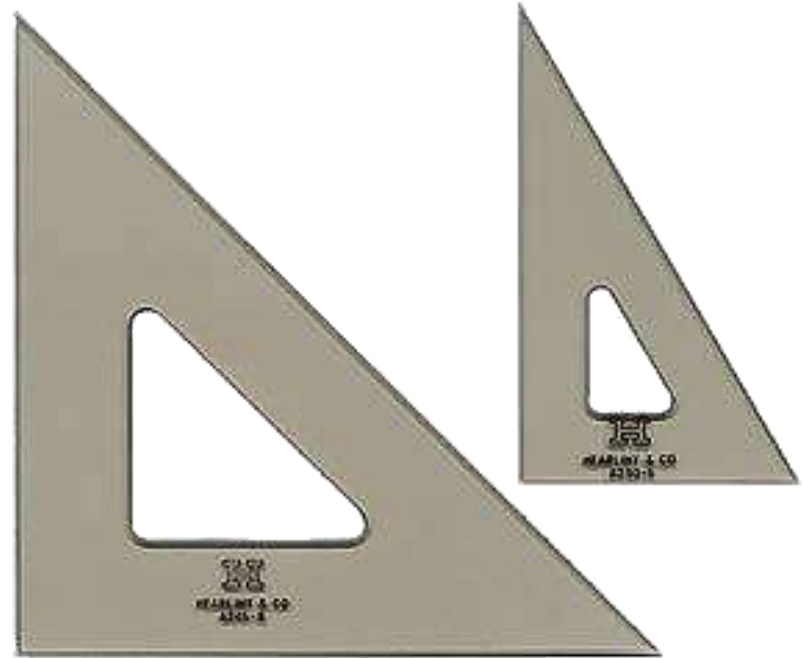
DRAWING TOOLS



DRAWING TOOLS



1. T-Square



2. Triangles

DRAWING TOOLS



3. Adhesive Tape



2H or HB for thick line
4H for thin line



4. Pencils

DRAWING TOOLS



5. Sandpaper

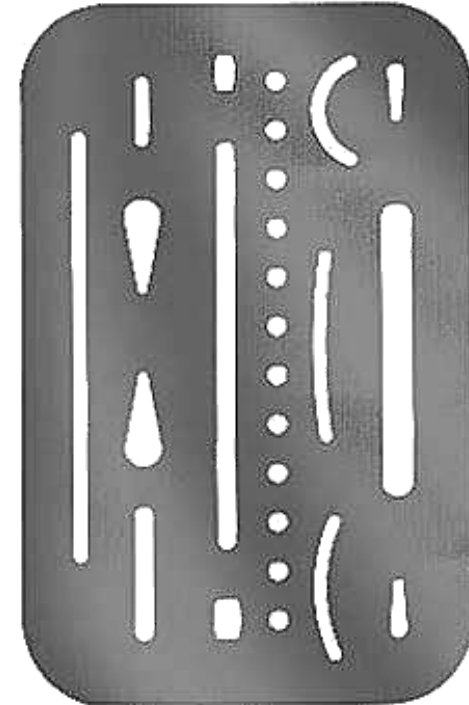


6. Compass

DRAWING TOOLS

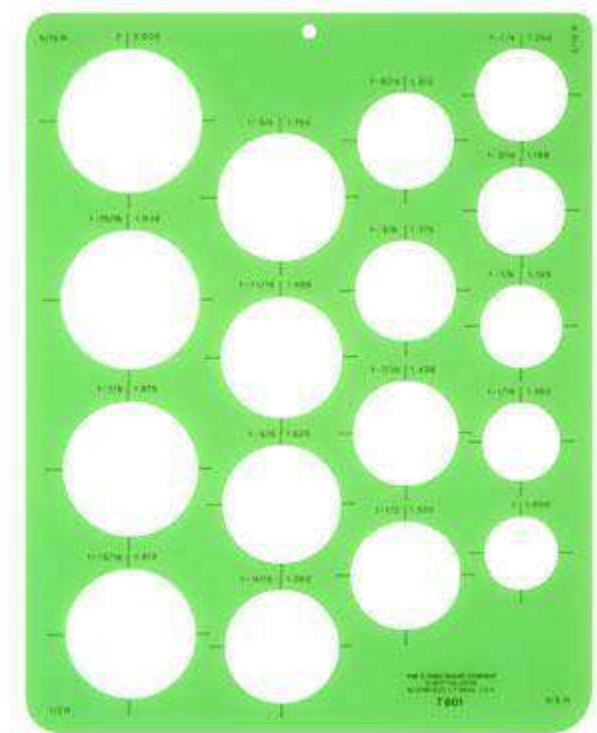


7. Pencil Eraser



8. Erasing Shield

DRAWING TOOLS

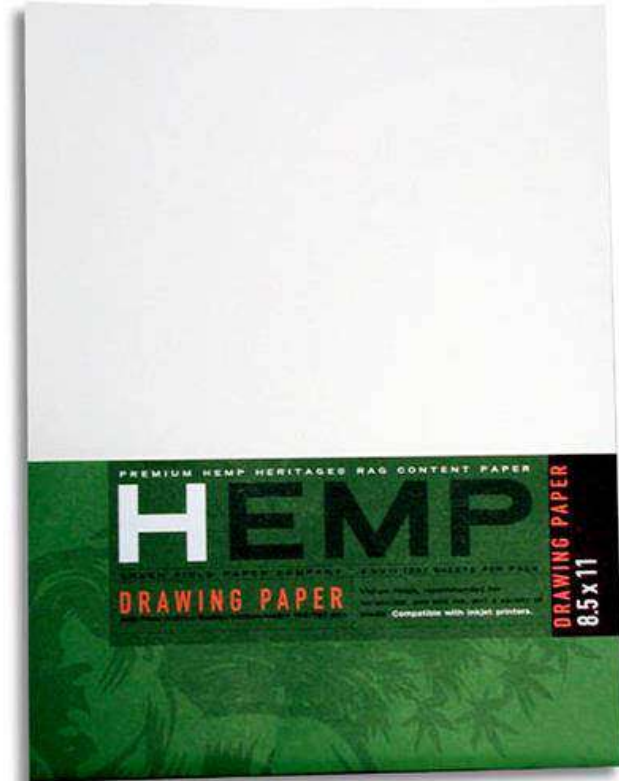


9. Circle Template



10. Tissue paper

DRAWING TOOLS



11. Sharpener

12. Clean paper

ABCDEFGHIJKLMNOPQRSTUVWXYZ

ABCDEFGHIJKLMNOPQRSTUVWXYZ

VWXYZABCDEF

Lettering

ABCDEFGHIJKLMNOPQRSTUVWXYZ

ABCDEFGHIJKLMNOPQRSTUVWXYZ

VWXYZABCDEF

Text on Drawings

Text on engineering drawing is used :

- To communicate nongraphic information.
- As a substitute for graphic information, in those instance where text can communicate the needed information more clearly and quickly.

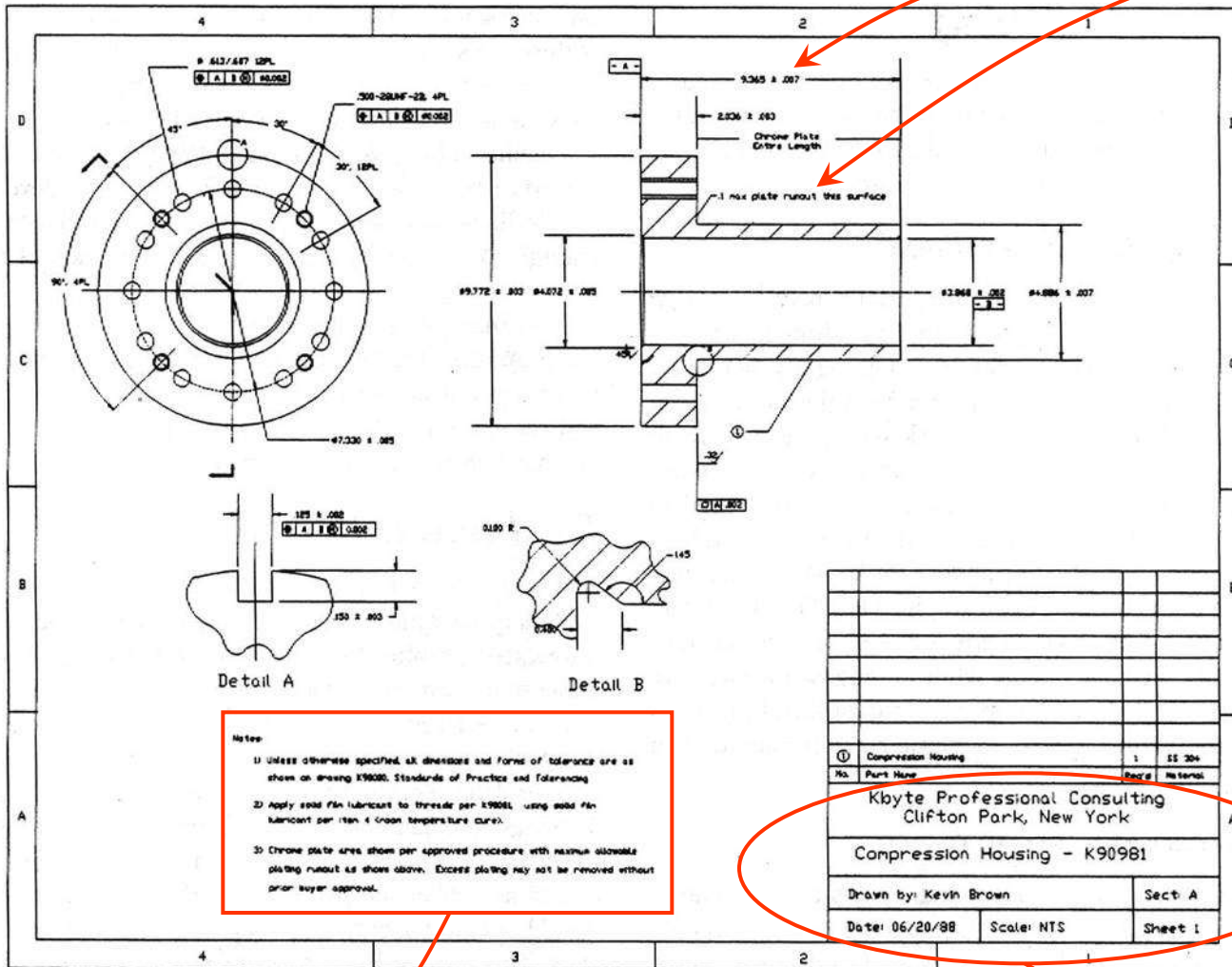
Thus, it must be written with

Legibility - shape
- space between letters and words

Uniformity - size
- line thickness

Example Placement of the text on drawing

Dimension & Notes



Notes

- 1) Unless otherwise specified, all dimensions and forms of tolerance are as shown on drawing K9080. Standards of Practice and Tolerancing
- 2) Apply gold film lubricant to threads per K9081, using gold film lubricant per item 4 (room temperature cure).
- 3) Chrome plate area shown per approved procedure with maximum allowable plating runoff as shown above. Excess plating may not be removed without prior buyer approval.

No.	Part Name	QTY	Material
1	Compression Housing	1	SS 304

Kbyte Professional Consulting
Clifton Park, New York

Compression Housing - K909B1

Drawn by: Kevin Brown Sect. A

Date: 06/20/88 Scale: NTS Sheet 1

Notes

Title Block

Lettering Standard

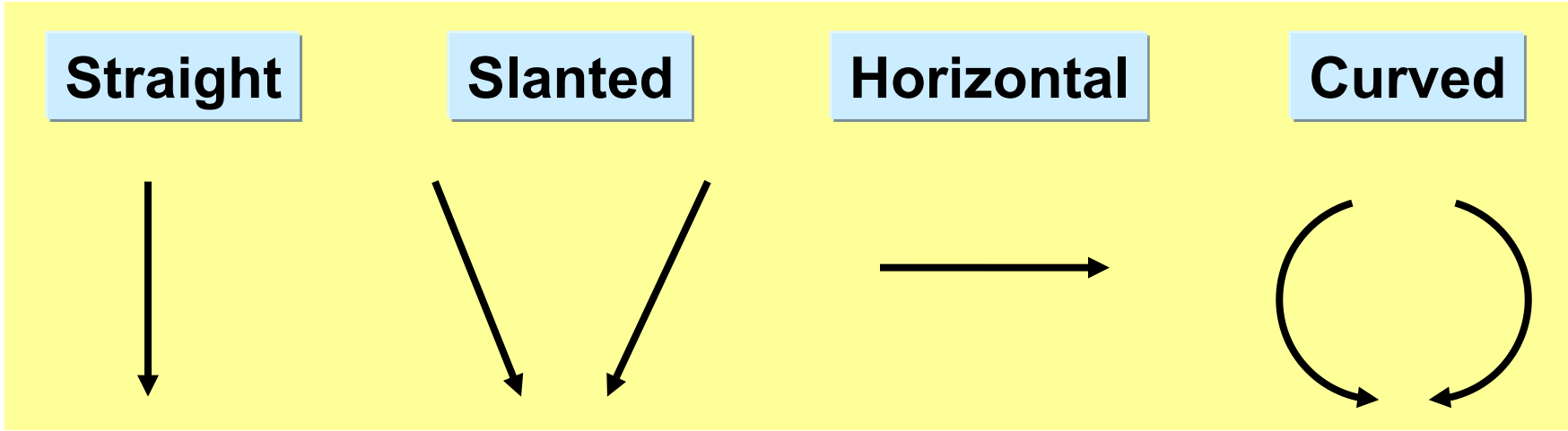
ANSI Standard

- Use a Gothic text style, either inclined or vertical.
- Use all capital letters.
- Use 3 mm for most text height.
- Space between lines of text is **at least** 1/3 of text height.

This course

- Use only a vertical Gothic text style.
- Use both capital and lower-case letters.
- Same. For letters in title block it is recommend to use 5~8 mm text height
- N/A.
Follows ANSI rule.

Basic Strokes

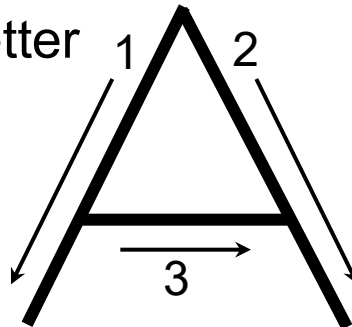


Examples : *Application of basic stroke*

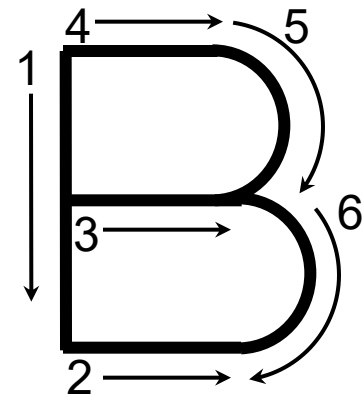
“I” letter



“A” letter

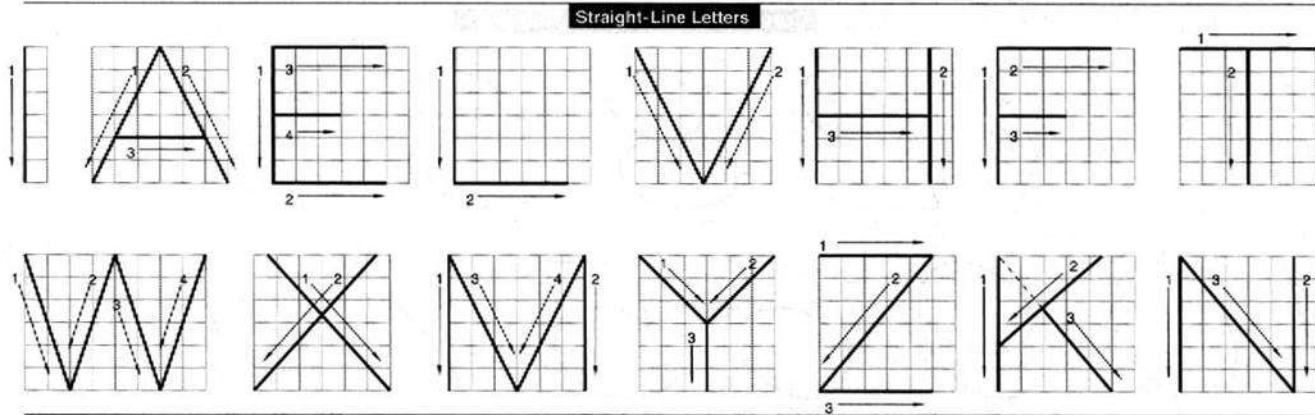


“B” letter

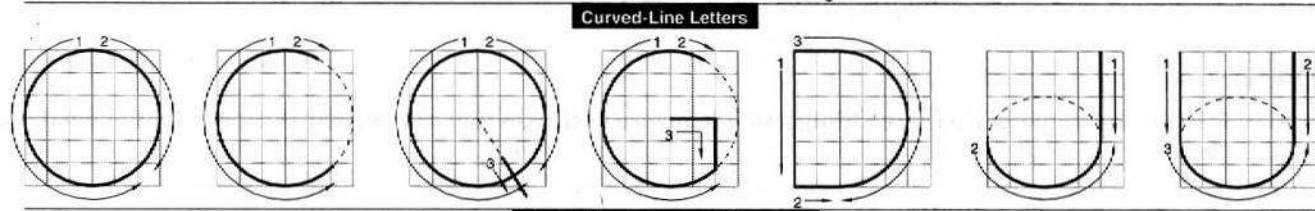


Upper-case letters & Numerals

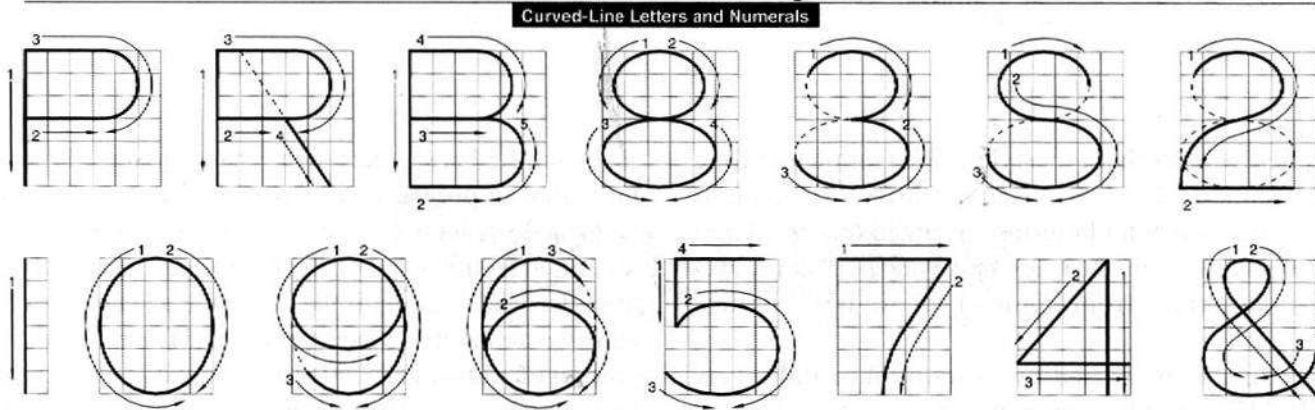
Straight line letters



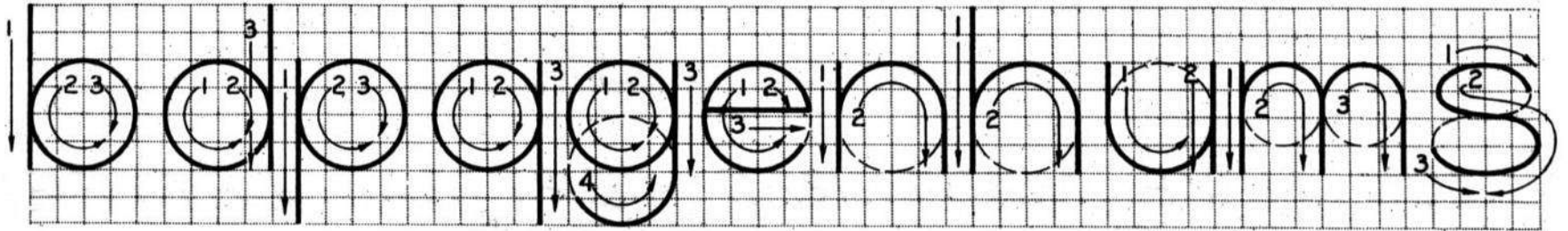
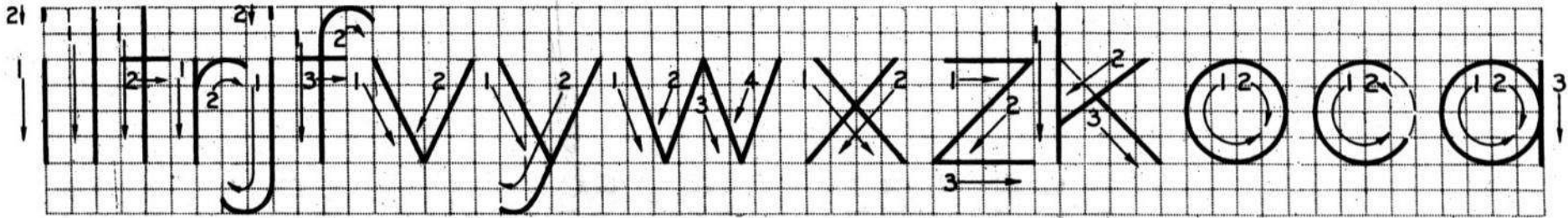
Curved line letters



Curved line letters & Numerals



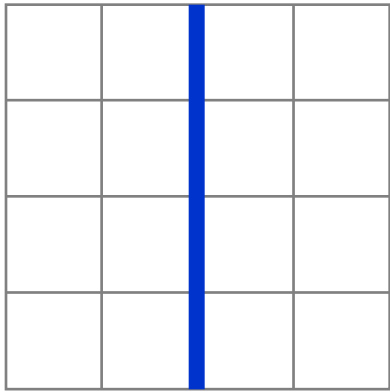
Lower-case letters



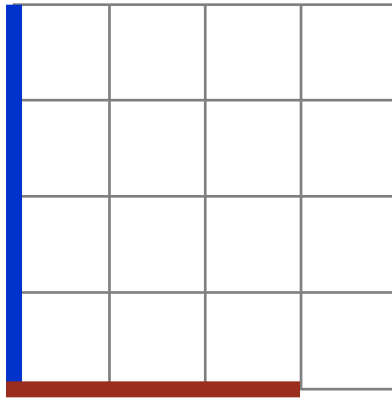
- The text's body height is about $2/3$ the height of a capital letter.

Stroke Sequence

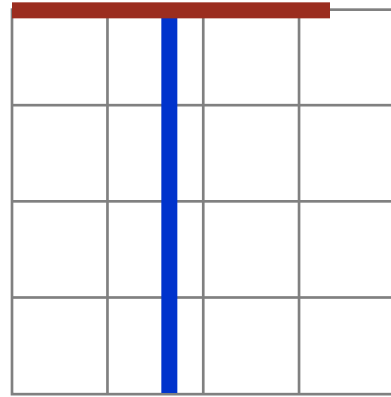
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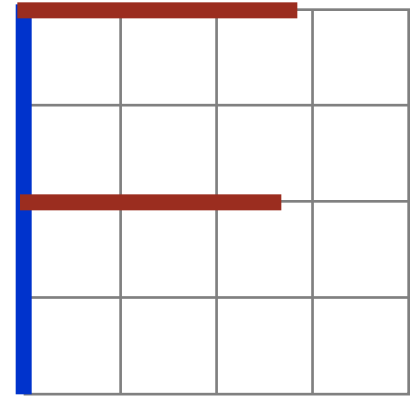
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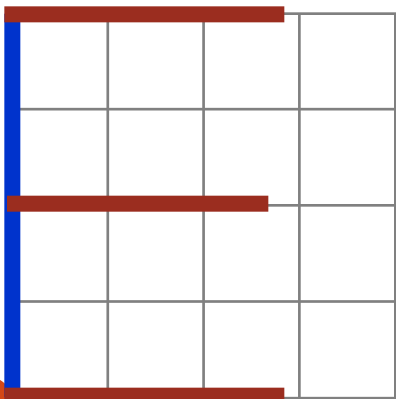
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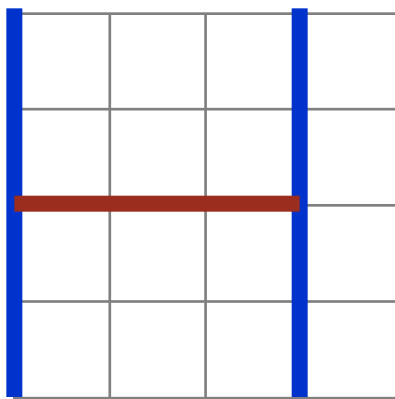
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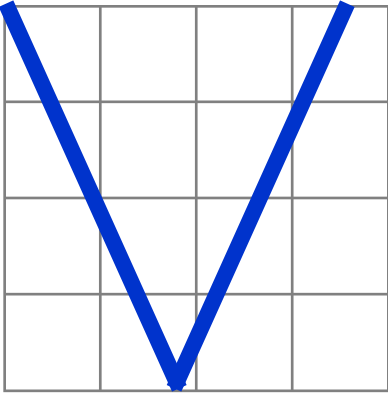


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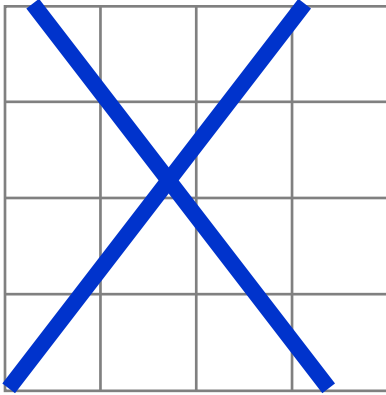


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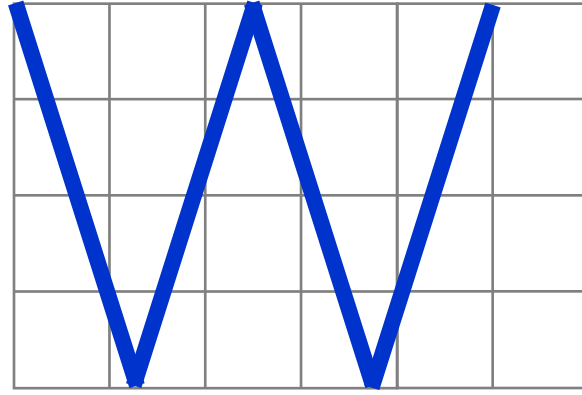
V



X

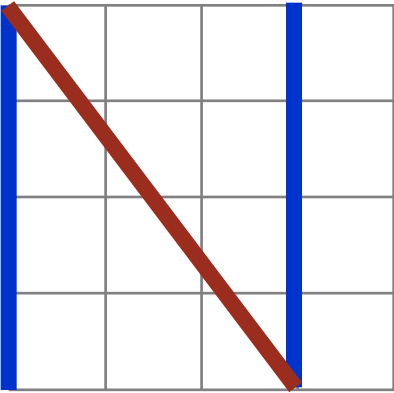


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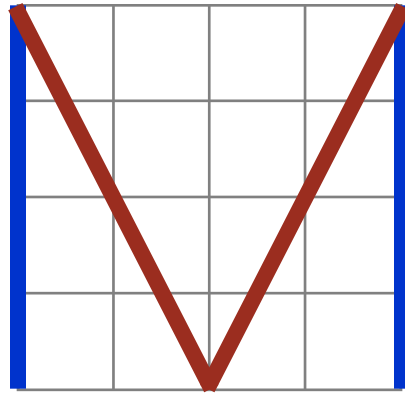


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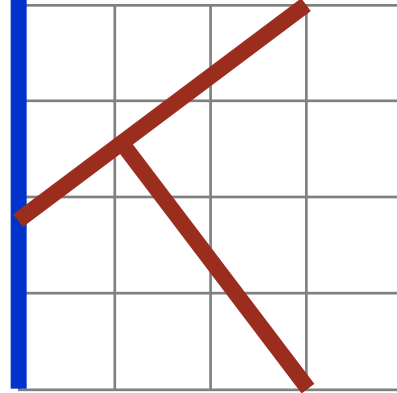
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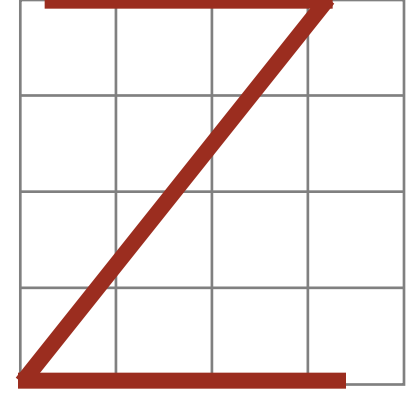
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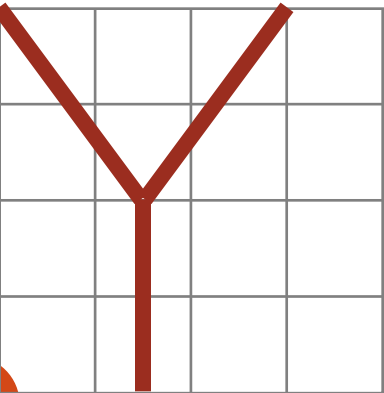
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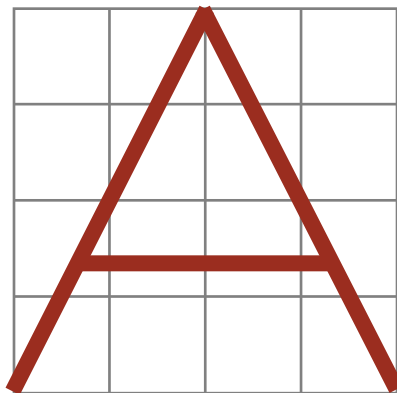
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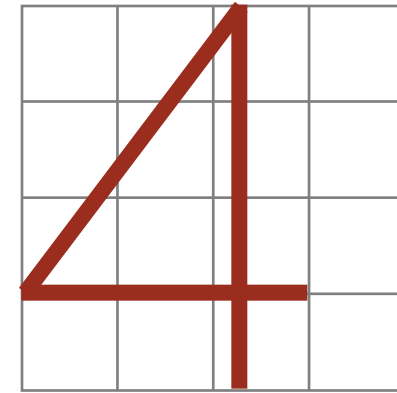
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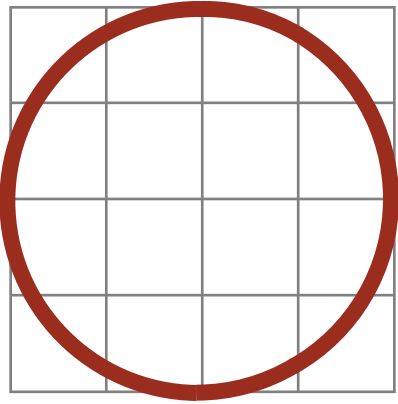


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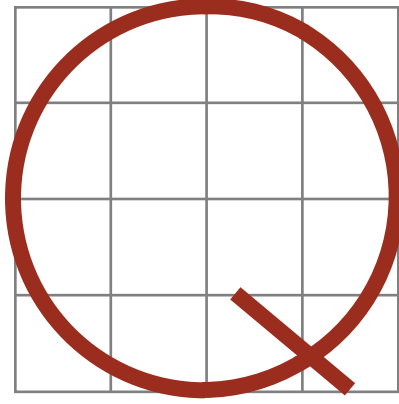


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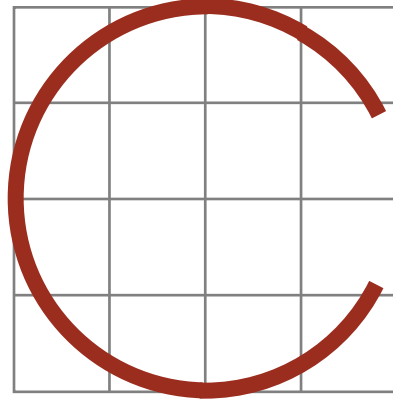
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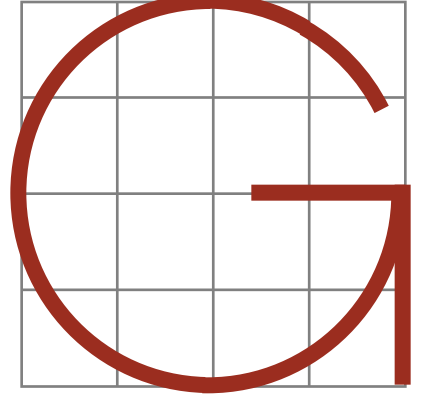
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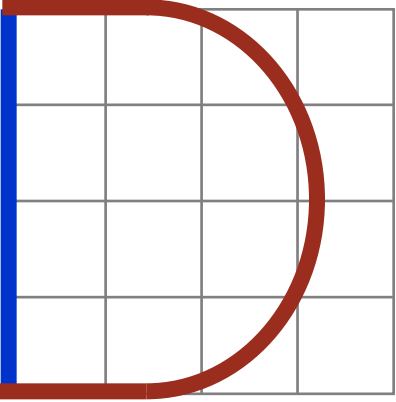


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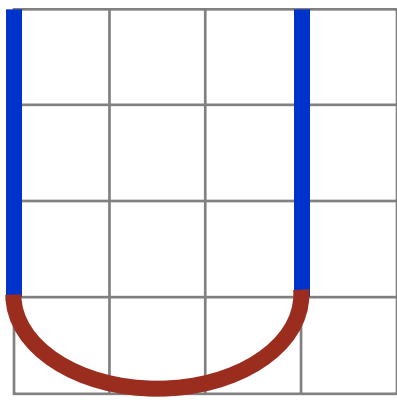


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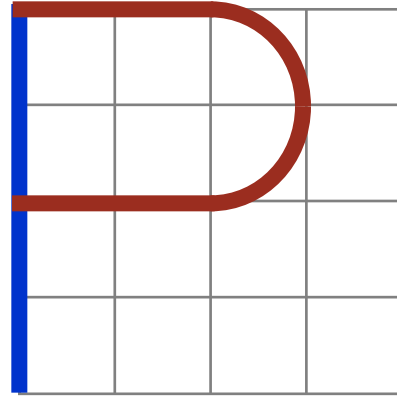
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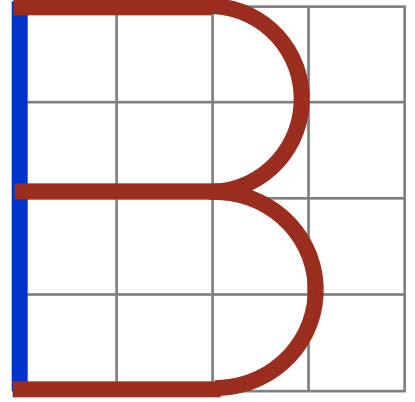
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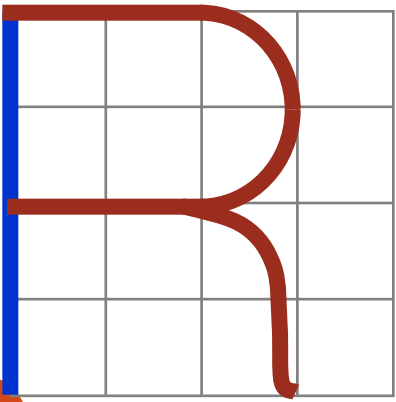
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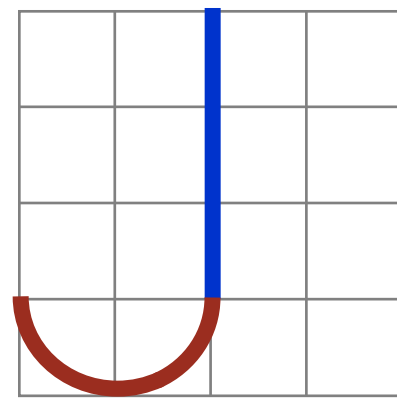
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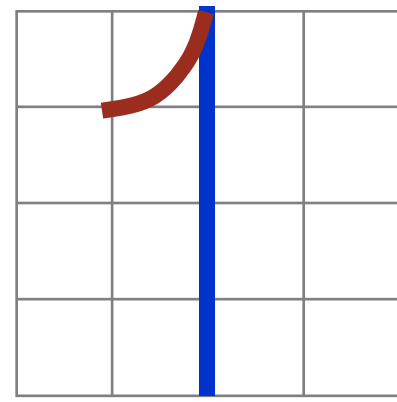
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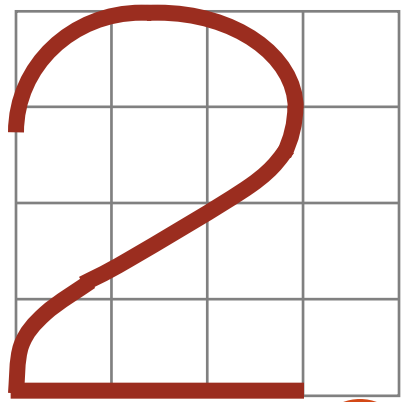
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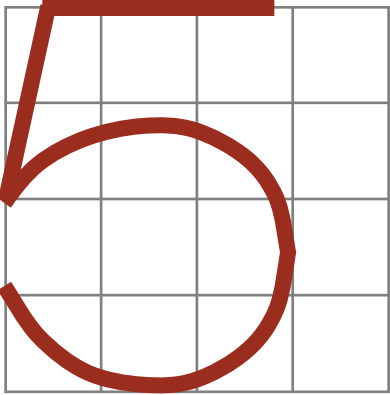


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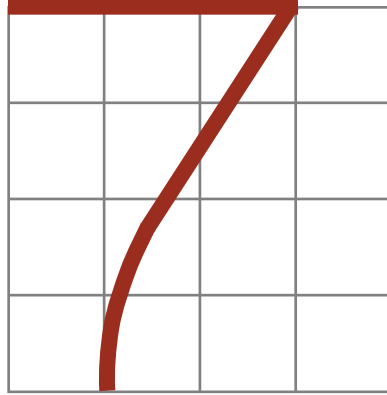


Stroke Sequence

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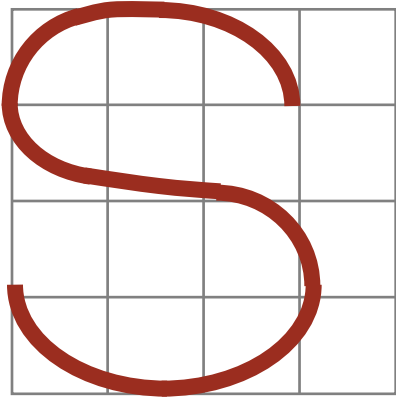


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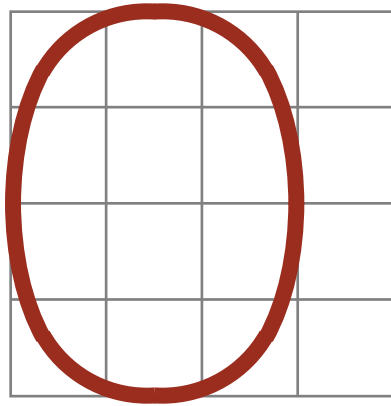


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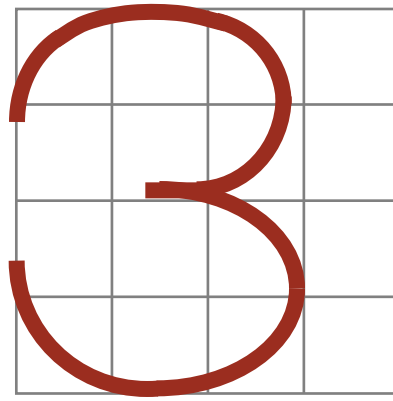
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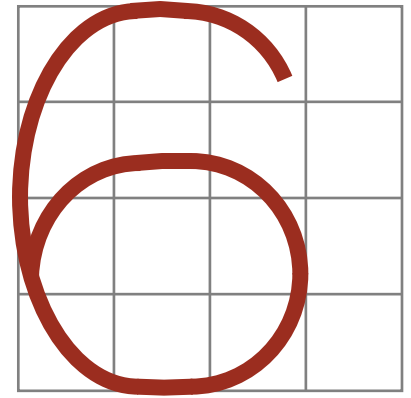
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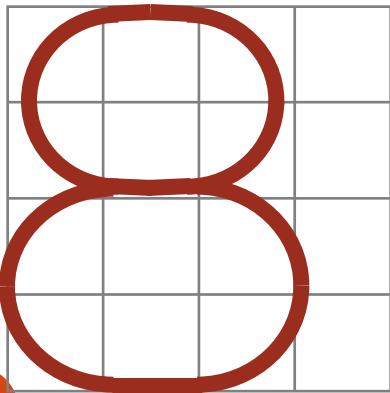
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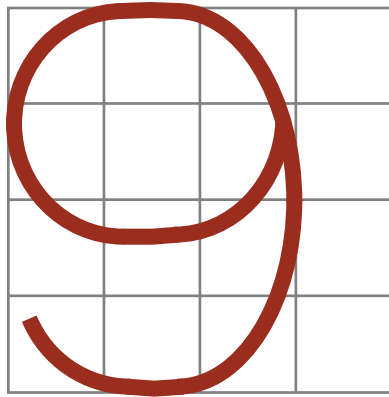
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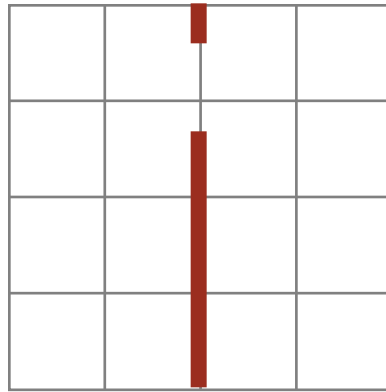
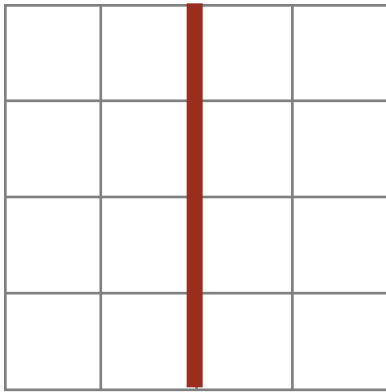
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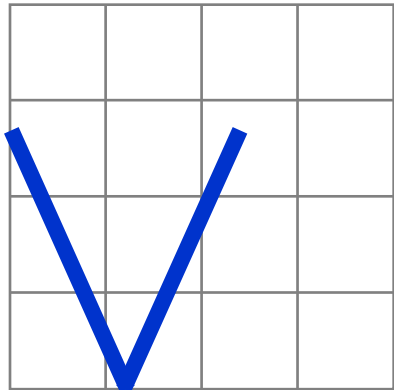


Stroke Sequence

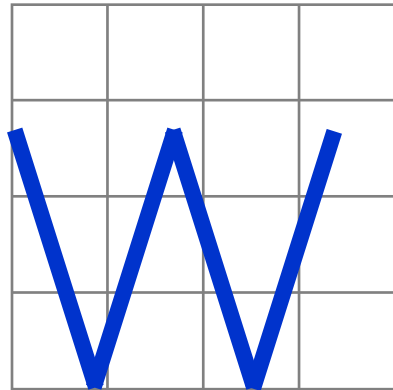


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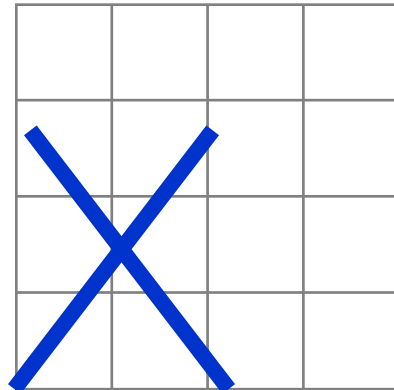
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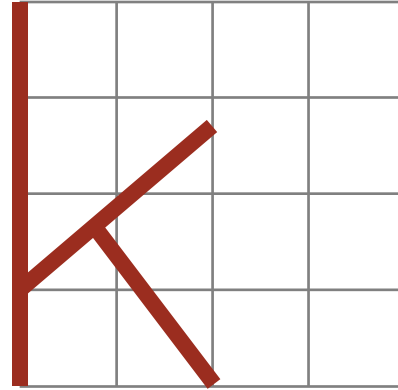
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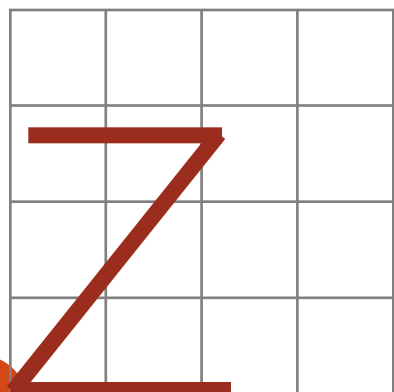
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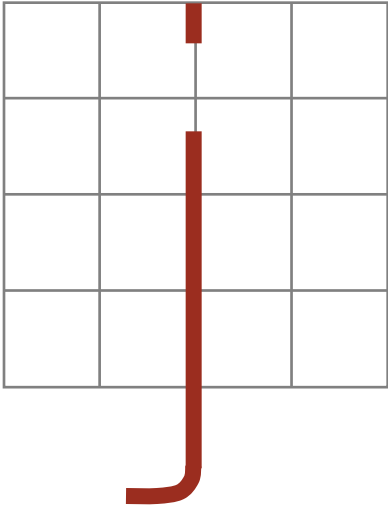


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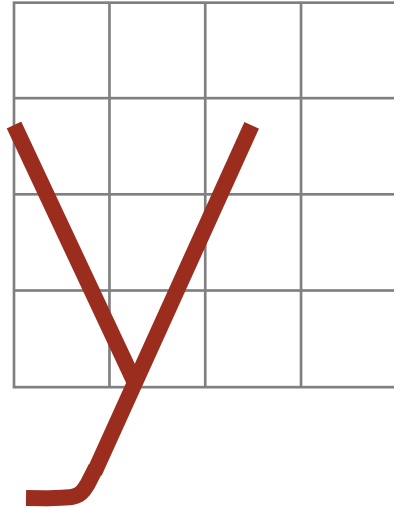


Stroke Sequence

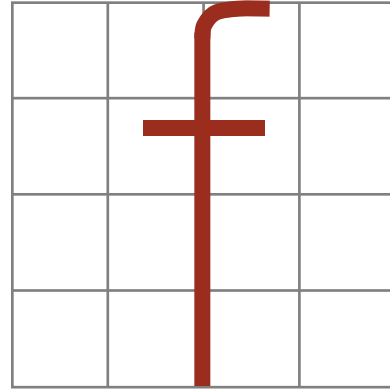
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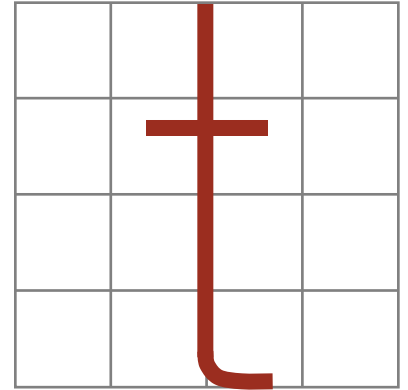
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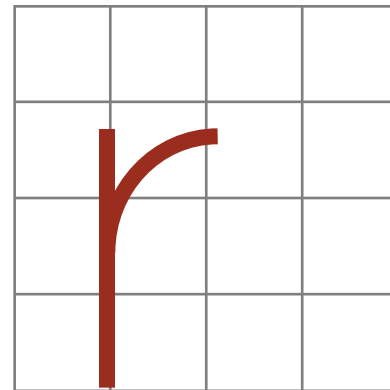
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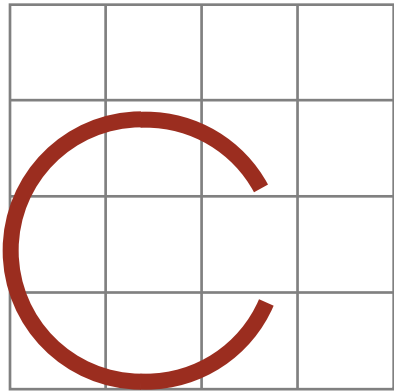


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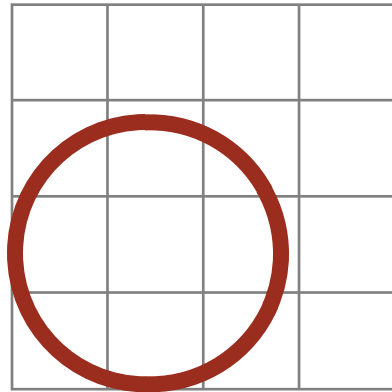


Stroke Sequence

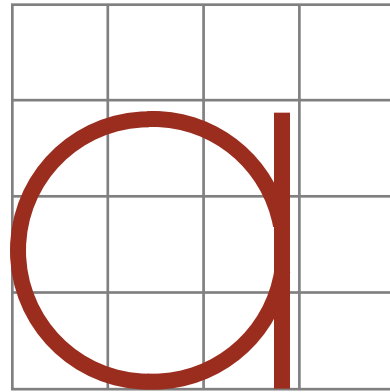
c



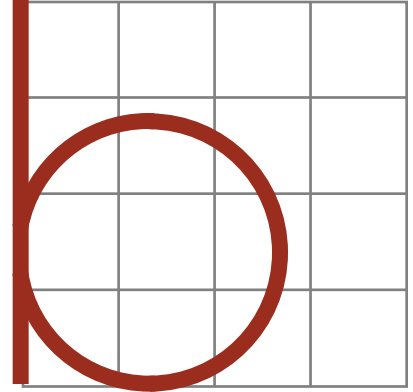
o



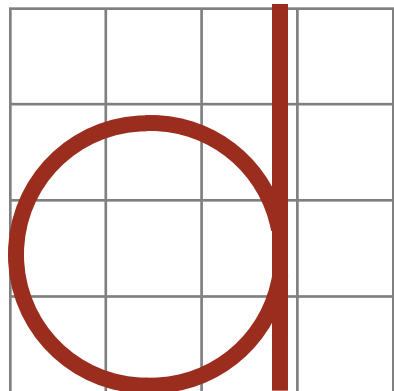
a



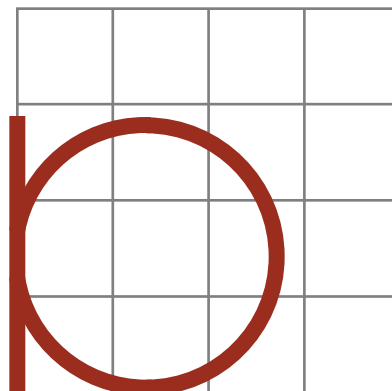
b



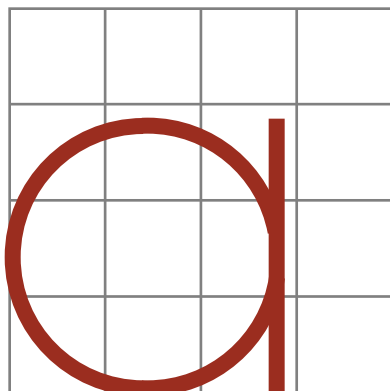
d



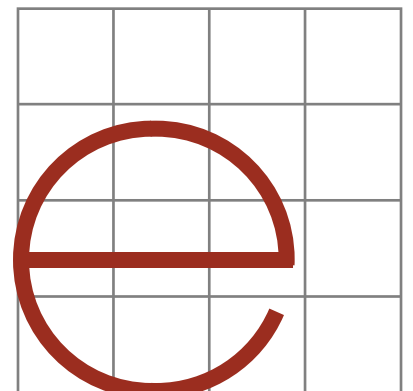
p



q

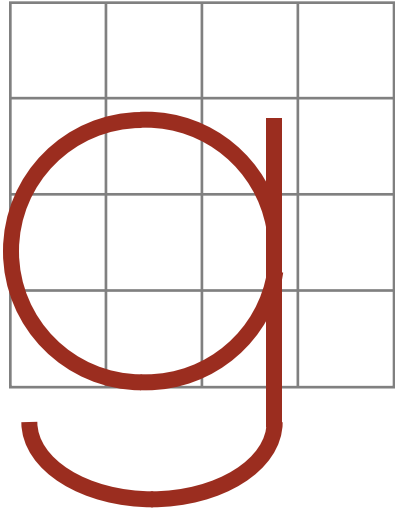


e

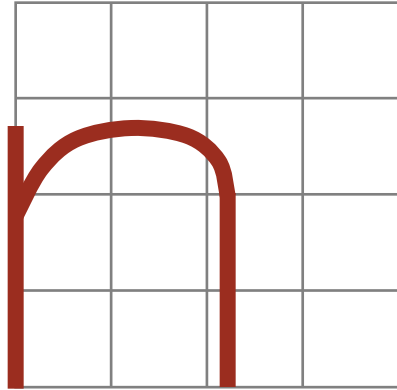


Stroke Sequence

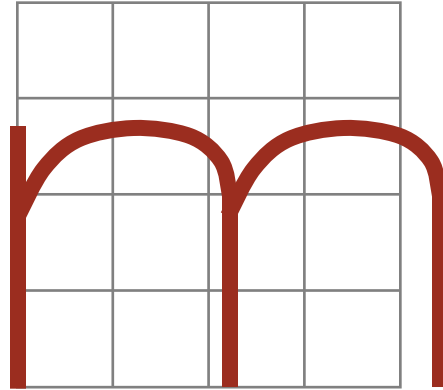
g



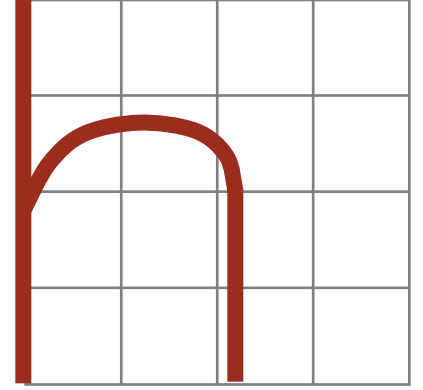
n



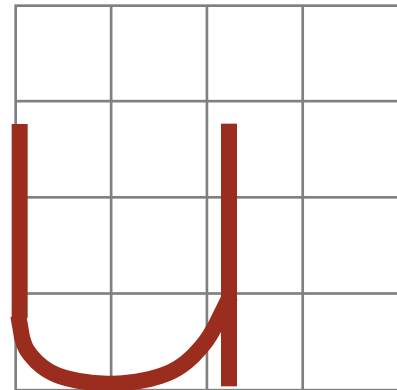
m



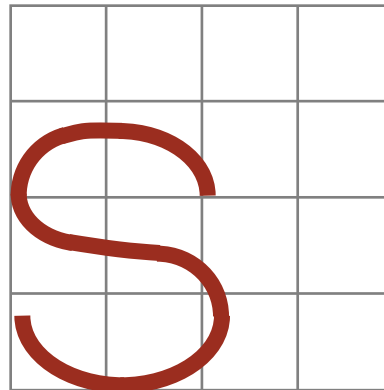
h



u



s



Word Composition

Look at the same word having different spacing between letters.

A) Non-uniform spacing

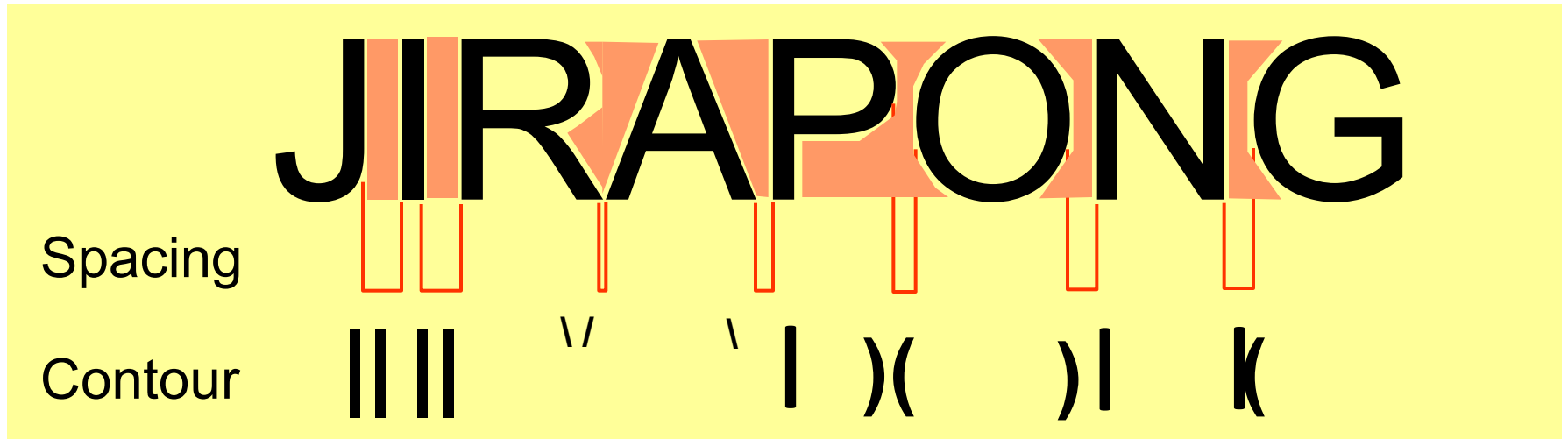
JIRAPONG

B) Uniform spacing

JIRAPONG

Which one is easier to read ?

Word Composition

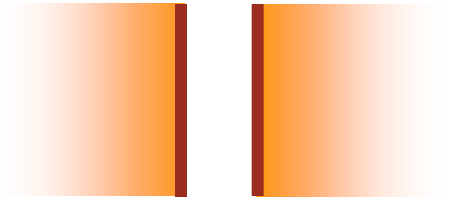


General conclusions are:

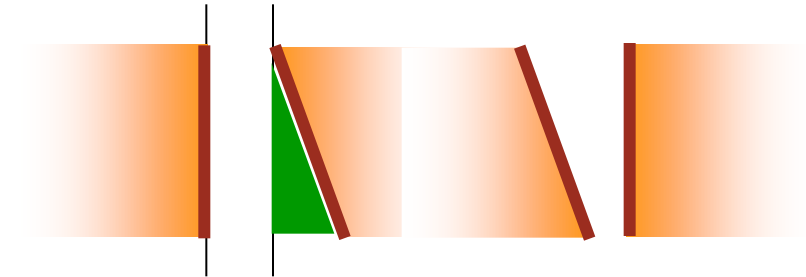
- Space between the letters depends on the contour of the letters at an adjacent side.
- Good spacing creates approximately equal **background area** between letters.

Space between Letters

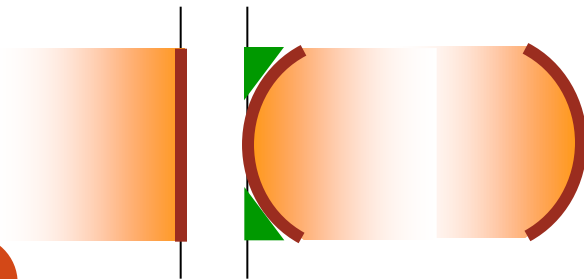
1. Straight - Straight



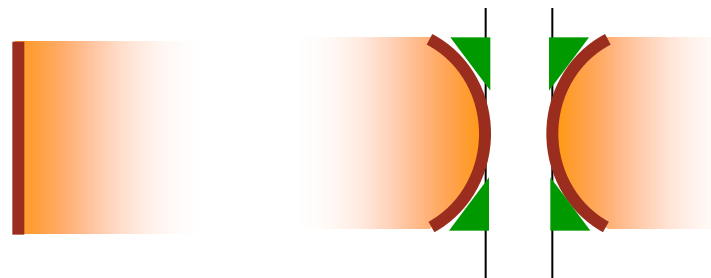
3. Straight - Slant



2. Straight - Curve

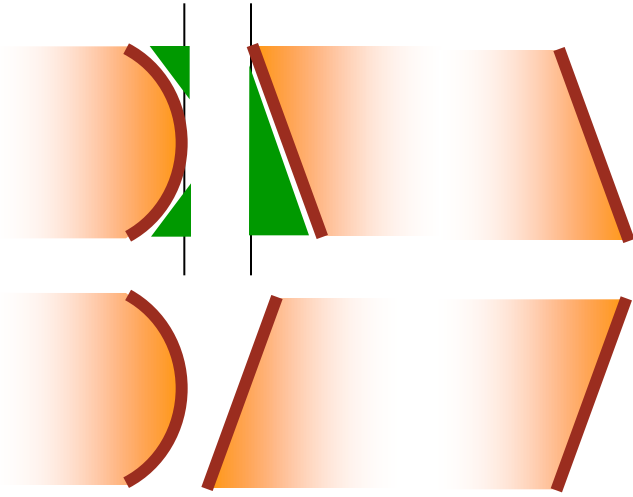


4. Curve - Curve

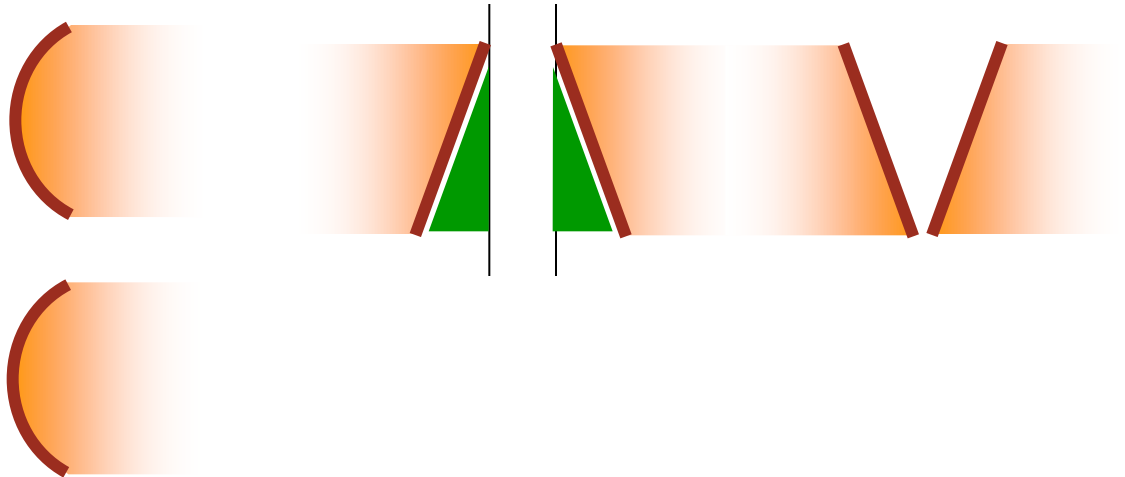


Space between Letters

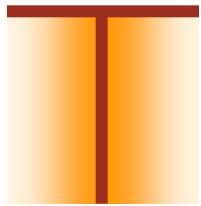
5. Curve - Slant



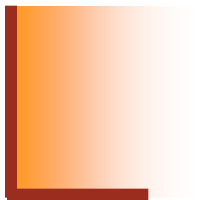
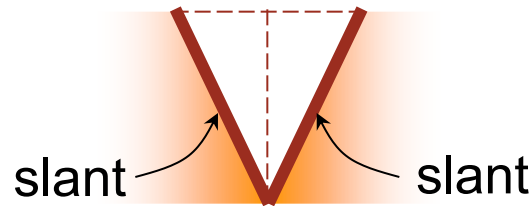
6. Slant - Slant



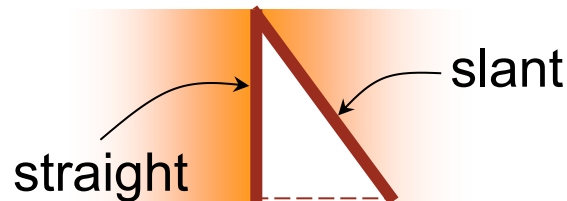
7. The letter "L" and "T"



≡



≡



Example : *Good and Poor Lettering*

ESTIMATE

GOOD

EstiMaTE

Not uniform in style.

ESTIMATE
ESTIMATE

Not uniform in height.

ESTIMATE
ESTIMATE

Not uniformly vertical or inclined.

ESTIMATE
ESTIMATE

Not uniform in thickness of stroke.

ESTIMATE

Area between letters not uniform.

ABILITY WILL NEVER CATCH UP
WITH THE DEMAND FOR IT

Area between words not uniform.

Sentence Composition

- Leave the space between words equal to the space requires for writing a letter “O”.

Example

ALL O DIMENSIONS O ARE O IN
MILLIMETERS O UNLESS
OTHERWISE O SPECIFIED.