ENGINEERING SERVICE DRAWING.

Technical drawing – is the language used by the engineers

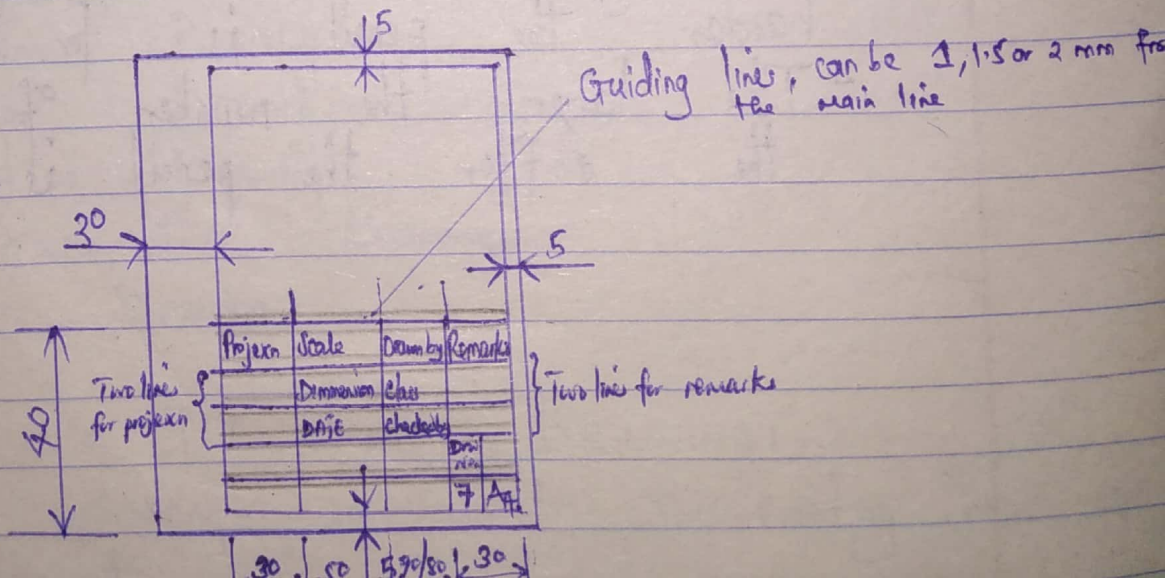
language. (Graphics / Diagrams). Three things to be considered when using this language includes:-

- Shape
- Size
- Surface quality / finish, fit, material.

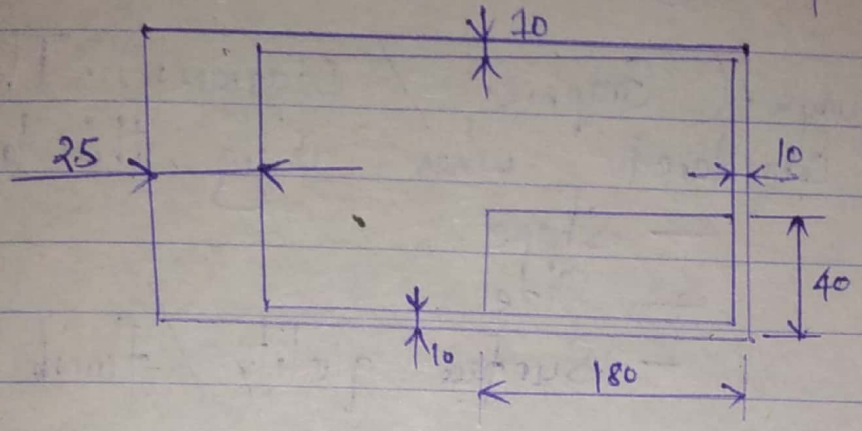
ISO Drawing papers.

Designation	length x Width. (mm)
A_0	1189 x 841
A_1	841 x 594
A_2	594 x 420
A_3	420 x 297
A_4	297 x 210
A_5	210 x 148
⋮	⋮

Title block



A_3 and A_2 should be placed horizontally. and the letters inside title block are written in capital letters and A_4 is placed vertically.



PENCILS.

- Hard pencils 2H, 3H etc used for starting or sketching (0.3mm thick lines).
- Medium pencils HB, B, H, F Used for the general purposes.
- Soft pencils 2B, 3B, 4B, 5B etc. used for outlining. (lines are 0.7mm thick)

Note:- The larger the number of the pencil, the harder the pencil is. for harder pencils.
- The larger the number of the soft pencils the softer the pencil is.

SCALE.

Eg. 1:1 means 1mm on drawing paper represents 1mm on the actual ~~drawing~~ object.

1:2 means 1mm on drawing paper is representing 2mm of the actual drawing. Meaning the drawing is half of the actual drawing. It is a reducing scale.

2:1 — It is the enlarged scale.
1:5
1:10

These are prefferable numbers (scale) in designing

PICTORIAL DRAWING.

Are drawings/figures having three measurements. They are sometimes reffered as the 3D.

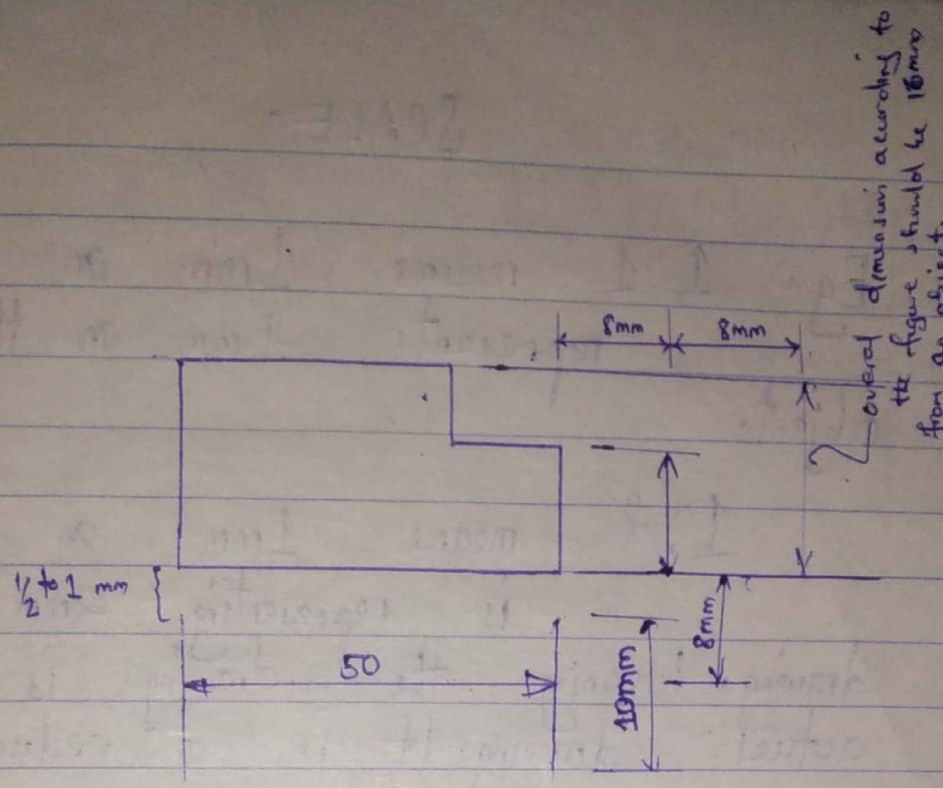
TYPES OF PICTORIAL DRAWING.

1. Isometric Drawings.
2. Oblique Drawings.
3. Perspective Drawings.
4. Axnometric Drawings.
5. Dimetric Drawings.

ISOMETRIC DRAWINGS.

Are drawings in which the reciding lines are drawn at 30°.

Example:



Steps for Isometric Drawing.

Make BOX = L X W X H

ORTHOGRAPHIC DRAWINGS.

Are drawings in which each view have only two measurements. Sometimes reffered to as 2D.

PROJECTION ANGLES.

1. 1st Angle projection.
   - In first angle projection always the plan is drawn below / beneath the view and whatever seen from LHS will be drawn to the right of the front view and whatever seen from RHS will be drawn to the left of the front view.
2. 3rd Angle projection.
   - In 3rd Angle projection always the plan is drawn on top of the front view. And whatever seen from your LHS is drawn

to the left. to the left of the front view and whatever seen from Rt is will be drawn to the right of the front view.

SECTION VIEWS.

Section views are views seen or observed after cutting the ~~section~~ object.

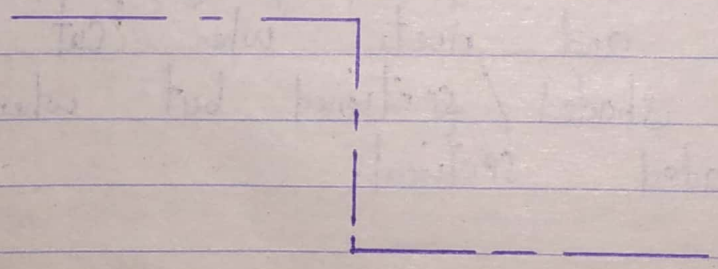
Why cut objects? Objects are cut for the purpose of showing clearly internal features.

TYPES.

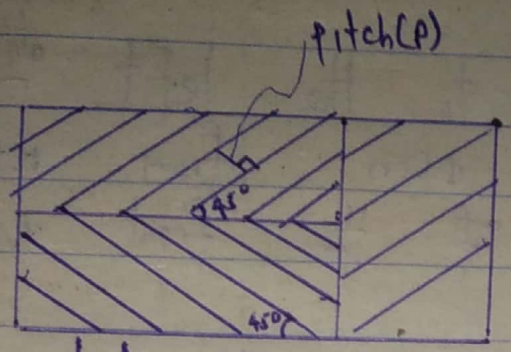
1. Full section
2. Half section
3. Partial section
4. Off set section
5. Aligned section
6. Revolved section.
7. Removed section

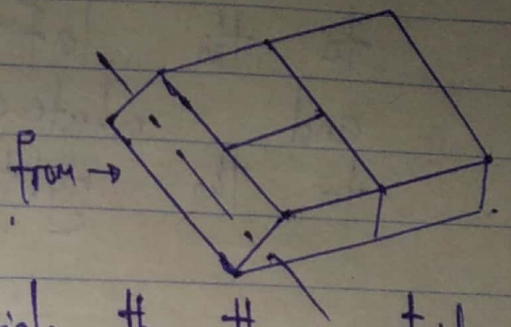
TOOLS.

① Cutting plane

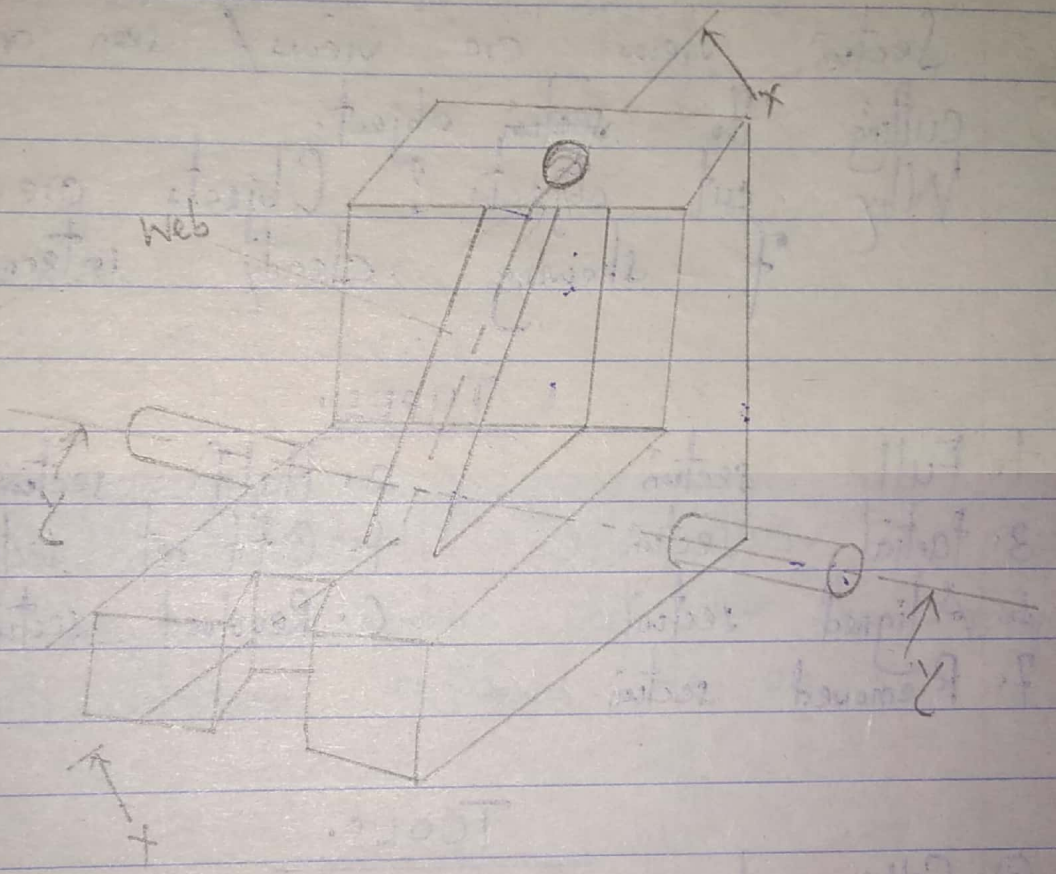


2. Sectioning / Hatching / shading lines
   - Always are drawn at 45°.
   - Must be parallel and equidistant.

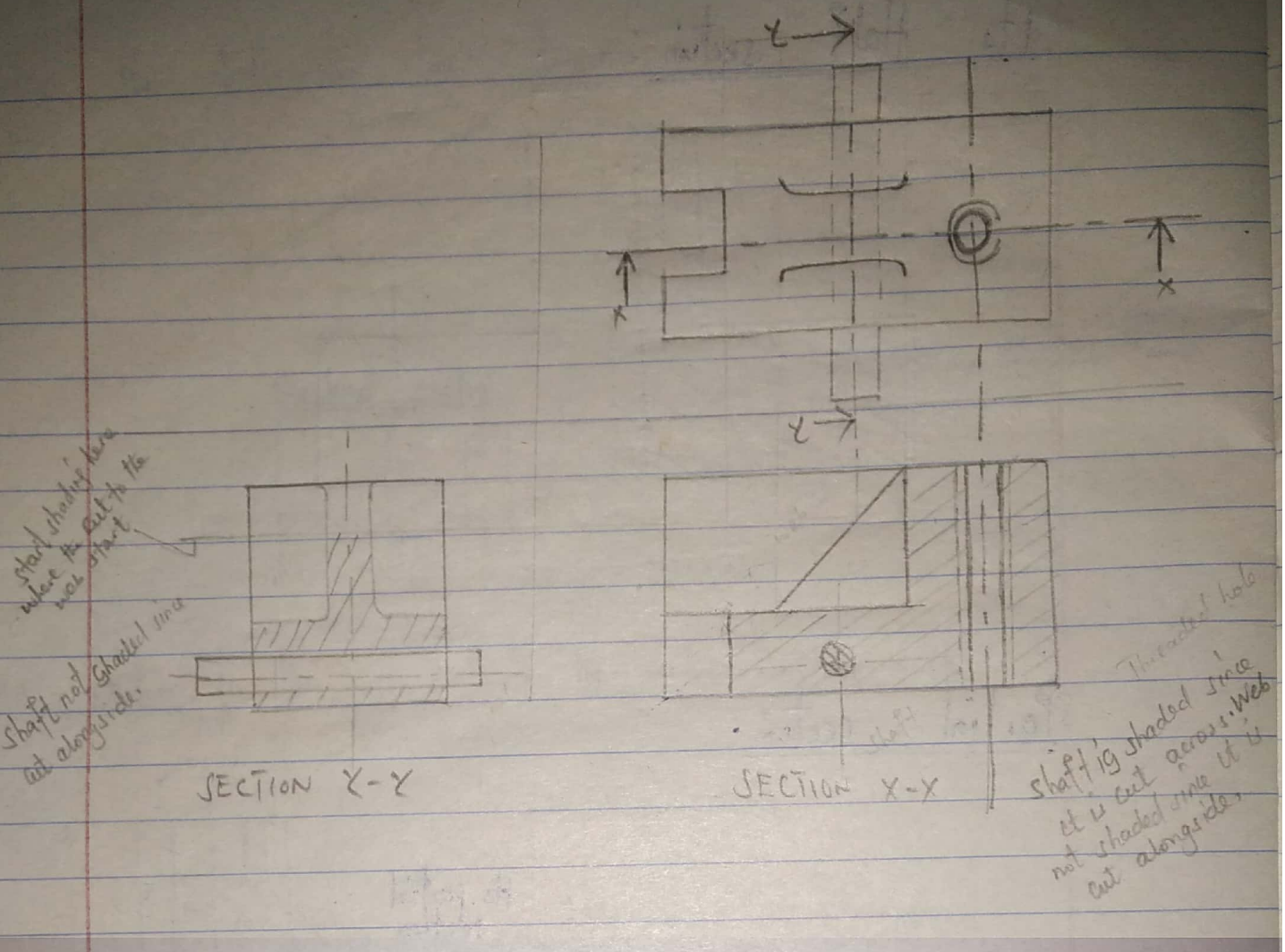




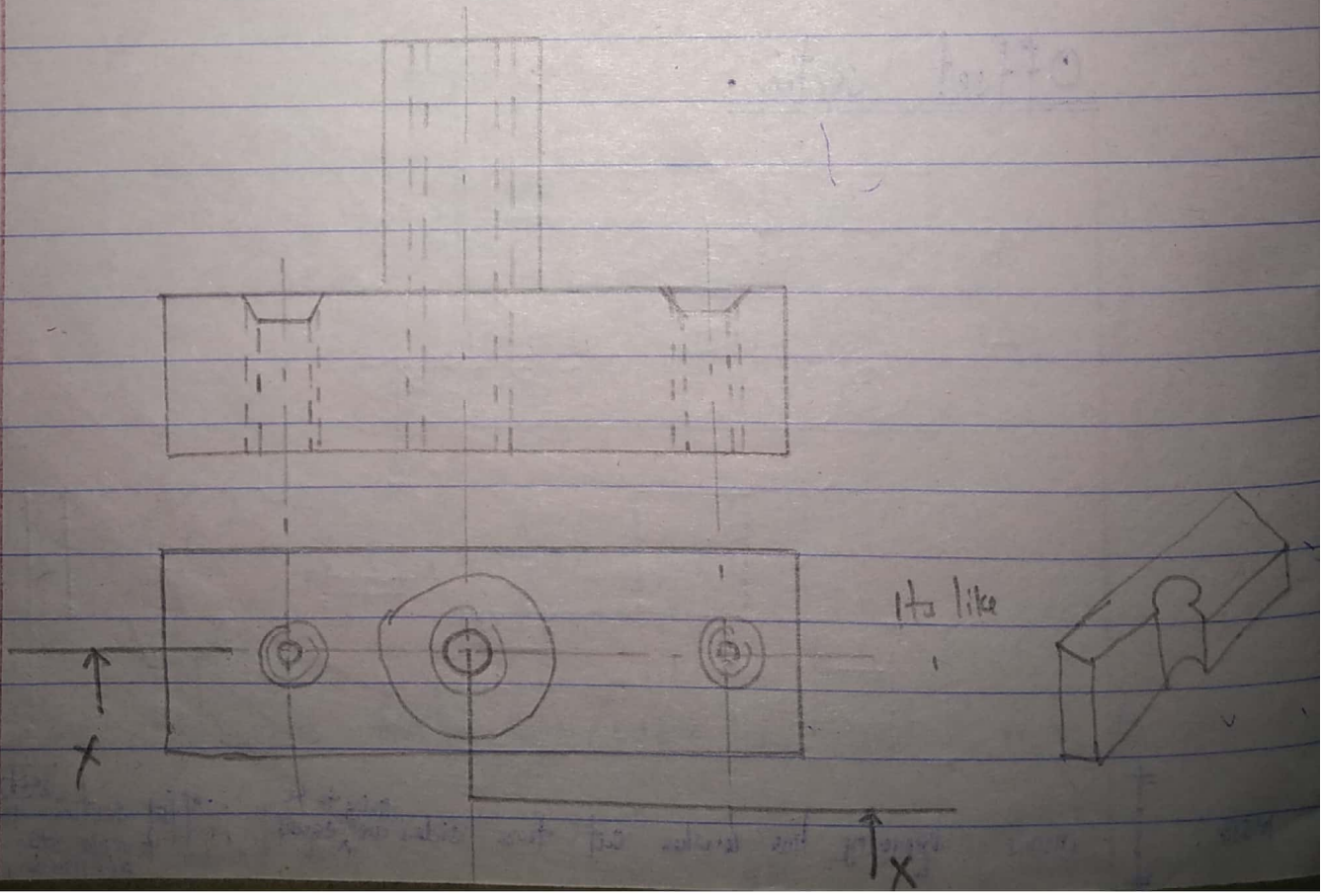
To differentiate the three materials the three materials are hatched differently, ie. In directions and pitch if directions used.



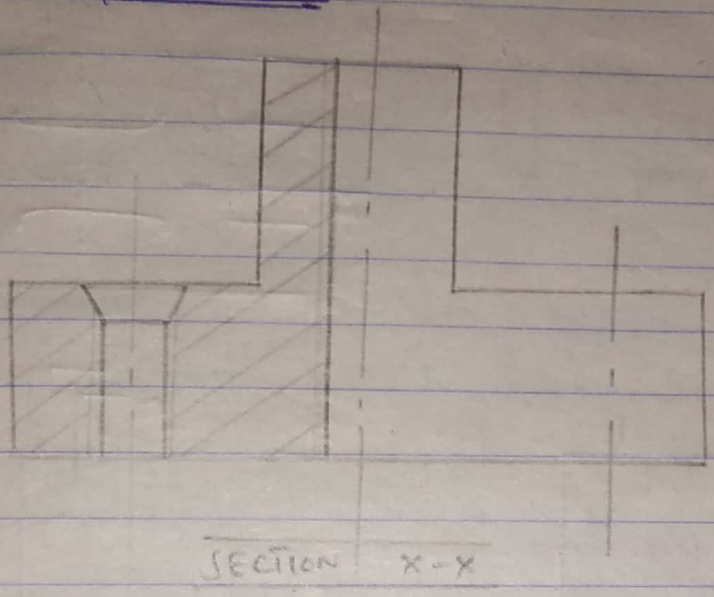
Laws ① Hidden lines are not shown in the sectioned views
② Webs / Ribs, shaft, keys, pins, bolts, studs, screw and rivets when cut along (lengthwise) are not shaded / sectioned but when cut across are shaded sectional.



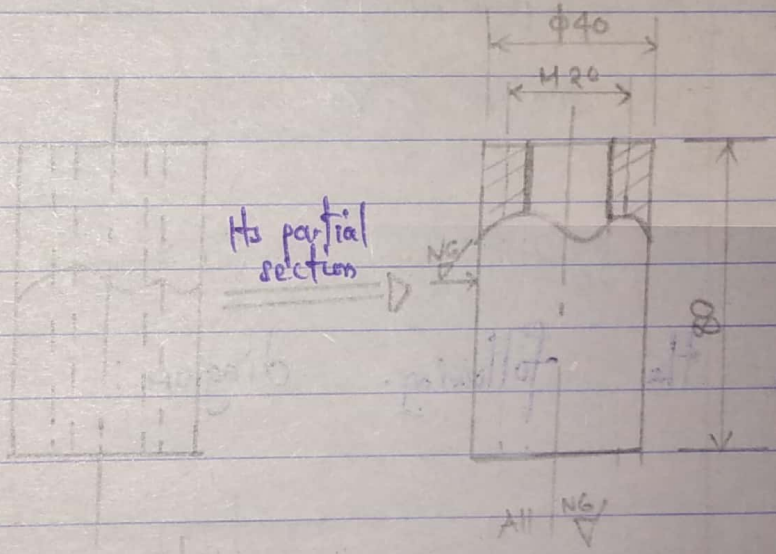
Given the following diagram:



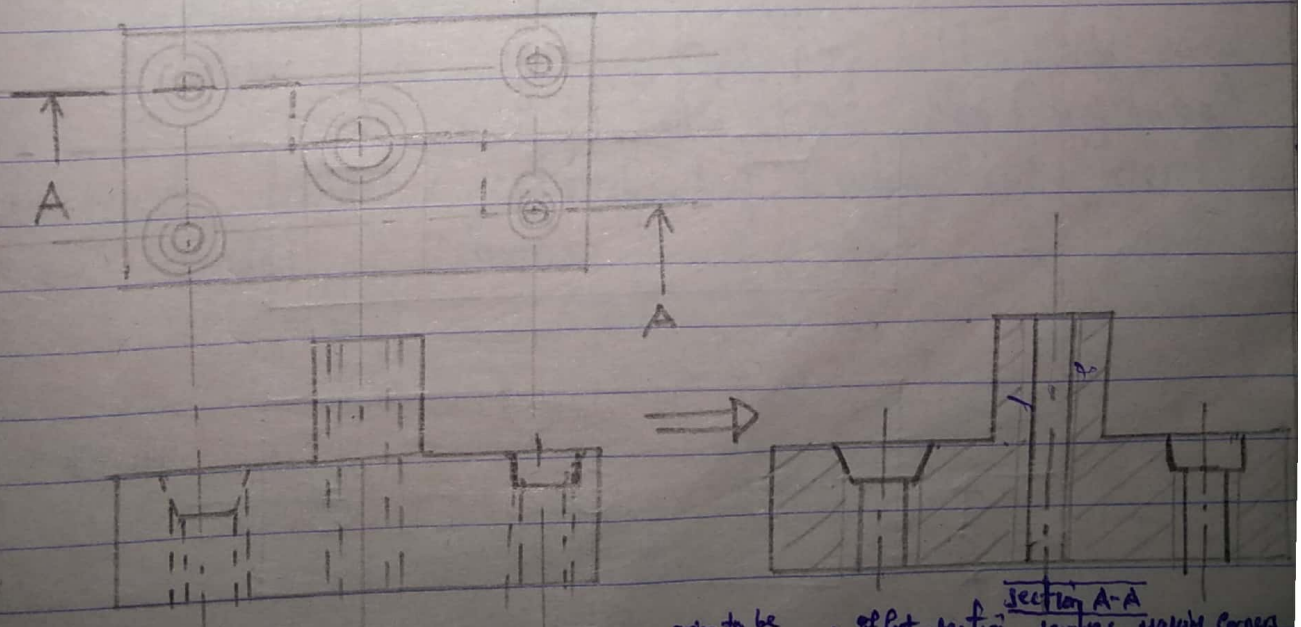
Its Half section:



Partial section:



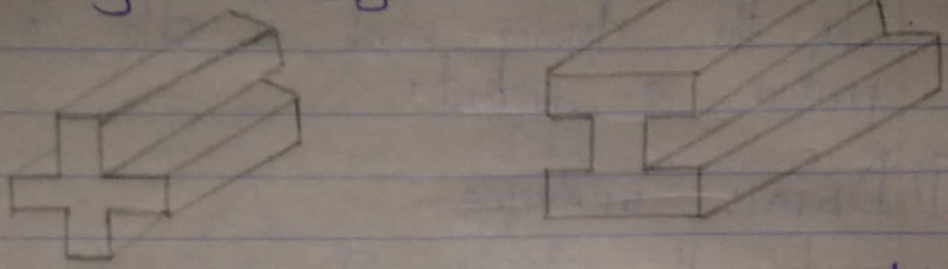
Offset section:



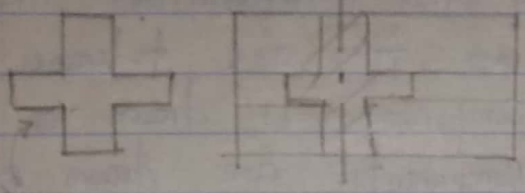
Note: ⊕ means symetry line which cut two sides are going to be equal

- offset section involves making corners to make other things visible and avoid obstructions.

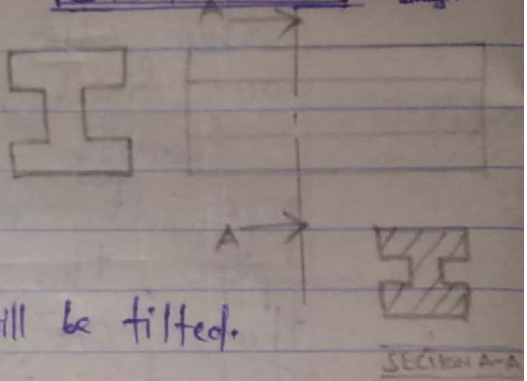
Consider the following two diagrams:



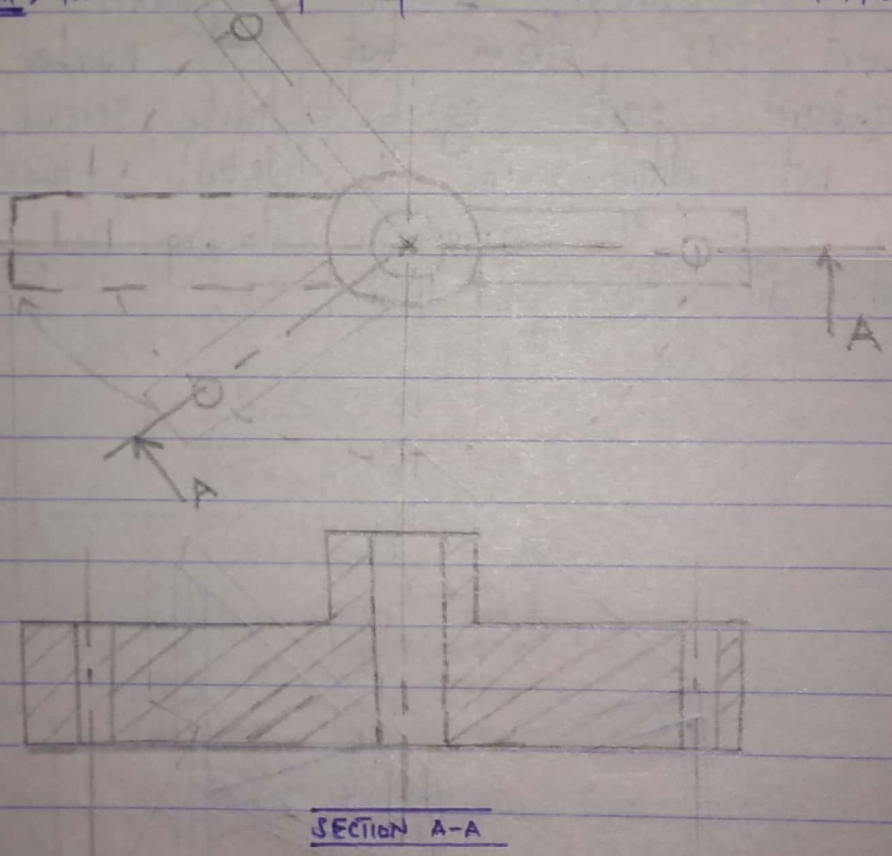
Revolved section



Removed section: maybe when the space is not enough.



Align section: In this part of the section will be tilted.



SECTION A-A

The dimension was not really there as it is to the vision we have to align/project it.

Note: In align section: You can give true shapes/vision when object is ⊥r to the observation

— Counter sink holes to receive screw of tapered head

— Counter bored hole to receive the or screws of parallel head.

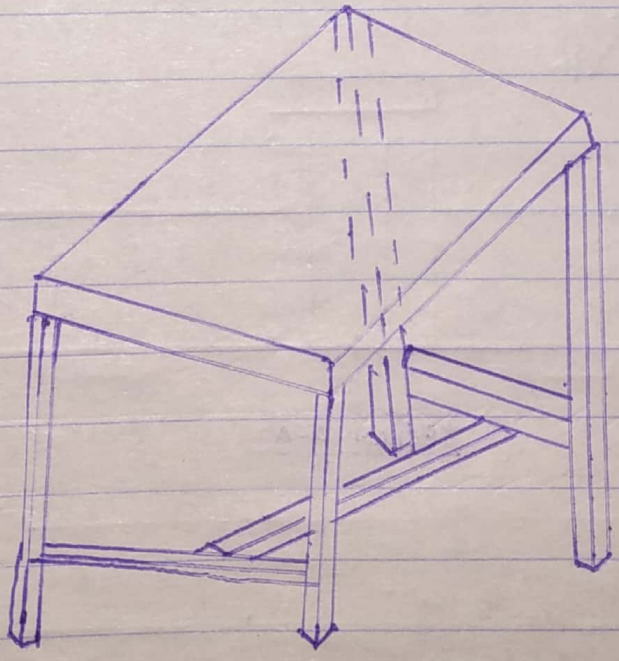
WORKING DRAWING.

Is the drawing which is able to help a drawing to produce a product.

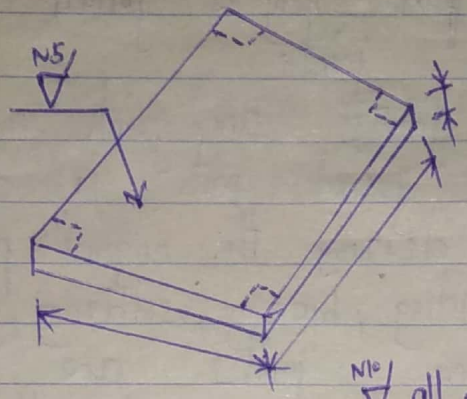
① DETAIL DRAWING

Is the drawing of a single component showing shape, size and other informations like material, surface finish, dimensions, fits and tolerance etc.

Normally each component is drawn on its separate paper; if many components are drawn on a single paper, they must be separated by a frame. When there are many similar components only one component is drawn but its number is stated. Standard parts eg. bolts, nuts, screws, bearings etc are not drawn in the detail drawing but are shown in the assembly drawing and their quantity stated in the part list.



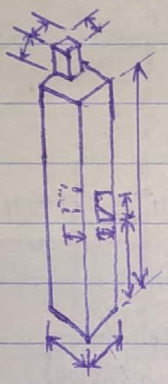
1/3 detail drawing.



N10 all over except where stated (indicated)

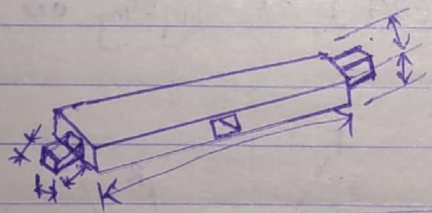
TOP 1 OFF 1 — (3-5) mm

MATL WOOD



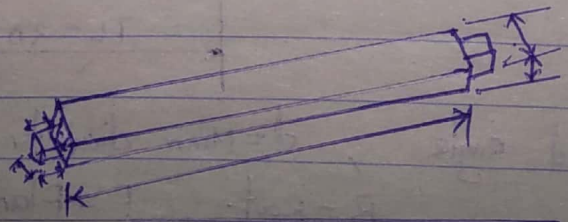
LEG 1 OFF 4

MATL WOOD



END SUPPORT 1 OFF 2

MATL WOOD



CENTRAL SUPPORT 1 OFF 1

MATL WOOD

JOINTS.

Machine parts may be joined together by a permanent or a Temporary joint.

Permanent joints are joints in which if you want to separate the joined parts is difficult and sometimes you might destroy the original parts. Permanent joints include welding, brazing, soldering, glueing, etc

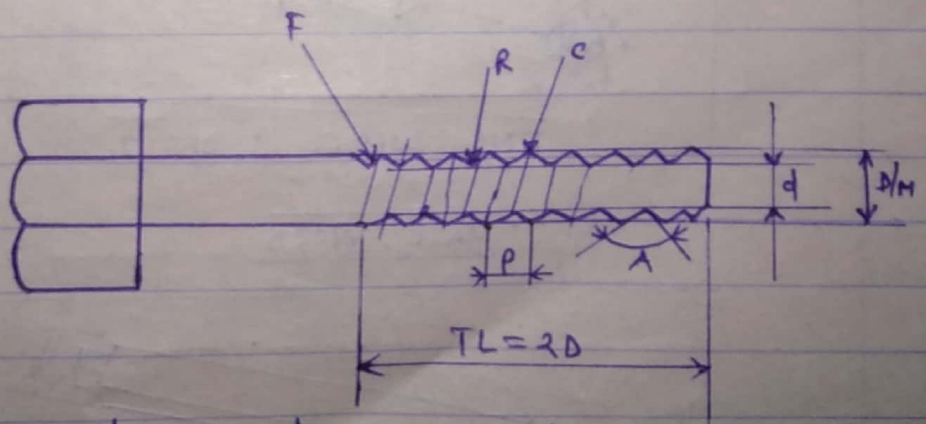
Temporary joints are joints in which if you want to separate the joined parts it is easily. Temporary joints includes bolts and nuts, screws, studs, pins, keys etc

THREADS.

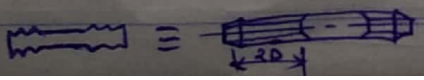
Are helical grooves cut around a round body

TYPES.

1. Metric threads (60°) for general use
2. Square threads (90°) for lifting heavy loads eg. Mechanical jacks
3. ACME (29°) for transmission eg. lathe lead screw.
4. Buttruss threads (47°) for tighting one direction eg. bench vice.



where A = Thread angle, d = Minor diameter, D = Major diameter
C = Crest, R = Root, F = Flank, P = Pitch, TL = Thread length

Stud 

If Pitch P = 1.5 and size of bit M20.

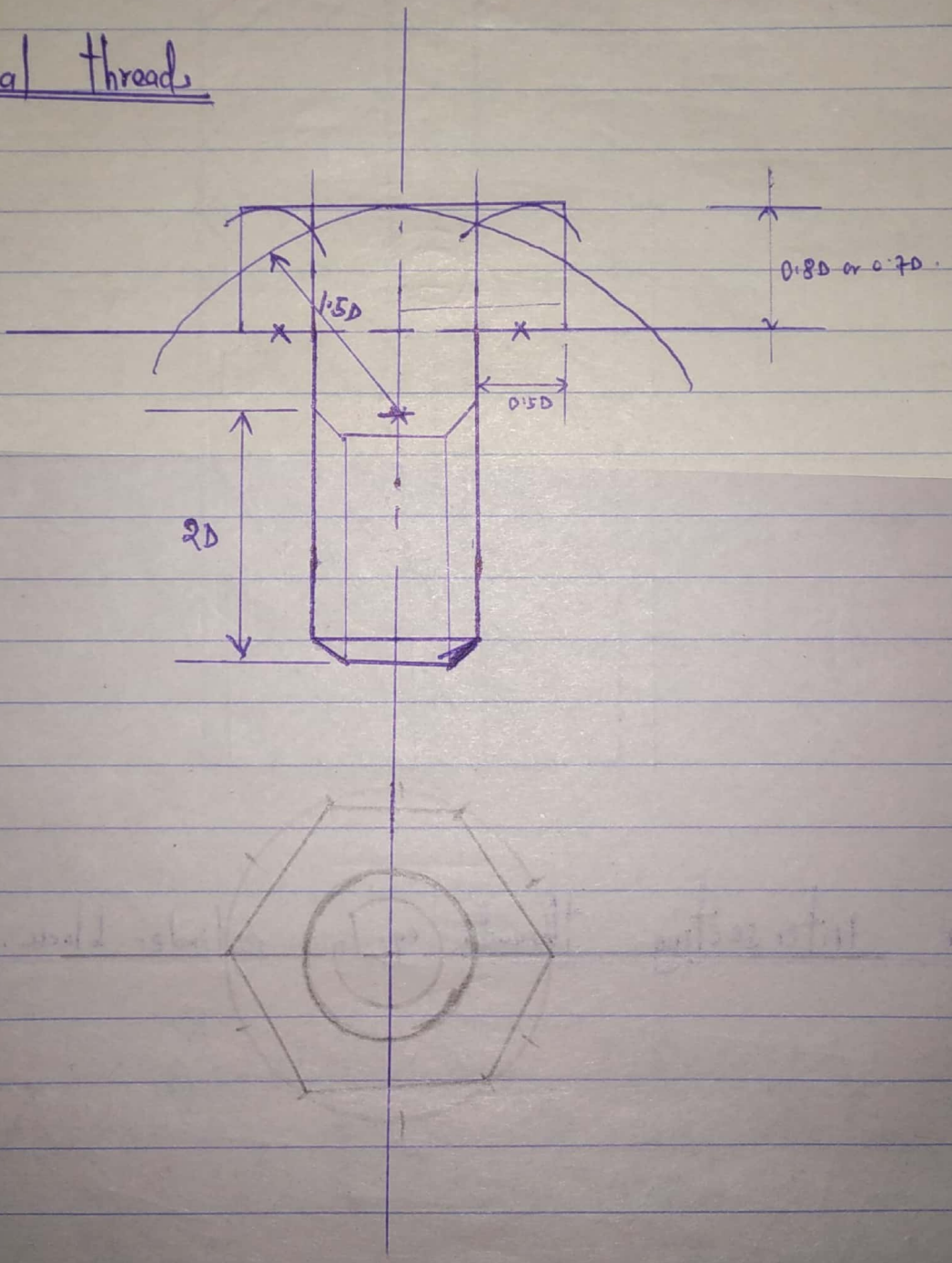
for internal thread,

$$TDS = D(M) - (0.54 \times P)\ ?$$

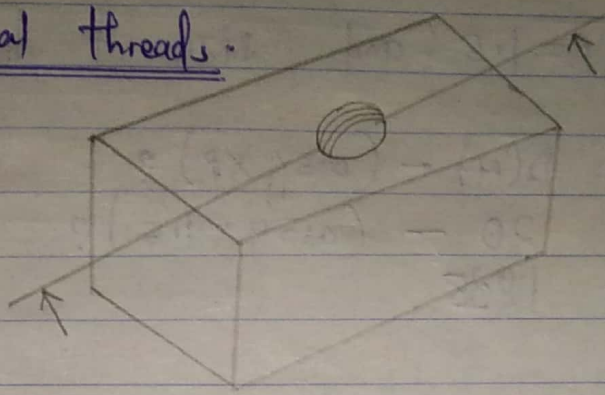
$$= 20 - (0.54 \times 1.5)\ ?$$

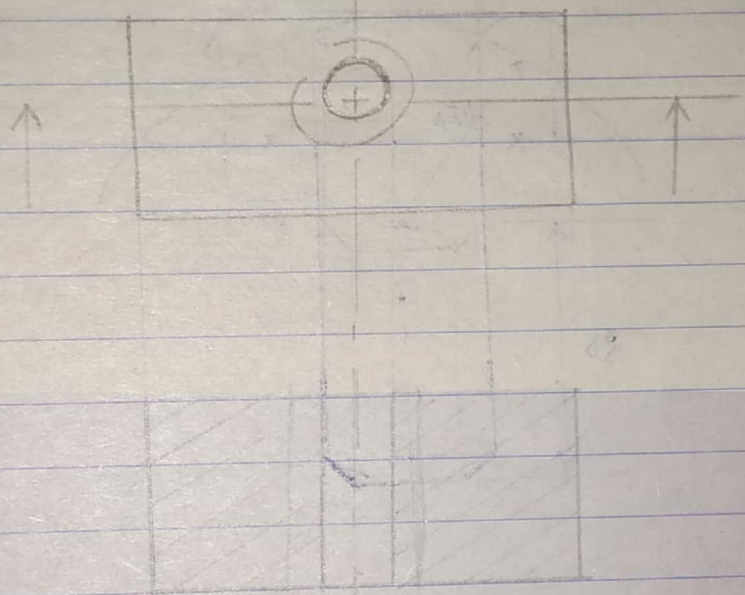
Thread size = 18.38

for external thread,

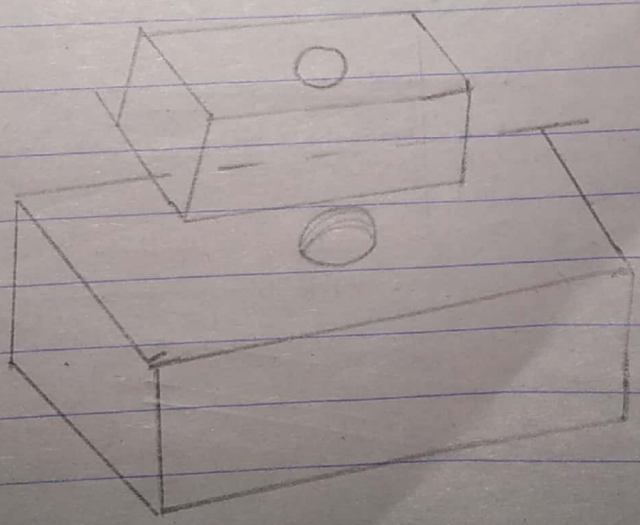


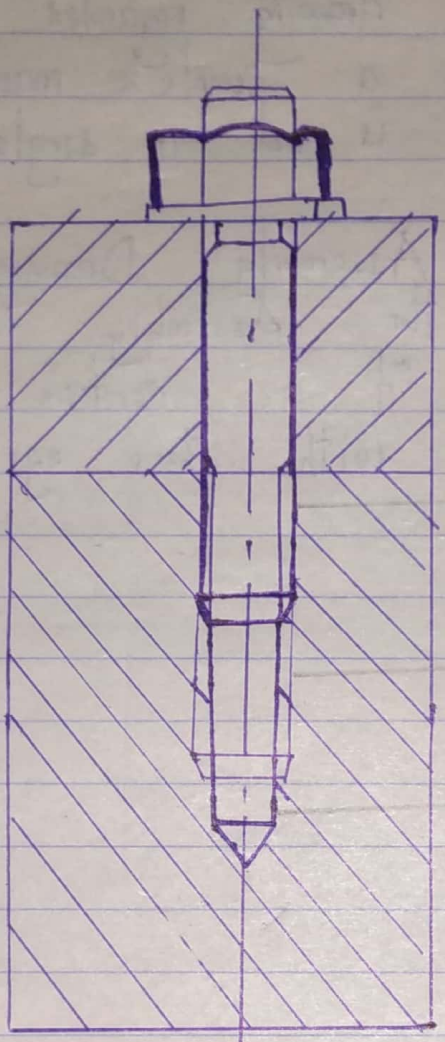
for Internal threads.





for Intersecting threads eg: In cylinder block.





ASSEMBLY DRAWING.

Assembly drawing is the collection of different parts positioned to the relative positions for the purpose of doing / executing a certain function.

TYPES.

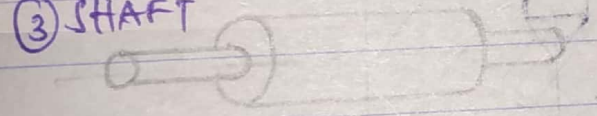
1. General Assembly Drawing.

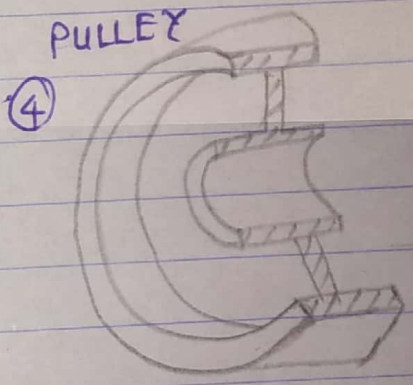
Is the assembly comprising of detail single/ component collected together to their relative positions.

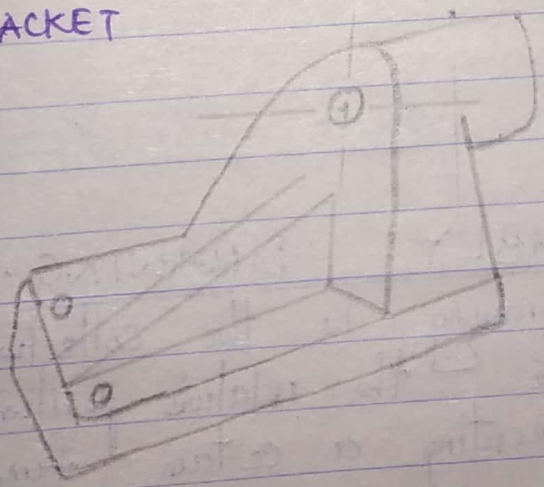
2. Sub Assembly Drawing
Is the drawing regarded as a single part when put in a complete machine / system but in real sense is not a single part. eg: a car engine.

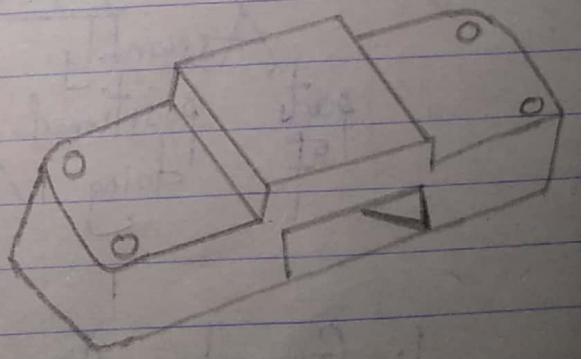
3. Installation Assembly Drawing
Is the Assembly drawing showing the place / position of a certain sub assembly when put together with others eg: a car transmission system.

Example:









Its Assembly Drawing: