

# ME 1110 - Engineering Practice 1

## Engineering Drawing and Design - Lecture 4

### Orthographic Views & Sectioning

Prof Ahmed Kovacevic

School of Engineering and Mathematical Sciences  
Room C130, Phone: 8780, E-Mail: **a.kovacevic@city.ac.uk**

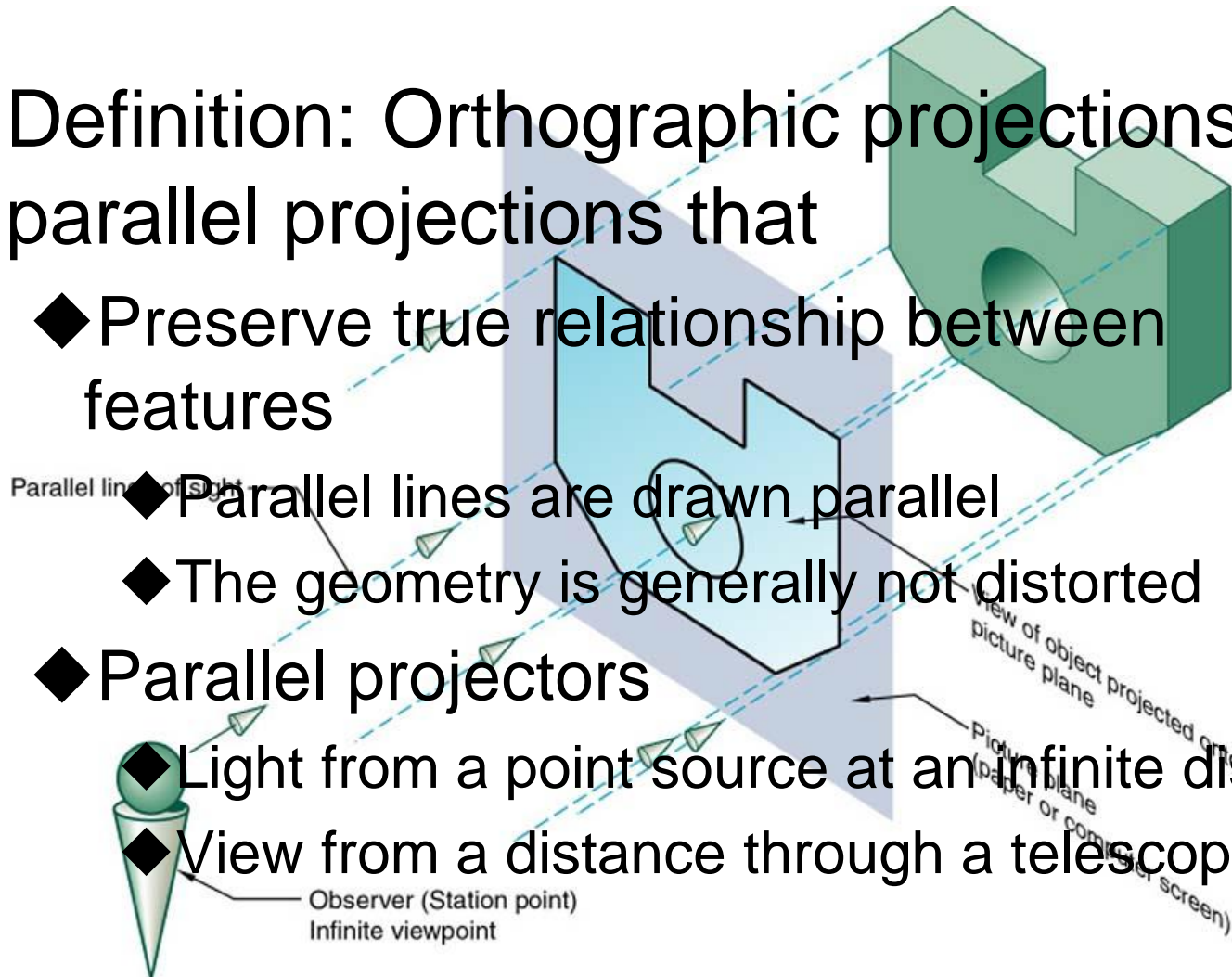
**[www.staff.city.ac.uk/~ra600/intro.htm](http://www.staff.city.ac.uk/~ra600/intro.htm)**

# Objectives for today

- Prepare for DrE-3
- Additional features in multiview drawings:
  - » Cutting plane, Section, hatching, hidden feature
- Section views and Section drawings
  - » Ribs, webs, assemblies, threads

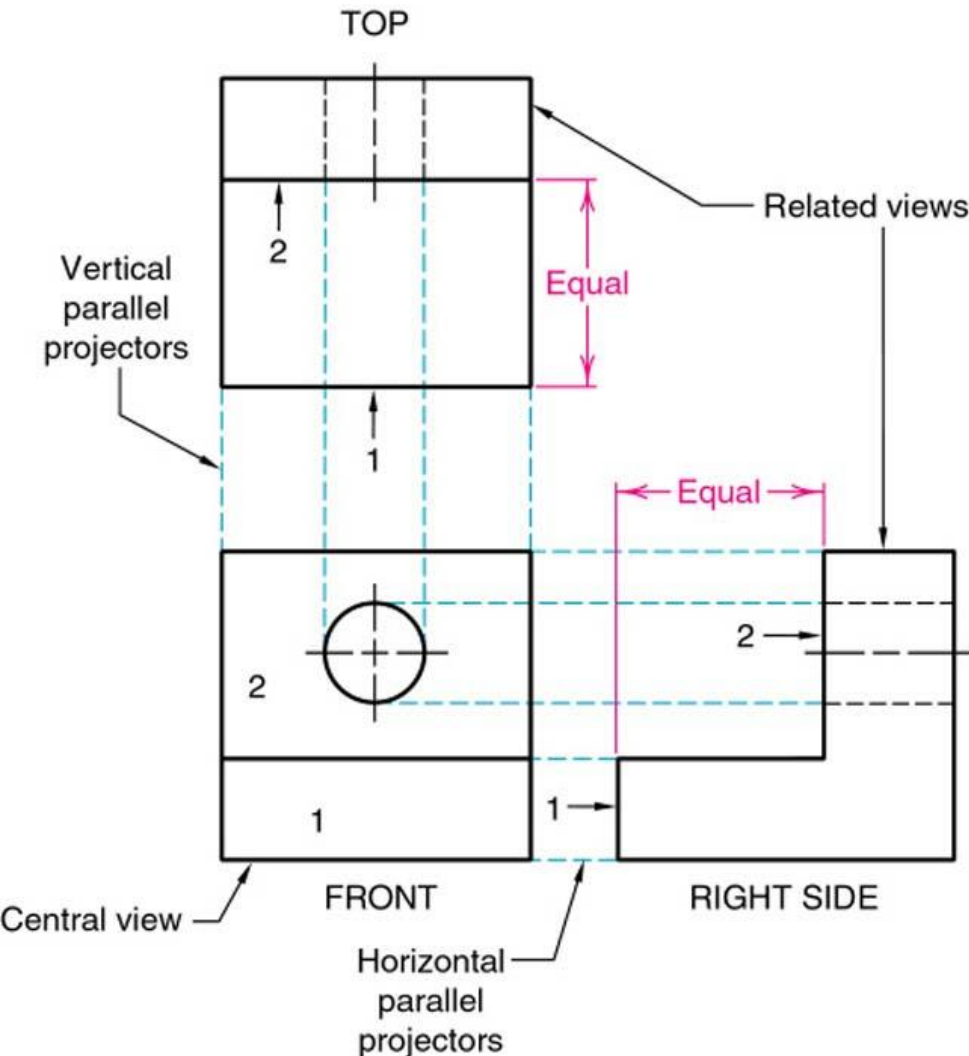
# Orthographic Projections

- Definition: Orthographic projections are parallel projections that
  - ◆ Preserve true relationship between features
  - ◆ Parallel lines are drawn parallel
  - ◆ The geometry is generally not distorted
  - ◆ Parallel projectors
    - ◆ Light from a point source at an infinite distance
    - ◆ View from a distance through a telescope





# Orthographic Projection Properties



## ◆ Projection planes

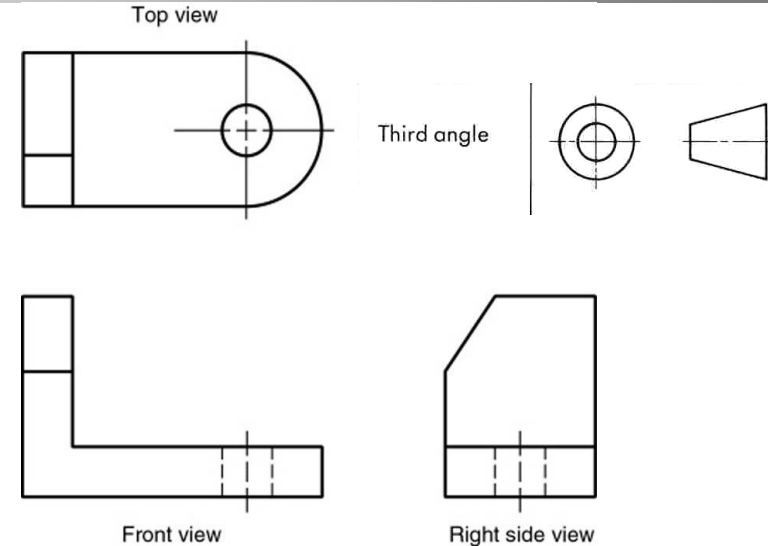
- ◆ Horizontal, frontal, and profile
- ◆ Each projection plane is perpendicular to adjacent projection planes

## ◆ Views

- ◆ top, front, and right side
- ◆ Only use the views that are needed to represent the object
- ◆ The most descriptive view should be the front view
- ◆ Represented with dashed lines
- ◆ Views should be selected to minimize the use of hidden lines

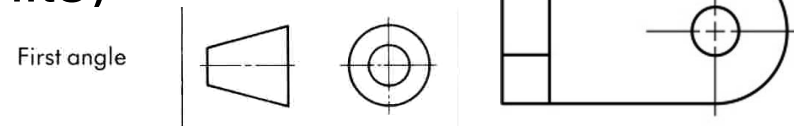
# Angle projections

- ◆ Third Angle Projection
  - ◆ Associated with English units
  - ◆ If English units are used assume third angle projection unless otherwise specified
  - ◆ Include ANSI standard symbol

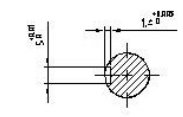


## First Angle Projection

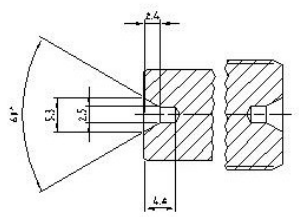
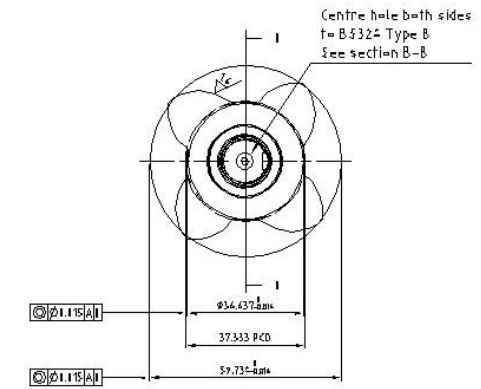
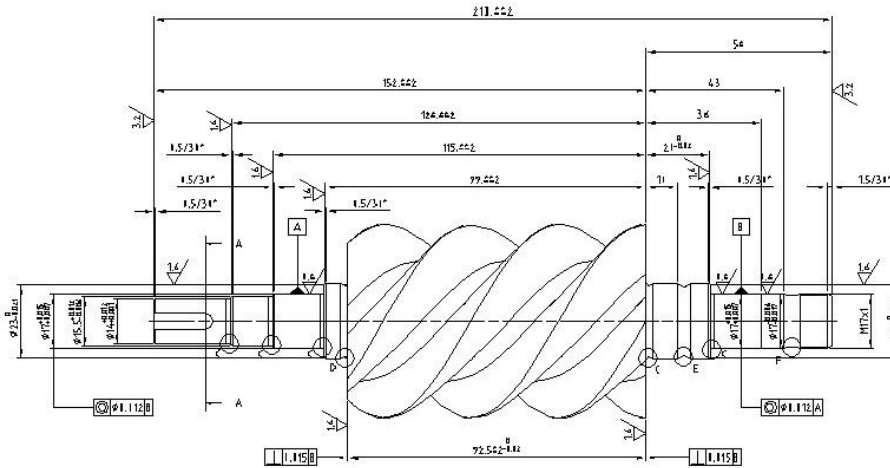
- ◆ Associated with SI units  
(International System of units)



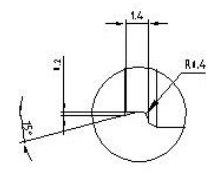
# Detailed views



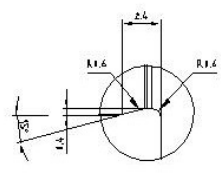
Section A-A



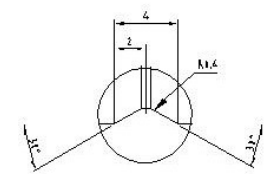
Section B-B (2:1)



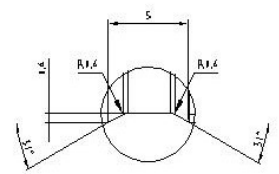
Detail C (5:1)



Detail D (5:1)



Detail E (5:1)



Detail F (5:1)

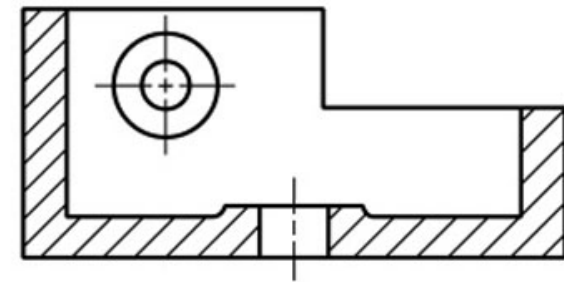
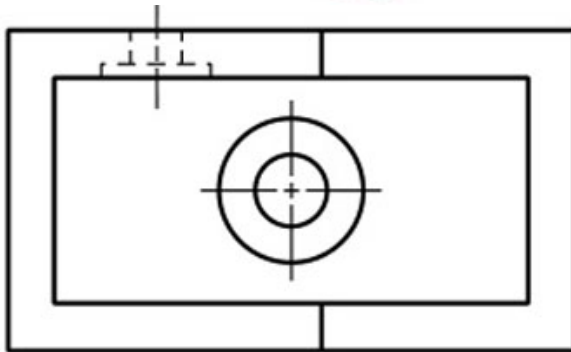
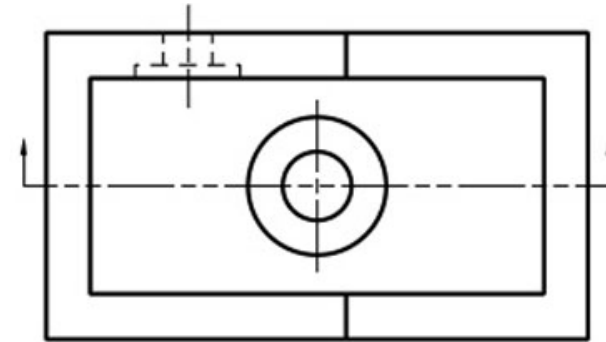
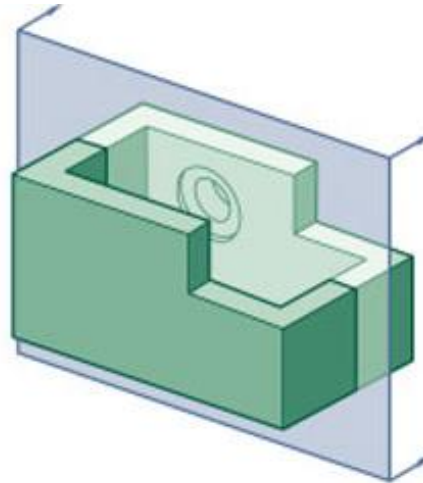
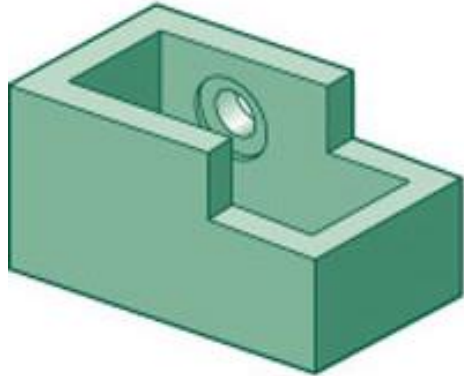
ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.

MODEL		VMC		CITY		CENTRE FOR POSITIVE DISPLACEMENT COMPRESSOR TECHNOLOGY	
MATERIAL		STEEL ANSI C-1141		University			
						city_a2	
				MALE ROTOR			
DESIGNED	AK	02/04/03		OFFING N.	VMC_000	FILENAME	
DRAWN	AK	02/04/03		SCALE	1:1	Drawing No. VMC_001	
CAD		02/04/03		REVISED	1/1	REVISION	
CHECKED		02/04/03					
APPROVED	NS	02/04/03					

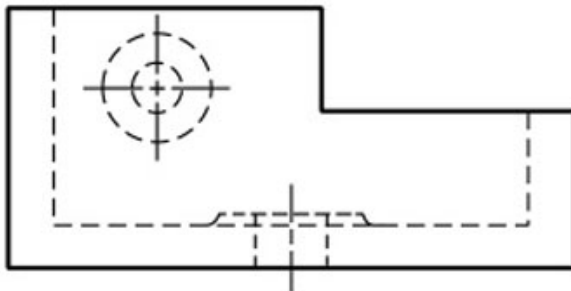
# Sectioned Drawing

- Definition:
  - » A multiview technical drawing that reveals details about internal features by displaying the part as if cut by an imaginary cutting plane
- Objective:
  - » To make the drawing more understandable, especially the internal details of the part
- Principles:
  - » Since the sectioned drawing shows internal features there is generally no need to show hidden lines
  - » Helpful for both, detailed and assembly drawings

# How to reveal hidden feature



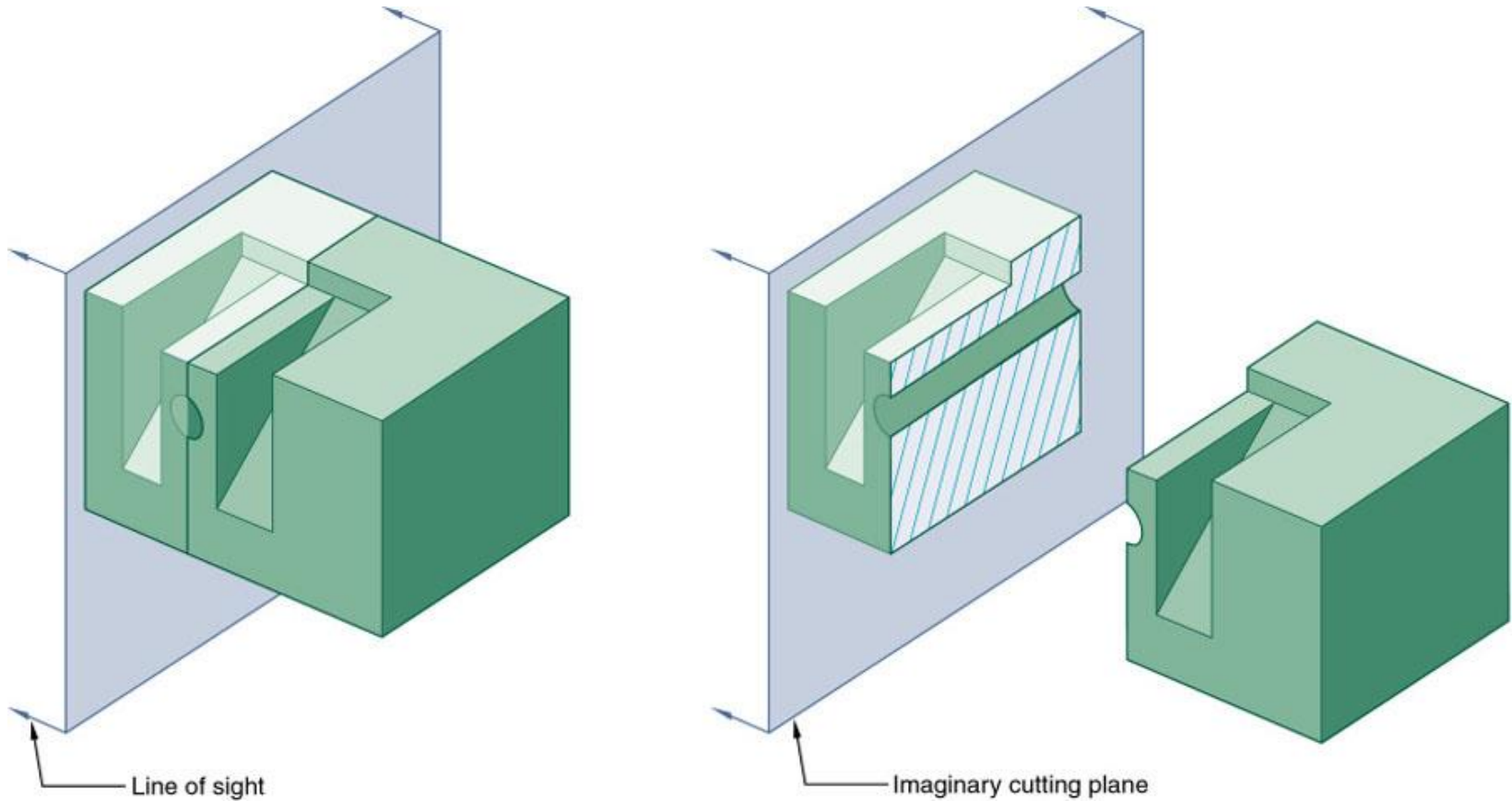
Section view drawing



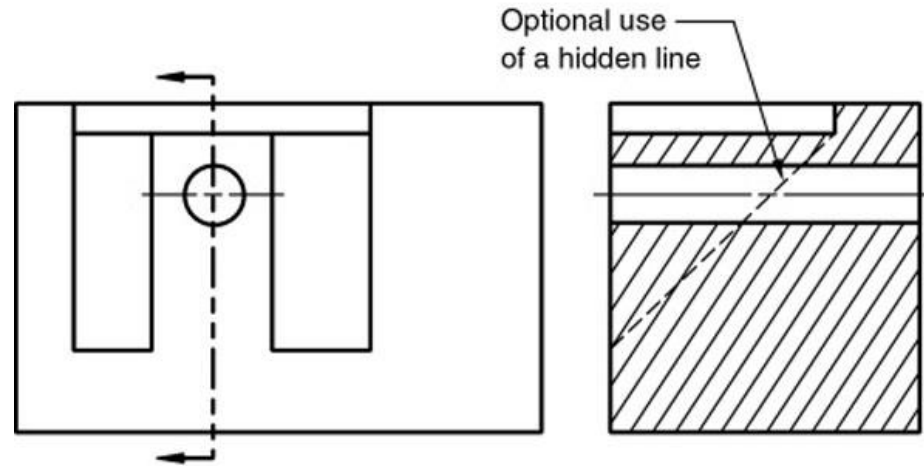
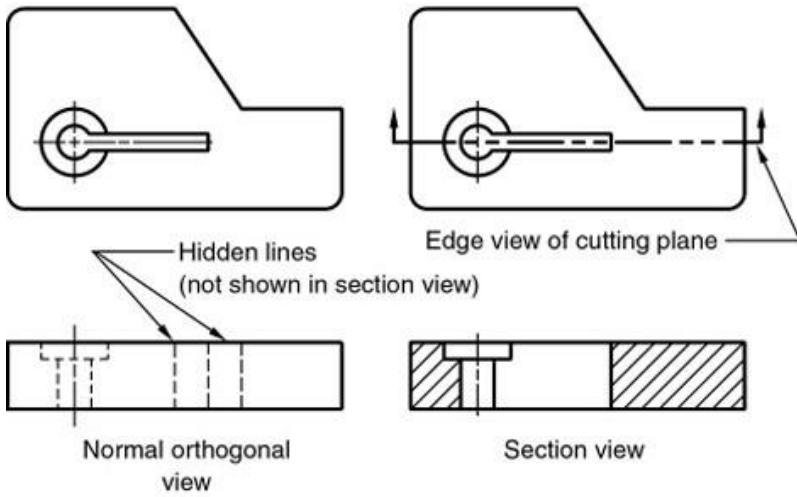
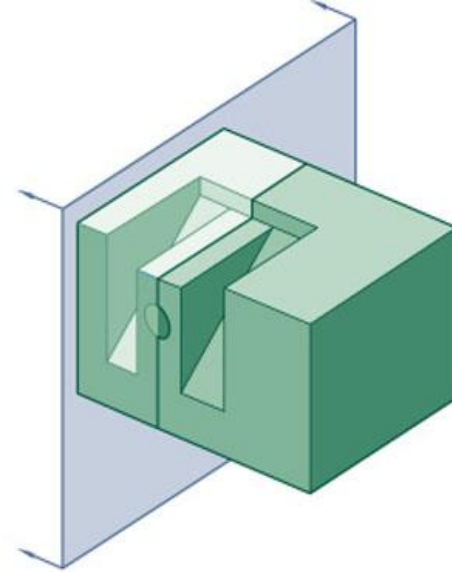
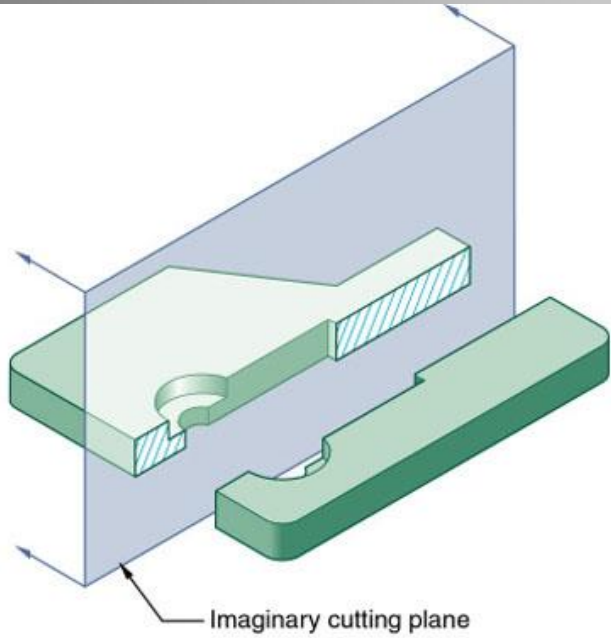
Normal multiview drawing



# Cutting plane

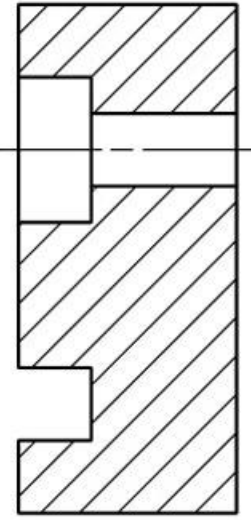
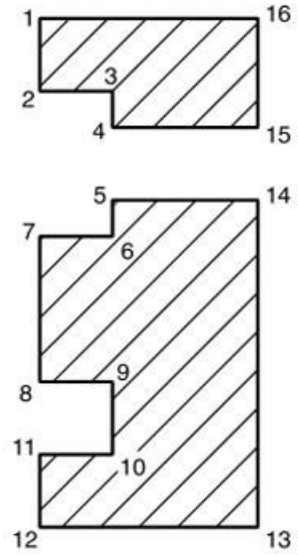
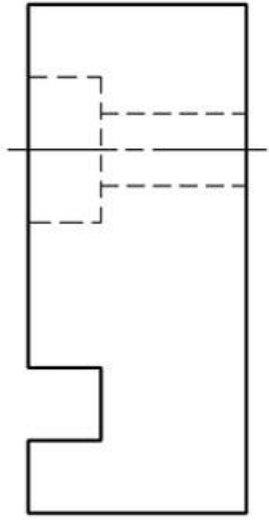
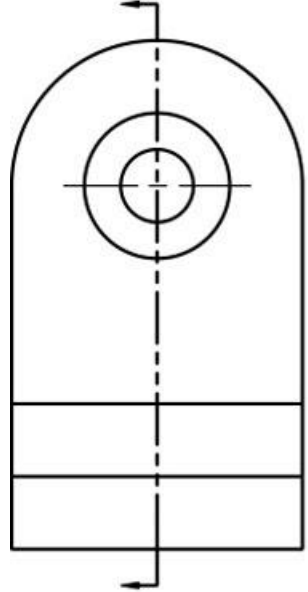
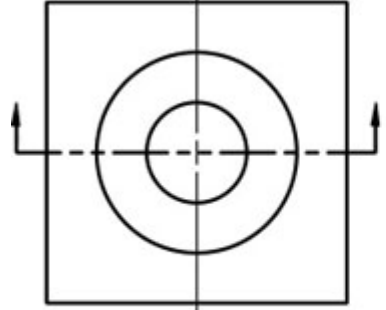
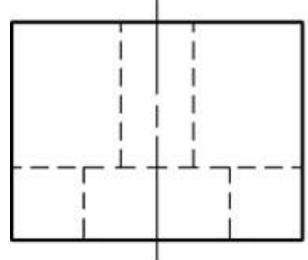
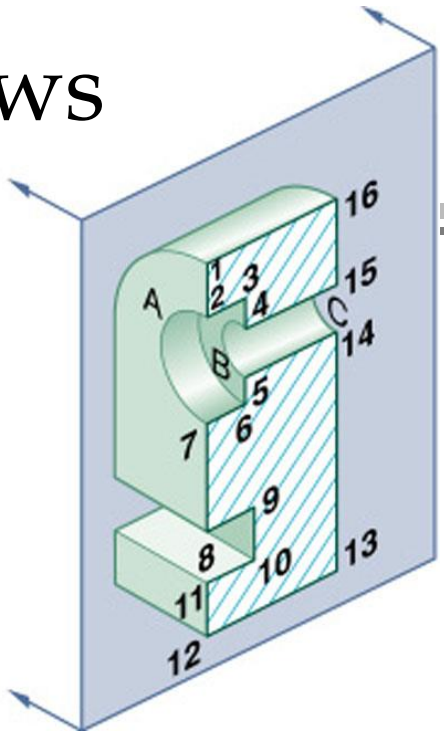
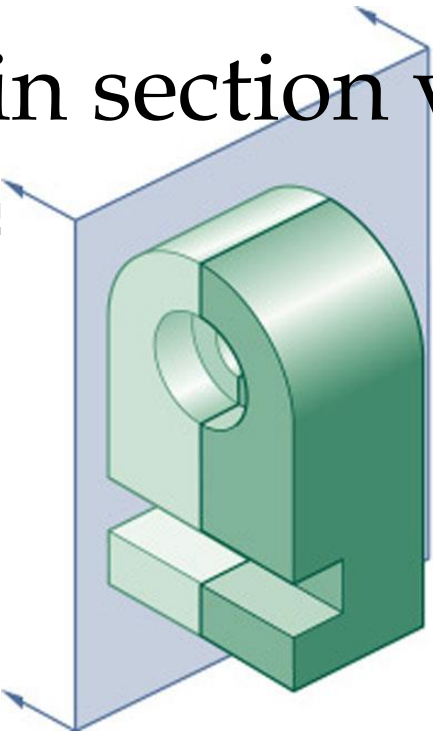
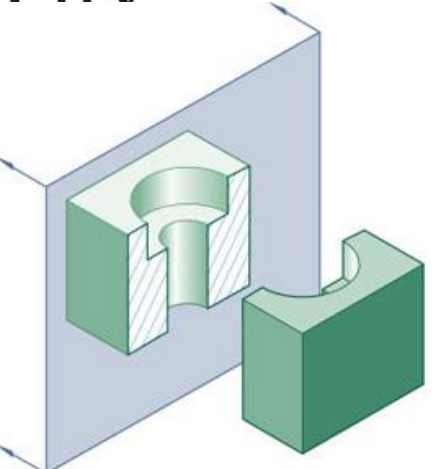


# Hidden lines

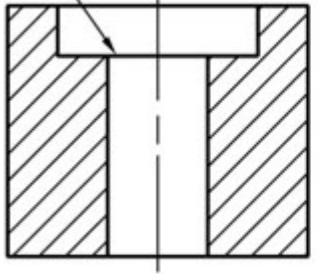




# Surfaces and edges in section views



Change of plane behind the cutting plane represented as a line



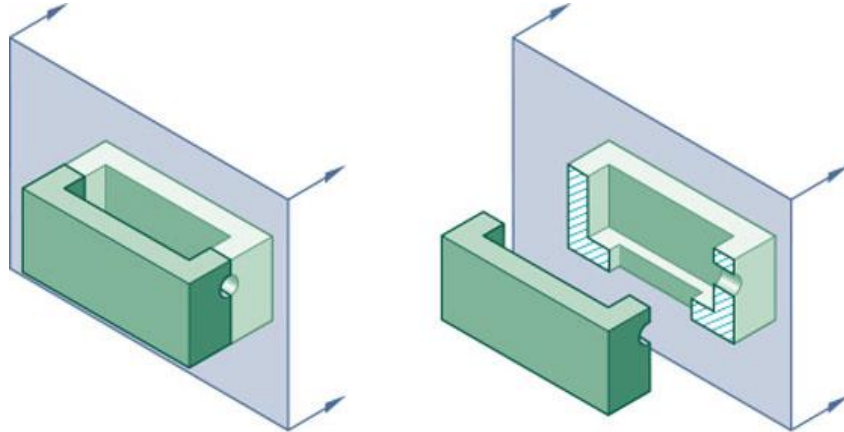
(A) Correct representation

Normal multiview drawing

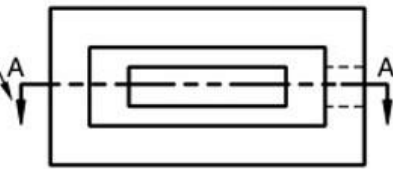
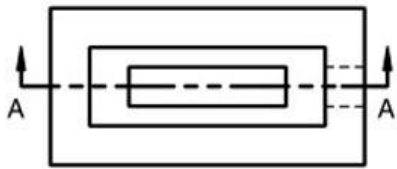
(A)

(B)

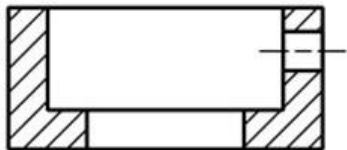
# Positioning



Arrows in wrong direction:  
arrows should show the line of  
sight necessary for section view



No!

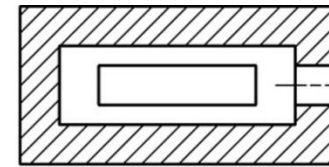
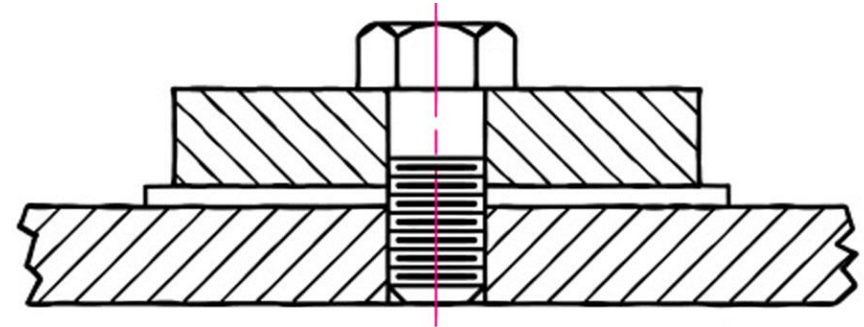


Correct cutting  
plane line

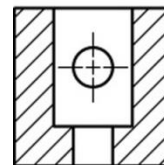


Incorrect cutting  
plane line

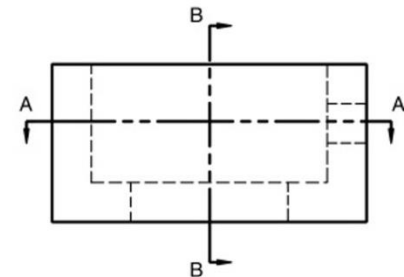
## Hatching of thin parts



SECTION A-A



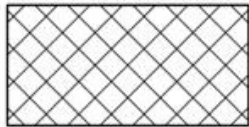
SECTION B-B



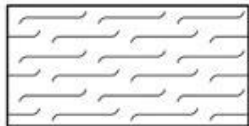
# Hatch features



(A) Cast or malleable iron and general use for all materials



(D) White metal, zinc, lead, babbitt, and alloys



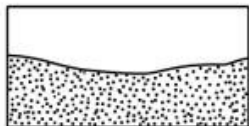
(G) Cork, felt, leather and fiber



(J) Titanium and refractory material



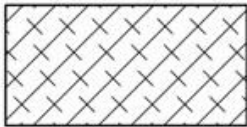
(M) Marble, slate, glass, porcelain, etc.



(P) Sand



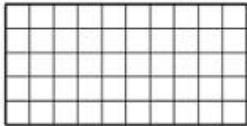
(B) Steel



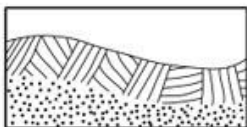
(E) Magnesium, aluminum, and aluminum alloys



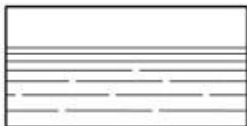
(H) Sound insulation



(K) Electric windings, electromagnets, resistance, etc.



(N) Earth



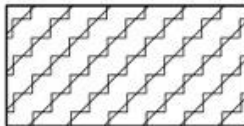
(Q) Water and other liquids



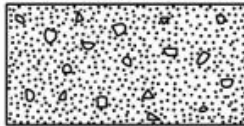
(C) Bronze, brass, copper, and compositions



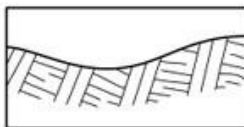
(F) Rubber, plastic, and electrical insulation



(I) Thermal insulation



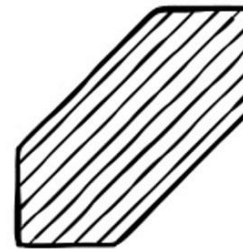
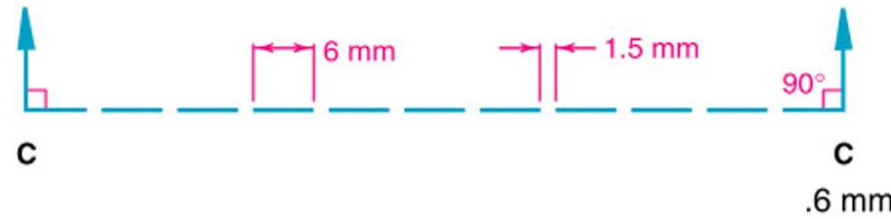
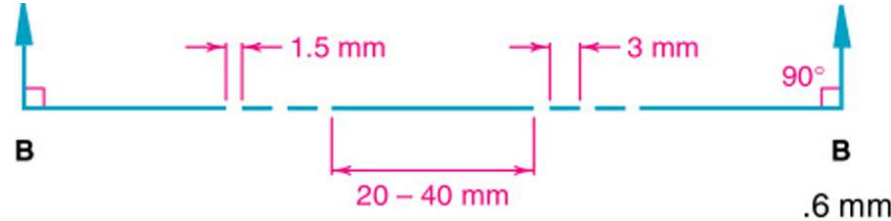
(L) Concrete



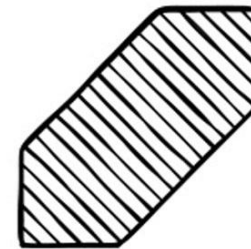
(O) Rock



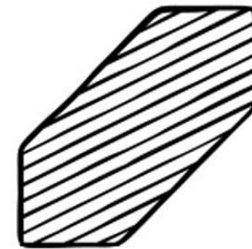
(R) Across grain > With grain > Wood



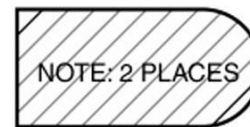
(A) Avoid!



(B) Avoid!

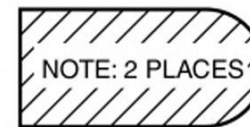


(C) Preferred



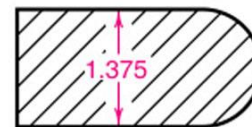
NOTE: 2 PLACES

(A) Avoid!



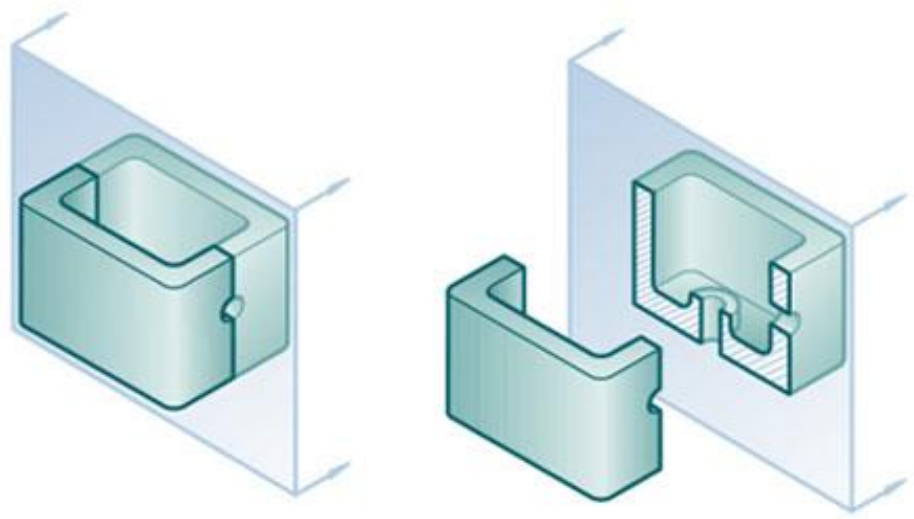
NOTE: 2 PLACES

(B) Preferred

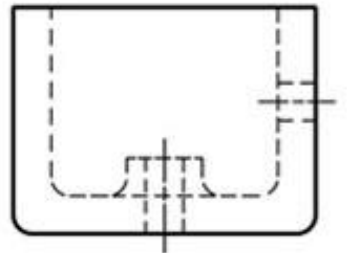
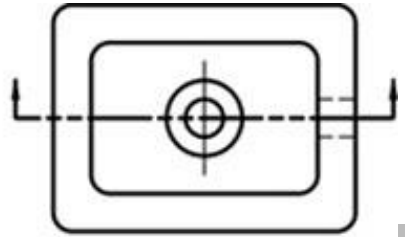
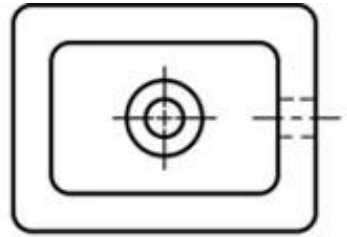


1.375

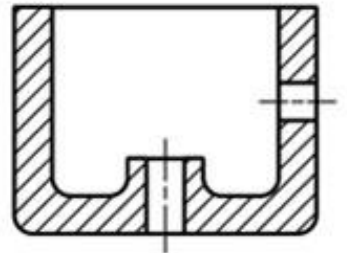
(C) Preferred



(A) Full section

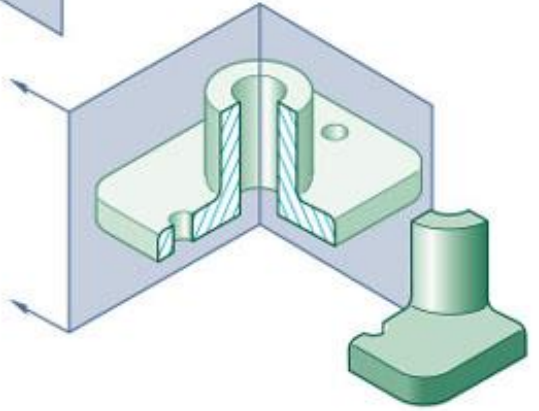
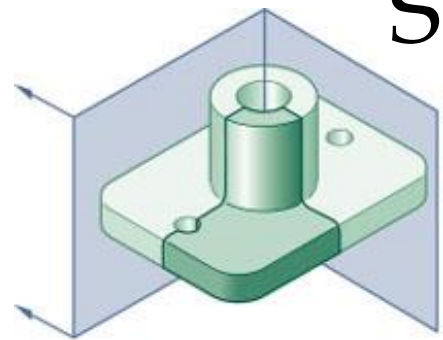


(B) Standard multiview

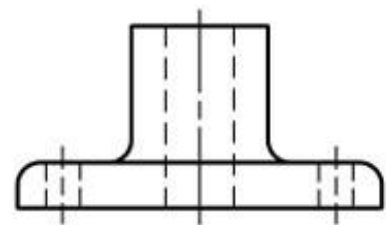
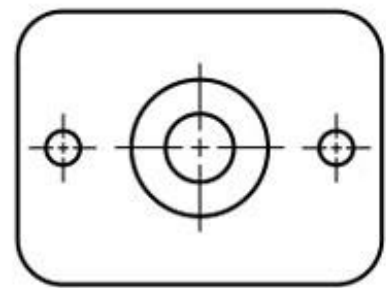


(C) Full section view

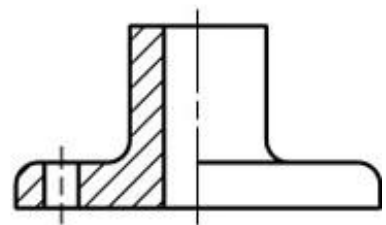
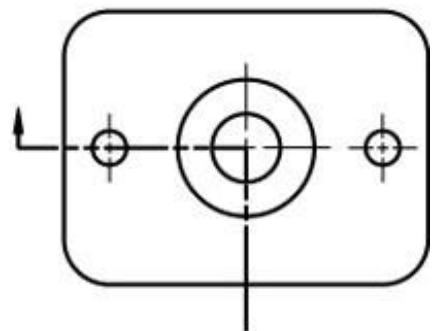
# Section types



(A) Half section

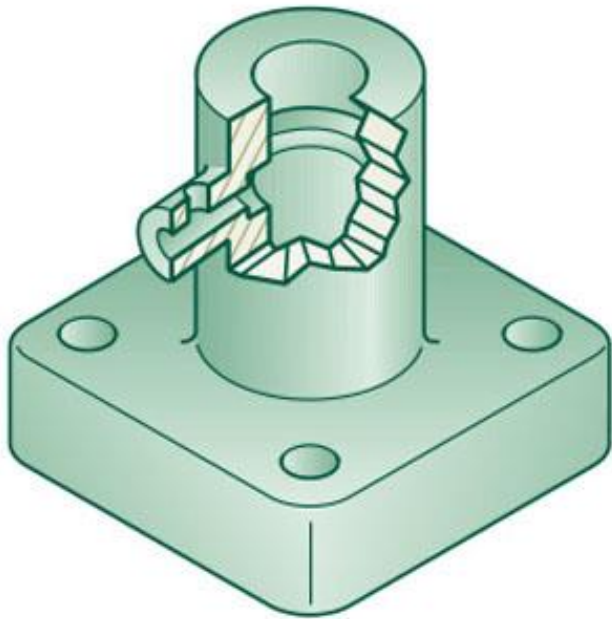


(B) Multiview

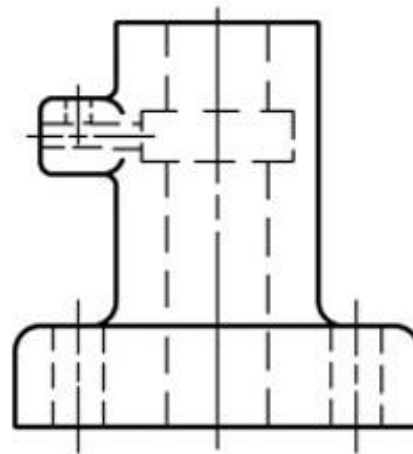
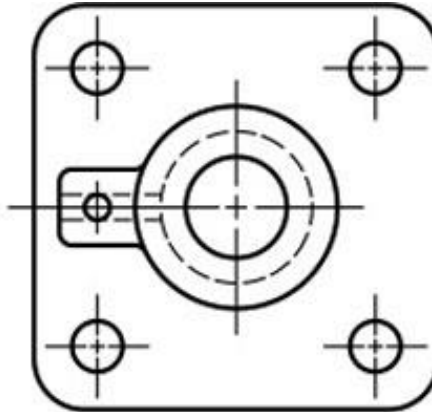


(C) Half section view

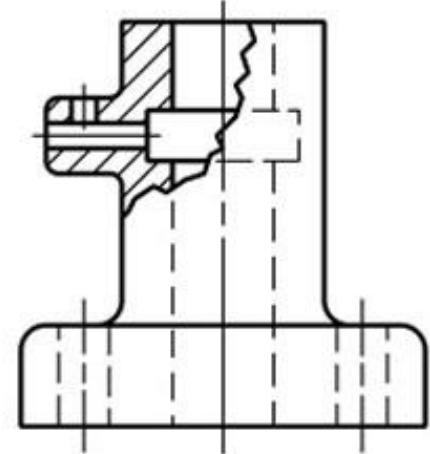
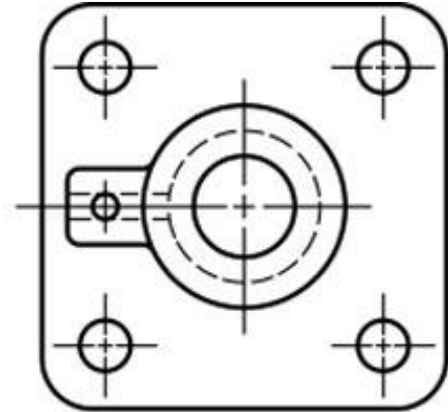
# Broken out section



(A) Broken-out section

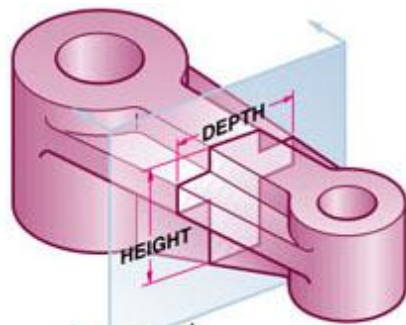


(B) Multiview

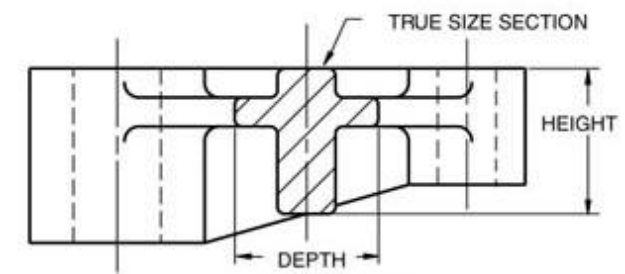
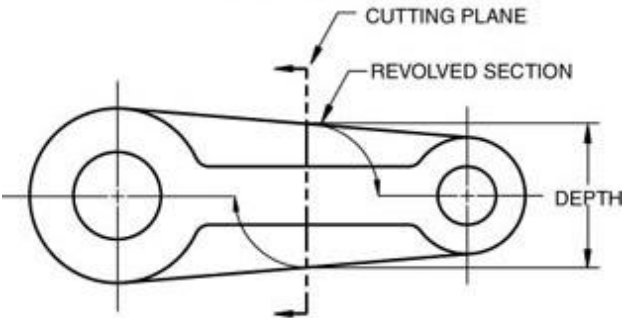


(C) Broken-out section view

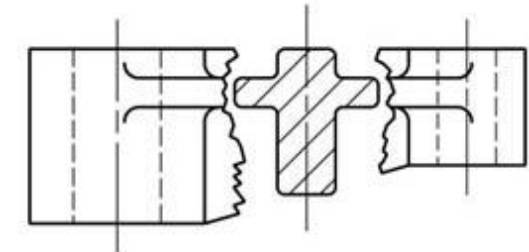
# Revolved & Removed



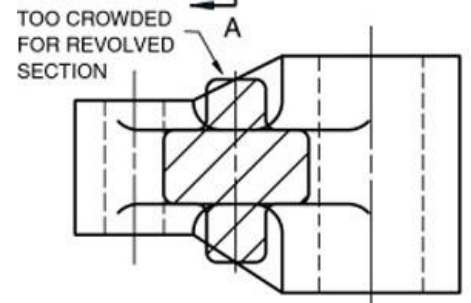
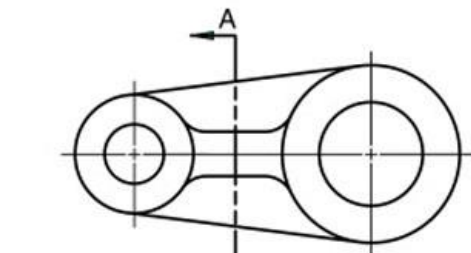
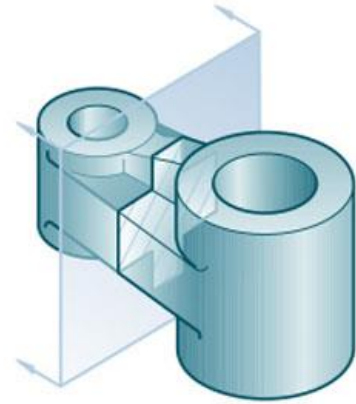
Imaginary cutting plane  
Line of sight



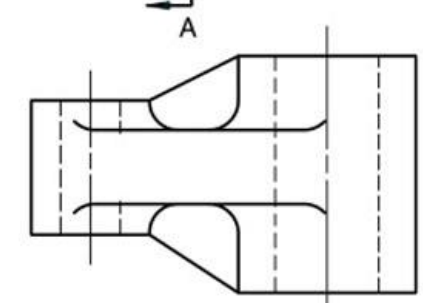
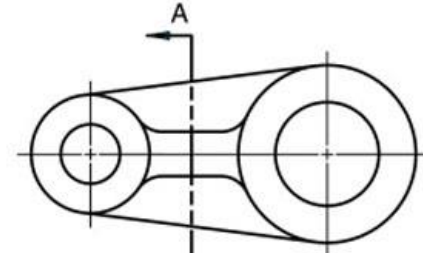
(A) Revolved section



(B) Revolved section; broken view

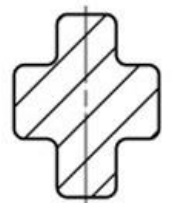


Poor technique



Good technique

REMOVED SECTION



SECTION A-A

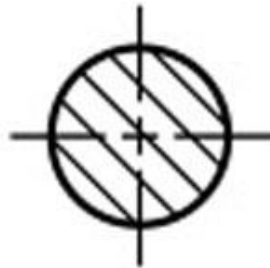


# Multiple removed section views

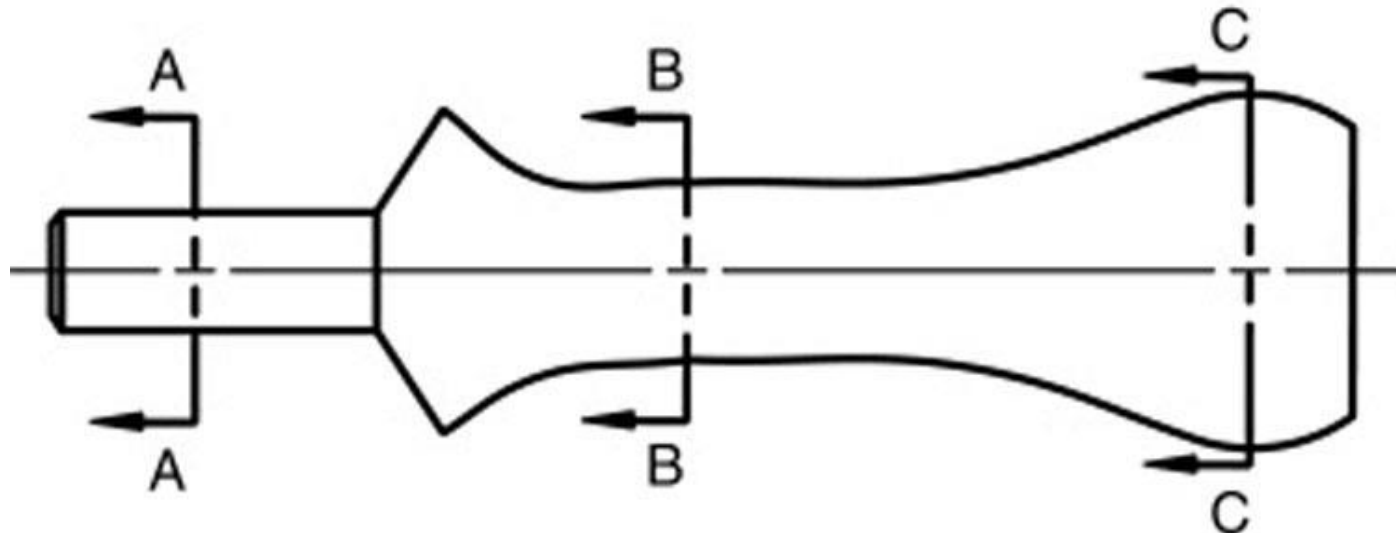
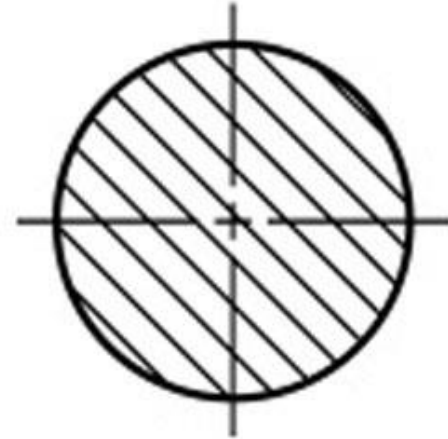
SECTION A-A



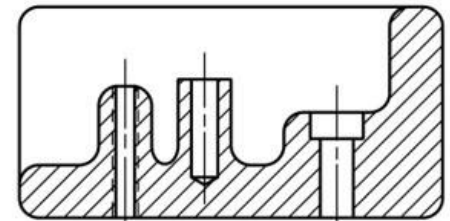
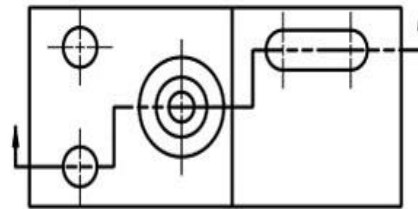
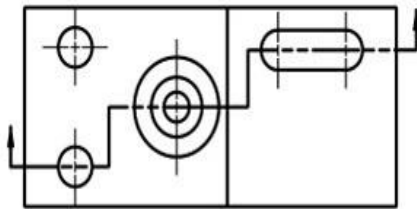
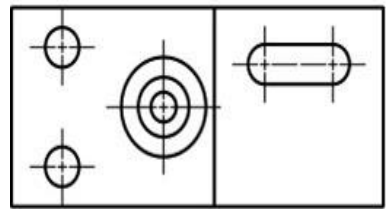
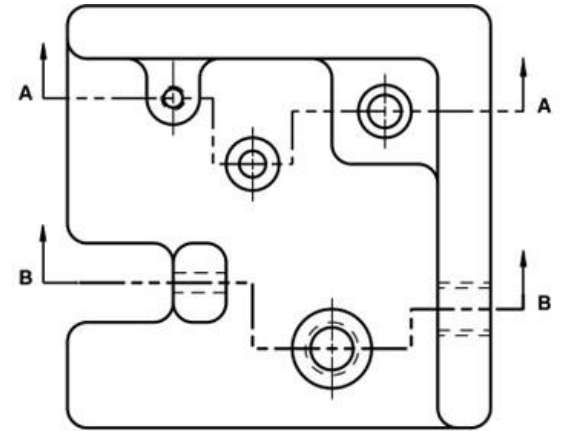
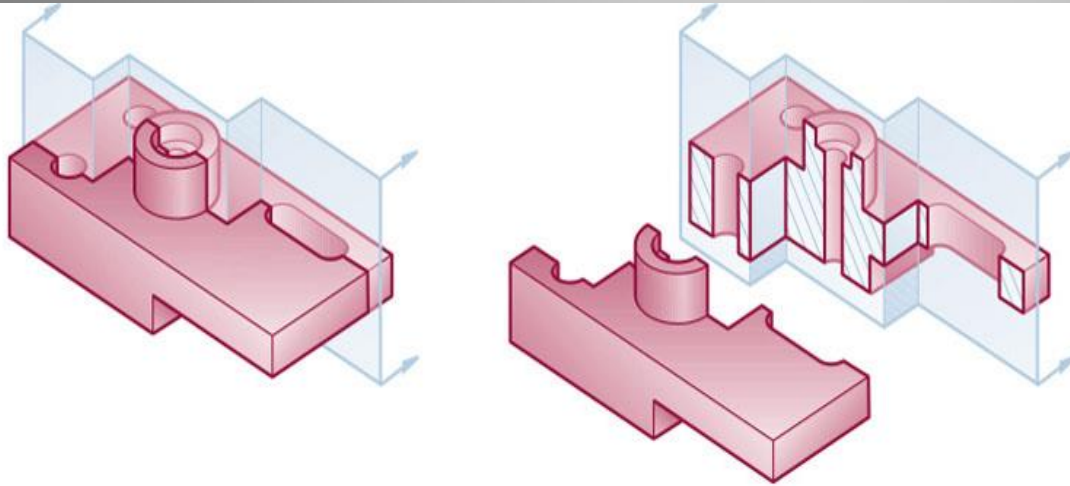
SECTION B-B



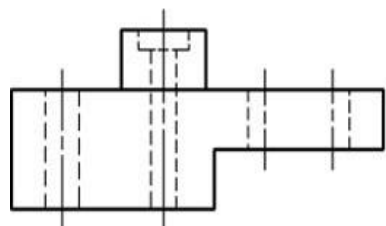
SECTION C-C



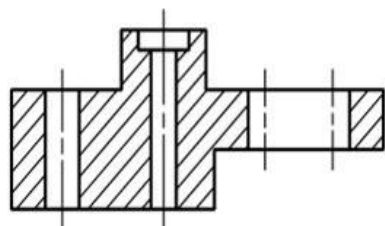
# Offset section



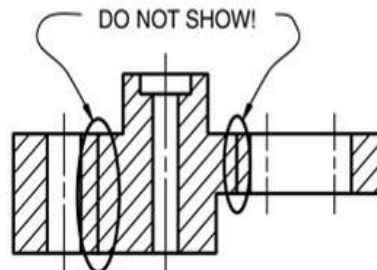
SECTION A-A



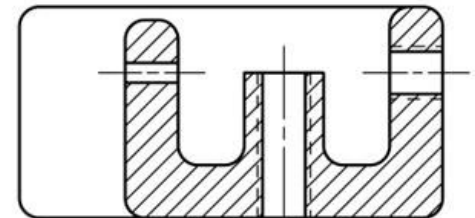
Normal multiview



(A) Offset section view

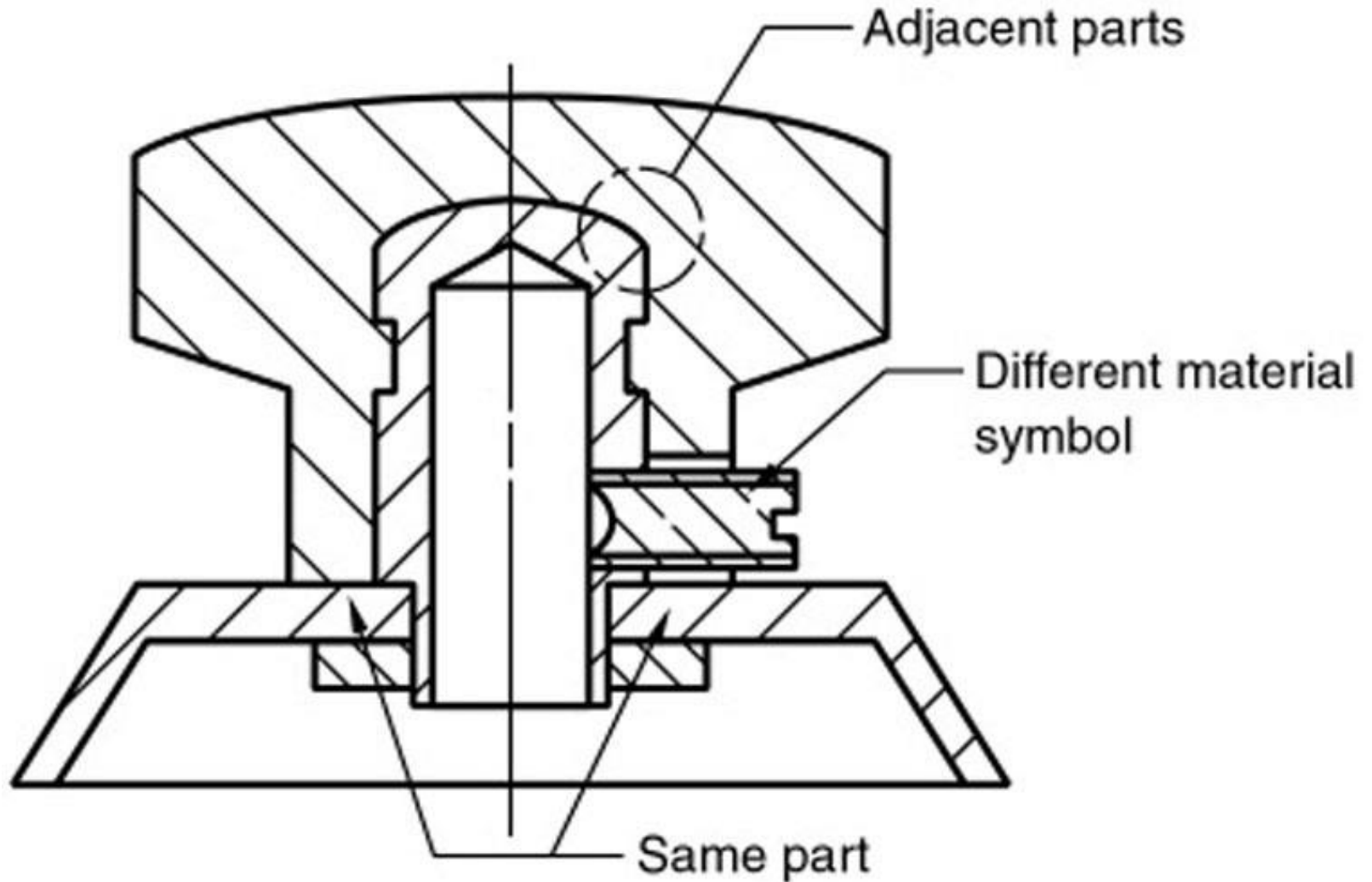


(B) No!

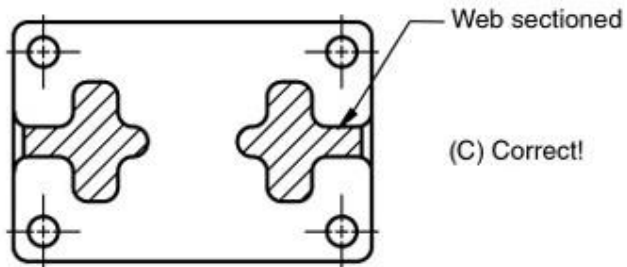


SECTION B-B

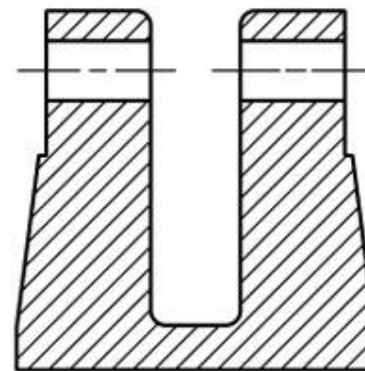
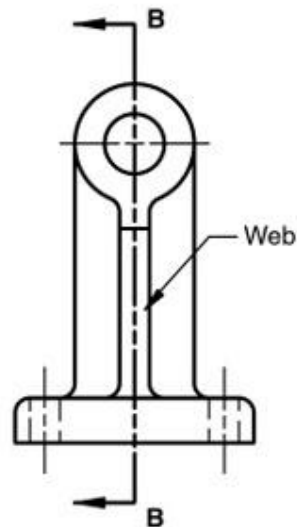
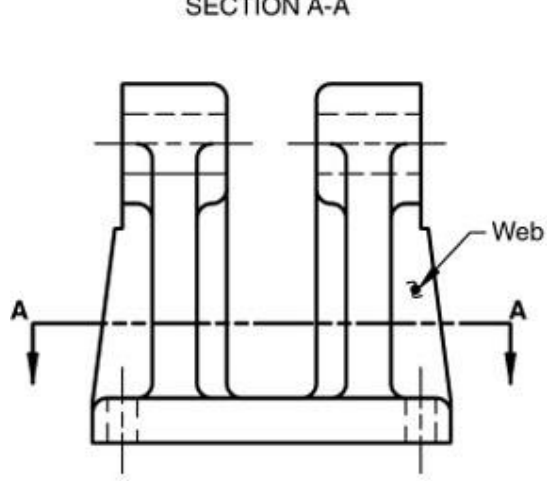
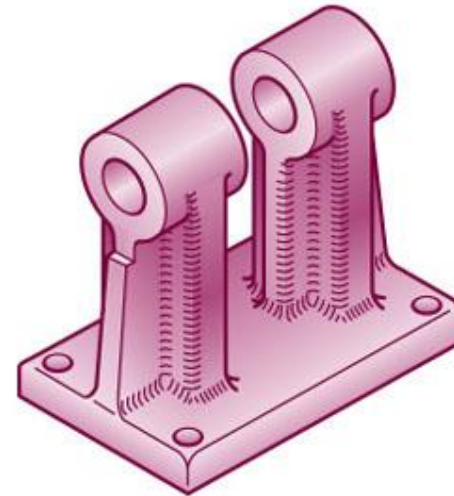
# Assembly section



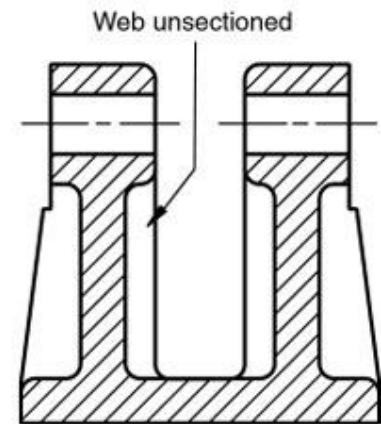
# Convention for webs



SECTION A-A

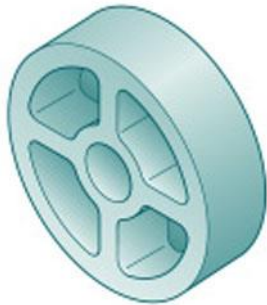


SECTION B-B  
(A) Incorrect!

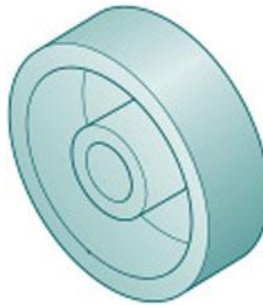


SECTION B-B  
(B) Correct!

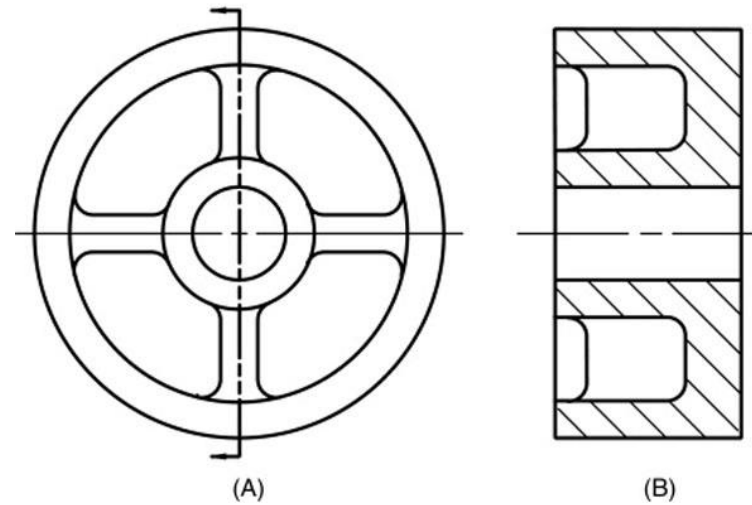
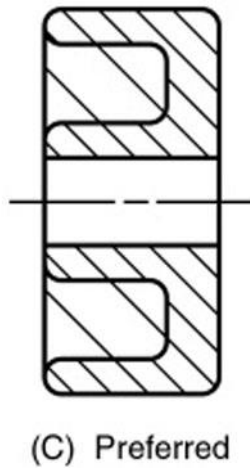
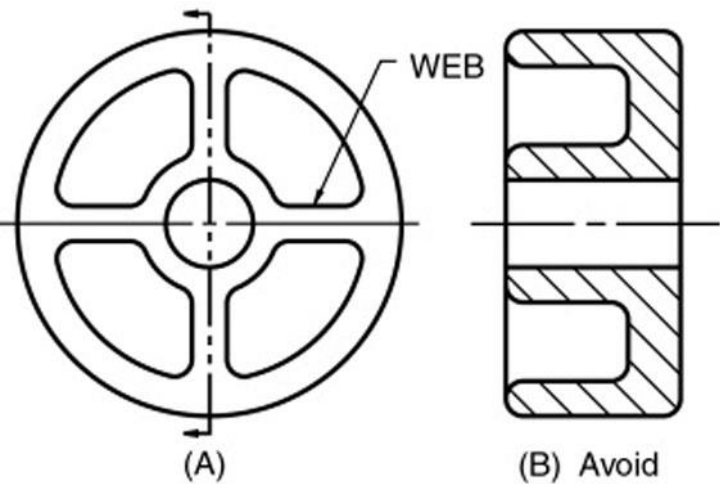
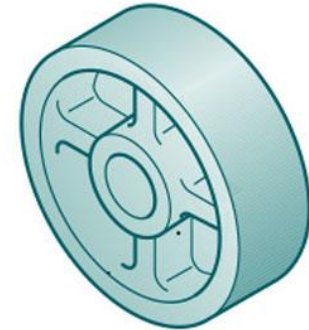
# Alternate methods for webs

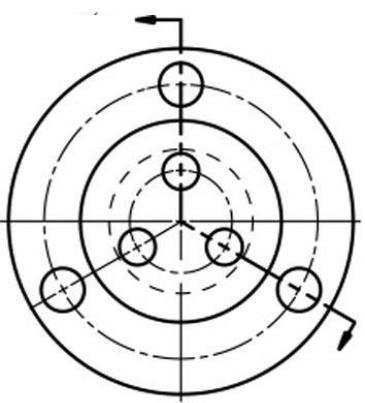


With webs

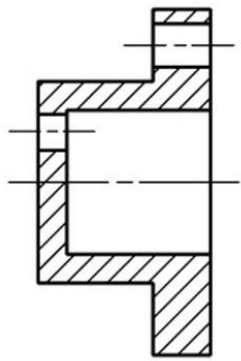


Without webs

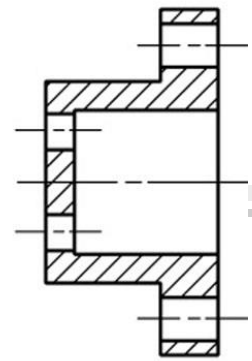




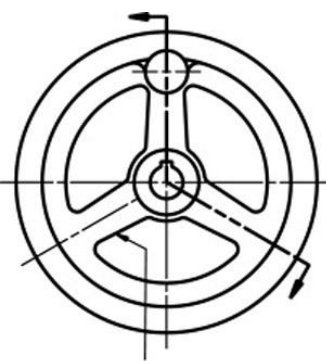
Aligned sections



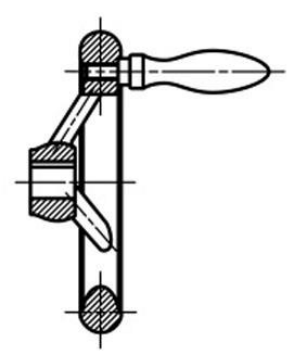
(A) True Projection



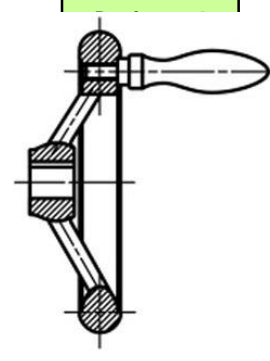
(B) Preferred



Spoke A omitted in the "preferred" projection

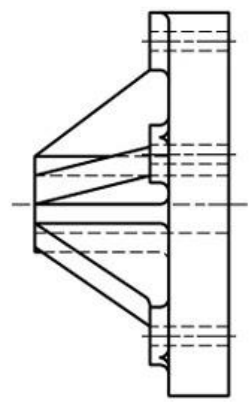
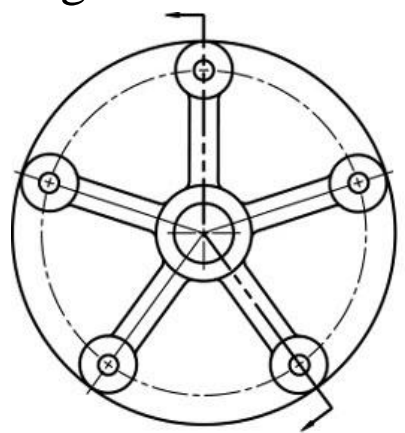


True Projection

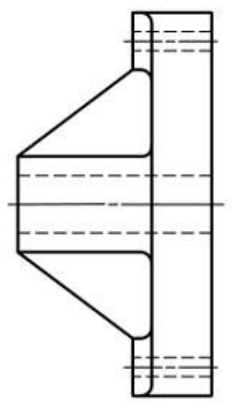


Preferred

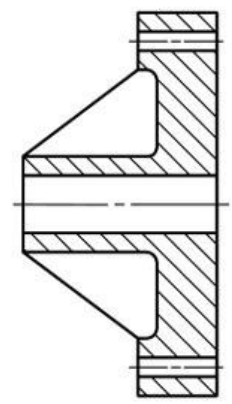
Aligned spokes



(A) True projection

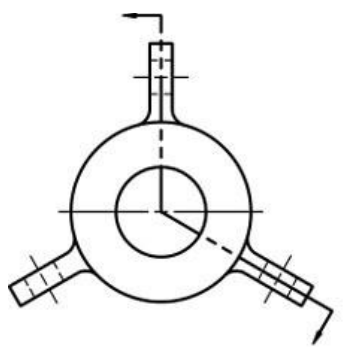


(B) Preferred

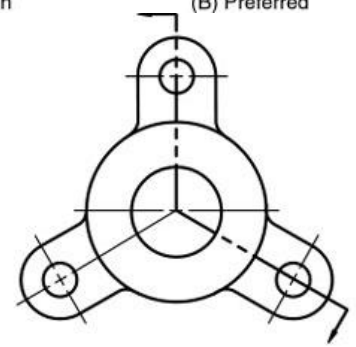
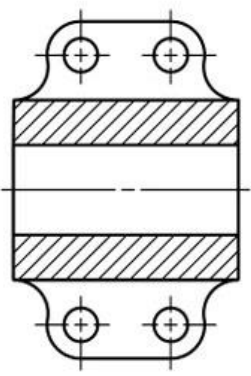


(C) Section view

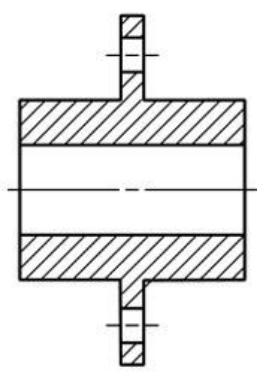
Aligned ribs



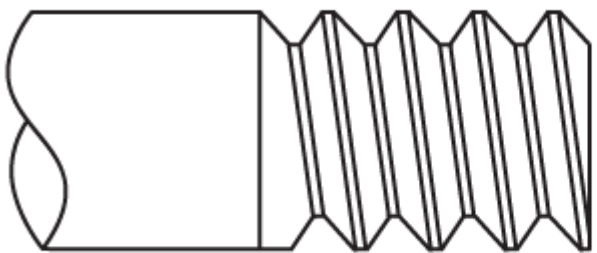
(A)



(B)



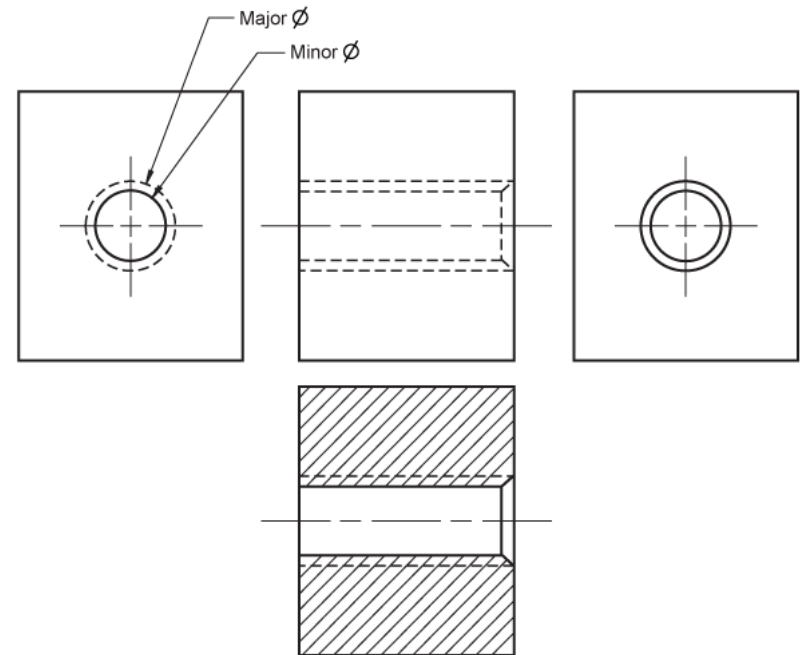
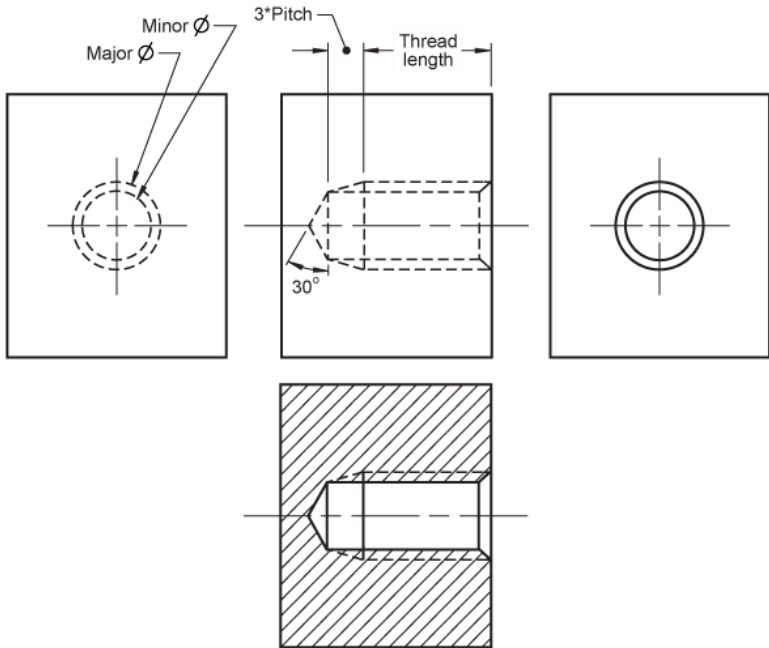
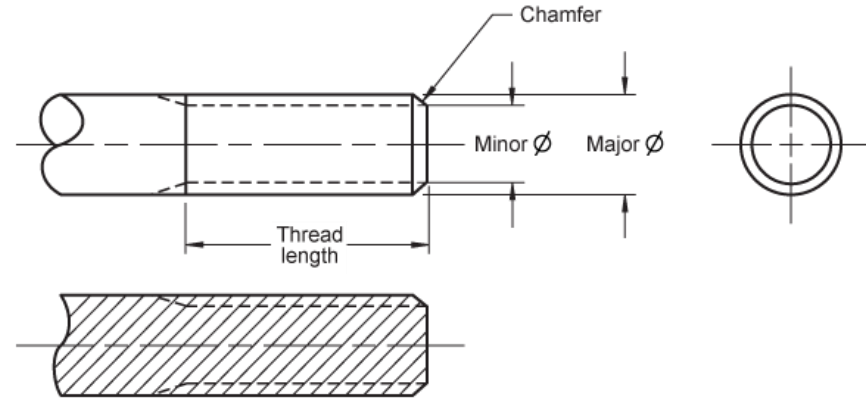
# Threads



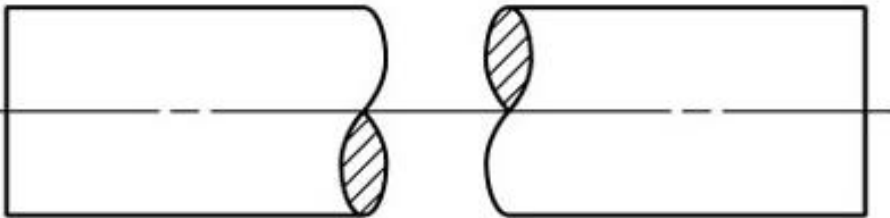
External Threads



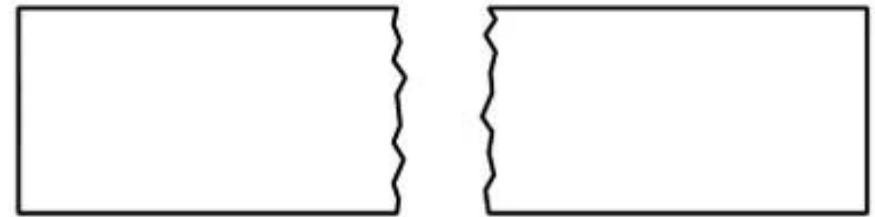
Internal Threads



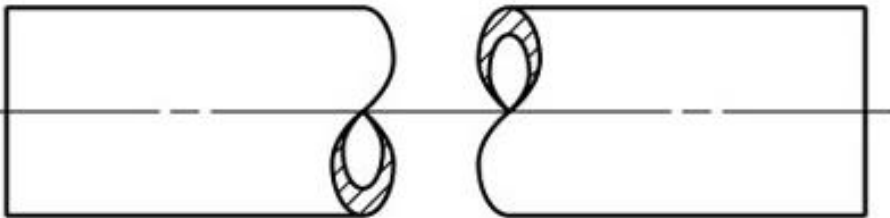
# Break symbols



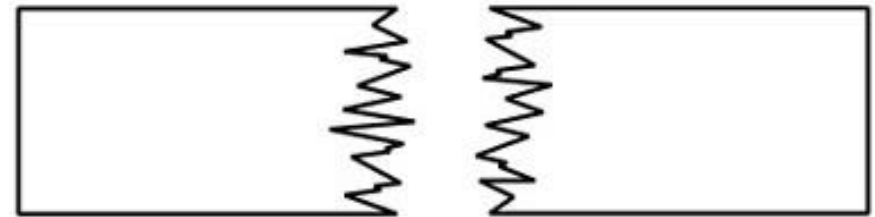
(A) Round solid



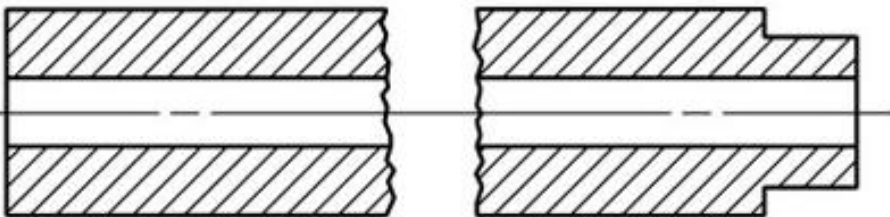
(D) Rectangular



(B) Round tubular



(E) Rectangular wood



(C) Round tubular





# Exercise DrE-3

City University London

School of Engineering and Mathematical Sciences

Engineering Drawing and Design, EM 1105 (EM1.5)

Exercise code: DrE-3

Exercise type: Individual

Exercise title: Orthographic projections and sectioning

## Exercise Assignment:

Use A3 paper with standard border. Divide the drawing space in two equal parts and:

- 1) From Figure 1 draw in scale 1:1 the view in the direction of arrow X and the offset section on section plane A-A.
- 2) From Figure 2 draw in scale 1:2 section views on section planes A-A and B-B one underneath the other

### Exercise tips:

Always read exercise assignment carefully.

This exercise requires using scales – NOT FREEHAND. Arrange drawings neatly and ensure all letters and lines are made according to BS308.

Hand in A3 drawing to your tutor during tutorials in week 6 (6<sup>th</sup> and 7<sup>th</sup> November 2003). Ensure that name, group and other relevant data are filled in the title block

Figure 1.

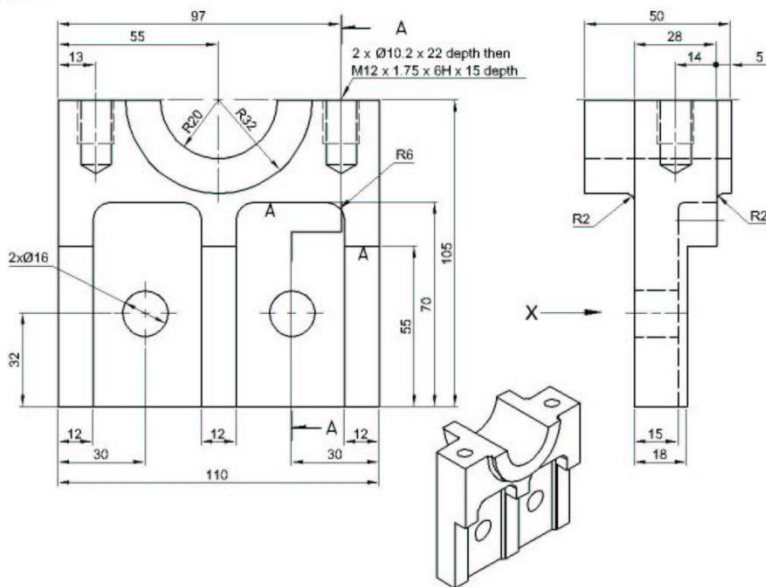


Figure 2.

