



# Chapter 3

## Sectioning

**Basic Topics**

**Advanced Topics**

**Exercises**



# Sectioning: Basic Topics

## Summary

3.1) Sectional Views

3.2) Types of Sections

3.2.1) Full section

3.2.2) Half section

3.2.3) Offset section



# Sectioning: Advanced Topics

## 3.2) Types of Sections

3.2.4) Aligned section

3.2.5) Rib and web sections

3.2.6) Broken section

3.2.7) Removed section

3.2.8) Revolved section

3.2.9) Non-sectioned parts

3.2.10) Thin sections



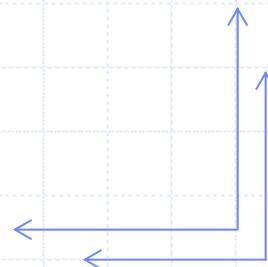
# Summary

## ➤ What will we learn in Chapter 3?

→ How to create various types of sectional views. (Sectional views allow you to see inside an object.)

## ➤ Key points

→ Using a sectional view can be very useful for parts that have complex interior geometry.





# Sectioning

## 3.1) Sectional Views



# Sectional Views

➤ A sectional view or section looks inside an object.

- Sections are used to clarify the interior construction of a part that can not be clearly described by hidden lines in exterior views.
- By taking an imaginary cut through the object and removing a portion, the inside features may be seen more clearly.



# Sectional Views

- What is this?
- An ugly rock?





# Sectional Views

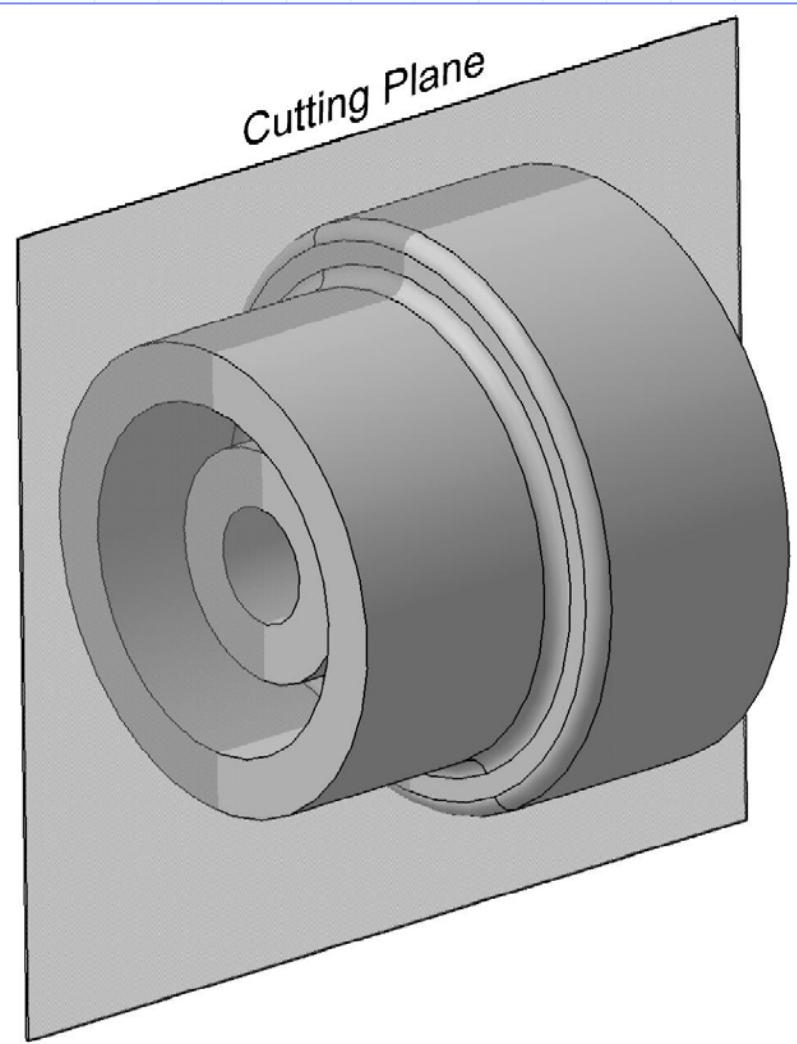
➤ A pretty rock?





# Creating a Section View

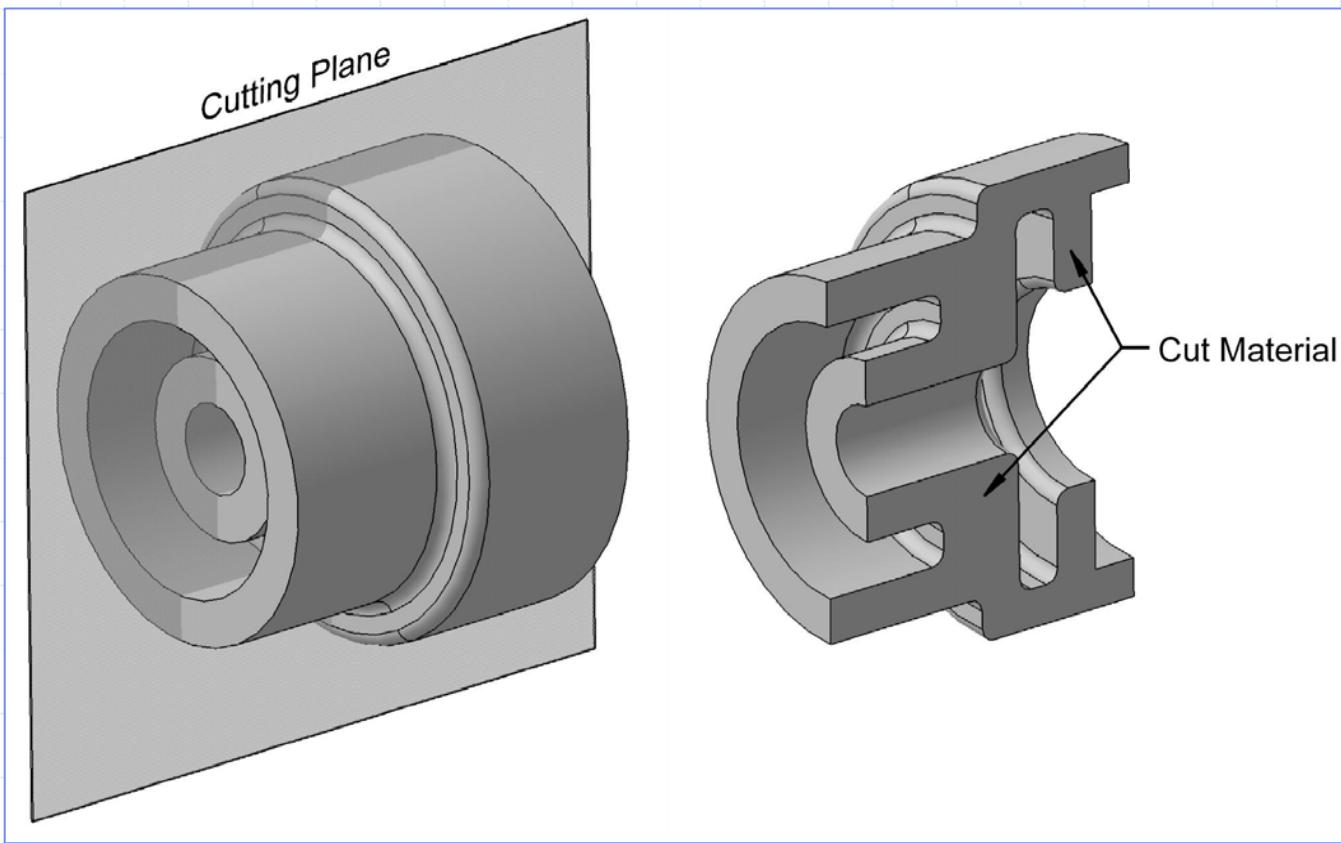
- The part is cut using an imaginary cutting plane.





# Creating a Section View

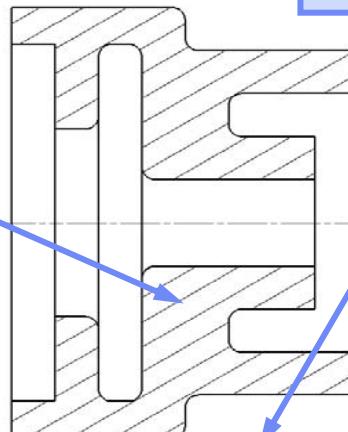
- The unwanted portion is mentally discarded exposing the interior construction.



# Section Example

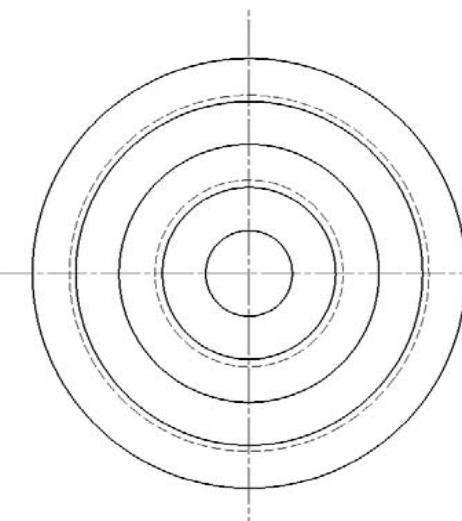
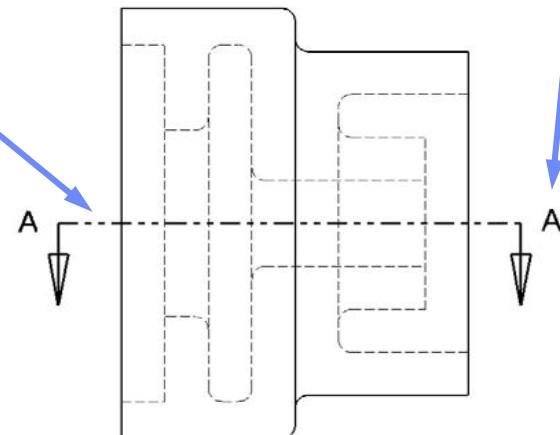
Notice how the cut material is shown.

Sectional view label



SECTION A-A

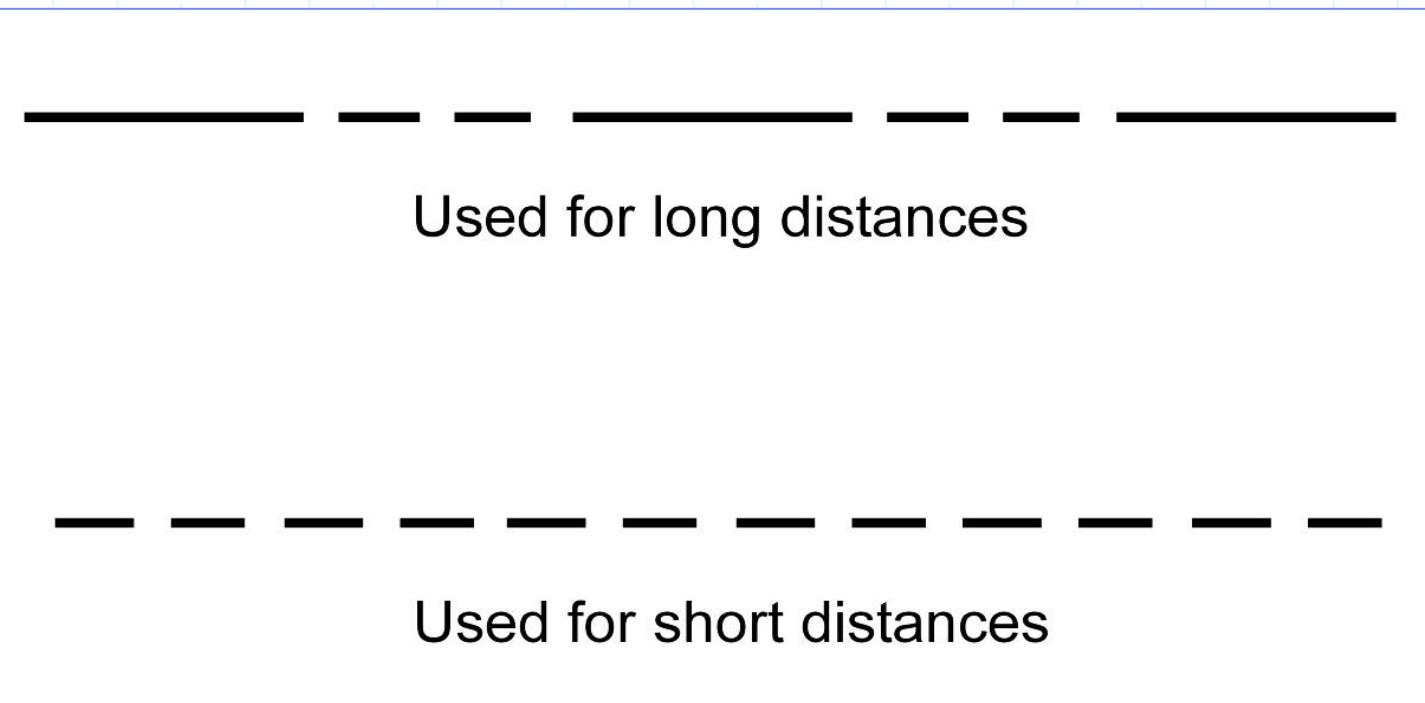
Notice how the cutting plane is indicated.



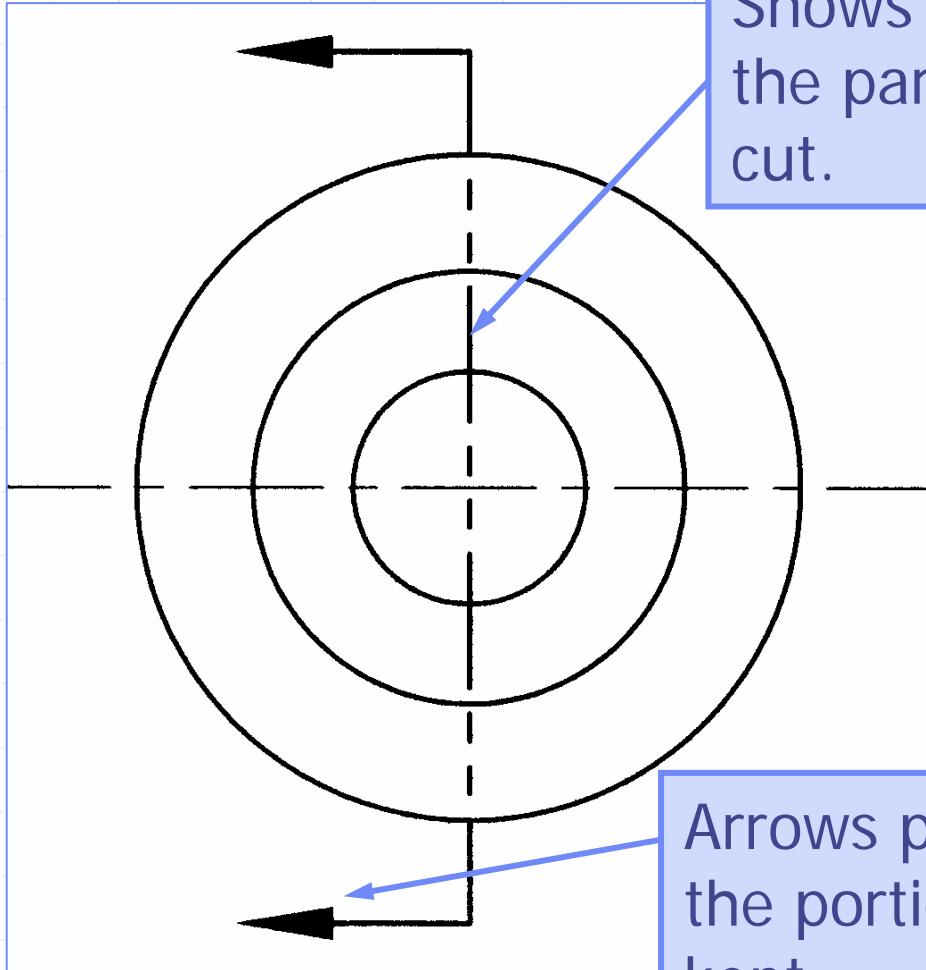


# Lines Used in Section Views

- **Cutting Plane Line:** Used to show where the object is being cut.  
→ (Phantom line type)

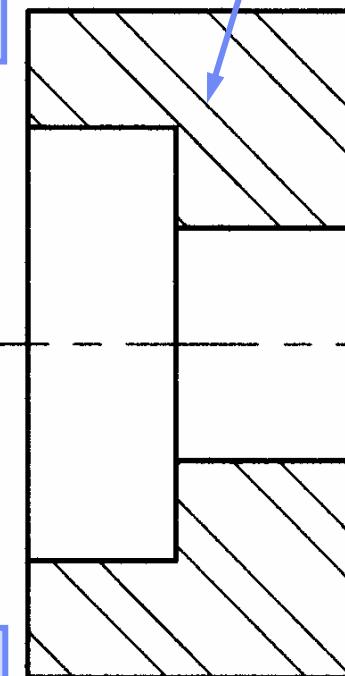


# Lines Used in Section Views



Arrows point to the portion being kept.

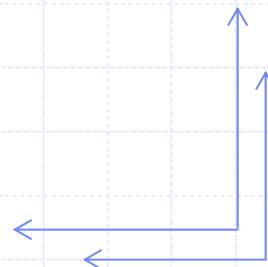
Section Lines





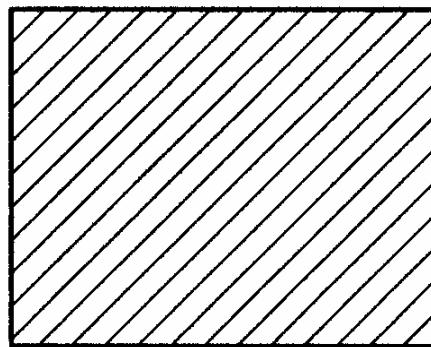
# Lines Used in Section Views

- **Section Lines:** Section lines are used to indicate where the cutting plane cuts the material.
  - Section lines are thin lines.
  - Section line symbols are chosen according to the material of the object
  - Section lines are generally drawn at a 45° angle.

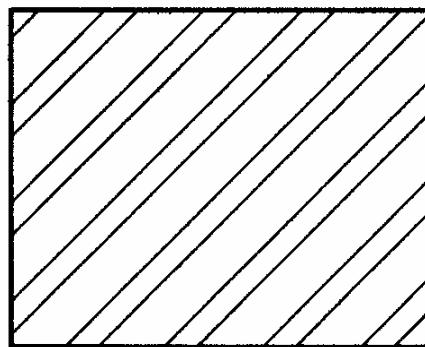


# Lines Used in Section Views

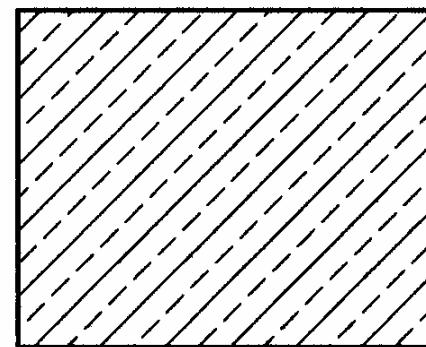
## ➤ Common Section Line Symbols



Cast Iron  
General Use  
all materials



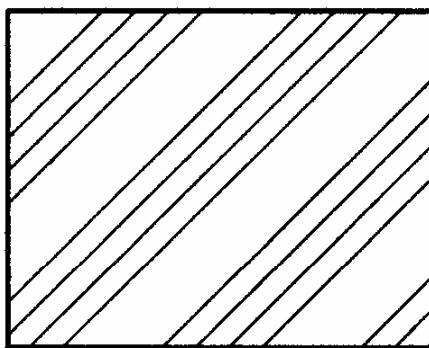
Steel



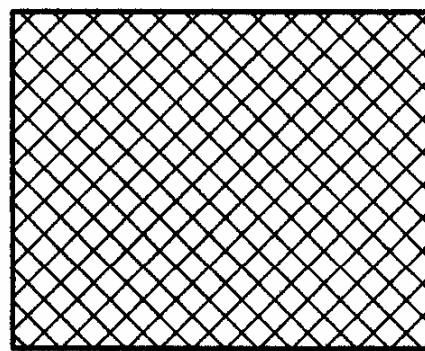
Brass, Bronze,  
Copper

# Lines Used in Section Views

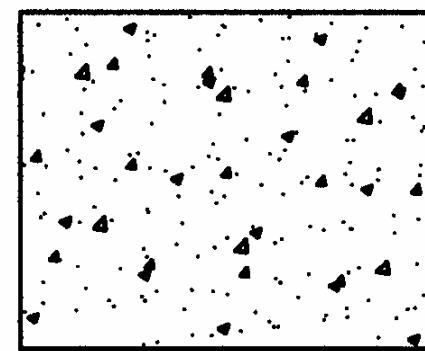
## ➤ Common Section Line Symbols



Rubber, Plastic,  
and Electrical  
Insulation



Zinc and Lead



Concrete

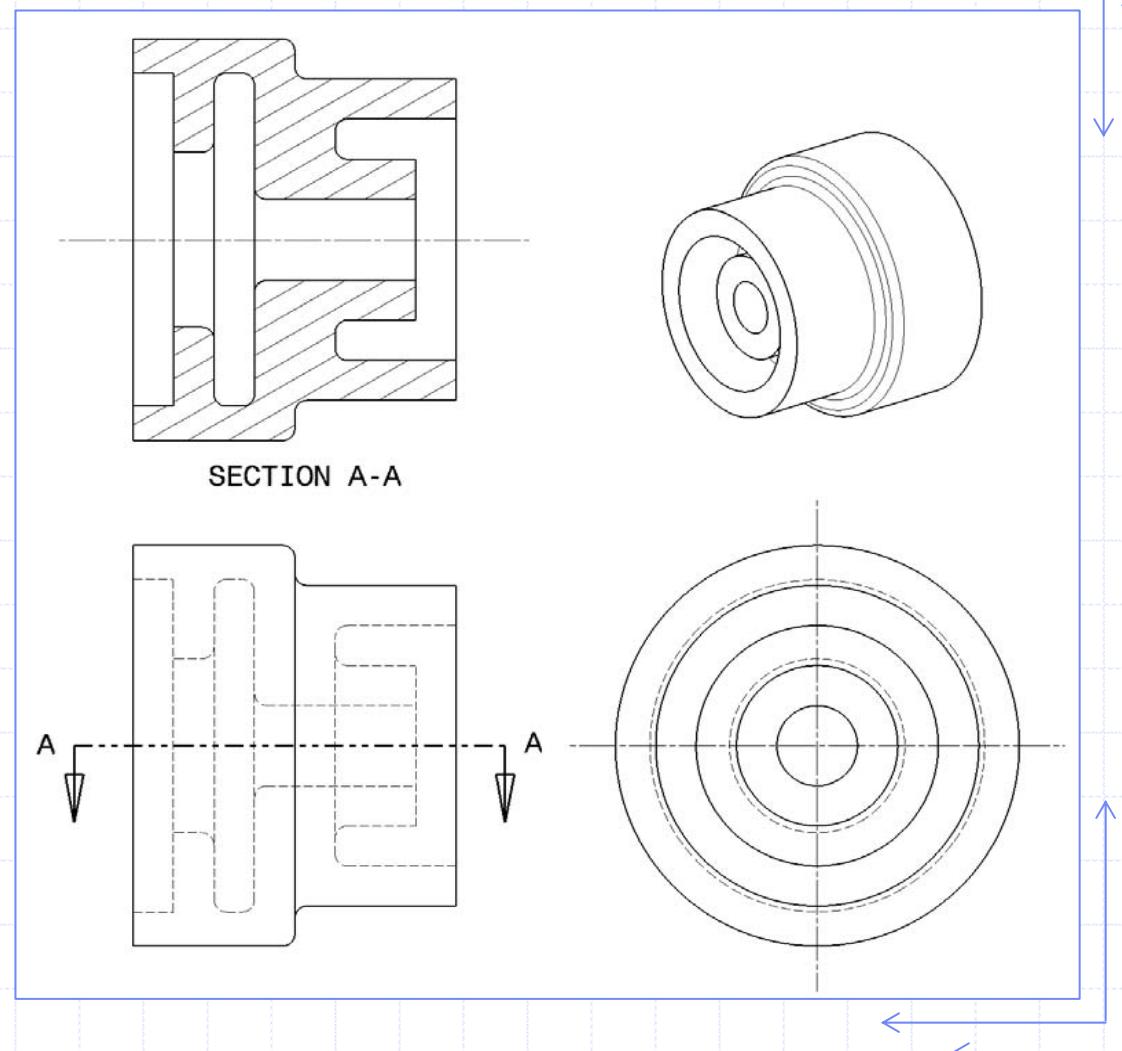
More section line symbols shown in Fig. 3-4 on page 3-5



# Rules of Sectioning

## ➤ **Rule 1:**

A section  
lined area is  
always  
completely  
bounded by a  
visible outline.



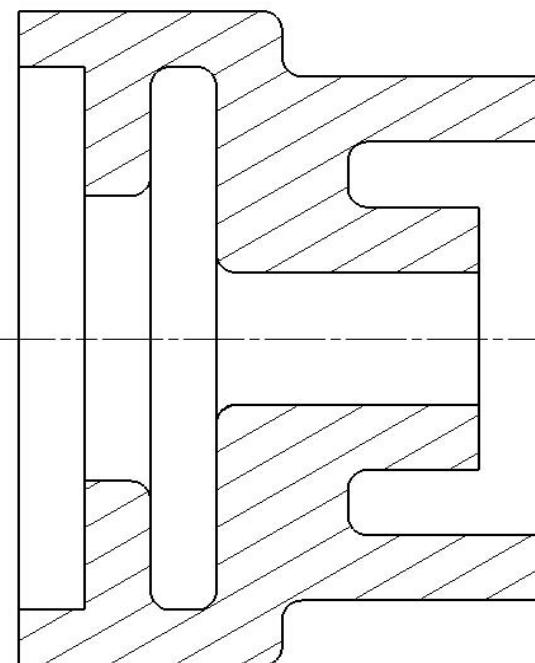


# Rules of Sectioning

## ➤ Rule 2:

The section lines in all areas should be parallel.

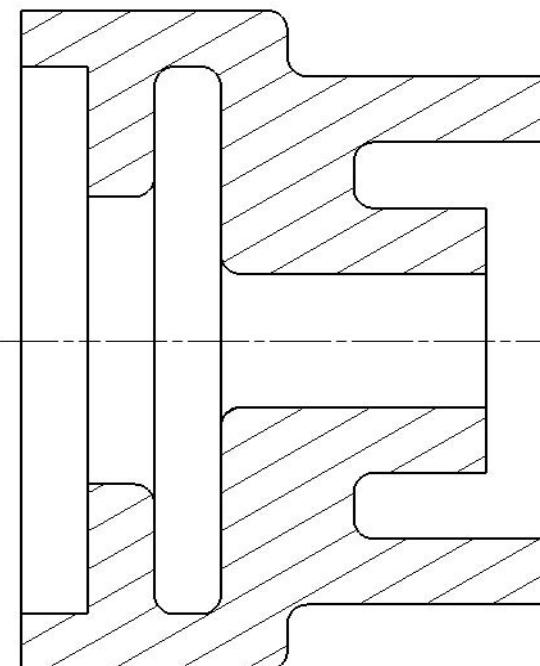
→ Section lines shown in opposite directions indicate a different part.



SECTION A-A

# Rules of Sectioning

- **Rule 3:** All the visible edges behind the cutting plane should be shown.



SECTION A-A

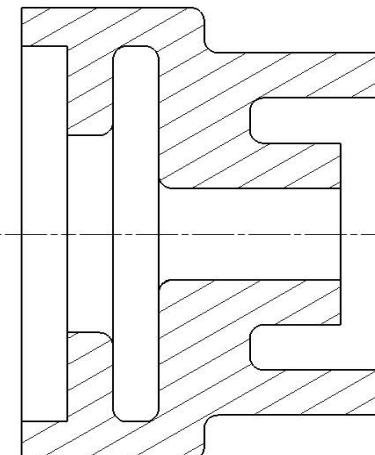


# Rules of Sectioning

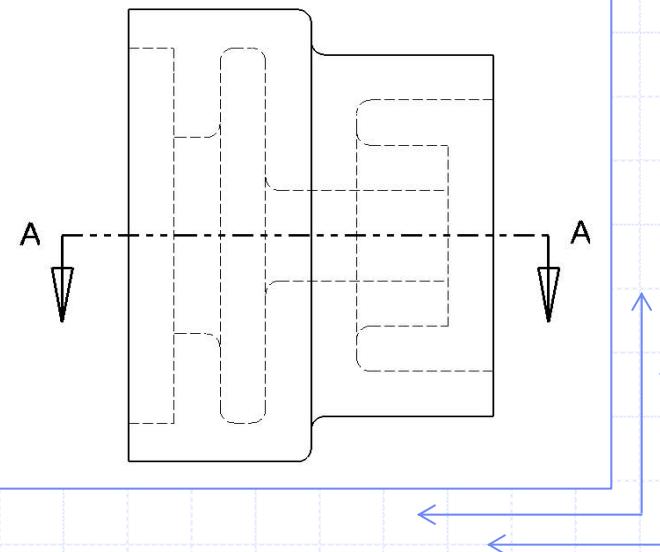
## ➤ Rule 4:

Hidden features should be omitted in all areas of a section view.

→ Exceptions include threads and broken out sections.



SECTION A-A





# Sectioning

## 3.2) Types of Sections



# Types of Sections

➤ The type of section used depends on the situation and what information needs to be conveyed.

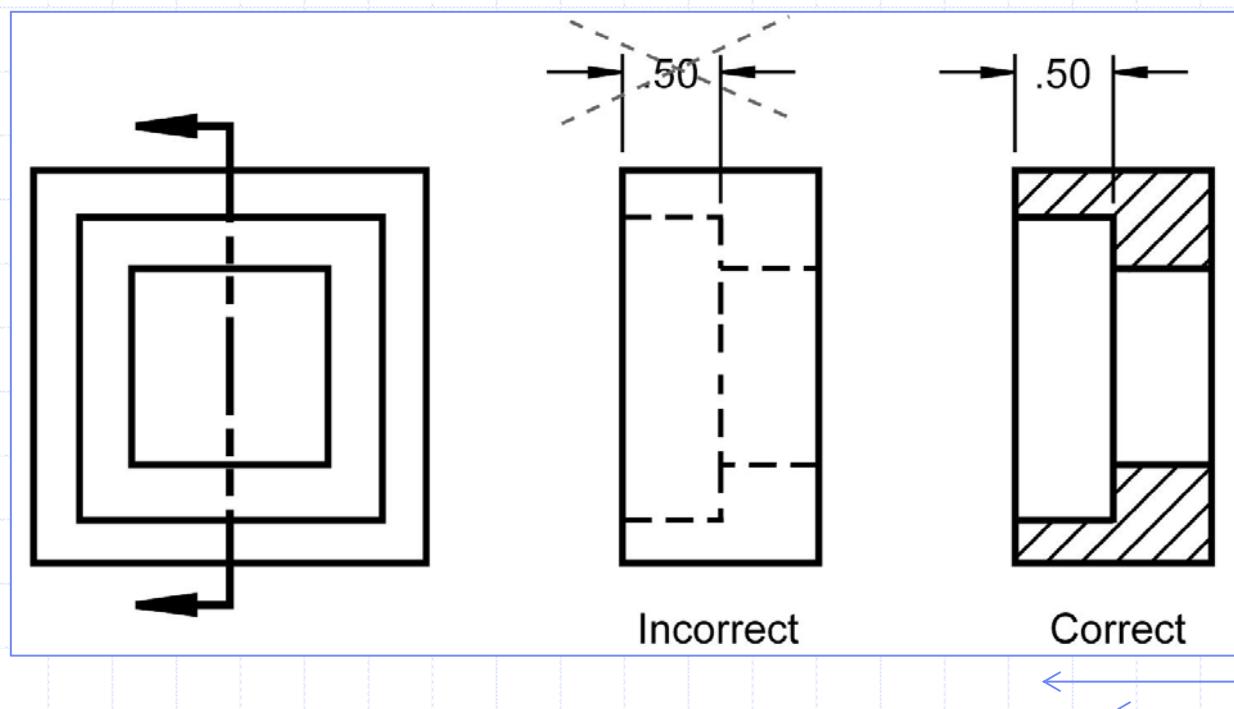
➤ Types of sections

- Full Section
- Half Section
- Offset Section
- etc ...



# Full Section

- To create a **full section**, the cutting plane passes fully through the object.
  - Used in many cases to avoid having to dimension hidden lines.



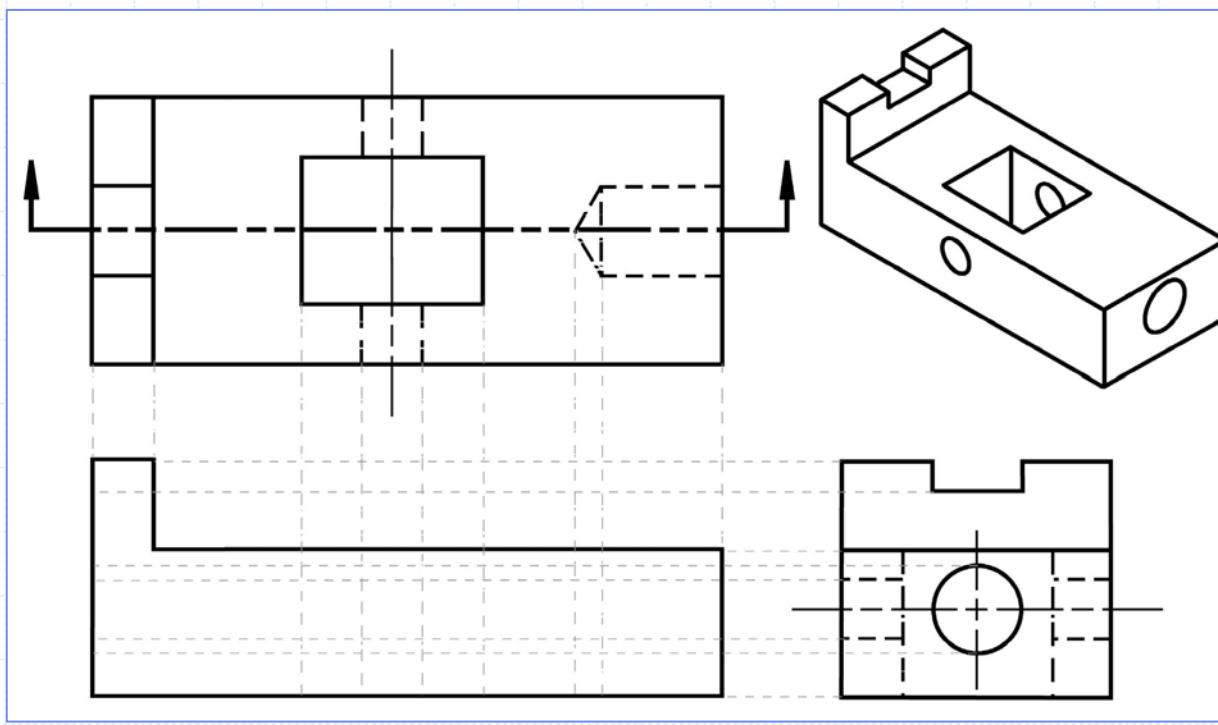
# Exercise 3-1

Full Section

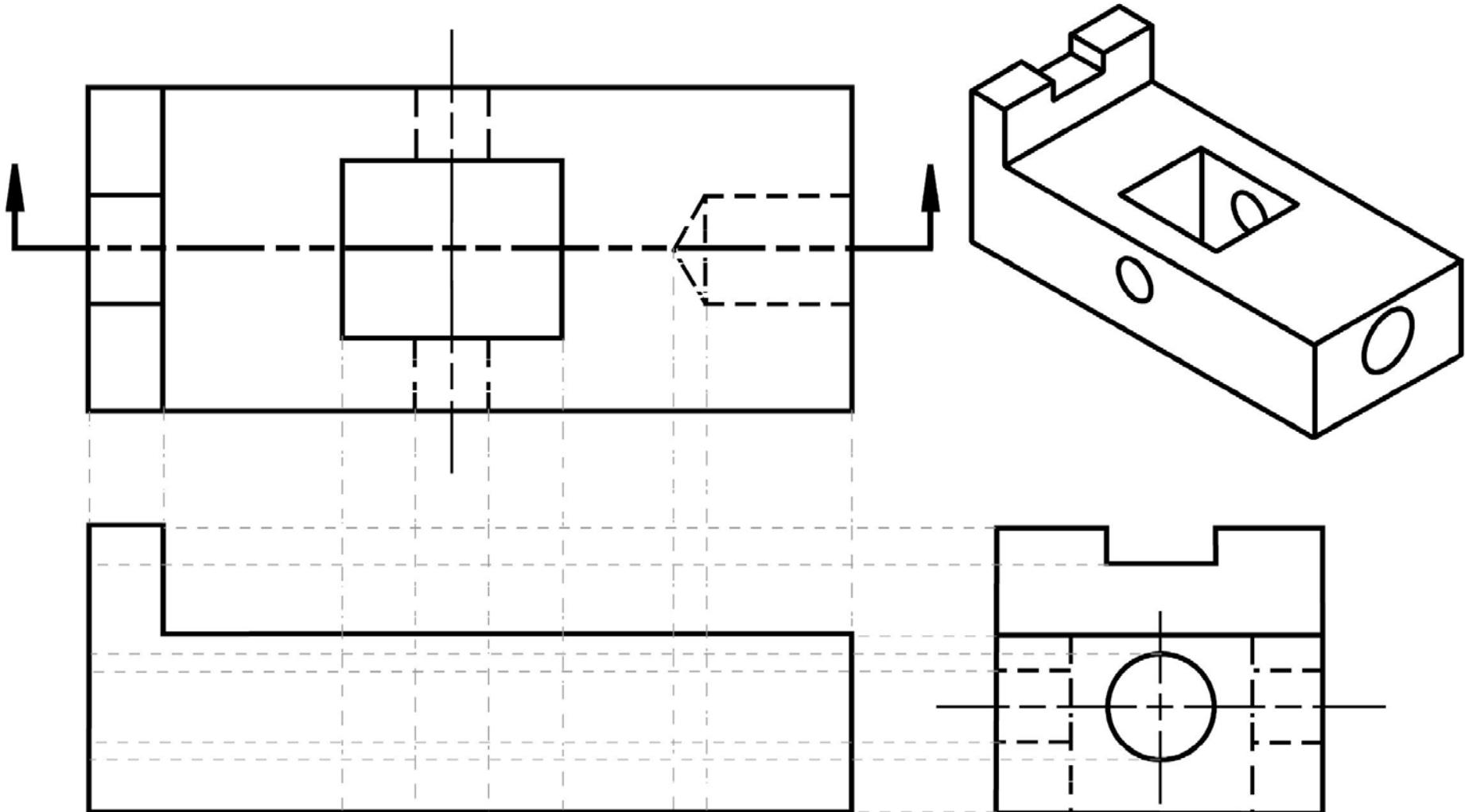


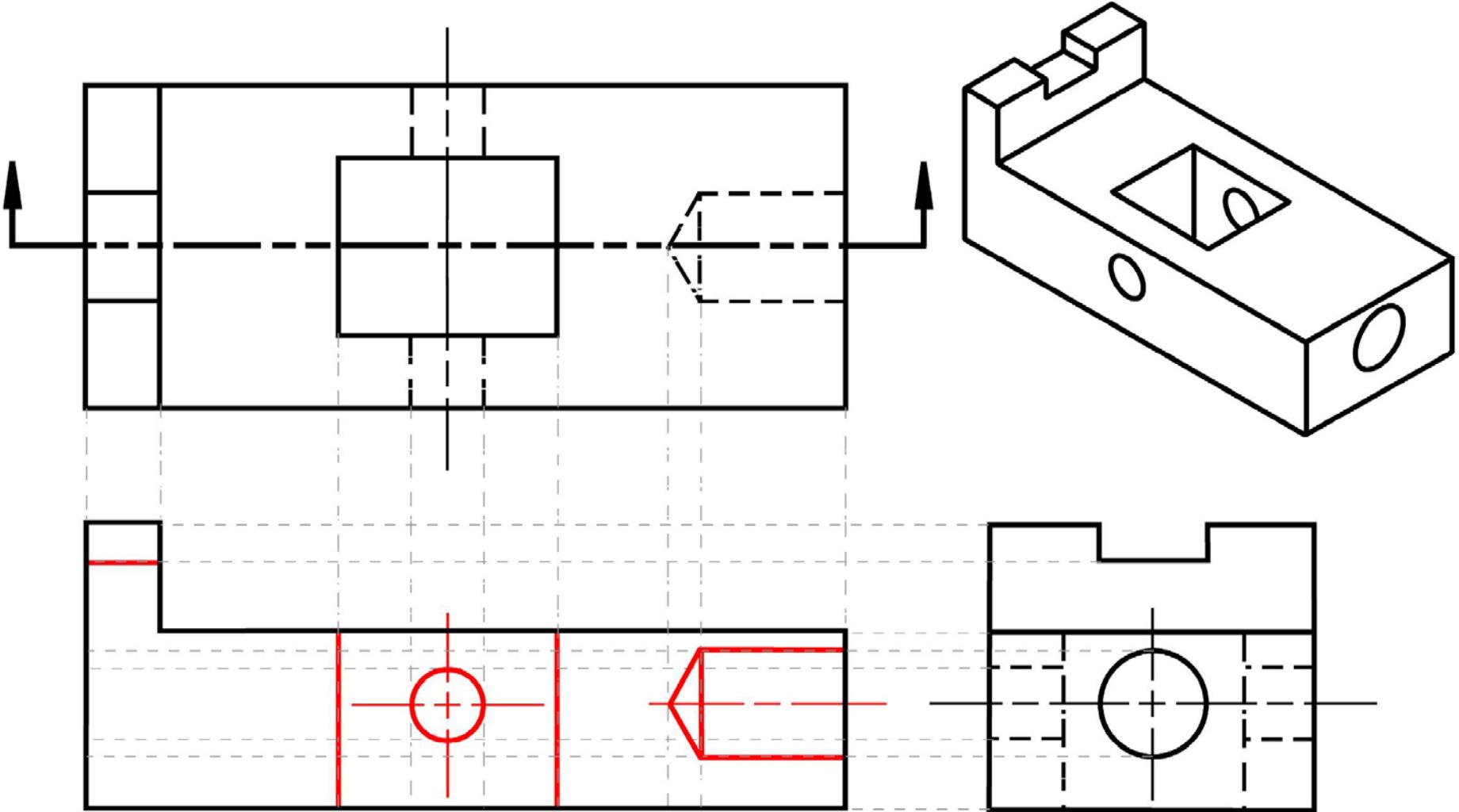
# Exercise 3-1

- Given the top and right side views, sketch the front view as a full section.
  - The material used is steel.

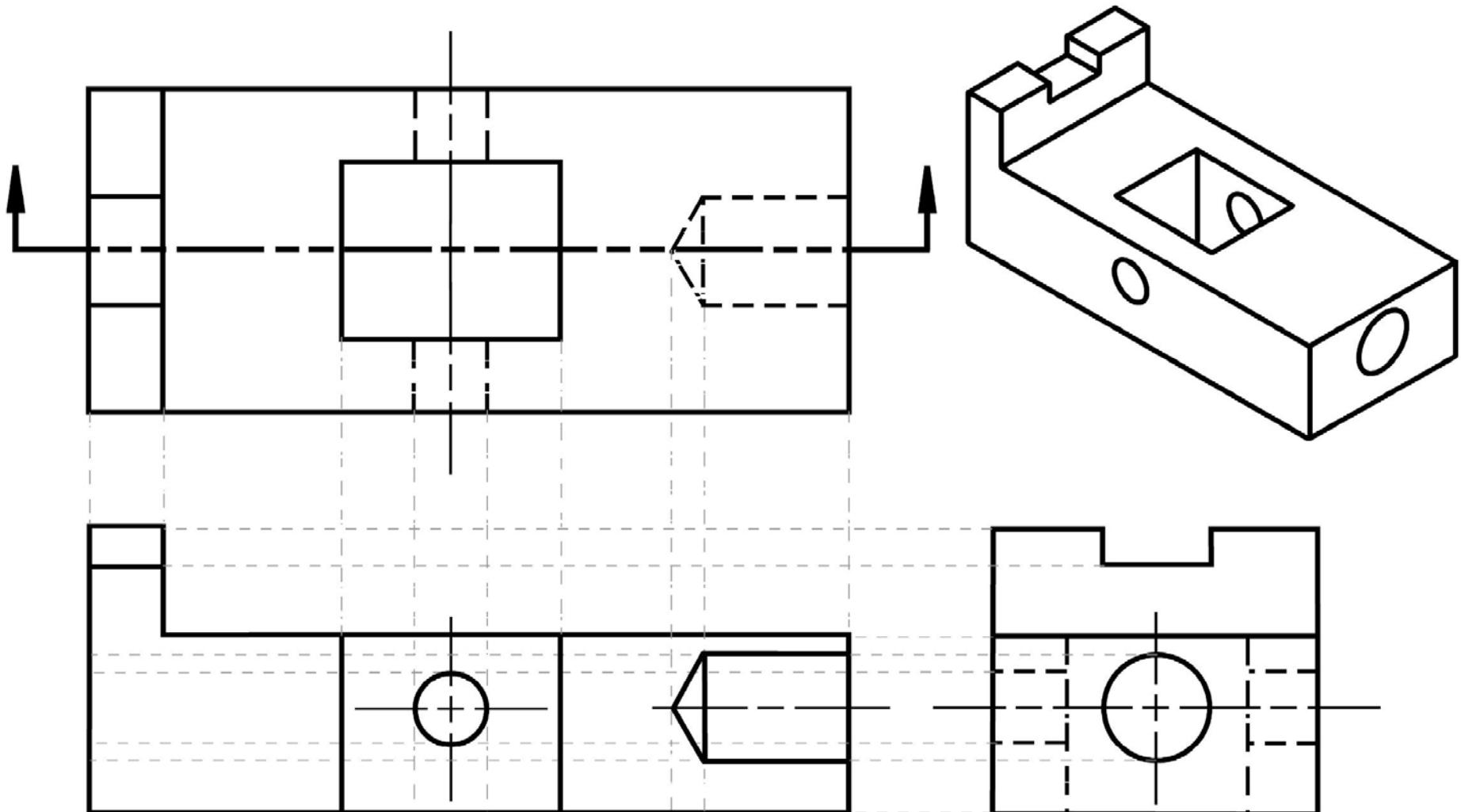


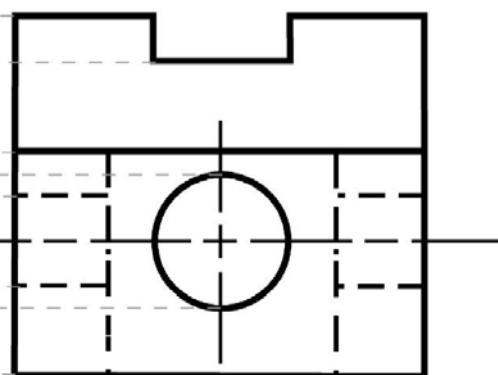
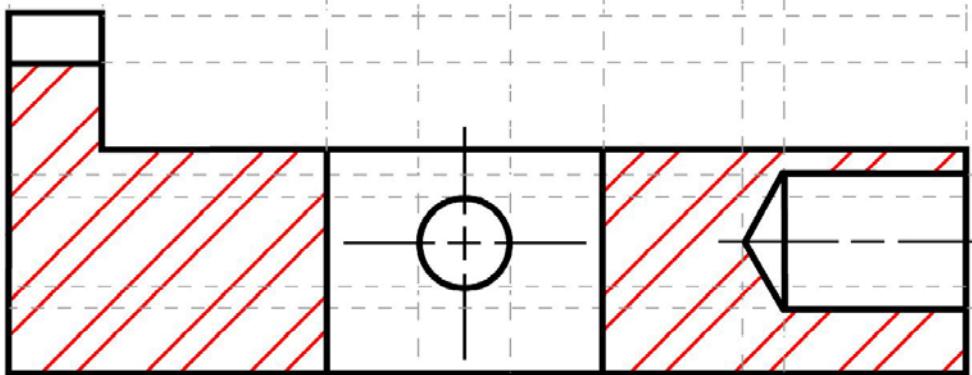
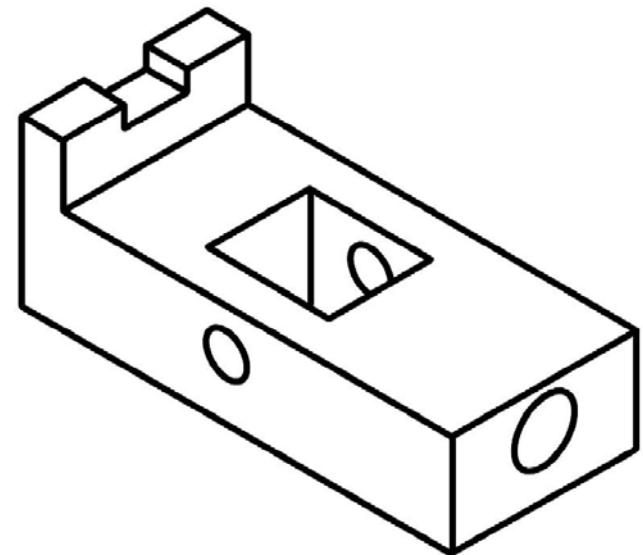
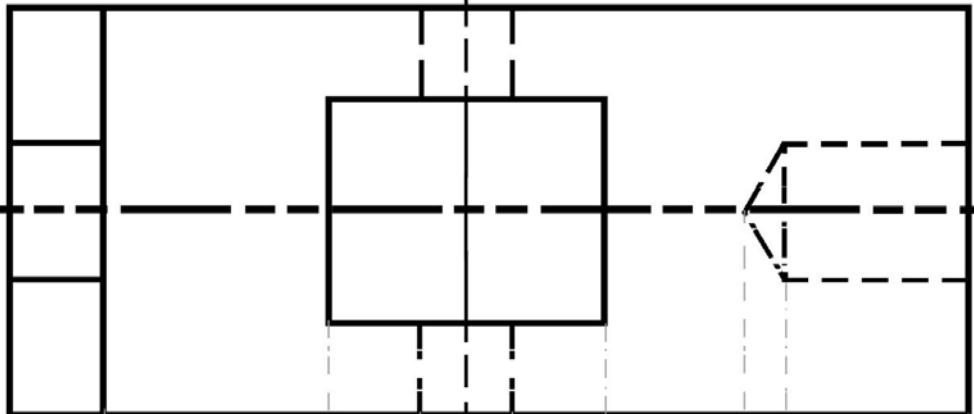
Fill in the visible lines in the front full sectional view

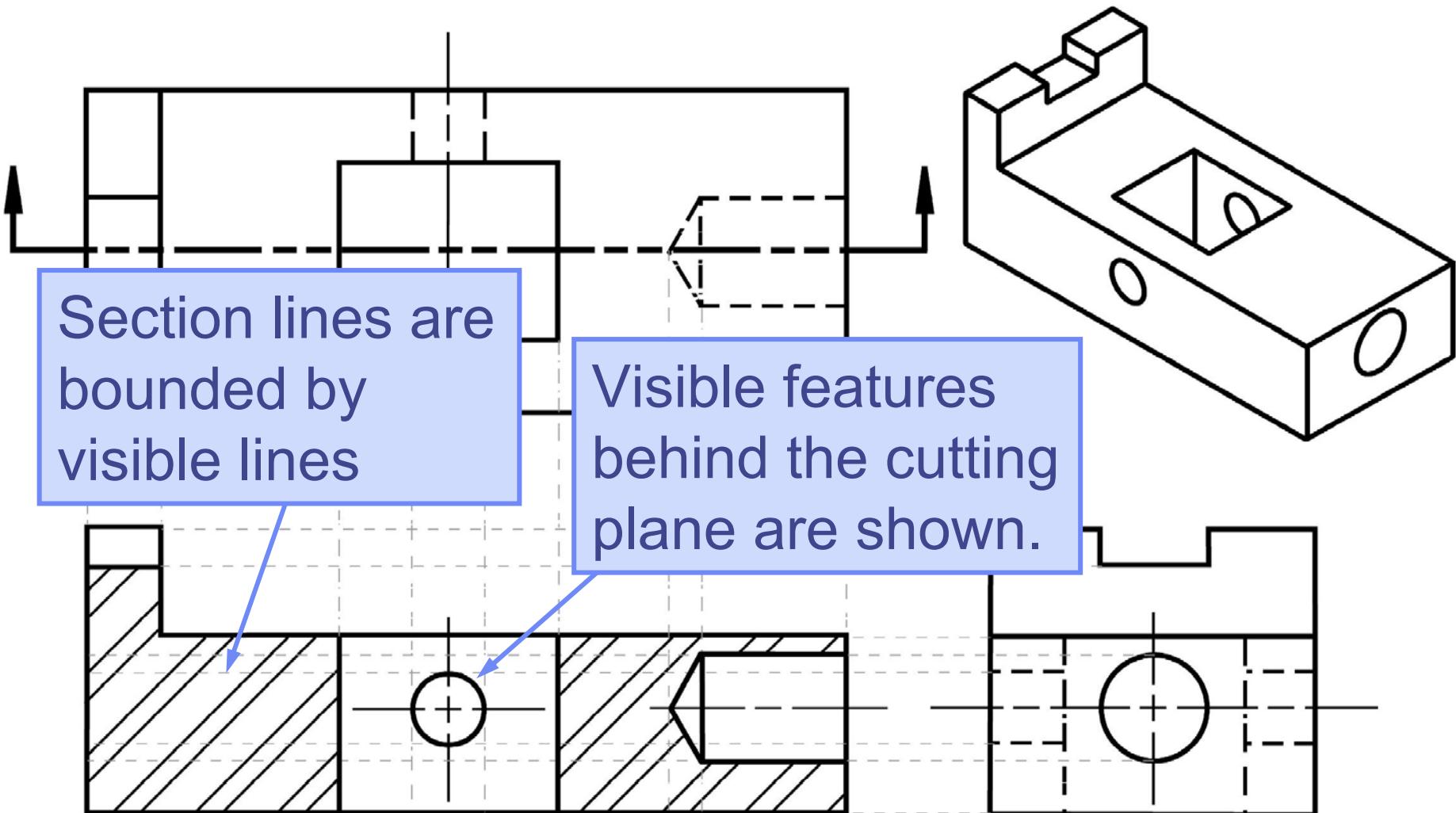




Fill in the section lines in the front full sectional view



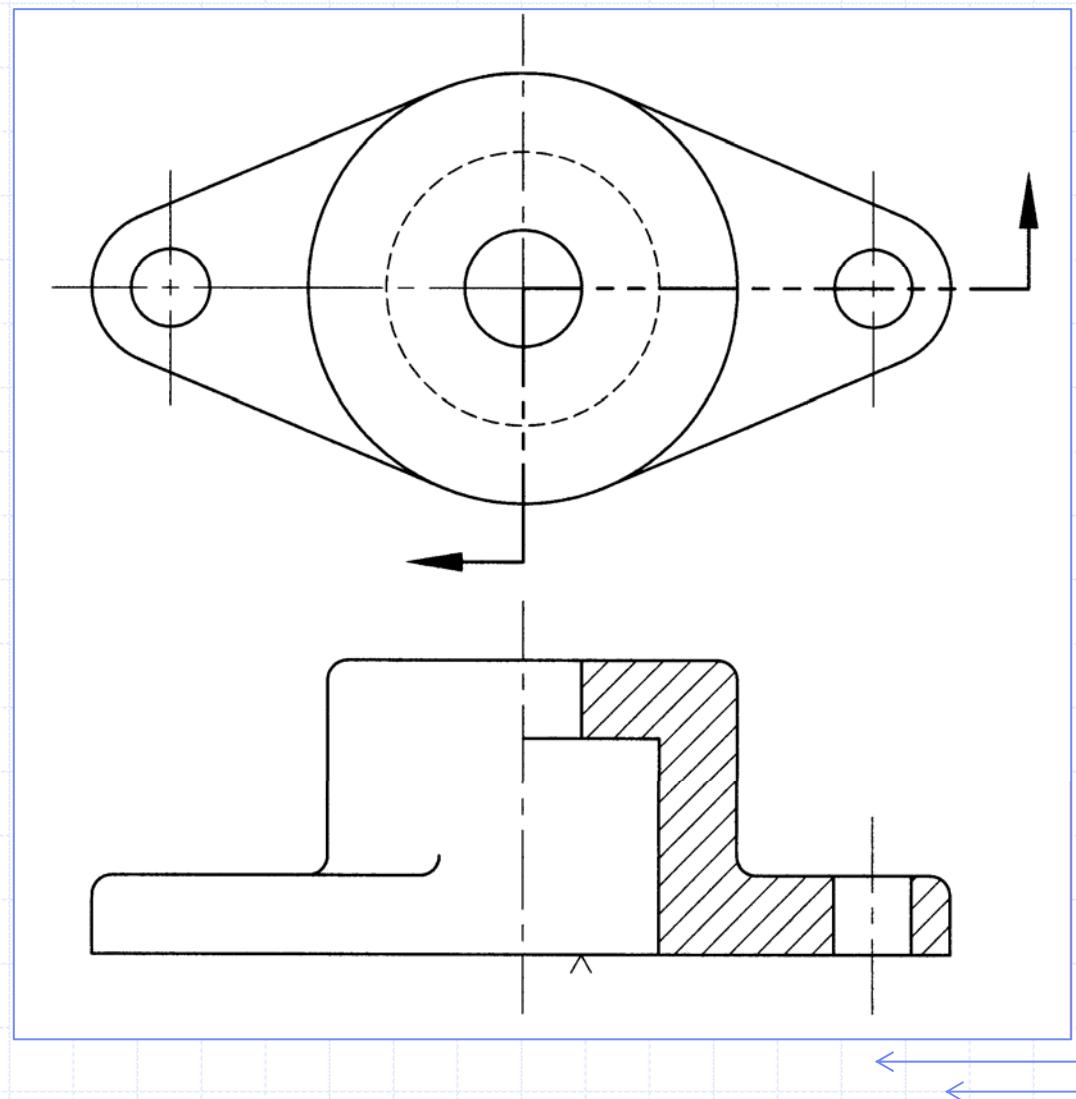






# Half Section

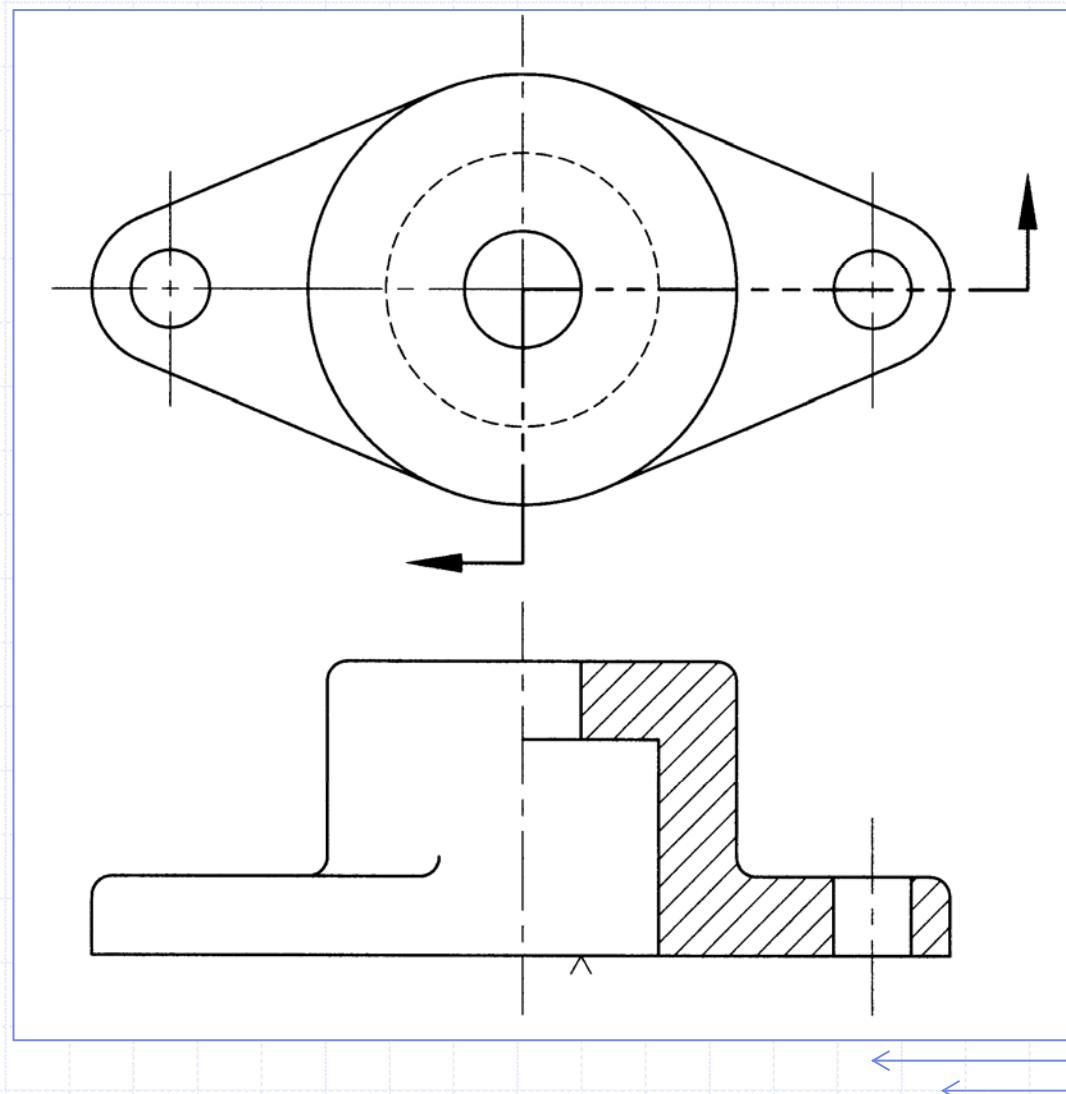
- A half section exposes the interior of one half of an object while retaining the exterior of the other half.





# Half Section

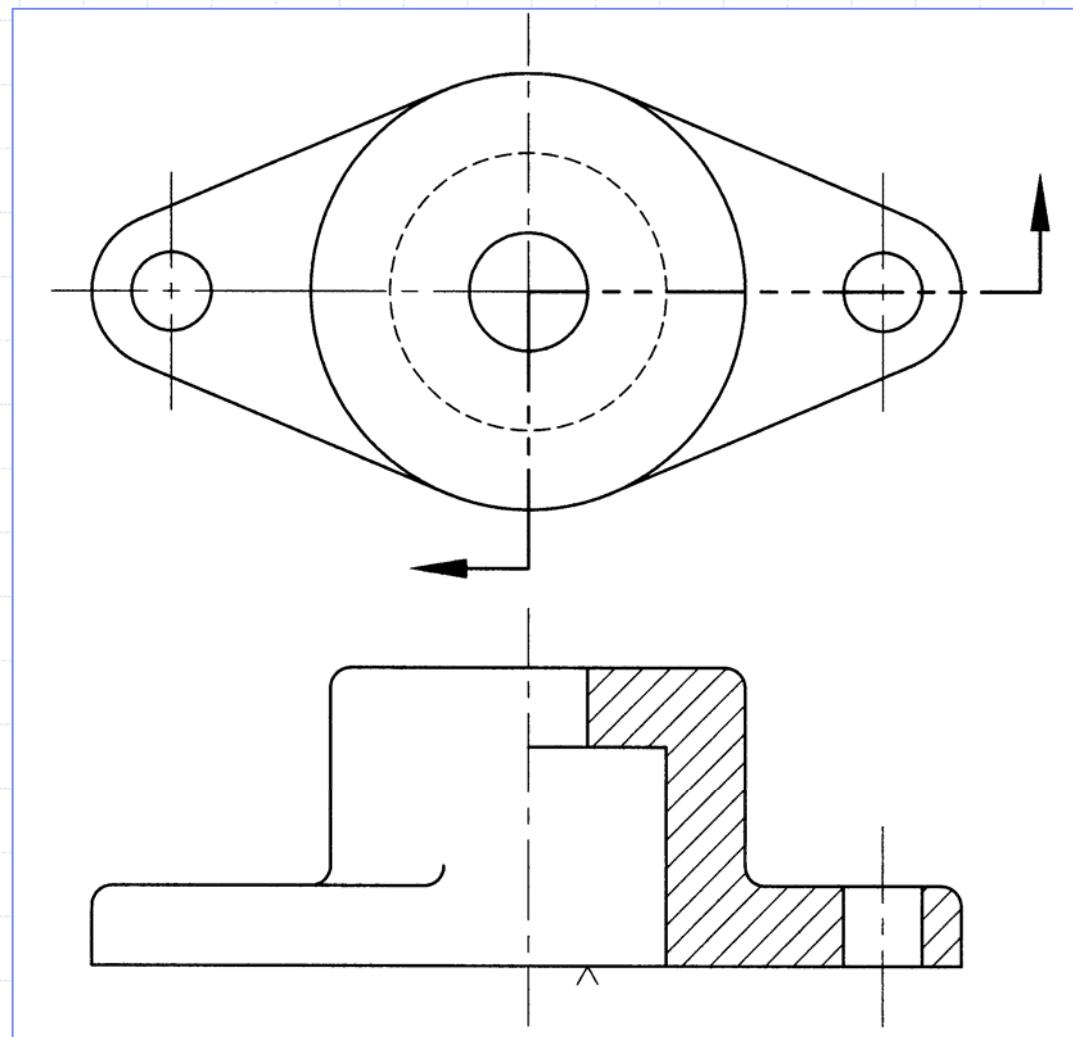
- Half sections are used mainly for symmetric objects or assembly drawings.





# Half Section

- A centerline is used to separate the two halves.
- Hidden lines should not be shown on either half.



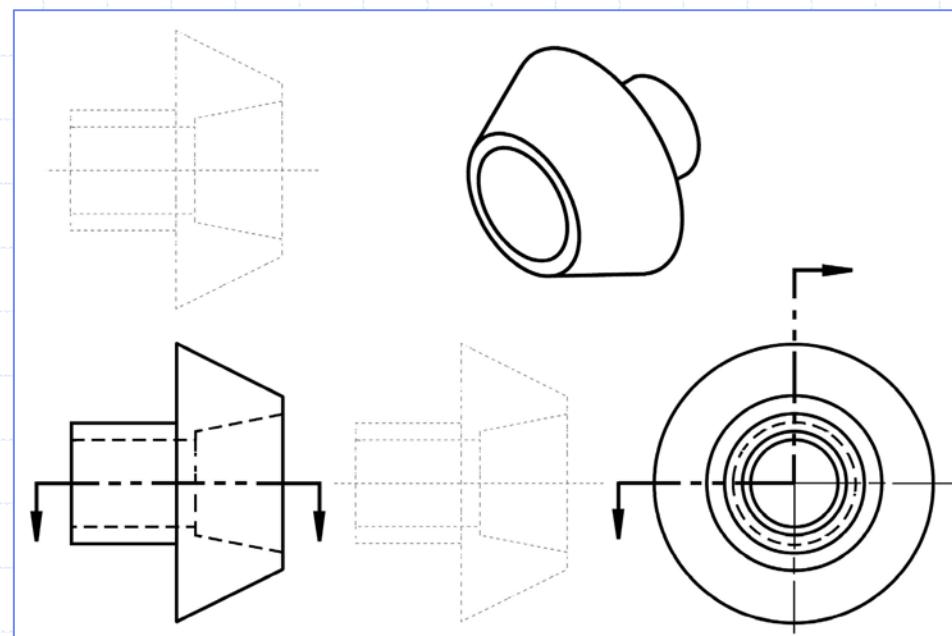
# Exercise 3-2

## Half Section

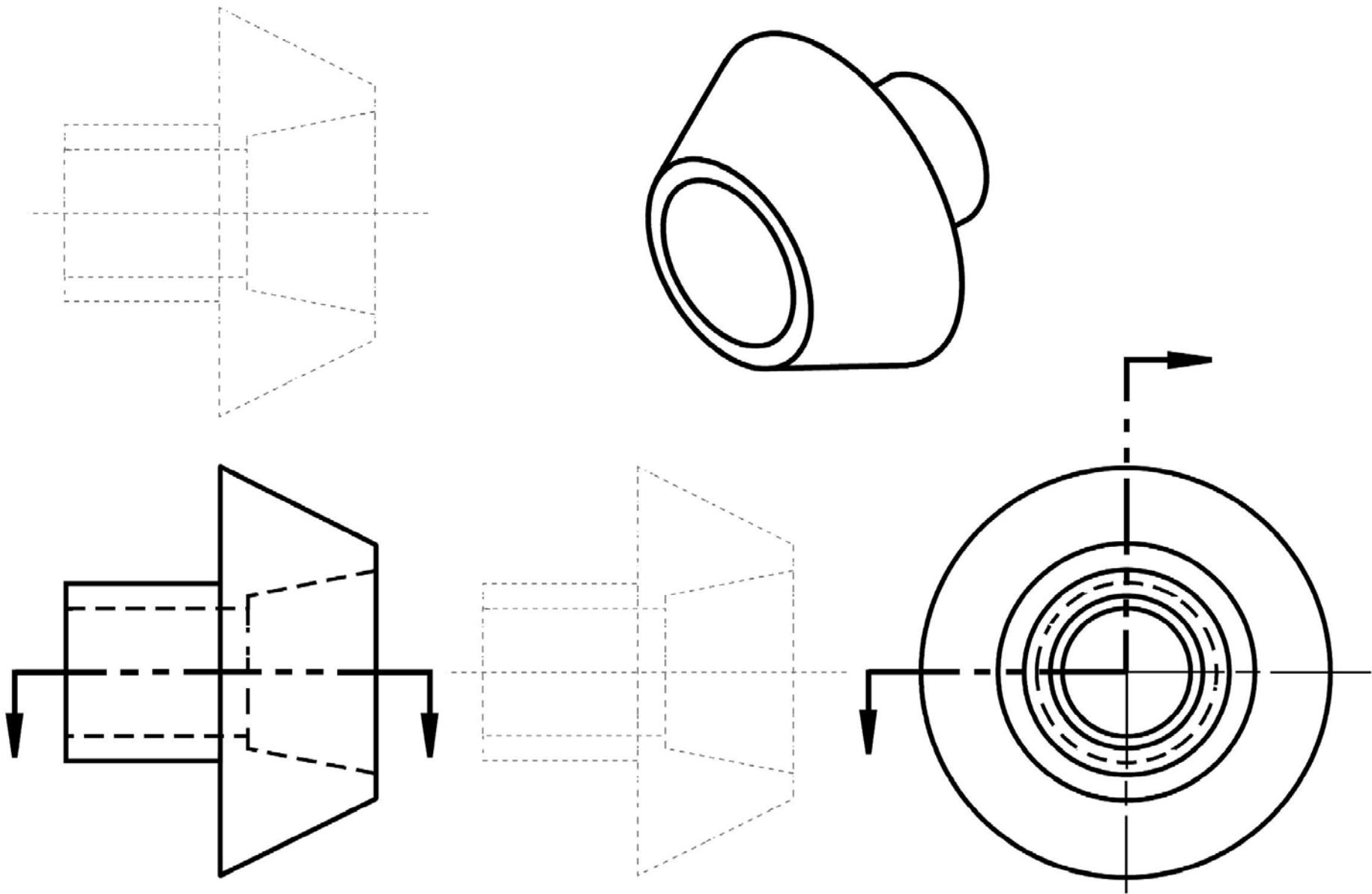


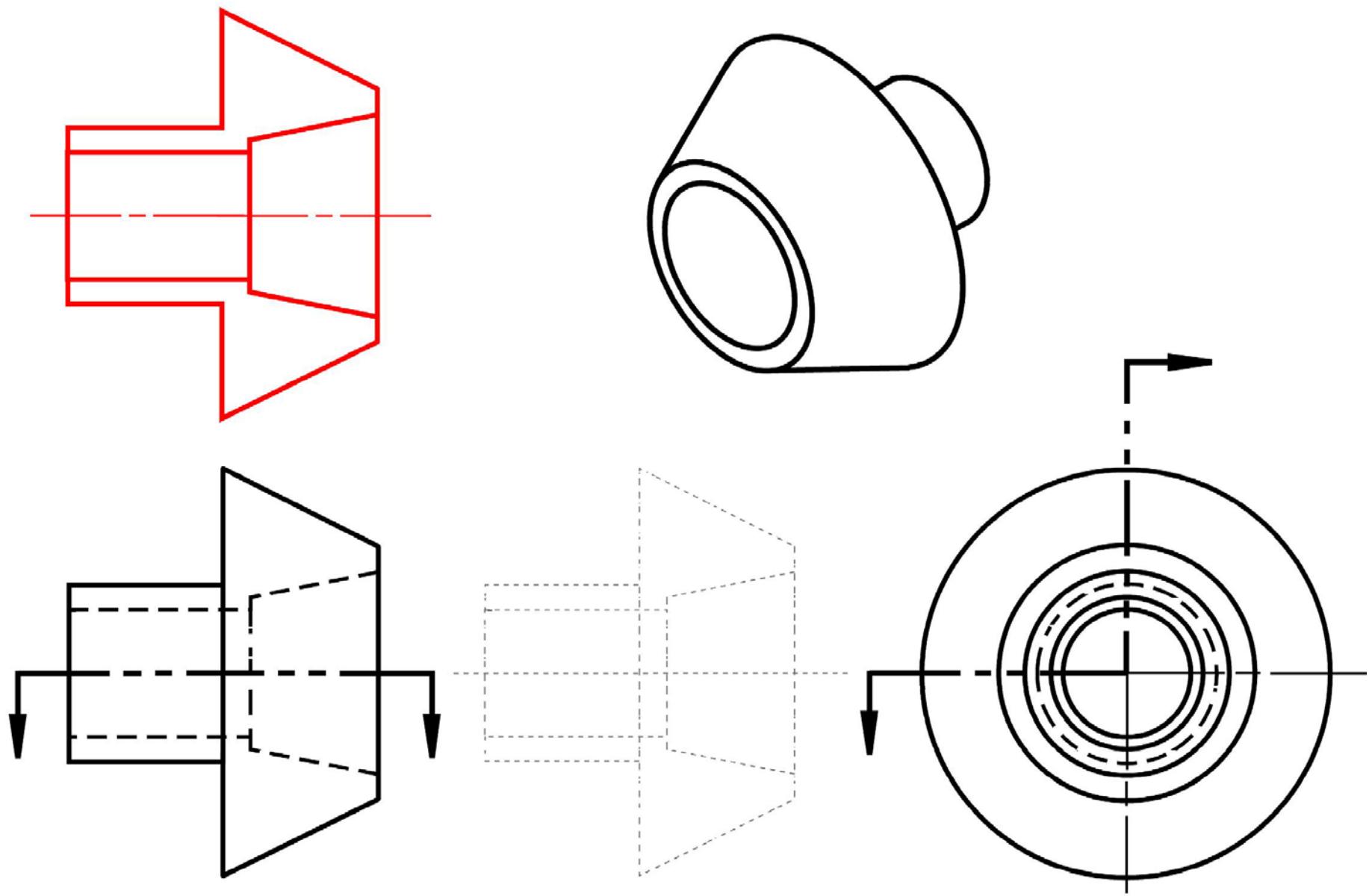
# Exercise 3-2

- Given the front and right side views, sketch the top view as a full section and create a half sectioned front view.  
→ The material is brass.

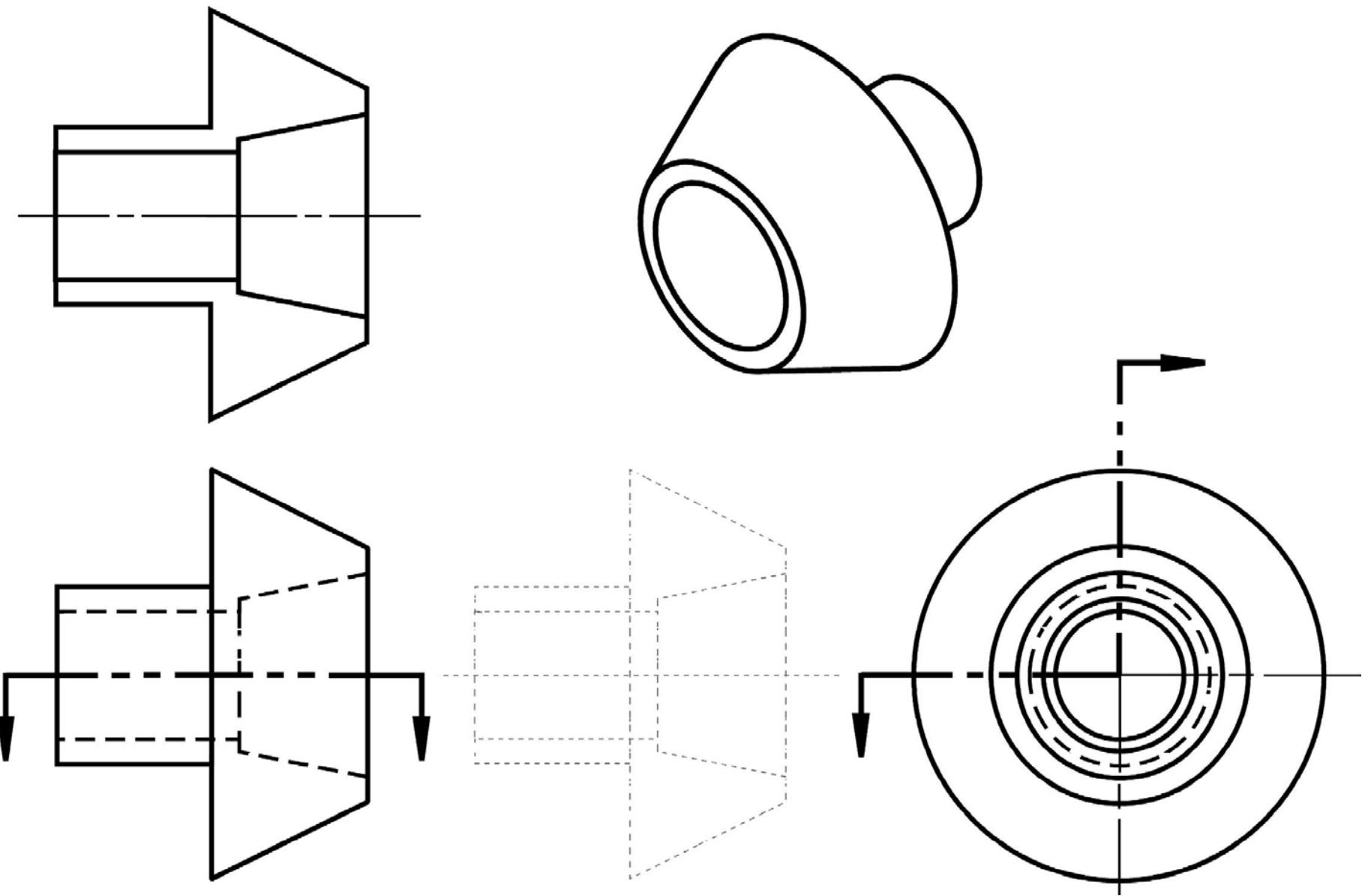


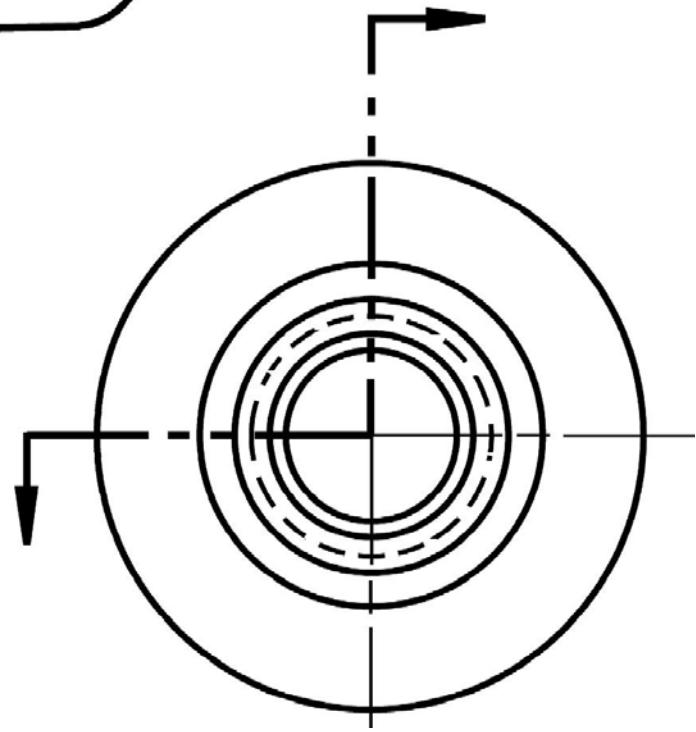
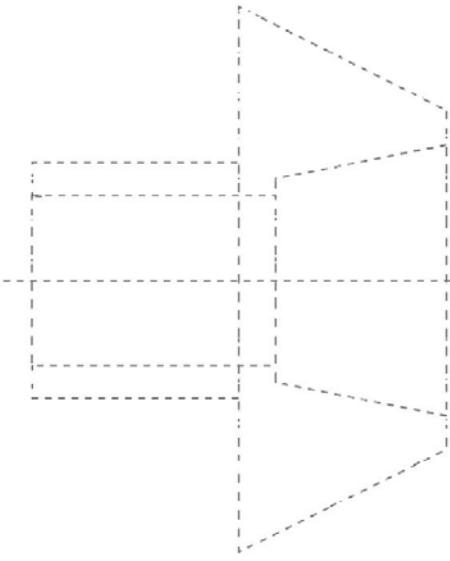
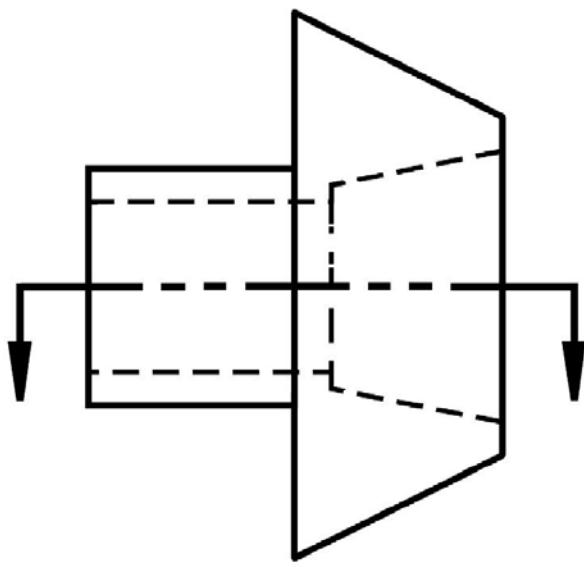
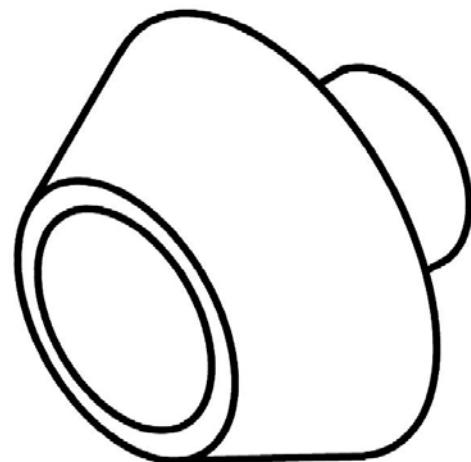
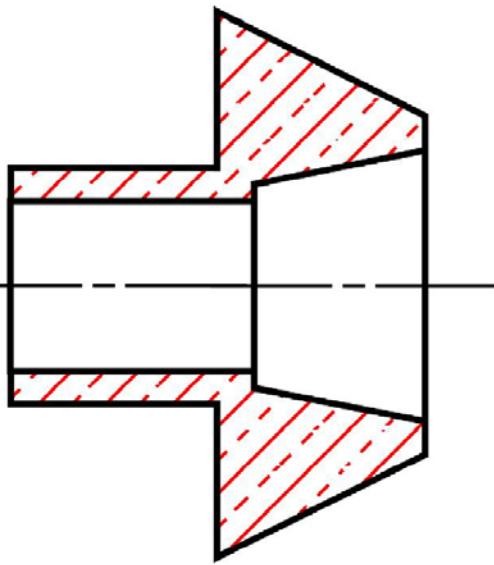
Fill in the visible lines in the top full section view.



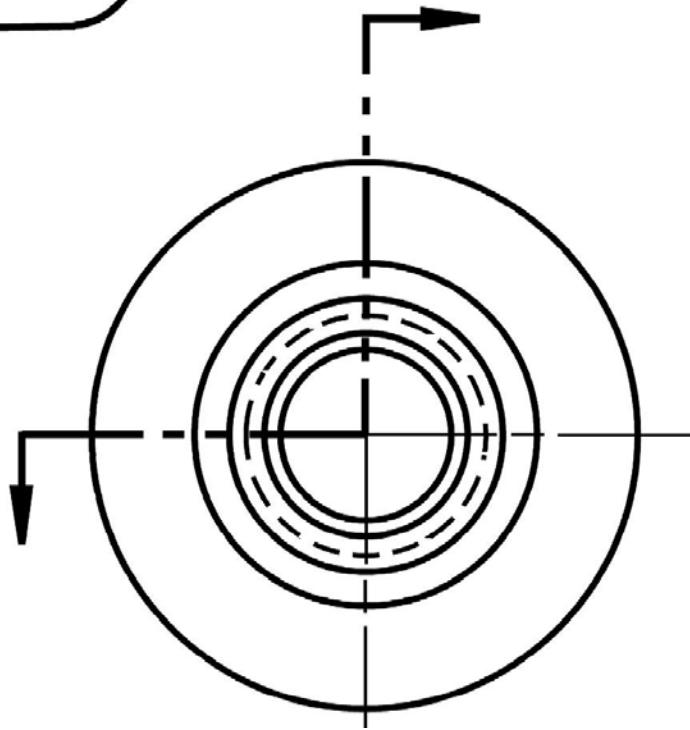
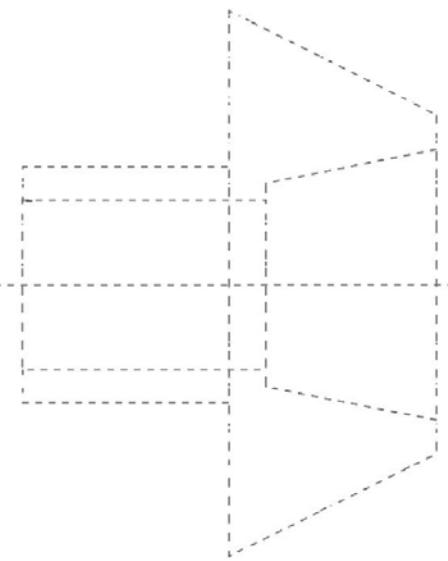
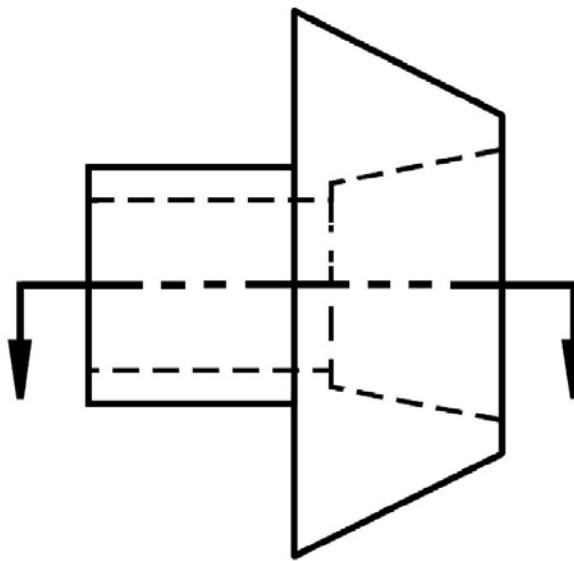
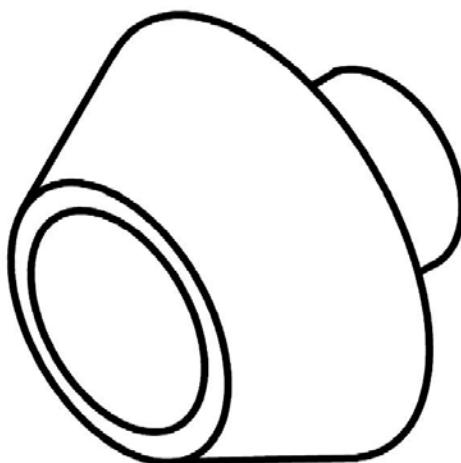
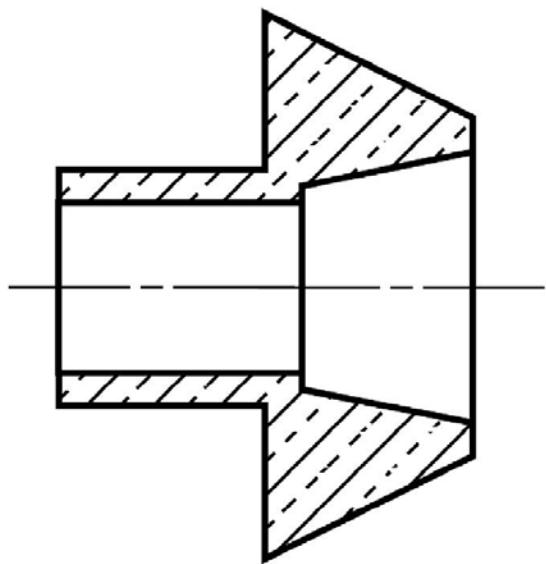


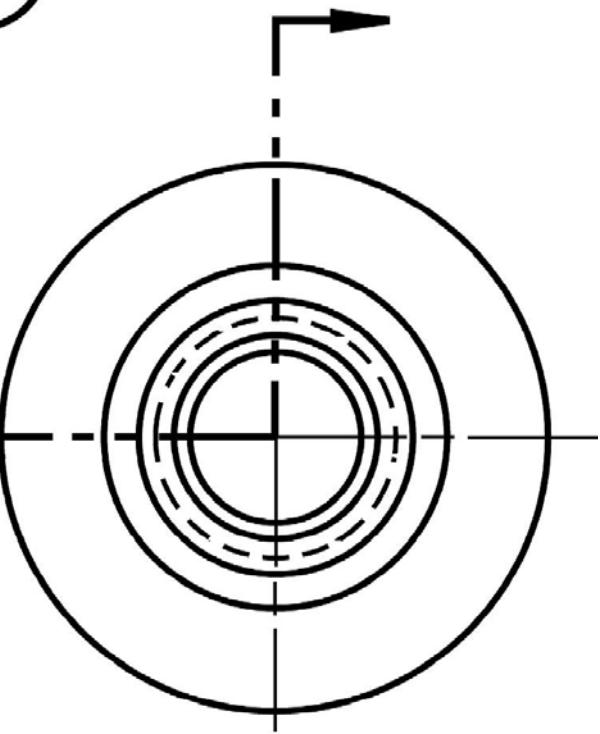
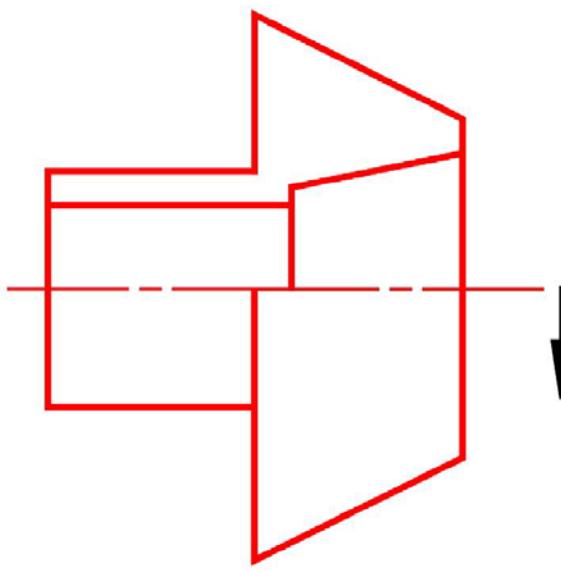
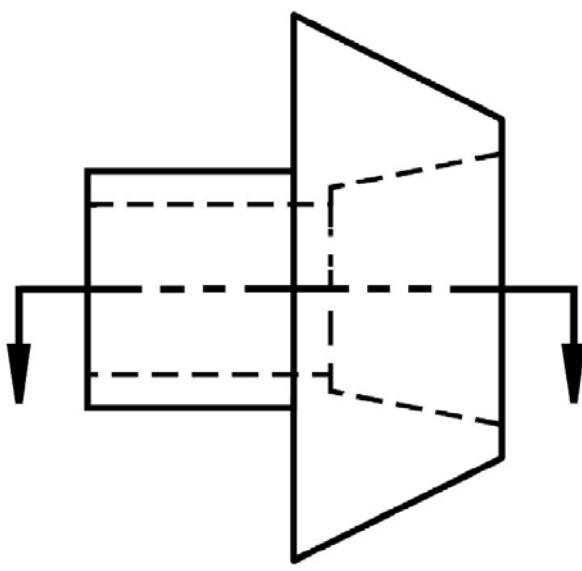
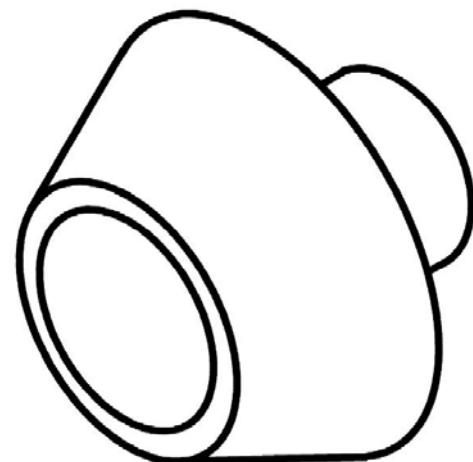
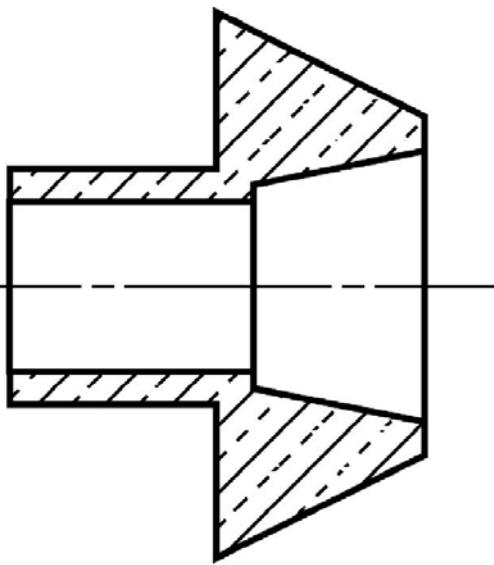
Fill in the section lines in the top full section view.



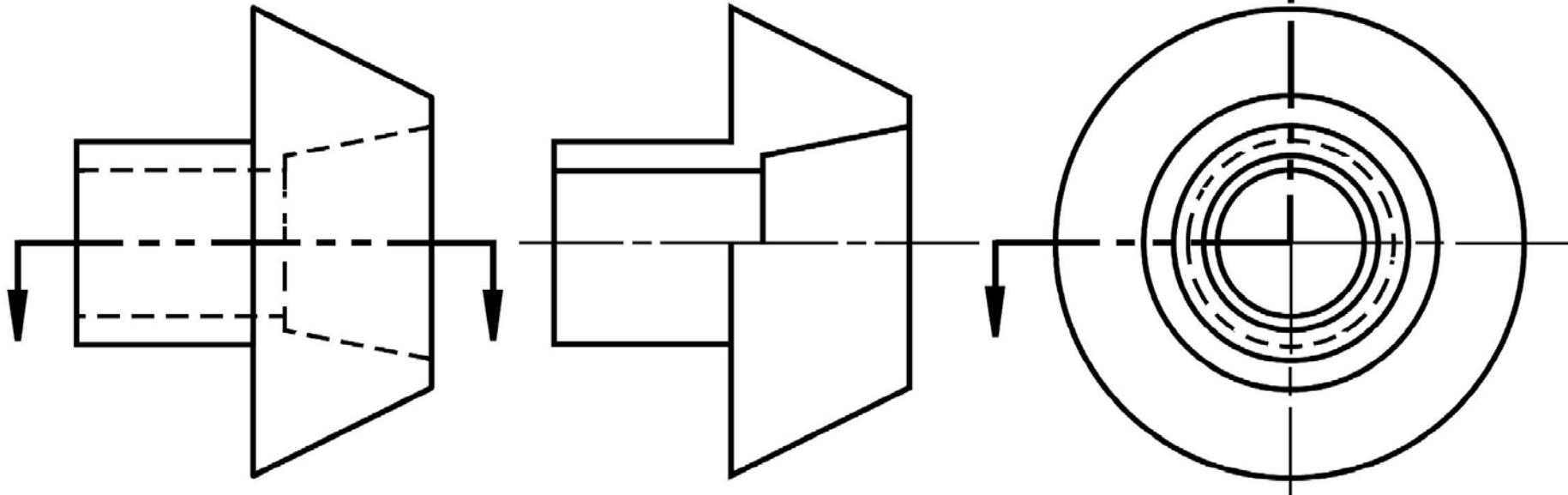
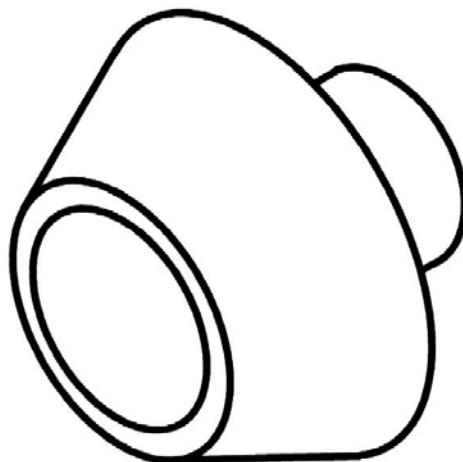
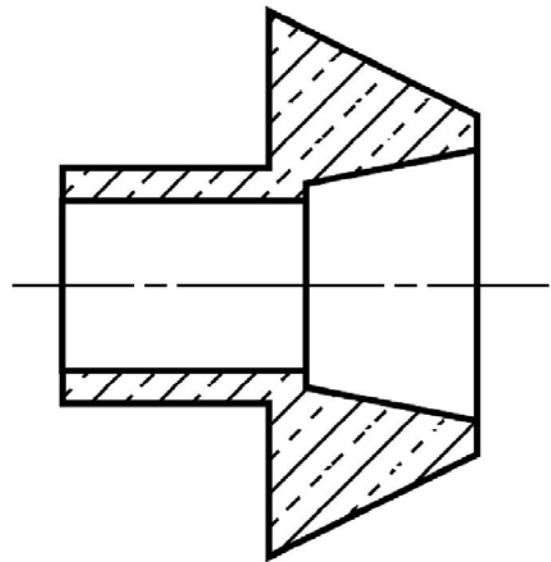


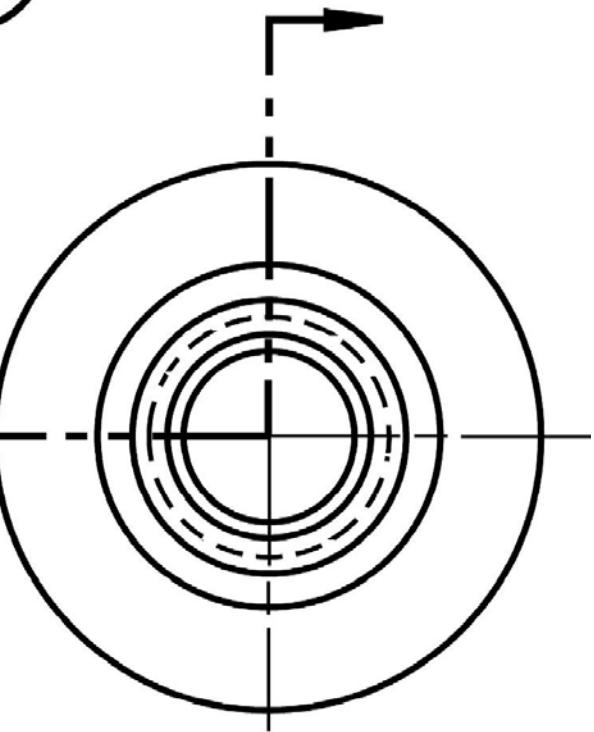
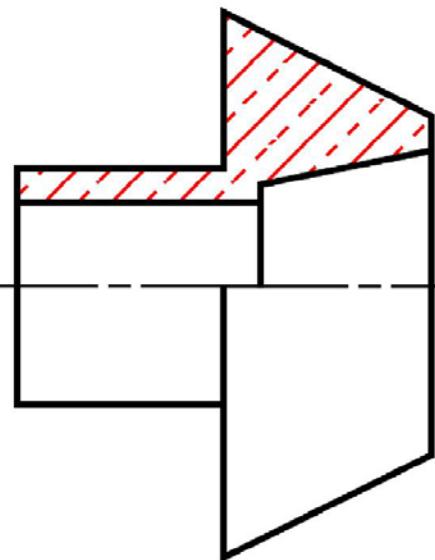
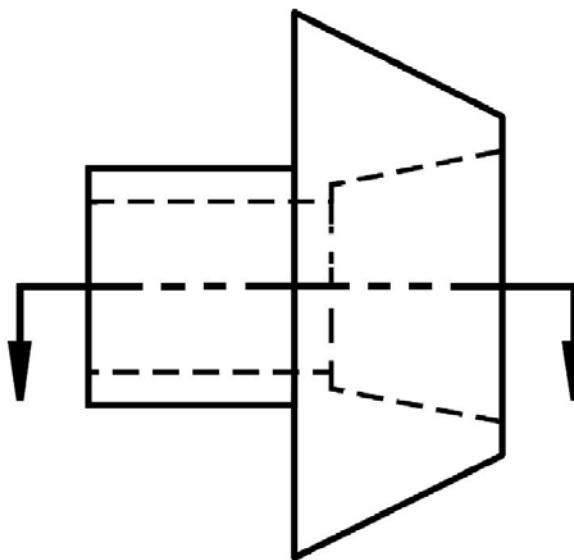
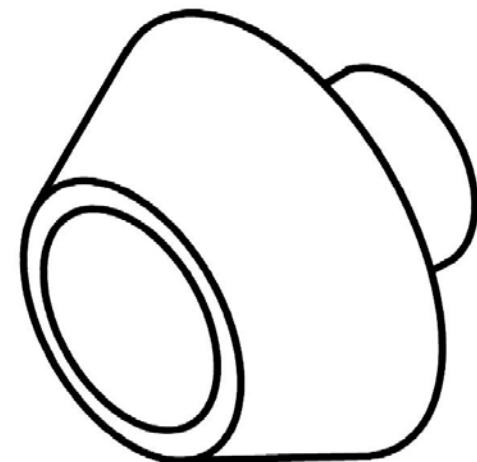
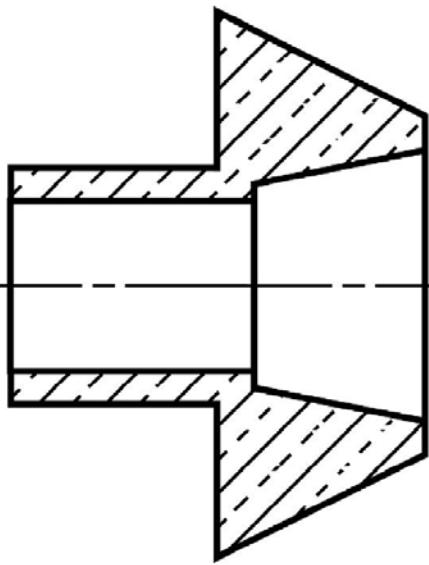
Fill in the visible lines in the right side half section view.

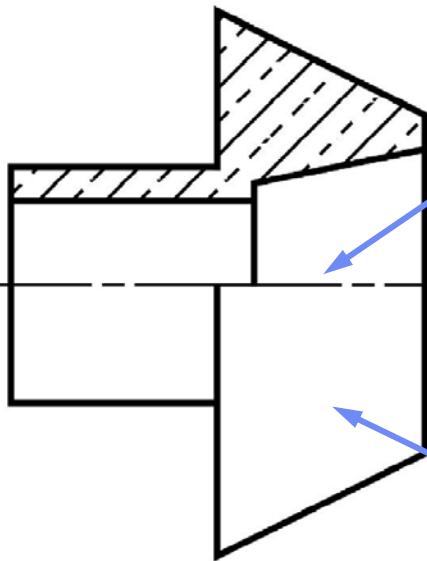
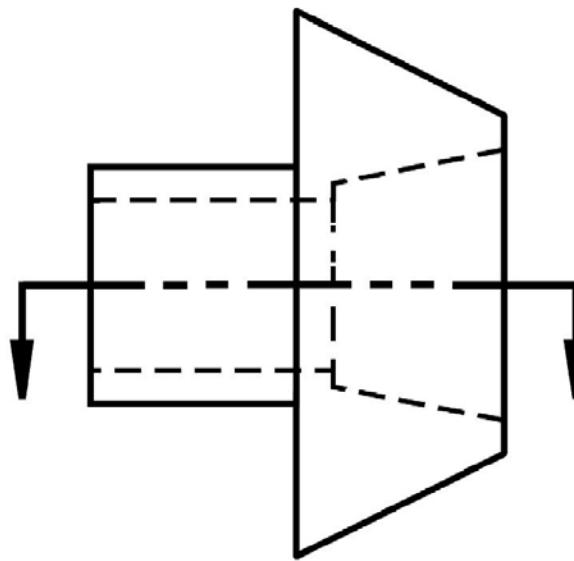
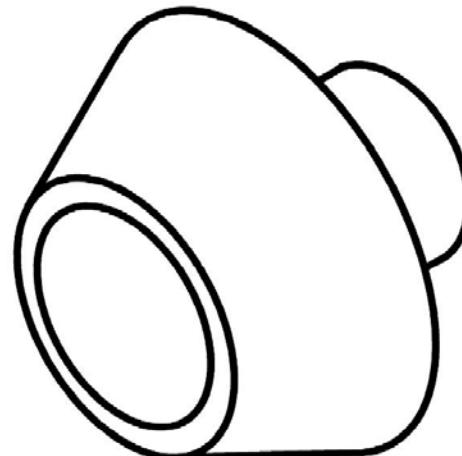
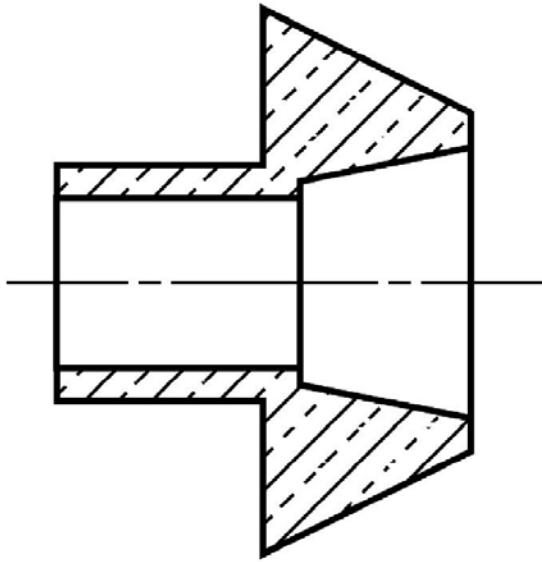




Fill in the section lines in the right side half section view.







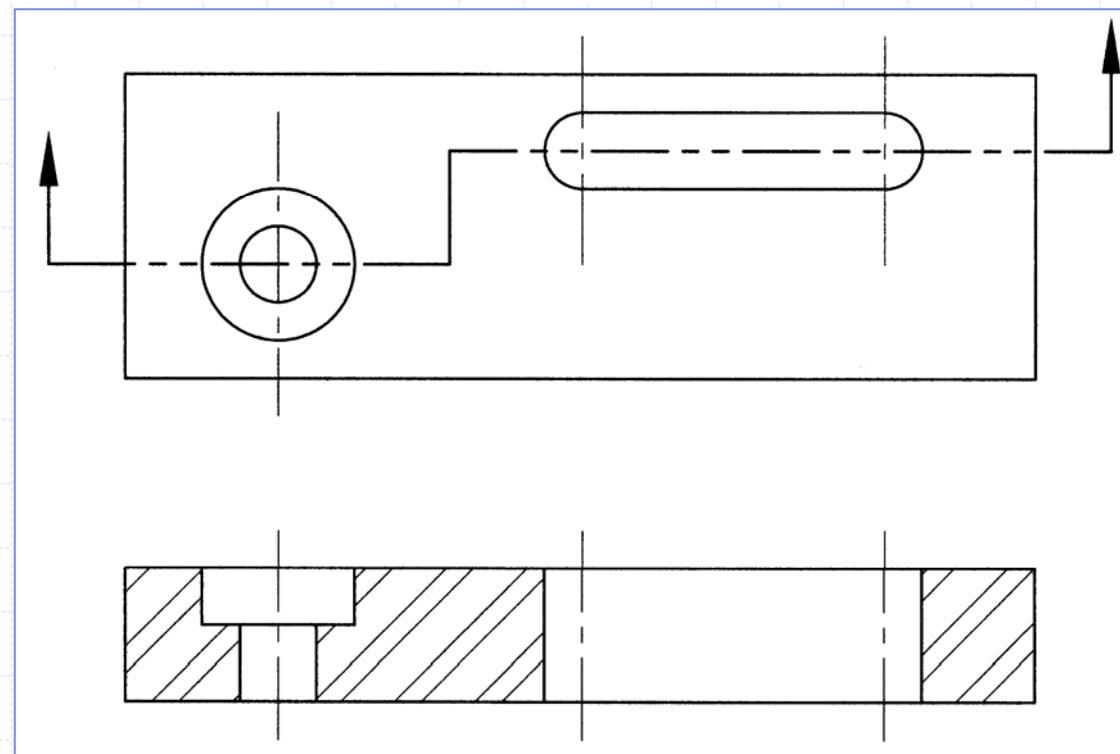
Center line divides  
the halves

No hidden lines



# Offset Section

- An **offset section** is produced by bending the cutting plane to show features that don't lie in the same plane.



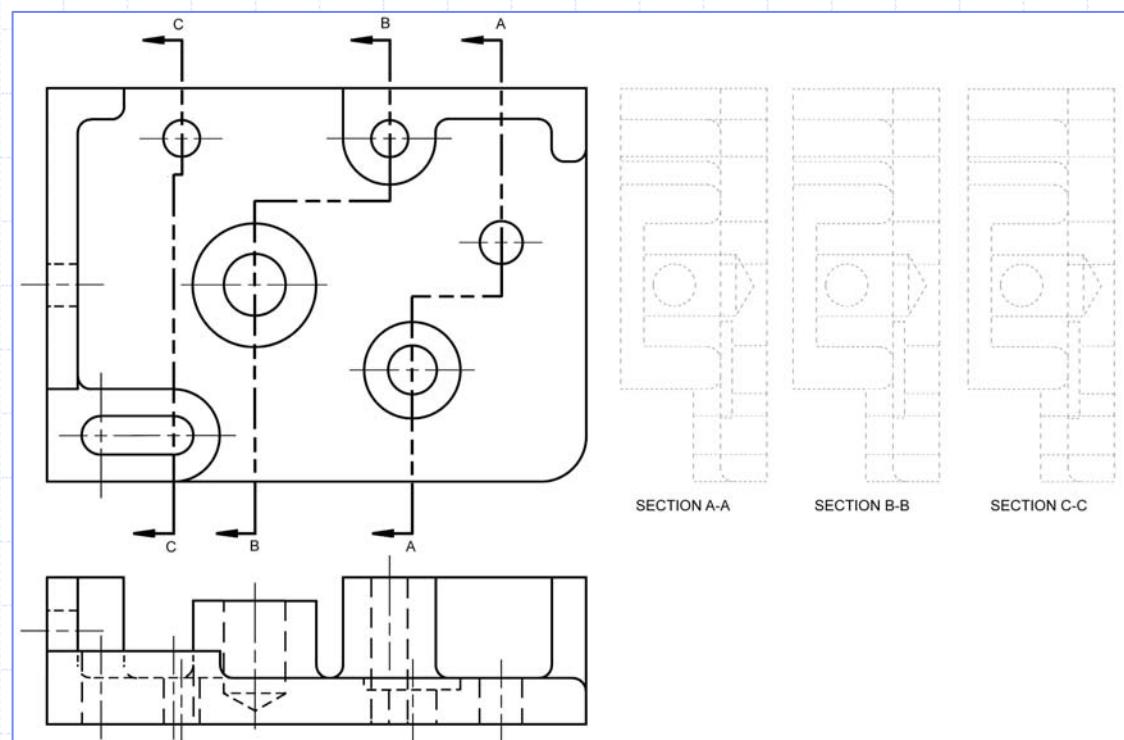
# Exercise 3-3

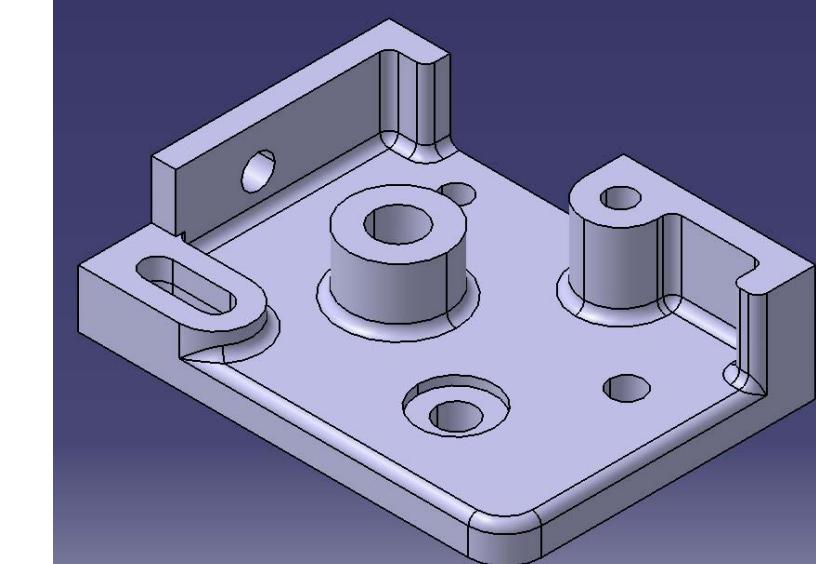
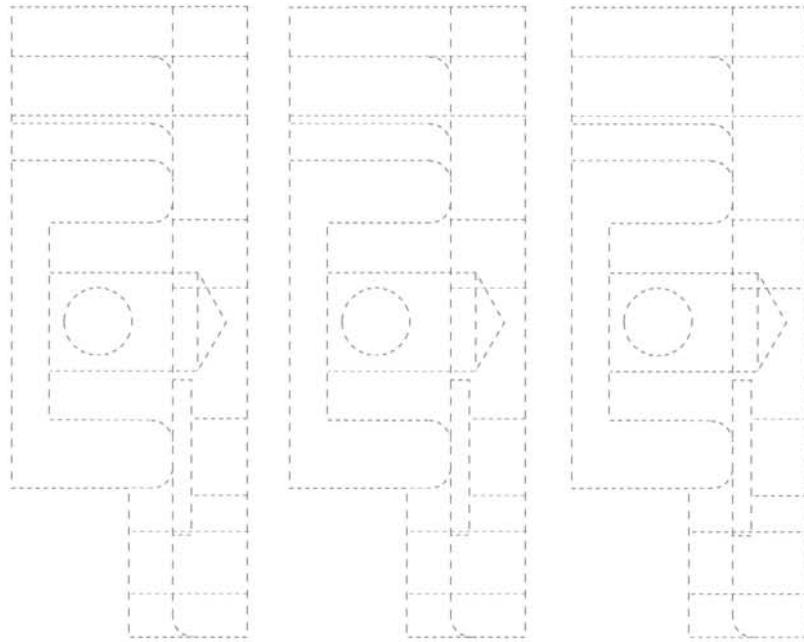
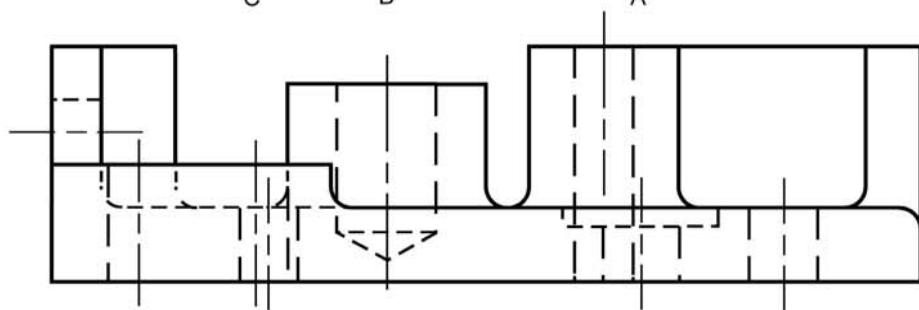
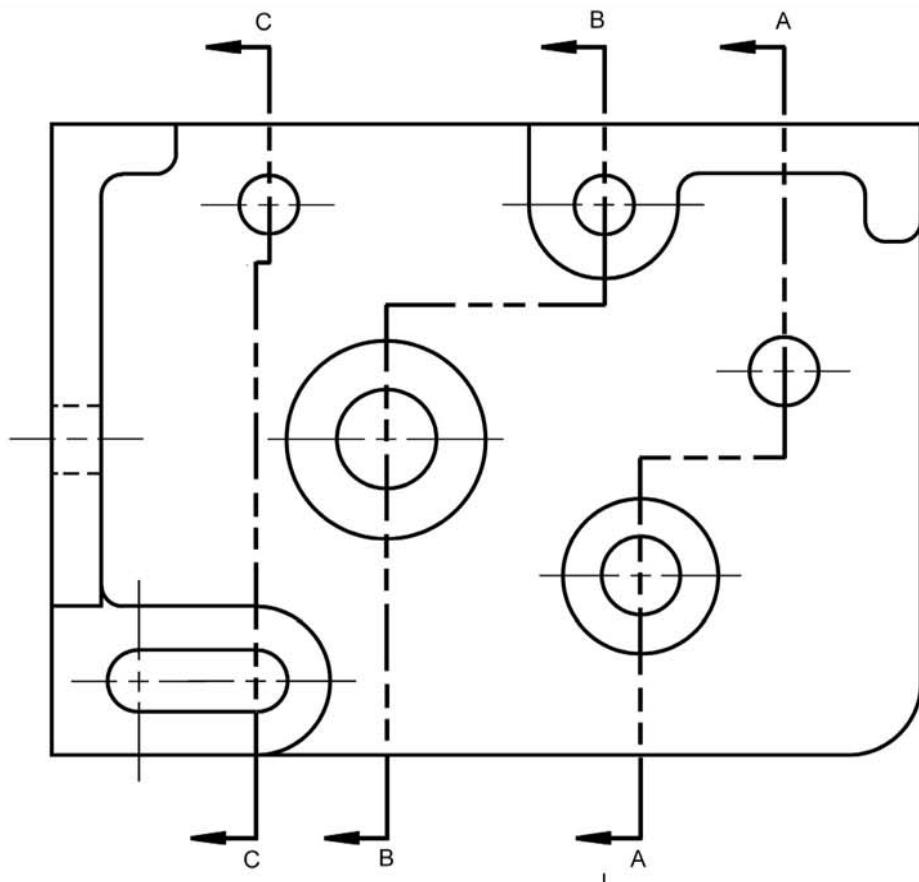
## Offset Section

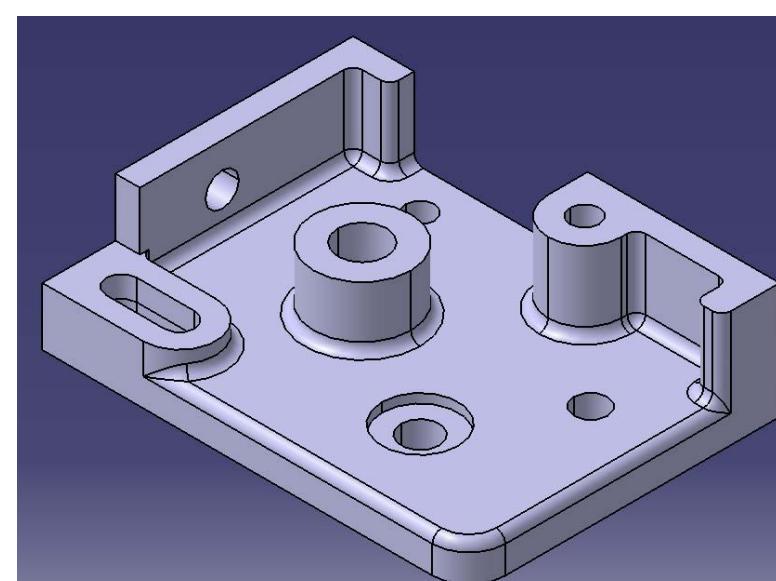
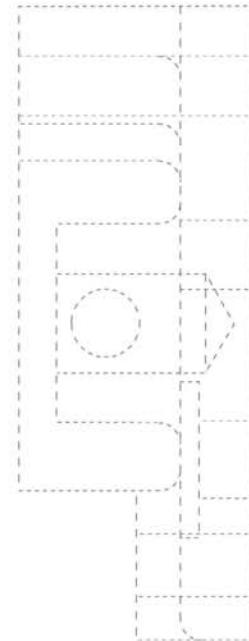
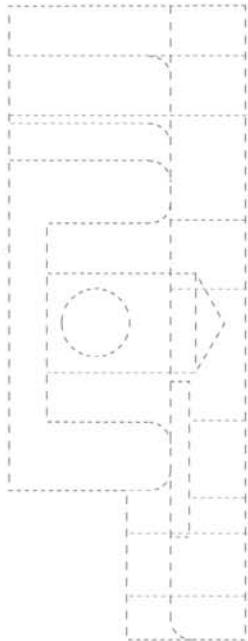
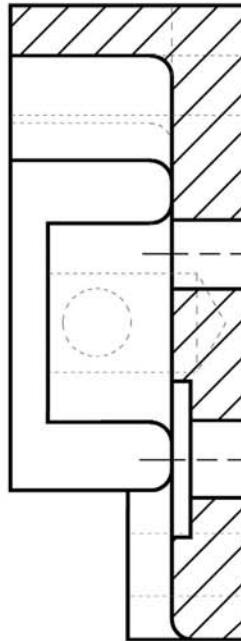
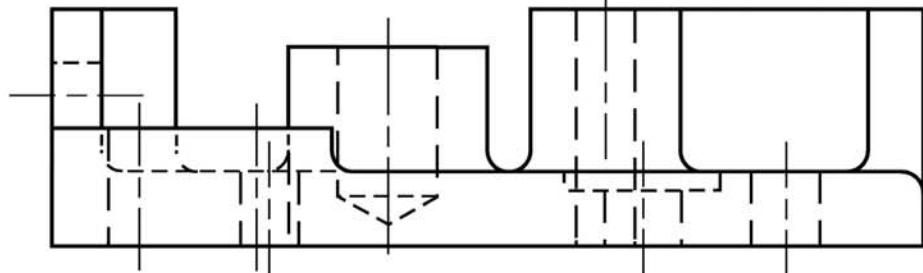
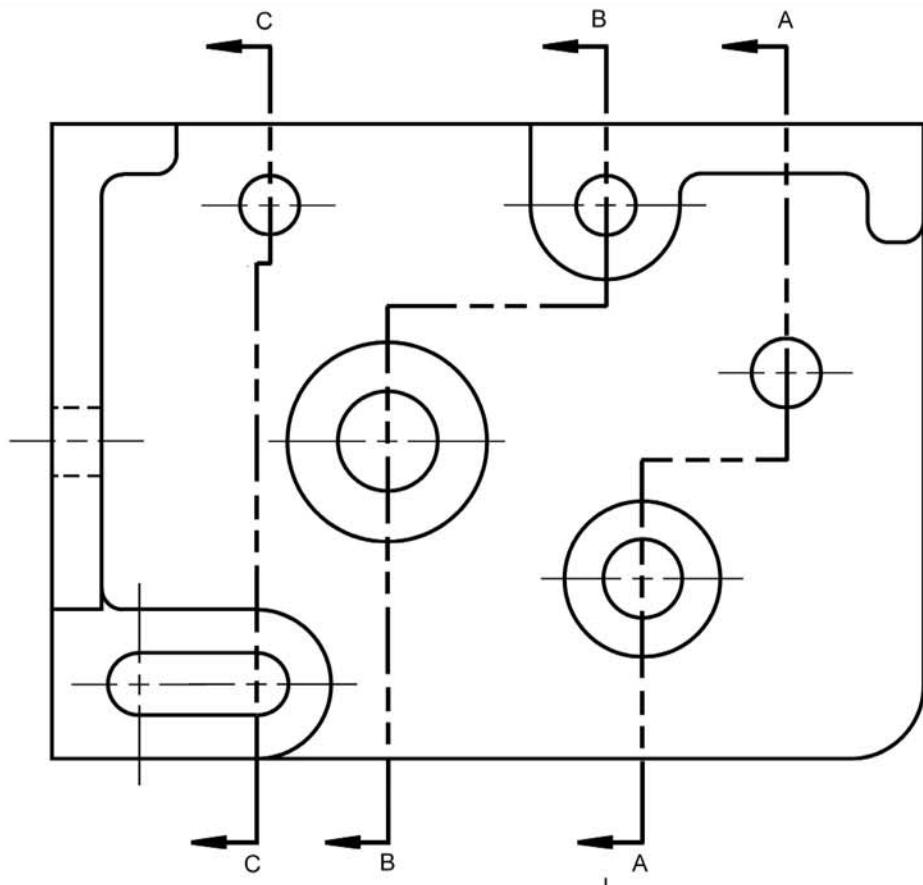


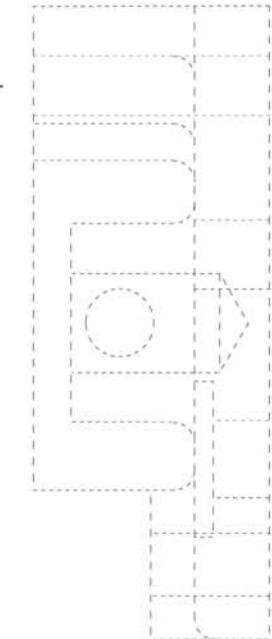
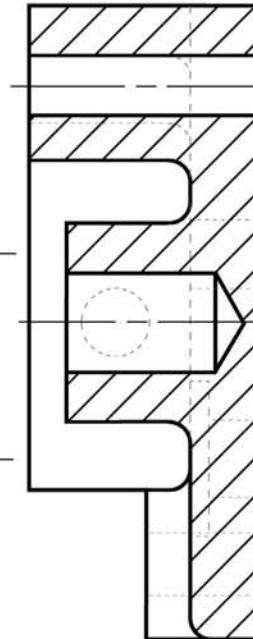
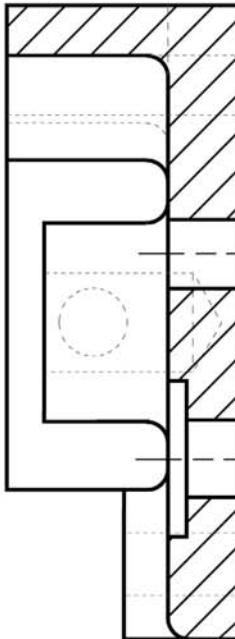
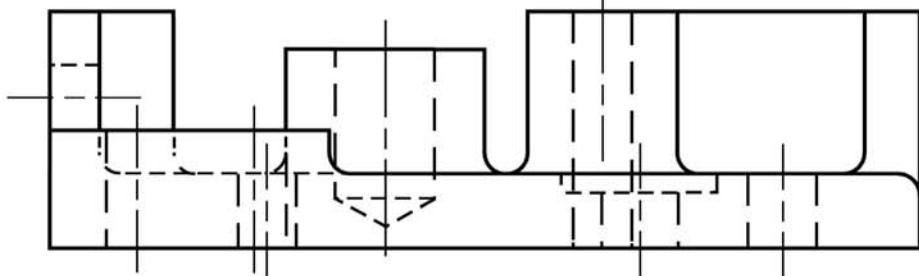
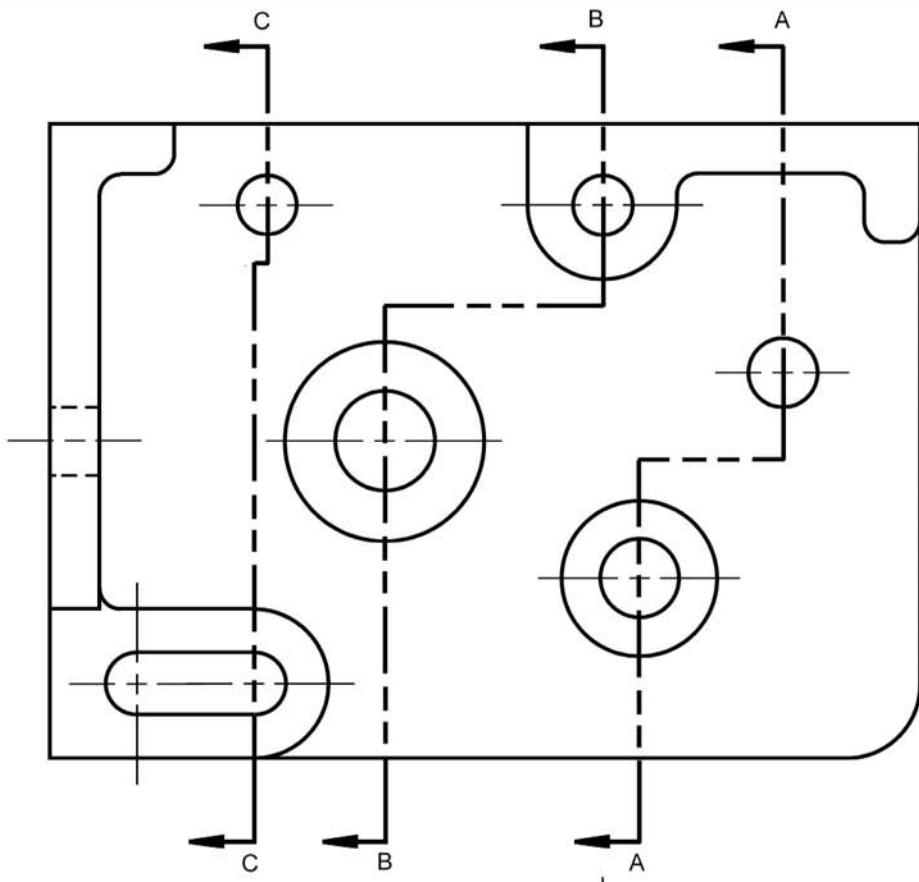
# Exercise 3-3

➤ Given the front and top views, sketch the three missing section views in their appropriate places. The material is cast iron.





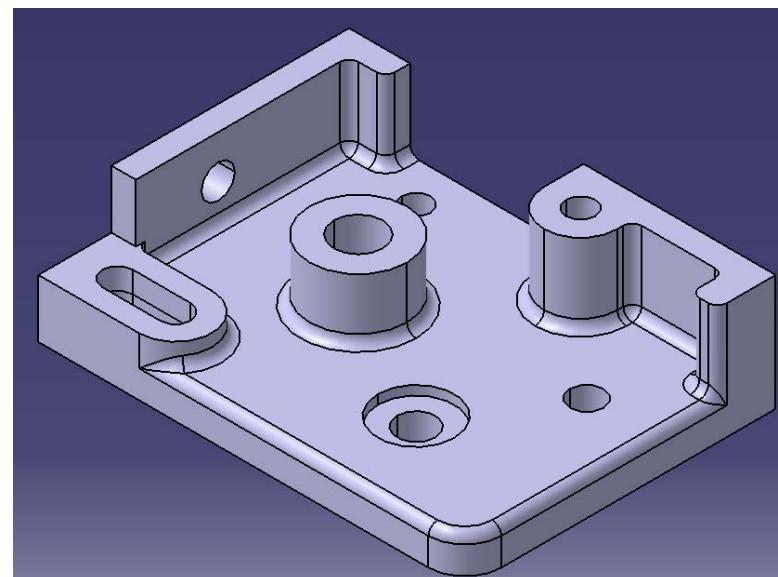


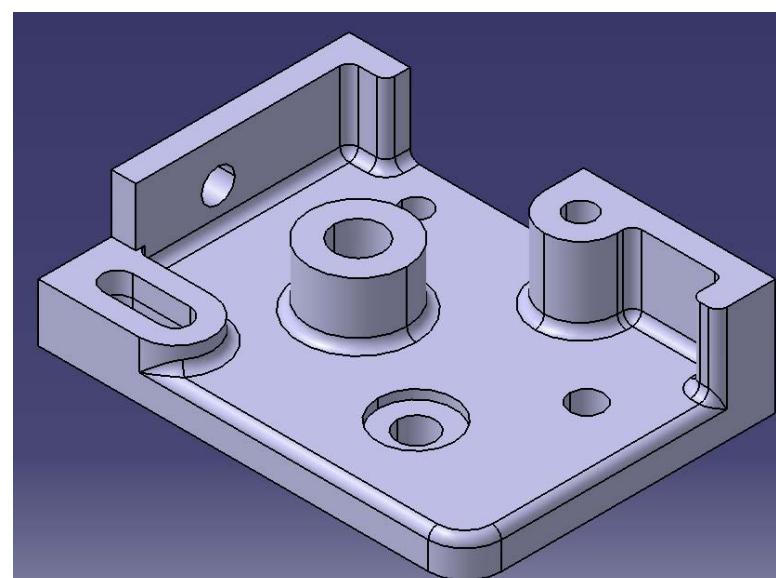
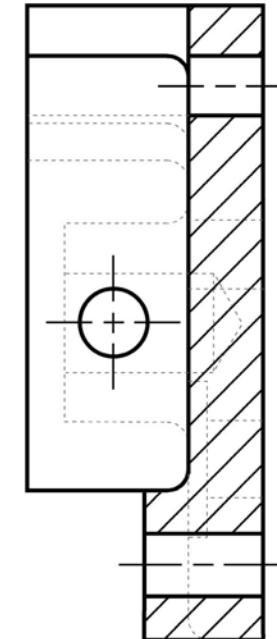
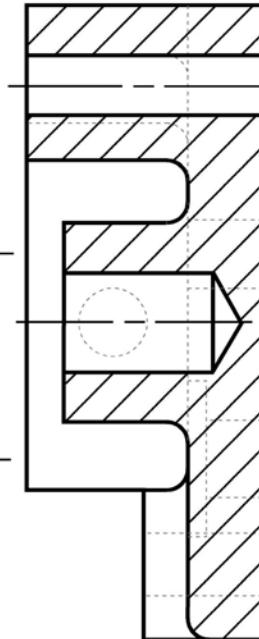
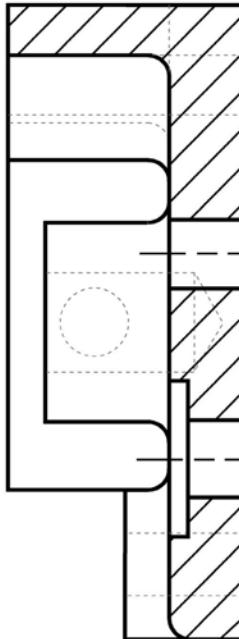
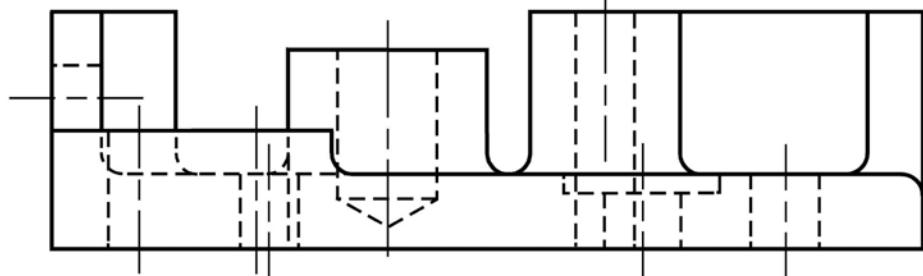
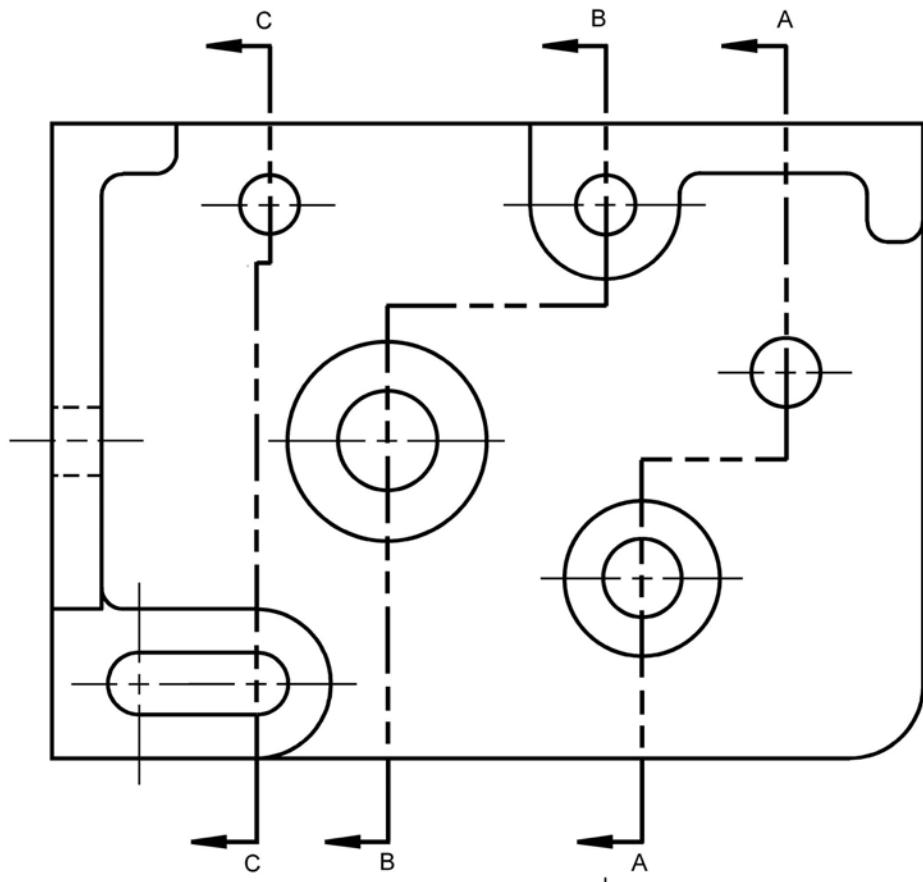


SECTION A-A

SECTION B-B

SECTION C-C

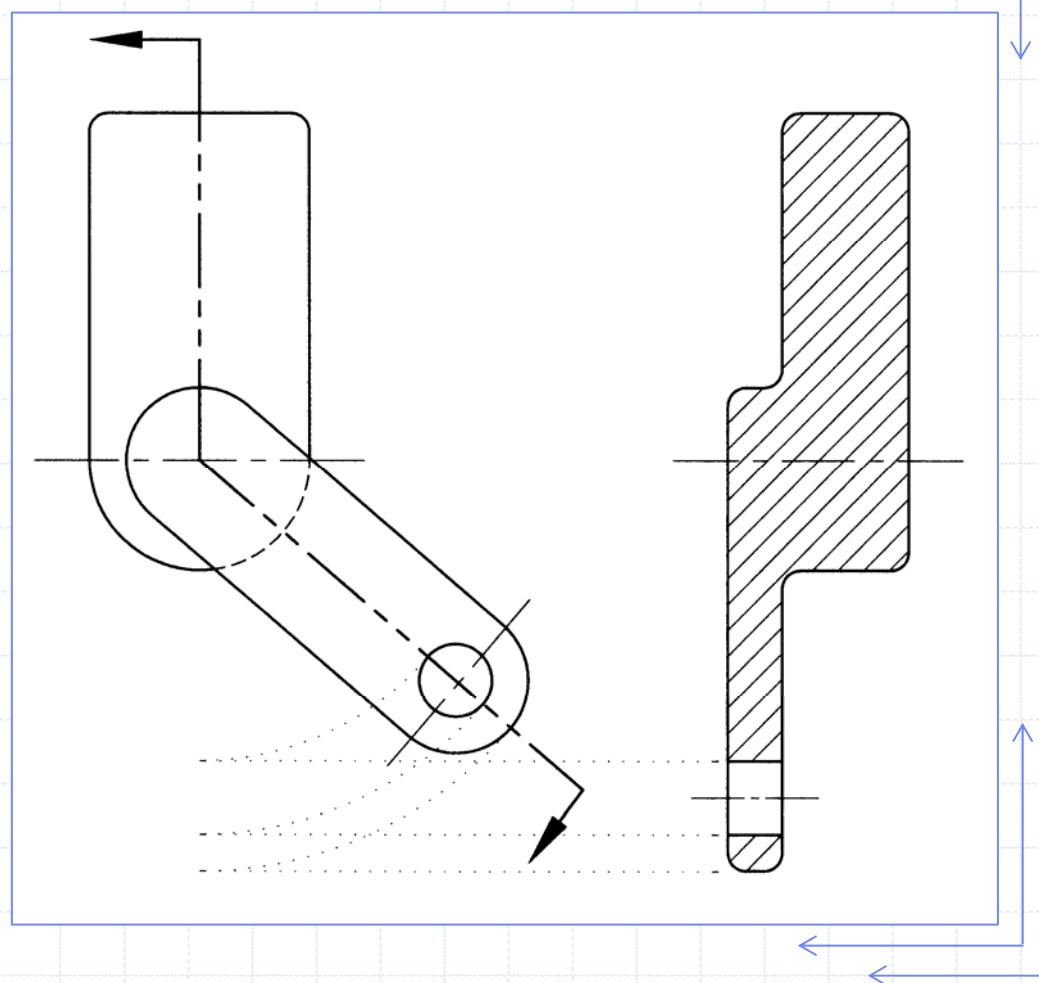






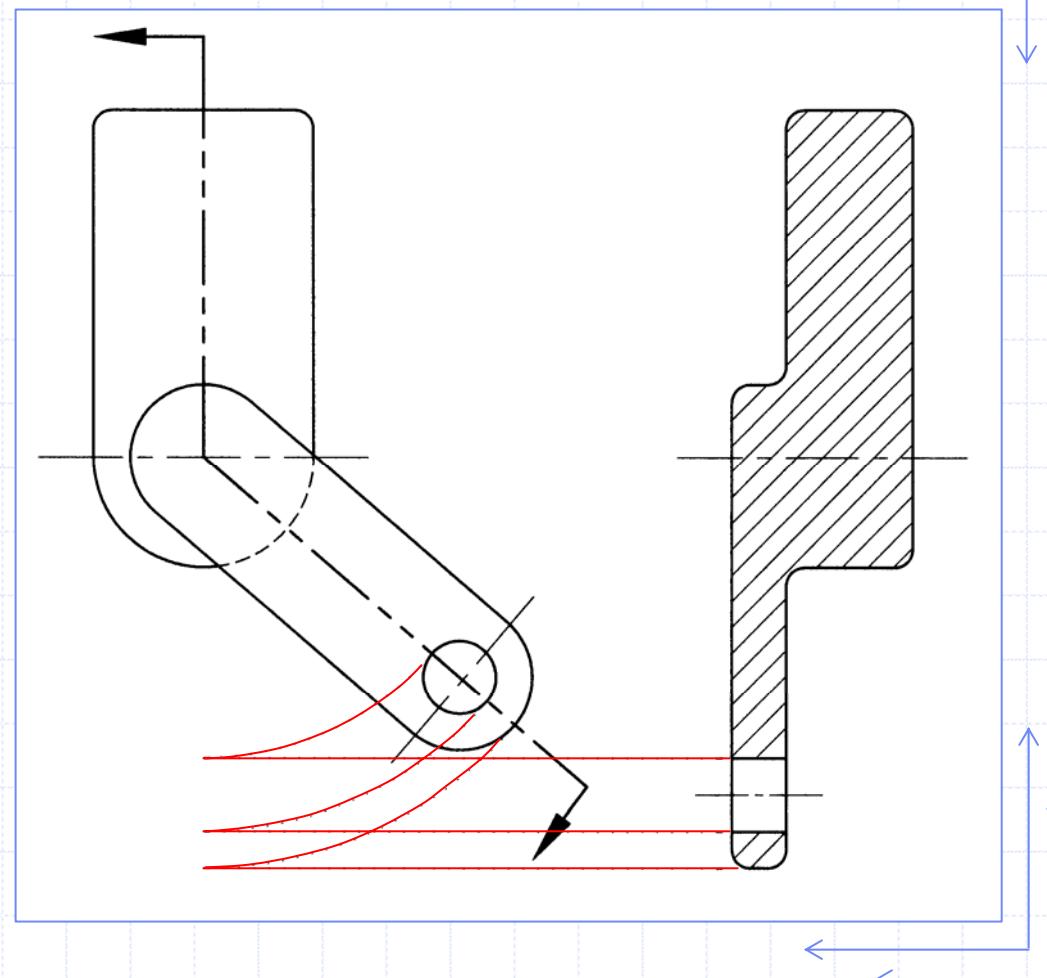
# Aligned Section

- In order to include angled elements in a section, the cutting plane may be bent so that it passes through those features.



# Conventions of Revolution

- Features are revolved to the projection plane, and then projected over.



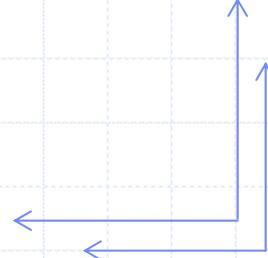
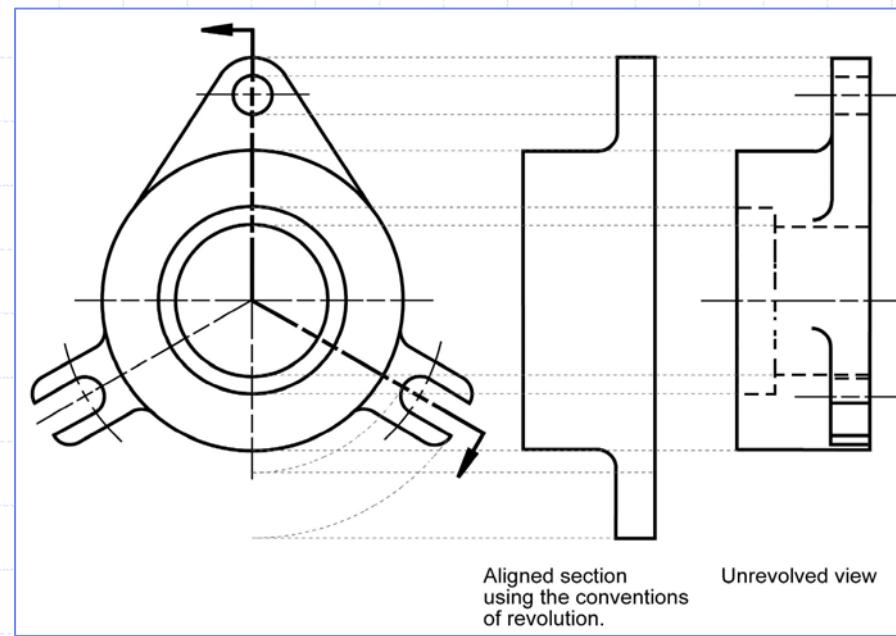
# Exercise 3-4

## Aligned Section

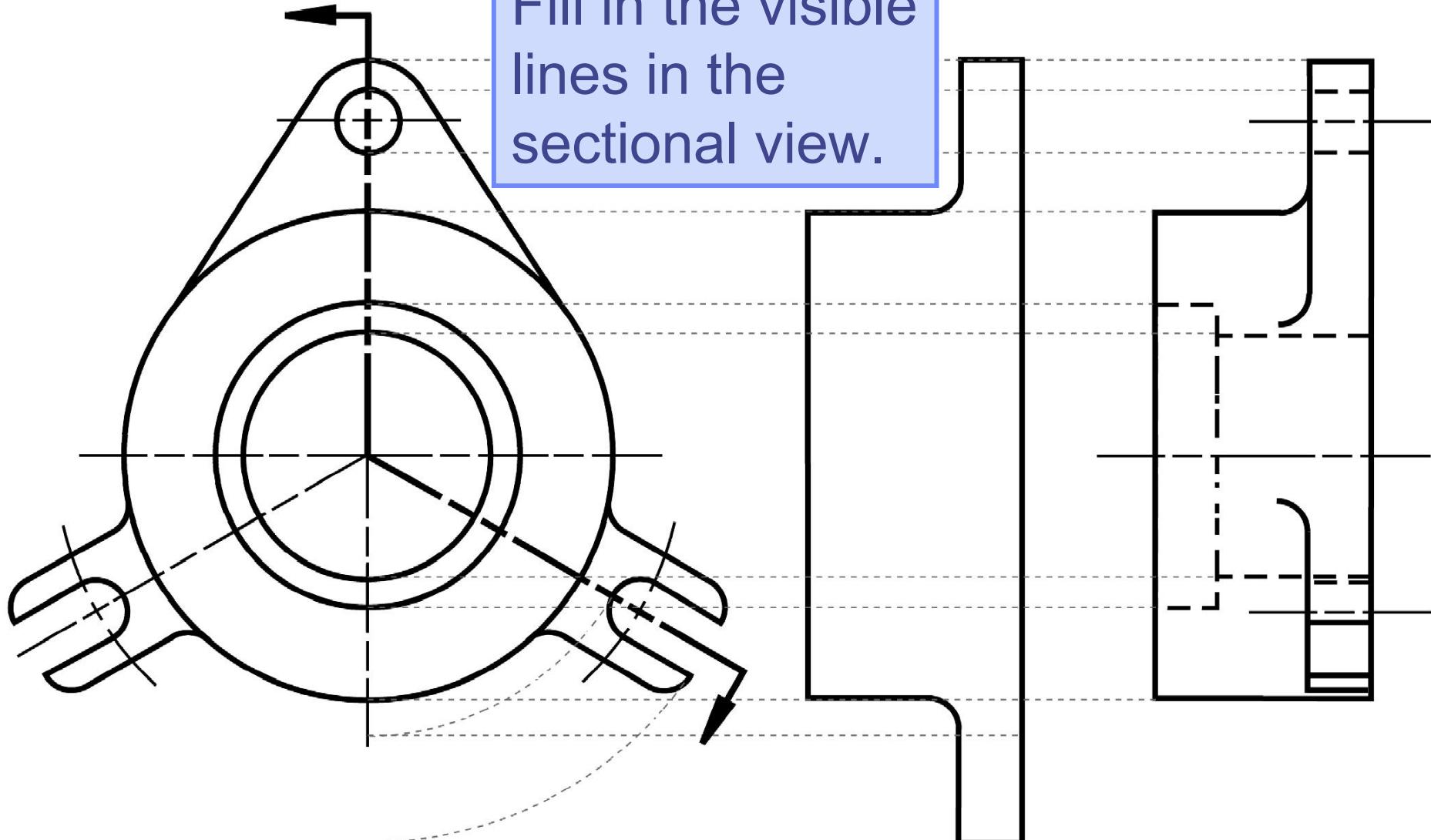


# Exercise 3-4

- Given the front and unrevolved right side views, sketch the right side view as an aligned section using the conventions of revolution. The material is cast iron.



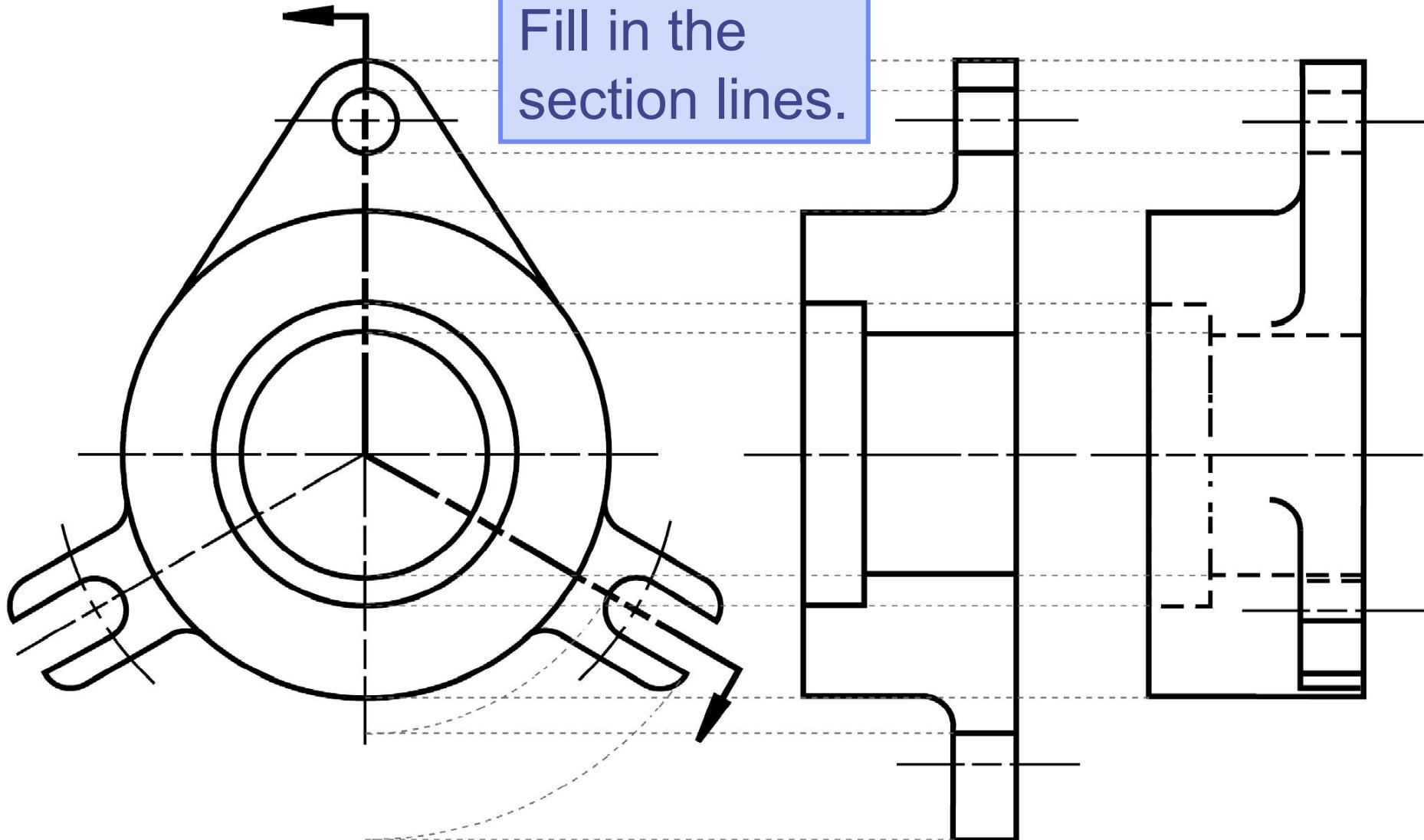
Fill in the visible  
lines in the  
sectional view.



Aligned section  
using the conventions  
of revolution.

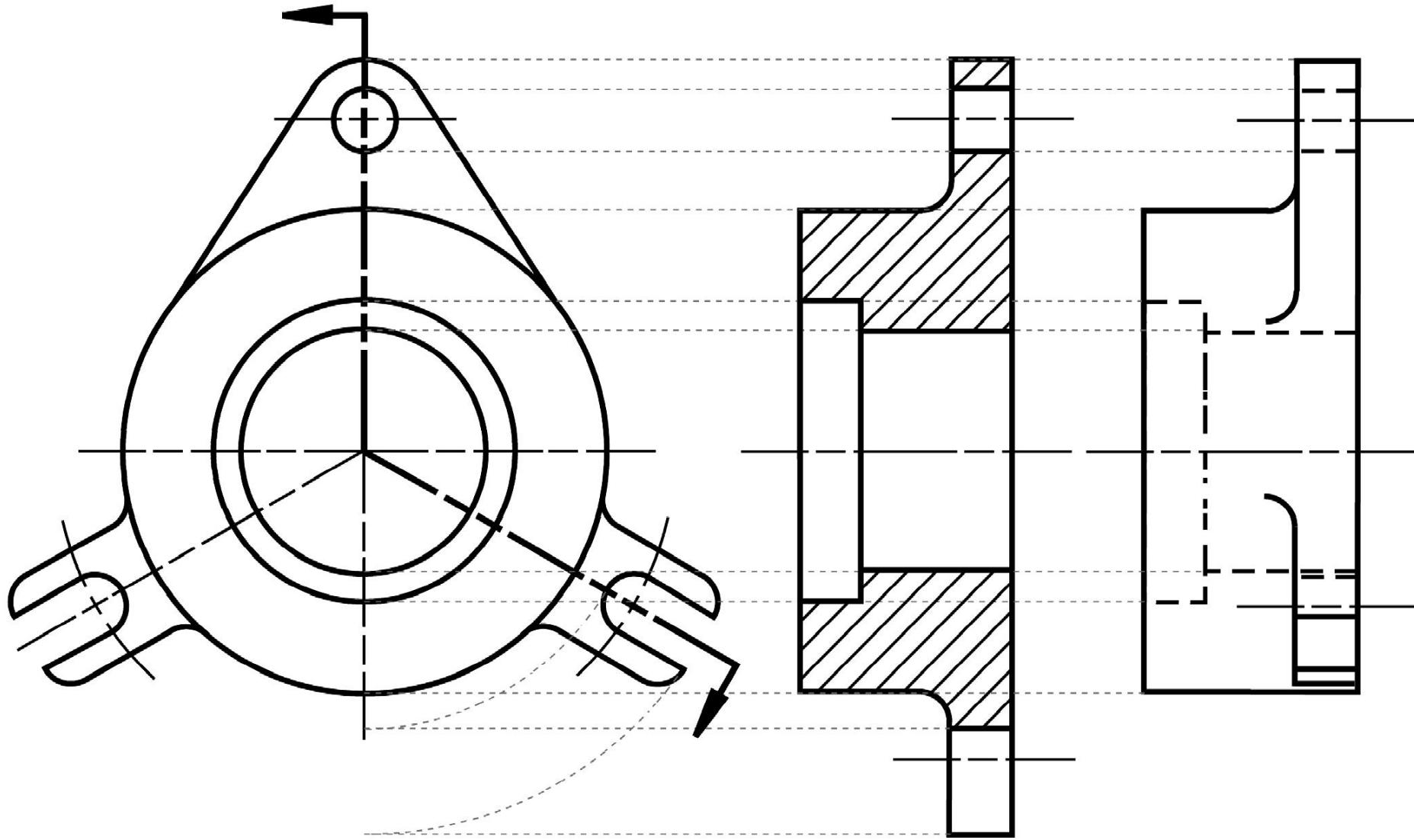
Unrevolved view

Fill in the  
section lines.



Aligned section  
using the conventions  
of revolution.

Unrevolved view



Notice how much clearer  
the sectional view is.

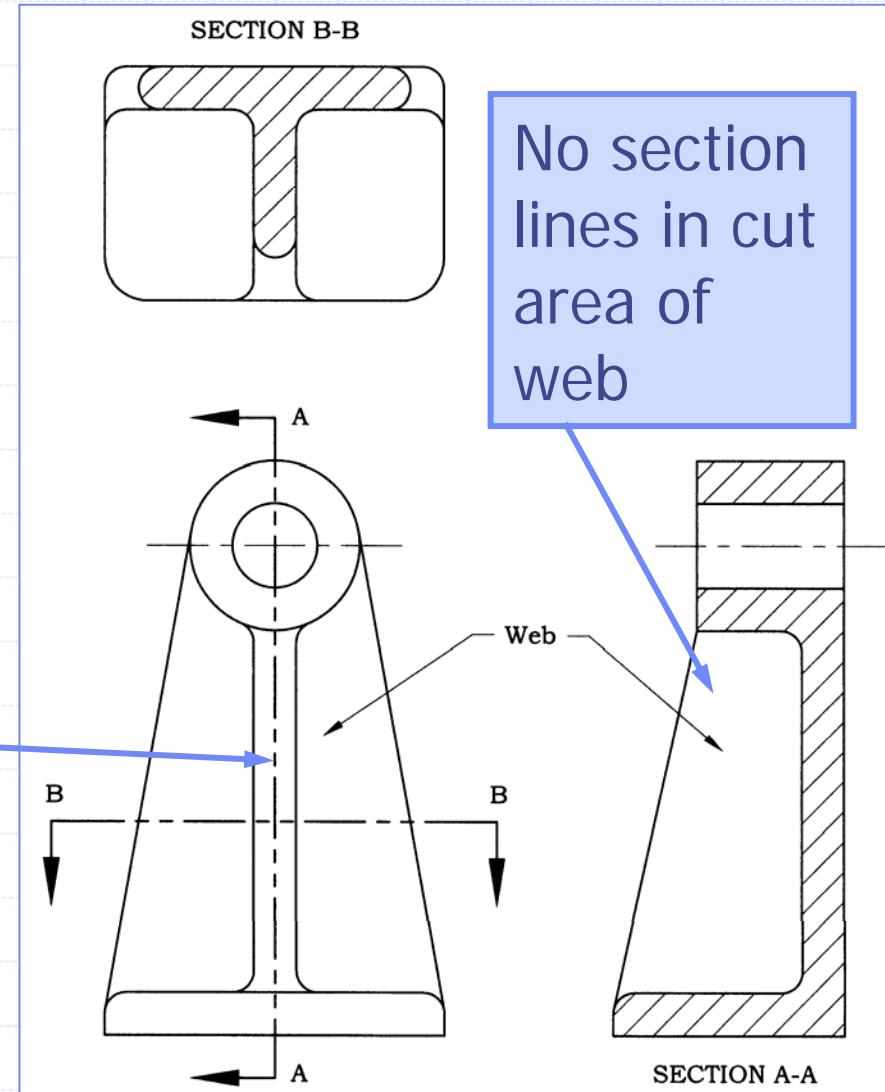
Aligned section  
using the conventions  
of revolution.

Unrevolved view

# Rib and Web Sections

- To avoid a false impression of thickness and solidity, ribs and webs are not sectioned.

Cutting plane passes through the web

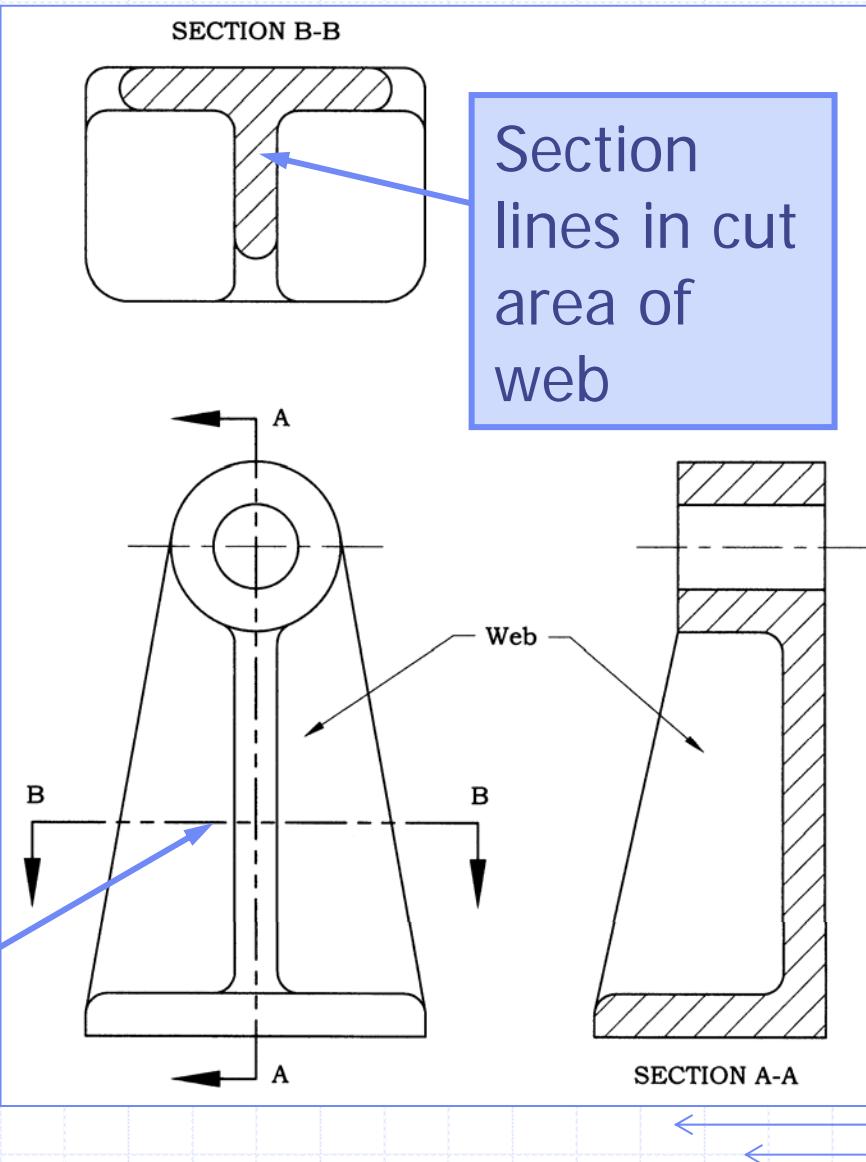


No section lines in cut area of web

# Rib and Web Sections

➤ If the cutting plane passes crosswise through the rib or web, we include section lines.

Cutting plane passes through the web

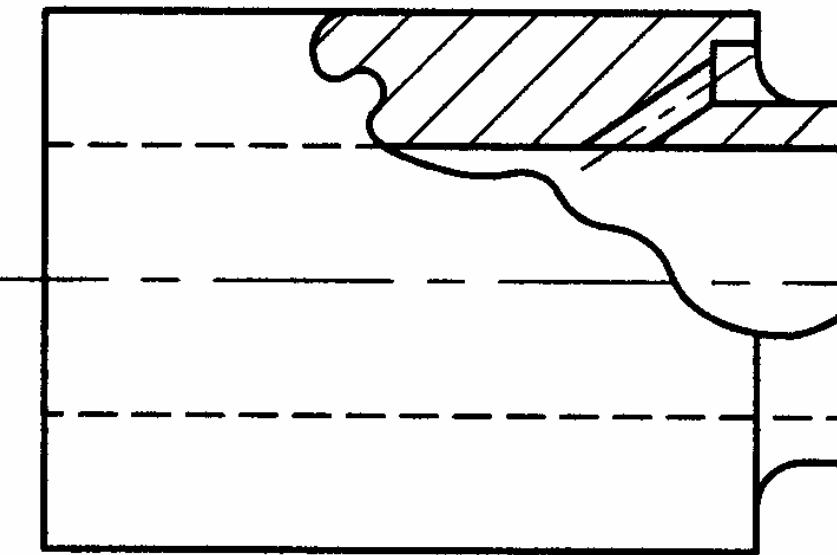


Section lines in cut area of web



# Broken Section

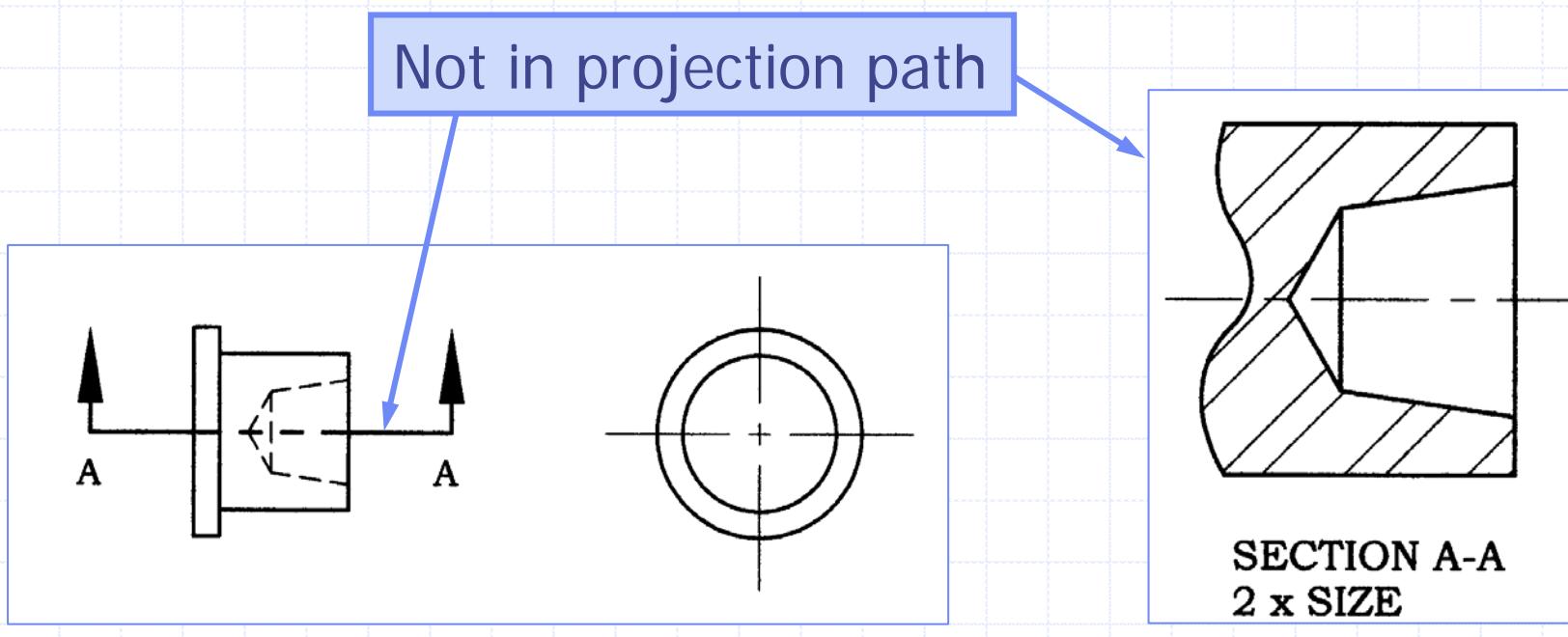
- Sometimes only a partial or **broken out** section is needed.
  - Hidden lines are shown in the non-sectioned area of a broken section.



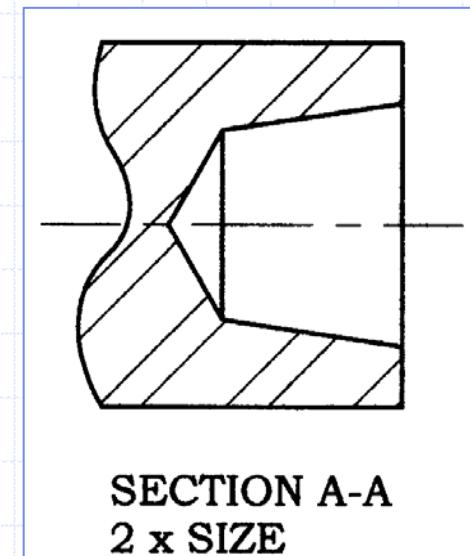
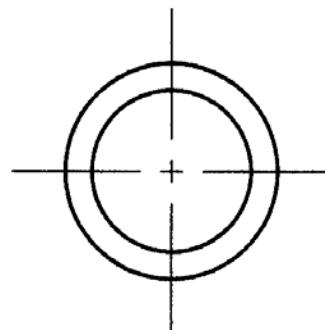
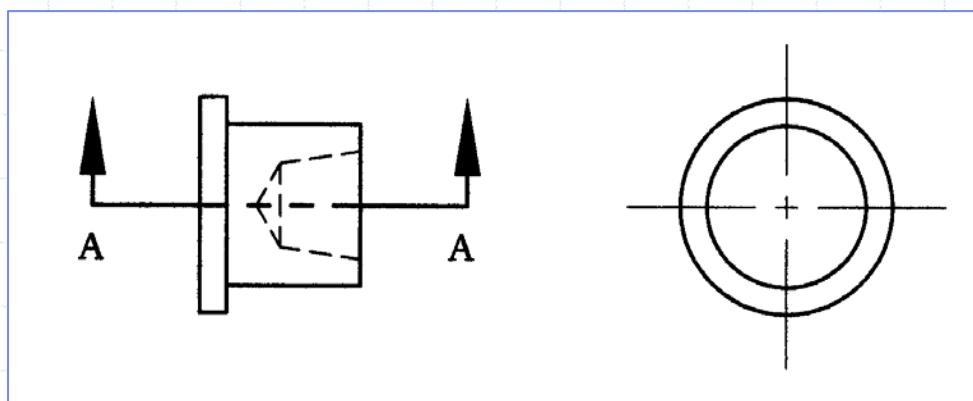


# Removed Section

- A **removed section** is one that is not in direct projection of the view containing the cutting plane.



# Removed Section



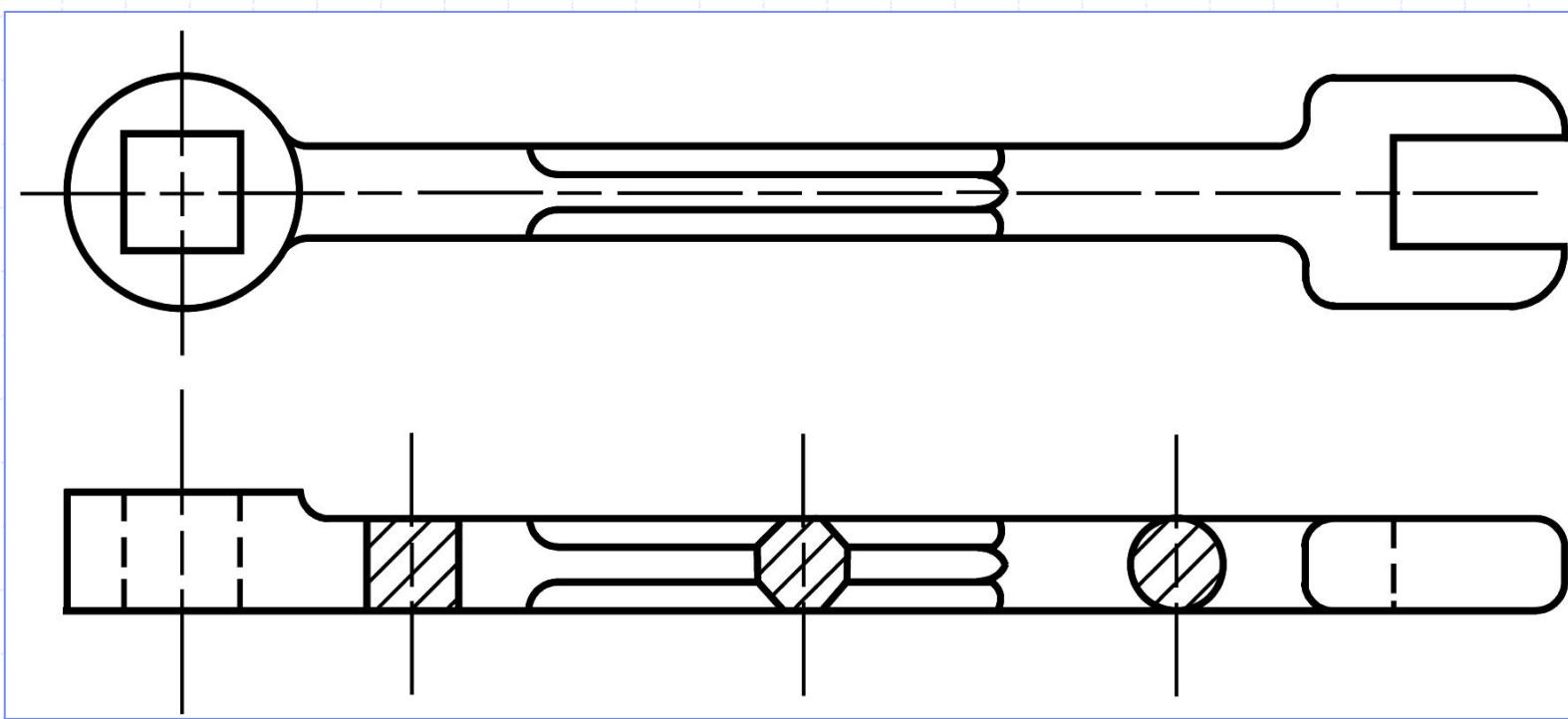
**SECTION A-A  
2 x SIZE**

Removed section should be labeled with name and scale.



# Revolved Section

- The cross sectional shape of an object may be shown in the longitudinal view by means of a **revolved section**.





# Non – Sectioned Parts

➤ It is common practice to show standard parts 'in the round' or un-sectioned.

- Nuts
- Bolts
- Rivets
- Shafts
- Screws



# Thin Sections

➤ For extremely thin parts of less than 4 mm thickness, the parts should be shown in solid black or without section lines.

→ Sheet metal

→ Washers

→ Gaskets



# Sectioning

The End