

Orthographic Projection

Basic Topics

Advanced Topics

Exercises

Orthographic Projection

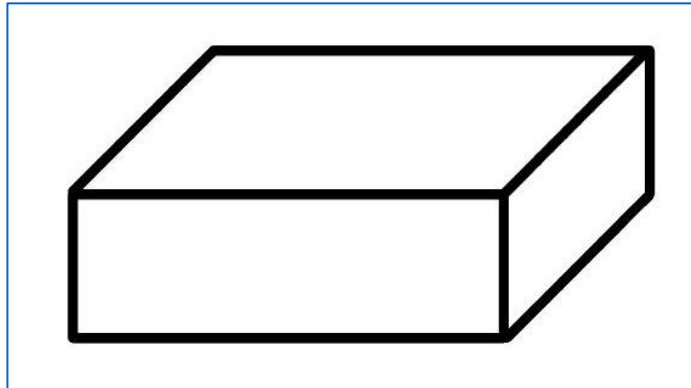
- 1.4) The Standard Views

Standard Views

- When constructing an orthographic projection, we need to include enough views to completely describe the true shape of the part.
 - Complex part = more views
 - Simple part = less views

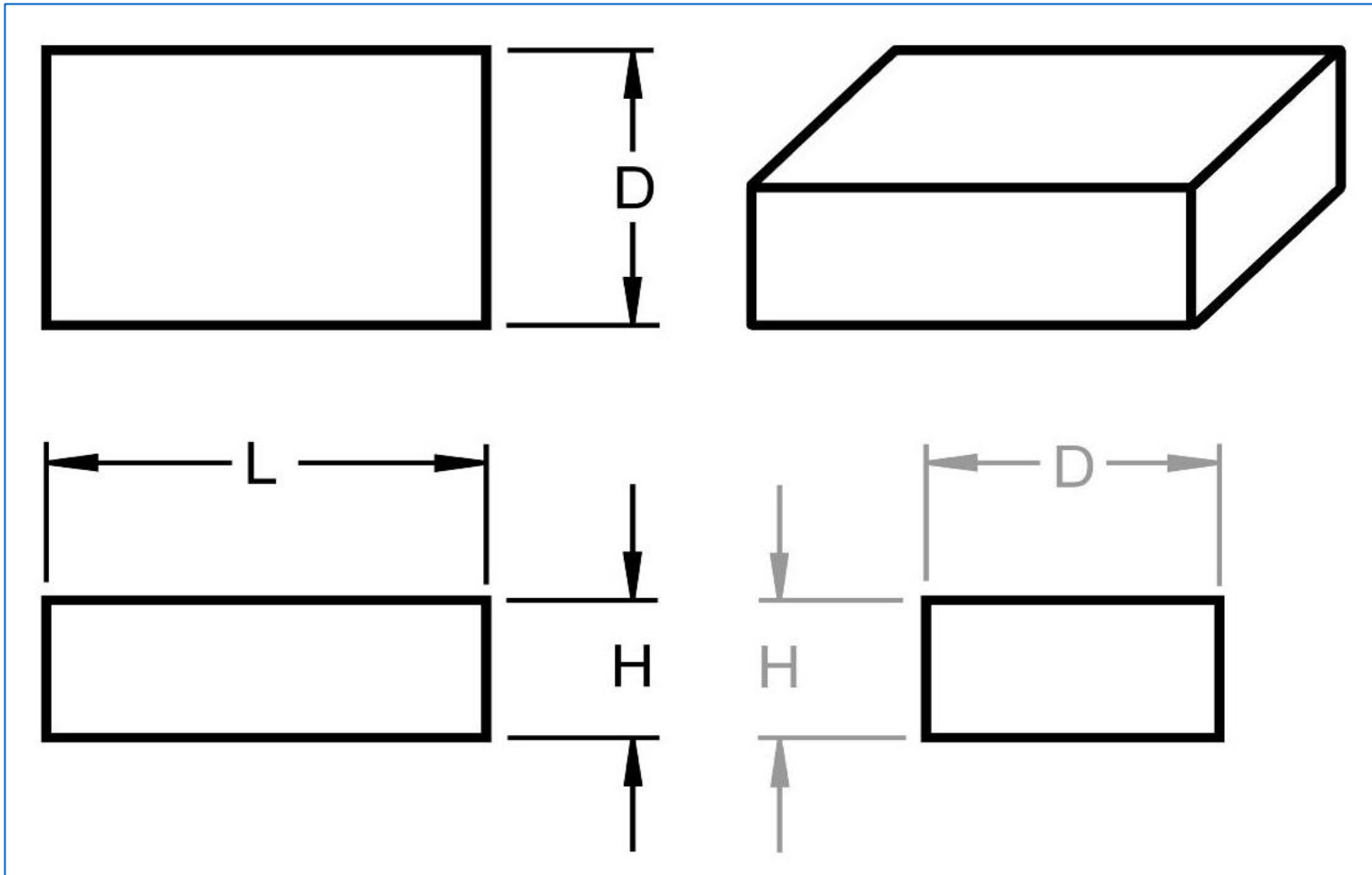
Standard Views

- The standard views used in an orthographic projection are;
 - Front view
 - Top view
 - Right side view
- The remaining 3 views usually don't add any new information.
- How many views do we need to completely describe a block?



Standard Views

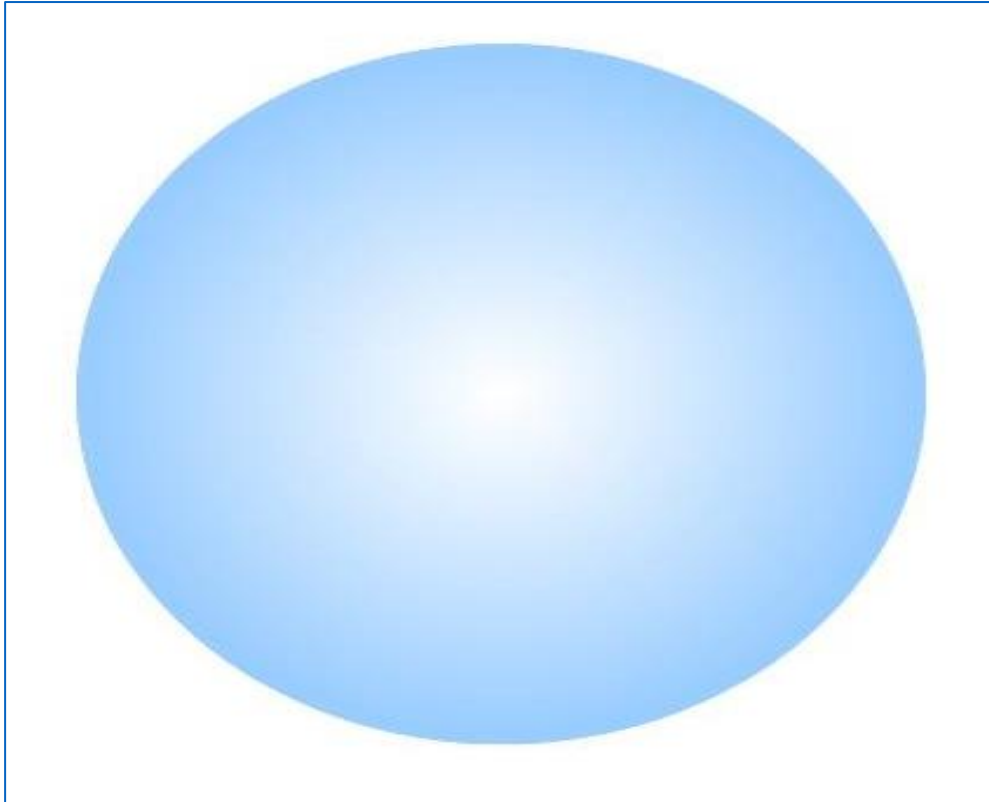
- How many views do we need to completely describe a block?



2 views.
The 3rd view
duplicates
information.

Standard Views

- How many views do we need to completely describe a sphere?



1 view.

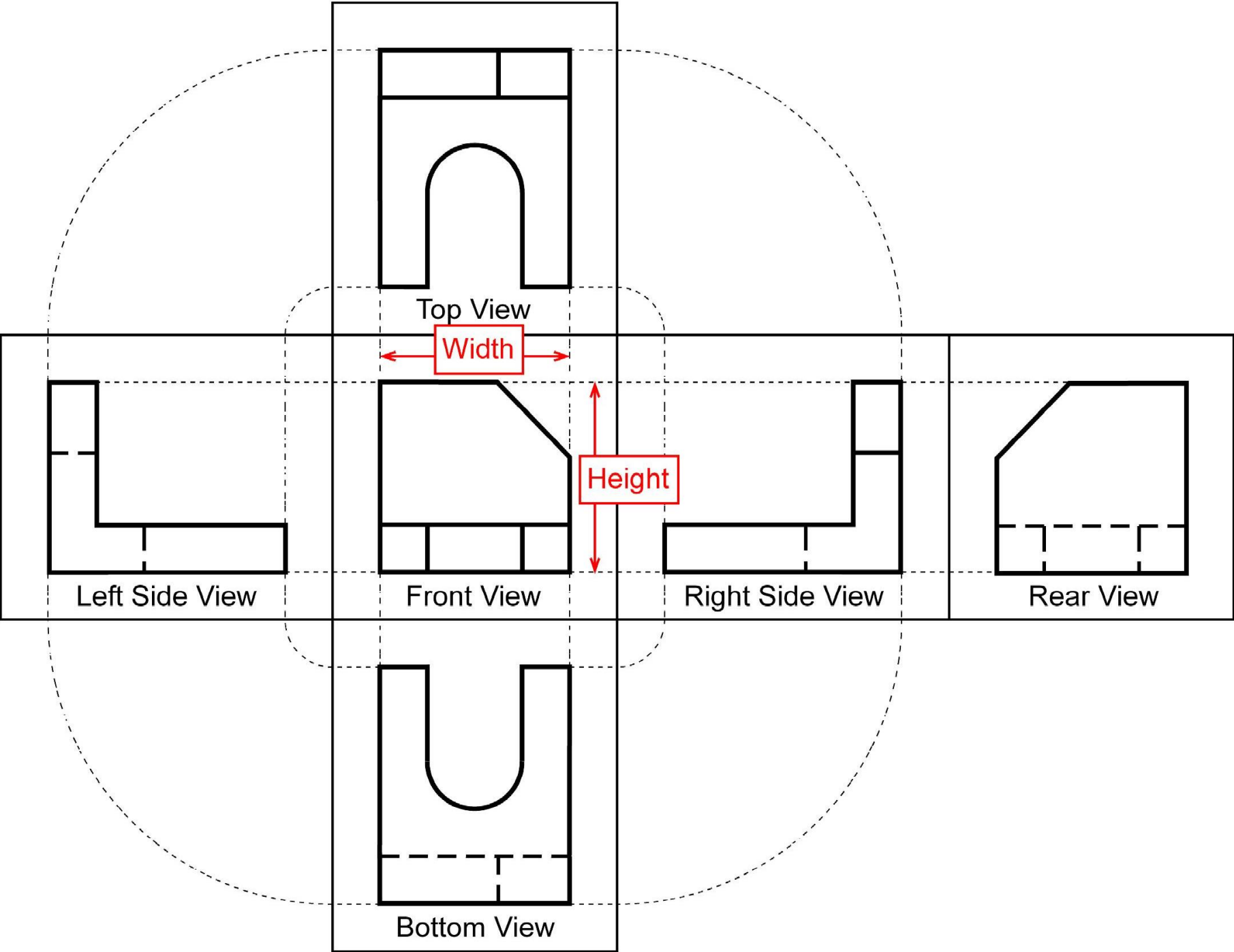
A sphere has only one dimension. Its diameter.

Front View

- The front view shows the most features or characteristics of the object.
 - It usually contains the least amount of hidden lines.
 - The front view is chosen first and the other views are based on the orientation of the front view.

View Alignment

- The top and front views are aligned vertically and share the same width dimension.
- The front and right side views are aligned horizontally and share the same height dimension.



Orthographic Projection

- 1.5) Lines Types Used in an Orthographic Projection

Line Type and Weight

- *Line type* and *line weight* provide valuable information to the print reader.
- For example, line type and weight can answer the following questions.
 - Is the feature visible or hidden from view?
 - Is the line part of the object or part of a dimension?
 - Is the line indicating symmetry?

Line Type and Weight

- There are four commonly used line types;
 - continuous
 - hidden
 - center
 - phantom

Line Type and Weight

- Some lines are more important than others. Importance is indicated by line weight or thickness.
 - The thicker the line, the more important it is.

Line Types

- Center lines:

- Represent axes of symmetry.
- **Long dash – short dash** and **thin** (0.3 mm).

- Visible lines:

- Visible lines represent visible edges and boundaries.
- **Continuous** and **thick** (0.5 - 0.6 mm).

- Hidden lines:

- Hidden lines represent edges and boundaries that cannot be seen.
- **Dashed** and **medium thick** (0.35 - 0.45 mm).

- Phantom line:

- Phantom lines are used to indicate imaginary features.
 - alternate positions of moving parts
 - adjacent positions of related parts
- The line type is **long dash – short dash – short dash** and the line weight is usually **thin** (0.3 mm).

- Dimension and Extension lines:

- Dimension and extension lines are used to show the size of an object.
 - In general, a dimension line is placed between two extension lines and is terminated by arrowheads, which indicates the direction and extent of the dimension.
- The line type is **continuous** and the line weight is **thin** (0.3 mm).

- Cutting Plane line:

- Cutting plane lines are used to show where an imaginary cut has been made through the object in order to view interior features.
- The line type is **phantom** and the line weight is **very thick** (0.6 to 0.8 mm).
- Arrows are placed at both ends of the cutting plane line to indicate the direction of sight.

- Section line:

- Section lines are used to show areas that have been cut by the cutting plane.
- Section lines are grouped in parallel line patterns and usually drawn at a 45° angle.
- The line type is usually **continuous** and the line weight is **thin** (0.3 mm).

- Break line:

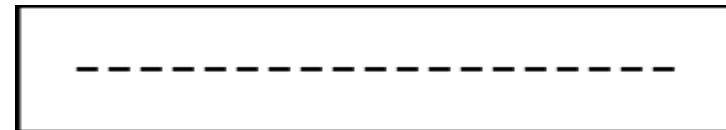
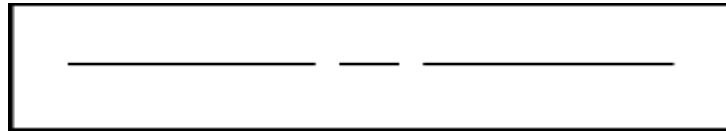
- Break lines are used to show imaginary breaks in objects.
- A break line is usually made up of a series of connecting arcs.
- The line type is **continuous** and the line weight is usually **thick** (0.5 – 0.6 mm).

Exercise 1-2

- Line types

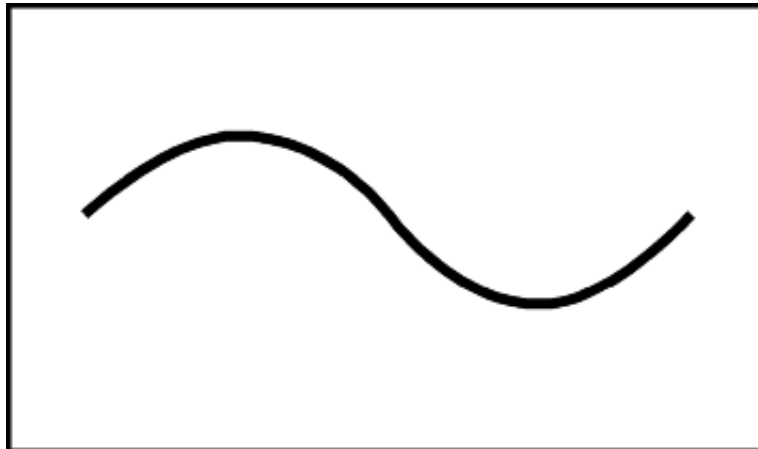
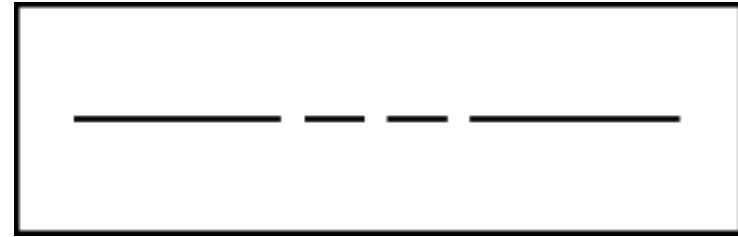
Example 1-2

- Which of the following line types is a VISIBLE line?



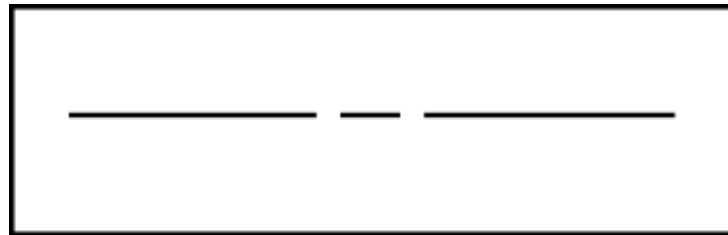
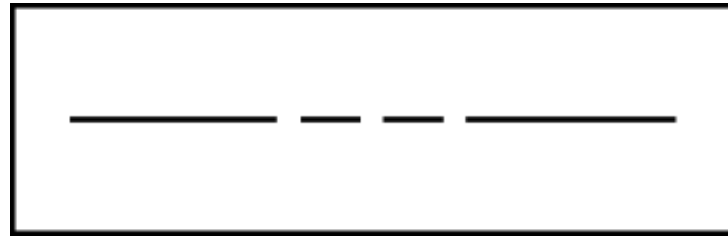
Example 1-2

- Which of the following line types is a HIDDEN line?

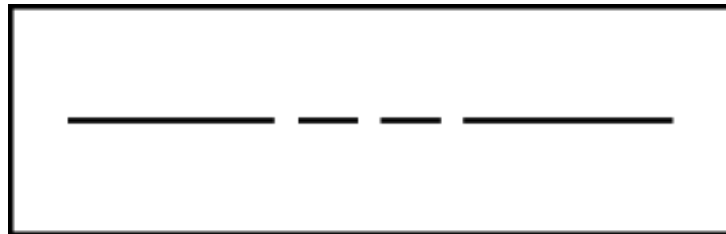
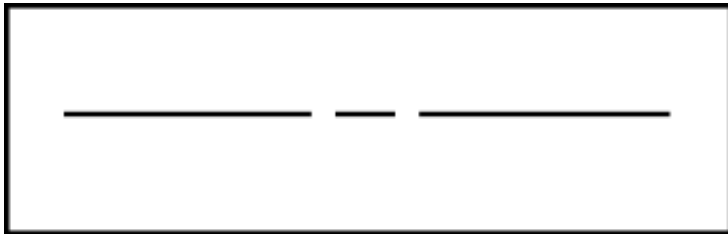
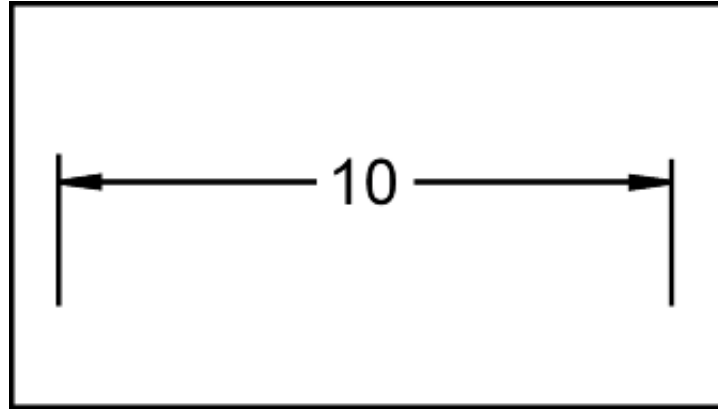


Example 1-2

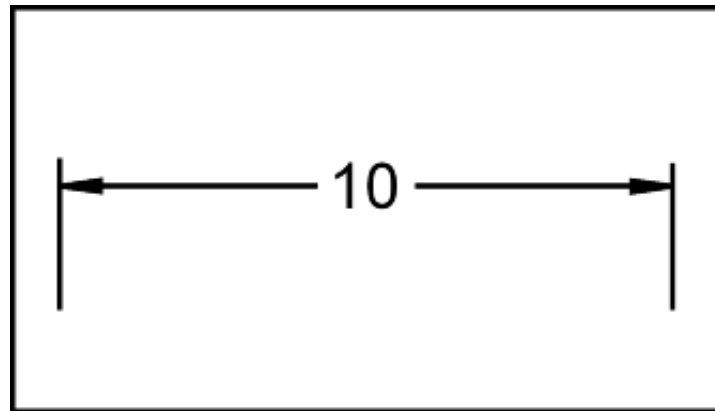
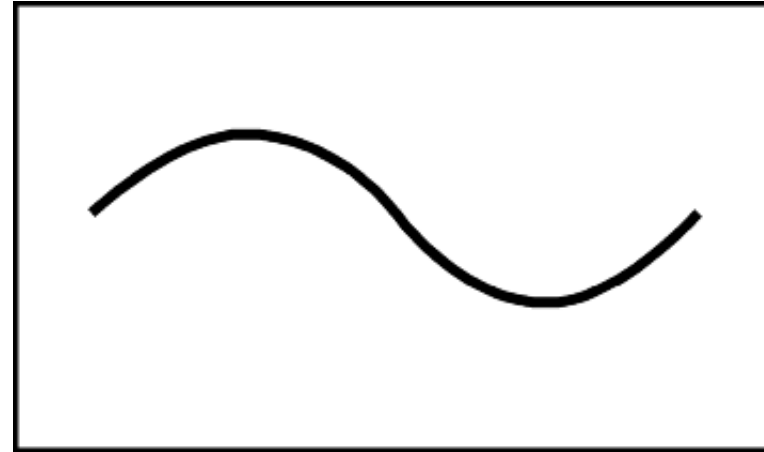
- Which of the following line types is a CENTER line?



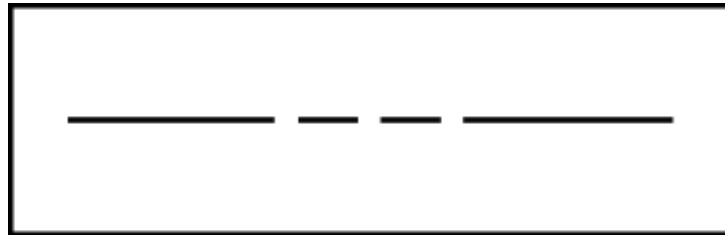
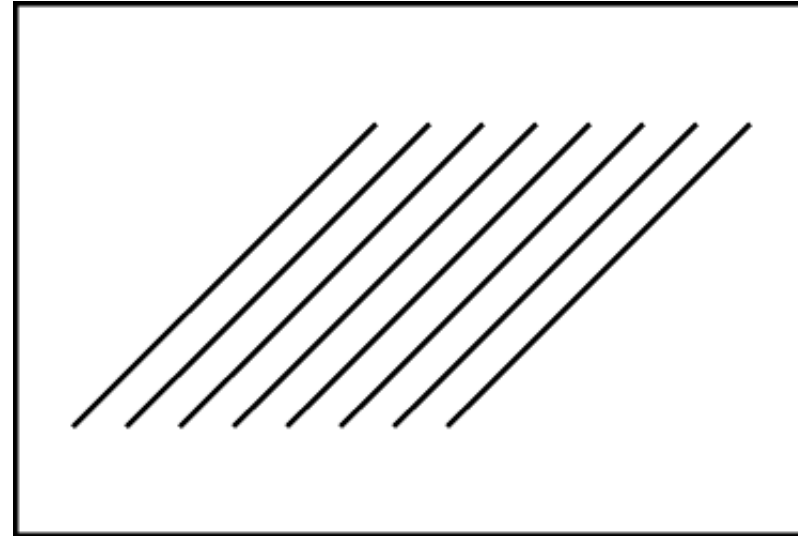
- Which of the following line types is a PHANTOM line?



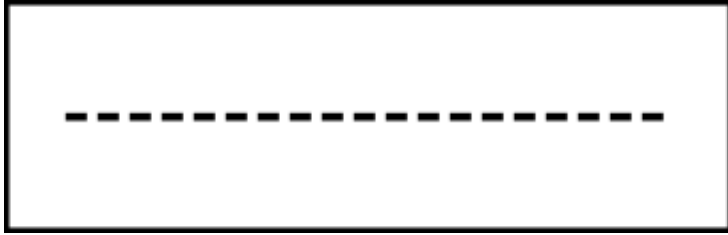
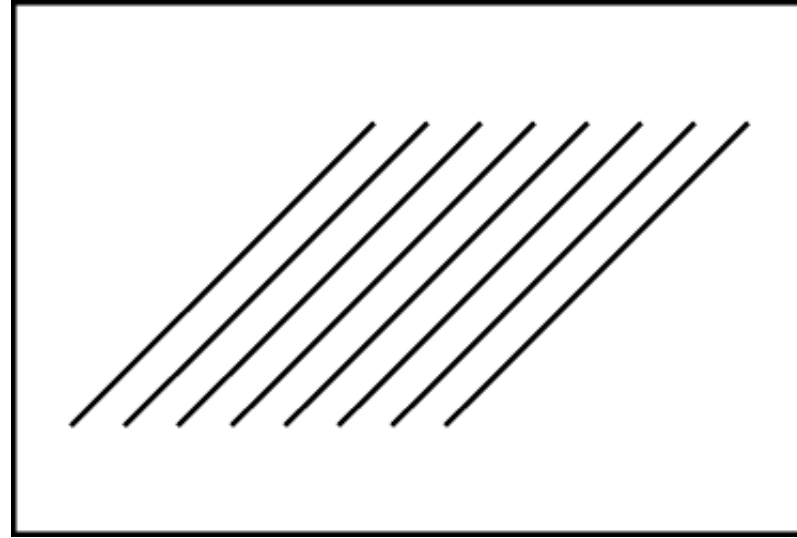
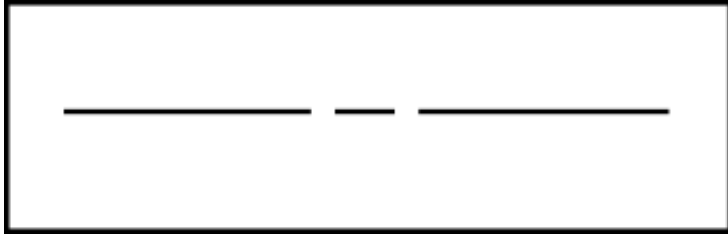
- Which of the following line types is a DIMENSION & EXTENSION lines?



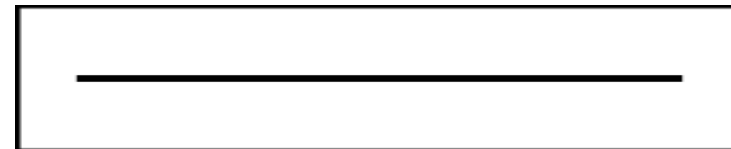
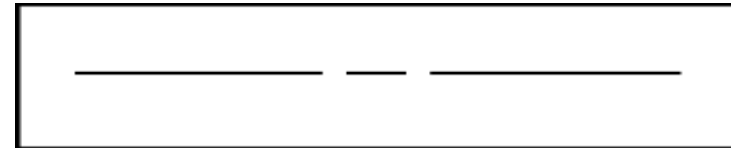
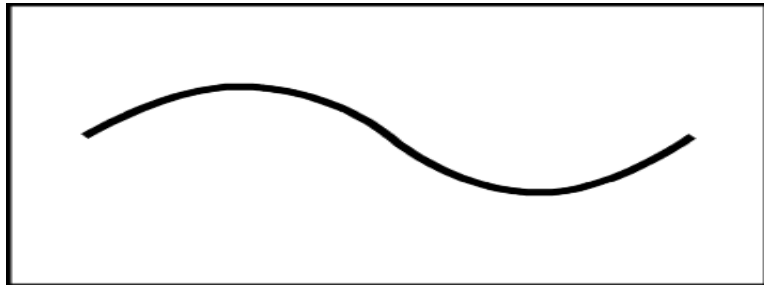
- Which of the following line types is a CUTTING PLANE line?



- Which of the following line types is a SECTION line?

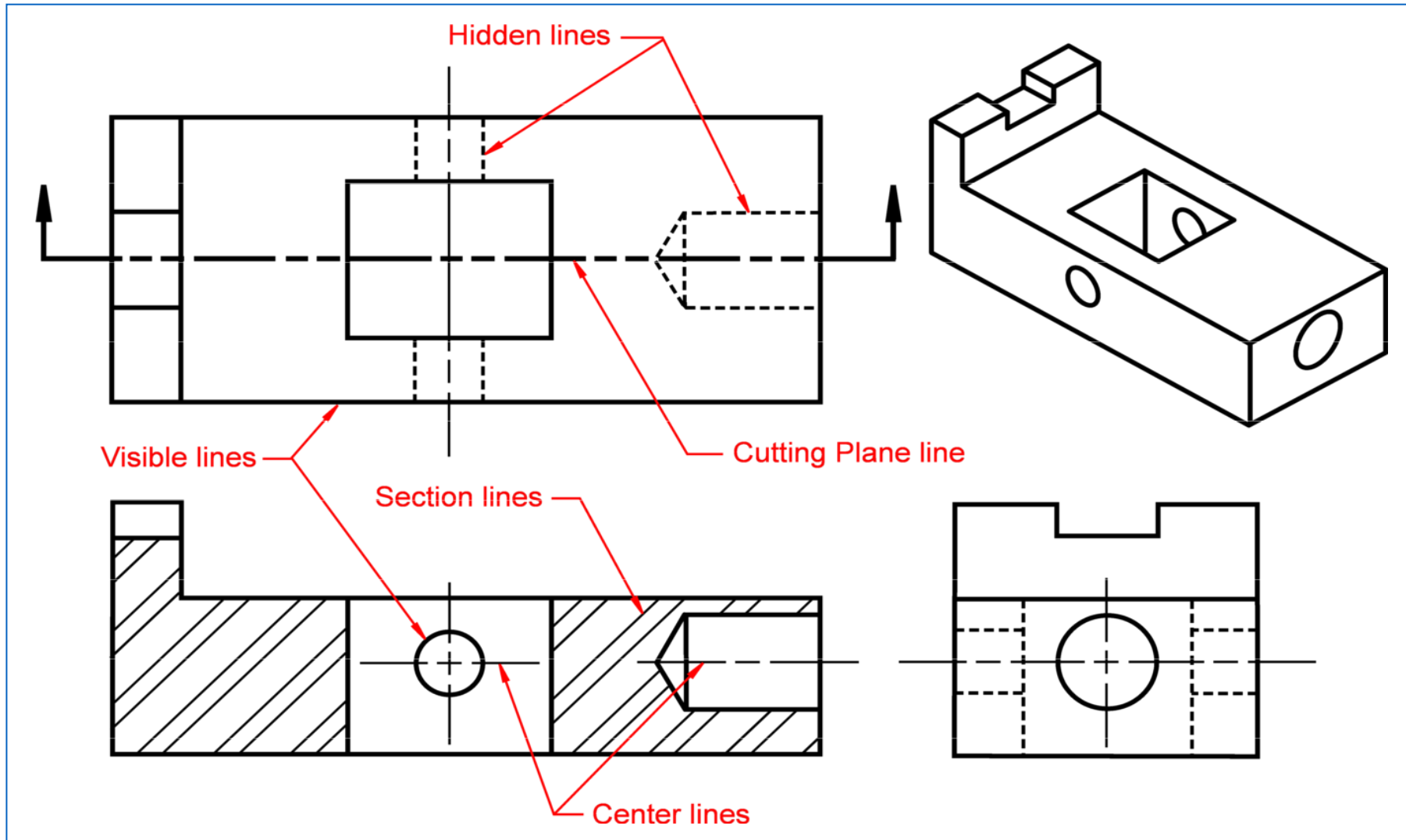


- Which of the following line types is a BREAK line?



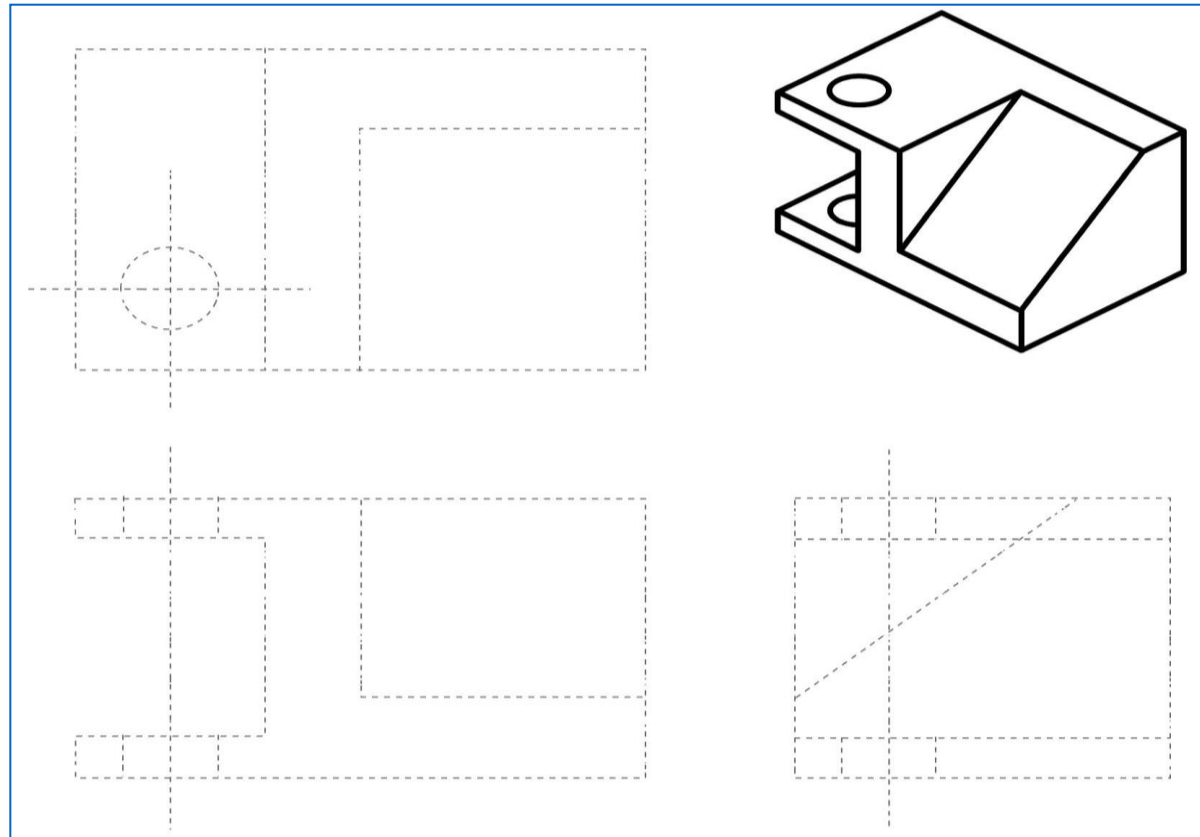
Example 1-2

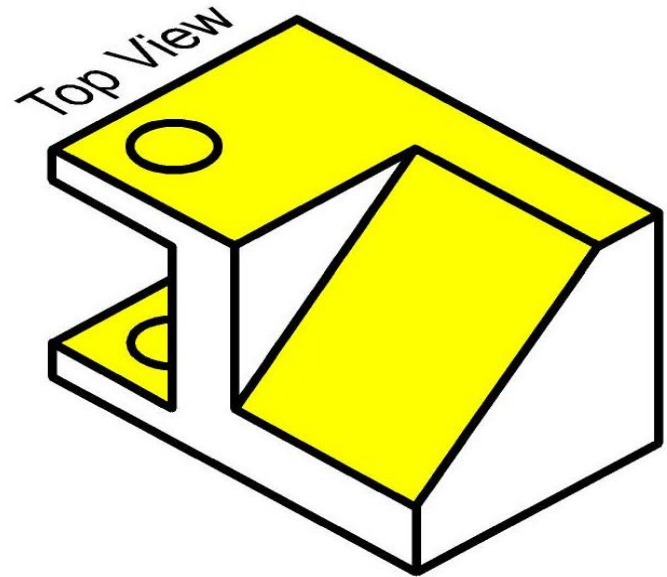
- Notice how different line types are used.



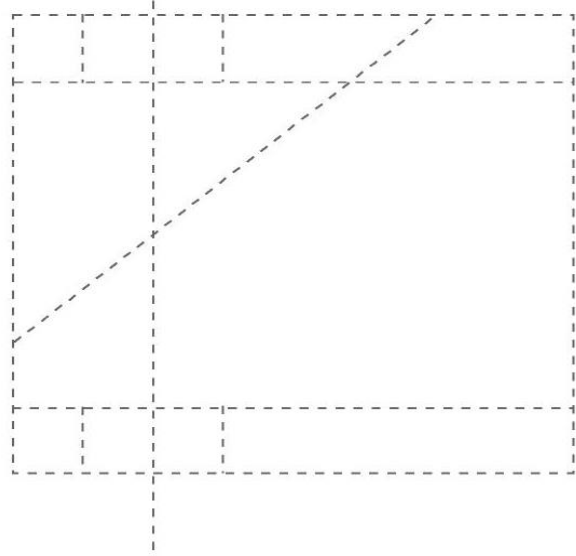
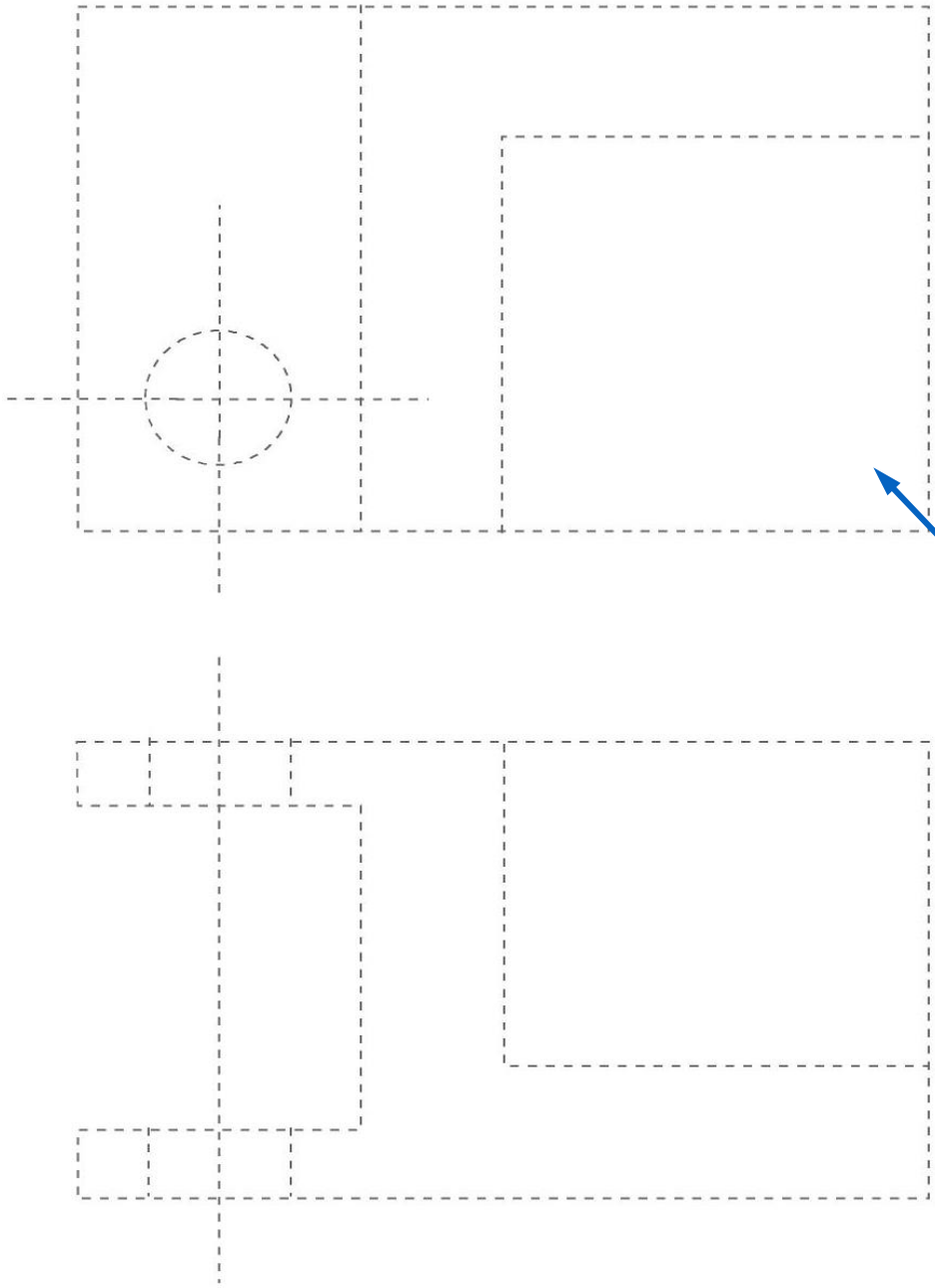
Exercise 1-3

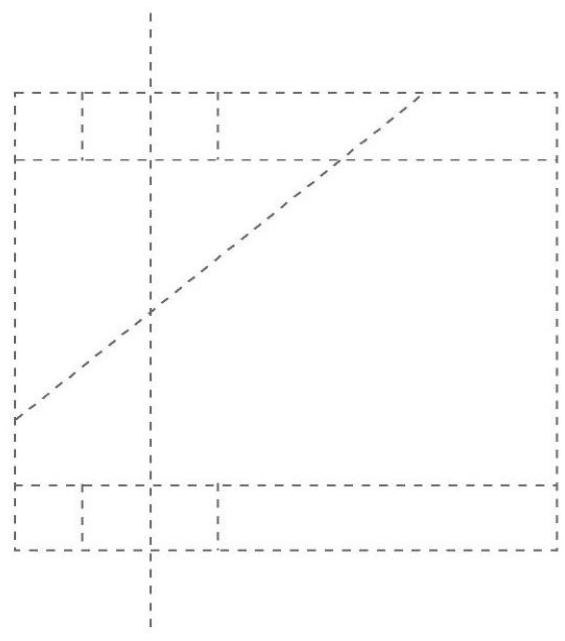
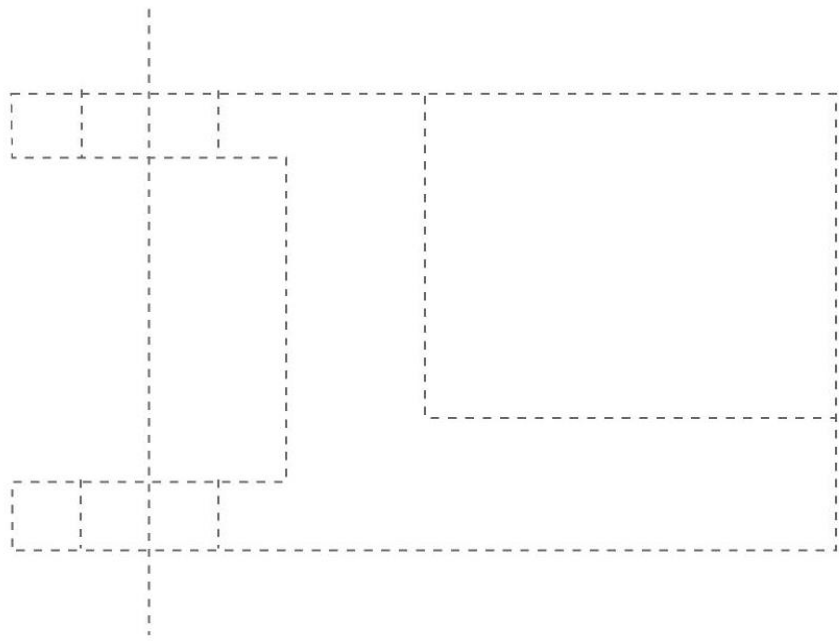
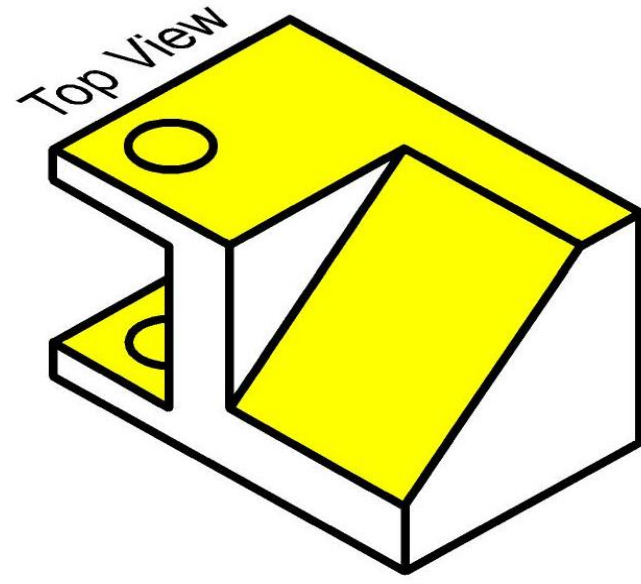
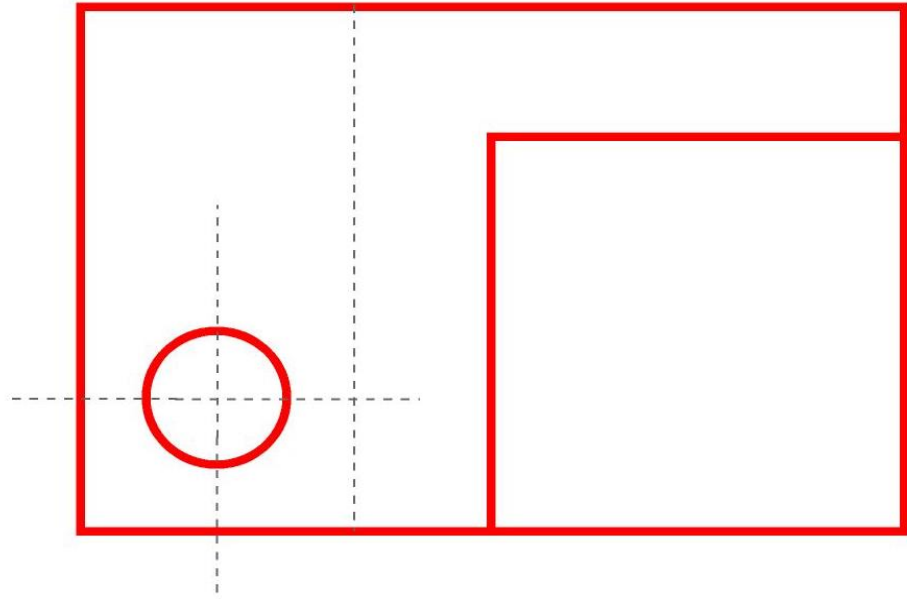
- Line use in an orthographic projection
- Fill the following dotted orthographic projection with the appropriate line types.

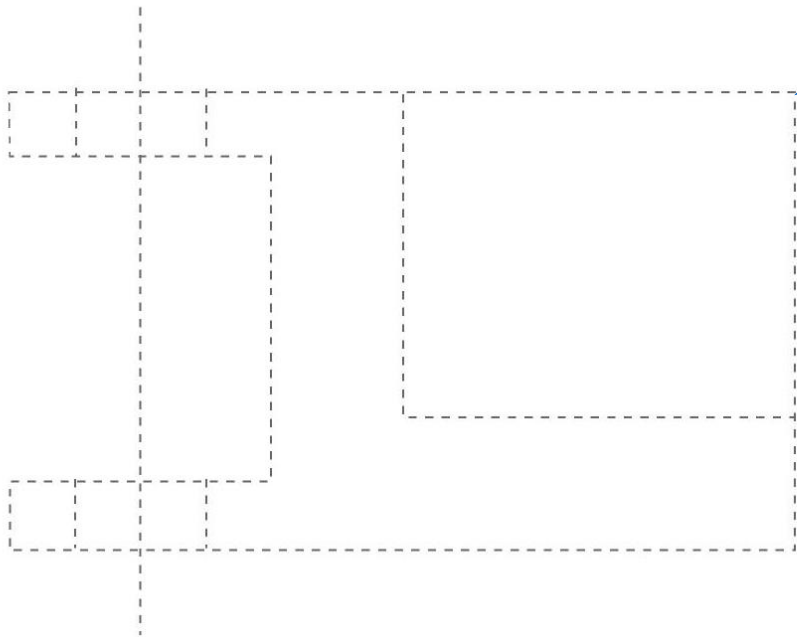
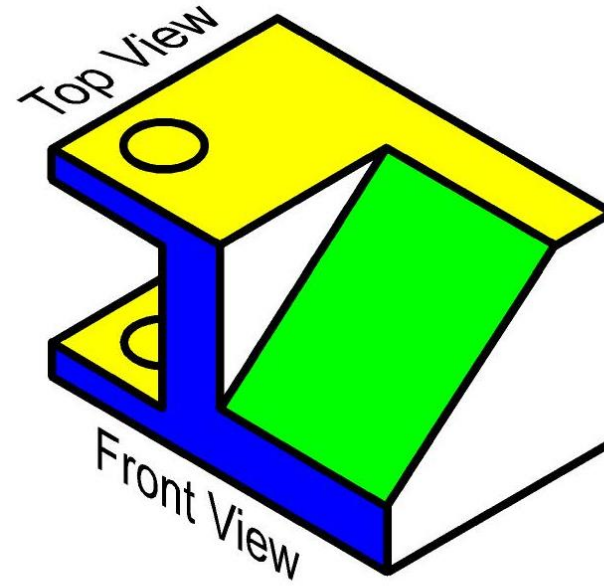
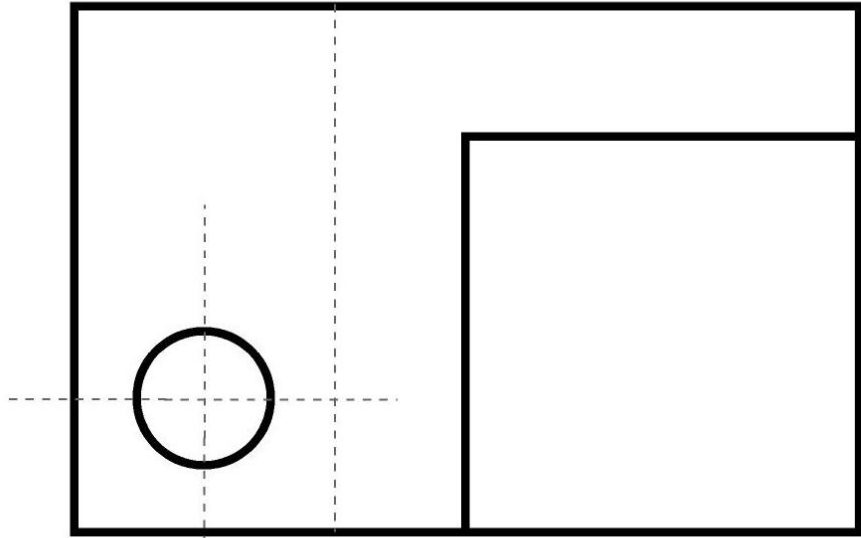




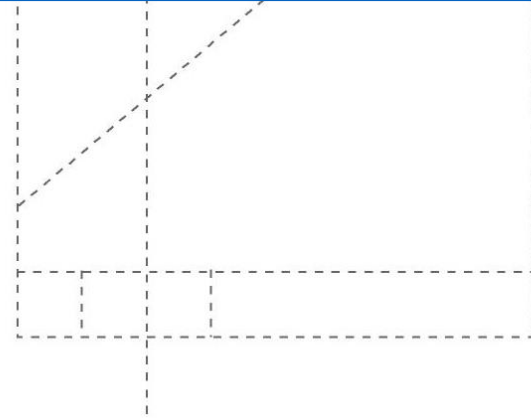
Fill in the visible lines in to top view.

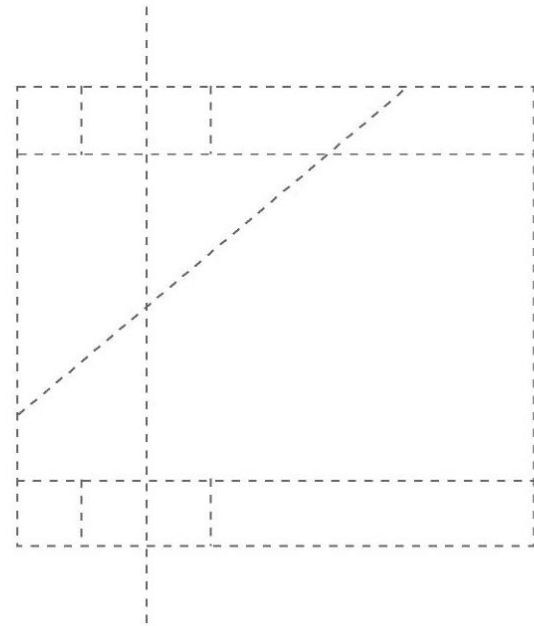
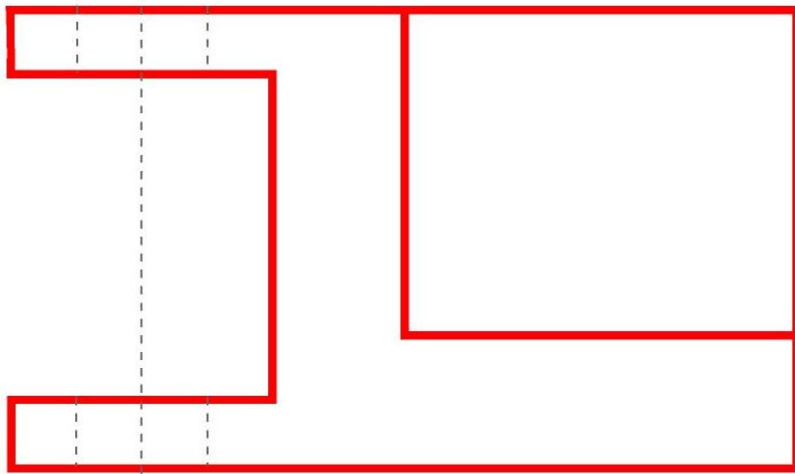
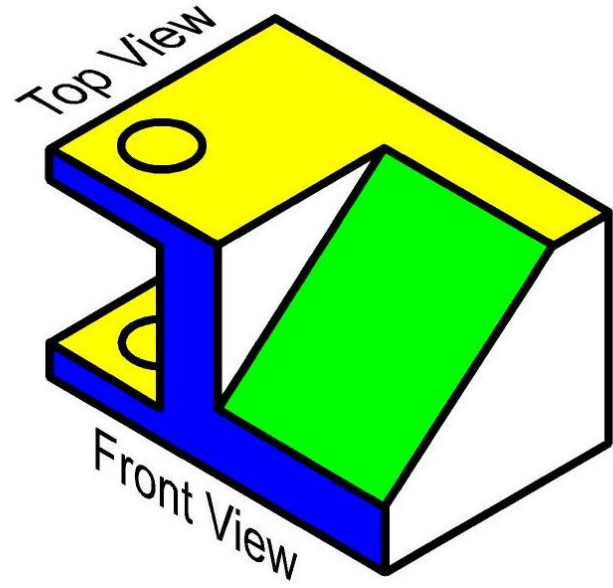
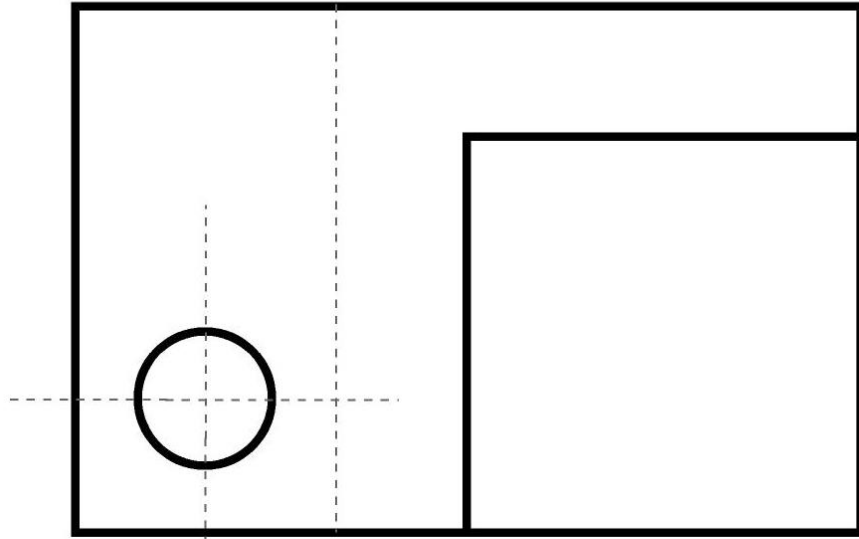


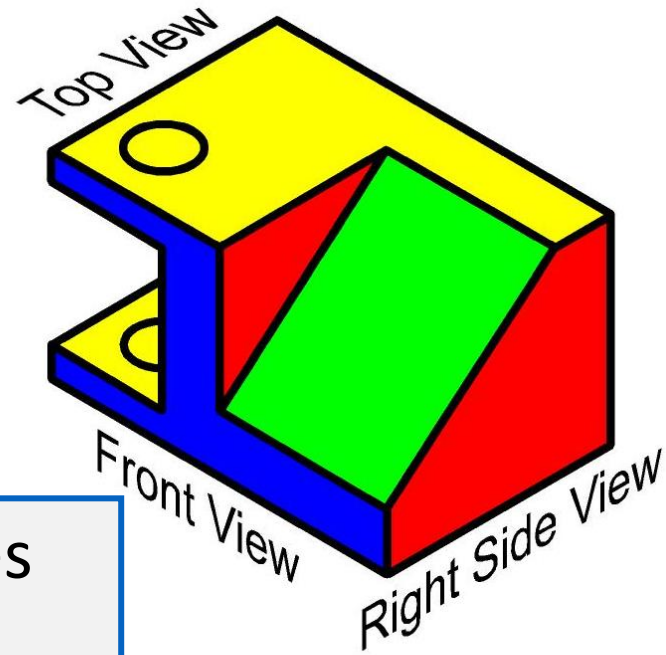
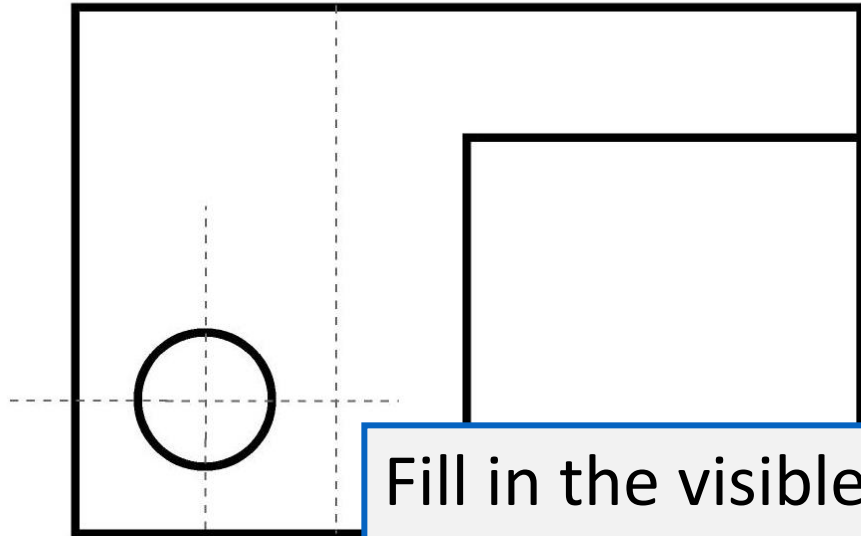




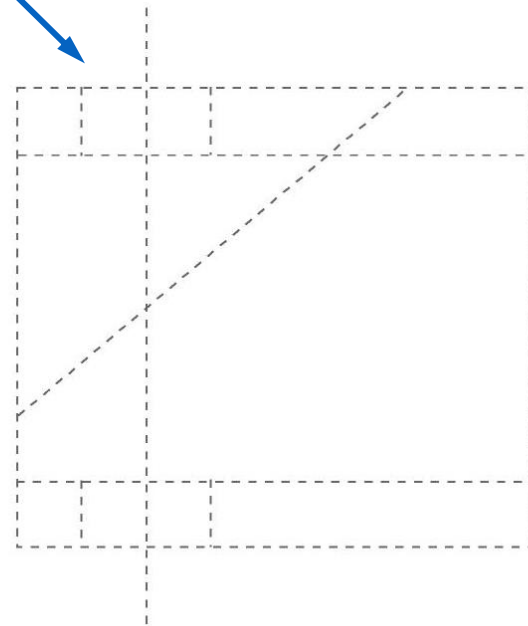
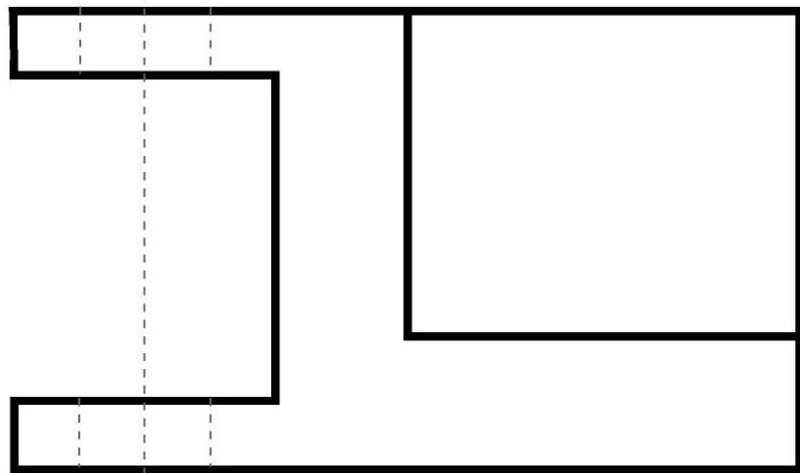
Fill in the visible lines in to front view.

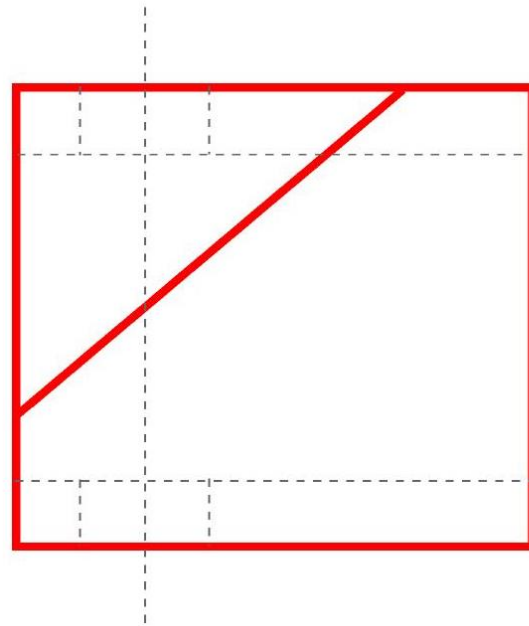
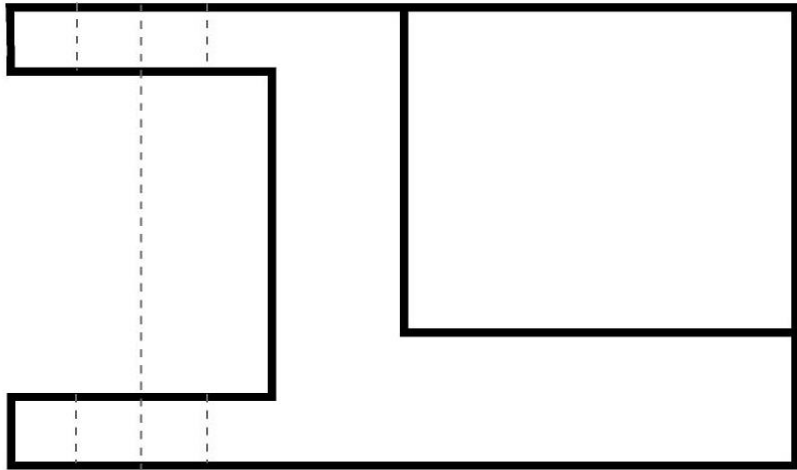
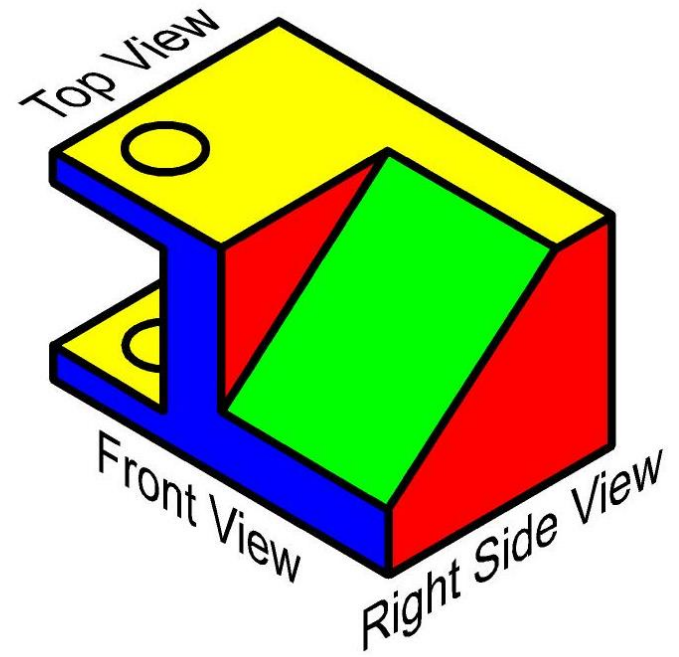
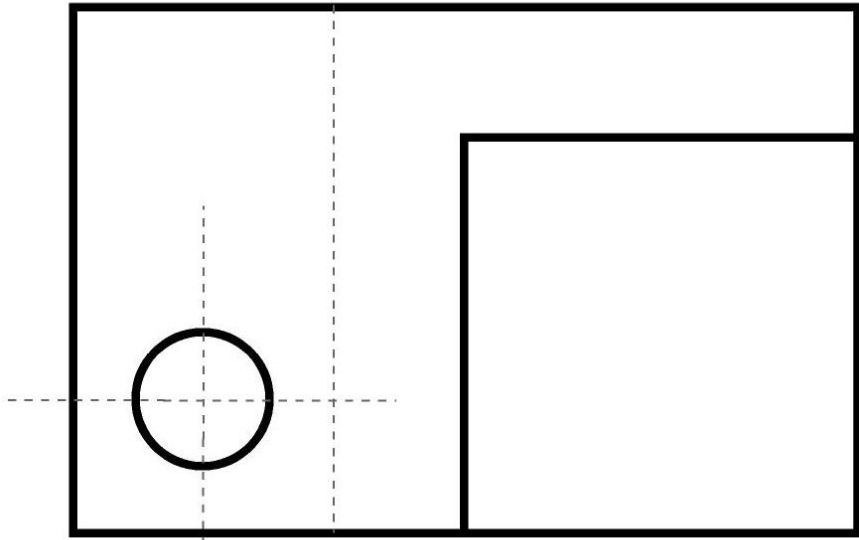


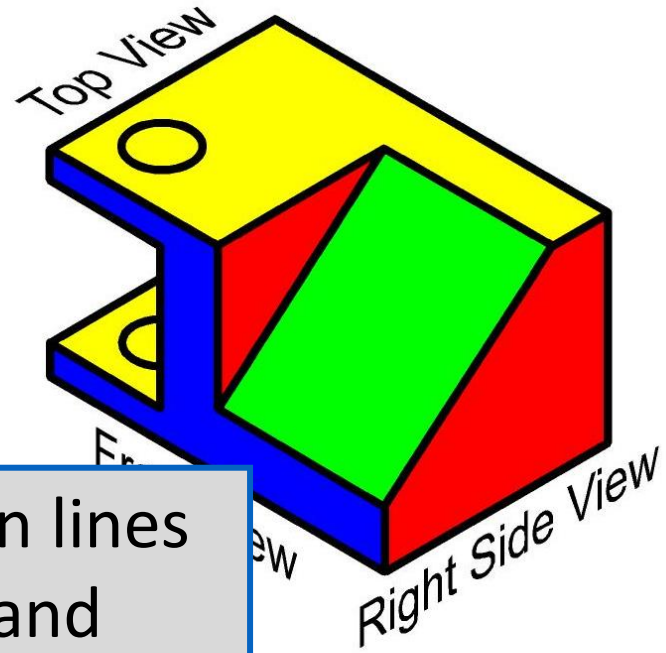
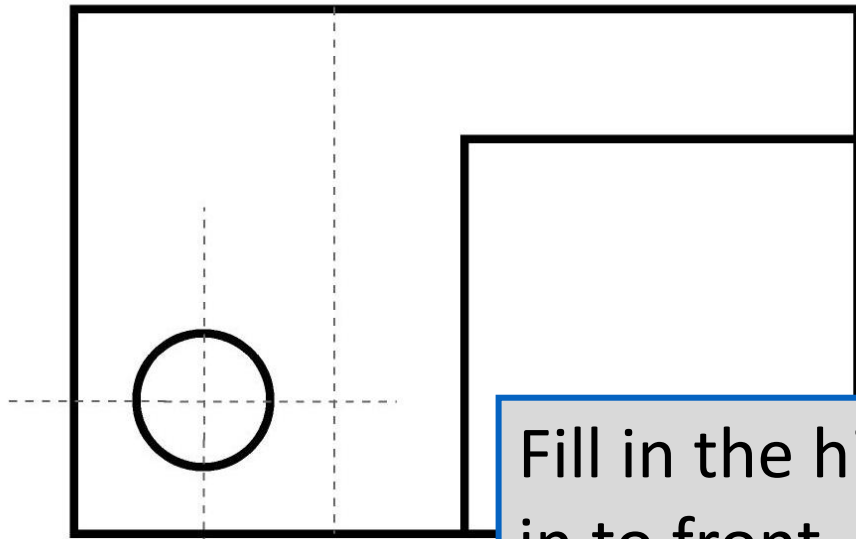




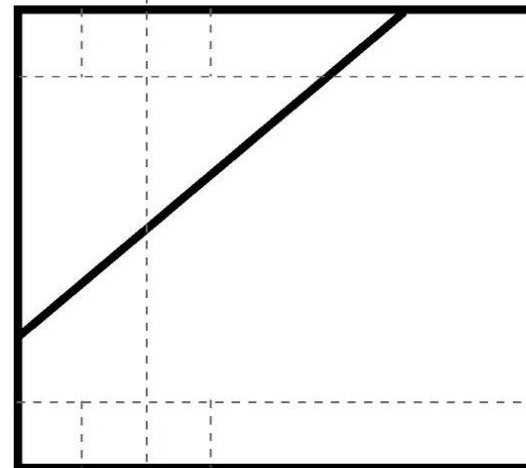
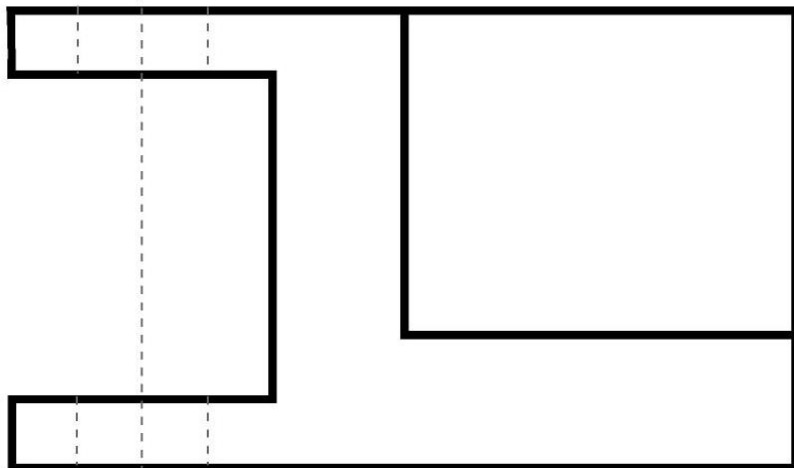
Fill in the visible lines in to right side view.

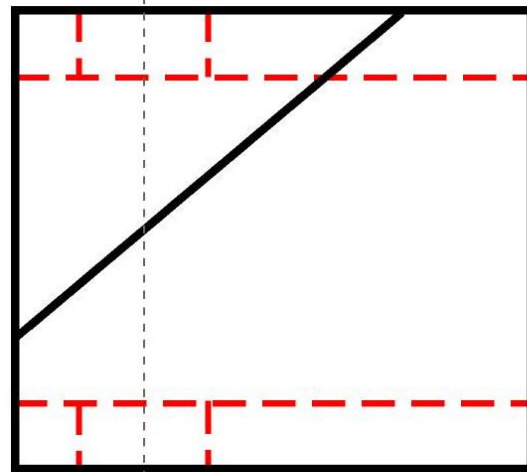
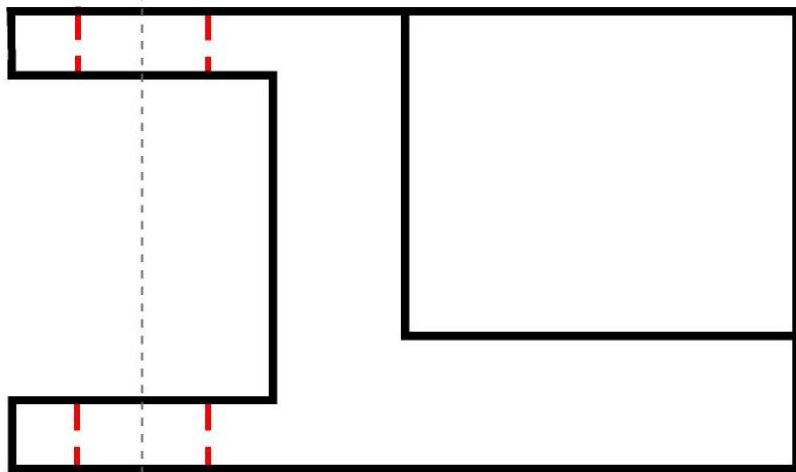
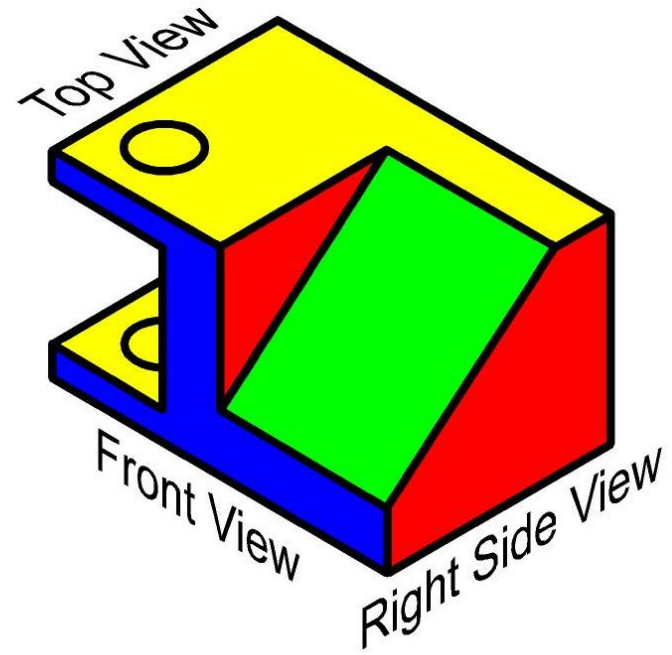
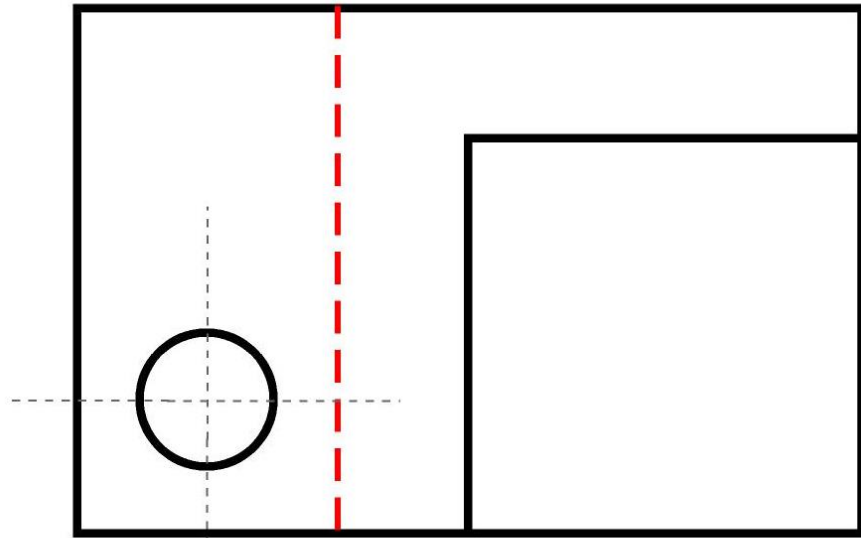


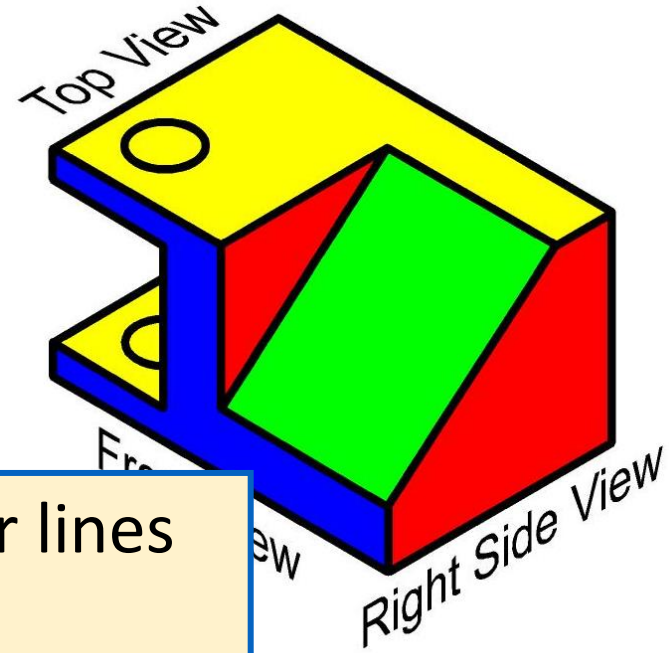
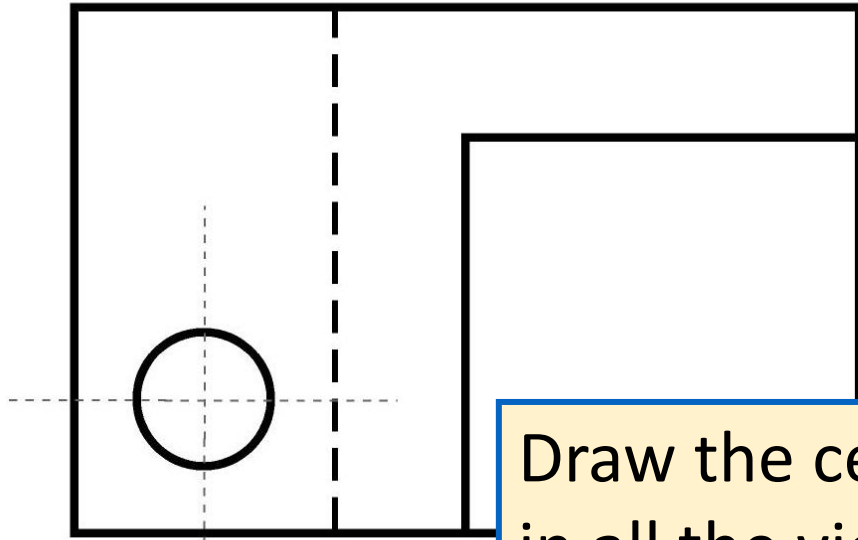




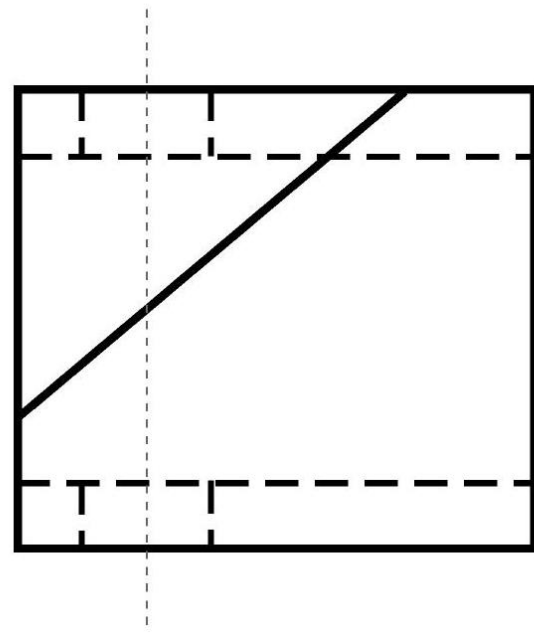
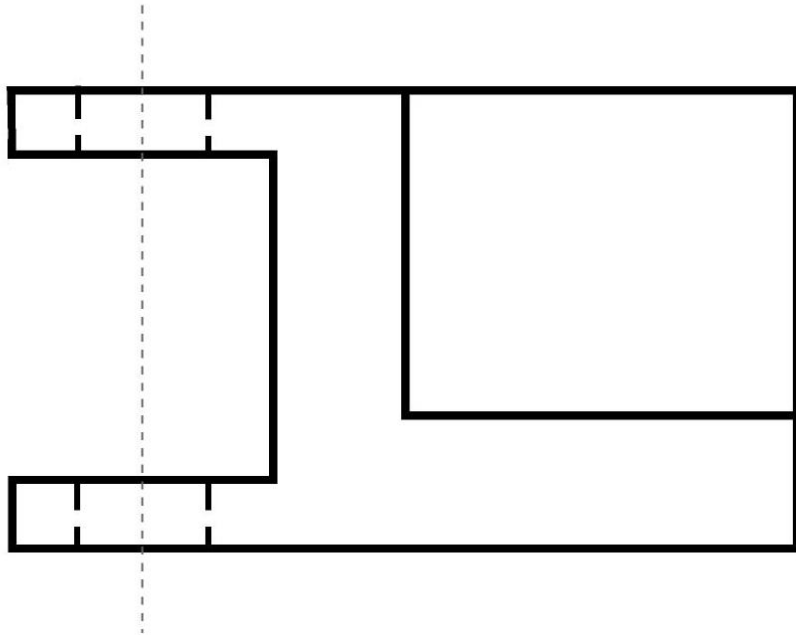
Fill in the hidden lines in to front, top and right side views.

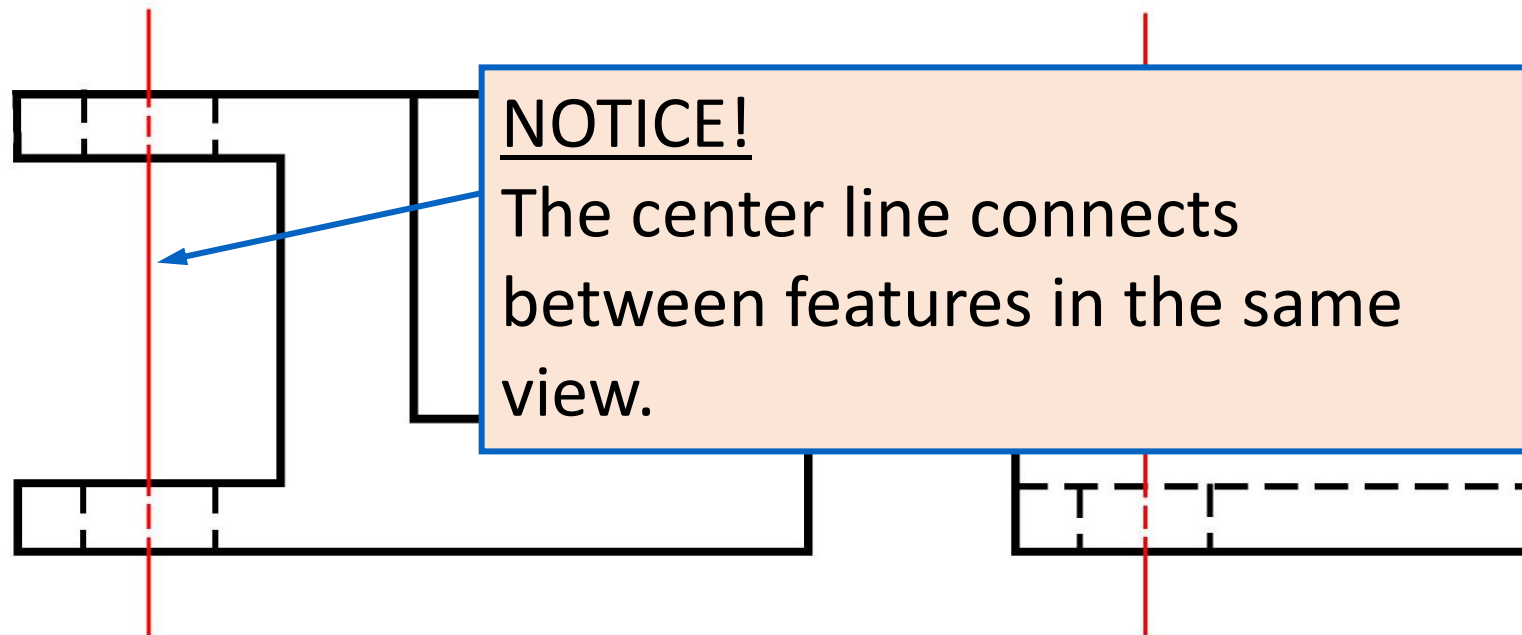
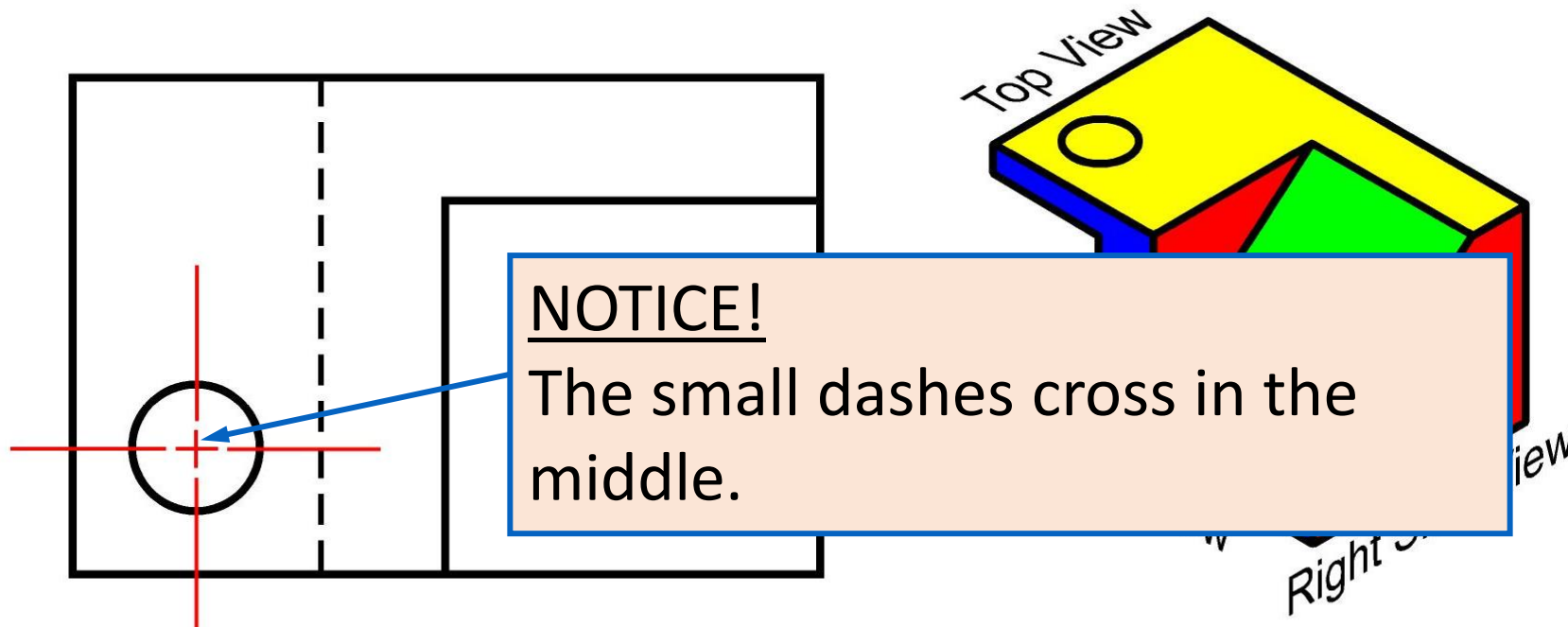






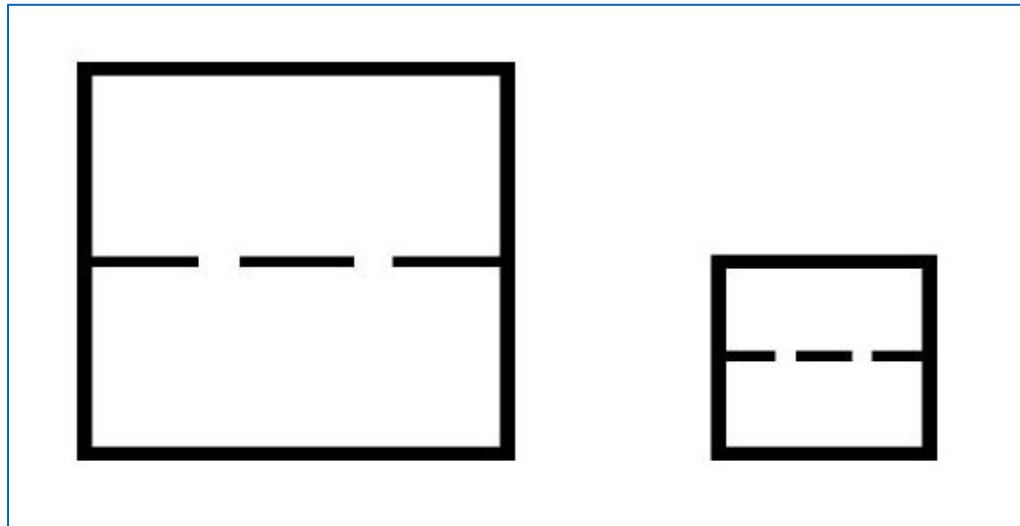
Draw the center lines in all the views.





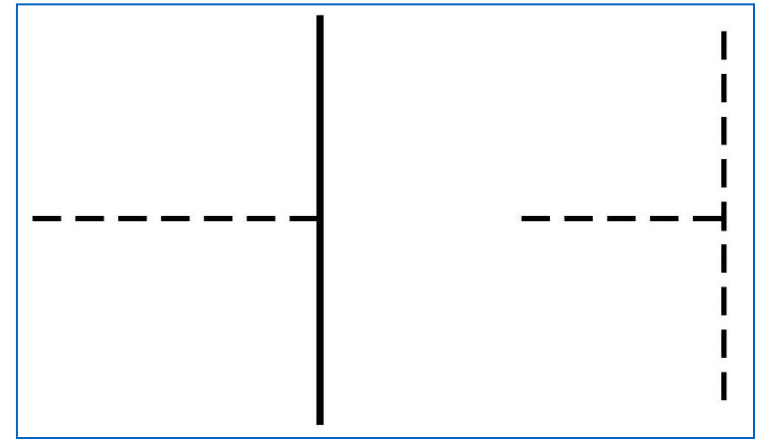
Orthographic Projection

- 1.6) Rules for Line Creation and Use
- The following rules will help us create lines that communicate effectively.
 - CAUTION! Due to computer automation, some of the rules may be hard to follow.
- Hidden lines represent edges and boundaries that cannot be seen.
- Rule 1:
 - The length of the hidden line dashes may vary slightly as the size of the drawing changes.



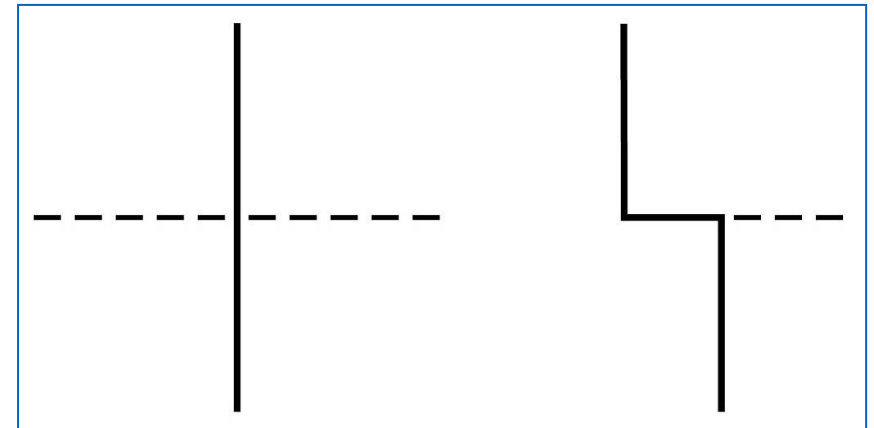
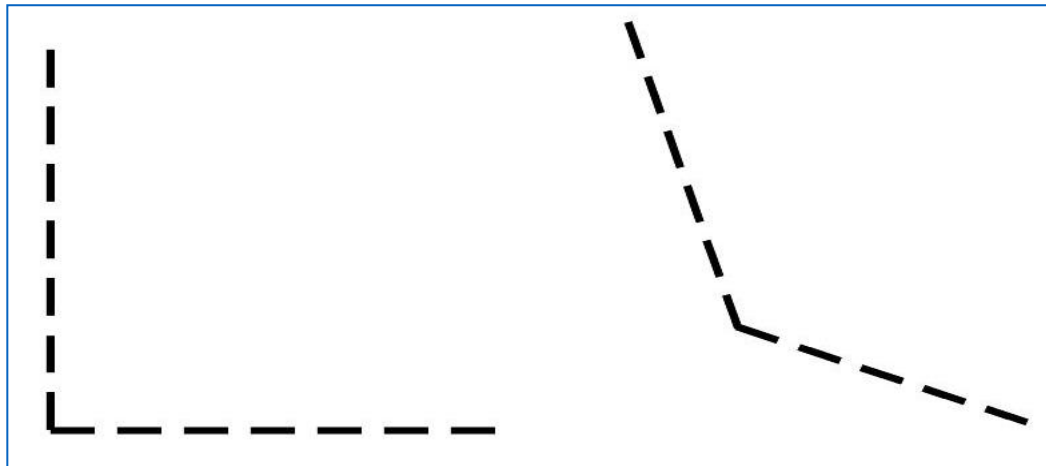
- Rule 2:

- Hidden lines should always begin and end with a dash,
- Exception: When the hidden line begins or ends at a parallel visible or hidden line.



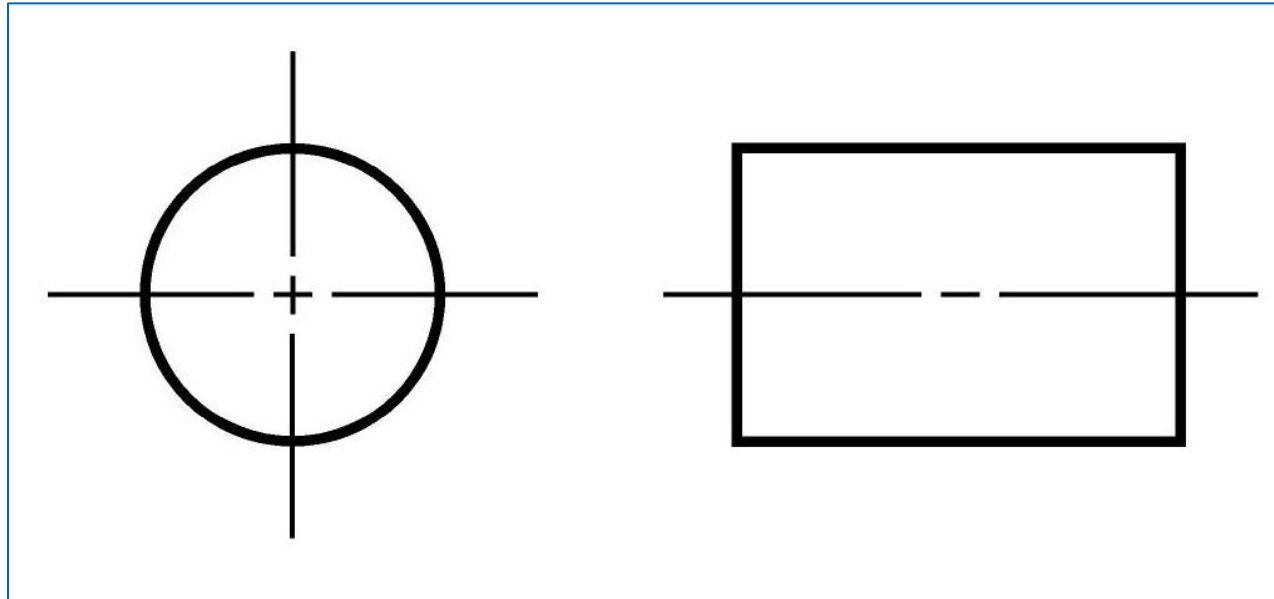
- Rule 3:

- Dashes should join at corners.

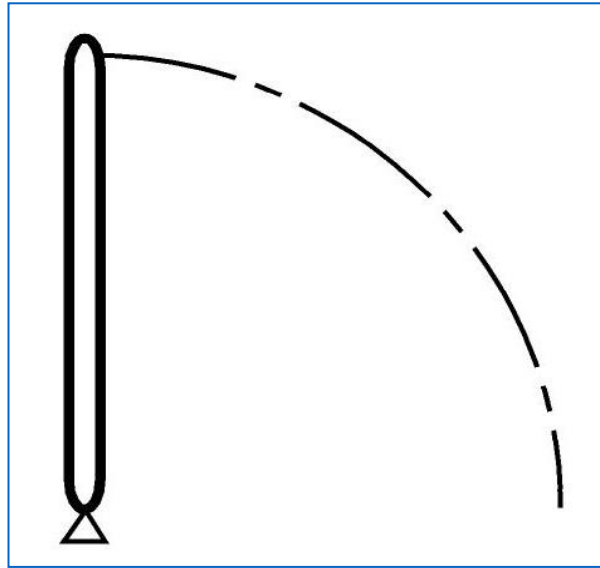
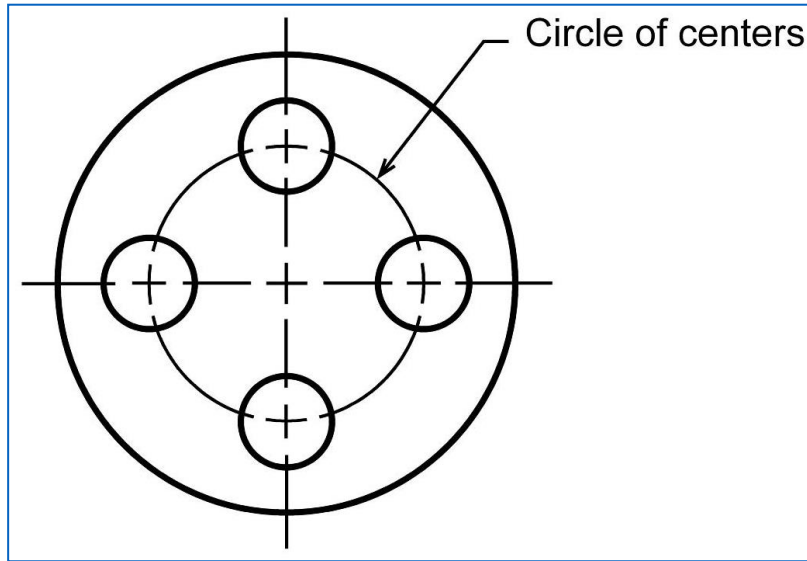


Using Center Lines

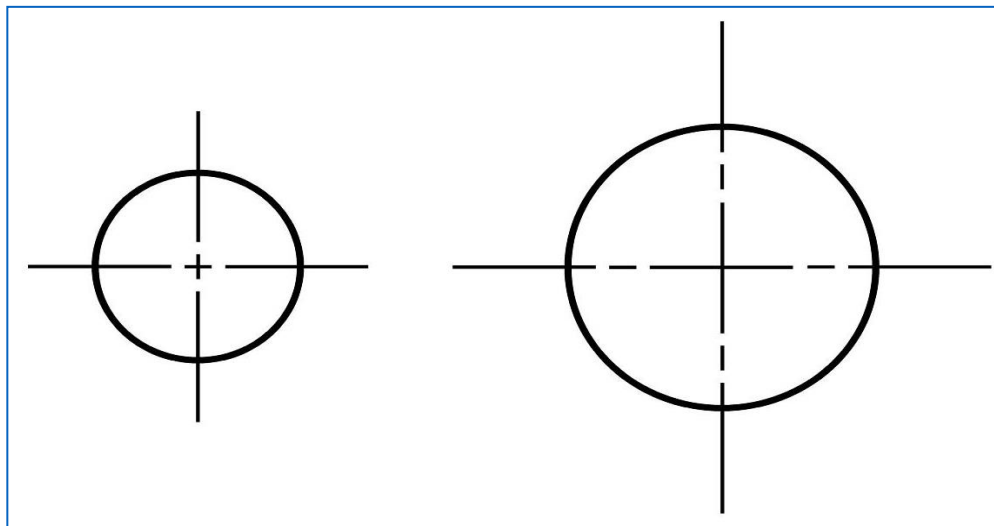
- Center lines represent axes of symmetry.
 - They are important for interpreting cylindrical shapes.



- They are also used to indicate circle of centers, and paths of motion.

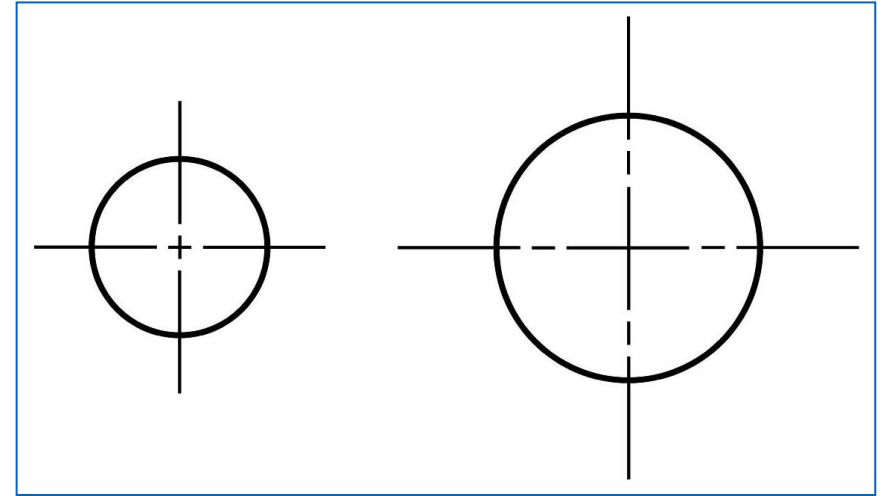


- Rule 1: Center lines should start and end with long dashes.



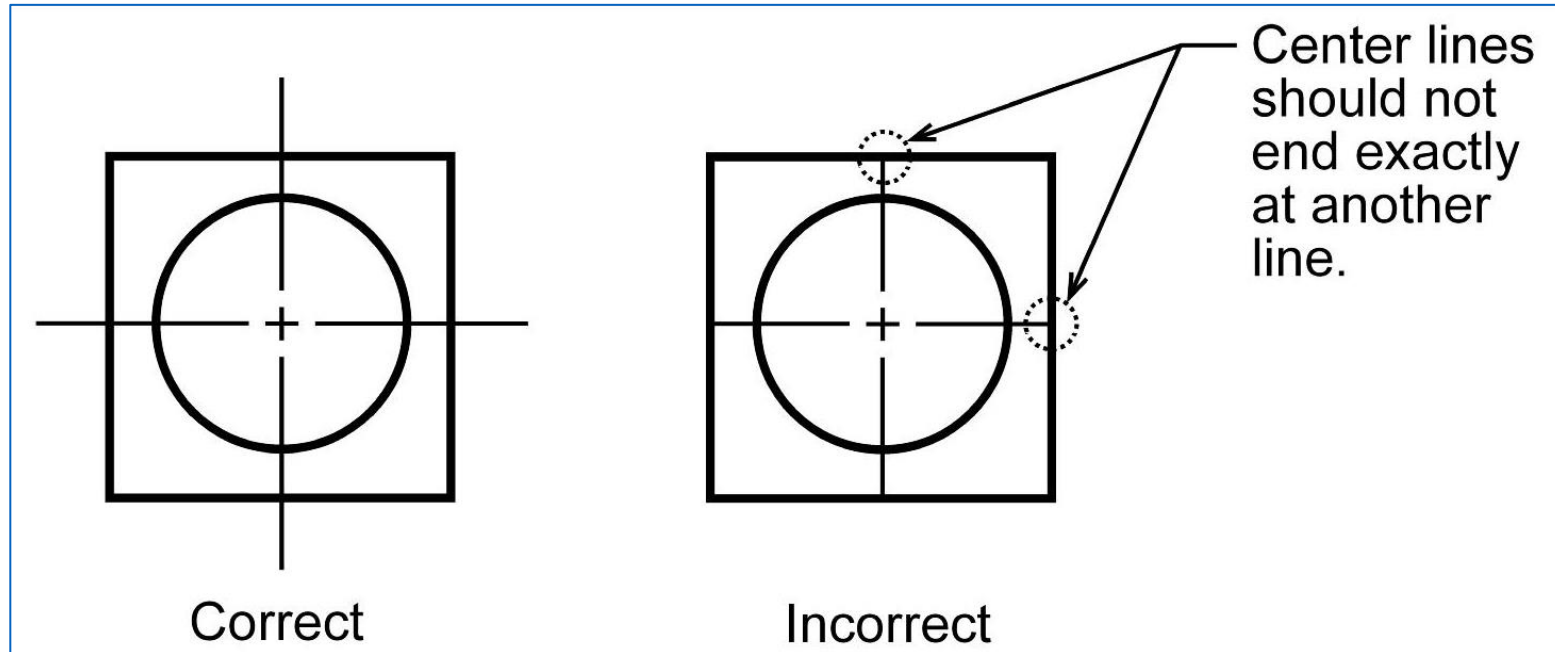
- Rule 2:

- Center lines should intersect by crossing either the long dashes or the short dashes.



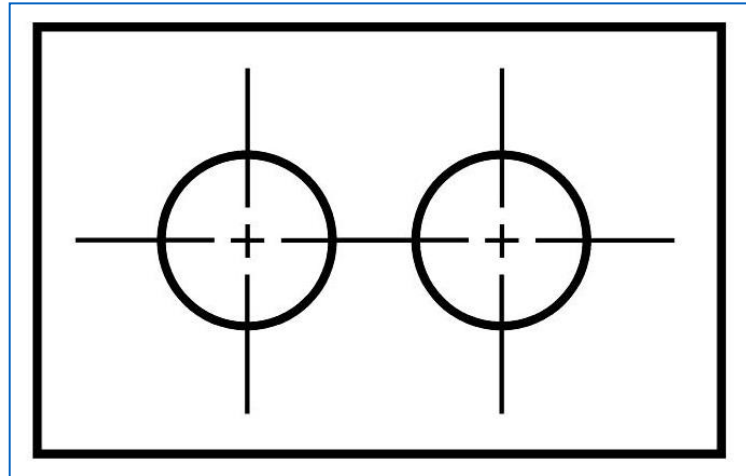
- Rule 3:

- Center lines should extend a short distance beyond the object or feature.



- Rule 4:

- Center lines may be connected **within a single view** to show that two or more features lie in the same plane.
 - CAUTION! Center lines should not extend through the space between views .



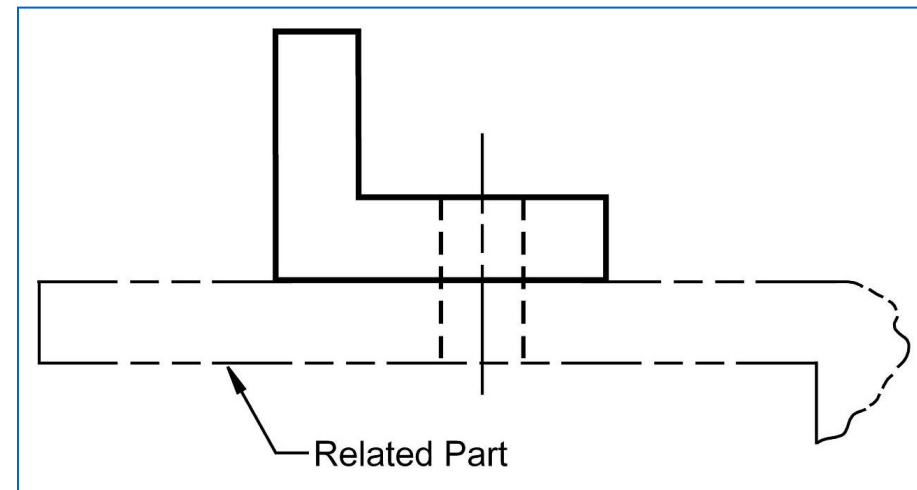
Using Phantom Lines

- Phantom lines uses:

- They may also be used to indicate adjacent positions of related parts.

- Phantom lines uses:

- Used to indicate repeated detail.

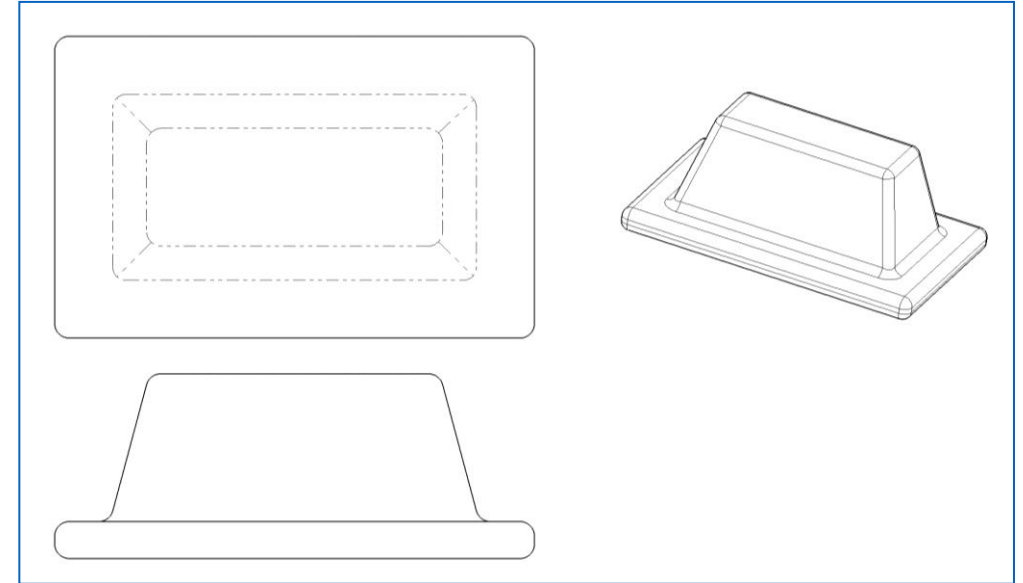
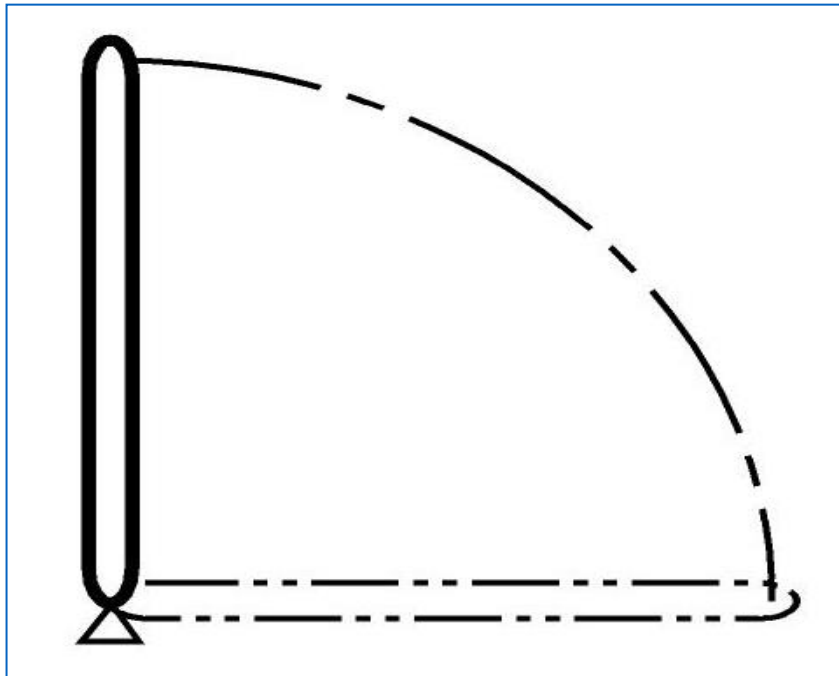


- Phantom lines uses:

- They are also used to show a change in surface direction produced by fillets and rounds.

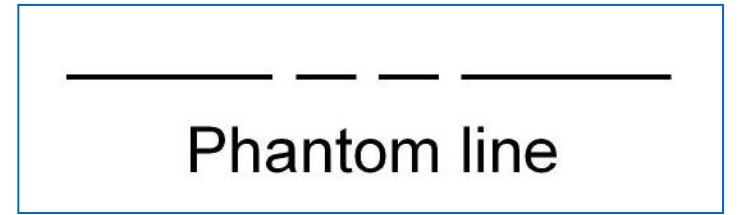
- Phantom lines uses:

- Used to indicate alternate positions of moving parts.



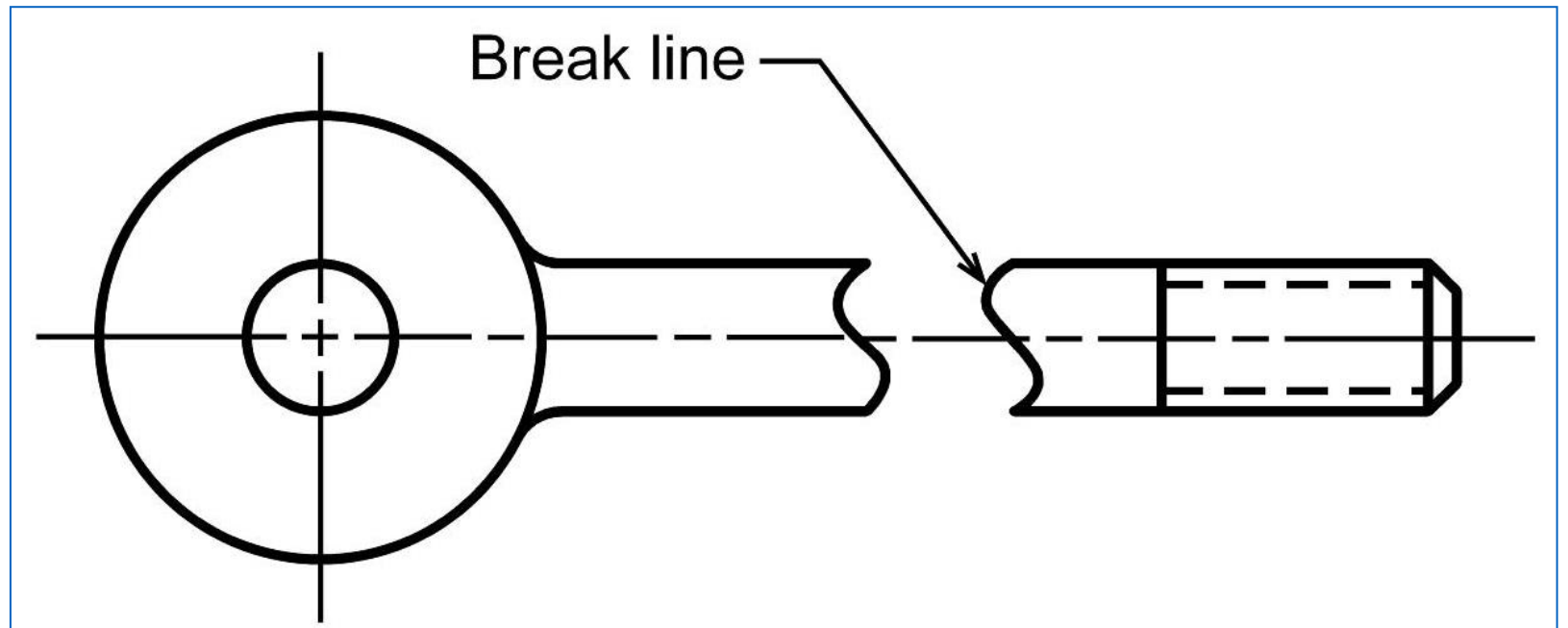
- Rule 1:

- Phantom lines should start and end with a long dash.



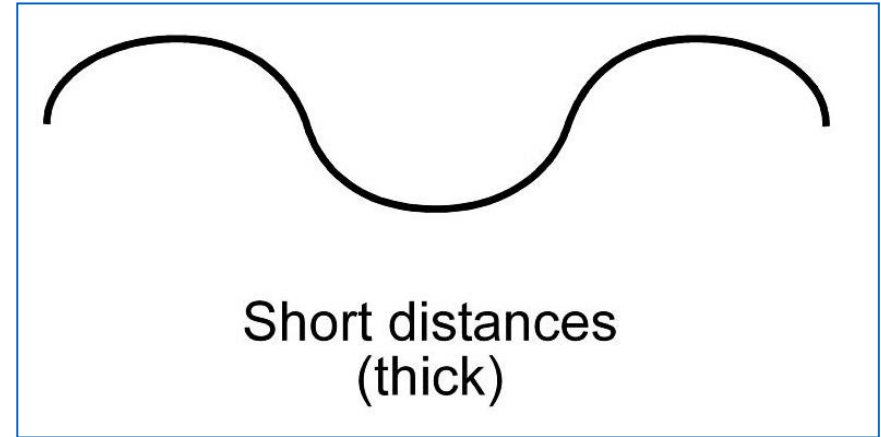
Using Break Lines

- Break lines are used to show imaginary breaks in an object.

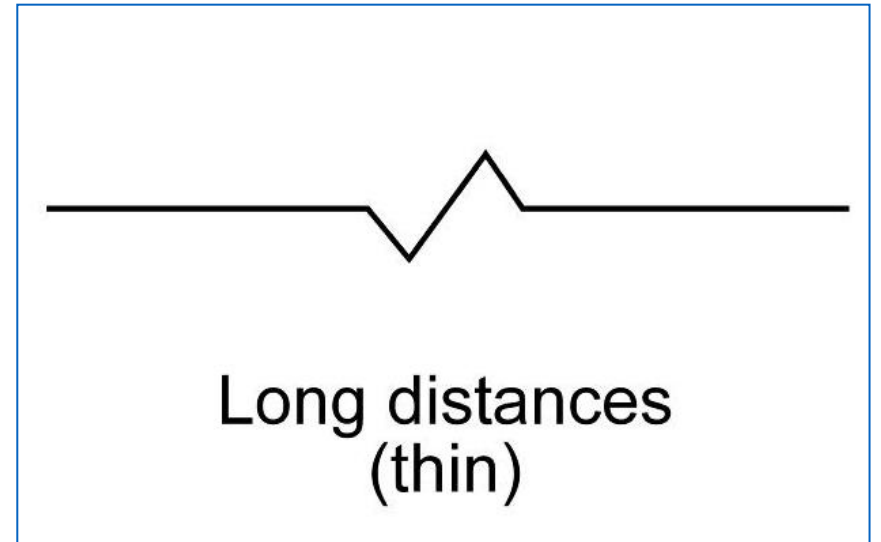


Creating Break Lines

- There are two types of break lines.
 - If the distance to traverse is short the series of connecting arcs is used.



- There are two types of break lines.
 - If the distance is long the thin straight line with a jog is used.



Line Precedence

- If two lines occur in the same place, the line that is considered to be the least important is omitted.
- Lines in order of precedence/importance are as follows;
 - Cutting plane line
 - Visible line
 - Hidden line
 - Centerline