Fusion 360 Introduction
&
2D sketching

Referance.

Chapter 5, Lieu and Sorby book (Visualization, Modeling, and Graphics for Engineering Design)

Autodesk: Product documentation

Fusion 360

- **Fusion** is a **cloud-based** CAD/CAM/CAE tool for **collaborative product development**.

- Fusion **combines fast and easy organic** modeling with **precise solid** modeling.

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- To help you create **manufacturable designs**.

Fusion 360

File structure

Design/Project/product

- Components, bodies, sketches and joints

Bodies and Components

- All components exist in the same Fusion file.
- Component groups act like sub-assemblies, and bodies are physical objects that exist either in the global space or in a component.

Joints

- Joints **define the degrees of freedom between parts** to show how components move in an assembly.
- They drive motion studies and animations.
- Joints are **created between components**, but are defined by certain features within the component, like bodies, faces, or edges.

Fusion 360

File structure

As-built Joints

- **When the components of a design are already in the correct positions relative to each other,**
- **As-Built Joint is used to constrain them.**
- **As-Built Joints maintain the position and define the relative motion.**

Sketches

- **Sketches are often the foundation from which solid, surface, and T-Spline bodies can be created in a design.**
- **Often within the context of an assembly.**

Fusion 360

Create a sketch

From the **Design** workspace, **Solid** tab, select **Create Sketch** icon.
Select the initial plane or face to begin the sketch on.

Valid selections are:
- **Origin planes**
- **Work planes**
- **Planar faces on geometry**

Create lines in a sketch

- On the **Sketch** contextual tab, select **Create** > **Line** icon.
- **In the canvas, click to place the first end point.**
- **Specify the length and angle of the line segment:**
- **Click to place the second point.**
- **Continue placing points:**
- **Or, click create and continue to complete and create another line.**
- **Pause over a point, then click and drag to create arc line segments.**
- **Complete the line:**
- **Click the start point to create a closed sketch profile.**
- **Press Enter to complete the command.**

Fusion 360

Fully define and constrain sketches

- A sketch is **fully constrained** when the **size** and **position** of all sketch geometry is completely defined.

- This is achieved using a combination of **constraints** and **dimensions**.
- No need to fully constrain sketches, but it is often good practice to do so.

- In the **Browser**, a **red** lock displays on the icon next to the sketch when it is fully constrained.

- When sketch geometry is fully constrained, it changes from its initial color to **black**.

Fusion 360

Commands to constrain sketches:

- **Horizontal/Vertical**
- **Coincident**
- **Tangent**
- **Equal**
- **Parallel**
- **Perpendicular**
- **Fix/UnFix**
- **Midpoint**
- **Concentric**
- **Collinear**
- **Symmetry**
- **Curvature**
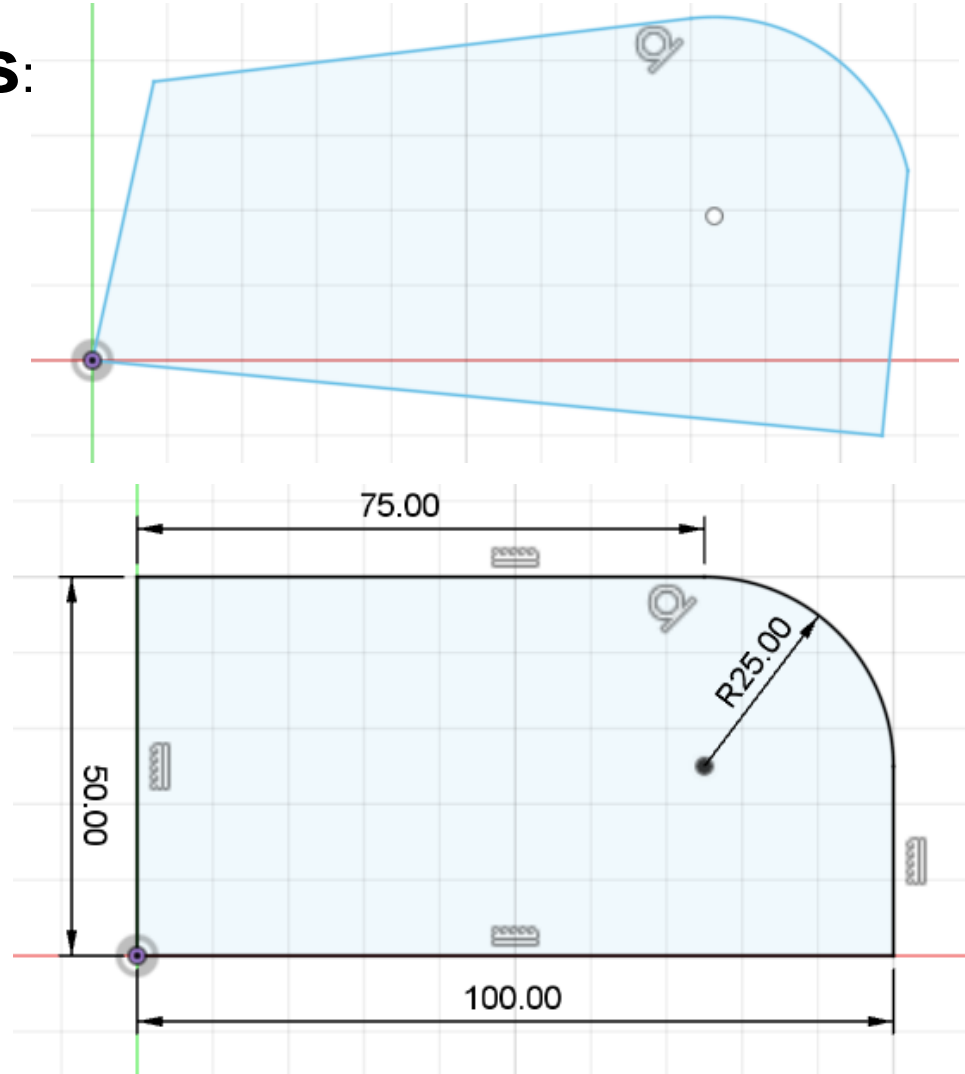
Uniqueness of Constraints

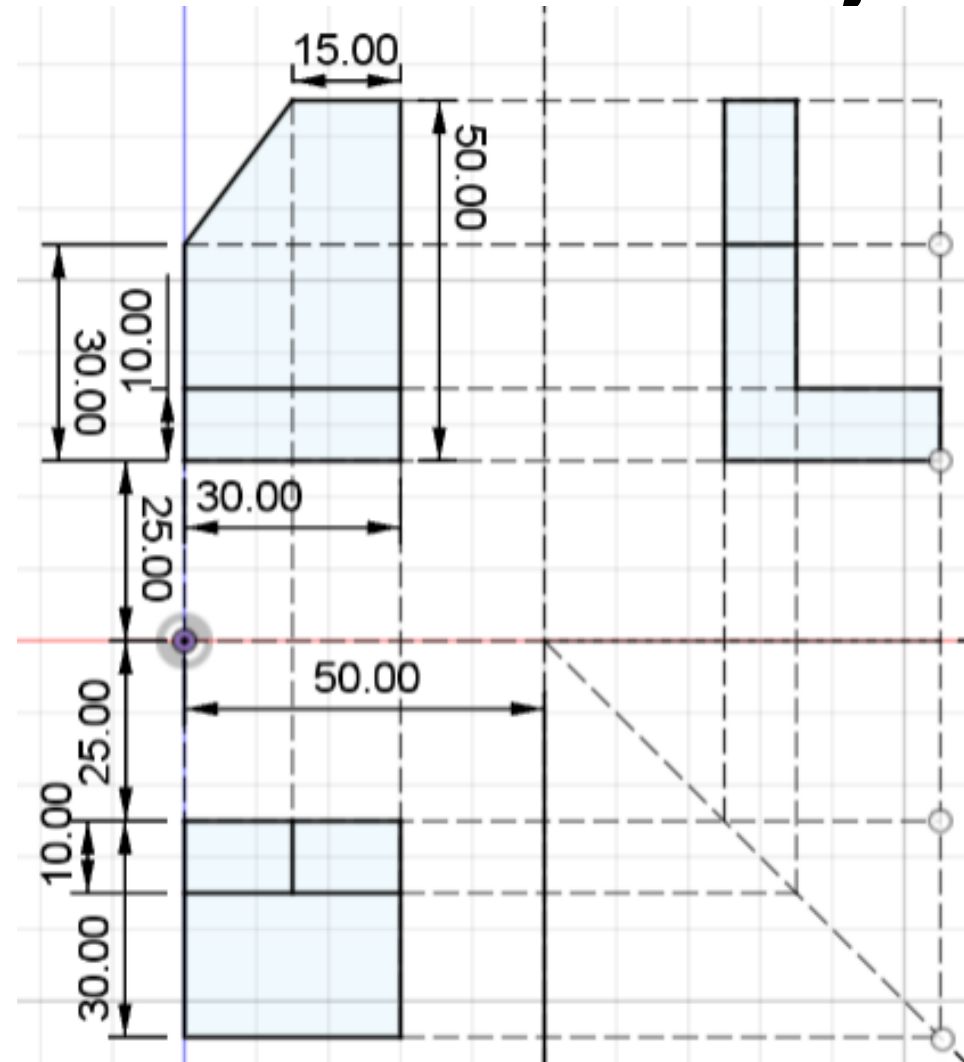Two different sets of geometric constraints that define the same geometry
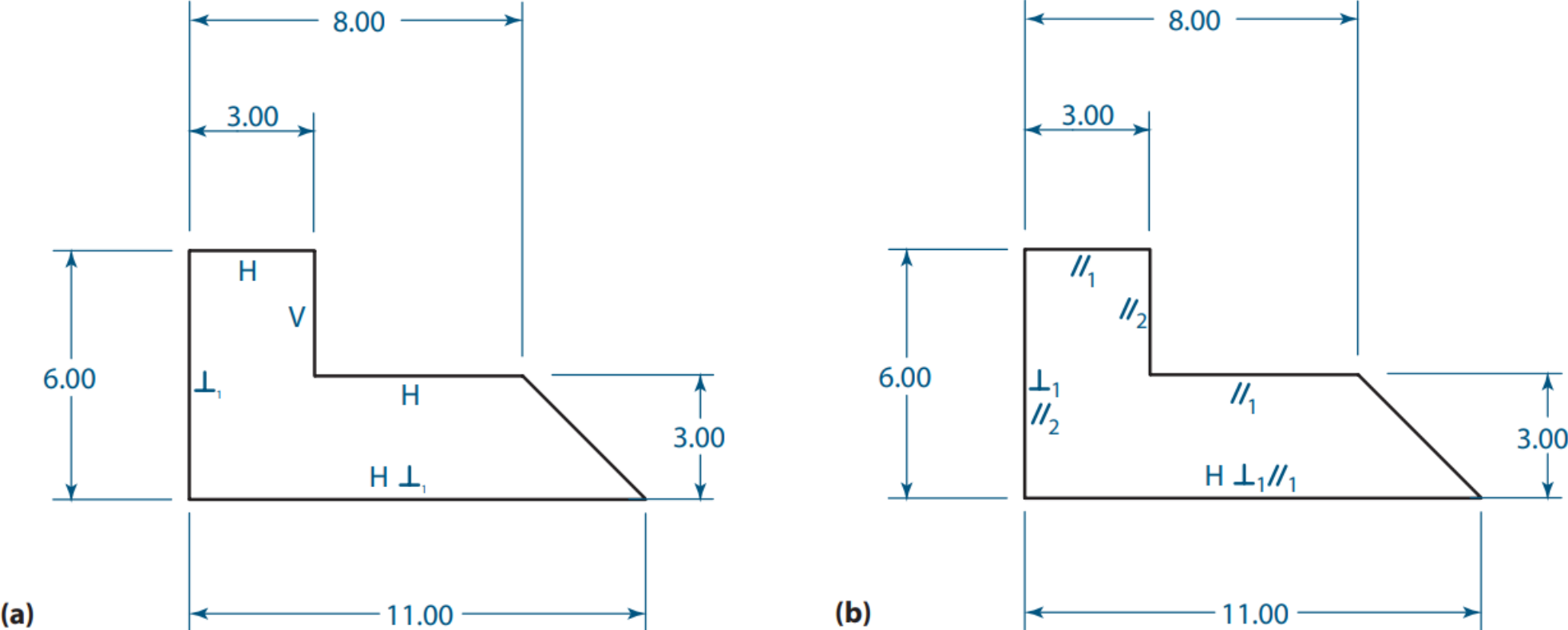
2D sketching in Fusion 360

First angle projections of a 3D object
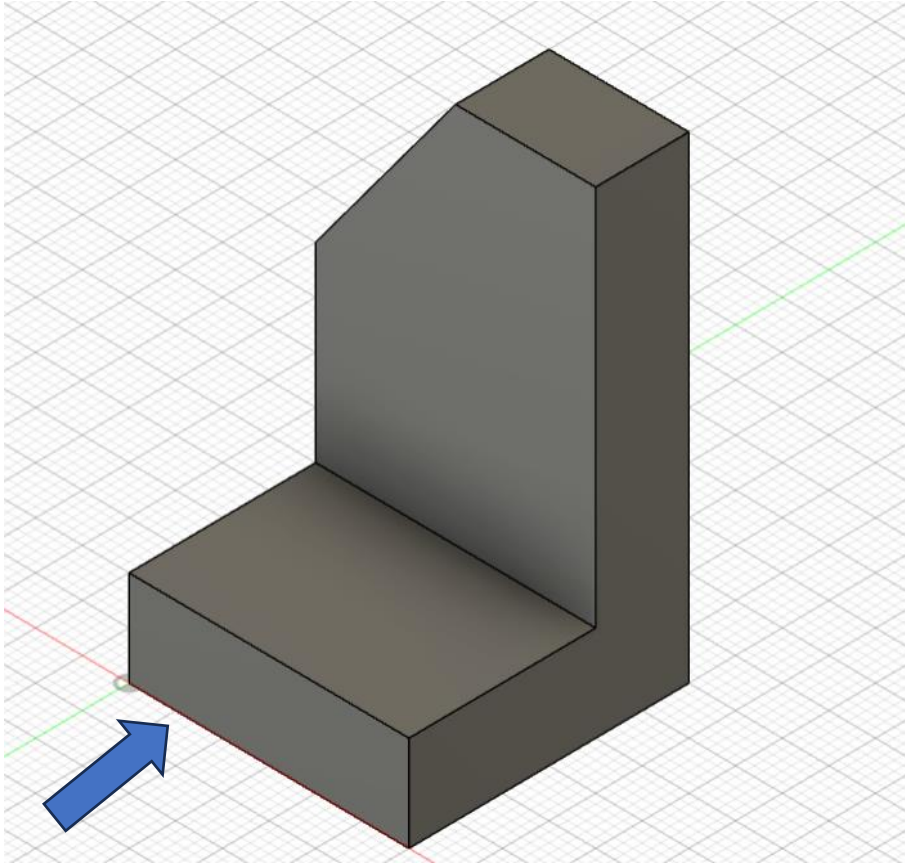
Isometric view
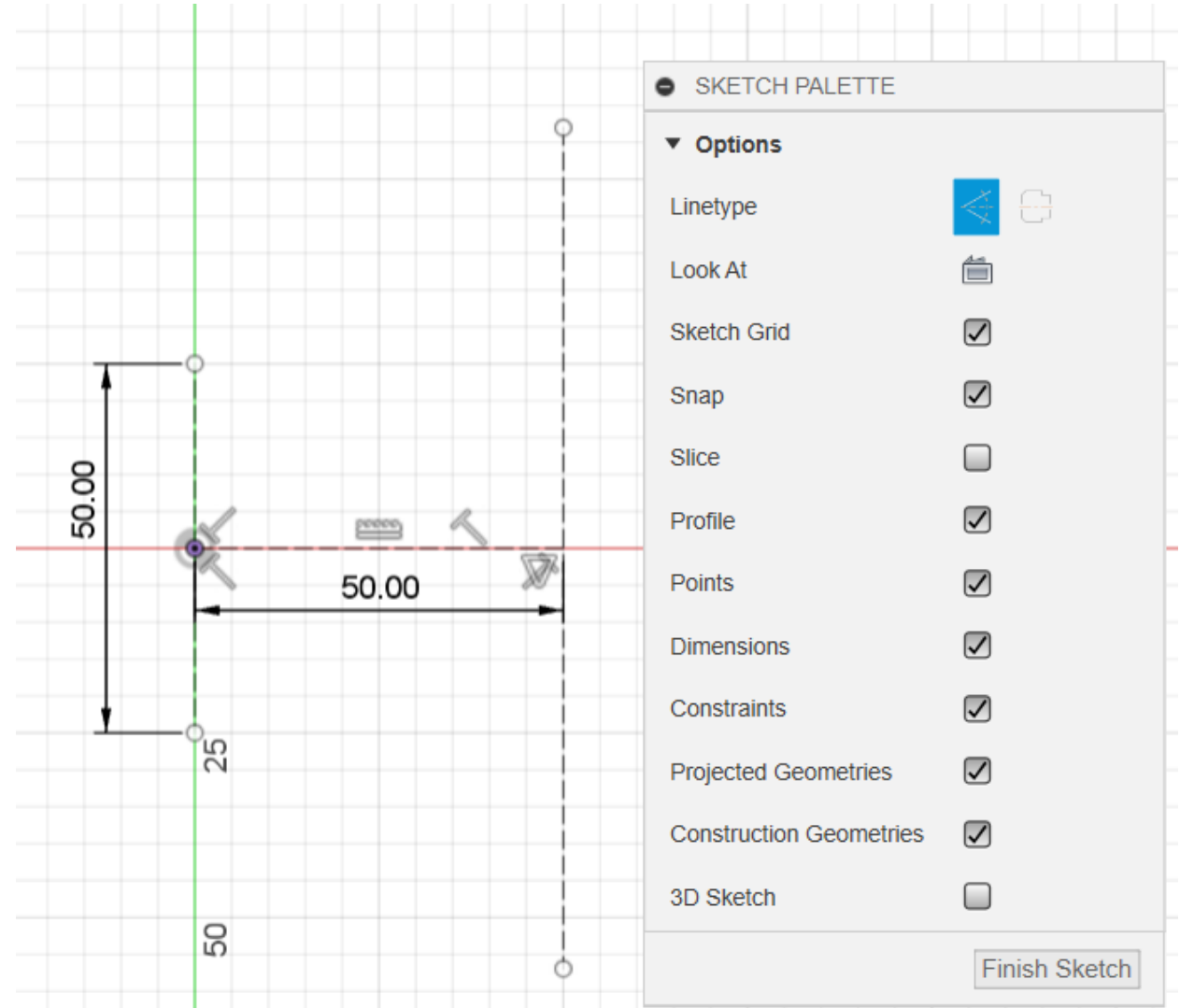
First angle projections

First angle projections of a 3D object

- **Create sketch**
- **Choose a plane 'front plane' for creating the 2D sketch**
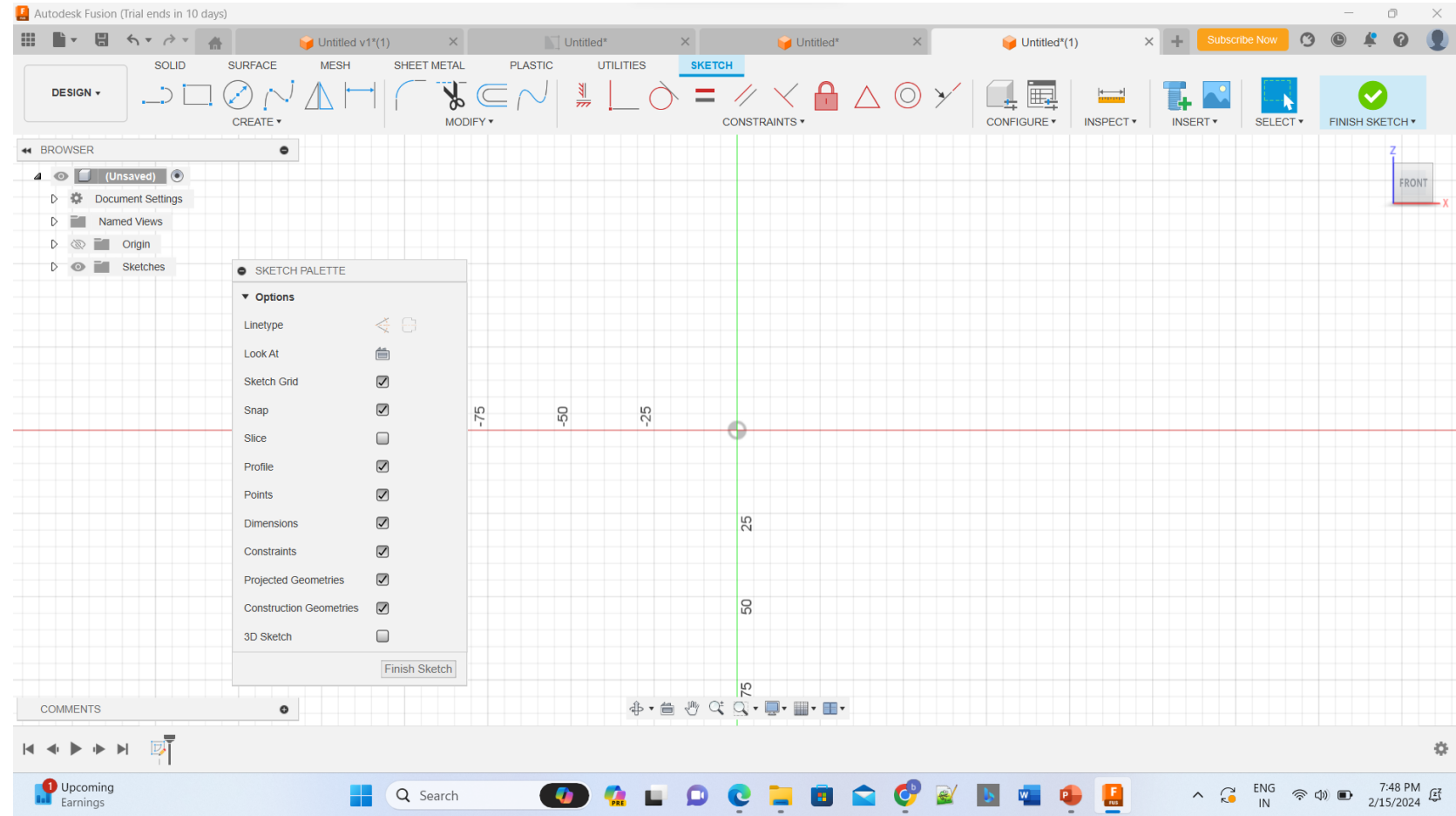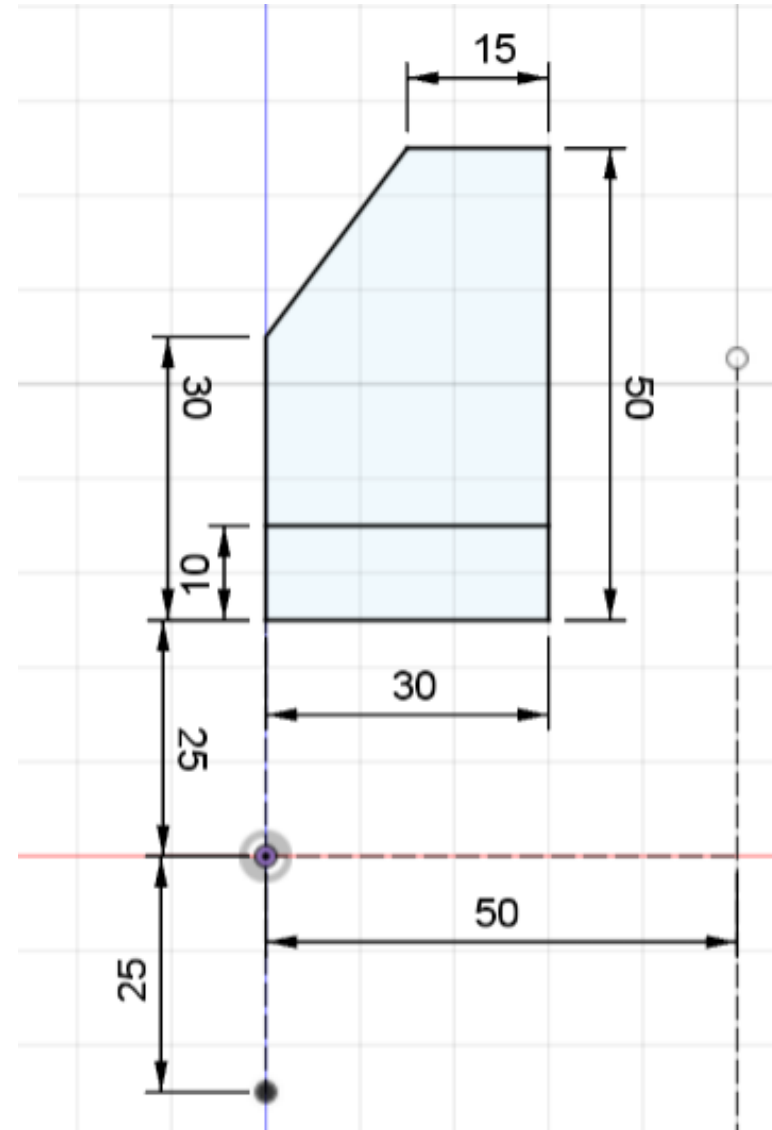
First angle projections of a 3D object

- Line type 'construction'
- 'Line'/L to draw line
- Origin as 1st point
- 2nd point, 50 mm horizontal
- Horizontal constraint symbol
- XY line
- Vertical line +25 for front view
- Vertical line -25 for top view
- Vertical line 50 mm away, X_1Y_1
- Constraint X_1Y_1 with XY(midpoint)

SKETCH PALETTE

▼ Options

Linetype	
Look At	
Sketch Grid	☑
Snap	☑
Slice	☐
Profile	☑
Points	☑
Dimensions	☑
Constraints	☑
Projected Geometries	☑
Construction Geometries	☑
3D Sketch	☐

Finish Sketch

50.00

50.00

25

50

First angle projections of a 3D object

FV

- 30 mm vertical, horizontal from 25 mm above origin.
- 50 mm vertical from horizontal end point.
- 15 mm horizontal from 50 mm vertical end.
- Joint 30 mm vertical and 15 mm horizontal.
- Horizontal from 10 mm above 30 mm horizontal.
- Constraint as the initial point is fixed using construction line from origin.
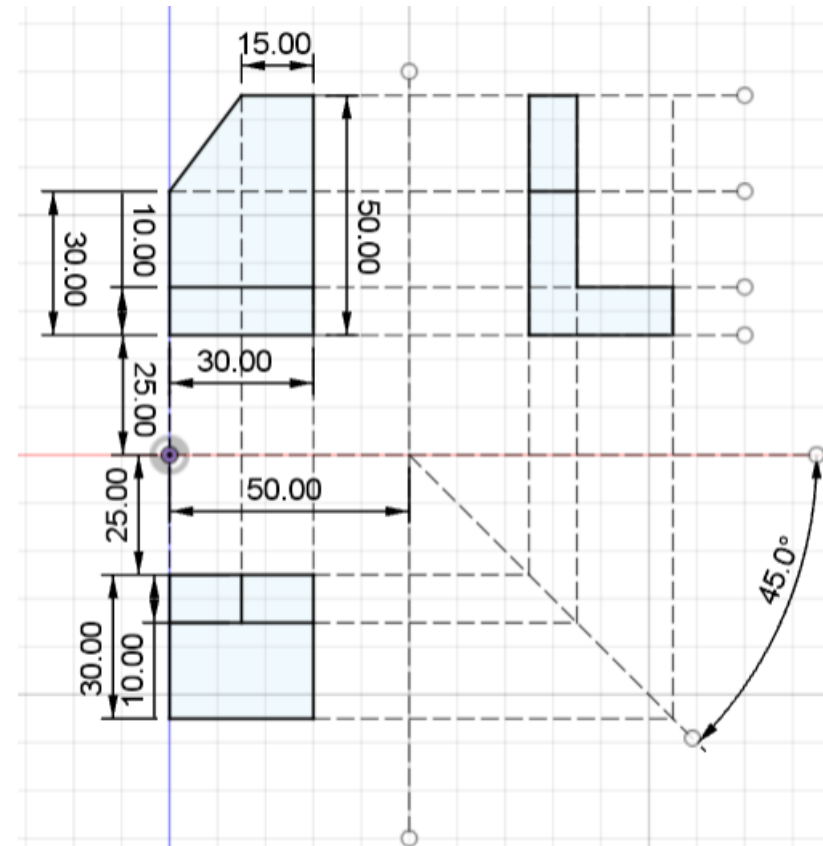
First angle projections of a 3D object

FV & TV

- Draw vertical projectors(construction lines) from the edges of the front view.
- Draw 30 mm vertical, horizontal lines from 25 mm point below the origin.
- Draw horizontal, vertical lines from the end points.
- Draw horizontal line 10 mm below.
- Draw vertical line(10 mm) between midpoints of two horizontal lines.
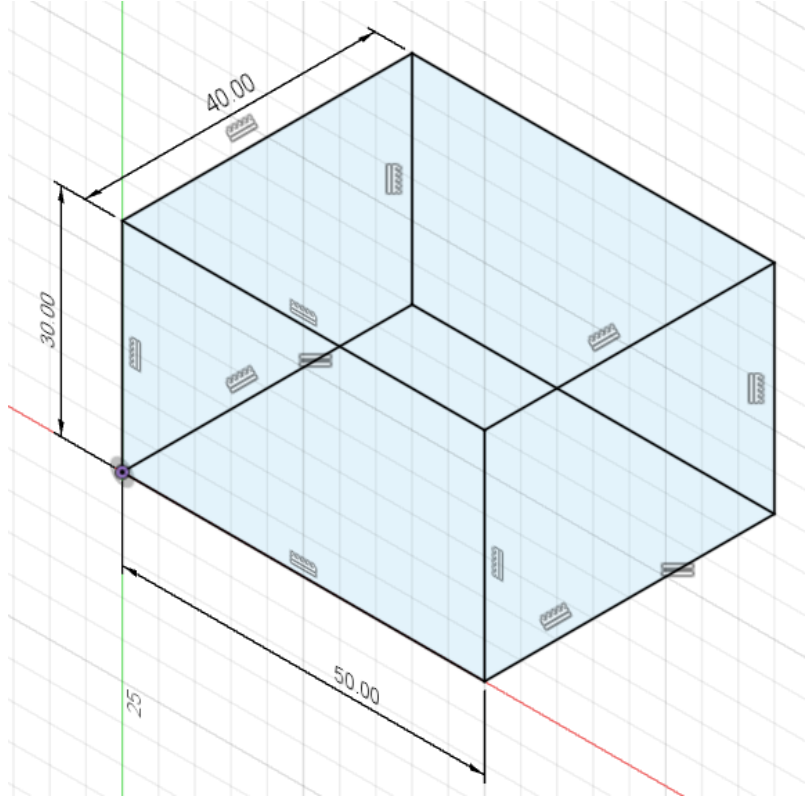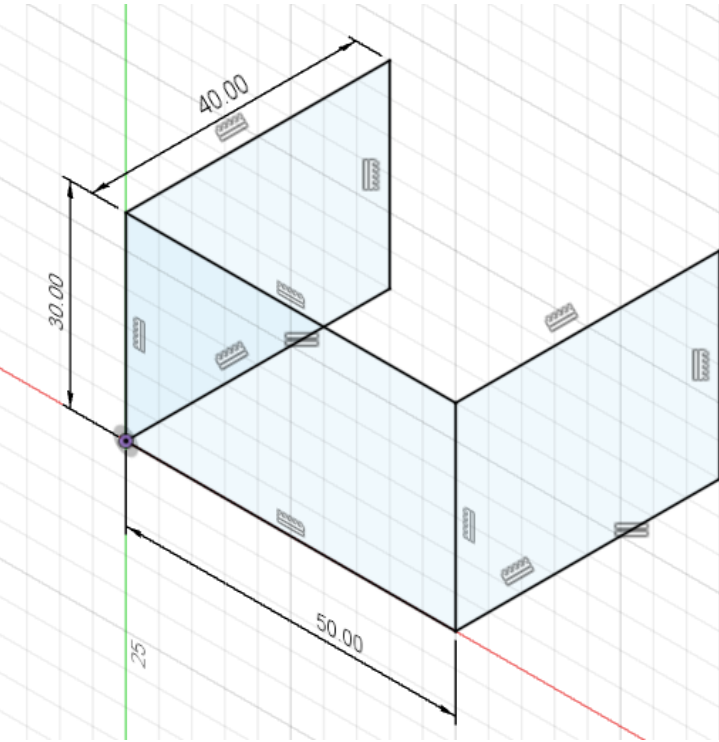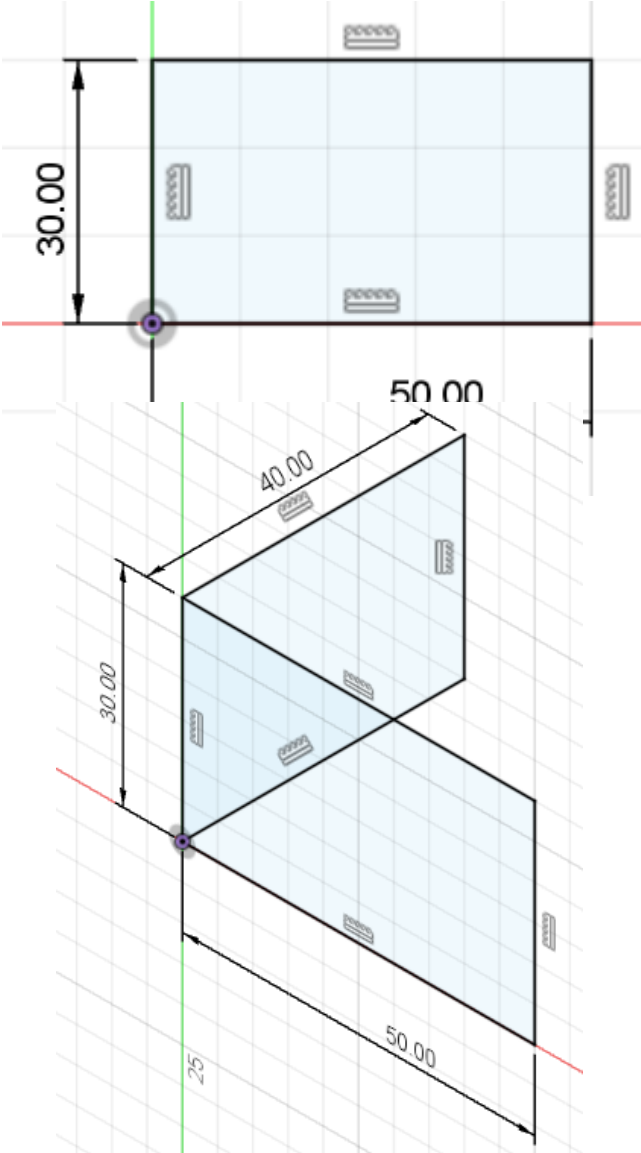- Sketch is constrained as the initial point is fixed to the origin.
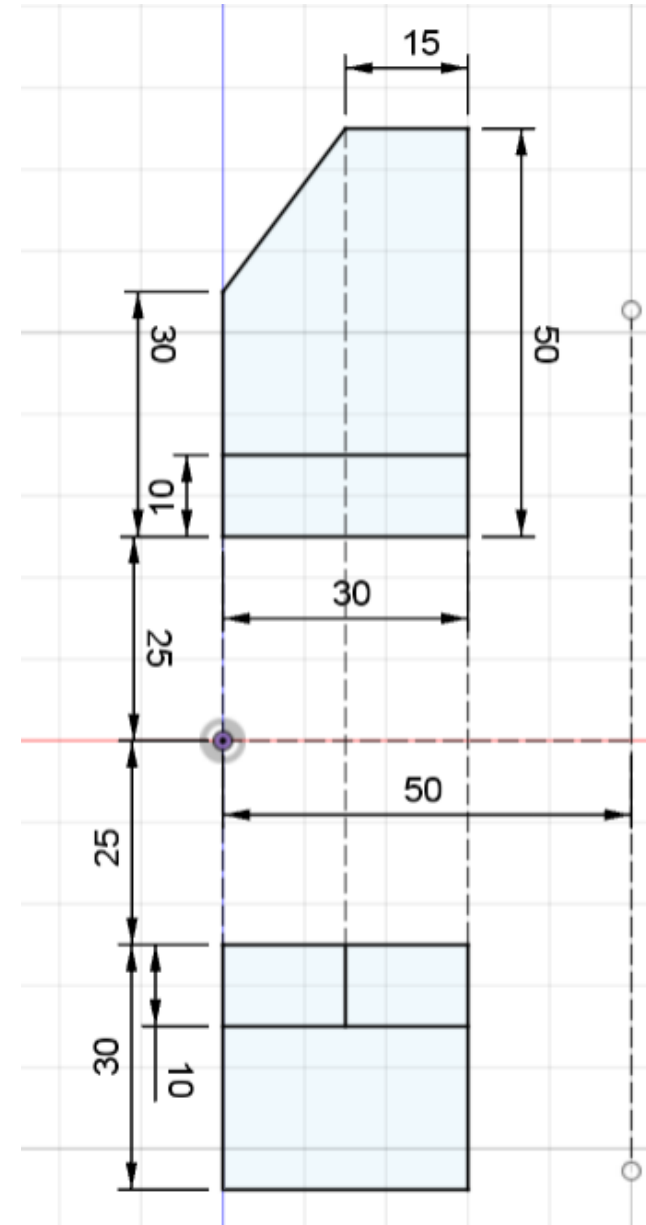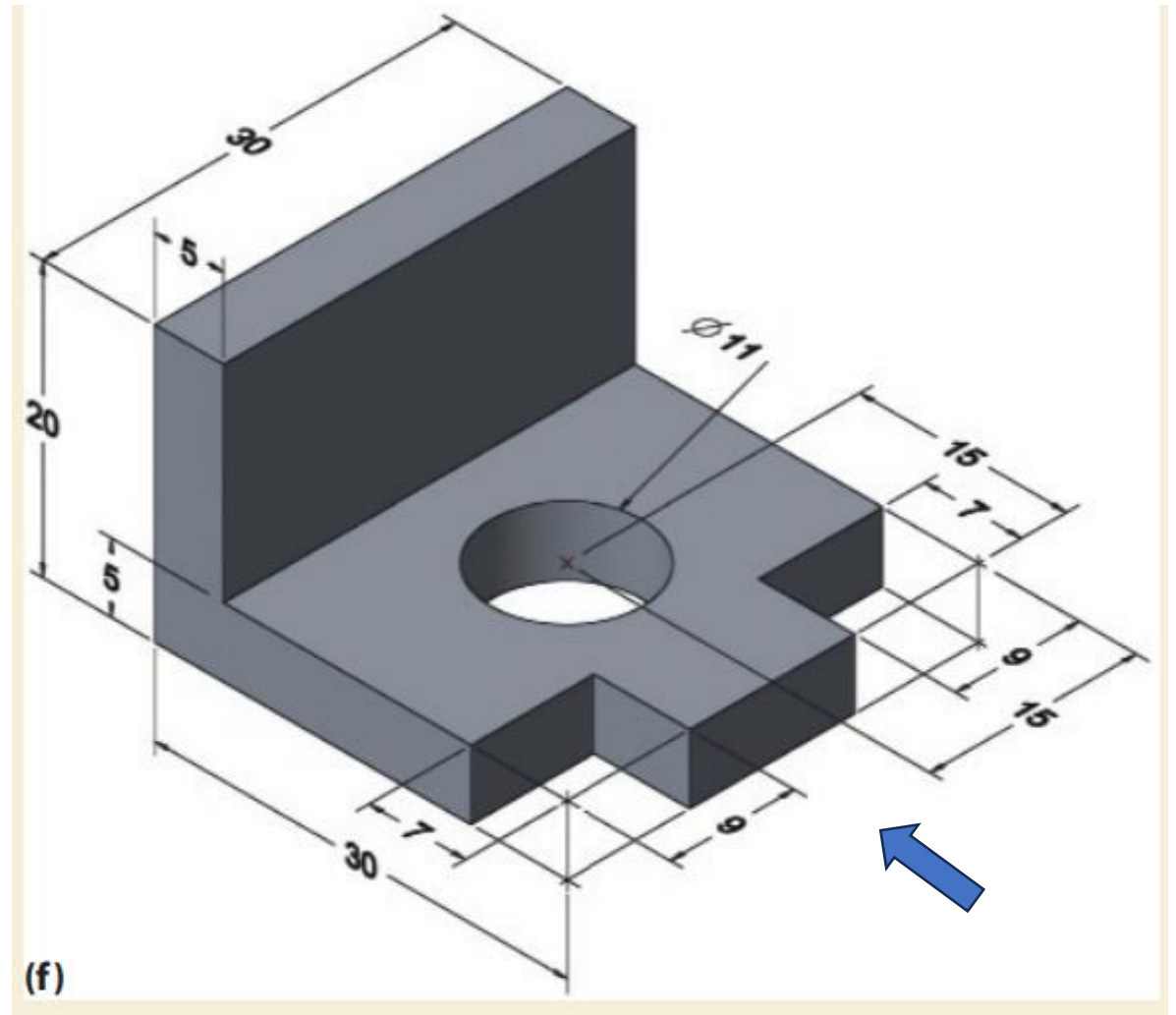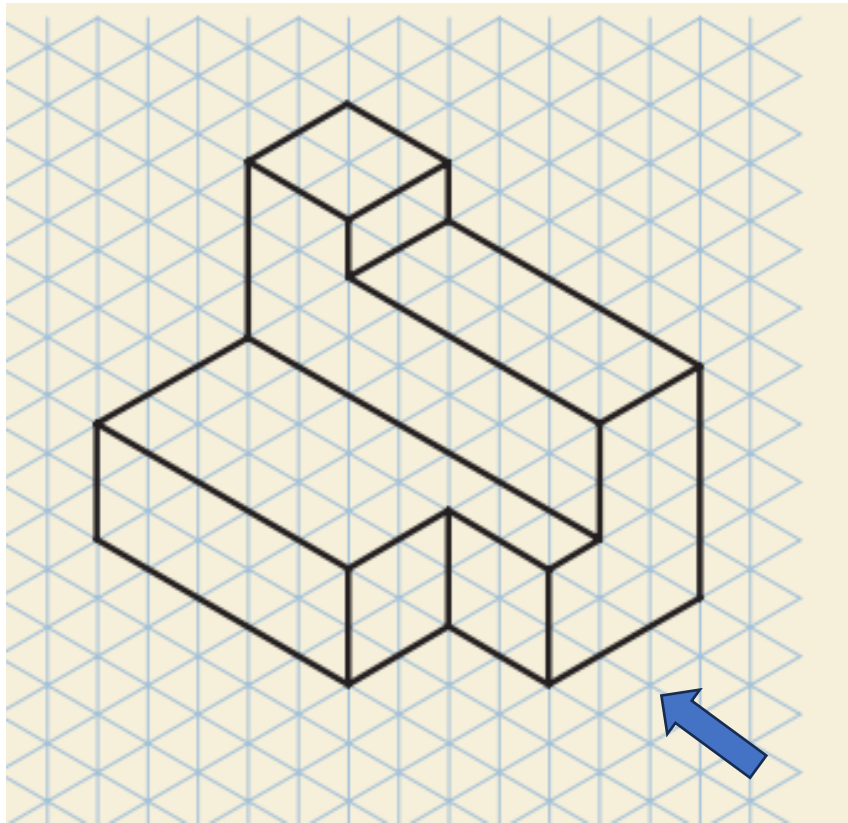
First angle projections of a 3D object

- Construction line from the intersection XY and X_1Y_1 at 45^0.
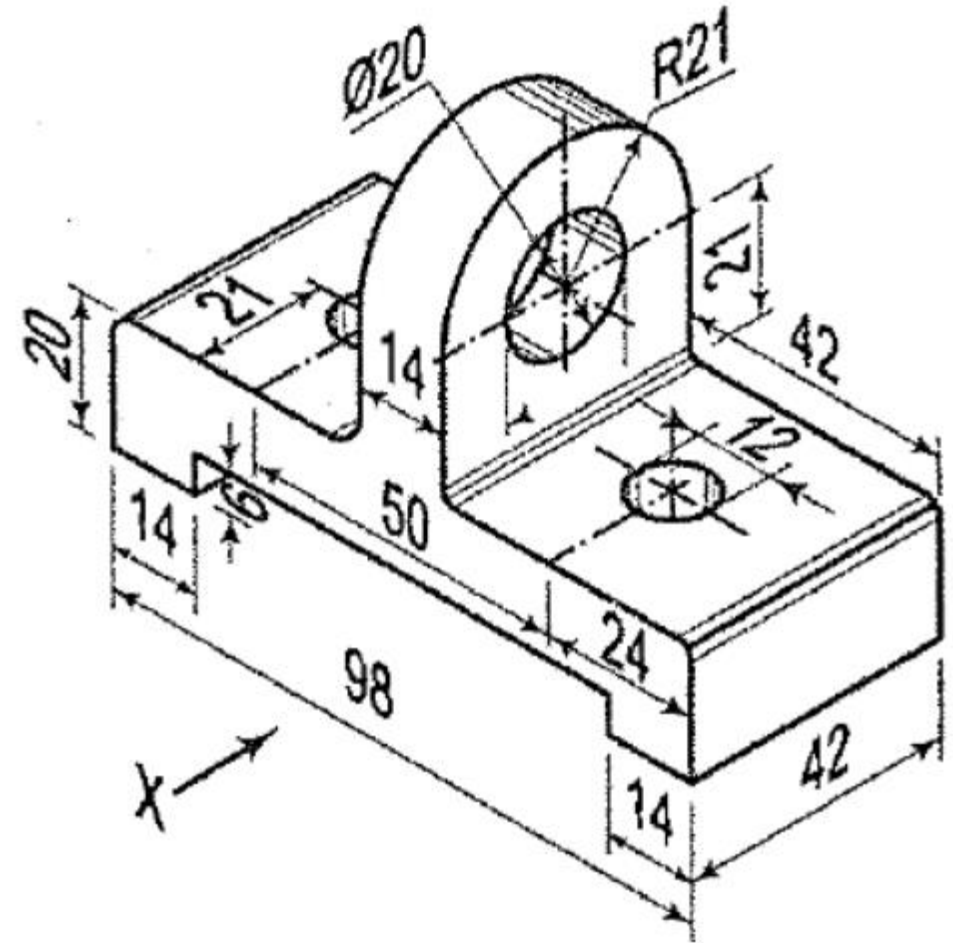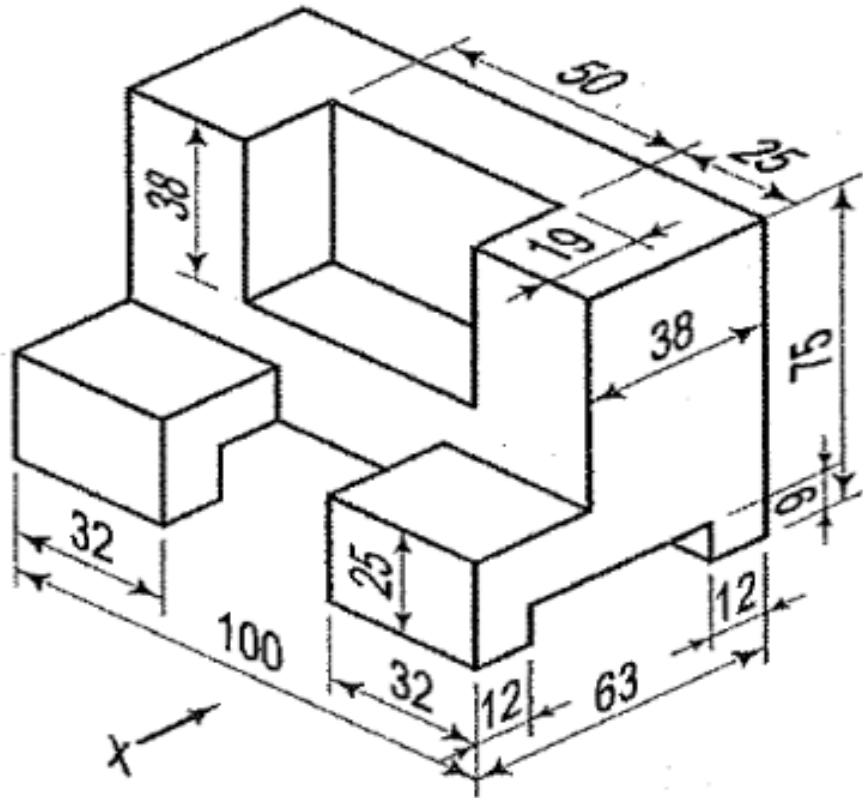- Intersection of projectors from TV and FV is used to create the LSV.

3D Sketch

3D objects for First/Third angle projections

(f)

3D object for First/Third angle projections

Please note

- Lab session 3 cycle: Friday, Aug. 23rd to Thursday, Aug. 29.

- Repeat of Lab session 2 in Fusion 360

- You are welcome to practice the assignment in advance

- Not allowed to bring it to the lab session in any form.

- If found on you, you will be asked to leave the lab with zero marks for this lab session, and no make-up permitted.

Thank you