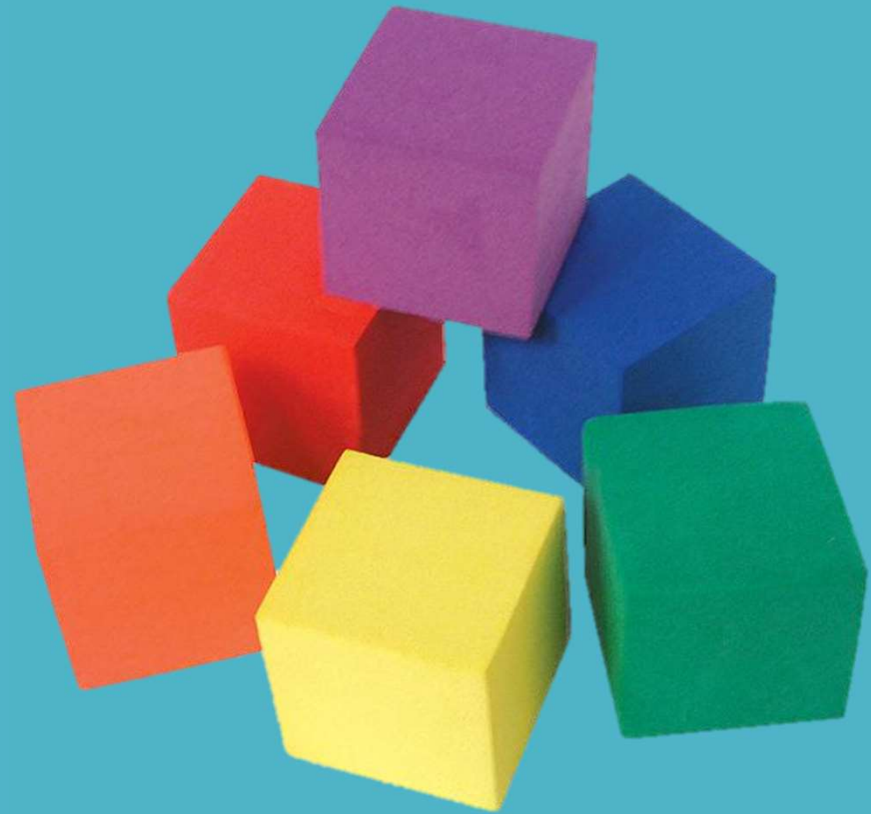
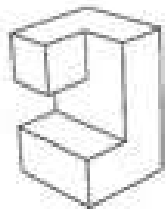


Spatial Visualization

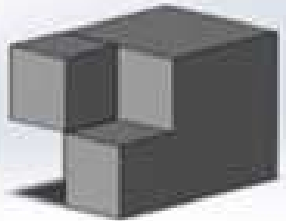
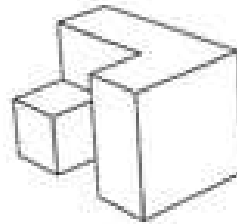
Let's Learn about Spatial Vis!



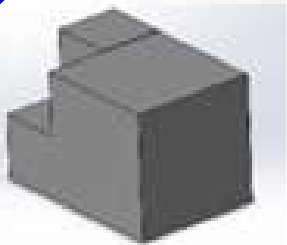
Example spatial visualization quiz question



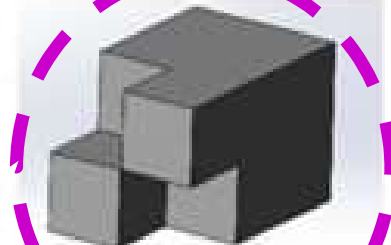
is rotated to →



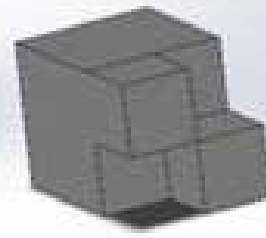
is rotated to:



A



B



C

1. Imagine rotating the top left (white) shape to look like the top right shape
2. Then imagine rotating the middle (gray) shape the same way
3. How would it look?
Pick from the three choices provided

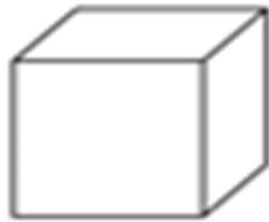
What is the correct answer?

ACTIVITY 1:

Connect the Dots:
Isometric Drawings
and Coded Plans

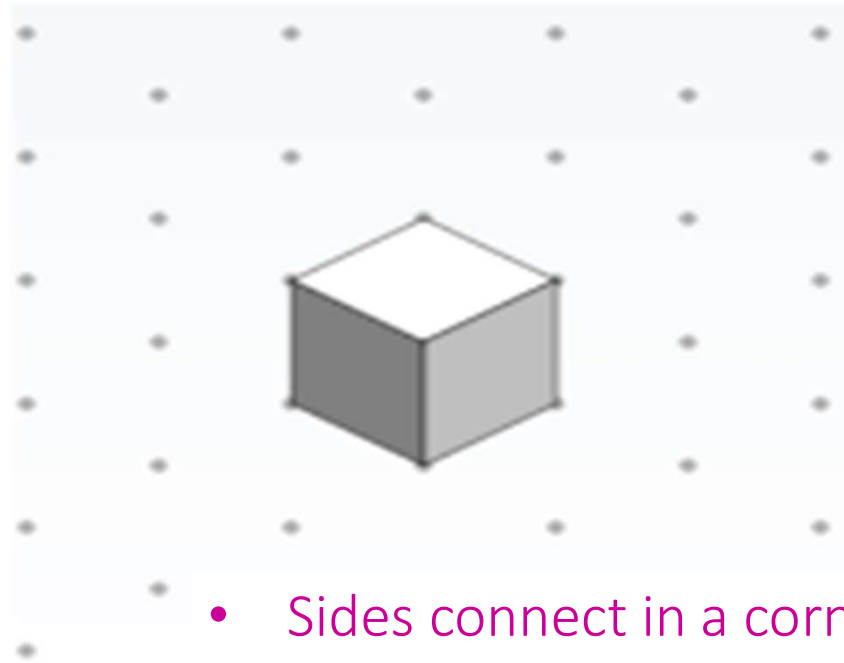
Depicting a 3-D Cube

Non-isometric
view of a cube ↘



- Corner angles are not equal
- Sides have different areas

Isometric view
of a cube ↙



- Sides connect in a corner
- All corner angles are equal (120°)
- Sides are the same size
- Shown on triangle-dot paper

Isometric Drawing Example

Isometric means “equal measure”

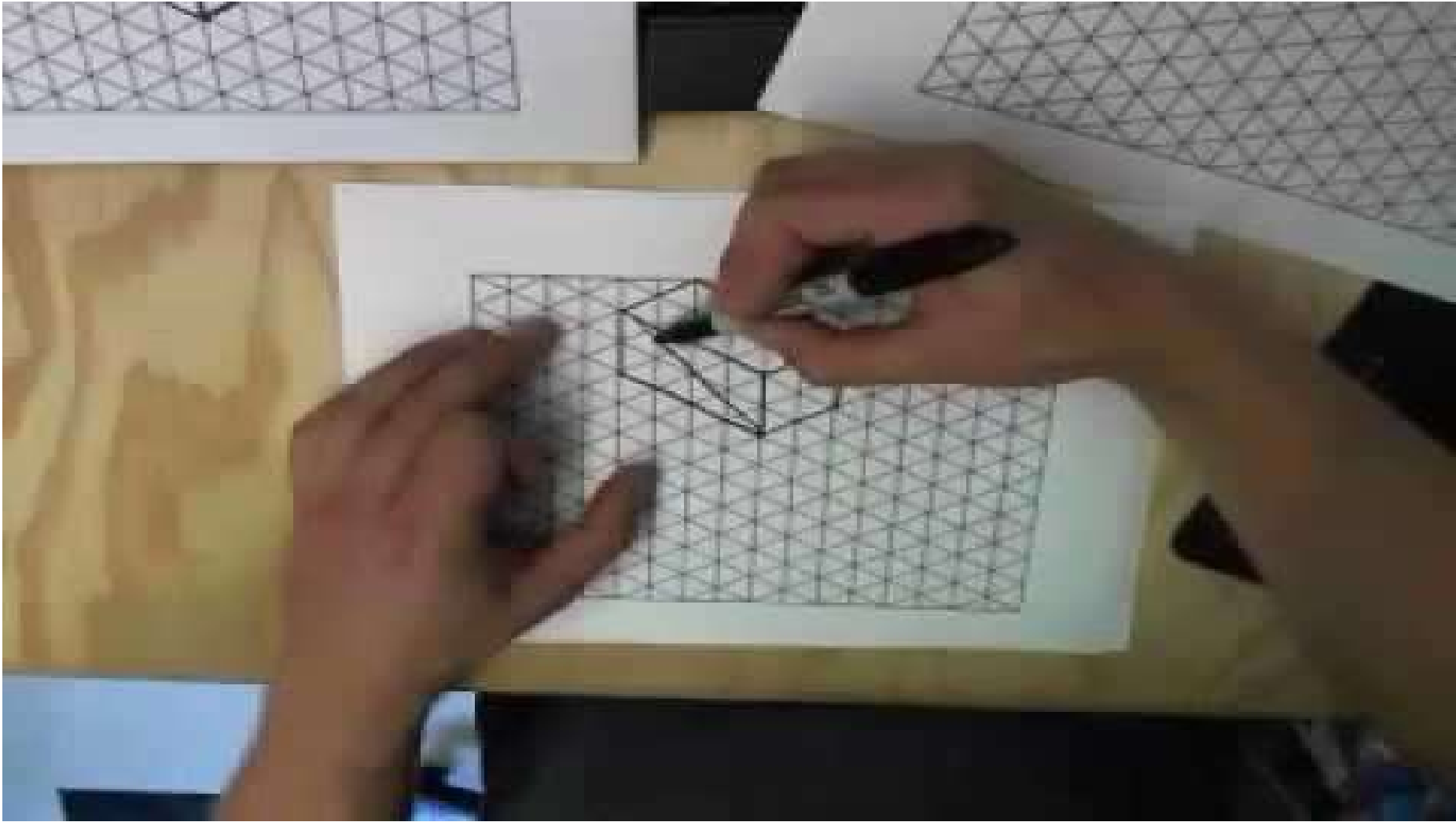
A house depicted
isometrically using
AutoCAD →

Useful for blueprints
and design plans



Think of the cube:

- Equal side faces
- Equal corner angles (120°)
- Triangle-dot paper: dots are 120° from each other



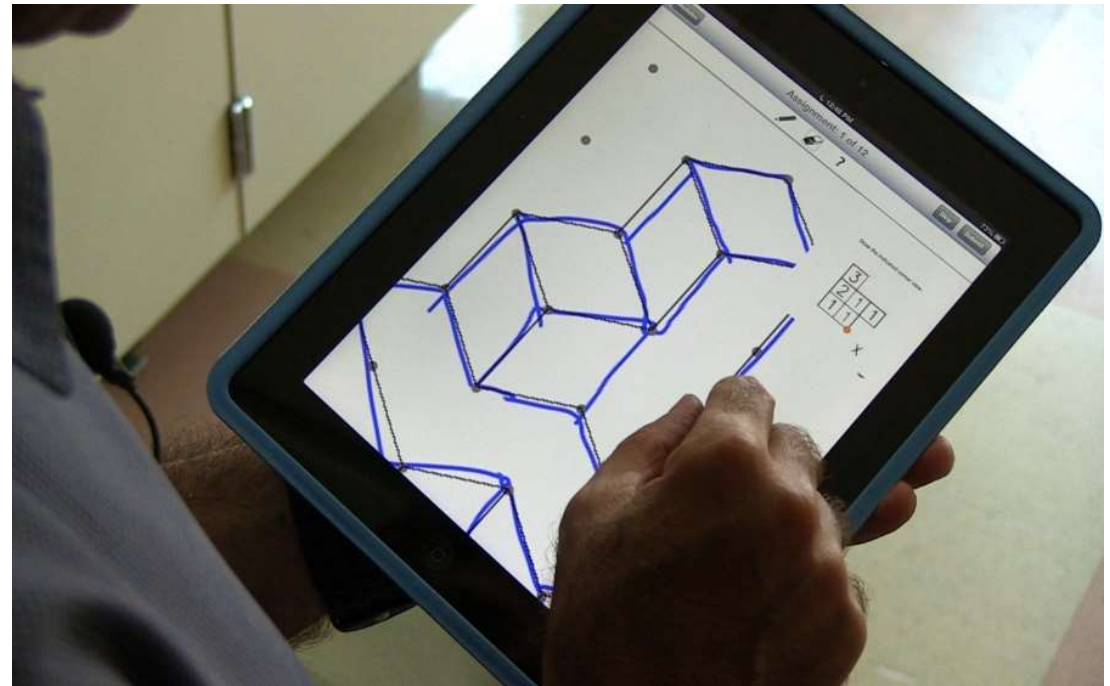
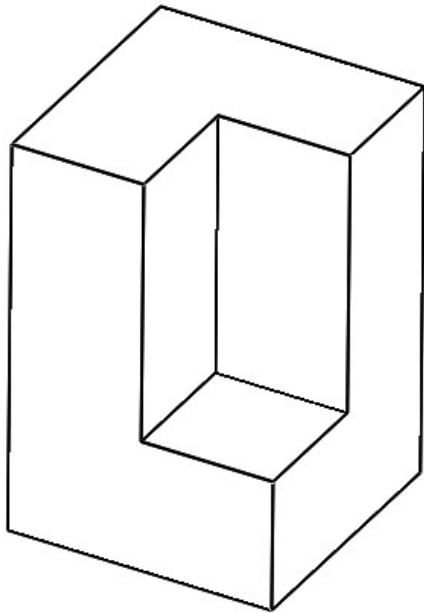
Coded Plans

Once all partners' eyes are closed, click the mouse or keyboard to reveal the image...

↑ Describe this image for your non-seeing partner to draw

Click to reveal the solution

Isometric Views



Tips:

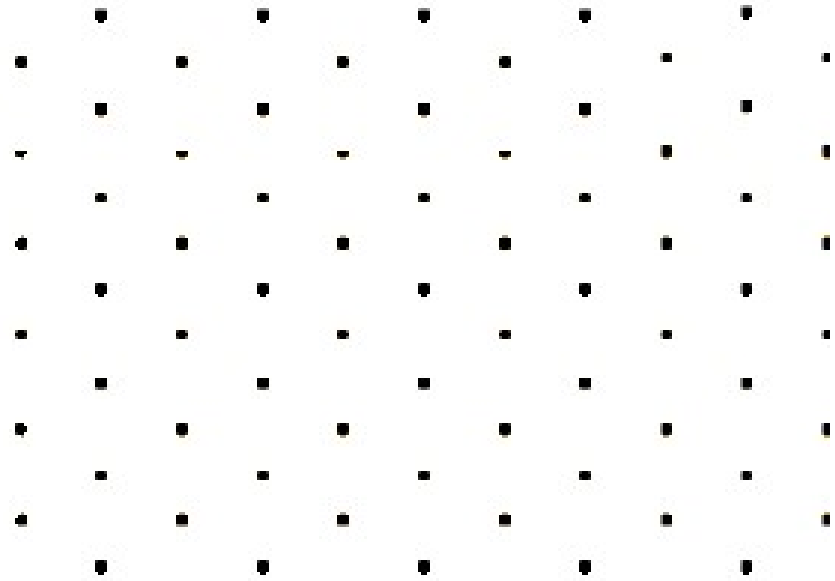
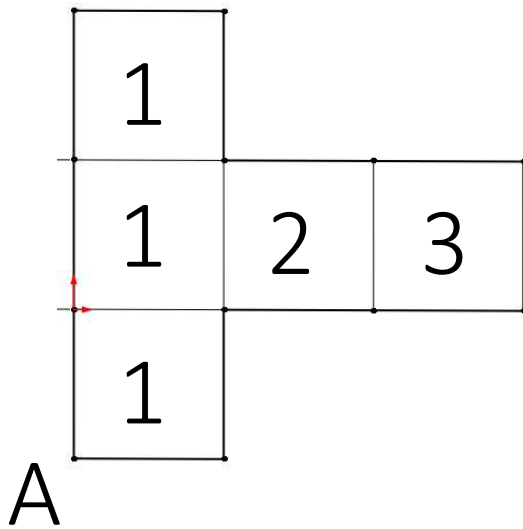
- Define your axes on the object and isometric paper
- Align paper in “landscape” orientation
- Only draw lines where there are edges

Isometric Views

The image shows a grid of dots on a light blue background. Three colored boxes are overlaid on the grid:

- An orange box on the left containing the text "Click mouse/keyboard to reveal".
- A purple box in the middle containing the text "Click to reveal".
- A blue box on the right containing the text "Click to reveal".

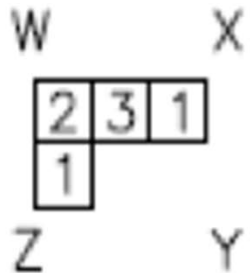
Coded Plans > to Isometric Views



Tips:

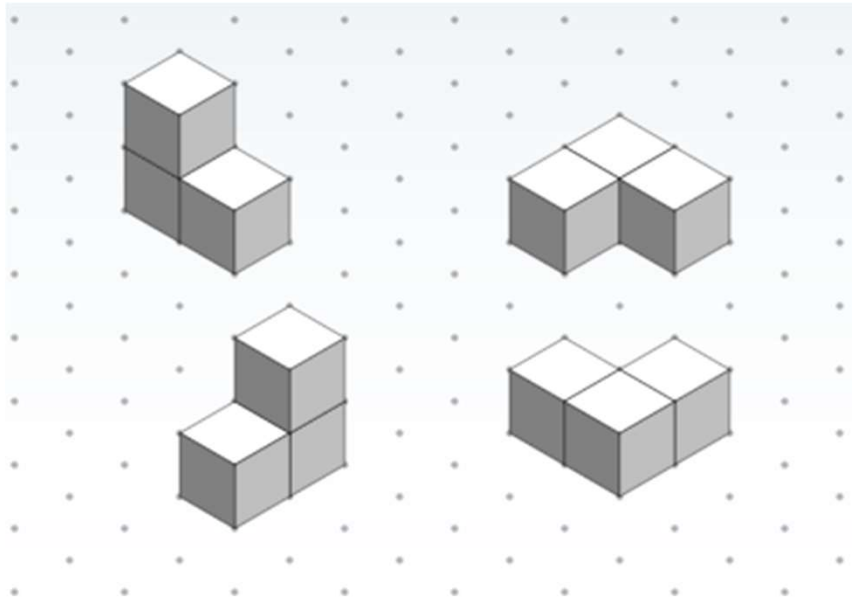
- Define your axes on a coded plan and isometric paper
- Start drawing from perspective

Coded Plans to Isometric Views

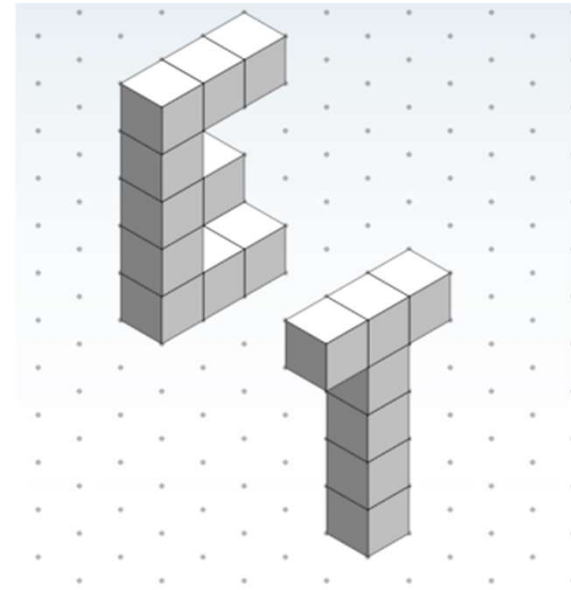


Click mouse/keyboard to reveal the possible solutions

Isometric Views: Extra Credit



4 views of the same
multi-cube object

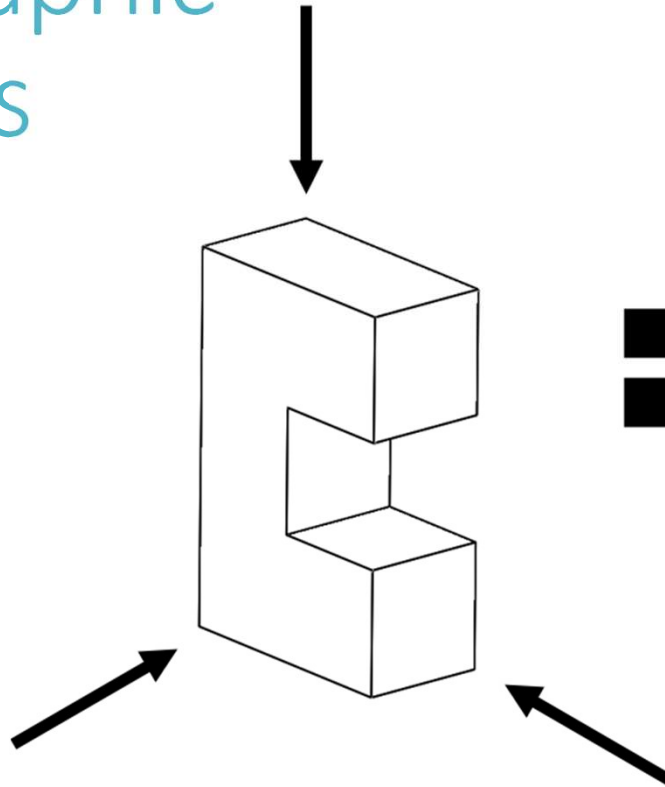


Two capital letters
drawn isometrically

Activity 2:

Seeing All Sides: Orthographic Drawings

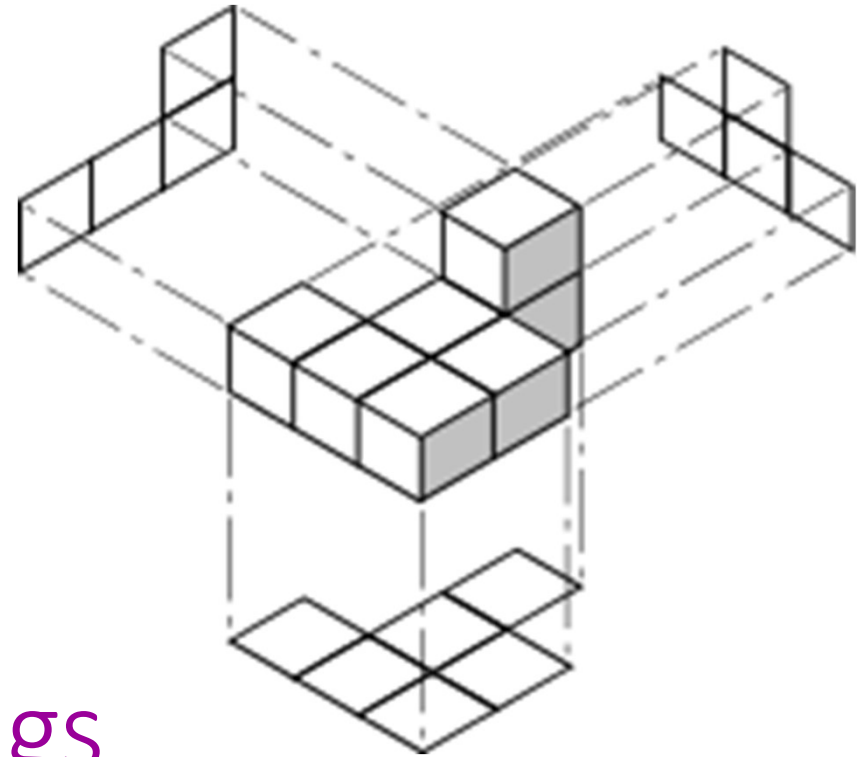
Orthographic Drawings



Click to reveal

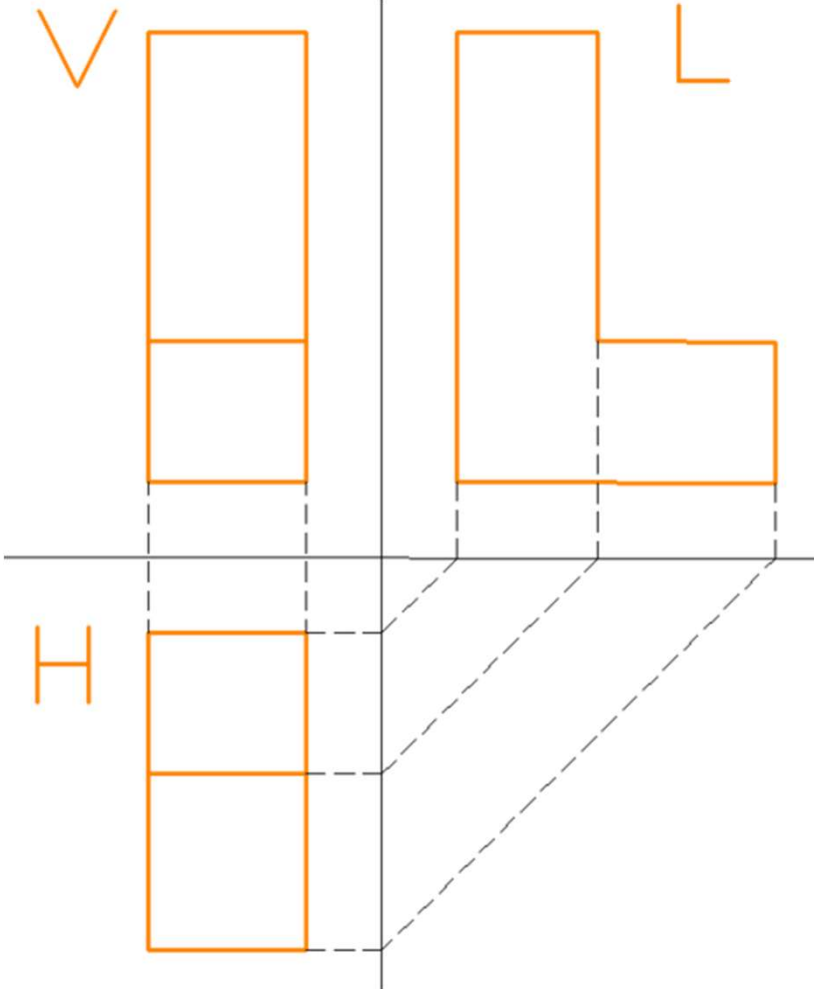
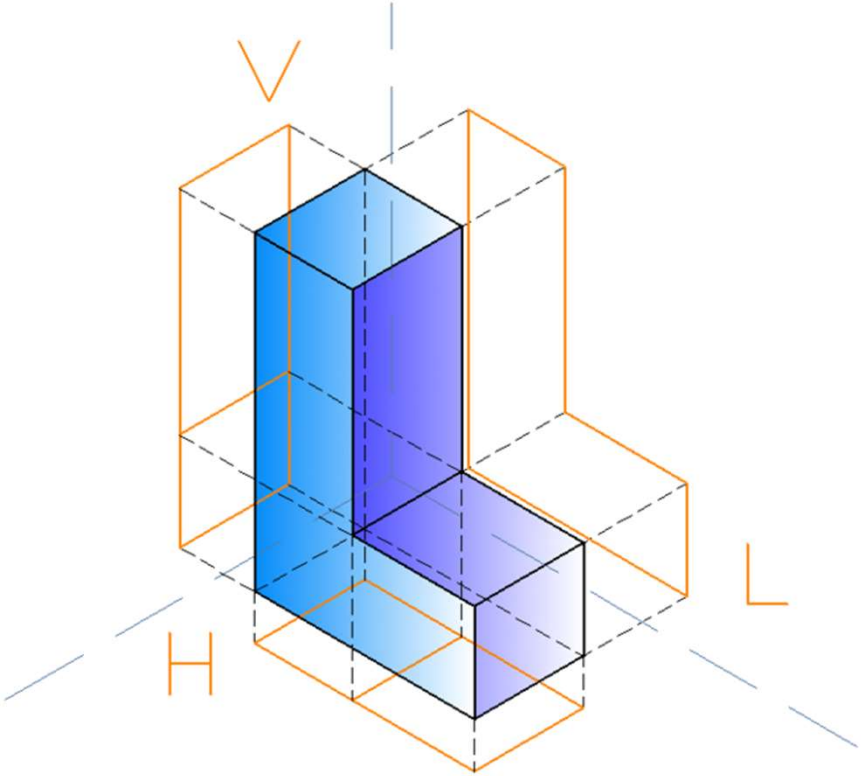
What are the three main orthographic views of an object?

Orthographic Drawings

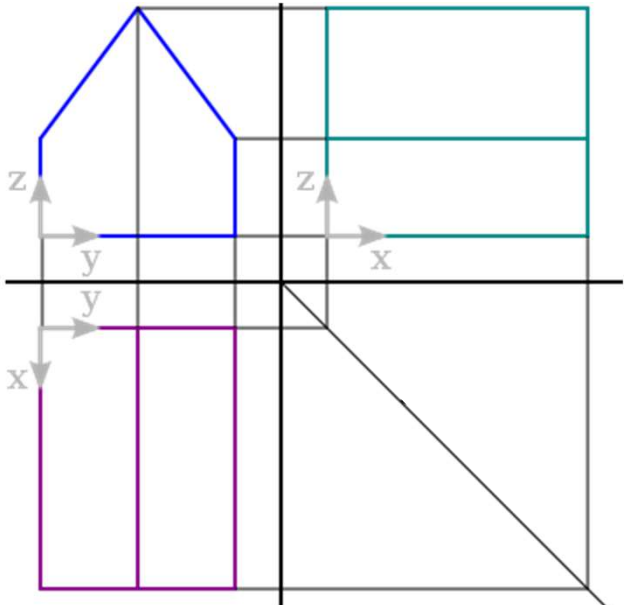


Also called:
“multiview” drawings

Orthographic Drawings



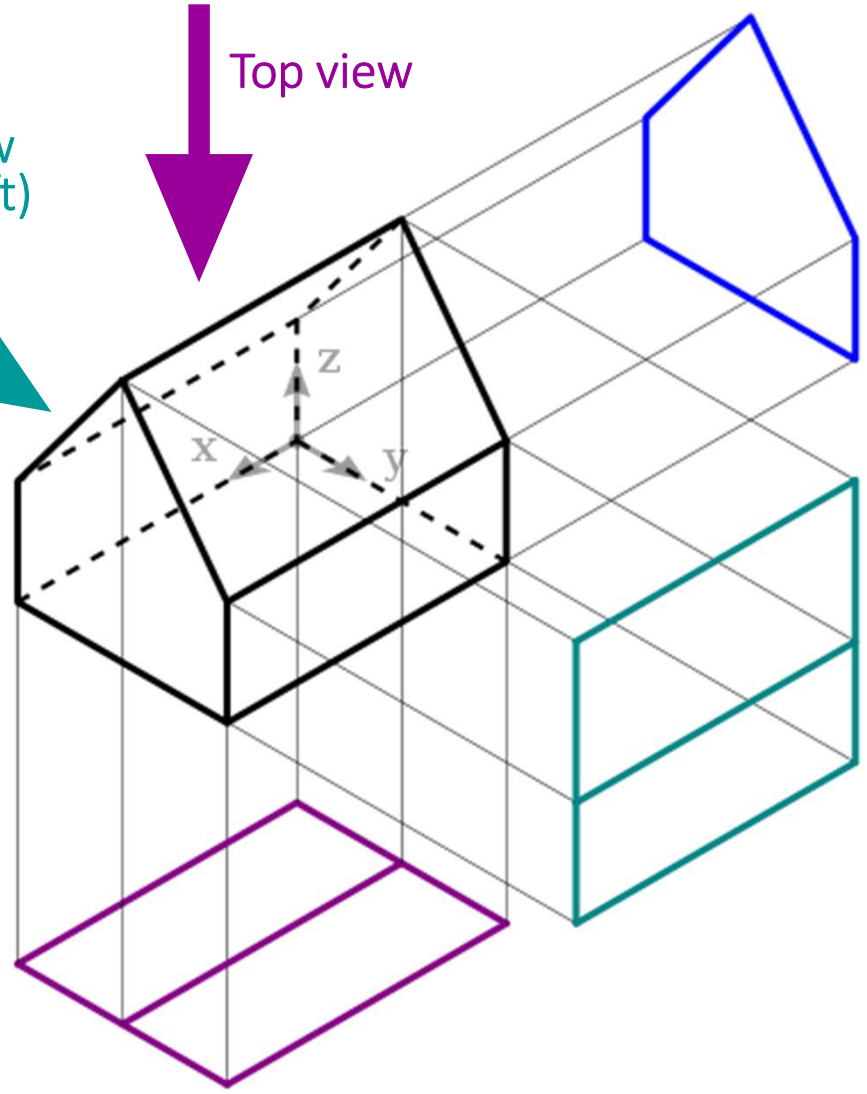
Orthographic Drawings



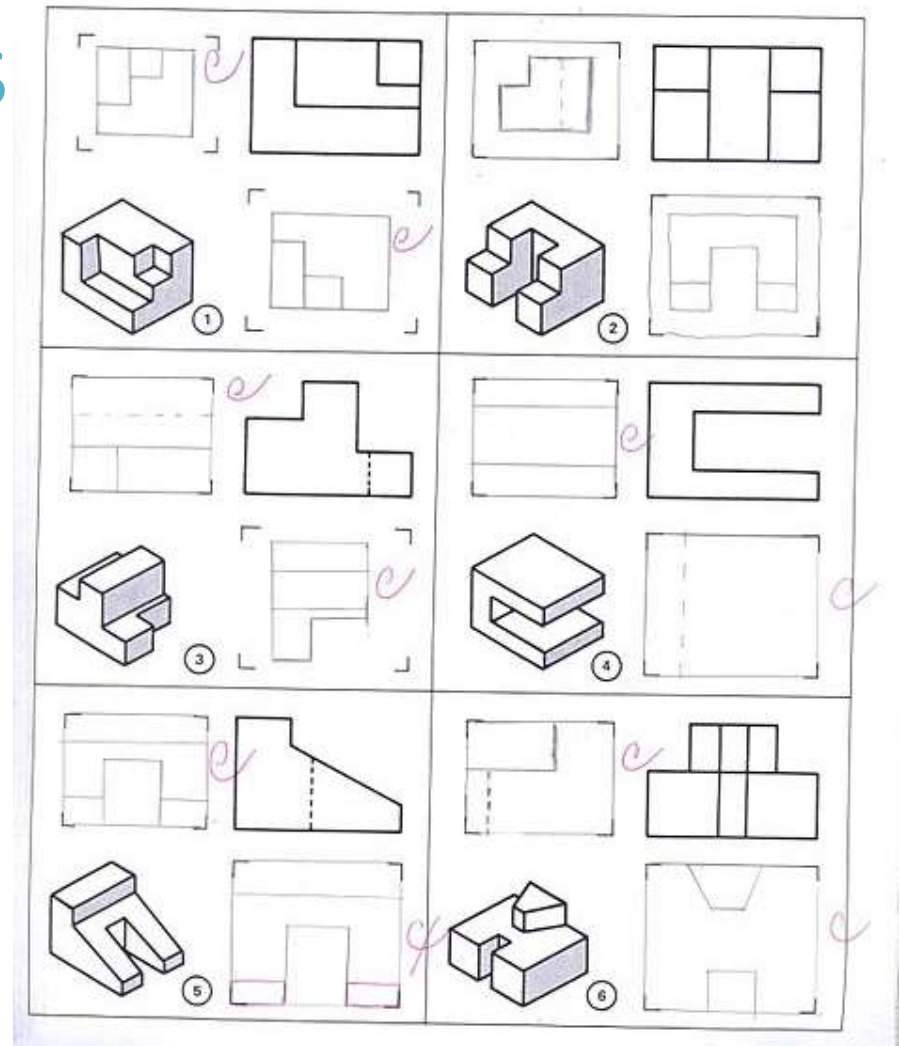
Front view

Side view
(from left)

Top view

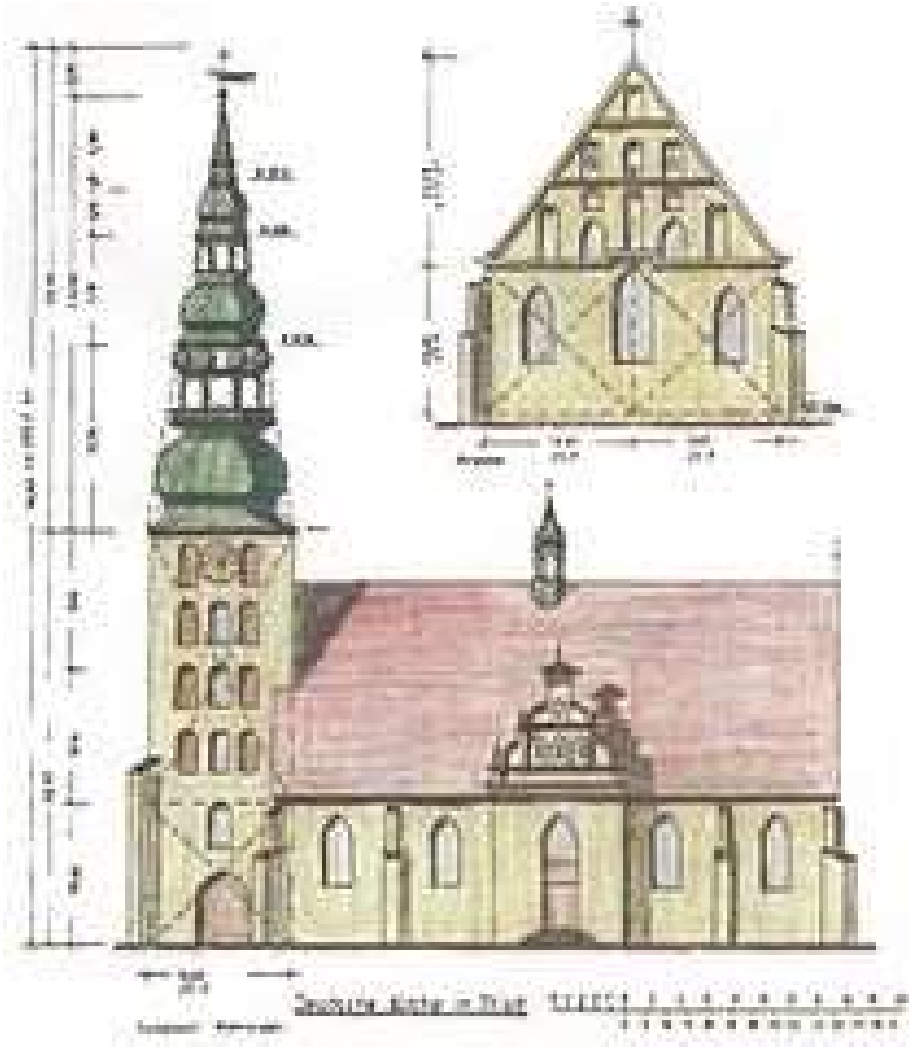
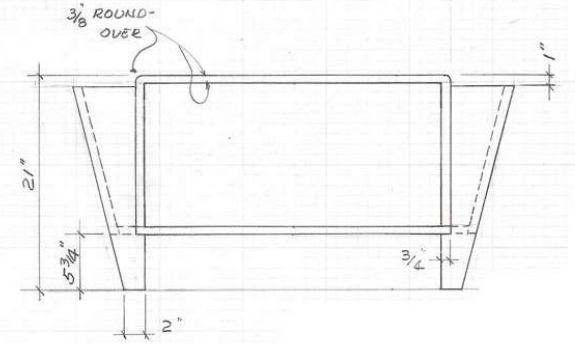
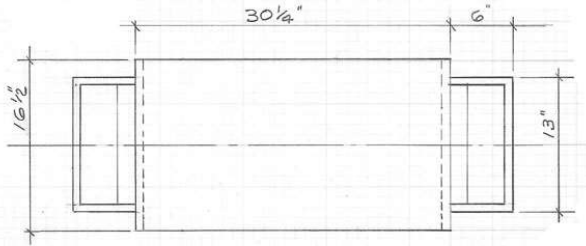
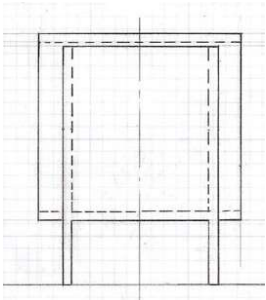


Orthographic Drawings

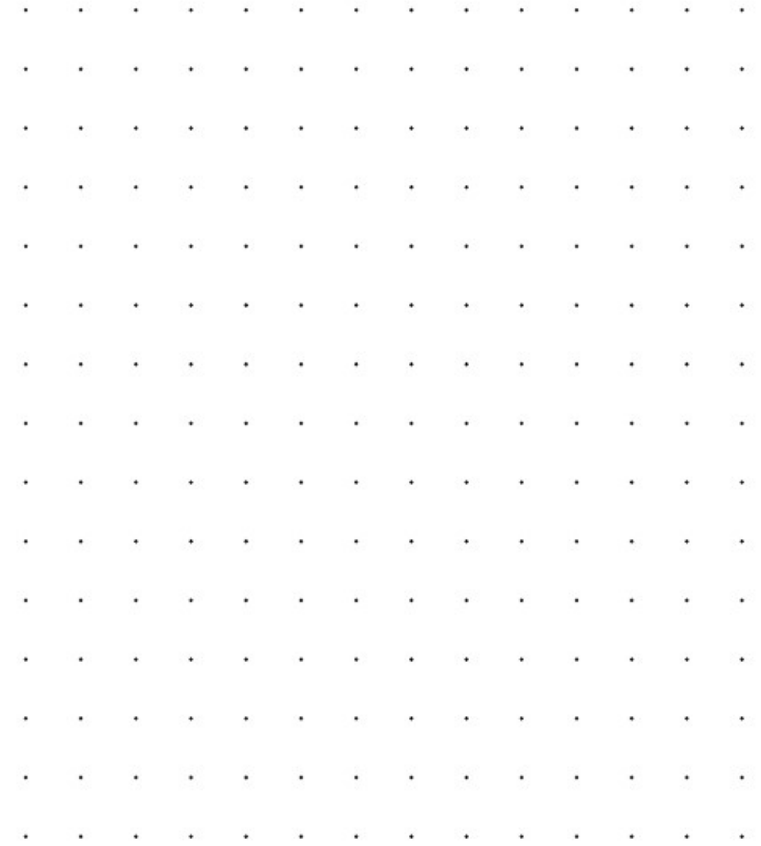
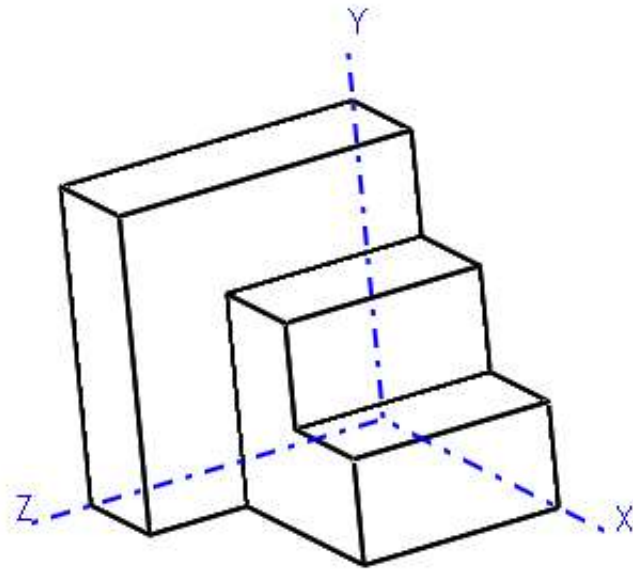


Orthographic Drawings

Engineering examples



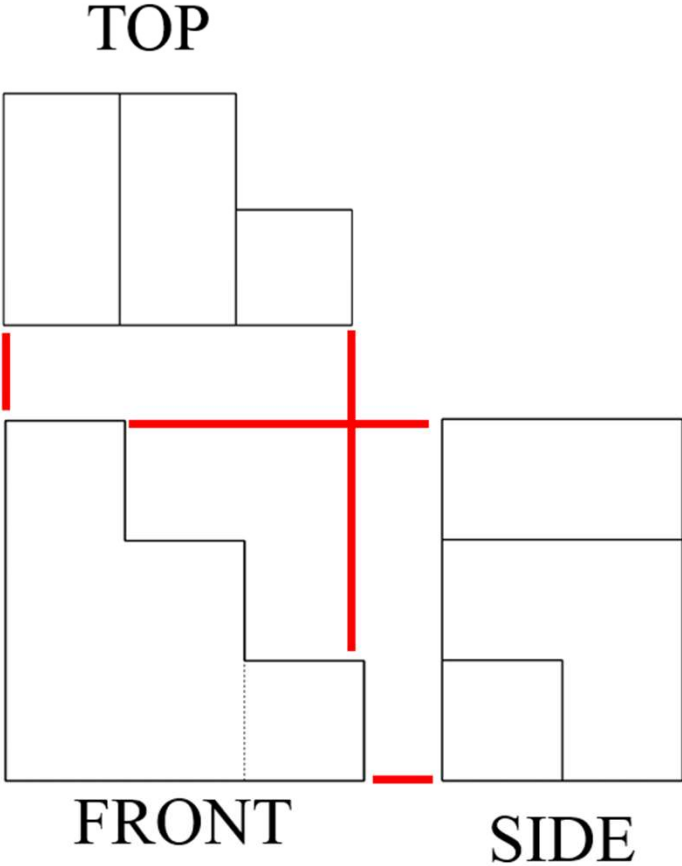
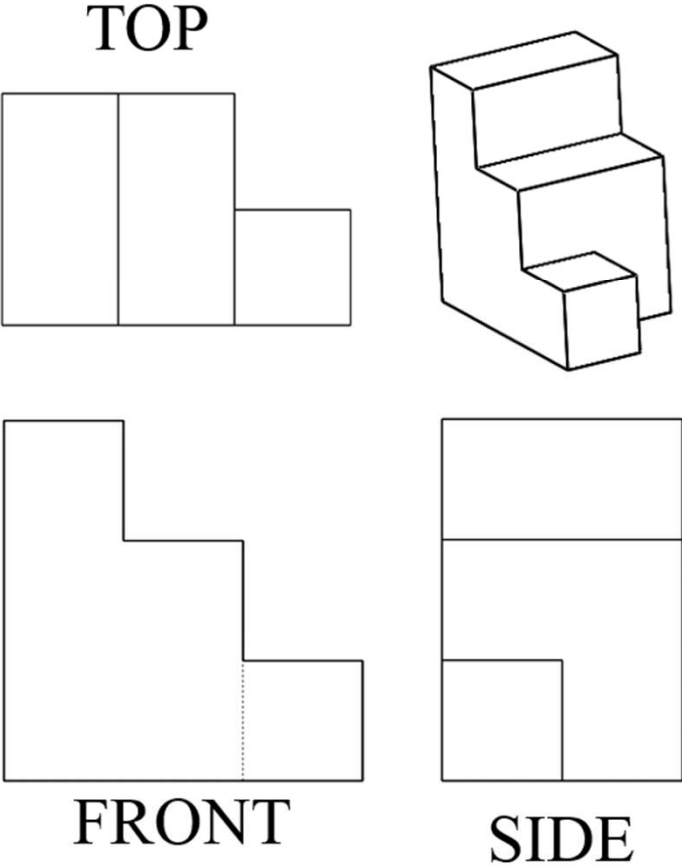
Orthographic Drawings



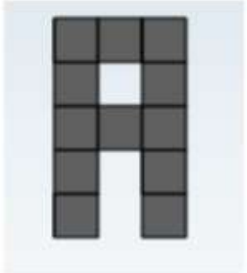
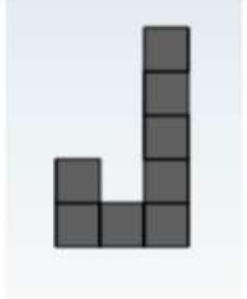
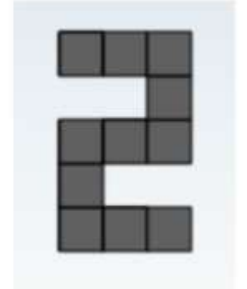
Tips:

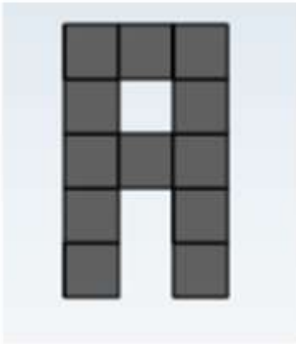
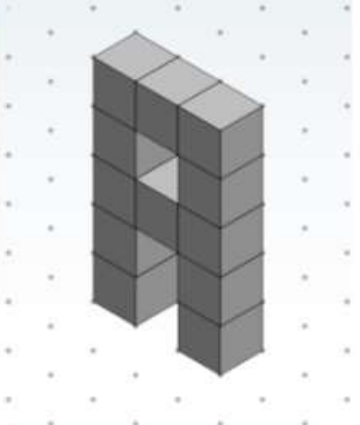
- Draw views in order (top → front → side)
- Draw lines where there are edges (changes in plane)
- Use dotted lines to show hidden edges
- Solid lines trump dotted lines

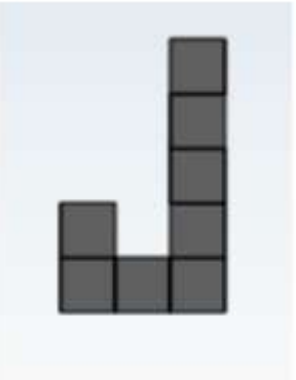

Orthographic Drawings

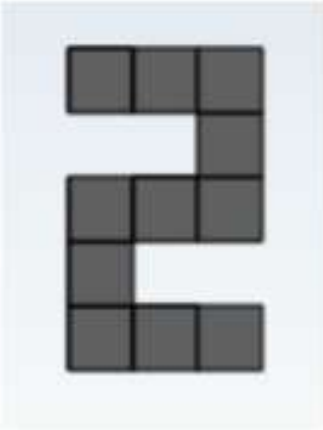
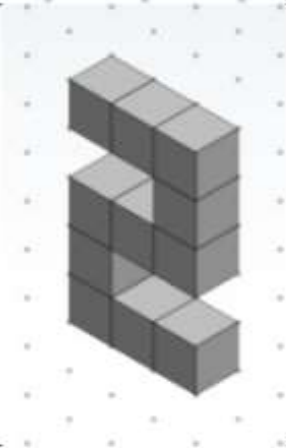


Your Turn:

Letter to Draw	Front View
A	 A 5x5 grid of dark gray squares forming the letter 'A'. The top row has 3 squares, the second row has 3 squares with a gap in the middle, the third row has 3 squares, the fourth row has 2 squares, and the fifth row has 2 squares.
J	 A 5x5 grid of dark gray squares forming the letter 'J'. The top row has 1 square, the second row has 2 squares, the third row has 2 squares, the fourth row has 2 squares, and the fifth row has 2 squares.
Z	 A 5x5 grid of dark gray squares forming the letter 'Z'. The top row has 3 squares, the second row has 3 squares with a gap in the middle, the third row has 3 squares, the fourth row has 2 squares, and the fifth row has 2 squares.

Letter to Draw	Front View	Isometric View
A		

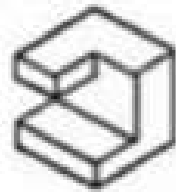
J		
---	--	---

Z	
	

ACTIVITY 3:

Let's Take a Spin:
One-Axis Rotations

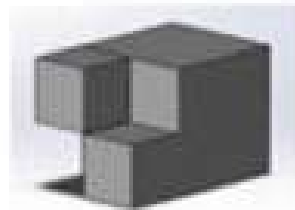
One-Axis Rotations



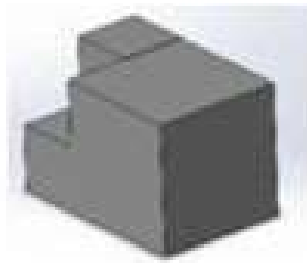
is rotated to →



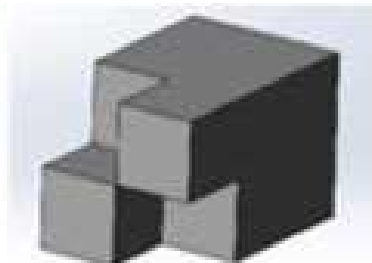
Can you find the rotation of the gray object that is analogous to the rotation of the white object?



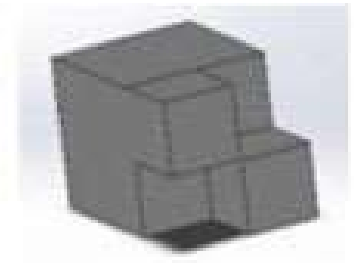
is rotated to:



A



B



C

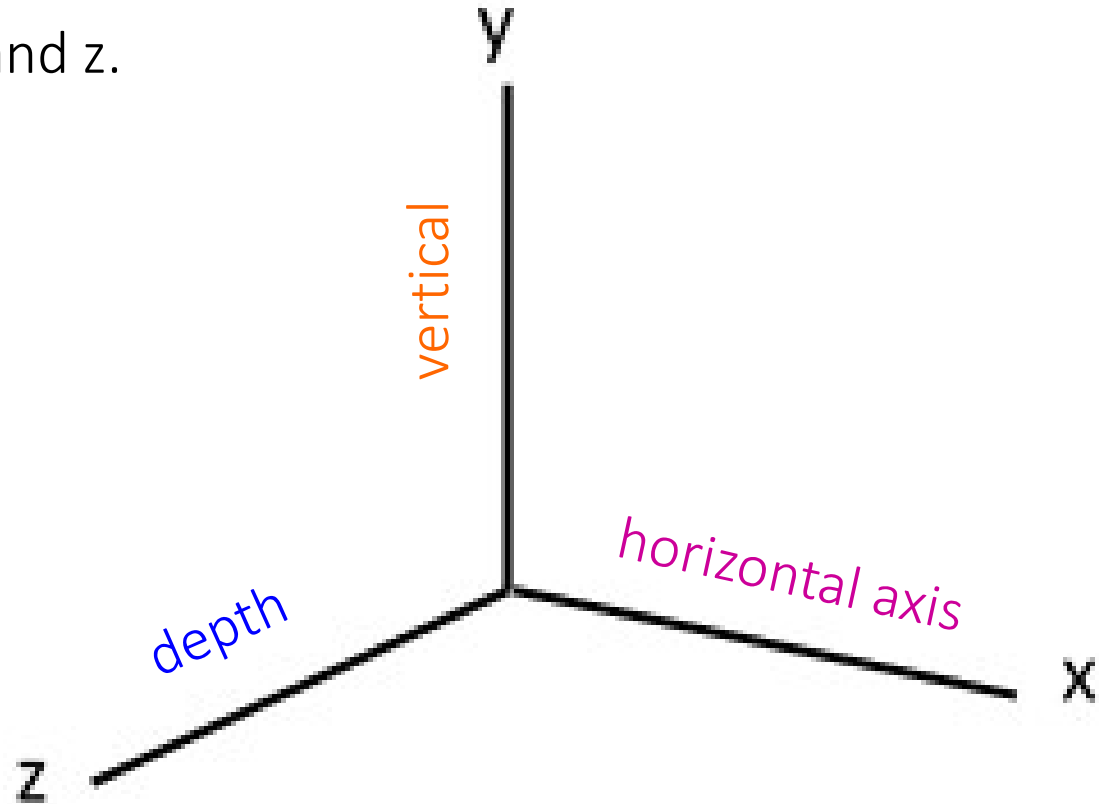
One-Axis Rotations

Three positive axes, x, y and z.

X = horizontal axis

Y = vertical axis

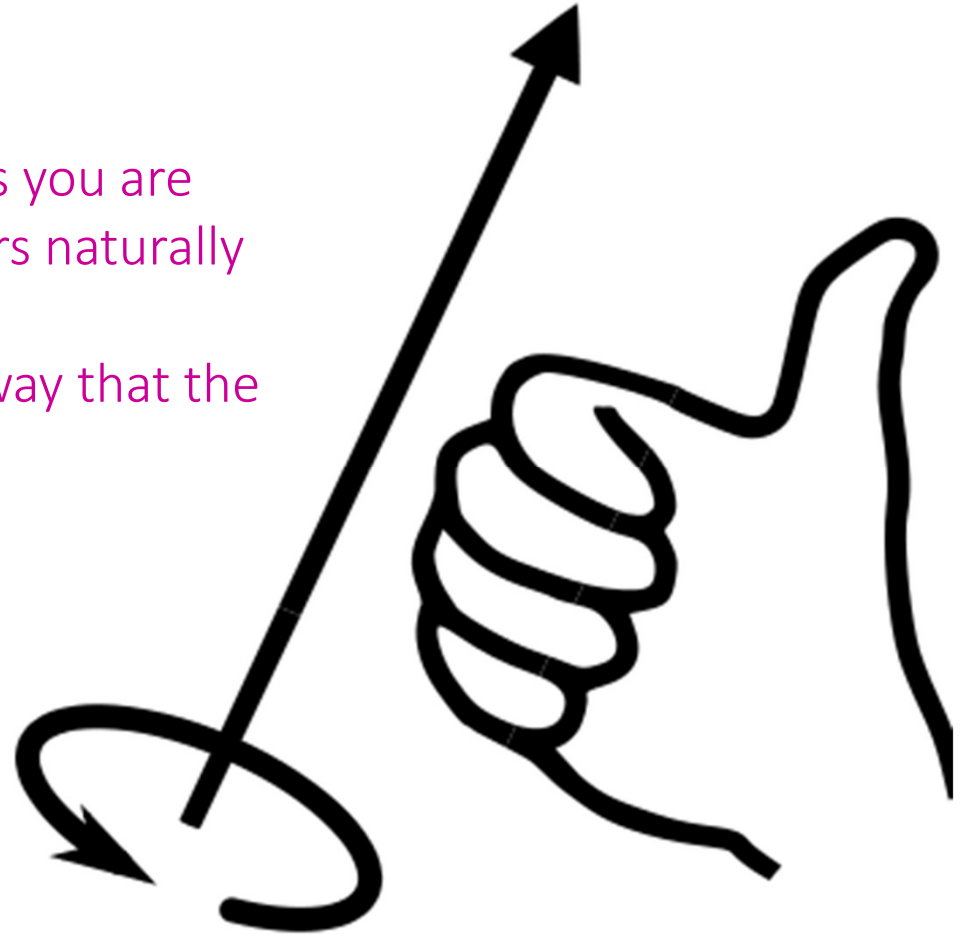
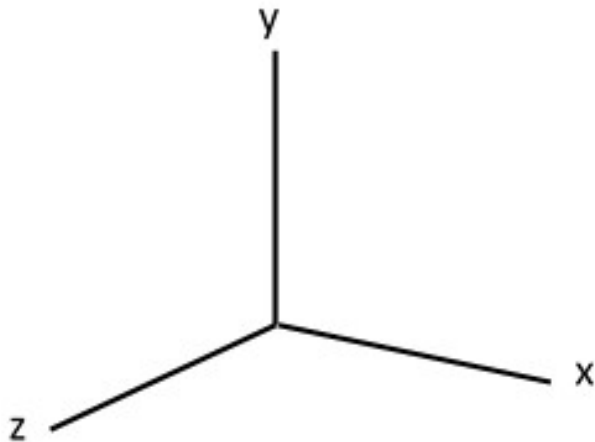
Z = axis coming towards us



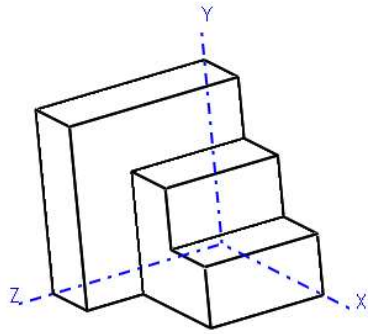
One-Axis Rotations

How to do the right-hand rule

- Point your thumb parallel to the axis you are rotating about and curve your fingers naturally towards the palm of your hand
- Your fingers will move in the same way that the object will move



One-Axis Rotations



original object position



Tips:

- Right-hand rule!
- Clockwise = negative rotation; counter-clockwise = positive rotation
- 90° , 180° , 270° rotations only
- Think of a "flag around a flagpole"

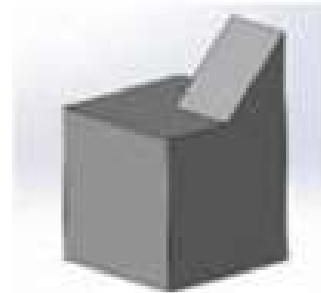
ACTIVITY 4:

New Perspectives: Two-Axis Rotations

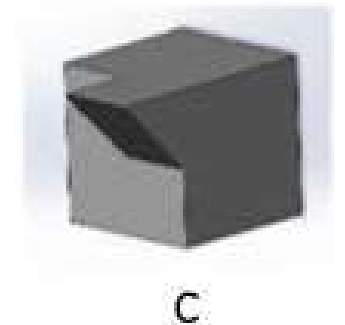
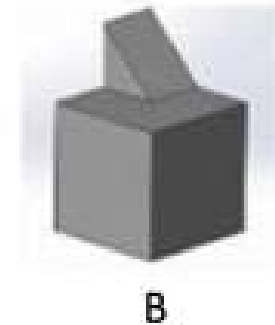
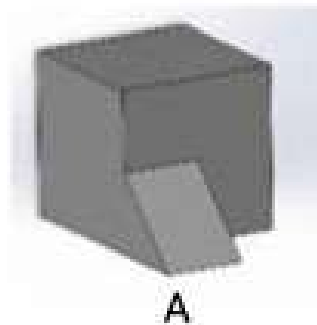
Two-Axis Rotations



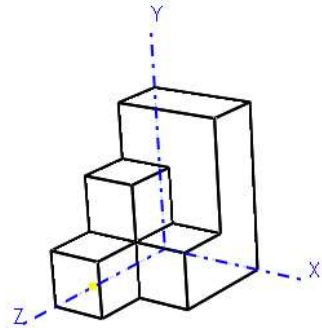
Can you find the rotation of the gray object that is analogous to the rotation of the white object?



is rotated to:



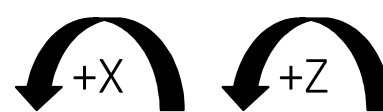
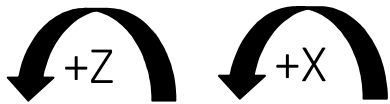
Two-Axis Rotations



original object position

Tips:

- Use the right-hand rule!
- Clockwise = negative rotation
- Counter-clockwise = positive rotation
- Two-axis rotation is NOT commutative (order matters!)



Write a Rule Approach

1. Pick a side

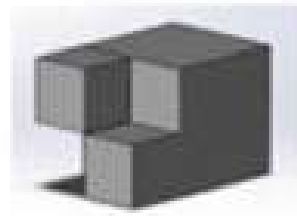
2. Find the same side after rotation

3. Write a “rule”!

4. Pick the same side on a new object

5. Follow your rule

6. Compare to answers



is rotated to:

