

Drawing Like an Engineer – Lesson Plan Final
Isometric, Orthographic, and Thumbnail Drawings

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CTE Partnership Project
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- **Duration of Unit:** 3-4 class periods. (Teach one drawing type per 50 minute class period.)
- **Materials Needed:** Student's Engineer's notebooks, isometric paper, graph paper, blank white (8.5 X 11) paper, rulers, pencils, Presentations (What I Did on My Summer Vacation, and Why..., Drawing Like an Engineer), 4 small objects for Thumbnail sketch lesson
- **Standards Addressed:**
 - Technological Literacy*
Standard 9 – The student will develop an understanding of engineering design.
Standard 11 – The student will develop the abilities to apply the design process.
 - National Science Education Standards*
Content Standard E – The student will develop the skills and abilities to Apply technological design, and have understandings of technology's role in science.
 - Principles and Standards for Mathematics*
Geometry Standard – The student will use visualization, spatial reasoning, and geometric modeling to solve problems.
 - Standards for English Language Arts*
Standard 8 – Students use a variety of technological resources to gather and synthesize knowledge, and create and communicate knowledge.
- **Learning Objective:** Given background information, instruction, and modeling, the student will demonstrate their understanding of structure and purpose of isometric drawing by completing three drawings in their engineer's notebook.

- **Student Learning Target:** I know how engineers use isometric, orthographic, and thumbnail drawings, and I can describe how I might use these drawing strategies in my school work and/or in my life.
- **Introduce Unit.** Use Presentation, What I Did on My Summer Vacation, and Why..., to introduce purpose and direction of drawing unit. Discuss purpose and intent of CTE project participation.
- **Background Information:** Provide this information to students - There are many different kinds of languages. You might know English or you may have learned about or heard people speak other languages, such as Spanish, French, or Italian. There are other ways to communicate which are not spoken languages. Sign language, for example, uses gestures and hand symbols. Morse code is another language, using a system of dots and dashes to represent letters. Pictures or drawings can also communicate ideas, just like spoken languages.

When you write formulas in mathematics or science class, you are using still another form of communication that involves the use of symbols that follows special rules. These formulas communicate ideas; for example, how to solve a technological problem.

In this activity, you will create a portfolio of sketches and drawings that will enable you to learn and understand the terminology and different methods of sketching and drawing to communicate your ideas.

Procedure:

- Introduce isometric drawing first, using appropriate slides from “Drawing Like An Engineer” PPT.
- Prompt students to analyze examples – what do you notice? What do all of these drawings have in common?
- From PPT, have students complete three drawings as instructed.
- Use guided practice to complete first drawing as a class. Use overhead or document camera to project your drawing and have students copy your lines. Clarify and assist as needed.
- Show students a second drawing, again, asking them to describe what they see, and define similarities and differences to first drawing. Draw second shape, again projecting your drawing, as students draw, either with you or independently. Walk around room, monitoring, assisting as necessary.
- Show students third drawing, once again, asking them to define similarities and differences to first and second drawings. This time, only monitor and assist as students complete drawing.

- Repeat steps 1-6, using appropriate slides, to complete orthographic and thumbnail drawings
- Students should attach drawings into notebooks, titling and dating pages.
- **Product:** The student will complete three isometric drawings on isometric paper, three orthographic drawings using format given, and 4 thumbnail sketches of provided objects. The student will then cut and glue drawings into engineer's notebooks. Student will appropriately title page, and add assignment to their table of contents page.
- **Evaluation Criteria:** Each drawing type will be evaluated for effort and completeness. Given that this is an introductory elective course, students in 6th – 8th grade are in the class, and there is a wide range of abilities. Drawings should be neatly cut out and glued in notebooks on appropriately titled pages. Drawings should resemble examples, and should show evidence of student effort.

Drawing Like An Engineer



**INSTRUCTIONAL PRESENTATION FOR
TEACHING THE FORMATS AND PURPOSES OF
ISOMETRIC, ORTHOGRAPHIC, AND
THUMBNAIL DRAWINGS**

PAULA SANCHEZ 2009-2010

The Purpose of Sketching and Drawing



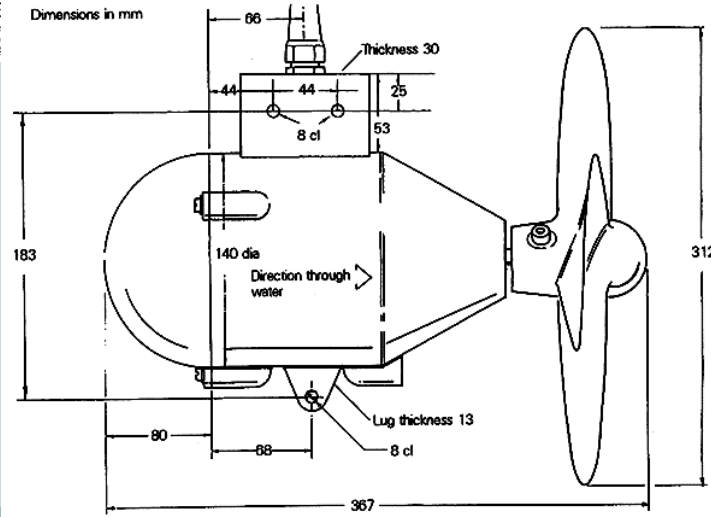
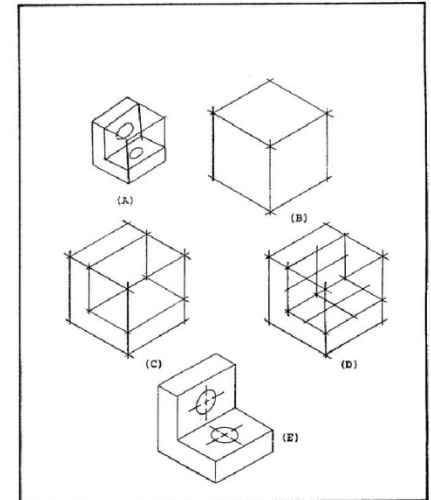
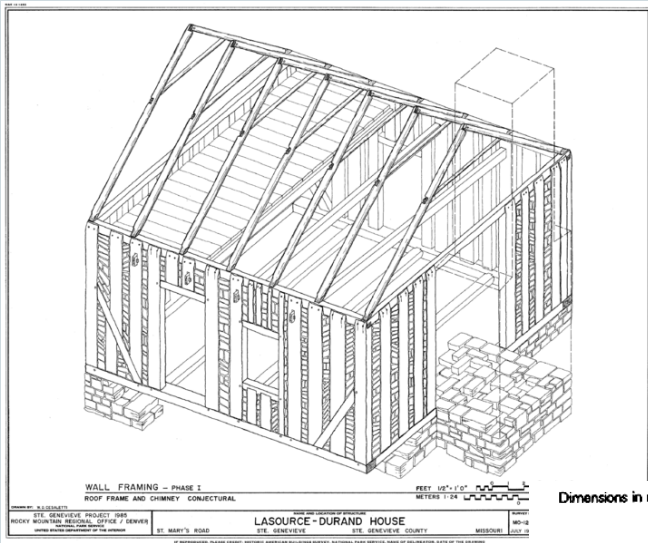
- Engineers use drawings to share and convey their ideas.
- Sketches can be used to brainstorm ideas, and to show what is being designed or what needs to be designed.
- Sketches can also be done “away from the office”, brought back to the office, and then transferred to a computer.
- We’ll learn three main types: Isometric, Orthographic, and Thumbnail Drawings.

Isometric Drawings



- Isometric drawings show an object from the front, right, and top in equal proportion.
- All lines are drawn to scale.
- Manufacturers instructions are often given as isometric drawings.
- Isometric drawings are representations of 3-D objects with 3 axes – x, y, and z.
- X=width of object, y= height of object, z=depth of object.

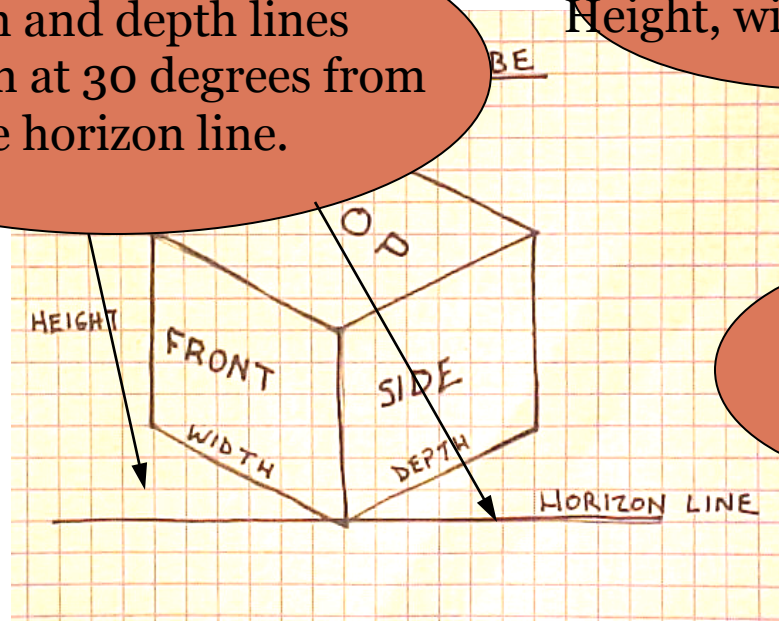
Isometric Drawing Examples



Isometric Sketching

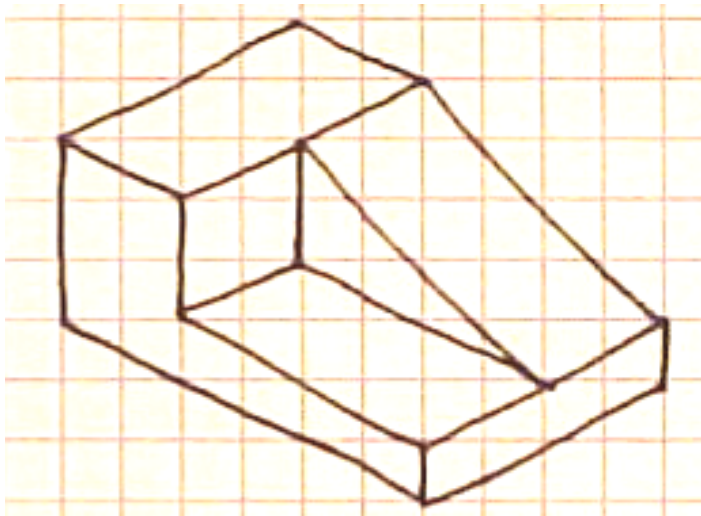
Width and depth lines are drawn at 30 degrees from the horizon line.

Note: one view shows Height, width, and depth.



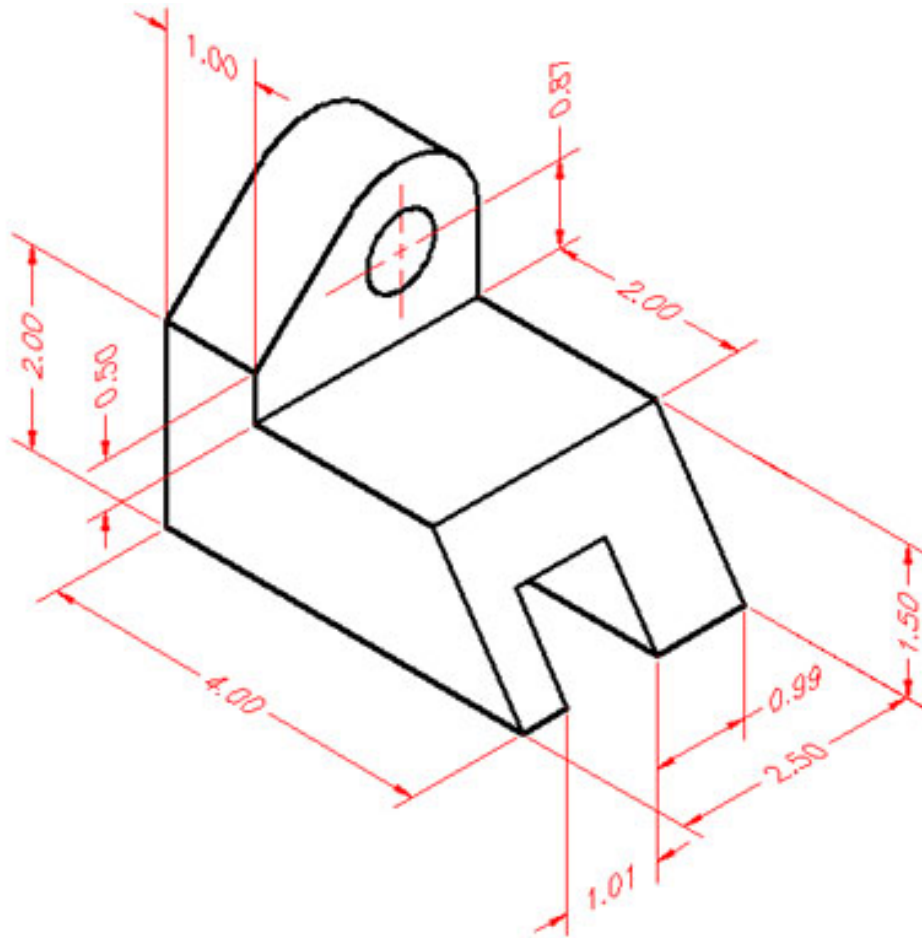
Copy and label this cube on your isometric axis

Isometric Sketching



Copy this sketch onto
your 2nd isometric
axis.

The Challenge Drawing



In your third drawing space, try this figure. You don't need to copy the dimensions, but your drawing does need to be scaled and proportionate!

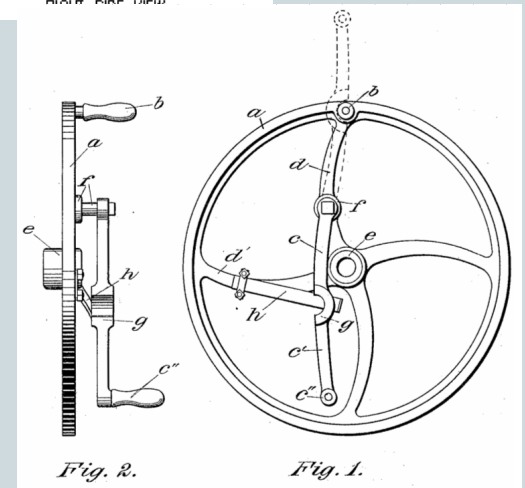
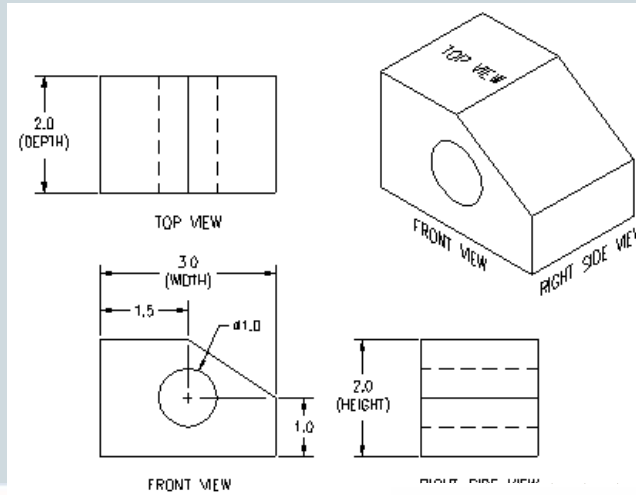
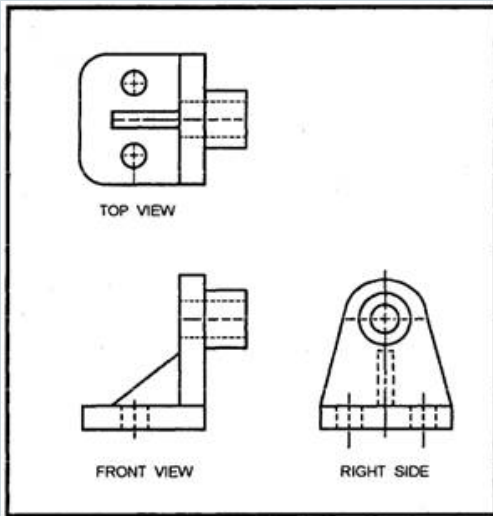


Orthographic Drawing



- Orthographic drawings are a 2-D representation of an object in a view that shows only one side at a time.
- Most orthographic drawings are done in sets, showing a side, top, and bottom view of an object.
- An example would be when a contractor shows a home builder the layout, size, and shape of the house he's building. House floor plans are a common type of orthographic drawing.
- When drawn in scale, orthographic drawings can be used to determine accurate dimensions.

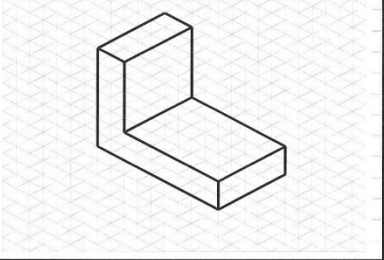
Examples of Orthographic Drawings



Your turn to try Orthographic Drawing



- Show the three sides of this figure:

ORTHO EXERCISE 1	NAME: _____
	

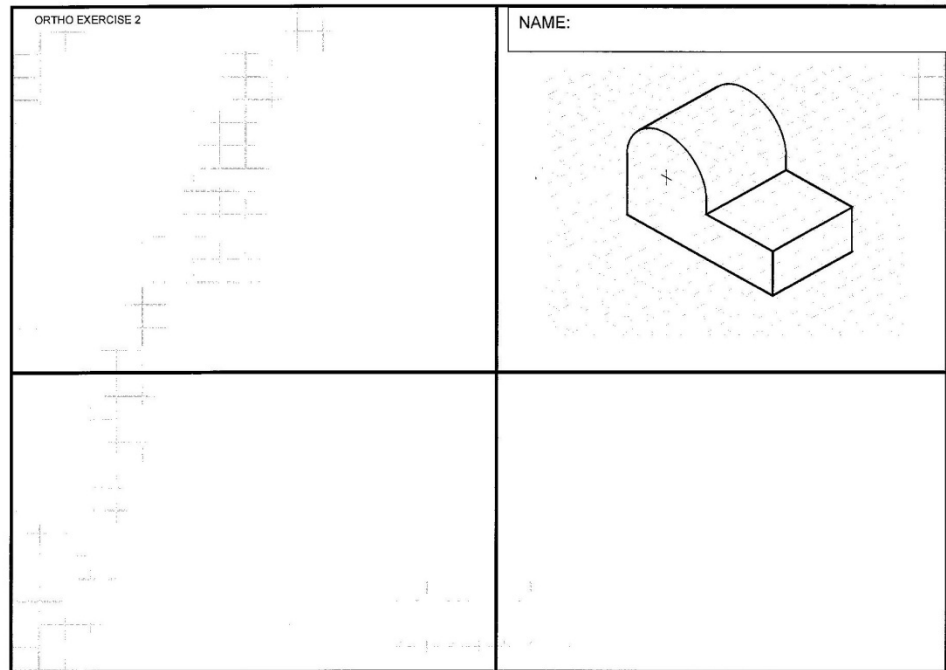
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GTT – Design and Modeling Unit – Lesson 4 – Activity 4.2 – Introduction to 3D Modeling – Page 3

Another Orthographic Drawing



- And three sides of this figure:



Orthographic views – choose an object



- Choose an object in the classroom – nothing rectangular prism shaped!
- Position the object in front of you.
- Draw the three orthographic views of your object in your notebook.
- Finish with an isometric drawing of your object.



Thumbnail Sketching



- The purpose of thumbnail sketching is to quickly get your ideas down on paper.
- Thumbnail sketches are usually small (about the size of your thumbnail, but are proportionately correct.
- The sketches are done lightly in pencil so changes can be made easily. Lines you want to keep can be darkened, those you don't want can be easily erased.
- Thumbnail sketches can also help you choose between multiple ideas.

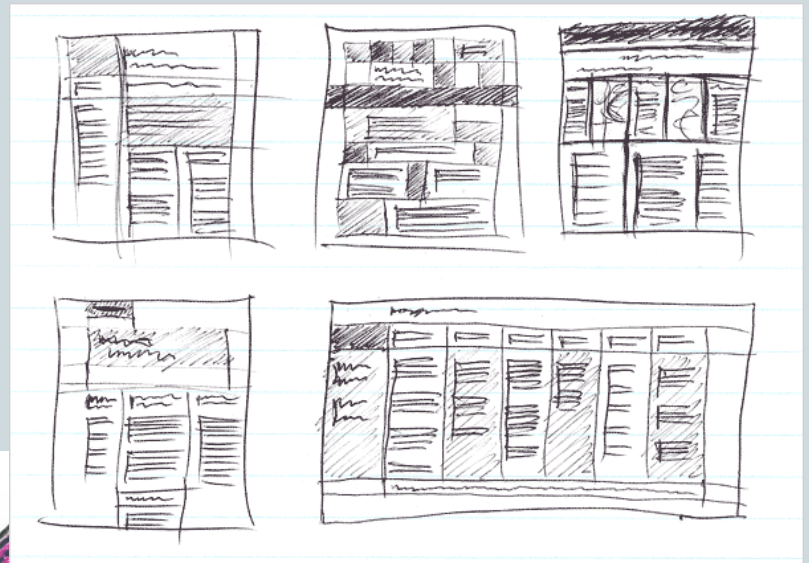
Thumbnail Sketch Examples



My name is...

1

My name is...



and I love shopping

My name is...

3



and I love shopping

My name is...

4



and I love shopping



and I love shopping

Try Thumbnail Sketching



- 1. Fold your paper into 8 equal squares. This will give you a defined space to sketch in.
- 2. Observe the item shown on the screen.
- 3. Quickly sketch the item, without using tools, to capture the main idea of the object.
- 4. Don't try to add too much detail.
- 5. Your sketch should only take 3-4 minutes.