**Youth Explore Trades Skills Design and Drafting – 2D Drawing**

# Create an Orthographic Drawing

**(Mechanical and Architectural CAD)**

## Description

In this activity students will create an orthographic drawing. Students will also change line layers.

## Lesson Objectives

The student will be able to:

* Define *orthographic drawing*
* Draw three to six orthographic views
* Change lines into different layers

## Assumptions

The student will:

* Know how to login to a computer and open up the software
* Be familiar with all skills taught in the four preceding activities:
  + Computer and Network Orientation
  + CAD Orientation
  + Set Up Your Model Space
  + Draw Your Border

## Terminology

**Imperial file**: a CAD drawing file set up in inches, or feet and inches. Often an imperial file is defaulted to inch input.

**Layers**: CAD layers are powerful organizational tools for drawing. In graphics software, layers are the different levels at which you can place an object or image file.

**Letter-sized sheet**: a standard sized sheet that is 8.5" × 11".

**Limits**: the extents of your drawing space (and of your zoom). Limits can be modified to suit each individual drawing.

**Object snap (Osnap)**: a mode that allows you to “snap” to an object (line) at its endpoint, midpoint, etc.

**Origin**: the point where x and y axes meet, which has a coordinate value of (0,0).



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**Orthographic drawing**: a two-dimensional representation of a 3D shape. Often there are multiple views; together they make an *orthographic projection*. A complete projection will have six views: front, right side, top, left side, bottom, and back.

**Rise**: the vertical height of a stair, or set of stairs.

**Run**: the horizontal depth of a stair, or a set of stairs.

**Snap**: used to limit your movement of the crosshairs of the cursor to a predetermined interval to aid in drawing to specific measurements.

## Estimated Time

30 minutes

## Recommended Number of Students

20, based on *BC Technology Educators’ Best Practice Guide*

## Facilities

Computer lab installed with CAD software (Google SketchUp, AutoCAD, etc.)

## Tools

Projector with computer and speakers, Internet access

## Materials

Student activity sheet, and Internet access so students can watch tutorial videos

## Resources

Instructional videos for teacher and students to follow:

* 5.1 Creating an Orthographic Drawing (Part 1)
* 5.2 Creating an Orthographic Drawing (Part 2)
* 5.3 Creating an Orthographic Drawing (Part 3)
* AUTODESK

## Teacher-led Activity

Use a computer with a projector to demonstrate how to:

* Open the imperial border file with layers
* Change page limits
* Draw the three orthographic views: front, right side, and top
* Assign layers to the different lines
* Save the file as an orthographic drawing

## Student Activity

Students will follow video tutorials and complete activities wherein they will create an orthographic projection of an object.

## Extension Activity

Have students make a full orthographic projection with six views.

## Assessment

Students will show the teacher that their orthographic projection is completed and saved.

# Student Activity: Create an Orthographic Drawing

Using the software, draw three orthographic views of the object located in this activity. Videos to support the lesson are located under Resources.

## Commands to Use/Learn

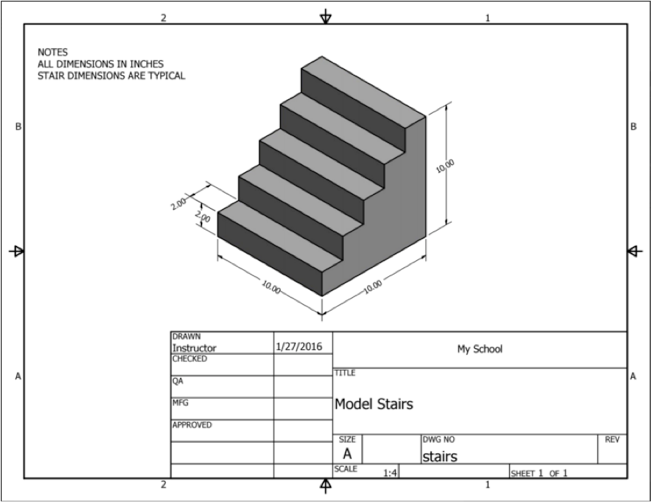
### LIMITS SNAP OSNAP LINE TRIM

**Procedure**

1. Open up your CAD software and watch Student Videos #1 and # 2 as the software loads. Once the software has loaded, open up your inches border file with layers.
2. Once the drawing file is open, set up your drawing space limits:
   1. Type **LIMITS (enter)**.
   2. Set your origin to **0,0 (enter)**.
   3. Type your upper right corner as **100,100 (enter)**.

Now your drawing space is large enough to draw your orthographic views and you should have plenty of room to zoom and pan.

1. The object in Figure 1 below is what you will be drawing orthographically



**Figure 1**—Isometric view of staircase

1. In the video “Creating an Orthographic Drawing,” Part 1 the “glass box” method to determine orthographic views is discussed. Here are some pictures to help explain that method:

**Figure 2**—Multi-view of object through a glass box

Top-side view

Front-side view

Bottom-side view

**Figure 3**— Box opened to produce orthographic views

|  |  |  |  |
| --- | --- | --- | --- |
|  | | Top (plan) view |  |
| Back view | Left view (elevation) | Front-side view (elevation) | Right view (elevation) |
|  | | Bottom view |  |

**Figure 4**—Drawing with the glass box flattened out

1. Follow the steps in the video “Creating an Orthographic Drawing,” Part 2. Draw the three orthographic views (front, top, and right side) of the stair block. Use the Trim command to remove all of the extension lines
   1. In Part 2 the *object snap tracking* feature is mentioned; this feature is available in AutoCAD, but it may not be available in all CAD software. In the video, object snap tracking appears as the dotted green line that extends from the endpoints of lines when lining up views. In AutoCAD 2016 this feature is built into your Osnap and polar tracking and will come on automatically anytime you select those commands on the bottom toolbar. Here is a link explaining the feature and how to turn it on:

https://knowledge.autodesk.com/support/autocad/learn-explore/caas/CloudHelp/ cloudhelp/2016/ENU/AutoCAD-Core/files/GUID-665DC37F-8C3E-414A-9369- 72A13C0BE07A-htm.html

* 1. If your software does not offer this option, you can always draw extension lines using the Line command, then trim the unwanted extension lines.

1. Once you have completed your orthographic projection, assign layers to your lines. Select all of your object lines, then click the Layer Manager and select the Object layer. Next, assign the rest of the lines in your border and title block according to the video “Creating an Orthographic Drawing,” Part 2.
2. When you are finished save the file as *orthographic drawing.dwg*.
3. At this point, if your instructor asks you to do a full orthographic projection with six views, you will need to watch the video “Creating an Orthographic Drawing,” Part 3.
4. Once you have watched the clip, draw the additional views using the appropriate layers, then trim all of the extension lines and re-save your file.
5. Show your instructor that you have completed your orthographic projection.