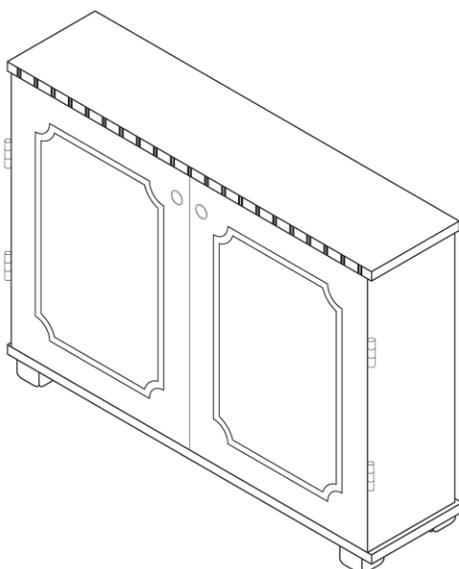# Projected drawing

Welcome to Corel DESIGNER®, a comprehensive vector-based drawing application for creating technical graphics.

When drawing with Corel DESIGNER, you can use drawing profiles to draw or project objects onto projected drawing planes. This tutorial introduces you to the terms and tools that are used in projected drawing and shows you how to add a three-dimensional (3D) appearance to a drawing of a cabinet.

The following illustration shows what your completed drawing will look like.


What you will learn

In this tutorial, you will learn to do the following:

- understand drawing profiles and drawing planes
- understand the tools that are used in projected drawing
- choose a drawing profile and a drawing plane
- set options for dynamic guides
- project objects by using the **Transformations** docker
- draw lines that are tangent to two objects
- use the **Virtual segment delete** tool to delete line segments
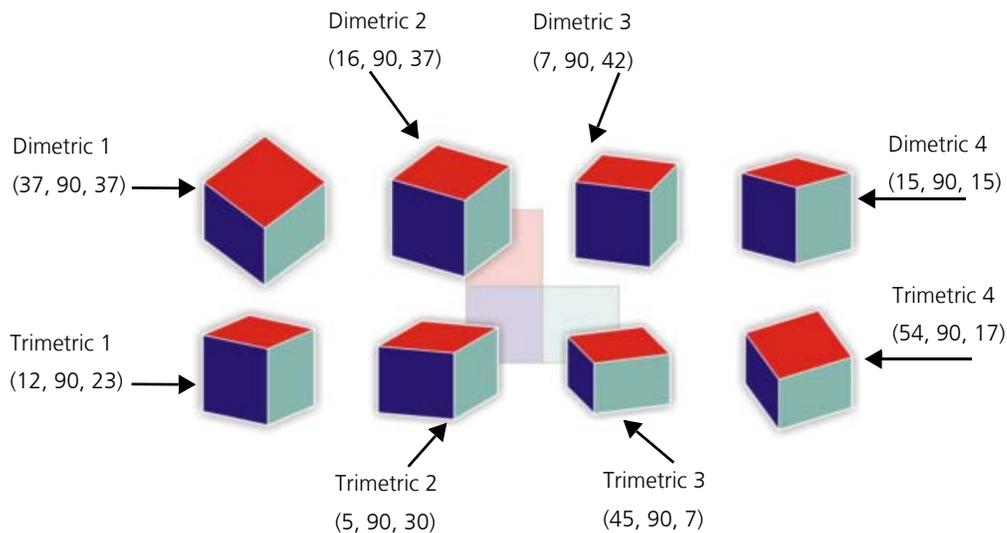
Understanding projected drawing

Projected drawing modes use predefined drawing profiles to represent 3D objects in two dimensions. You can draw and project objects onto one of three drawing planes: front (x and z), top (x and y), and right (y and z).

Each drawing profile is defined by a set of three angles that correspond to the x, y, and z axes. The x-axis is measured in degrees, clockwise from a line perpendicular to the y-axis. The y-axis is measured in degrees, counterclockwise from the true horizontal, which is 0 degrees east. The z-axis is measured in degrees, counterclockwise from a line perpendicular to the y-axis. You can create custom drawing profiles that meet your needs.
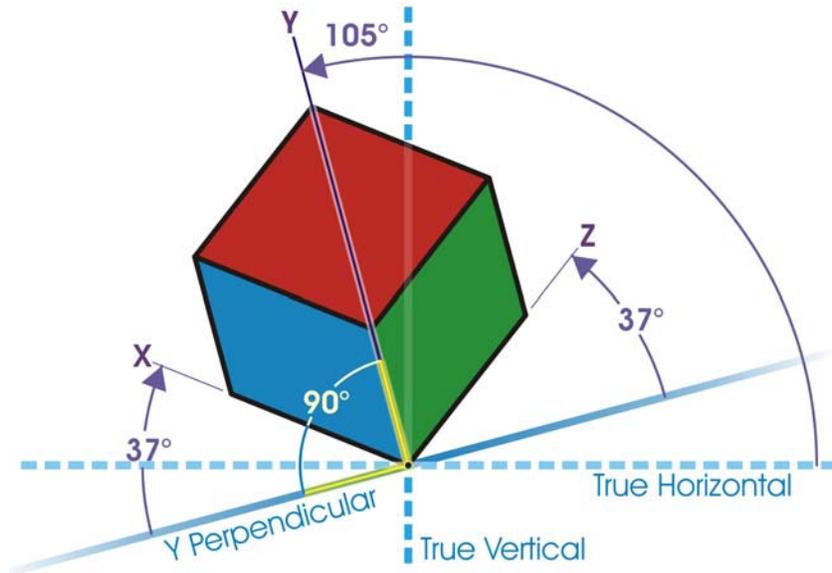

In this example, the x-axis is 37 degrees clockwise from a line perpendicular to the y-axis. The y-axis is 105 degrees counterclockwise from the true horizontal. The z-axis is 37 degrees counterclockwise from a line perpendicular to the y-axis. The drawing profile is based on these values (37, 105, 37).

Corel DESIGNER provides 11 preset drawing profiles that you can use to create projected views of objects. One isometric, four dimetric, four trimetric, one cavalier oblique, and one cabinet oblique drawing profile are provided. The following diagram shows projected views of a cube that were drawn by using different drawing profiles.

Projected drawing modes are sometimes confused with perspective drawing. Projected drawing modes let you draw and project objects along parallel lines. In perspective drawing, objects are projected along lines that emerge from a single point (called a "viewpoint"). The result is that lines that are parallel in reality (for example, railway tracks) appear to converge toward a single point, known as a "vanishing point."
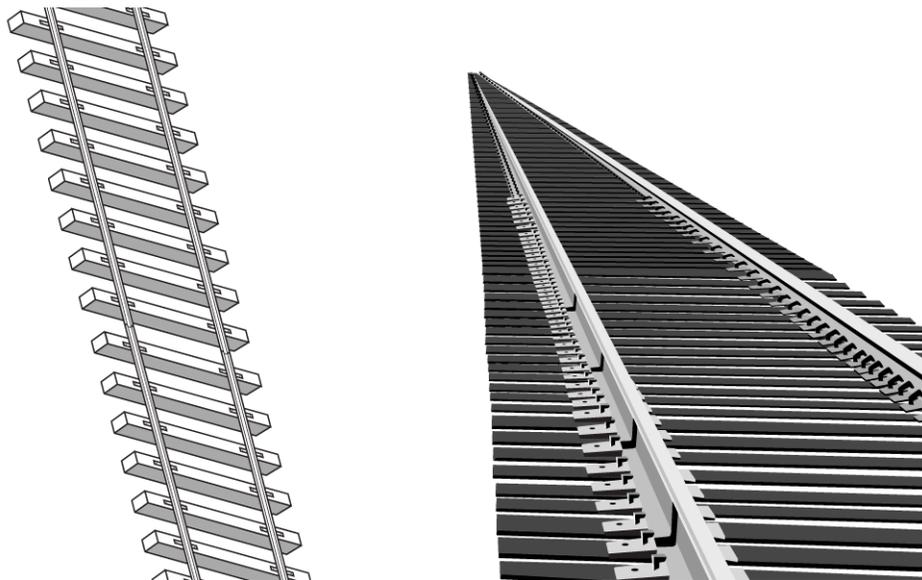

Depiction of railway tracks in a projected drawing and a perspective drawing

Using projected drawing tools

The following tools let you work with projected drawing: the **Drawing plane** toolbar, the **Projected axes** docker, and the **Transformations** docker.

In the default workspace, the **Drawing plane** toolbar is displayed next to the standard toolbar. If the toolbar is not displayed, you can access it by clicking **View ▶ Toolbars ▶ Drawing plane**. The **Drawing plane** toolbar lets you choose a drawing profile and a projected drawing plane (top, front, or right) so that you can draw in a projected drawing mode. The default orthographic drawing plane lets you draw unprojected objects.
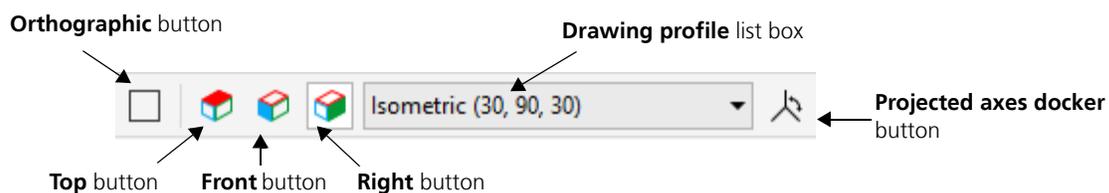
The **Projected axes** docker lets you customize the available drawing profiles and create new ones. If you don't know the angles of the axes in a projected object that you have imported, you can use the controls of the **Projected axes** docker to create the drawing planes. Then, you can draw objects on the drawing planes of the imported object.

The **Project** page of the **Transformations** docker lets you project objects onto the top, front, and right drawing planes. You can also undo the projection of an object from a drawing plane to restore the object to an orthographic view.

Project page of the **Transformations** docker

Projected axes docker
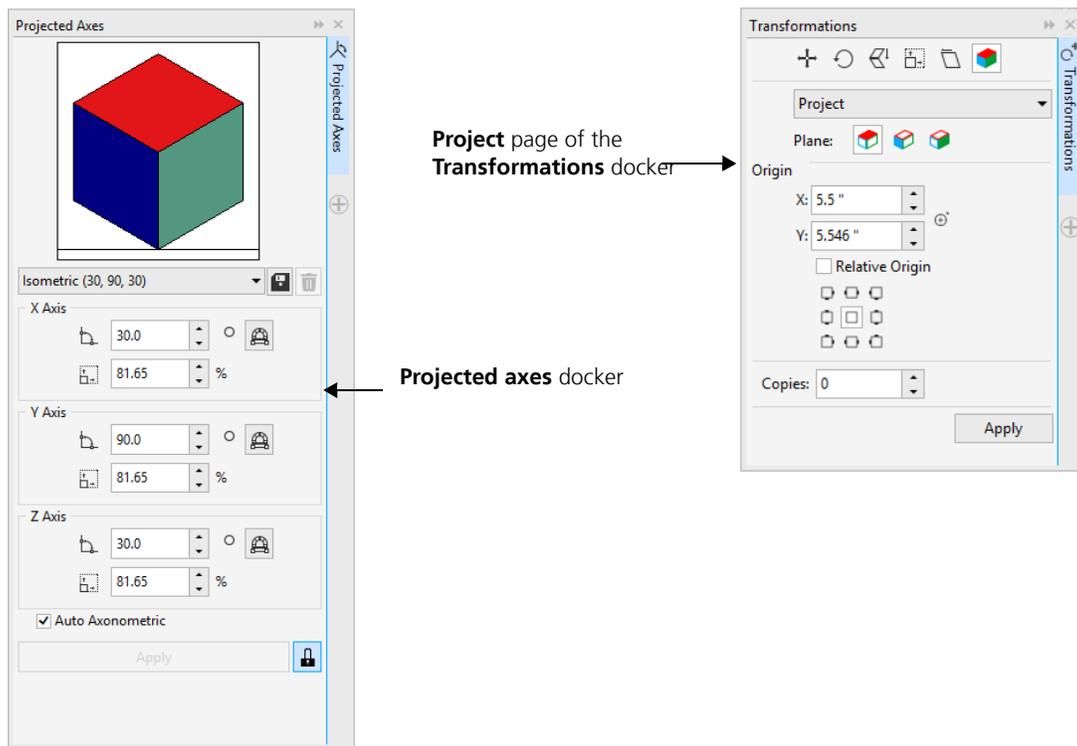
In the following procedure, you will practice projecting objects by projecting a square to create the faces of a cube.

To create a cube by projecting a square

1 In the drawing window, draw a square on the default orthographic plane, and click a color on the on-screen color palette to fill the square.

2 Click **Object ▶ Transformations ▶ Project** to open the **Transformations** docker.

3 In the **Copies** box, type **1**. A duplicate of the square will be projected, and the original square will remain unprojected.

4 Click the **Front** button , and click **Apply**. The front view of the cube appears in the drawing window. Move it to the side.

5 Select the original square in the drawing window.

6 In the **Transformations** docker, click the **Top** button , and click **Apply**. Move the top view to the side.

7 Select the original square in the drawing window.

8 In the **Transformations** docker, click the **Right** button , and click **Apply**.

You now have all the faces of the cube.

9 Move the projected squares to assemble the cube.
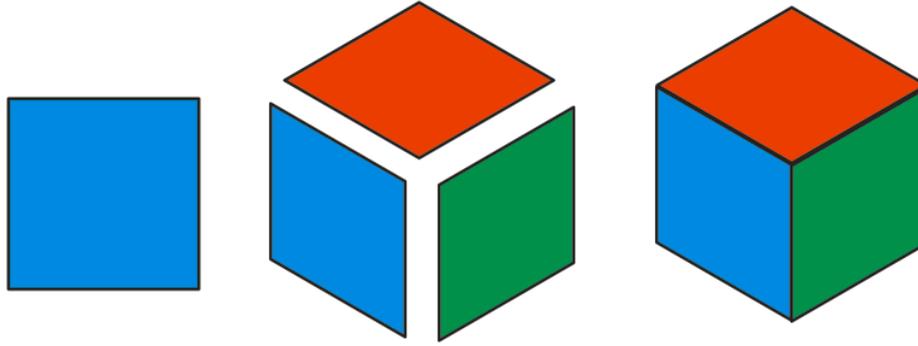
In this illustration, different colors are used for the different views: blue for the front view, red for the top view, and green for the right view.

Opening and setting up the drawing

You will now open a drawing of a cabinet. To prepare for projected drawing, you will choose a drawing profile and then choose options for dynamic guides that match the drawing profile. You will also change the default outline width so that it matches the outline width of the objects in the drawing.

To open the drawing

1 Click **File ▸ Open.**

2 Open the file **projected.des**, which you downloaded earlier.

To choose a preset drawing profile

• From the **Drawing planes** toolbar, choose **Isometric (30, 90, 30)** from the **Drawing profiles** list box.

To set up dynamic guides

1 Click **Tools ▸ Alignment and dynamic guides** to open the **Alignment and dynamic guides** docker**.**

2 Enable the check box in the top-right corner of the **Dynamic guides** section of the docker.

3 In the **Dynamic guides** section, disable the **45** and **60** check boxes.

4 Enable the **30** and **135** check boxes to be able to display dynamic guides at the angles of the isometric drawing profile.

To set default outline properties

1 Holding down **Ctrl**, click the left leg of the cabinet. The cabinet is a group of objects, so holding down **Ctrl** lets you select an object within that group.

2 On the property bar, choose **1.0 pt** from the **Outline width** list box.

3 Click the **Keep settings** button ⛛. This sets the default outline properties for all graphic objects. All new rectangles, circles, curves, and other graphic objects that you add will have an outline width of 1.0 pt.

Identifying the parts of the cabinet

In the procedures that follow, you will project the front of the cabinet, and then you will add its right knob, countertop, right side, and missing legs. The parts of the finished drawing are identified to help you follow the instructions.
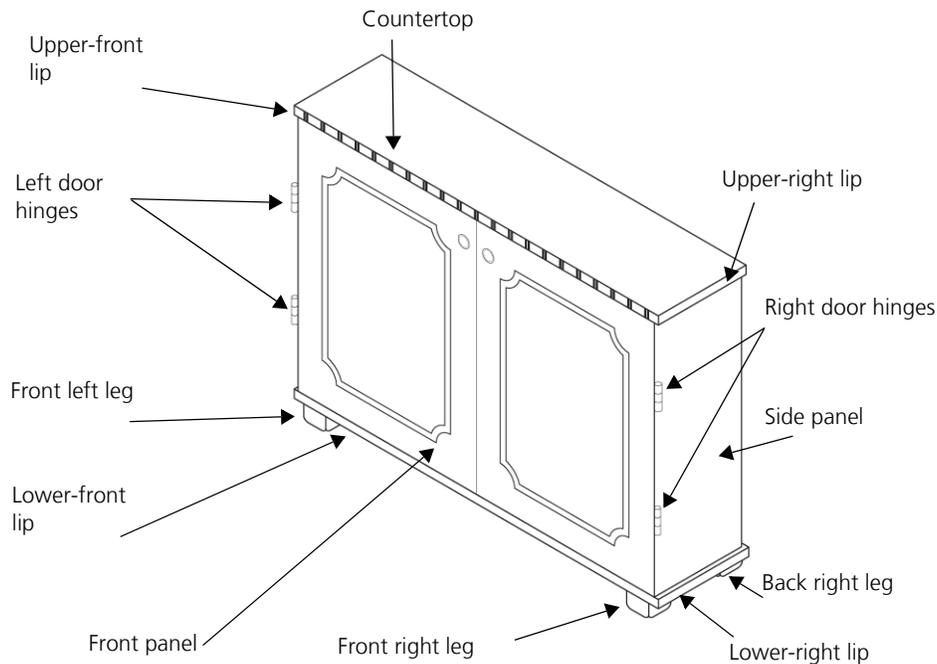

Projecting the front of the cabinet

The cabinet is drawn on the default orthographic drawing plane, which is flat. You will project the entire cabinet on the front plane to create the front projected view.

To project the front panel of the cabinet

1 Using the **Pick** tool　　, select the cabinet.

2 Click **Object ▸ Transformations ▸ Project**.

3 In the **Transformations** docker, choose **Project** from the **Projection modes** list box, and click the **Front** button 　.

4 In the **Copies** box, type **0**.

5 Click **Apply**.
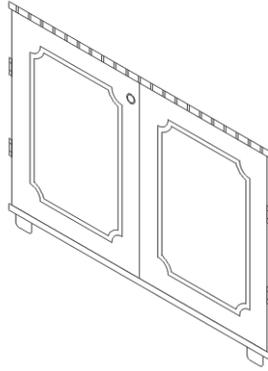
Adding the right knob

To add the right knob in projected mode, you will move a copy of the left knob by a specified distance.

To add the right knob in projected mode

1 On the **Drawing plane** toolbar, click the **Front** button .

2 Using the **Pick** tool , hold down **Ctrl**, and click the left knob to select it.

3 In the **Transformations** docker, click the **Position** button.

4 In the **Gap** box, type **0.22**, and choose **Horizontal** from the **Direction** list box.

   The left knob is 0.11 " from the right edge of the left door so we need to add another 0.11 " to position the right knob correctly.

5 Type **1** in the **Copies** box, and click **Apply**.

   The right knob appears to the lower-right of the left knob, placed 0.11 " away from the left edge of the door.
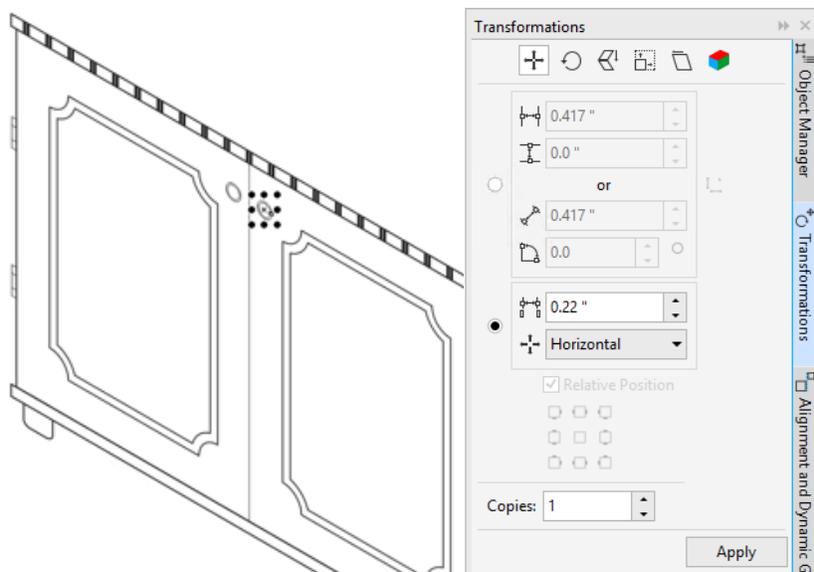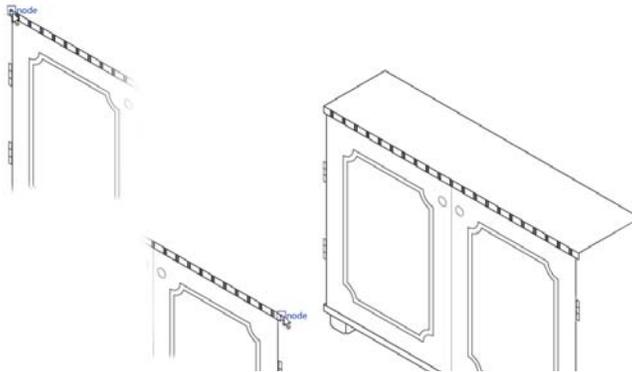
Drawing the countertop

Next, you will use the **3-point rectangle** tool to draw the countertop of the cabinet on the top drawing plane, which will create the top view.

To draw the countertop

1 In the toolbox, click the **Rectangle tools** button, and click the **3-point rectangle** tool ⬚.

2 On the **Drawing plane** toolbar, click the **Top** button 🟥.

3 Point to the upper-left corner of the cabinet, click when the node snap point appears, and drag to the upper-right corner of the cabinet. When the corner node snap point appears, release the mouse button, and then move the pointer to specify the width of the rectangle. Click to insert the rectangle, which forms the countertop of the cabinet.

If you want to specify the exact height of the countertop, in the **Transformations** docker, click the **Size** button, and type a value in the **Y** box (for example, 1.8).
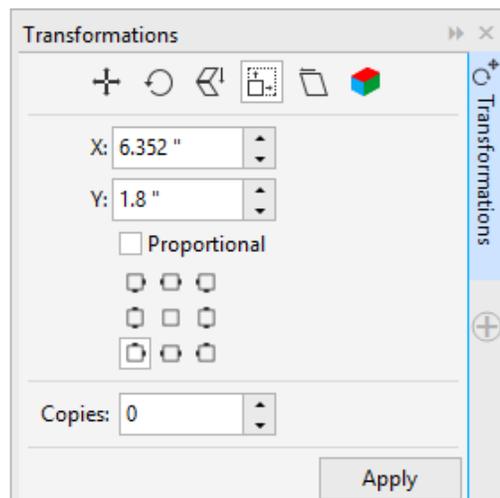

Drawing the right side of the cabinet

To create the right projected view, you will change the drawing plane and draw the following components of the right side of the cabinet: side panel, upper-right lip, and lower-right lip. The front legs are already partially drawn, so you will use the existing objects to create the missing parts of the legs.

## To draw the right side of the cabinet

1 On the **Drawing plane** toolbar, click the **Right** button 🔲.

2 Using the **3-point rectangle** tool ▭, point to the lower-right corner of the front panel (not the corner of the lower-front lip). Click when the node snap point appears and drag upward along the right edge of the front panel to the upper-front lip. Release the mouse button, move the pointer to specify the width of the rectangle, and then click. The right side of the rectangle should not reach as far as the upper-right corner of the countertop.
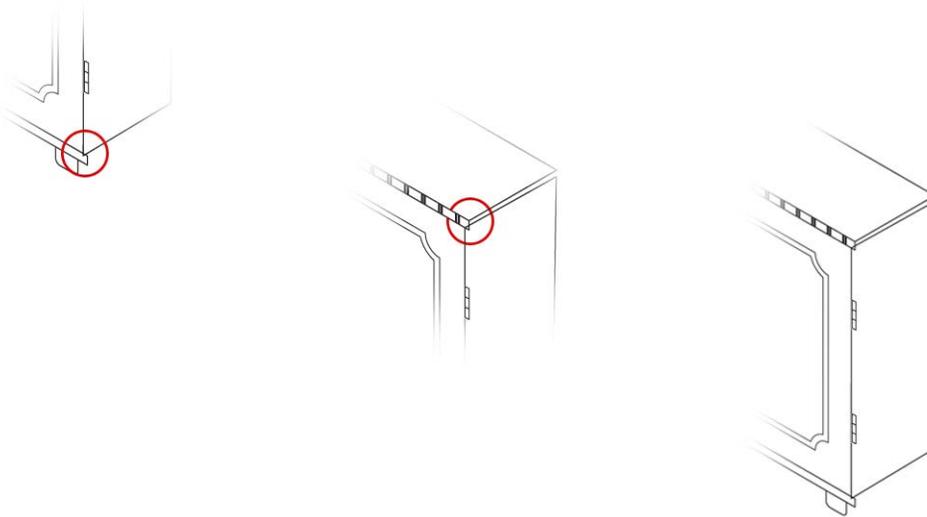
If you want the width of the right side to match the height of the countertop, on the **Size** page of the **Transformations** docker, type the corresponding value in the **X** box. (For example, type **1.8** if this is the value you entered for the countertop height).
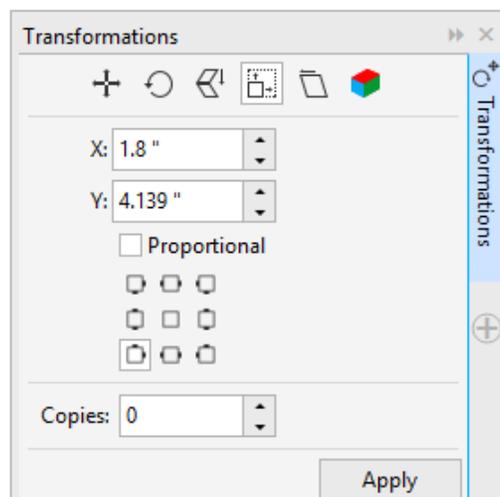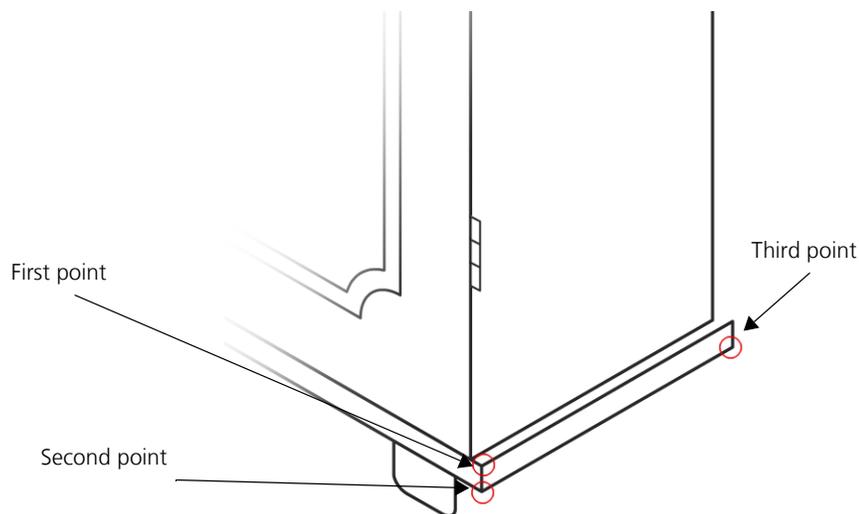

3 Now, you'll draw the upper-right lip. Point to the upper-right corner of the countertop, click when the node snap point appears (first point), and drag along the edge to the lower-right corner of the countertop (second point). Release the mouse button, move the pointer to the lower-right corner of the upper-front lip, and click to place the third point of the rectangle.
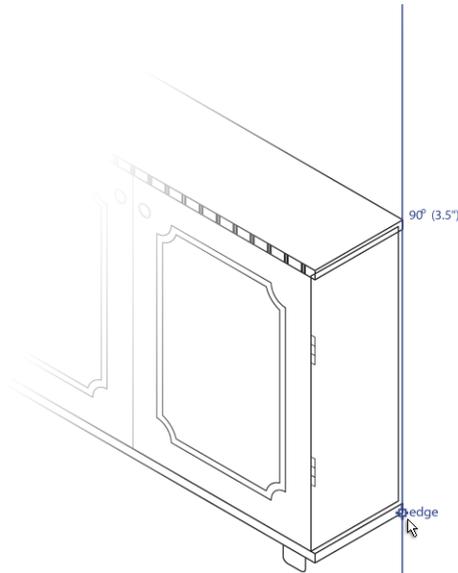
First point

Second point

Third point
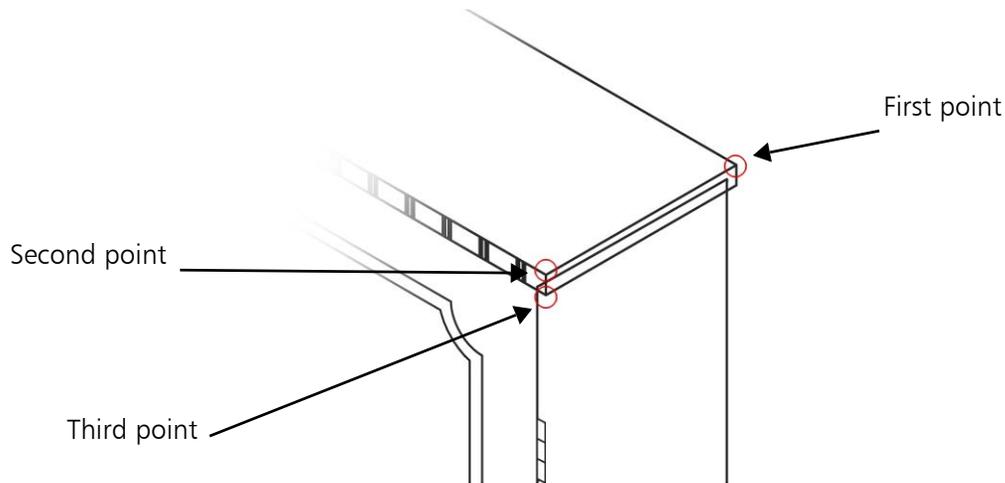
Some lines that are supposed to be hidden from view are visible. You will delete these lines later.

4 You'll now draw the lower-right lip of the cabinet. Point to the upper-right corner of the lower-front lip, and click when the node snap point appears (first point). Drag along the edge to the lower-right corner of the lower-front lip (second point). Release the mouse button, move the pointer to the right until the rectangle is slightly wider than the side panel, and click (third point).

Third point

First point

Second point

To align the lower-right lip with the upper-right lip while drawing, you can display a dynamic guide (by pointing to the upper-right corner of the countertop) before you place the third point of the rectangle.

Corel DESIGNER tutorial

5 Next, you'll draw the top view of the lower-right lip. Click the **Top** button on the **Drawing plane** toolbar. Point to the upper-left corner of the lower-right lip, and click when the node snap point appears (first point). Drag along the upper edge of the lower-right lip to its upper-right corner, and release the mouse button (second point). Move the pointer to the left, and release the mouse button to finish the top view (third point). You will later delete the lines that should be hidden from view.
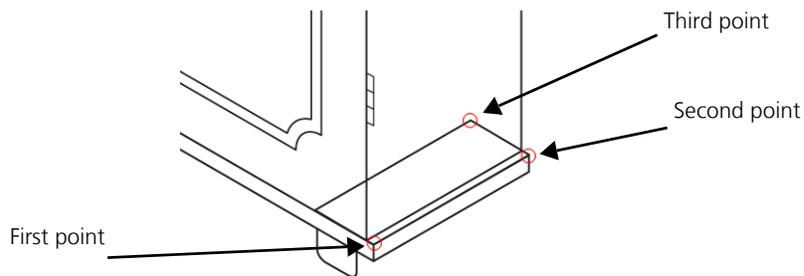

To finish the legs of the cabinet

1 Click the **Pick** tool . Then, holding down **Ctrl**, click the right leg.

2 On the **Project** page of the **Transformations** docker, choose **Unproject** from the **Projection modes** list box.

3 Click the **Front** button . In the next step, you will undo the projection of an object on the front drawing plane.

**4** In the **Copies** box, type **1**. Click **Apply**.

A duplicate of the leg is created and placed on the orthographic drawing plane.
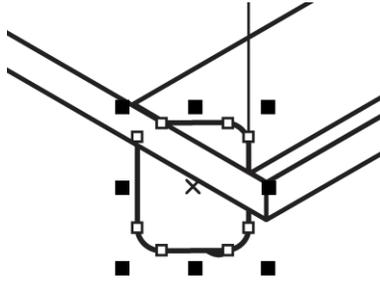
5 Choose **Project** from the **Projection modes** list box, and click the **Right** button to project the leg on the right plane.

6 In the **Copies** box, type **0**. Click **Apply**.

7 Drag the projected object, and align it with the right edge of existing front right leg for exact placement.
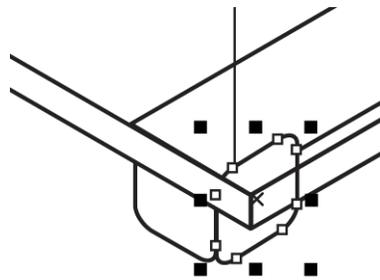
8 Next, you'll add the missing part of the front left leg. Duplicate the projected view of the right leg (**Ctrl + D**), and drag it to align it with the existing part of the front left leg.
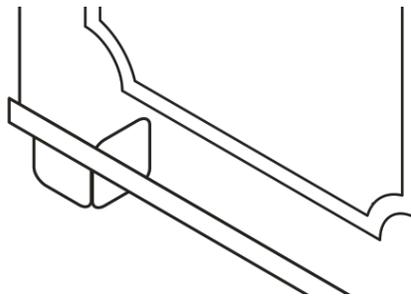
9 Next, you'll add the back right leg. Select the two components of the front right leg, and duplicate them.

10 Drag the duplicates along the edge. You can use dynamic guides to place them with precision.

Projecting the hinges

The hinges must be redrawn on the top plane to give them a realistic 3D appearance. You will redraw one of the hinges and then duplicate it to create the remaining hinges.

To redraw the hinges

1 On the **Drawing plane** toolbar, click the **Top** button .

2 Using one of the circle-drawing tools, draw a circle. The shape will look like an ellipse because it is on a projected drawing plane.

3 Right-click the circle, drag downward, and click **Copy here**.

4 On the **Drawing plane** toolbar, click the **Orthographic** button [ ].

5 From the vertical ruler, drag a guideline to the center of the first circle. The guideline will help you align the circles vertically.

6 Snap the center of the second circle to the guideline to align the centers of the circles vertically.

**7** In the toolbox, click the **Curve tools** button, and click the **2-point line** tool ✏. On the property bar, click the **Tangential 2-point line** button ◯. Snap the pointer to the edge snap point of the upper circle, and drag downward to the tangent snap point of the lower circle.
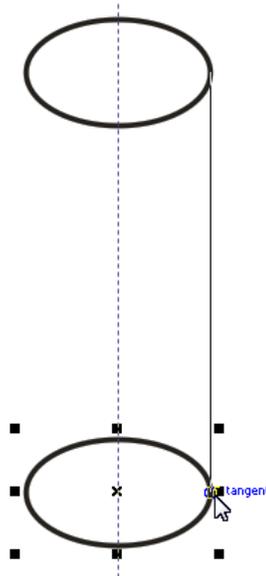

If the midpoint snap point is not displaying, click **Tools ▶ Gravity**, and in the **Modes** box, enable the **Tangent** check box.

**8** Repeat the previous step to draw the other side.

9 Create two more copies of the circle, and place them between the top circle and the bottom circle, as shown in the following illustration.
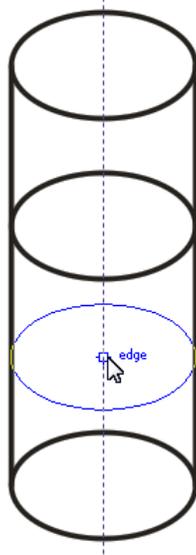

10 The next task is to space the circles evenly by clicking the **Pick** tool , holding down **Shift**, and selecting the circles.

11 Click **Window ▶ Align and distribute** to open the **Align and distribute** docker.

12 In the **Distribute** area, click the **Distribute centre vertically** button .
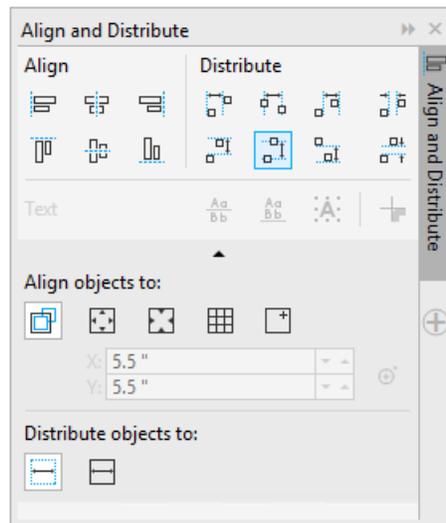
13 Click the **Deletion tools** button, and click the **Virtual segment delete** tool .

14 Click the line that should not be displayed in the second circle. Half of the line is deleted. Click the remaining part to delete it.
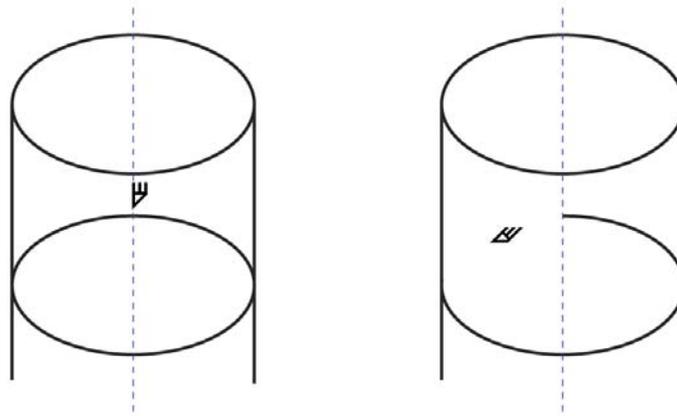
15 Remove the undesired line segments in the third and last circles by using the **Virtual segment delete** tool.
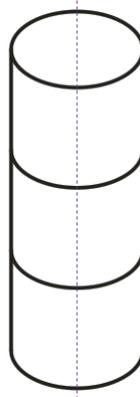
16 Select all the components of the hinge, and click **Object ▸ Group ▸ Group objects**.

17 Drag a corner handle to resize the hinge.

18 Press **Ctrl + D** three times to create three duplicates of the hinge.

19 Holding down **Ctrl**, click the unprojected hinges on one of the sides, and press **Delete**.

20 Repeat the previous step until all unprojected hinges are deleted.

21 Position the projected hinges along the edges of the cabinet to replace the unprojected hinges.
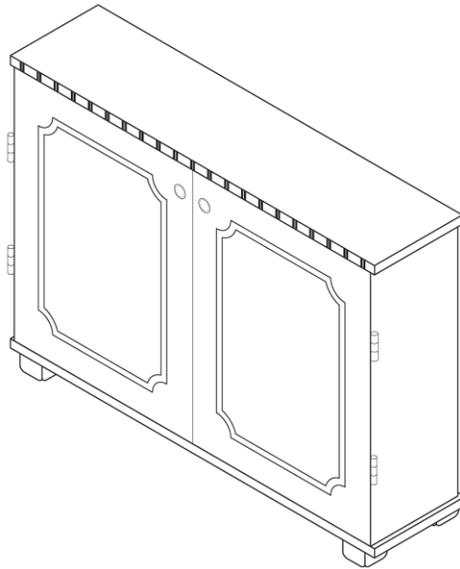
Adding the final touches

The drawing still has quite a few lines that must be removed. You will use the **Virtual segment delete** tool to delete these lines. Note that after you use the **Virtual segment delete** tool on objects, their object type may change — for example, rectangles and ellipses are converted to curves. For this reason, it is recommended that you use this tool after you have finished other editing tasks.
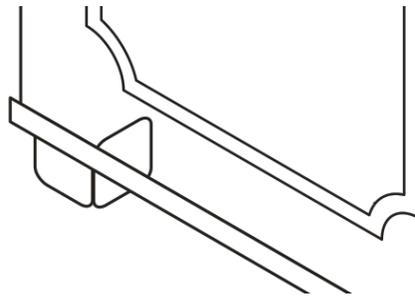
An alternate method of hiding the lines is to place the objects that contain the undesired lines behind other objects, and to fill the front objects with a white fill. This method can be used at any stage of your drawing, because it does not change the object type.

To delete line segments

1 In the toolbox, click the **Deletion tools** button, and click the **Virtual segment delete** tool .

2 Click the lines that should appear hidden.

Your projected drawing is now complete. If you want to save the file, you must save it with a new filename.

From here...

You can explore Corel DESIGNER on your own, or you can learn more by completing other tutorials.

For more information about the topics and tools discussed in this tutorial, refer to the Help. To access Corel DESIGNER Help, click **Help ▸ Product help**.