Axonometric Box

Draw the artwork for the three sides. Group each side and arrange as shown..

Select the top. Rotate it 45° about its lower left corner.

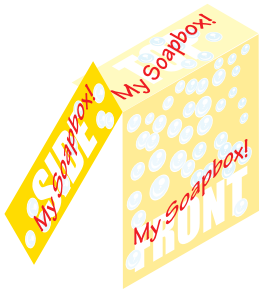
Scale it vertically 58% from its bottom.

Select the front. Rotate it 45° about its upper left corner.

Scale it horizontally 58% from its left side.

Turn on Snap To Points. Rotate the front 30° about its leftmost corner.

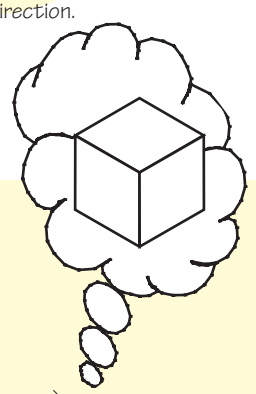
Select the side. Rotate it -45° about its upper right corner.



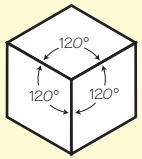
Scale it horizontally 58% from its right side.

Rotate the side 30° about its rightmost corner.

Pet Peeve:
If drawing programs like Illustrator and FreeHand were really more illustration-oriented than design-oriented, we would be able (among many other things) to scale things along the direction of our drawing axes, rather than just horizontally or vertically relative to the page edges. A simple Angle checkbox and value field in the Scale dialog—just like those in the Shear and Reflect dialogs—would be a step in the right direction.

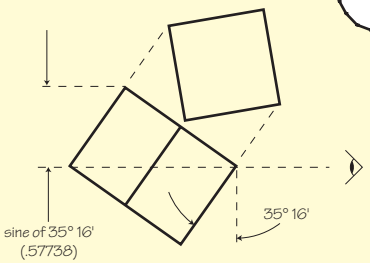


Why did we use 58% and 30°? Well, the whole idea of isometric is that the three drawing axes are arranged so that all three visible sides of a cube are viewed at the same angle (foreshortened equally). It naturally follows then, that the three angles between the axes are equally spaced and must therefore be 120° (360/3). Because we want the vertical axis to be vertical, that means the axes occur at 30°, 90°, and 150° abiding by Illustrator's default orientation.



Of course, this means that the three axes are also tilted away from the viewer by the same angle. In orthographic projection, that angle works out to be 35°16'. The sides of the cube therefore appear foreshortened by the sine of that angle (.57738), which we round off to two decimal places and express as a percentage (58%).

Okay. So what if we want to view the sides at a different angle from the top? Well…



tip prepared by James E. Talmage www.IllustrationETC.com

Axonometric Box

Starting with the same artwork.

Select the top. Rotate it 45° about its lower left corner as before.

Scale it vertically by whatever percentage you want. Let's say 25% (again, using the bottom as the center of transformation).
The arcsine of .25 is 14.4775°. That means we now have the top of the box "tilted" up toward us by 14°.29' (translating the decimal to minutes, and rounding to two places).

Of course, the vertical edge of the box is perpendicular to the top. So if the top is tilted up toward us 14°29', then the vertical edge between the front and side must be tilted away from us by that same angle. Said another way, it is tilted toward us by the complimentary angle, 75°31'. That means that vertical edge will appear to be foreshortened by the sine of 75°31'—which is .9682.

So, we select the front and side and scale them both vertically by 97%.

Now, what about the width of the sides? We could do enough high-school trig to figure out the foreshortening factors and angles of the other two axes, but since we already have a box top, we can simply take those dimensions from it. Use the Measure Tool to measure along the right edge of the top, noting the width and the angle of the measure in the info palette.

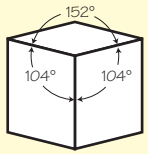
Select the front and set its width to the noted value.

OptionClick the upper left corner with the Shear tool and skew the front vertically by the negative of the noted angle.

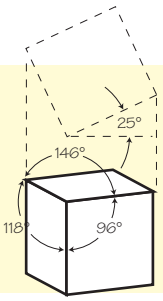
Similarly measure the left edge of the top…

…and apply the measured width and skew angle.

You have just drawn a DImetric box. It is dimetric because two foreshortening factors are used along the axes; one for the vertical axis, and another for the other two axes.



You could similarly construct a TRImetric box by using an angle other than 45° when first rotating the box top. You would then end up with three different foreshortening factors—one for each axis.



It should be noted that, contrary to popular misconception, the values of foreshortening factors are not arbitrary. They are interdependent, as they must be for properly proportioned axonometric drawings.

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