1 Drawing 3D Objects in Adobe Illustrator

This Tutorial will show you how to draw simple objects with a three-dimensional appearance. At first we will draw arrows indicating a movement in 3D space. Adobe Illustrator 7.0 was used to create the following graphics, but all procedures are valid for newer versions (up to CS2), too.

In the first section you'll find some basic information about isometric views (a special kind of drawing, which is almost a standard for technical illustration)

The second section describes the steps necessary to create the corresponding drawings using Adobe Illustrator.

And now... have fun and create great graphics :-)

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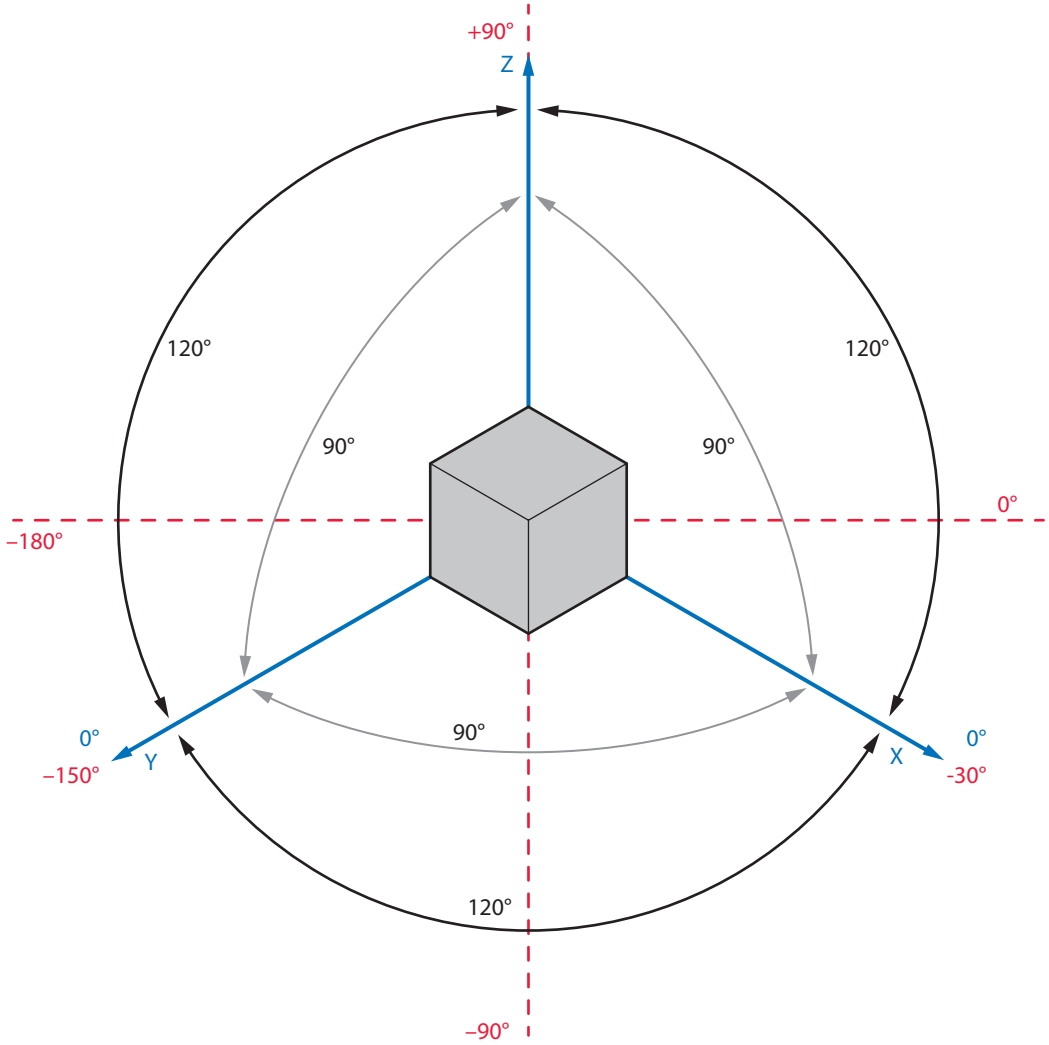
P.S.: English is not my native language, so any corrections are welcome...

1.1 Basics of Isometric Projection



Isometric projections are a two-dimensional drawing of three-dimensional objects, created by a parallel projection. Objects look like having a volume, without actually having one.

The main characteristics of an isometric projection are:

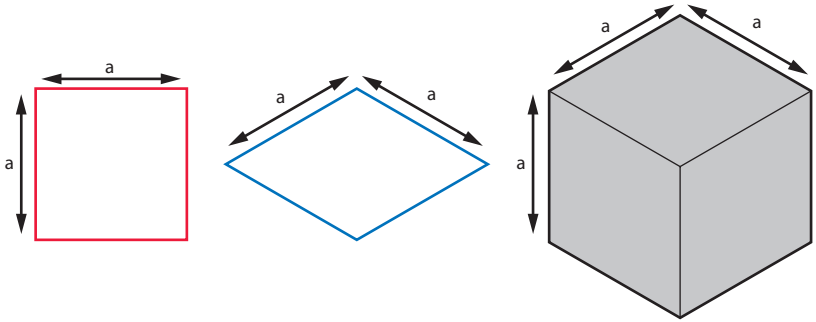
- there is no vanishing point
- lines that are parallel in reality will be parallel in the drawing
- same lenghts in reality will be drawn at the same length, without any shortening caused by a perspective view.

An isometric drawing is created along the axes representing the 3D space:

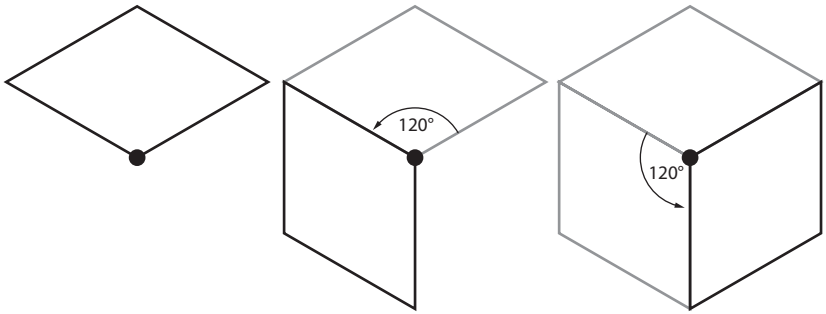
Red axes mark the 2D space (like a sheet of paper), as found in typical drawing applications (e.g. Adobe Illustrator, FreeHand). You'll find an axis named "x" and an axis named "y", drawn at their respective angles.

Blue axes mark the three dimensions (x, y, z) of 3D space. The angle between x/z, y/z and y/x is equivalent to 90° (in 3D space) and is drawn at 120° in 2D space (red).

Practically this results in two simple rules for drawing:



Dimension **a** (x, y) of the quadratic shape (red) can be directly used on the isometric axes x, y (blue).



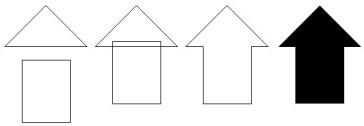
When the basic shape of the object (here: a cube) is drawn, the correspondig faces can simply be created by a double 120° rotation of the shape.

1.2 Isometric Projections using Illustrator

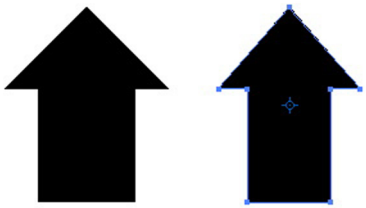
Isometric objects can be created out of 2D shapes using the **Distortion Tool**. Since this tool produces non-proportional distortions (resulting edges have different lengths), this error must be corrected by applying a known scaling factor before distorting the shape.

Flat Arrows

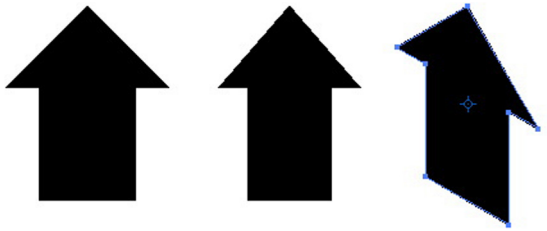
The following instructions apply to flat objects, that will be positioned on one of the three planes (x/y, y/z, y/x).



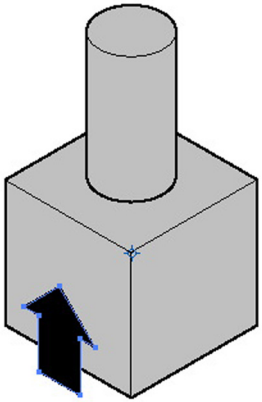
- Create the basic shape in top view



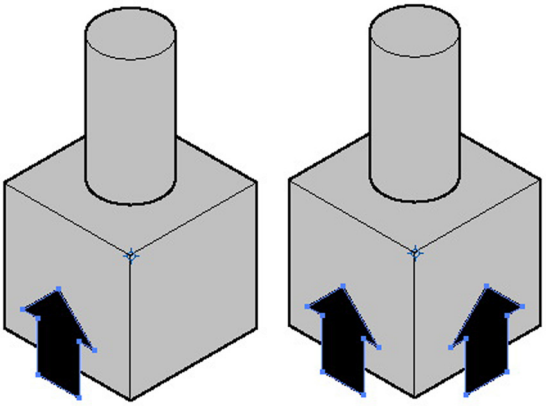
- Select the object and open the **Scale Tool** options. Enter a non-proportional scaling using a factor of 86,602% horizontally and 100% vertically.



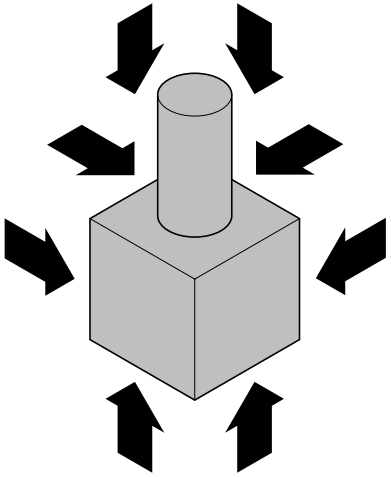
- Now select the **Distortion Tool**. Enter a distortion angle of 30° along the vertical axis. This setting means, that vertical lines are just moved vertically, while horizontal lines are tilt by 30°. Without the preceding scaling, the horizontal lines would get longer than the vertical lines at this moment.



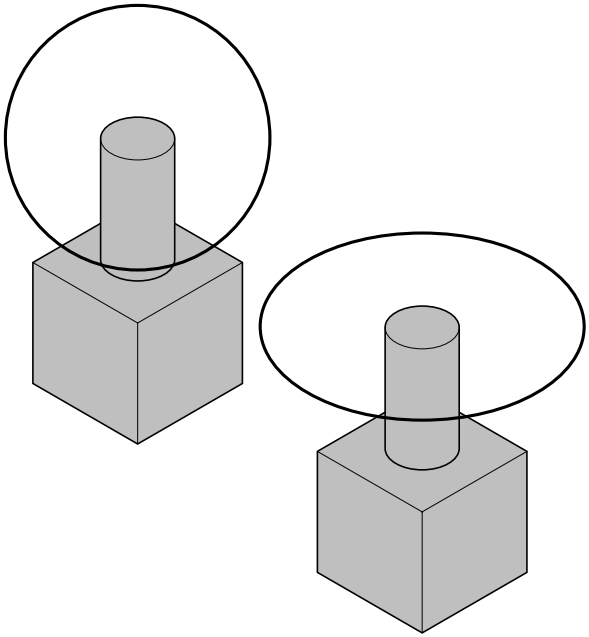
Finally you have created an arrow, which is correctly displayed as an isometric object, positioned in the x/z plane. This arrow fits to any other object, which is drawn as an isometric body.



- The easiest way to create an arrow within the y/z plane is mirroring a copy along the vertical axis.



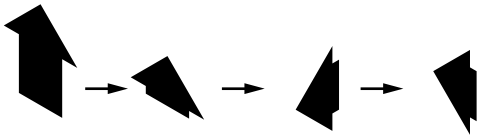
- If you rotate copies of these two arrows around 120°, you'll get a whole library of isometric arrows at various positions and directions. Missing arrows can now be created by further mirroring along the horizontal axis.



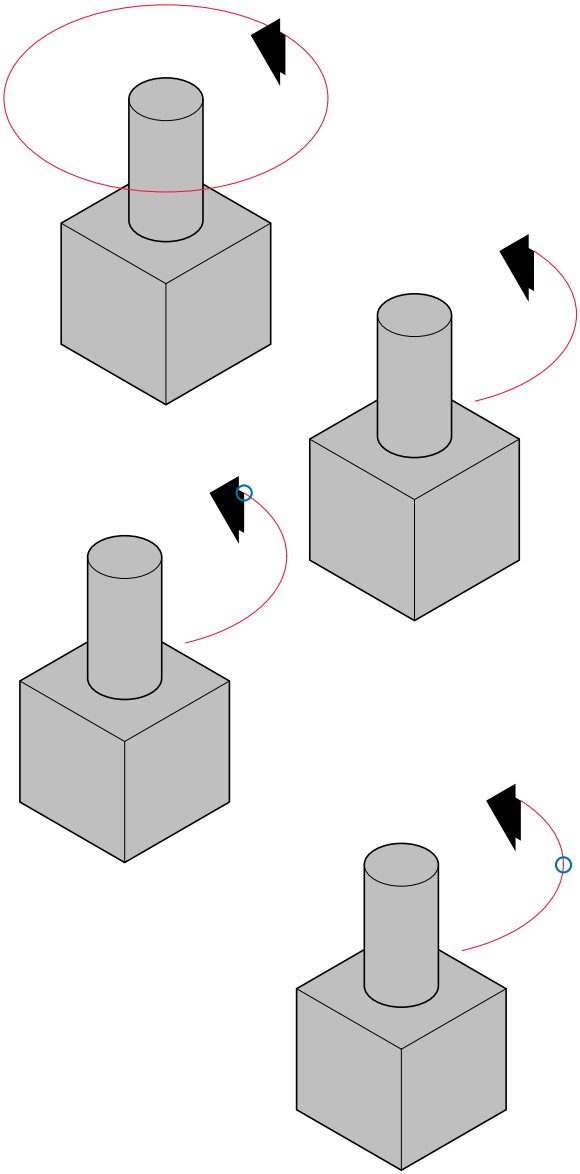
3D Arrows

Using the arrows as created before you can simply build arrows "moving" through 3D space. The following example demonstrates the rotation of a cylindrical object.

- Draw a circle with a radius, that's significantly larger than the cylindrical object's radius. Place the center of the circle onto the center of the upper cylinder face.
- Now create an isometric ellipse from the circle as described before (scale, distort, rotate).



- Copy an arrow (upright standing) from your newly created library and shorten its shaft by moving the endpoints upwards. Now rotate/mirror the resulting arrowhead as shown on the left.

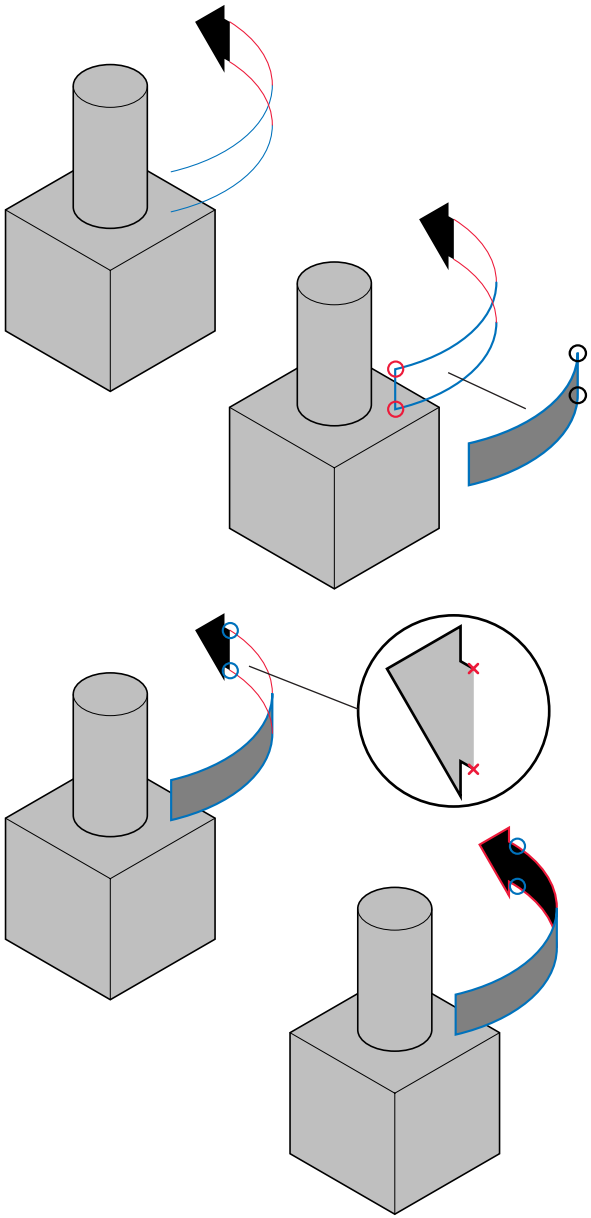


- Place the arrowhead onto the ellipse (shown in red). Try to match the directions of arrow and ellipse by choosing the appropriate position on the ellipse.

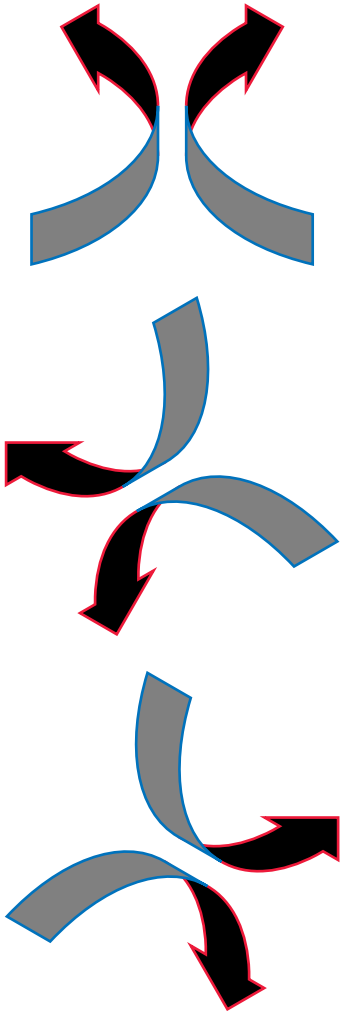
- Cut the ellipse as desired and delete the unecessary parts.

- Now place the corner point of the arrowhead **exactly** onto the ellipse's end point (blue) .

- Cut the remaining part of the ellipse again at the outmost (here: rightmost) point of the curve.



- Select both segments (shown in different colors for a better distinction) and move a **copy** to the lower corner point of the arrowhead, as shown on the left.
- Select both end points of the blue segments and **Join** them using the corresponding command. Close the other end of the new object as well.
- Assign any fill color to the new object.
- Now cut the arrow at the marked points and delete the segment between them (the arrow is no longer a closed shape).
- **Join** the end points of the arrow and the corresponding end points of the (red) ellipse parts.
- Assign a contour and fill color to the front part of the arrow.
- If necessary, move the parts of the arrow to the front or back.



As already done before, you may mirror (horizontally) and rotate (2 x 120°) the arrow in order to use it on different axes of the isometric 3d space.