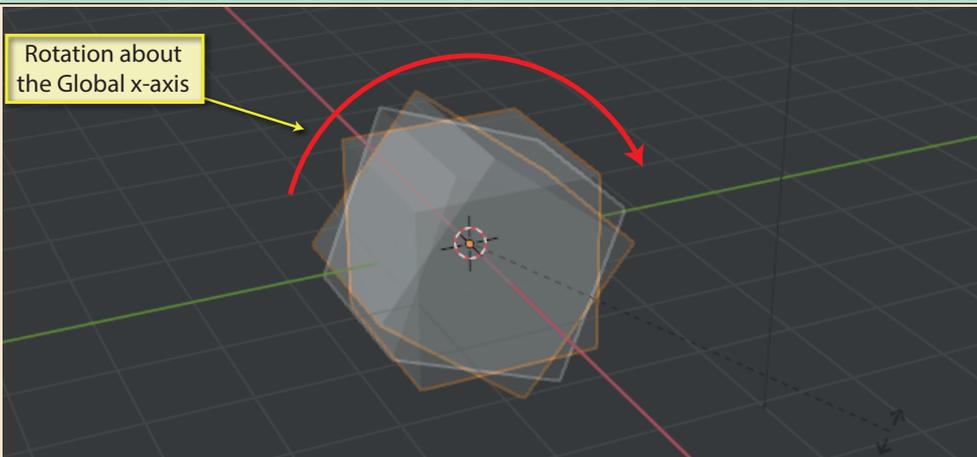## Object Rotation

We can rotate an object about any of the Global, Local, or View axes.
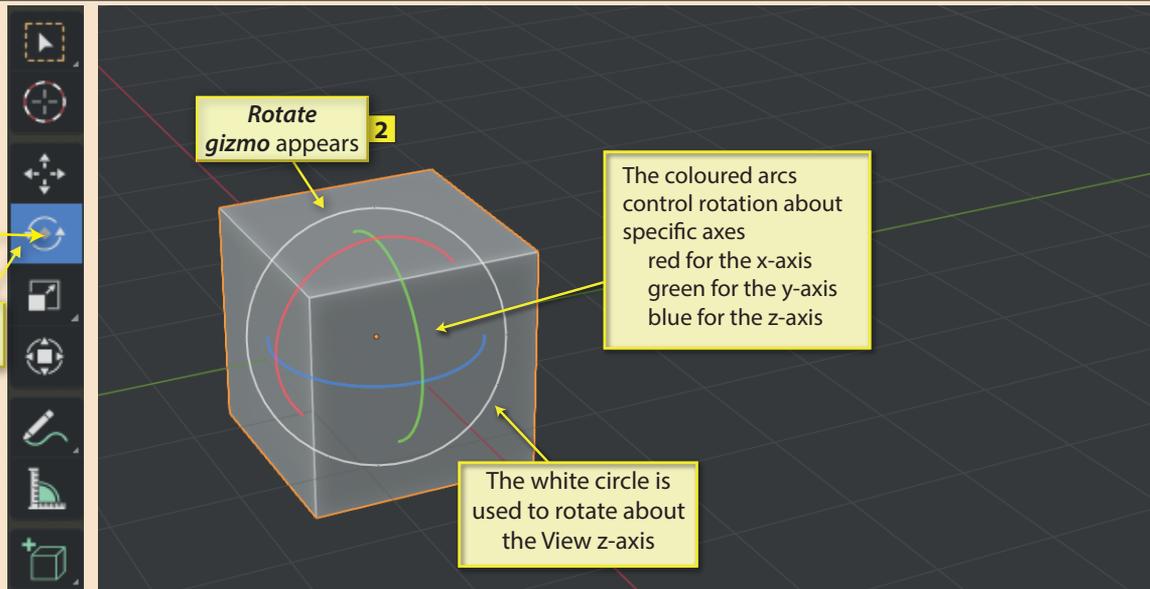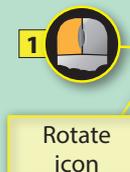
We can do freehand rotation, selecting the amount of rotation by eye, or we can be more exacting and enter the angle of rotation in degrees or radians of rotation.

There are several ways to initiate rotation with options to use an icon in the *Toolbar*, keyboard shortcuts, or to enter rotation angles directly.
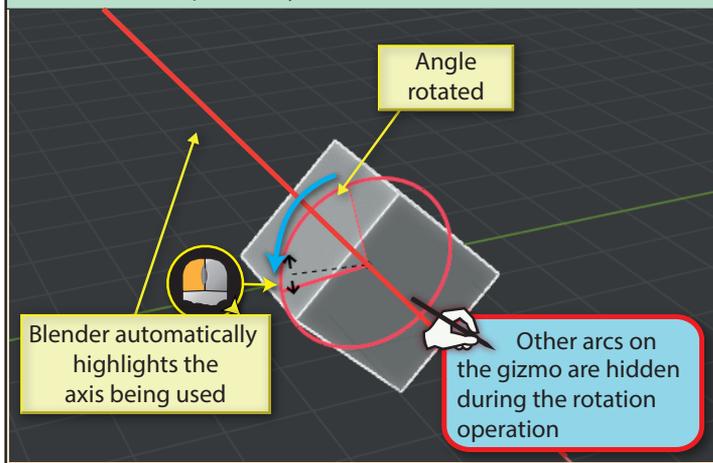
Rotation is one of the three fundamental operations that we can perform on an object. When rotating we must select the axes set: *Global*, *Local* or *View* (there are other options that can be ignored for the moment). Next we need to select which axis, *X*, *Y* or *Z*, we want to rotate about.
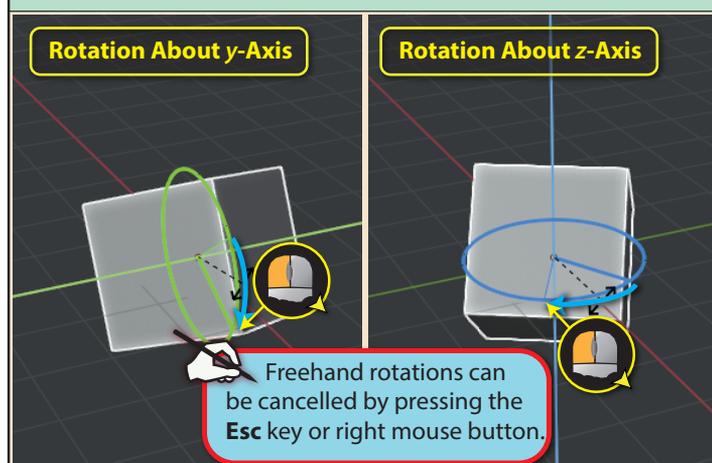
Rotation about the Global x-axis

In the *Toolbar* we have a **Rotate icon**. Clicking on this creates a **Rotation Gizmo** around the selected object centred on the object's origin.

1

Rotate icon

Rotate gizmo appears **2**

The coloured arcs control rotation about specific axes
red for the x-axis
green for the y-axis
blue for the z-axis

The white circle is used to rotate about the View z-axis

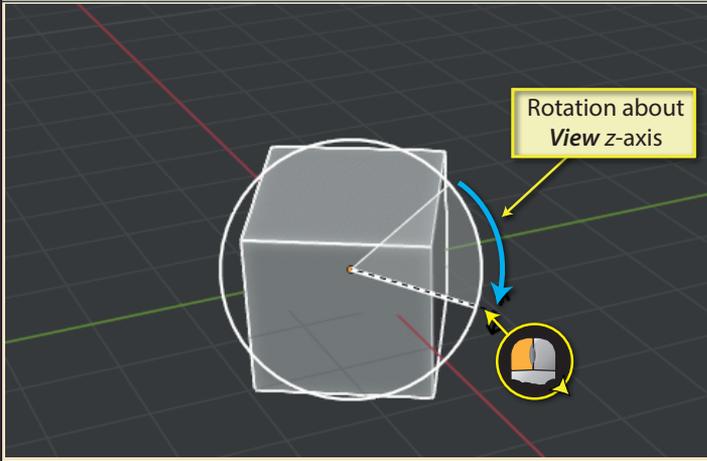Dragging the mouse pointer on one of the coloured arcs of the *Rotate gizmo* will rotate the object about the corresponding axis. For example, dragging on the red arc will rotate the Cube about the *x*-axis of the previously selected axes set.

Angle rotated

Blender automatically highlights the axis being used

Other arcs on the gizmo are hidden during the rotation operation

The effects of rotating about the Global *y*-axis and about the Global *z*-axis are shown in the two images below.

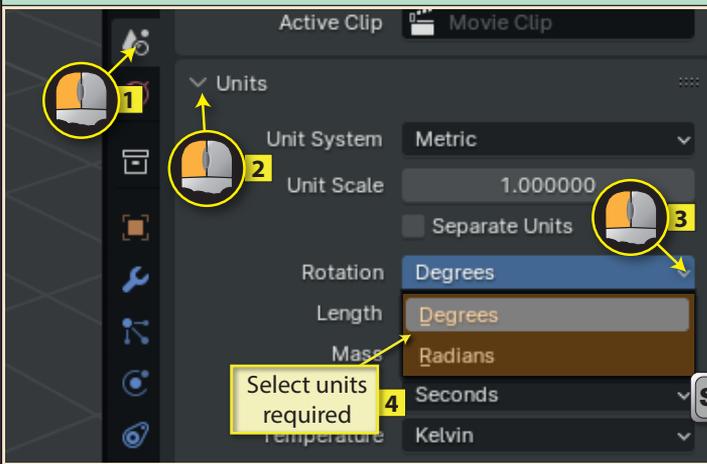**Rotation About *y*-Axis**

Rotation About *z*-Axis

Freehand rotations can be cancelled by pressing the **Esc** key or right mouse button.

Dragging on the white circle rotates the object about the *z*-axis of the *View axes* set.


Rotation about *View z*-axis

In the top-left of the *3D Viewport* the angle through which the object is rotating and the axes set being used is displayed. Note that this information is removed when the rotation operation is complete.

Rotation: −24.06 global

Angle

Axes set

No axes set is displayed when rotating about the View's z-axis
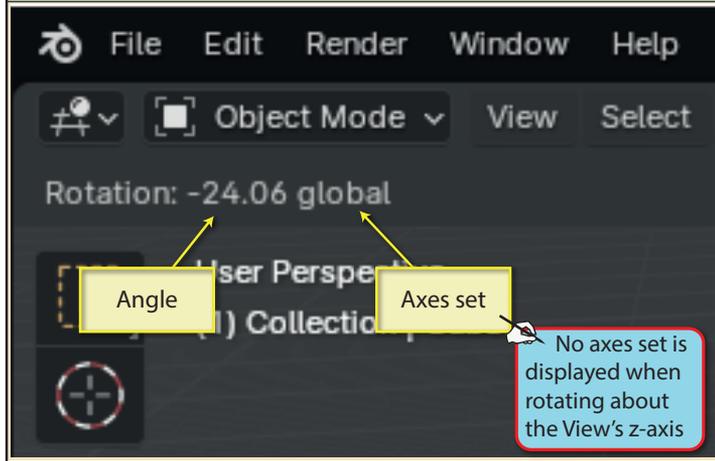
To switch between degrees and radians we need to go to the **Scene** page of the *Properties Editor*. Under the **Units** heading we find **Rotation** where we can select between *Degrees* and *Radians*.

Active Clip   Movie Clip

∨ Units   1

Unit System   Metric   2

Unit Scale   1.000000

            Separate Units   3

Rotation   Degrees

Length   Degrees

Mass   Radians

Select units required   4   Seconds

Temperature   Kelvin

There are two ways of adjusting the characteristics of the drag. Holding down **Shift** will dragging gives a much slower rotation. Holding down **Ctrl** forces rotation to increment in 5° steps.

Slower rotation

Ctrl +

Shift +

Rotation in 5° steps
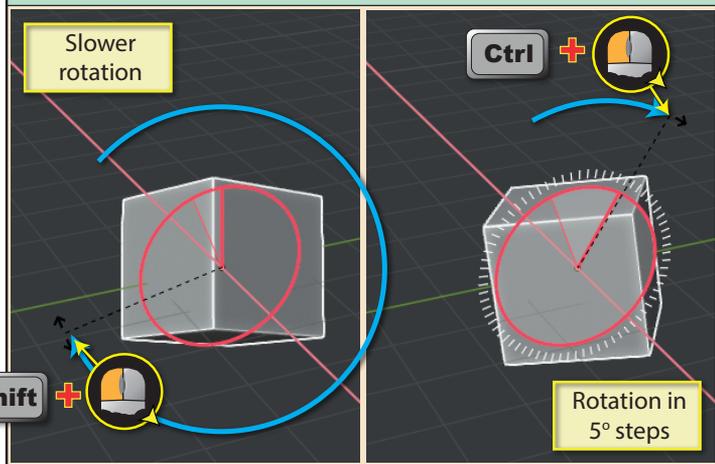
At the top-centre of the *3D Viewport* is the **Transform Orientation** setting. It's here that we get to select the axes set about which rotation is to take place. On most occasions we'll select either *Global* or *Local*.

Texture Paint   Shading   Animation   Rendering   Compositing

    Global

Transform Orientations

    Global   +
    Local
    Normal
    Gimbal
    View
    Cursor
    Parent

When the selected object has already been rotated, we'll see the arcs of the *Navigation* gizmo change orientation to match the currently selected axes set. In the example below, the Cube has already been rotated by 45° about the *Global x*-axis.

Transform Orientation ∨
Global

Transform Orientation ∨
Local
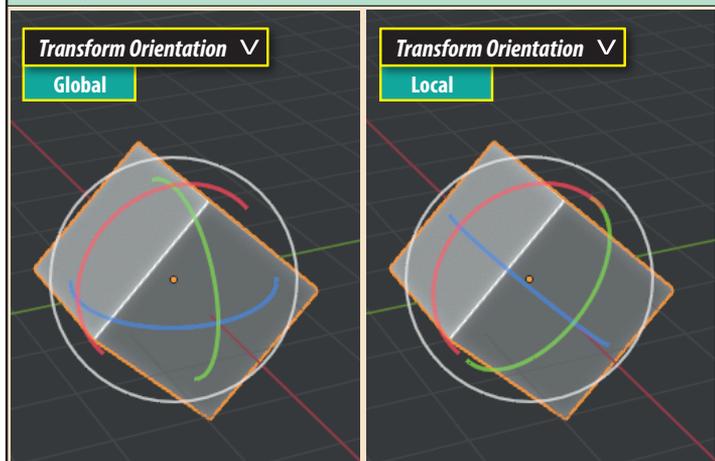
After completing the rotation the **Last Op panel** allows certain aspects of the rotation to be modified. For example, we can enter an exact angle of rotation or change which axis the rotation is about.

The other options here appear to have no effect.

On the **Item** page of the *Sidebar* (toggle using the **N** key), we can see the rotation of the selected objet about its *Global* axes. Note that there is no option for changing which axes set is displayed here.
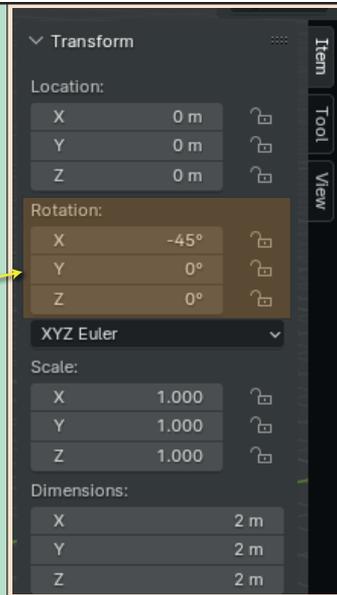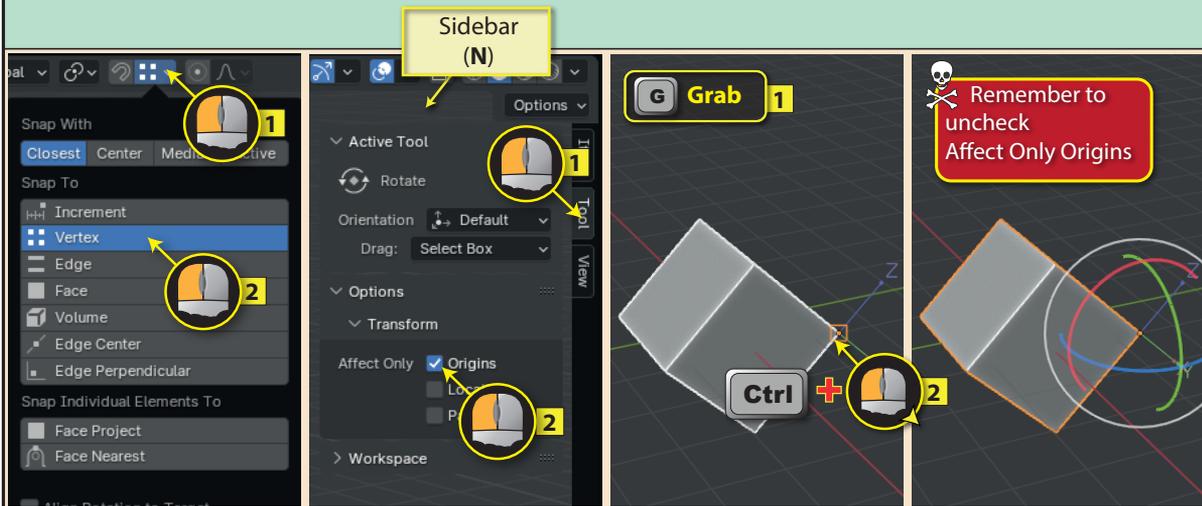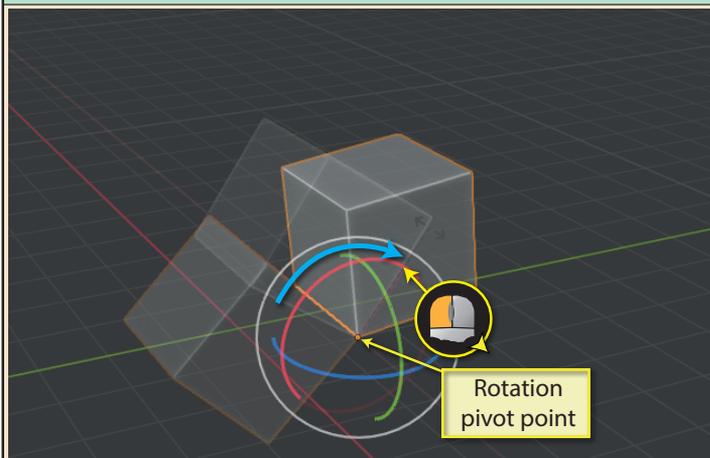
Rotation about each of the Global axes

Since an object's axes sets all have their origins at the origin of the object, if we move the object's origin, we also move the axes sets.

This, in turn, affects how an object rotates.

To demonstrate, we'll start by setting the Snap To option to Vertex and snap the origin to a vertex of the Cube.

Sidebar (**N**)

Snap With

Snap To
- Increment
- **Vertex**
- Edge
- Face
- Volume
- Edge Center
- Edge Perpendicular

Snap Individual Elements To
- Face Project
- Face Nearest

Active Tool — Rotate — Orientation Default — Drag: Select Box — Options — Transform — Affect Only ☑ Origins

G Grab **1**

Ctrl **2**

☠ Remember to uncheck Affect Only Origins

With the origin in one corner of the Cube, rotation pivots about that point.

Rotation pivot point

Rather than use the T*oolbar's Rotate* gizmo, we can initiate rotation by pressing the **R** key and then moving the mouse (with now buttons pressed) to cause rotation. Using this approach, rotation is always about the **View's z-axis**.

R Rotate **1**

The origin is at the centre of the Cube

Rotation is always about the *View's z-axis*
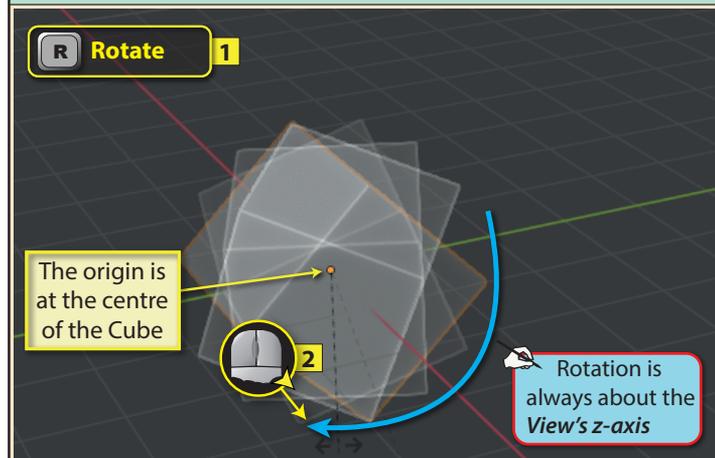
When we are rotating using the keyboard shortcut, pressing the left mouse button completes the rotation while pressing the right mouse button cancels the rotation, returning the object to its previous position.

Finish rotation

Cancel rotation

To rotate about the axes set specified in the *Transform Orientation* we need to follow the **R** key press by the axis letter: **X**, **Y** or **Z** before moving the mouse pointer.
If we enter more than one axis letter, it is the final one that is used.

R **X** **Rotate about the x-axis**

R **Y** **Rotate about the y-axis**

R **Z** **Rotate about the z-axis**

R **Y** **X** **Z** **Rotate about the z-axis**

We can also include an angle value which can be negative with the sign appearing either before or after the numeric value. We should complete the command by pressing the **Enter** key (or LMB).

R **Y** **3** **0** **Enter** **Rotate 30° about the y-axis**

R **Y** **-** **3** **0** **Enter** **Rotate -30° about the y-axis**

R **Y** **3** **0** **-** **Enter** **Rotate -30° about the y-axis**

We can enter the minus sign multiple times, with each entry switch the direction of rotation.

R **Y** **3** **0** **-** **Enter** **Rotate -30° about the y-axis**

R **Y** **3** **0** **-** **-** **Enter** **Rotate 30° about the y-axis**

R **Y** **3** **0** **-** **-** **-** **Enter** **Rotate -30° about the y-axis**

In fact, although we must always start with the **R** key press and finish with **Enter**, the other values can be given in almost any order. All of the examples below are valid with of rotating the selected object -30° about the y-axis.

R **Y** **3** **0** **-** **Enter**

R **3** **0** **Y** **-** **Enter**

R **-** **Y** **3** **0** **Enter**

If we enter the axis letter twice, rotation will be about the *Global* axes, irrespective of the setting in the *Transform Orientation*. There is only one exception to this...

Transform Orientation ∨
Local

R **X** **Rotation about Local x-axis**

R **X** **X** **Rotation about Global x-axis**

...if the *Transform Orientation* is already set to *Global*, then pressing the axis letter twice will cause rotation to be about the *Local* axis.
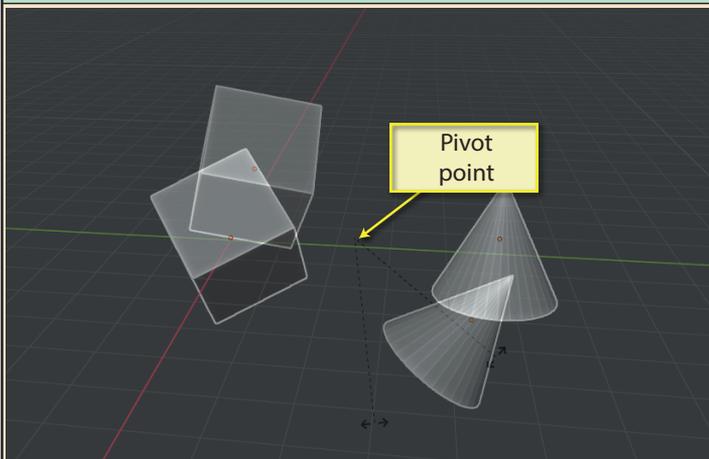
Transform Orientation ∨
Global

R **X** **Rotation about Global x-axis**

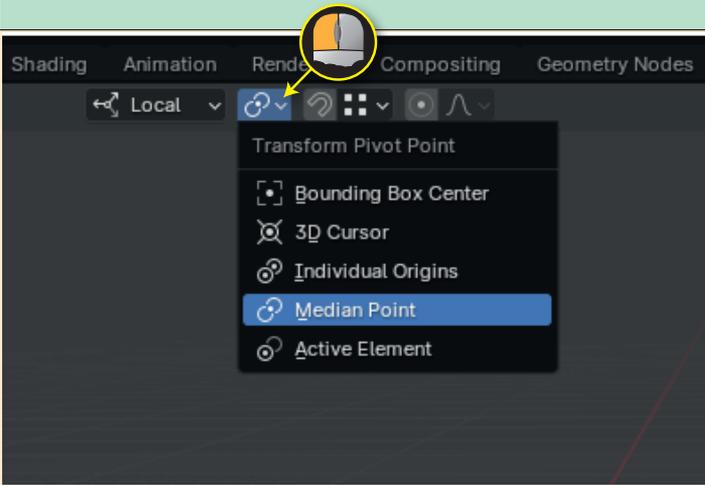**R** **X** **X** **Rotation about Local x-axis**

Trackball Rotation gives free rotation about all three axes and is initiated by pressing **R** twice. Rotation follows the position of the mouse pointer.


R R **Trackball Rotation**
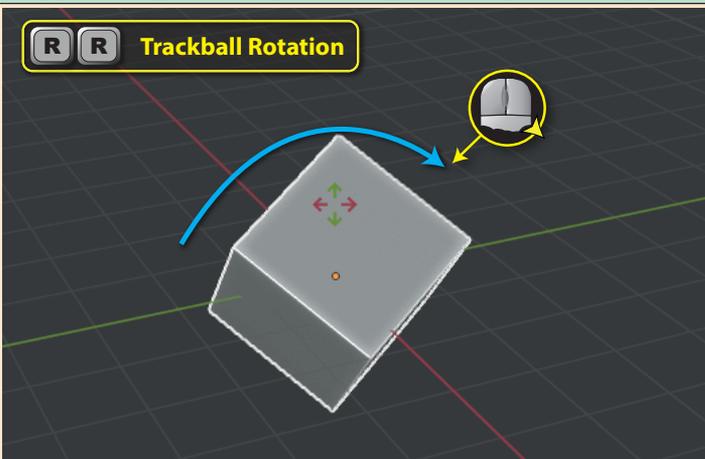
So far every rotation has been about the origin of the single selected object. But if we select more than one object, rotation is about a midpoint between the selected objects.


Pivot point

In fact, we can select the pivot point we want to use in the **Transform Pivot Point** setting which is specified in the field next to the *Transform Orientation*.


Shading   Animation   Rende   Compositing   Geometry Nodes

Local

Transform Pivot Point

⊡ Bounding Box Center
✕ 3D Cursor
⊙ Individual Origins
⊙ Median Point
⊙ Active Element

Bounding Box Center uses the centre of a bounding box which encloses the selected objects as the pivot point.

Transform Pivot Point ∨
Bounding Box Center

Bounding box when Cube and Cone selected

Pivot point is centre of bounding box
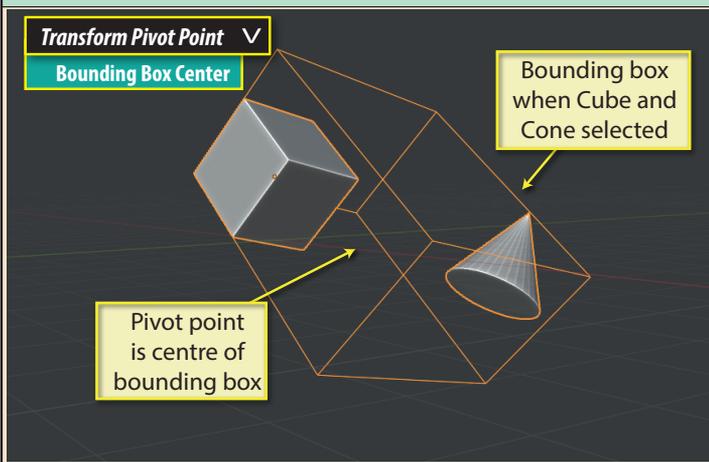
3D Cursor rotates the selected object(s) about the 3D cursor. In the image below, both the Cube and Cone are selected.

*Transform Pivot Point* ∨
3D Cursor

Rotation is about the 3D cursor
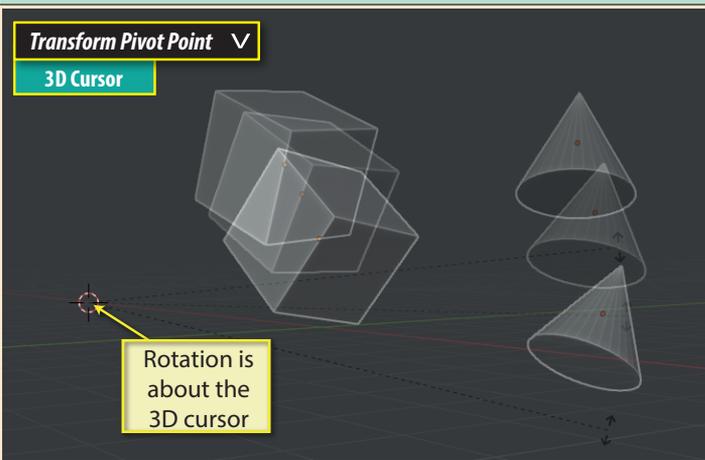
Individual Origins rotates each selected object about its own origin. In the image below, both the Cube and Cone are selected.


Transform Pivot Point ∨
Individual Origins

Pivot point

Pivot point
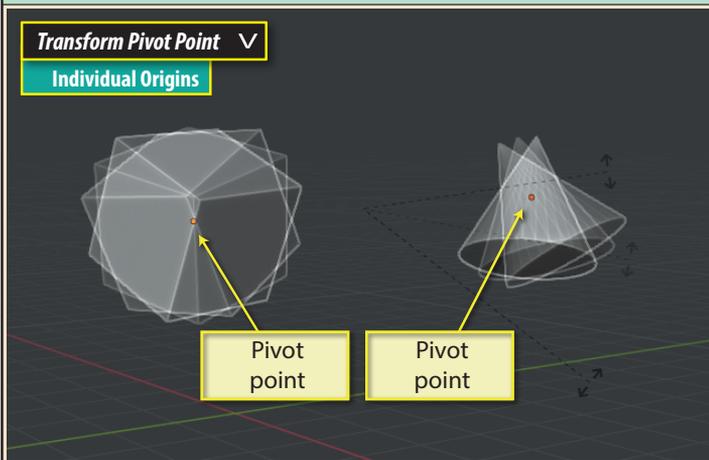
Median Point rotates the selected objects about a point which is the average of their separate origins' coordinates.

Transform Pivot Point ∨
Median Point

Pivot point
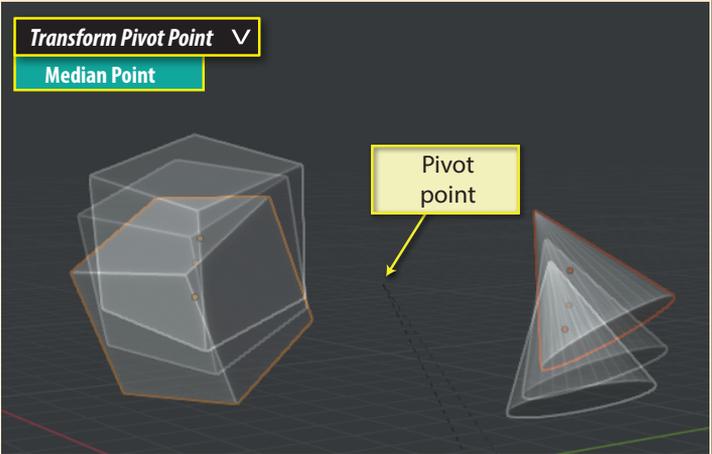
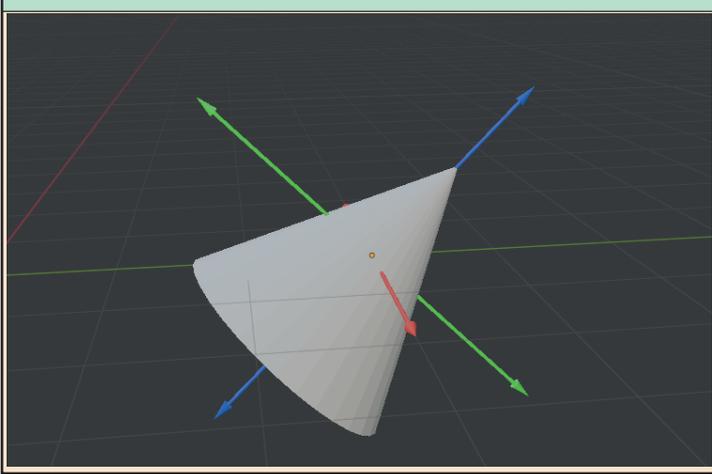**Active Element** rotates all selected objects about the origin of the active object (usually the last object to be selected).

Transform Pivot Point ∨
Active Element

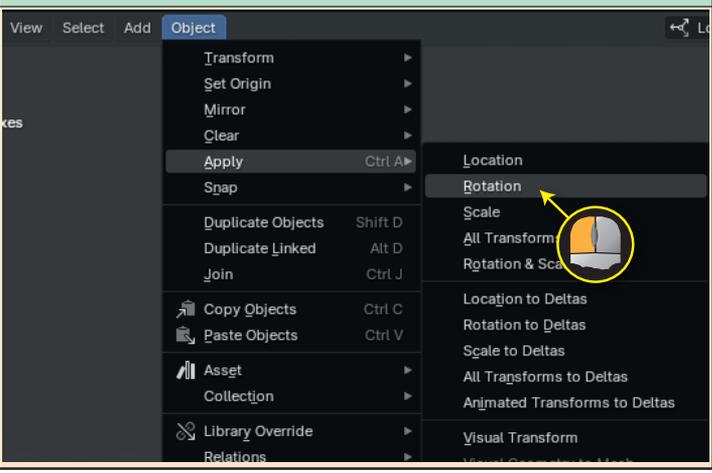Pivot point

Cube is active object
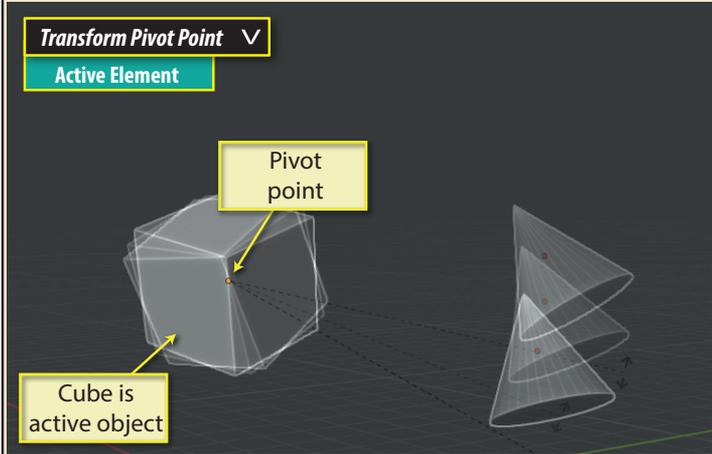
Alt R will reset the rotation of all the selected onbjects to zero. This can prove more useful than **Ctrl Z** which only undoes the last command to be executed.

Before

Alt R Undo all Rotation

After
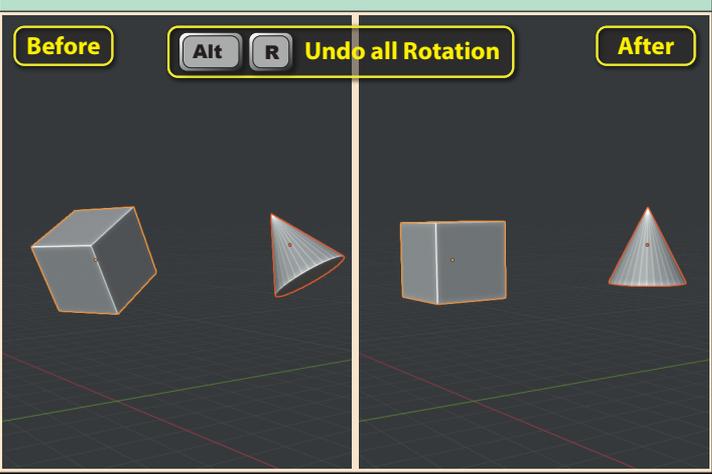
When an object is rotated, its Local axes rotate along with it.

In the **3D Viewport's Object menu** heading there is an *Apply>Rotation* option.

View Select Add Object

Transform
Set Origin
Mirror
Clear
Apply   Ctrl A ▸   Location
Snap   Rotation
Duplicate Objects   Shift D   Scale
Duplicate Linked   Alt D   All Transform
Join   Ctrl J   Rotation & Sca
Copy Objects   Ctrl C   Location to Deltas
Paste Objects   Ctrl V   Rotation to Deltas
Asset   Scale to Deltas
Collection   All Transforms to Deltas
Library Override   Animated Transforms to Deltas
Relations   Visual Transform

Using this option, resets the selected object's **Local** axes to realign with the **Global** and **World** axes as well as reseting the rotation values of the object to zero. In effect, this tells Blender that the current orientation is to be the starting point for the object.

Object
Apply
Rotation

Local axes alignment reset

∨ Transform
Rotation values reset to zero
Location:
X   0 m
Y   3 m
Z   0 m
Rotation:
X   0°
Y   0°
Z   0°
XYZ Euler
Scale:
X   1.000