

Job No: 04**Duration:** 28H**Job Title:** 2D and 3D Objects**Objective:**

To create and transform 3D primitive objects and 2D shapes objects

Students should be able to create and manipulate the following elements:

- Object Types
- Creating Primitives
- Transforms
- Transform Gizmo
- Pivot Points
- Object Naming
- Object Selection

Introduction:

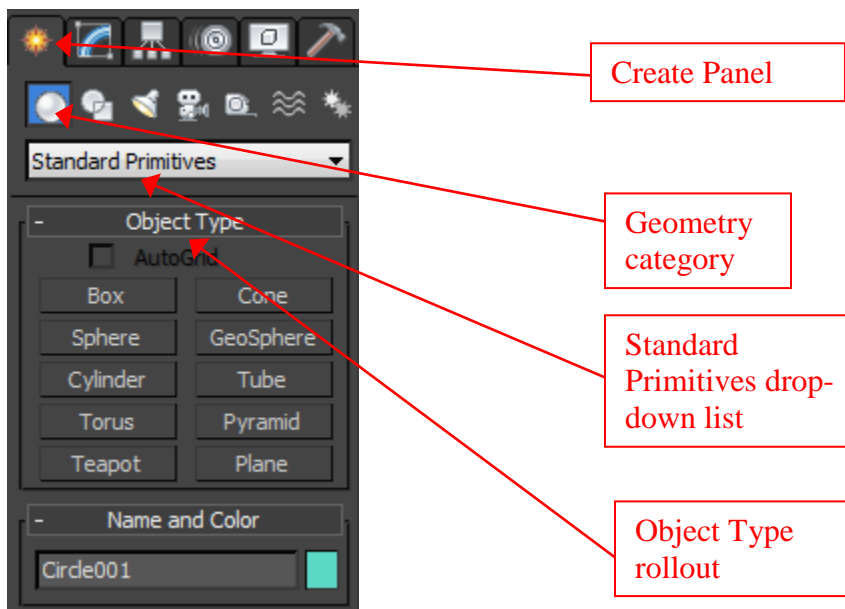
3ds Max has a good selection of 3D primitive objects and 2D shapes for basis modeling of more complex objects. Most of these are classified as parametric objects, they have a number of parameters that can be adjusted during creation or modified later, such as radius, height, or number of segments. This important concept of working with parametric objects is a key to efficient and flexible editing.

In this jobsheets, students will learn the very basic steps of creating both 3D and 2D objects in 3ds Max and will have the opportunity to practice the hand – eye coordination required for the first few times objects creation.

Object Types:

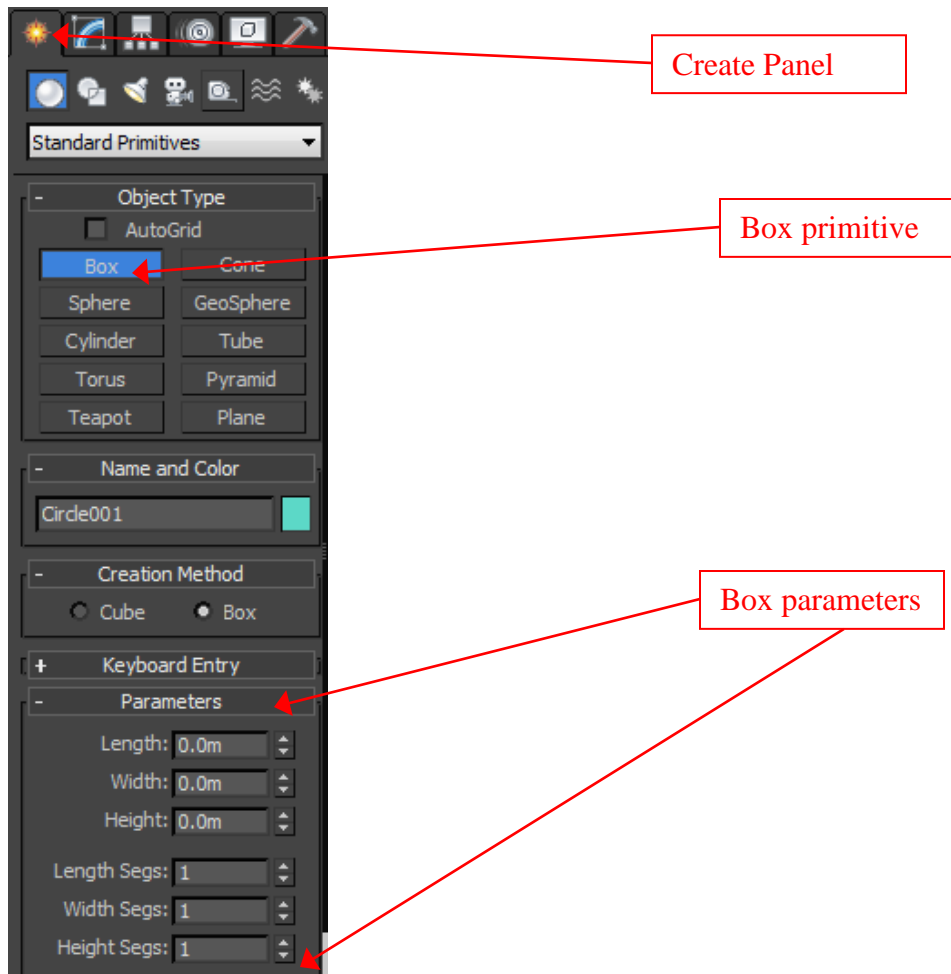
In this section, students will have a look at some of the common object types usually used as a starting point for more complex 3D models. The intent at this point is to learn where the objects are located in the user interface and the actions required to creating objects in a scene.

- 1) The default command panel is set to the Create panel with the Geometry category selected. Standard Primitives is active in the drop-down list and the object type rollout displays 10 buttons containing '3D' object types



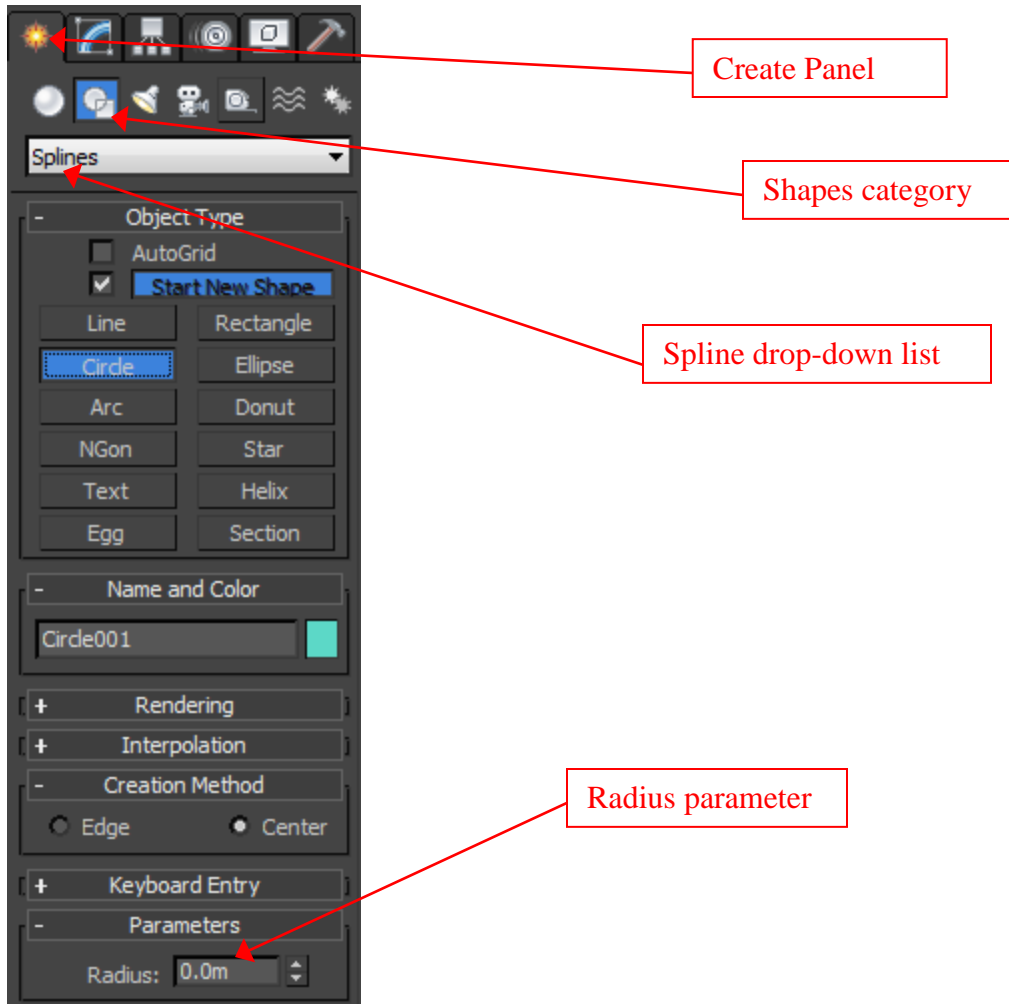
3D objects are created from the create panel, Geometry category.

- 2) In the object type rollout, click the Box primitive button and notice a list of parameters that appear in the parameters rollout below. A box primitive is defined by the length, width, height, and a number of segments in each direction.



A Box primitive has several parameters.

- 3) Click on the other standard primitive buttons in the object type rollout and observe the parameters associated with each object.
- 4) In the create panel, click the shapes category button to the right of geometry in the second row. The object type rollout, below a drop-down list named splines, now displays 12 buttons that will allow you to create 2D shape primitives. Click on the circle shape button and the only parameter associated with the circle is radius.



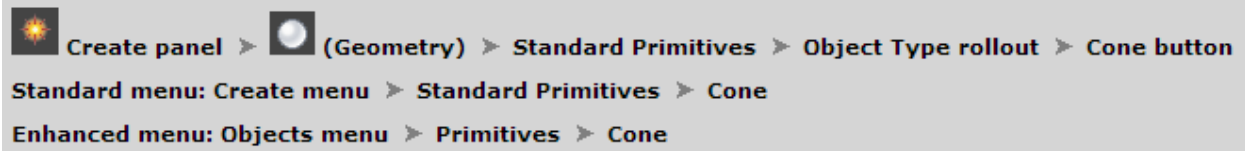
2D shapes are created from the create panel, shapes category

The create panel is the only command panel with a second row of category buttons where you can switch from a variety of object categories. The Geometry category contains 3D primitive objects whereas the shapes category contains 2D shapes.

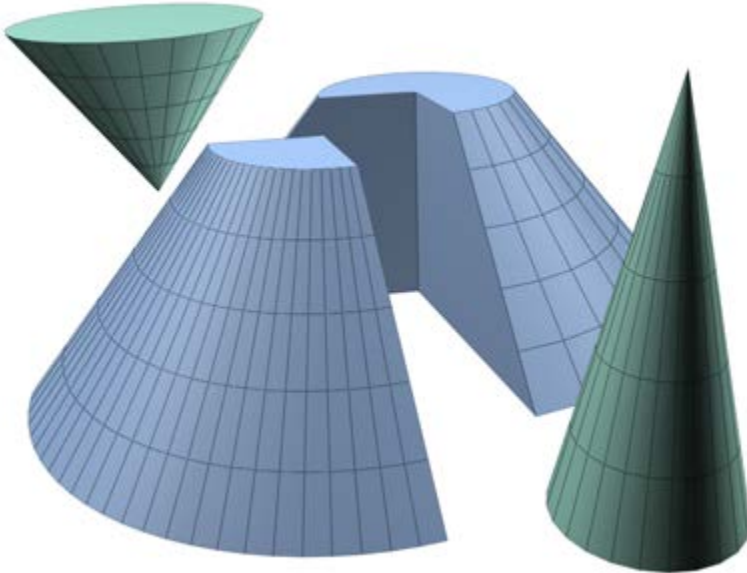
Creating Primitives:

Each primitive object type that you want to create in 3ds Max has a specific process of defining the parameters through a series of clicking and dragging the cursor in a viewport to define the object in 2D or 3D space.

Cone Primitive



The Cone button on the Creation command panel lets you produce round cones, either upright or inverted.



Examples of cones

Procedures

To create a cone:

1. On the Create menu choose Standard Primitives > Cone.
2. In any viewport, drag to define a radius for the base of the cone, then release to set it.
3. Move to up or down to define a height, either positive or negative, then click to set it.
4. Move to define a radius for the other end of the cone. Decrease this radius to 0 for a pointed cone.
5. Click to set the second radius and create the cone.

Interface

Creation Method rollout

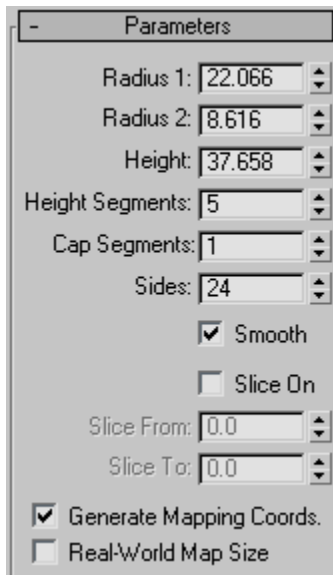
Edge

Draws a cone from edge to edge. You can change the center location by moving the mouse.

Center

Draws a cone from the center out.

Parameters rollout



The defaults produce a smooth, round cone of 24 sides with five height segments, one cap segment, and the pivot point at the center of the base. For improved rendering of smoothly shaded cones, particularly those with pointed tips, increase the number of height segments.

Radius 1, Radius 2

Set the first and second radii for the cone. The minimum value for both is 0.0. If you enter a negative value, 3ds Max converts it to 0.0. You can combine these settings to create pointed and flat-topped cones, upright or inverted. The following combinations assume a positive height:

Radius Combinations	Effect
Radius 2 is 0	Creates a pointed cone
Radius 1 is 0	Creates an inverted pointed cone
Radius 1 is larger than Radius 2	Creates a flat-topped cone
Radius 2 is larger than Radius 1	Creates an inverted flat-topped cone

If Radius 1 and 2 are the same, a cylinder is created. If the two radius settings are close in size, the effect is similar to applying a Taper modifier to a cylinder.



Effect of Radius settings

Height

Sets dimension along the central axis. Negative values create the cone below the construction plane.

Height Segments

Sets the number of divisions along the cone's major axis.

Cap Segments

Sets the number of concentric divisions around the center of the cone's top and bottom.

Sides

Sets the number of sides around the cone. Higher numbers shade and render as true circles with Smooth selected. Lower numbers create regular polygonal objects with Smooth off.

Smooth

Blends the faces of the cone, creating a smooth appearance in rendered views.

Slice On

Enables the Slice function. Default=off.

When you create a slice and then turn off Slice On, the complete cone reappears. You can use this checkbox to switch between the two topologies.

Slice From, Slice To

Sets the number of degrees around the local Z axis from a zero point at the local X axis.

For both settings, positive values move the end of the slice counterclockwise; negative values move it clockwise. Either setting can be made first. When the ends meet, the whole cone reappears.

Generate Mapping Coords

Generates coordinates for applying mapped materials to the cone. Default=on.

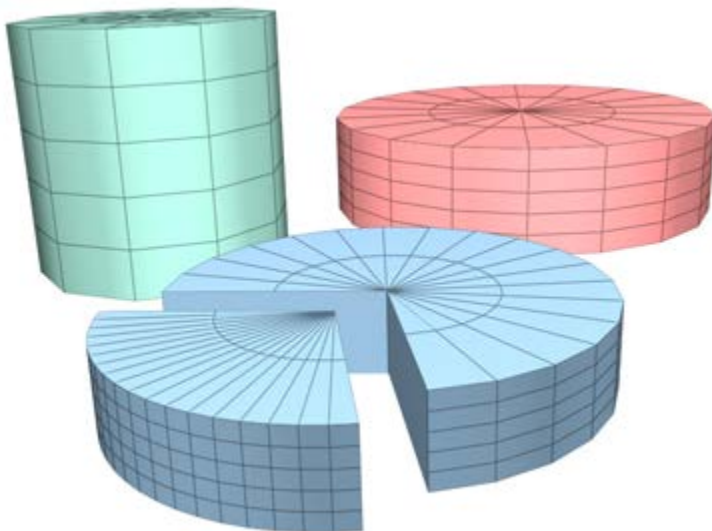
Real-World Map Size

Controls the scaling method used for texture mapped materials that are applied to the object. The scaling values are controlled by the Use Real-World Scale settings found in the applied material's [Coordinates rollout](#). Default=off.

Cylinder Primitive



Cylinder produces a cylinder, which you can "slice" around its major axis.



Examples of cylinders

Procedures

To create a cylinder:

1. On the Create panel, choose Standard Primitives > Cylinder.
2. In any viewport, drag to define the radius of the base, then release to set the radius.
3. Move up or down to define a height, either positive or negative.
4. Click to set the height and create the cylinder.

Interface

Creation Method rollout

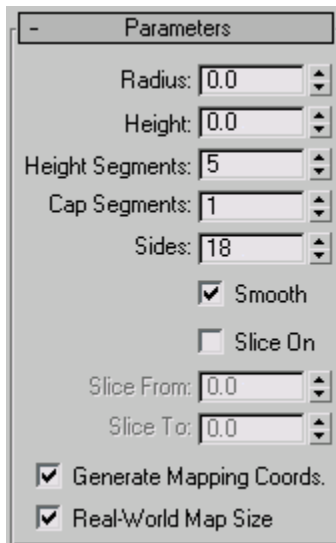
Edge

Draws a cylinder from edge to edge. You can change the center location by moving the mouse.

Center

Draws a cylinder from the center out.

Parameters rollout



The defaults produce a smooth cylinder of 18 sides with the pivot point at the center of the base. There are five height segments and one cap segment. If you don't plan to modify the cylinder's shape, such as with a Bend modifier, set Height Segments to 1 to reduce scene complexity. If you plan to modify the ends of the cylinder, consider increasing the Cap Segments setting.

Radius

Sets the radius of the cylinder.

Height

Sets the dimension along the central axis. Negative values create the cylinder below the construction plane.

Height Segments

Sets the number of divisions along the cylinder's major axis.

Cap Segments

Sets the number of concentric divisions around the center of the cylinder's top and bottom.

Sides

Sets the number of sides around the cylinder. With Smooth on, higher numbers shade and render as true circles. With Smooth off, lower numbers create regular polygonal objects.

Smooth

The faces of the cylinder are blended together, creating a smooth appearance in rendered views.

Slice On

Enables the Slice function. Default=off.

When you create a slice and then turn off Slice On, the complete cylinder reappears. You can use this checkbox to switch between the two topologies.

Slice From, Slice To

Sets the number of degrees around the local Z axis from a zero point at the local X axis.

For both settings, positive values move the end of the slice counterclockwise; negative values move it clockwise. Either setting can be made first. When the ends meet, the whole cylinder reappears.

Generate Mapping Coords

Generates coordinates for applying mapped materials to the cylinder. Default=on.

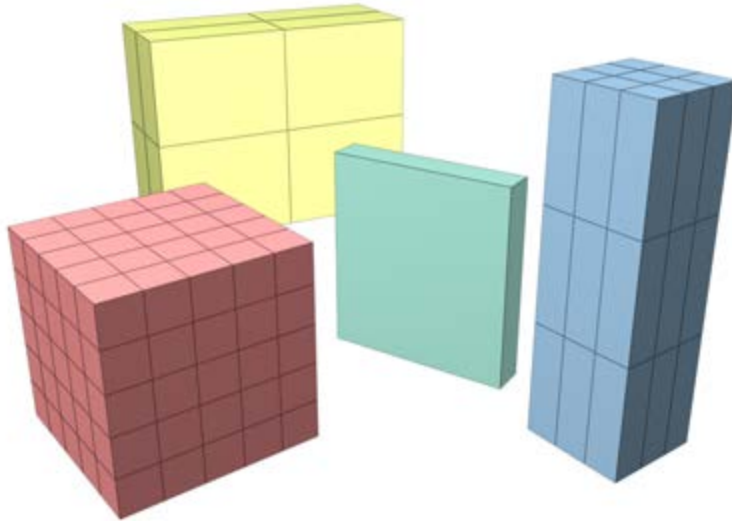
Real-World Map Size

Controls the scaling method used for texture mapped materials that are applied to the object. The scaling values are controlled by the Use Real-World Scale settings found in the applied material's [Coordinates rollout](#). Default=off.

Box Primitive



Box produces one of the simplest of the primitives. Cube is the only variation of Box. However, you can vary the scale and proportions to make many different kinds of rectangular objects, from large, flat panels and slabs to tall columns and small blocks.



Examples of boxes

Interface

Creation Method rollout

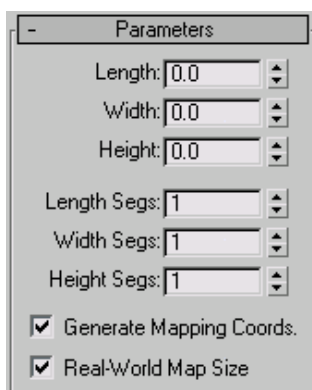
Cube

Forces length, width, and height to be equal. Creating a cube is a one-step operation. Starting at the center of the cube, drag in a viewport to set all three dimensions simultaneously. You can change a cube's individual dimensions in the Parameters rollout.

Box

Creates a standard box primitive from one corner to the diagonally opposite corner, with different settings for length, width, and height.

Parameters rollout



The defaults produce a box with one segment on each side.

Length, Width, Height

Sets the length, width, and height of the Box object. These fields also act as readouts while you drag the sides of the box. Default=0,0,0.

Length, Width, Height Segments

Sets the number of divisions along each axis of the object. Can be set before or after creation. By default, each side of the box is a single segment. When you reset these values, the new values become the default during a session. Default=1,1,1.

Tip Increase the Segments settings to give objects extra resolution for being affected by modifiers. For example, if you're going to [bend](#) a box on the Z axis, you might want to set its Height Segments parameter to 4 or more.

Generate Mapping Coords

Generates coordinates for applying mapped materials to the box. Default=on.

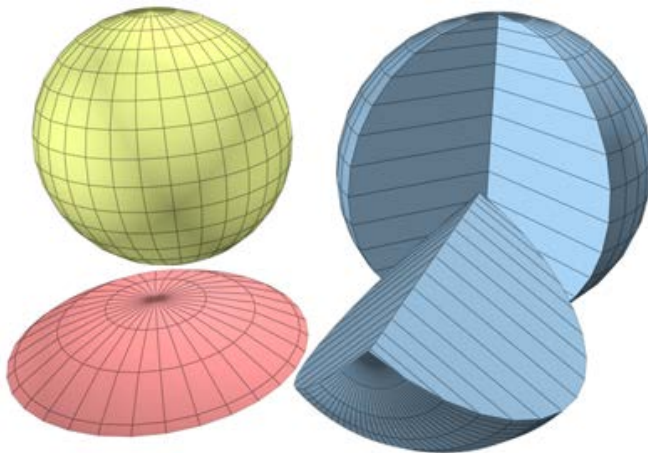
Real-World Map Size

Controls the scaling method used for texture mapped materials that are applied to the object. The scaling values are controlled by the Use Real-World Scale settings found in the applied material's [Coordinates rollout](#). Default=off.

Sphere Primitive



Sphere produces a full sphere, or a hemisphere or other portion of a sphere. You can also "slice" a sphere about its vertical axis.



Examples of spheres

Procedures

To create a sphere:

1. On the Create menu choose Standard Primitives ► Sphere.
2. In any viewport, drag to define a radius.
As you drag, a sphere emerges with its center at the pivot point.
3. Release the mouse to set the radius and create the sphere.

To create a hemisphere:

You can reverse the order of the following steps, if you like.

1. Create a sphere of desired radius.
2. Type **0.5** in the Hemisphere field.

The sphere is reduced to exactly the upper half, a hemisphere. If you use the spinner, the sphere changes in size.

Interface

Creation Method rollout

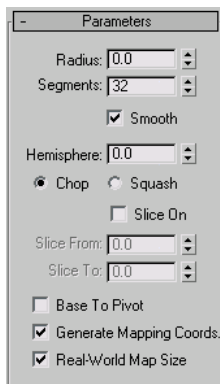
Edge

Draws a sphere from edge to edge. You can change the center location by moving the mouse.

Center

Draws a sphere from the center out.

Parameters rollout



The defaults produce a smooth sphere of 32 segments with the pivot point at its center.

Radius

Specifies the radius of the sphere.

Segments

Sets the number of polygonal divisions for the sphere.

Smooth

Blends the faces of the sphere, creating a smooth appearance in rendered views.

Hemisphere

Increasing values progressively will "cut off" the sphere, starting at the base, to create a partial sphere. Values range from 0.0 to 1.0. The default is 0.0, producing a full sphere. A setting of 0.5 produces a hemisphere, and 1.0 reduces the sphere to nothing. Default=0.0.

Chop and Squash toggle creation options for Hemisphere.

Chop

Reduces the number of vertices and faces in the sphere by "chopping" them out as the hemisphere is cut off. Default=on.

Squash

Maintains the number of vertices and faces in the original sphere, "squashing" the geometry into a smaller and smaller volume toward the top of the sphere.



Effects of Chop and Squash during hemisphere creation

Slice On

Uses the From and To angles to create a partial sphere. The effect is similar to lathing a semicircular shape fewer than 360 degrees.

Slice From

Sets the start angle.

Slice To

Sets the stop angle.

For both settings, positive values move the end of the slice counterclockwise; negative values move it clockwise. Either setting can be made first. When the ends meet, the whole sphere reappears.

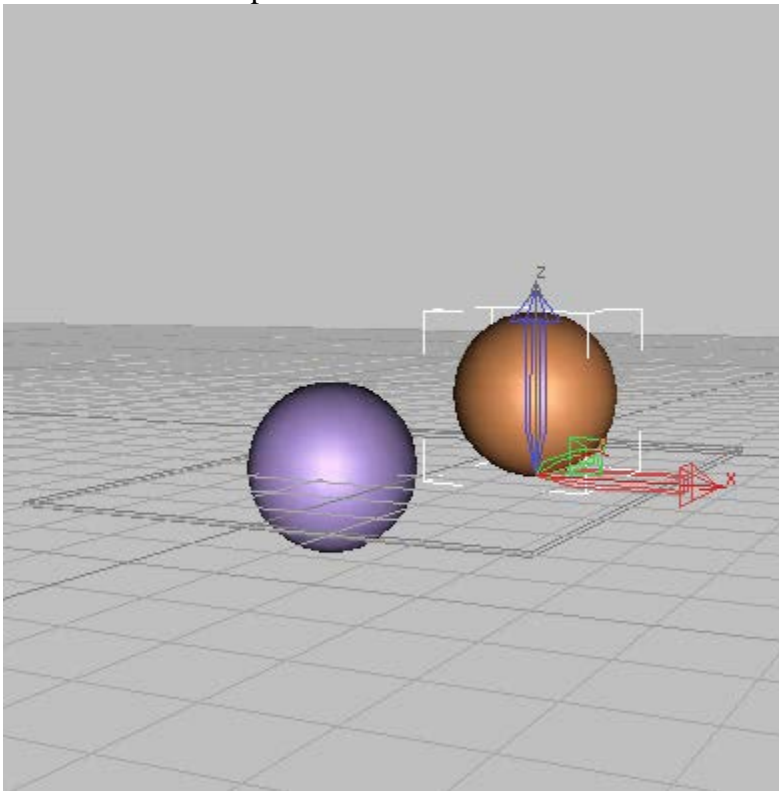
Smoothing groups are assigned to sliced spheres as follows: The surface of the sphere is always assigned group 1; the bottom, when Smooth is on, gets group 2. Facing the pie-slice surfaces, the cut on the left gets group 3, and the cut on the right gets group 4.

Material IDs are assigned to sliced spheres as follows: The bottom is 1 (when Hemisphere is greater than 0.0), the surface is 2, and the slice surfaces are 3 and 4.

Base To Pivot

Moves a sphere upward along its local Z axis so the pivot point is at its base. When off, the pivot point is on the construction plane at the center of the sphere. Default=off.

Turning on Base To Pivot lets you place spheres so they rest on the construction plane, like pool balls on a table. It also lets you animate a hemisphere so it appears to grow out of the construction plane or sink into it.



Effect of using Base To Pivot setting

Generate Mapping Coords

Generates coordinates for applying mapped materials to the sphere. Default=on.

Real-World Map Size

Controls the scaling method used for texture mapped materials that are applied to the object. The scaling values are controlled by the Use Real-World Scale settings found in the applied material's [Coordinates rollout](#). Default=off.

Transforms:

Move, Rotate, and Scale are the three transforms in 3ds Max, which allow to position, orientate, and size the objects in 3D space. In this chapter, students will learn how to use the “transform gizmos” to move and rotate the objects in the scene. Accuracy in moving and rotating objects will not be important for now, but instead focus on restricting transformations to either one axis or multiple axis.

When you create any object, 3ds Max records its position, rotation, and scale information in an internal table called a transformation matrix. Subsequent position, rotation, and scale adjustments are called [transforms](#).



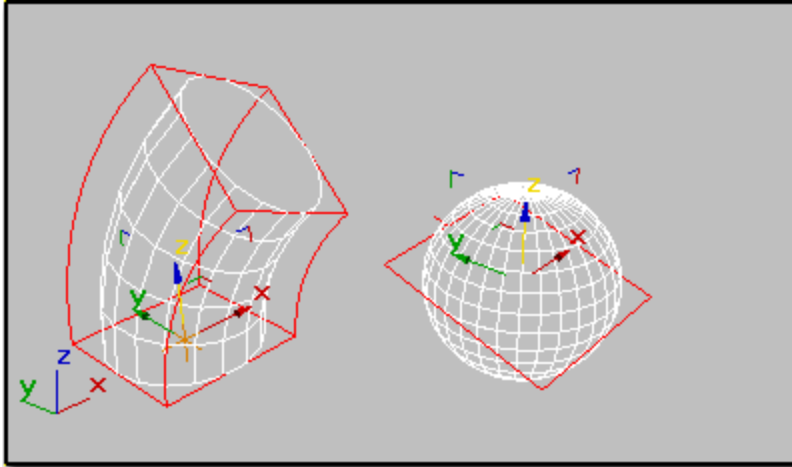
Moving, rotating, and scaling a figure

An object's actual position within the world coordinate system is always calculated in relation to its internal, or local coordinate system, which is based on the object's transformation matrix. The origin of the local coordinate system is the center of the object's [bounding box](#).

An object can carry any number of modifiers, but only one set of transforms. Although you can change transform values from frame to frame, each object always has only one position, one rotation, and one scale transform.

Transform Gizmo:

A *gizmo* is geometry that appears in viewports, but not in the scene. You manipulate a gizmo to modify the scene geometry or other effects. There are gizmos for [transforms](#), [modifiers](#), [atmospheric apparatus](#), and some directly modifiable geometry such as [spotlight cones](#). See [Gizmos Preferences](#).

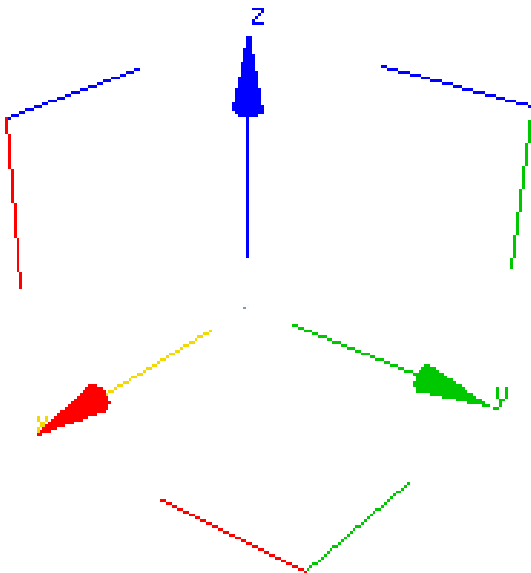


Examples of gizmos:

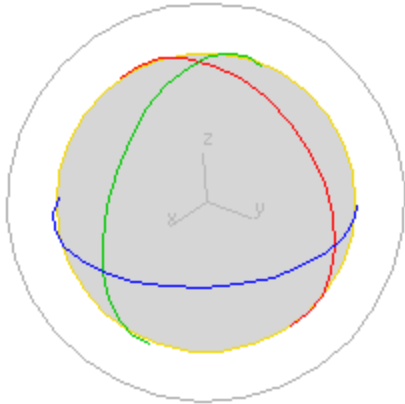
Left: Gizmo for a Bend modifier

Right: Gizmo for UVW mapping

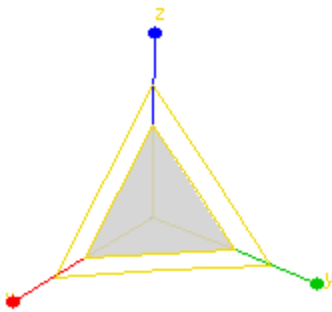
A [gizmo](#) that is displayed in viewports and provides a visual aid when you transform objects.



Move gizmo



Rotate gizmo

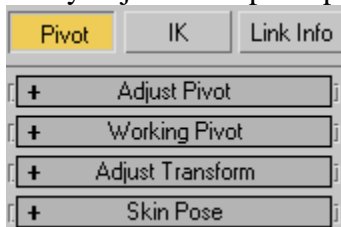


Scale gizmo

Pivot Points:

Make a selection in the viewport. >  Hierarchy panel > Pivot button

Every object has a pivot point that represents its local center and local coordinate system.



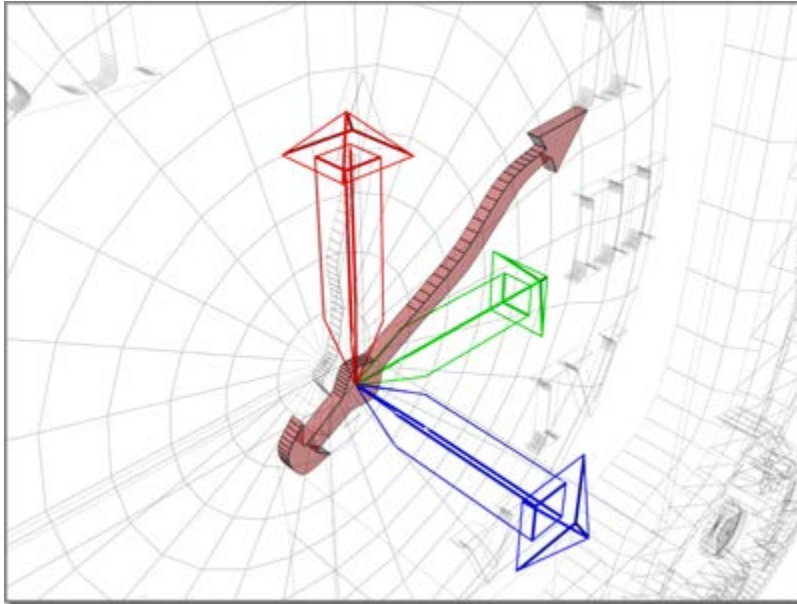
The pivot point of an object is used for the following:

- Functions as the center of rotation and scaling when you use the [Pivot Point transform center](#).
- Sets the default location of a modifier center.
- Defines the transform relationship for the object's linked children.

- Defines the joint location for [inverse kinematics \(IK\)](#).

You can adjust the position and orientation of an object's pivot point at any time using the buttons in the Adjust Pivot rollout in the Hierarchy panel. Adjusting an object's pivot has no effect on any children linked to that object.

The [transform center](#), or pivot point, is the spot about which a rotation takes place, or to and from which a scale occurs.



Pivot point sets hand to the center of the clock face.

All objects have a pivot point. You can think of the pivot point as representing an object's local center and local coordinate system.

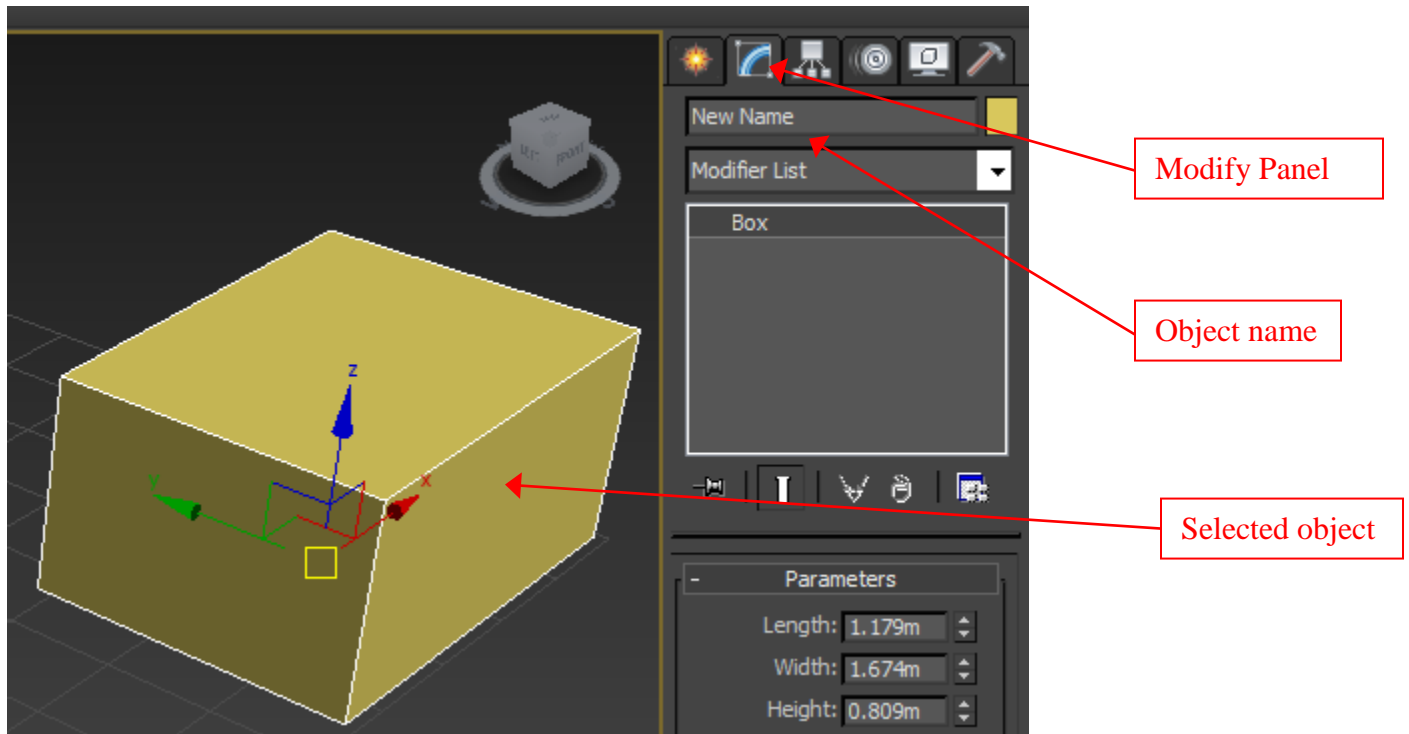
The pivot point of an object is used for a number of purposes:

- As the center for rotation and scaling when the Pivot Point transform center is selected.
- As the default location of a modifier center.
- As the transform origin for linked children.
- As the joint location for IK.

You can display and adjust the position and orientation of an object's pivot point at any time using the Pivot functions in the Hierarchy command panel. Adjusting an object's pivot has no effect on any children linked to that object.

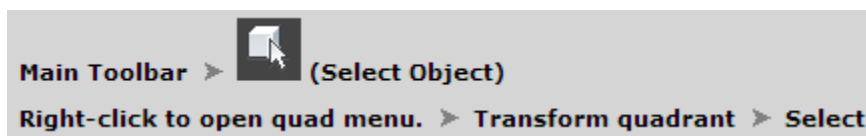
Object Naming:

Students are recommended to develop a habit of renaming objects as soon as they are created, so that everyone in the group member can clearly identify what the object is. This makes it easier to select objects in the scene and to build libraries of assets that people can retrieve quickly because the names are logical.



Object Selection:

Now that you have been introduced to the process of naming objects and understand that it is an important function for maintaining productivity, it's time to learn some of the options for selecting objects in a 3ds Max scene. These techniques are the fundamental processes commonly used in selecting objects in a 3ds Max scene.



Select Object lets you select objects or sub-objects for manipulation.

Object selection is affected by several other controls:

- The active Selection Region type: [Rectangular](#), [Circular](#), [Fence](#), [Lasso](#), or [Paint](#).

- The active [selection filter](#) (All, Geometry, Shapes, Lights, and so forth).
- The state of the crossing selection tool (which determines whether completely surrounded objects or surrounded and crossing objects are selected).

You can also select objects by name with the Select From Scene dialog ➤ [Select from Scene list](#); press the H key to access this dialog.

A number of objects selected together is called a [selection set](#). You can name selection sets in the Named Selection Sets field on the main toolbar and then recall them for later use.

Selection Buttons

The main toolbar has several selection-mode tools, listed following. When any of these tools is active, you can select objects by clicking them.



Select Object



Select by Name



Select And Move



Select And Rotate



Select And Scale



Select And Manipulate

Of the selection buttons, you use Select Object when you want selection only. The remaining buttons let you both select and transform or manipulate your selection. Use transforms to move, rotate, and scale your selection. See [Moving, Rotating, and Scaling Objects](#) and [Select and Manipulate](#).