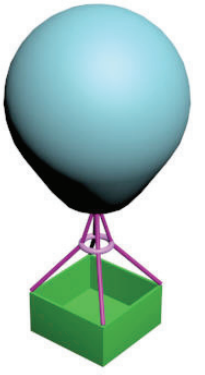
Chapter 3

Primitive Objects-II

Learning Objectives

After completing this chapter, you will be able to:

- *Create primitive objects*
- *Modify primitive objects*
- *Use the Boolean and Array tools*



INTRODUCTION

In this chapter, you will create primitive and extended primitive objects. You will also modify them using the **Edit Poly** and **Edit Mesh** modifiers. In addition to this, you will learn to use the **Boolean** and **Array** tools.

TUTORIALS

Tutorial 1

In this tutorial, you will create the model of a hot air balloon consisting of a balloon, a basket, ropes, and a collar, refer to Figure 3-1. You will create these components using primitive objects. **(Expected time: 25 min)**

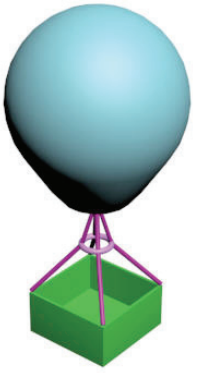


Figure 3-1 *The model of hot air balloon*

The following steps are required to complete this tutorial:

a. Create the project folder.
b. Create a balloon.
c. Create the basket.
d. Create the ropes.
e. Create the collar.
f. Smoothen the objects.
g. Save and render the scene.

Creating the Project Folder

Create the project folder with the name *c03_tut1* in the *3dsmax2021* folder as discussed in Tutorial 1 of Chapter 2.

Creating a Balloon

In this section, you will create a balloon using the **Sphere** tool.

1. Activate the Top viewport and choose **Create > Geometry** in the **Command Panel**. Now, invoke the **Sphere** tool from the **Object Type** rollout.

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2. In the **Keyboard Entry** rollout, set **150** in the **Radius** spinner. In the **Parameters** rollout, set **16** in the **Segments** spinner. Next, choose the **Create** button in the **Keyboard Entry** rollout; a sphere is created. Enter **Balloon** in the **Name and Color** rollout. Right-click in the viewport to exit the tool.

3. Activate the Perspective viewport. Next, invoke the **Zoom Extents All** tool from viewport navigation controls to zoom out the object in the Perspective viewport, refer to Figure 3-2.

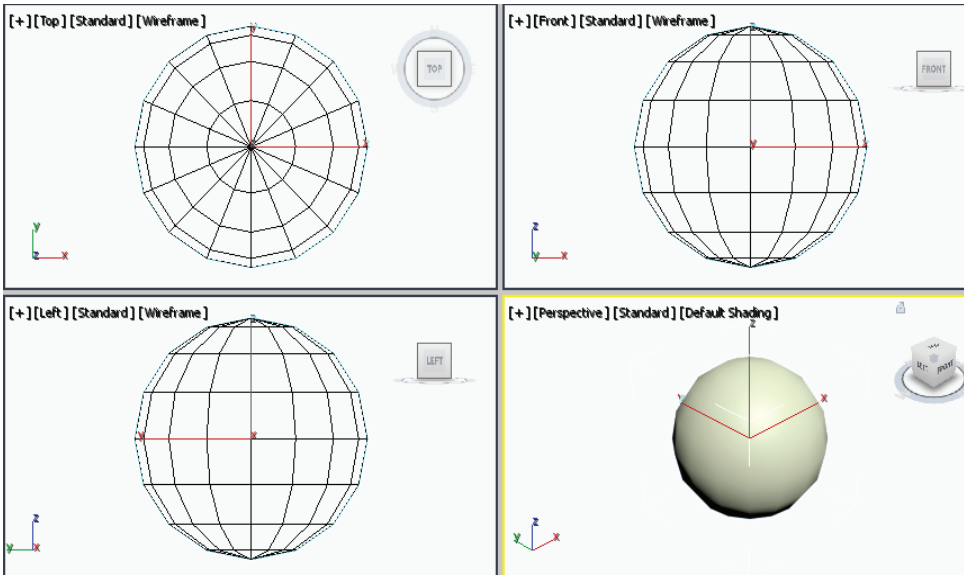

Figure 3-2 *The sphere created and zoomed in all four viewports*

4. Activate the Top viewport and click on the **Wireframe** Shading viewport label in the Top viewport to display a flyout. Choose **Default Shading** from the flyout to display the mesh in the Top viewport.

5. Invoke the **Zoom All** tool from the viewport navigation control. Next, hold the left mouse button and move the cursor downward in any viewport to zoom out to display *Balloon*. Right-click to exit the tool.

   The **Zoom All** tool simultaneously zooms in/out all viewports equally.

6. Activate the Front viewport and invoke the **2D Snap** tool from the **Snaps Toggle** flyout to turn on snaps. Right-click on this tool to open the **Grid and Snap Settings** dialog box. In the **Snaps** tab of this dialog box, make sure the **Grid Points** check box is selected and all other check boxes are cleared.

7. Close the **Grid and Snap Settings** dialog box.

8. Choose the **Transform Gizmo Y Constraint** button from the **Axis Constraints** toolbar.

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Note

*The **Axis Constraints** tools do not normally work with snaps on. To overcome this problem, right-click on the **Snaps Toggle** tool to display the **Grid and Snap Settings** dialog box. Choose the **Options** tab and make sure the **Enable Axis Constraints** check box is selected in the **Translation** area.*

9. Maximize the Front viewport and zoom it, if needed, to display the subgrid. Invoke the **Select and Move** tool from the **Main Toolbar**. Select *Balloon*, if it is not already selected.

10. Choose the **Modify** tab in the **Command Panel**. In the **Modifier List** drop-down list, select **Edit Mesh** in the **OBJECT-SPACE MODIFIERS** section. Next, choose the **Vertex** button in the **Selection** rollout; the **Vertex** sub-object mode is selected.

Note

*In the **Vertex** sub-object mode, selected vertices are displayed in red and unselected vertices in blue.*

11. Select the lowermost two layers of vertices by dragging a selection window around them in the Front viewport; the selected vertices turn red.

12. In the Front viewport, drag the vertices 40 units down in the -Y direction. This is shown as 0.0, –40.0, 0.0 in the coordinate display. The sphere changes into a balloon, refer to Figure 3-3.

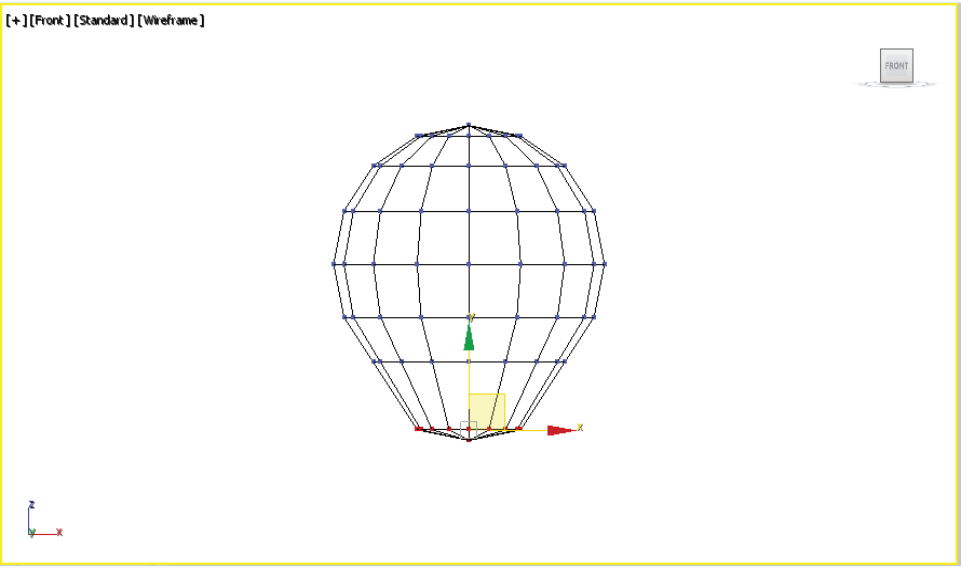

Figure 3-3 *The shape of the sphere changes into balloon shape*

Alternatively, right-click on the **Select and Move** tool from the **Main Toolbar**; the **Move Transform Type-In** dialog box is displayed. Next, set the value **–40** in the **Y** spinner of the **Offset: Screen** area.

13. Choose the **Vertex** button again in the **Selection** rollout to exit the sub-object mode. Return to four viewport configuration.

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Creating the Basket

In this section, you will create a basket using the **Box** and **Boolean** tools.

1. Activate the Top viewport. Choose **Create > Geometry** in the **Command Panel**. Next, invoke the **Box** tool.

2. Expand the **Keyboard Entry** rollout and set the values as given next:

   Length: **160** Width: **160** Height: **80**

   Choose the **Create** button in the **Keyboard Entry** rollout. Enter **Basket01** in the **Name and Color** rollout; the box is named as *Basket01*.

3. Now, again in the **Keyboard Entry** rollout, set the values as given next:

   Length: **150** Width: **150** Height: **100**

   Next, choose the **Create** button and then enter **Basket02** in the **Name and Color** rollout; *Basket02* is created and it protrudes through the top of *Basket01*. Right-click to exit the **Box** tool.

4. Press and hold the CTRL key and select *Basket01* and *Basket02* in the **Scene Explorer**, as shown in Figure 3-4.

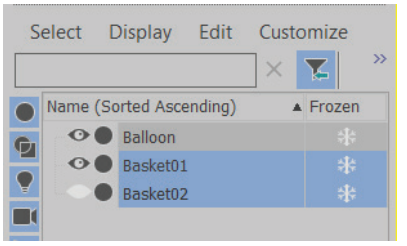

Figure 3-4 *Selecting Basket01 and Basket02 from the* ***Scene Explorer***

5. Activate the Front viewport and then invoke the **Maximize Viewport Toggle** tool from the viewport navigation controls. Next, invoke the **Select and Move** tool from the **Main Toolbar**.

6. You need to move both baskets down vertically by 430 units. To do so, right-click on the **Select and Move** tool from the **Main Toolbar**; the **Move Transform Type-In** dialog box is displayed. Next, set **–430** in the **Y** spinner in the **Offset: Screen** area and press the ENTER key, refer to Figure 3-5.

7. Close the **Move Transform Type-In** dialog box.

8. Select *Basket02* in the **Scene Explorer**; *Basket01* is deselected, while *Basket02* remains selected.

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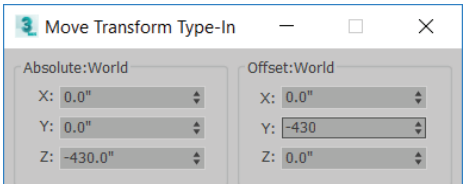

Figure 3-5 *The* ***Move Transform Type-In*** *dialog box*

9. Right-click on the **Select and Move** tool; the **Move Transform Type-In** dialog box is displayed. Next, set **10** in the **Y** spinner in the **Offset:Screen** area and press the ENTER key; *Basket02* is moved up by 10 units in the Front viewport. Next, close this dialog box.

10. Select *Basket01* in the **Scene Explorer**. Make sure the **Geometry** button is chosen in the **Create** tab of the **Command Panel**. Next, select **Compound Objects** in the drop-down list below the **Geometry** button.

11. In the **Object Type** rollout, invoke the **Boolean** tool. Choose the **Add Operands** button in the **Boolean Parameters** rollout and select *Basket02* from the Scene Explorer. Next, choose the **Subtract** button from the **Operand Parameters** rollout; *Basket02* is subtracted from *Basket01* thus creating a hollow basket. Invoke the **Select Object** tool from the **Main Toolbar** to complete the operation.

12. Invoke the **Maximize Viewport Toggle** tool from the viewport navigation controls. Next, invoke the **Zoom Extents All** tool from the viewport navigation controls to view all objects properly, refer to Figure 3-6.

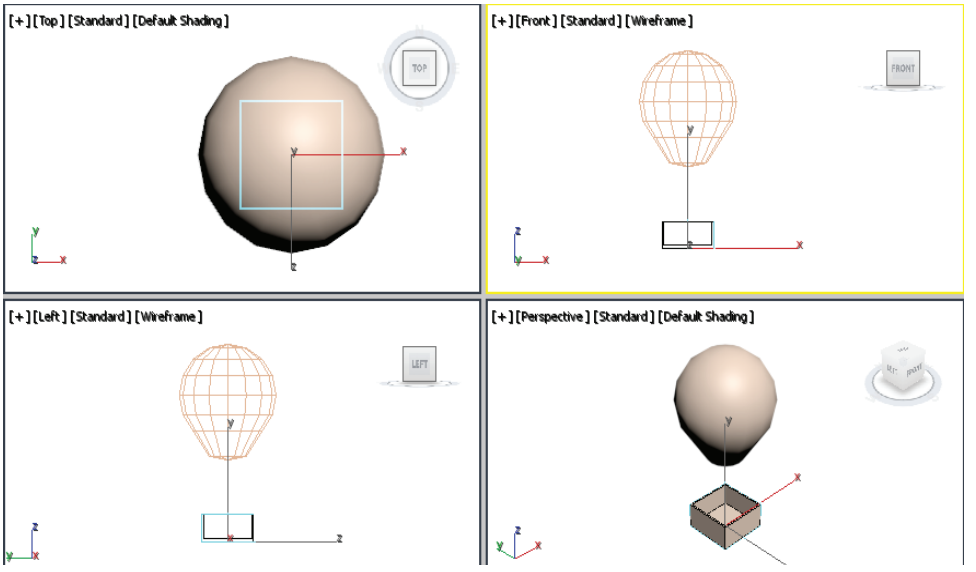

Figure 3-6 *Basket01 after performing the* ***Boolean*** *operation*

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Creating the Ropes

In this section, you will create ropes using the **Cylinder** and **Array** tools.

1. Activate the Top viewport. Click on the **Default Shading** viewport label on the top-left side of the viewport and then choose **Wireframe Override** from the flyout displayed.

2. Make sure the **Geometry** button is chosen in the **Create** tab of the **Command Panel**. Next, select **Standard Primitives** in the drop-down list below the **Geometry** button. Invoke the **Cylinder** tool from the **Object Type** rollout.

3. In the **Parameters** rollout, set **5** in the **Height Segments** spinner. In the **Keyboard Entry** rollout, set **4** in the **Radius** spinner and **150** in the **Height** spinner. Next, choose the **Create** button. Enter **Rope01** in the **Name and Color** rollout; *Rope01* is created.

4. Invoke the **Select and Rotate** tool from the **Main Toolbar** and choose the **Transform Gizmo X Constraint** button from the **Axis Constraints** toolbar. Turn the snap off. Invoke the **Angle Snap Toggle** tool from the **Main Toolbar** to rotate *Rope01* in increments.

   The **Angle Snap Toggle** tool in the **Main Toolbar** is used to rotate the object in the increments you set. By default, the rotations take place in 5-degree increments. Right-click on the **Angle Snap Toggle** tool; the **Grid and Snap Settings** dialog box is displayed. Set **30** in the **Angle** spinner in the **General** area of the **Options** tab, as shown in Figure 3-7. Close the **Grid and Snap Settings** dialog box.

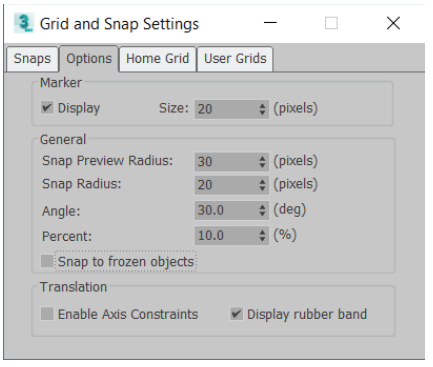

Figure 3-7 *The* ***Grid and Snap Settings*** *dialog box*

5. In the Top viewport, move the cursor over the X-axis and rotate *Rope01* through an angle of 30 degrees or enter **30** in the **X** spinner of Status Bar; the rotation value is displayed in the coordinate display below the viewports.

   Be careful that you do not override the axis constraint by accidentally selecting an unwanted portion of the transform gizmo.

6. Choose the **Transform Gizmo Y Constraint** button from the **Axis Constraints** toolbar. Right-click on the **Angle Snap Toggle** tool; the **Grid and Snap Settings** dialog box is

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displayed. Set **35** in the **Angle** spinner in the **General** area of the **Options** tab. Rotate *Rope01* through an angle of 35 degrees and then close this dialog box or enter **35** in the **Y** spinner of Status Bar. Turn the **Angle Snap Toggle** off.

7. Activate the Front viewport. Invoke the **Select and Move** tool from the **Main Toolbar** and also choose the **Transform Gizmo XY Plane Constraint** button from the **Axis Constraints** toolbar. Next, move *Rope01* so that its lower end touches the upper-left corner or the basket. Activate the Left viewport and move *Rope01* such that its lower end touches the upper-left corner of the basket, as shown in Figure 3-8.

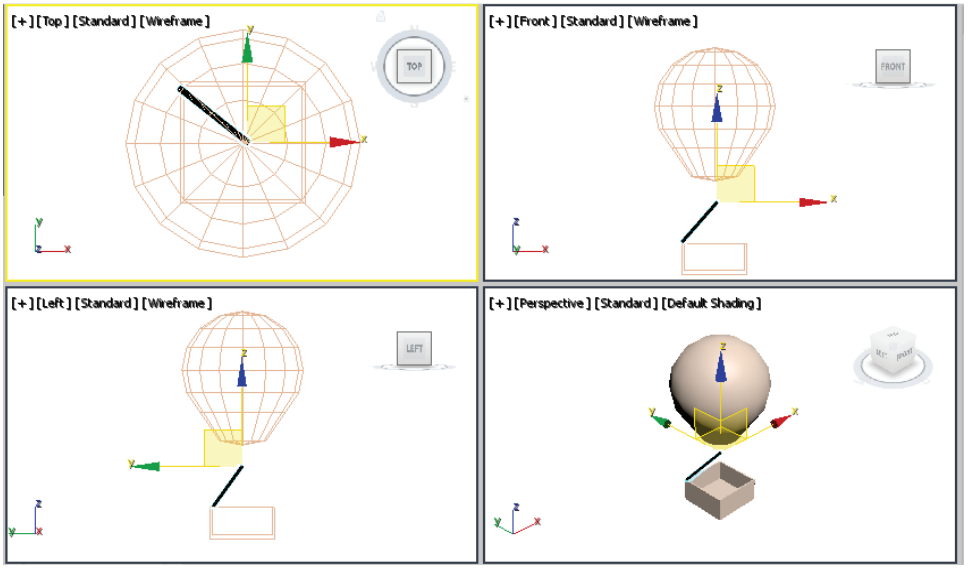

Figure 3-8 *Rope01 in all viewports*

8. Notice that the top of *Rope01* does not touch the bottom of *Balloon*. Invoke the **Zoom Region** tool. Next, zoom in on the bottom portion of *Balloon* and the upper portion of *Rope01* in the Front viewport.

9. Make sure *Rope01* is selected. Choose the **Modify** tab in the **Command Panel**. In the **Modifier List** drop-down list, select **Edit Mesh** in the **OBJECT-SPACE MODIFIERS** section. In the **Selection** rollout, choose the **Vertex** button to enter the sub-object mode and then select the upper vertex of *Rope01*; the vertex at the top turns red.

10. Choose the **Transform Gizmo Y Constraint** button from the **Axis Constraints** toolbar. Drag the selected vertices to touch the lower point of the balloon, as shown in Figure 3-9.

11. Choose the **Vertex** button in the **Selection** rollout again to exit the sub-object mode. Invoke the **Zoom Extents** tool from the viewport navigation controls.

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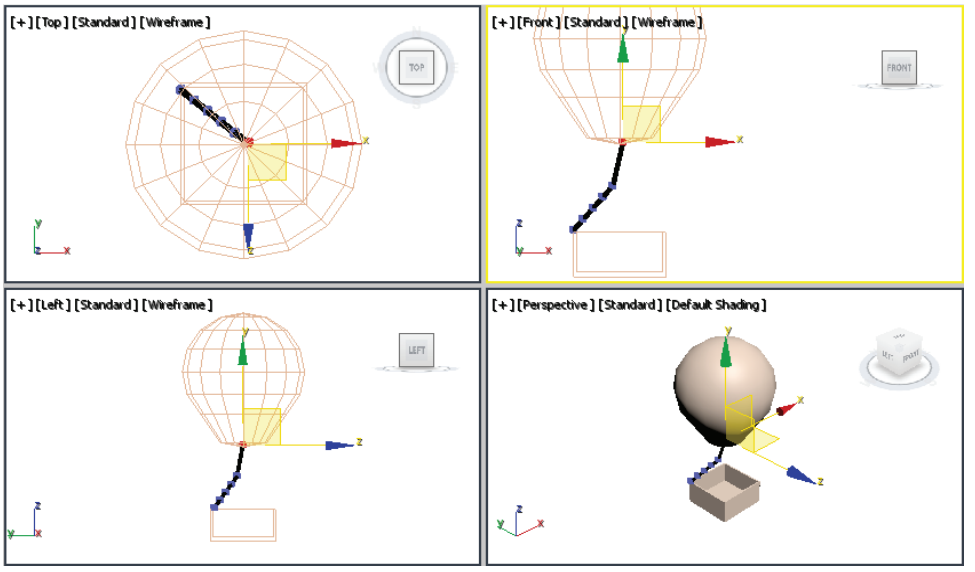

Figure 3-9 *The end vertices of the Rope01 moved to touch the bottom of the balloon*

Note

*The **View** option is selected in the **Reference Coordinate System** drop-down list by default. If you want to rotate objects about the world origin, you need to select the **World** option in this drop-down list, provided the viewport is not centered at the origin. After rotating the objects, you may select the **View** option in the **Reference Coordinate System** drop-down list to avoid confusion.*

12. Activate the Top viewport. Next, invoke the **Use Transform Coordinate Center** tool from the **Use Pivot Point Center** flyout from the **Main Toolbar**. Select **World** in the **Reference Coordinate System** drop-down list. Next, choose **Tools > Array** from the menu bar; the **Array** dialog box is displayed, as shown in Figure 3-10.

13. Choose the **Reset All Parameters** button available at the bottom of the **Array** dialog box and set **90** in the **Incremental Z** spinner in the **Rotate** row. In the **Type of Object** area, select the **Copy** radio button. In the **Array Dimensions** area, select the **1D** radio button and set **4** in the **1D Count** spinner. Choose the **OK** button; ropes are placed at the four corners of the basket and extended to the bottom of *Balloon*, as shown in Figure 3-11.

14. Select **View** in the **Reference Coordinate System** drop-down list and then choose the **Use Pivot Point Center** tool from the **Use Pivot Point Center** flyout from the **Main Toolbar**. Rename the three newly created ropes as **Rope02**, **Rope03**, and **Rope04**.

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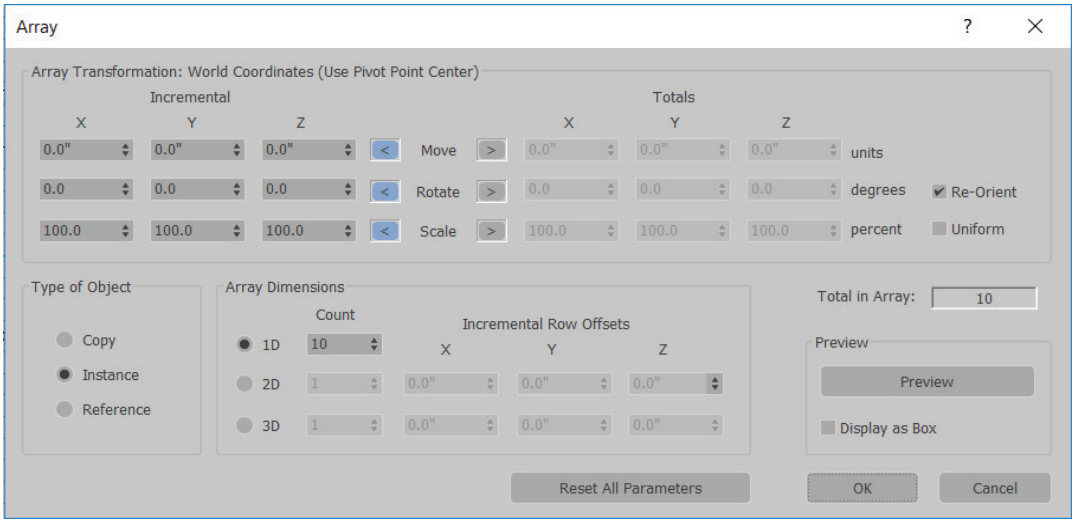

Figure 3-10 *The* ***Array*** *dialog box*

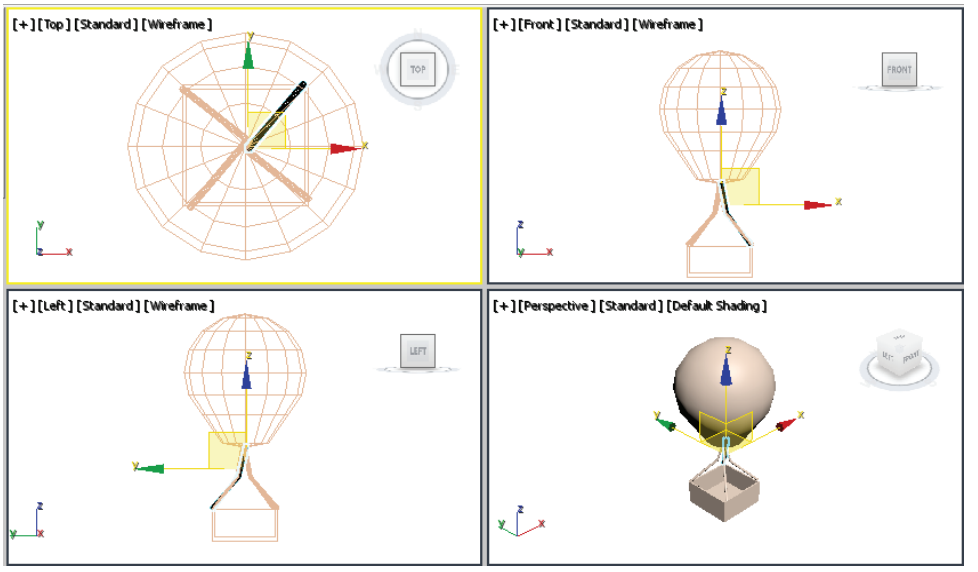

Figure 3-11 *The four ropes placed at the four corners of basket*

Creating the Collar

Next, you will create a collar and place it at the "kink" in the ropes.

1. Make sure the Top viewport is activated and then choose **Create > Geometry** in the **Command Panel**. Next, invoke the **Torus** tool from the **Object Type** rollout.

2. In the **Keyboard Entry** rollout, set the value **25** in the **Major Radius** spinner and **5** in the **Minor Radius** spinner. Choose the **Create** button and enter **Collar** in the **Name and Color** rollout.

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3. Invoke the **Select and Move** tool from the **Main Toolbar**. In the Front viewport, move *Collar* down so that the "kinks" in the ropes are inside the collar, as shown in Figure 3-12 and then zoom the view properly as needed.

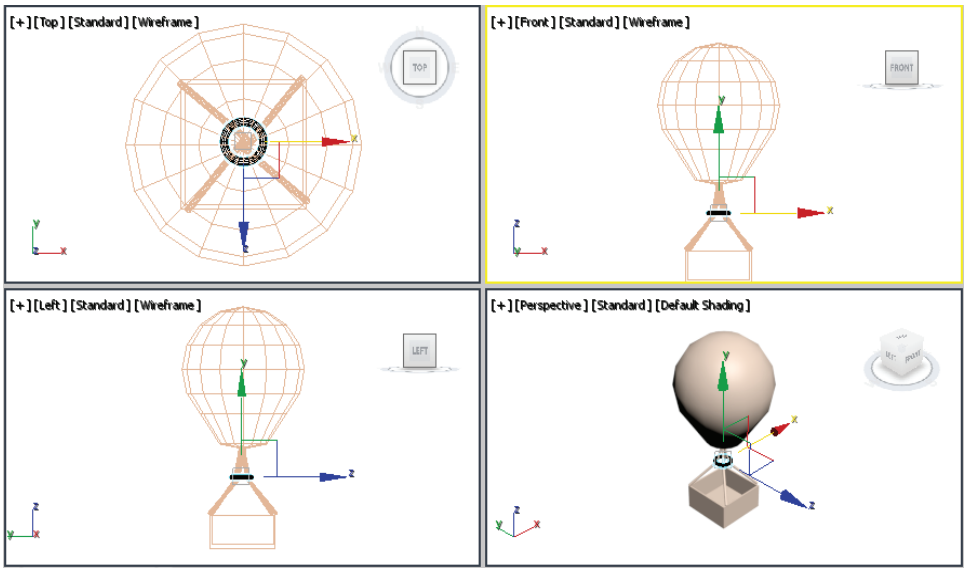

Figure 3-12 *Alignment of collar with the ropes*

4. Invoke the **Zoom Extents All** tool from the viewport navigation controls to view all objects properly.

Note

The process of texturing this model has been discussed in Chapter 11.

Smoothening the Objects

In this section, you will smoothen *Balloon* and *Basket* using the **MeshSmooth** modifier and the **Chamfer** modifier, respectively.

1. Select *Balloon* in the viewport. Choose the **Modify** tab in the **Command Panel**. In the **Modifier List** drop-down list, select **MeshSmooth** from the **OBJECT-SPACE MODIFIERS** section; the **MeshSmooth** modifier is applied to *Balloon*. You will notice that *Balloon* is smoothened.

2. Select *Basket* in the viewport. Choose the **Modify** tab in the **Command Panel**. In the **Modifier List** drop-down list, select **Chamfer** from the **OBJECT-SPACE MODIFIERS** section; the **Chamfer** modifier is applied to *Basket* and the **Parameters** rollout is displayed in the **Command Panel**.

3. In the **Chamfer Options** area, set **0.25** in the **Amount** spinner and **2** in the **Segments** spinner. You will notice that edges of *Basket* are smoothened.

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Saving and Rendering the Scene

In this section, you will save the scene that you have created and then render it. You can also view the final rendered image of this model by downloading the *c03_3dsmax_2021_rndr.zip* file from *www.cadcim.com*. The path of the file is as follows: *Textbooks > Animation and Visual Effects > 3ds Max > Autodesk 3ds Max 2021 for Beginners: A Tutorial Approach*.

1. Change the background color of the scene to white by following the steps as given in Tutorial 1 of Chapter 2.

2. Choose **Save** from the **File** menu.

3. Activate the Perspective viewport. Next, invoke the **Render Production** tool from the **Main Toolbar**; the rendered image of the hot air balloon is displayed, as shown in Figure 3-13.

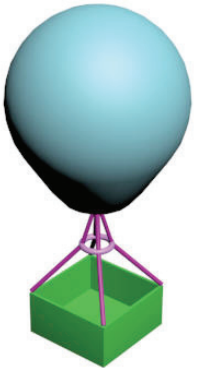

Figure 3-13 *The rendered image of the hot air balloon*

Tutorial 2

In this tutorial, you will create the model of a shed, as shown in Figure 3-14.

(Expected time: 60 min)

Figure 3-14 *The model of a shed*

The following steps are required to complete this tutorial:

a. Create the project folder.
b. Create the sides of the shed.
c. Create supports for the side.
d. Create the top of the shed.
e. Save and render the scene.

Creating the Project Folder

Create the project folder with the name *c03_tut2* in the *3dsmax 2021* folder as discussed in Tutorial 1 of Chapter 2.

Creating the Sides of the Shed

In this section, you will create one side of the shed and then copy it using the **Mirror** tool to create other sides.

1. Activate the Top viewport and then maximize it. Choose **Create > Geometry** in the **Command Panel**; **Standard Primitives** is displayed in the drop-down list. Next, invoke the **Box** tool from the **Object Type** rollout; various rollouts are displayed in the **Command Panel**.

2. Expand the **Keyboard Entry** rollout and set the values as given next:

   Length: **3** Width: **50** Height: **19**

Note

*To view segments of objects in the Perspective viewport, you need to switch from **Default Shading** view to **Default Shading+Edged Faces** view. To do so, click on the **Default Shading** viewport label in the Perspective viewport; a flyout is displayed. Choose the **Edged Faces** option from it.*

3. Choose the **Create** button from the **Keyboard Entry** rollout; a box is created. In the **Name and Color** rollout, enter **side1** and press ENTER; the box is named as *side1*.

4. Choose the **Modify** tab in the **Command Panel**. Next, in the **Parameters** rollout, set the values as given next:

   Length Segs: **1** Width Segs: **18** Height Segs: **1**

   On setting these values, the modified *side1* is displayed in all viewports, as shown in Figure 3-15.

   Next, you need to convert *side1* to editable poly to modify it at the sub-object level.

5. Make sure the **Modify** tab is chosen and then select the **Edit Poly** modifier from the **OBJECT-SPACE MODIFIERS** section in the **Modifier List** drop-down list; the **Edit Poly** modifier is displayed in the modifier stack. In the modifier stack, click on the arrow on the left of the **Editable Poly** to view all sub-object levels.

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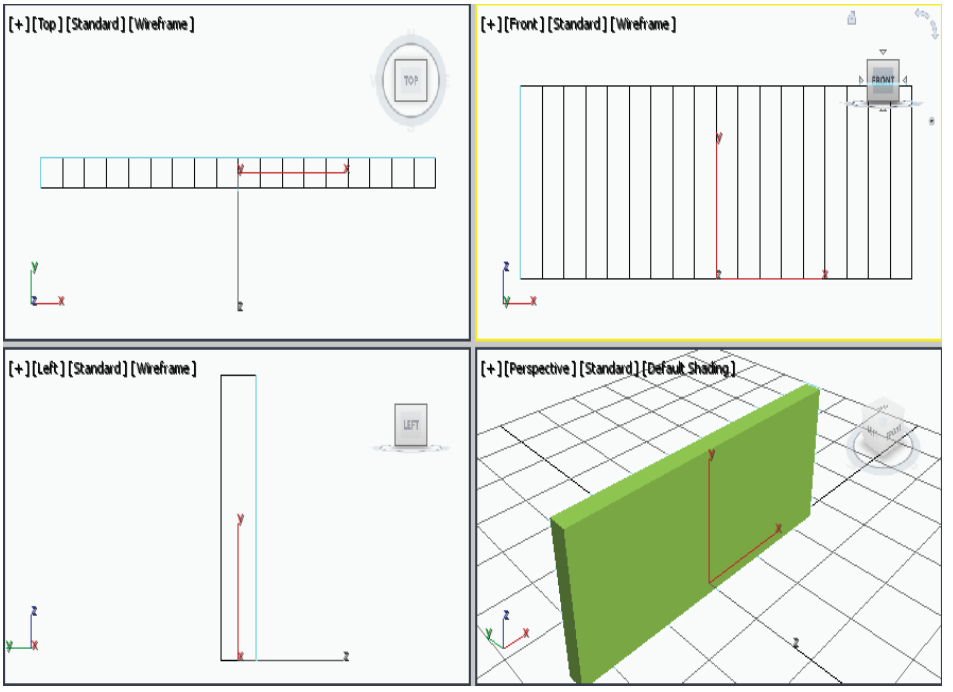

Figure 3-15 *The side 1 displayed in all viewports*

6. Activate the Front viewport. Select the **Polygon** sub-object level. Next, select the polygon of *side1*, as shown in Figure 3-16.

7. In the **Edit Polygons** rollout, choose the **Settings** button on the right of the **Extrude** button; the **Extrude Polygons** caddy control is displayed in the viewport, refer to Figure 3-17. Set the value **47** in the **Extrude Polygons-Height** spinner, and choose the **OK** button to close this caddy control; the selected polygon is extruded, as shown in Figure 3-18.

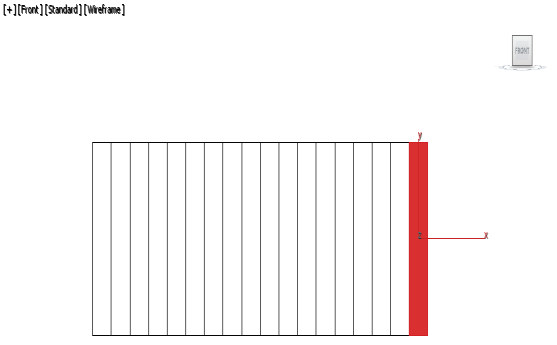

Figure 3-16 *The polygon selected*

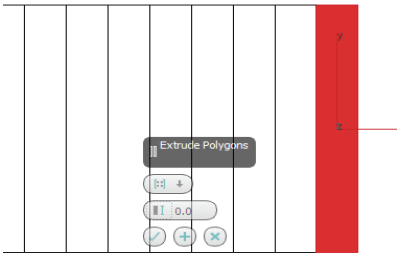

Figure 3-17 *The* ***Extrude Polygons*** *caddy control*

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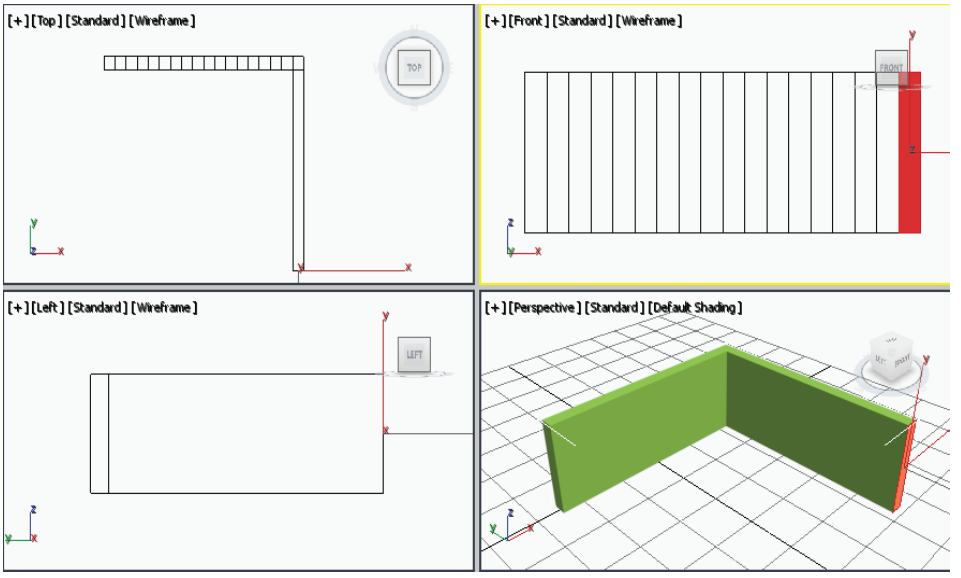

Figure 3-18 *The selected polygon extruded*

8. Activate the Perspective viewport and select the **Edge** sub-object level. Next, select the edge, as shown in Figure 3-19.

9. In the **Selection** rollout, choose the **Ring** button; the ring of edges is selected, as shown in Figure 3-20.

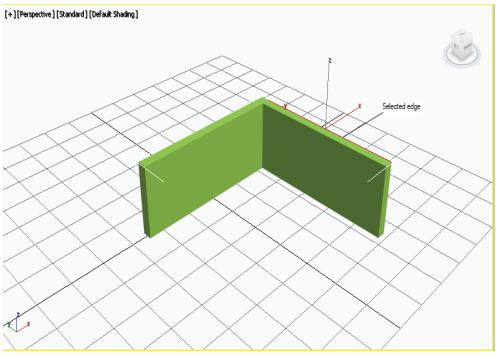

Figure 3-19 *The edge selected*

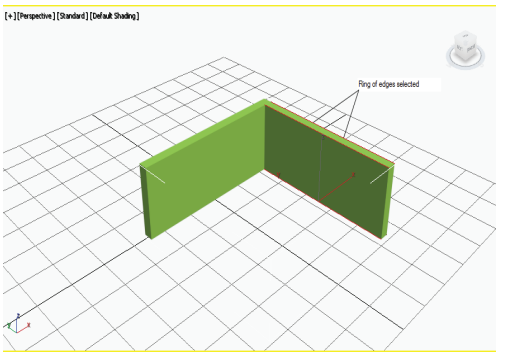

Figure 3-20 *The ring of edges selected*

10. In the **Edit Edges** rollout, choose the **Settings** button on the right of the **Connect** button; the **Connect Edges** caddy control is displayed in the viewport. Set the value **16** in the **Connect Edges Segments** spinner and choose the **OK** button to close this caddy control; edge loops are added, as shown in Figure 3-21.

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11. Activate the Top viewport. Make sure the **Edge** sub-object level is selected. Next, select a vertical edge, refer to Figure 3-22. Next, choose the **Ring** button in the **Selection** rollout to select edges, as shown in Figure 3-22.

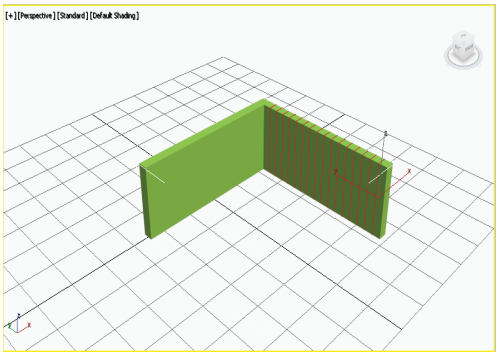

Figure 3-21 *The edge loops added*

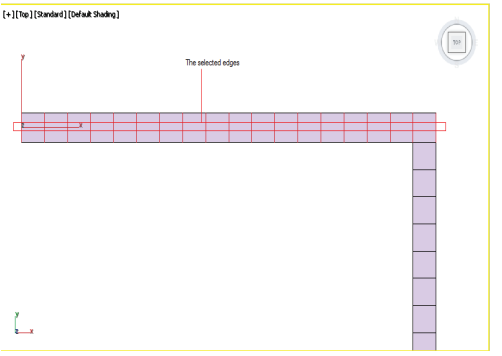

Figure 3-22 *The vertical edges selected*

12. In the **Edit Edges** rollout, choose the **Settings** button on the right of the **Connect** button; the **Connect Edges** caddy control is displayed in the viewport. Set the value **2** in the **Connect Edges Segments** spinner and **15** in the **Connect Edges Pinch** spinner. Next, choose the **OK** button to close this caddy control; two edge loops are added, as shown in Figure 3-23.

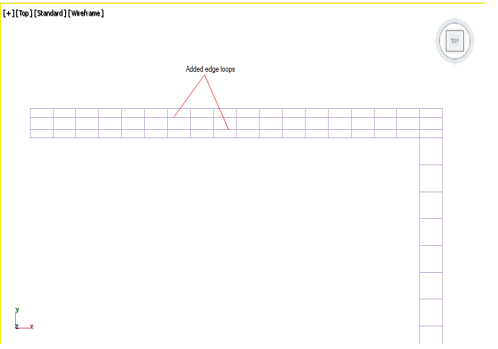

Figure 3-23 *Two edge loops added*

13. Similarly, select the horizontal edge, refer to Figure 3-24. Next, choose the **Ring** button in the **Selection** rollout to select the edges, as shown in Figure 3-24. Now, repeat step 12 to add two edge loops, as shown in Figure 3-25.

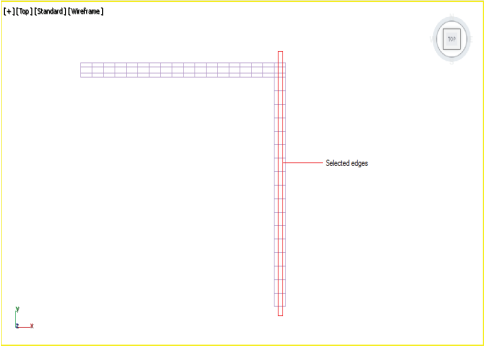

Figure 3-24 *The horizontal edges selected*

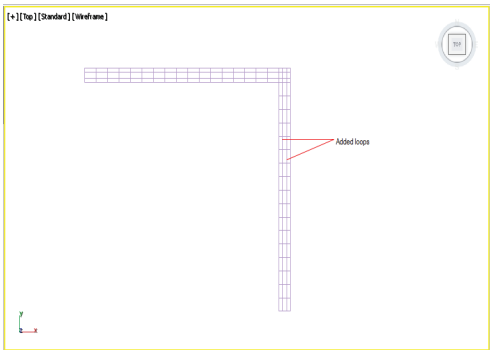

Figure 3-25 *Two edge loops added*

14. Make sure the Top viewport is activated. Select the **Polygon** sub-object level in the **Selection** rollout. Next, select the **Ignore Backfacing** check box in the **Selection** rollout and then select the polygons, as shown in Figure 3-26.

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15. In the **Edit Polygons** rollout, choose the **Settings** button on the right of the **Extrude** button; the **Extrude Polygons** caddy control is displayed in the viewport. Set the value **125** in the **Extrude Polygons-Height** spinner. Next, choose the **OK** button to close this caddy control; the polygons are extruded. Figure 3-27 shows the selected polygons extruded in the Perspective viewport.

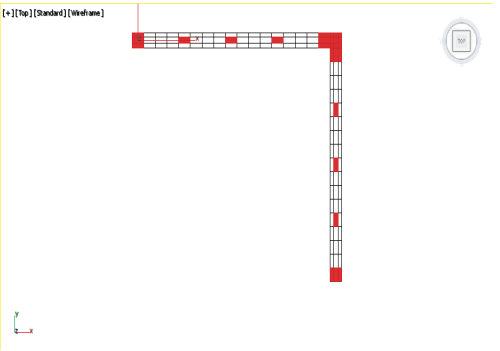

Figure 3-26 *The polygons selected*

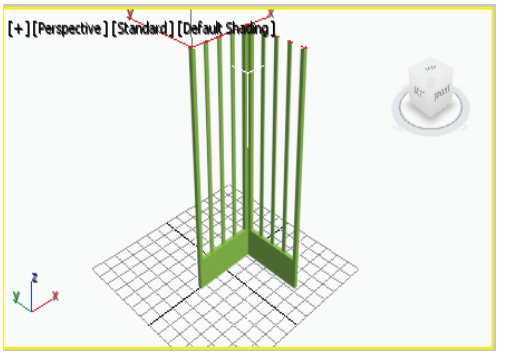

Figure 3-27 *The selected polygons extruded*

Next, you will create the horizontal strips of *side1*.

16. Make sure the Top viewport is activated. Choose **Create > Geometry** in the **Command Panel**; the **Standard Primitives** option is displayed in the drop-down list. Next, invoke the **Box** tool from the **Object Type** rollout; various rollouts are displayed in the **Command Panel**.

17. Expand the **Keyboard Entry** rollout and set the values as given next:

X: **0**	Y: **0**	Z: **27**
Length: **0.65**	Width: **47**	Height: **2.7**

18. Choose the **Create** button from the **Keyboard Entry** rollout; a box is created. In the **Name and Color** rollout, enter **hozt strip1** and press ENTER; the box is named as *hozt strip1*. Figure 3-28 shows *hozt strip1* in all viewports.

19. Activate the Front viewport and then invoke the **Select and Move** tool from the **Main Toolbar**. Make sure *hozt strip1* is selected. Next, press and hold the SHIFT key and drag the cursor in the Y direction till the value in the **Y** spinner of the coordinate display is changed to 12.7. Now, release the left mouse button; the **Clone Options** dialog box is displayed. In this dialog box, select the **Copy** radio button. Also, set the value in the **Number of Copies** spinner to **8** and then choose the **OK** button; the copies of *hozt strip1* are created. Figure 3-29 shows the copies of *hozt strip1* in the Perspective viewport.

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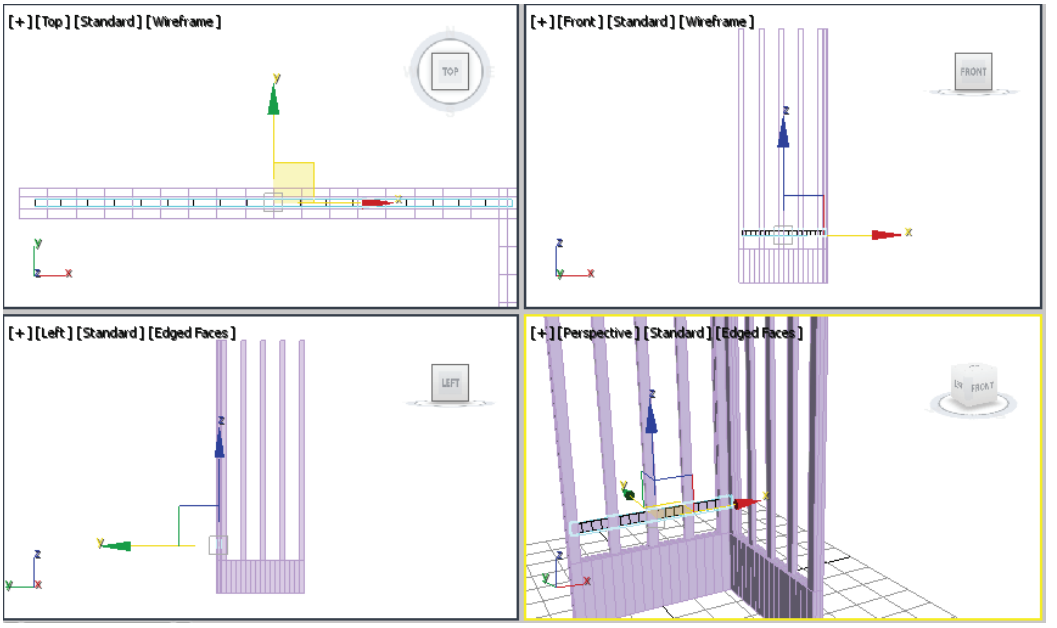

Figure 3-28 *The hozt strip1 aligned*

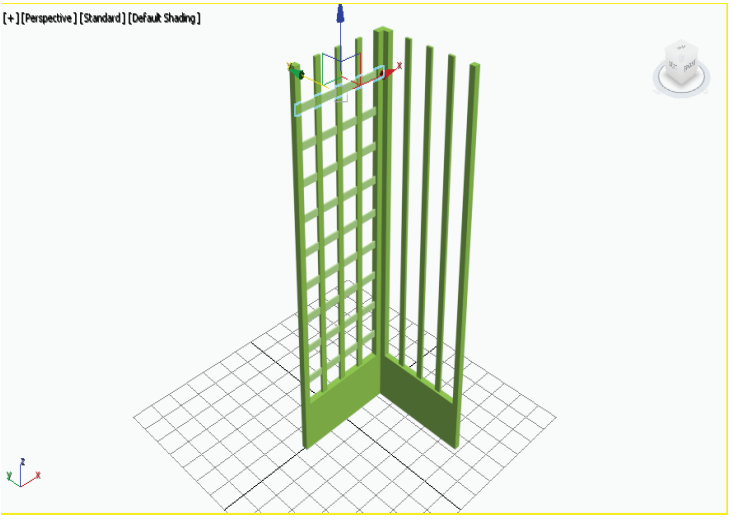

Figure 3-29 *The copies of hozt strip1 created*

20. Similarly, create horizontal strips for the other portion of *side1*, as shown in Figure 3-30.

    Next, you need to group all objects created in the scene.

21. Select all objects in the scene and then choose **Group > Group** from the menu bar; the **Group** dialog box is displayed. In this dialog box, enter **side01** in the **Group name** text box and choose the **OK** button to close the dialog box; *side01* group is created.

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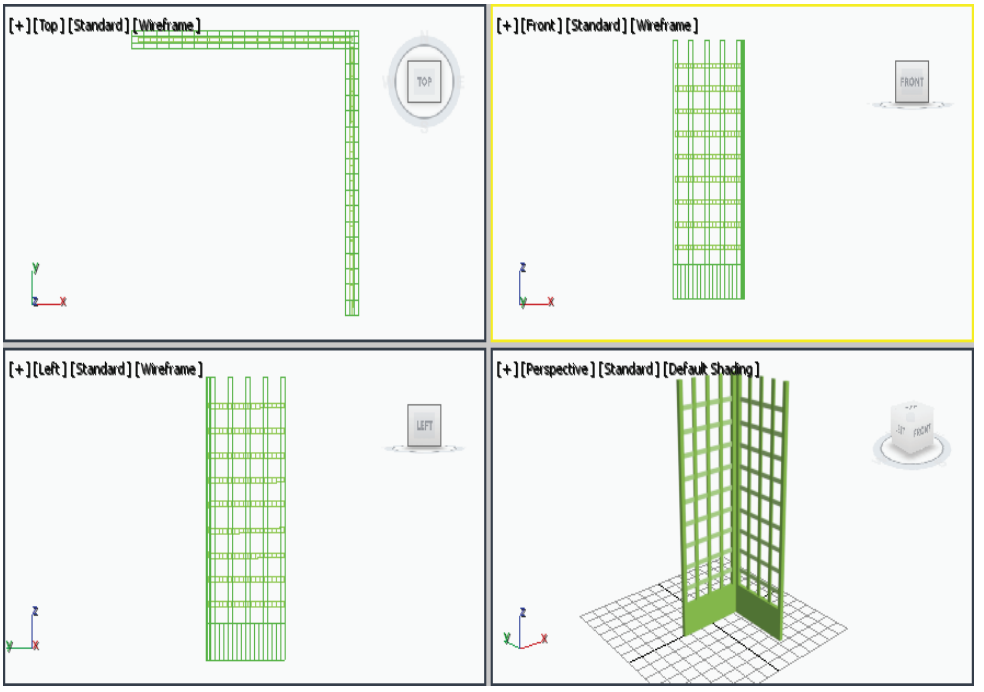

Figure 3-30 *The copies of the horizontal strips created*

Creating Supports for the Side

In this section, you will create supports for the side by using the **Box** tool.

1. Activate the Top viewport. Choose **Create > Geometry** in the **Command Panel**; the **Standard Primitives** option is displayed in the drop-down list. Next, invoke the **Box** tool from the **Object Type** rollout; various rollouts are displayed in the **Command Panel**.

2. Expand the **Keyboard Entry** rollout and set the values as given next:

X: **0**	Y:**0**	Z: **0**
Length: **49.8**	Width: **2.3**	Height: **17.5**

3. In the **Parameters** rollout, set the value in the **Height Segs** spinner to **6** and **Width Segs** spinner to **1**.

4. Choose the **Create** button from the **Keyboard Entry** rollout; a box is created. Enter **support1** in the **Name and Color** rollout; *support1* is created.

5. Switch the Left viewport to Right [Default Shading] viewport, as discussed earlier. Next, invoke the **Select and Move** tool and align *support1* in all viewports, as shown in Figure 3-31.

Note

For alignment of objects in the scene, you may need to switch from one viewport to another. To do so, click on the POV viewport label in a viewport; a flyout is displayed. Choose the desired option to switch to that viewport.

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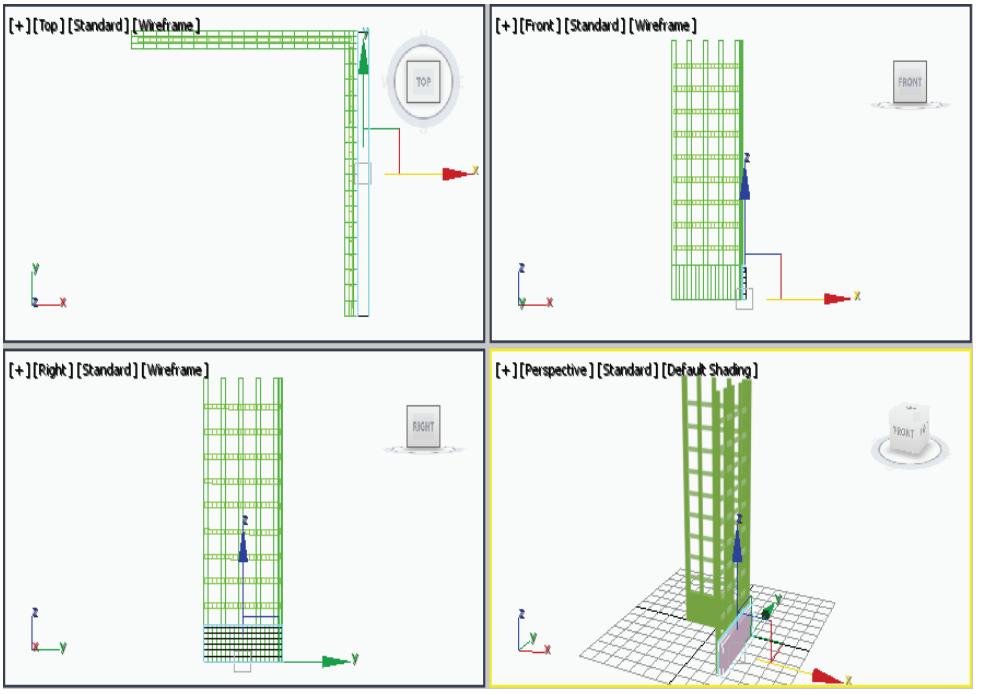

Figure 3-31 *The support1 aligned in all viewports*

6. Choose the **Modify** tab. Select the **Edit Poly** modifier from the **OBJECT-SPACE MODIFIERS** section in the **Modifier List** drop-down list; the **Edit Poly** modifier is displayed in the modifier stack. In the modifier stack, click on the arrow on the left of the **Editable Poly** to view all sub-object levels.

7. Activate the Perspective viewport. Select the **Edge** sub-object level from the **Selection** rollout. To display the edges of *support1*, you need to switch to the **Edge Faces** mode in the Perspective viewport. Next, select two edges using the CTRL key, as shown in Figure 3-32 and then choose the **Loop** button from the **Selection** rollout; two edge loops are selected.

8. In the **Edit Edges** rollout, choose the **Settings** button on the right of the **Chamfer** button; the **Chamfer** caddy control is displayed in the viewport. Set the value **0.1** in the **Chamfer-Amount** spinner and then choose the **OK** button to close this caddy control; two edge loops are added, as shown in Figure 3-33.

9. Select the **Polygon** sub-object level from the **Selection** rollout. Next, select the polygons in the Right, Front, and Back viewports using the CTRL key, as shown in Figure 3-34. Now, delete these polygons.

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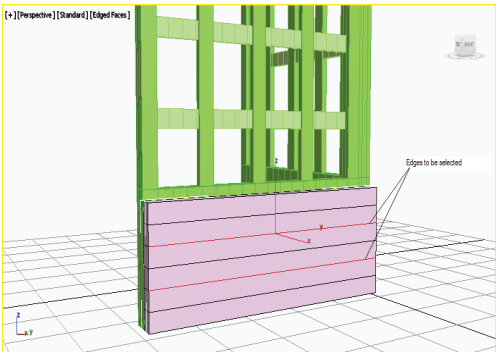

Figure 3-32 *Two edges selected*

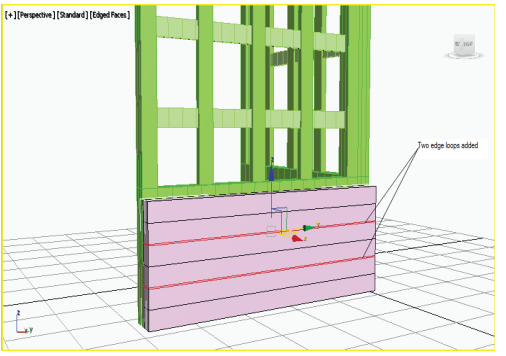

Figure 3-33 *Two edge loops added*

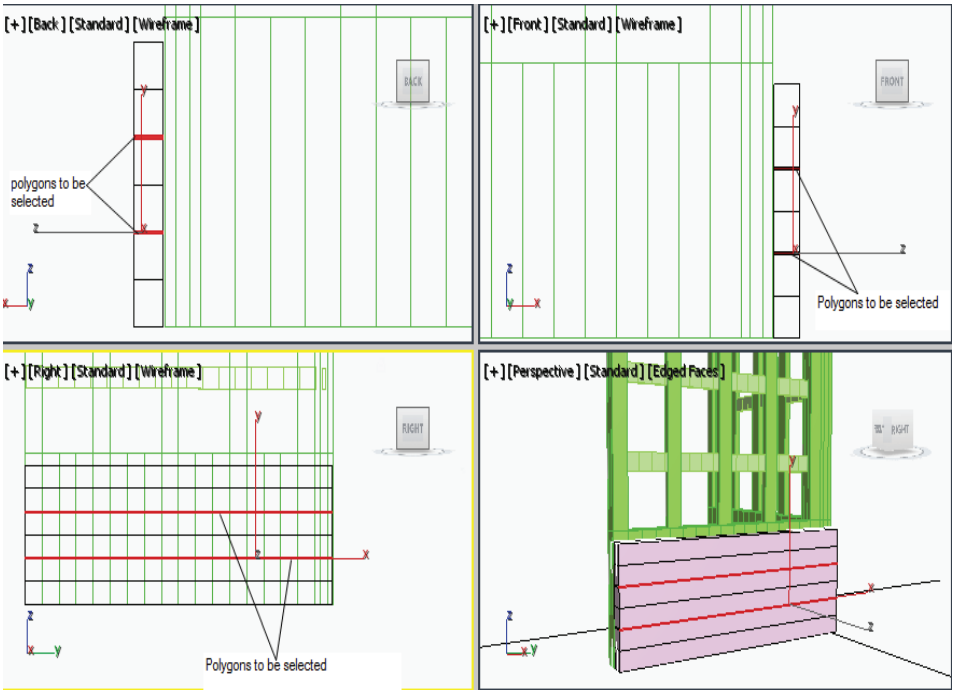

Figure 3-34 *The selected polygons*

Next, you need to create rivets to join the *support1* with *side01*.

10. Create rivets, as discussed in Tutorial 2 of Chapter 2. Next, align them, as shown in Figure 3-35.

11. Select *support1* as well as all rivets in the scene, and then choose **Group > Group** from the menu bar; the **Group** dialog box is displayed. In this dialog box, enter **support01** in the **Group name** text box and choose the **OK** button to close the dialog box; *support01* group is created.

12. Create a copy of *support 01* with the name *support02*. Now, align and rotate it, as shown in Figure 3-36.

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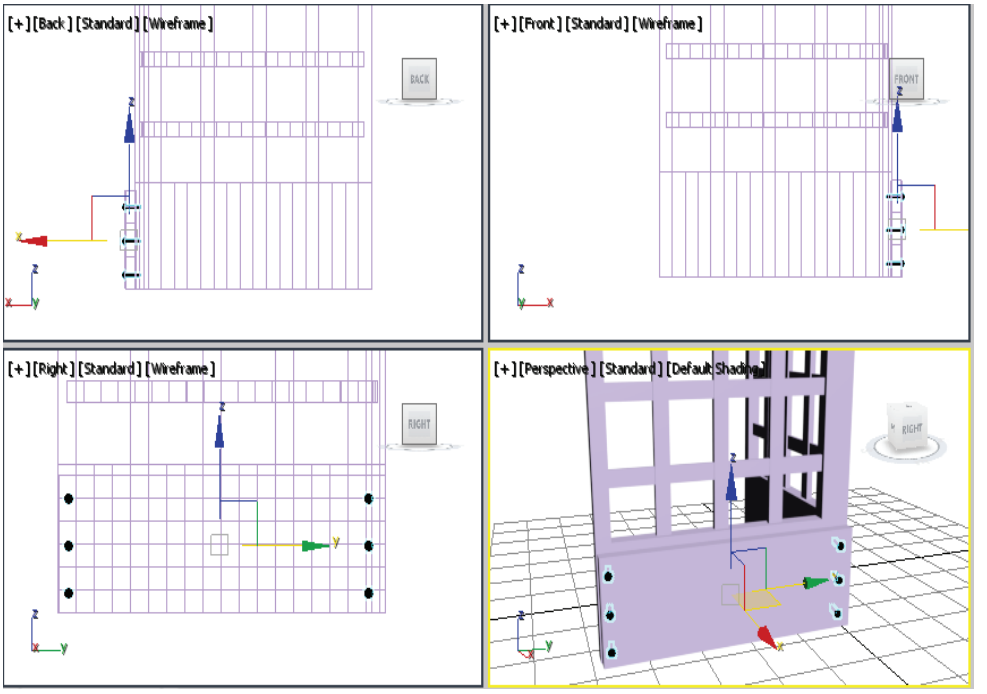

Figure 3-35 *The rivets aligned*

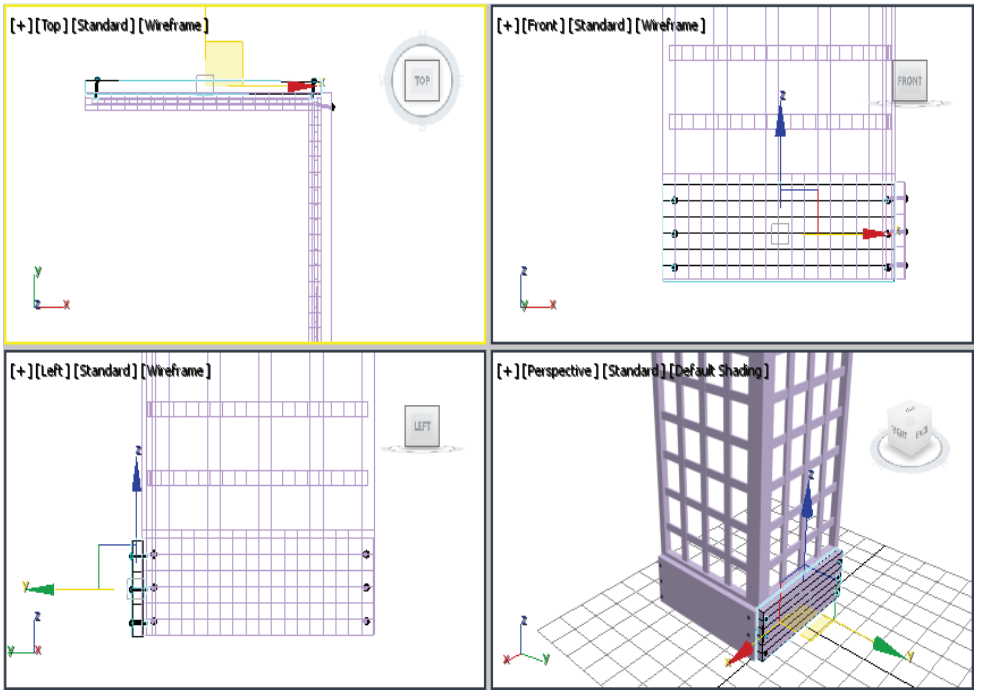

Figure 3-36 *The support02 aligned*

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Next, you need to create one more support similar to *support01*.

13. Activate the Top viewport and choose **Create > Geometry** in the **Command Panel**; the **Standard Primitives** option is displayed in the drop-down list. Next, invoke the **Box** tool from the **Object Type** rollout; various rollouts are displayed in the **Command Panel**.

14. Expand the **Keyboard Entry** rollout and set the values as given next:

    Length: **69** Width: **2.3** Height: **17.5**

15. In the **Parameters** rollout, set the value in the **Height Segs** spinner to **6** and **Width Segs** spinner to **1**.

16. Choose the **Create** button from the **Keyboard Entry** rollout; a box is created. Enter **support03** in the **Name and Color** rollout; *support03* is created.

17. Repeat steps 6 to 9 to chamfer the edges and delete the polygons for *support03*. Next, align *support03* using the **Select and Move** and **Select and Rotate** tools from the **Main Toolbar**, as shown in Figure 3-37.

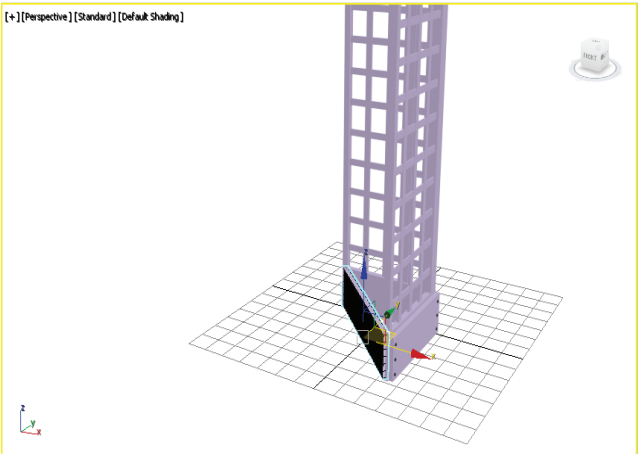

Figure 3-37 *The support03 aligned*

18. Select all objects in the scene and choose **Group > Group** from the menu bar; the **Group** dialog box is displayed. In this dialog box, enter **SIDE01** in the **Group name** text box and choose the **OK** button to close the dialog box; *SIDE01* group is created.

    Now, you will create other sides of the shed using the **Mirror** tool.

19. Make sure the Top viewport is activated. Select *SIDE01* and invoke the **Mirror** tool from the **Main Toolbar**; the **Mirror: Screen Coordinates** dialog box is displayed. In this dialog box, select the **Y** radio button and set the value in the **Offset** spinner to **-165** in the **Mirror Axis** area. Next, make sure the **Copy** radio button is selected in the **Clone Selection** area and choose the **OK** button to close the dialog box; the copy of *SIDE01* is created with the name *SIDE002* and positioned, as shown in Figure 3-38.

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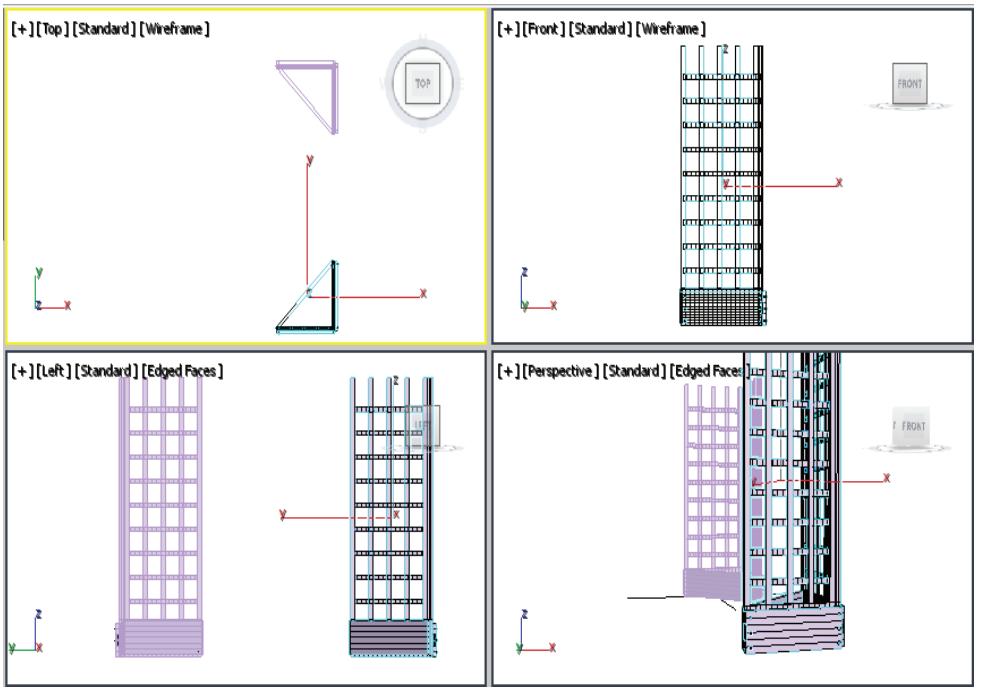

Figure 3-38 *The SIDE002 created and positioned*

20. Make sure the Top viewport is activated. Next, select *side01* and *side002* and again invoke the **Mirror** tool from the **Main Toolbar**; the **Mirror: Screen Coordinates** dialog box is displayed. In this dialog box, select the **X** radio button and set the value in the **Offset** spinner to **-165** in the **Mirror Axis** area. Next, make sure the **Copy** radio button is selected in the **Clone Selection** area and then choose the **OK** button to close the dialog box; the copies of *SIDE01* and *SIDE002* are created with the name *SIDE003* and *SIDE004* and positioned, as shown in Figure 3-39.

Creating the Top of the Shed

In this section, you will create the top of the shed using the **Box** and **Hedra** tools.

1. Make sure the Top viewport is activated. Choose **Create > Geometry** in the **Command Panel**; **Standard Primitives** is displayed in the drop-down list. Next, invoke the **Box** tool from the **Object Type** rollout; various rollouts are displayed in the **Command Panel**.

2. Expand the **Keyboard Entry** rollout and set the values as given next:

   Length: **205** Width: **195** Height: **4.5**

3. In the **Parameters** rollout, set the values as given next:

   Length Segs: **10** Width Segs: **10** Height Segs: **1**

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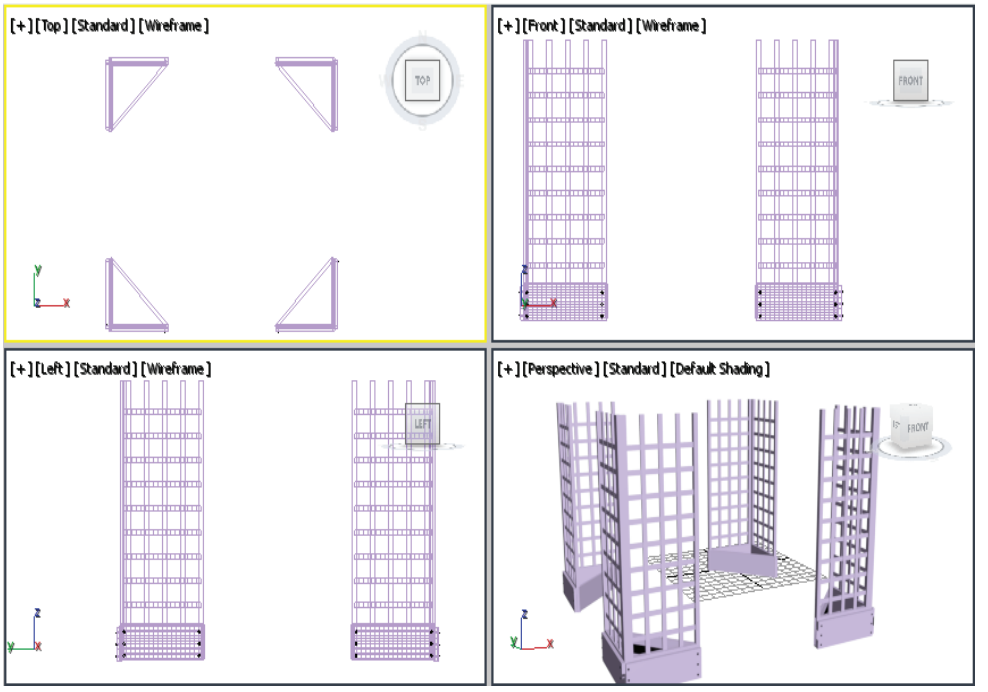

Figure 3-39 *The SIDE003 and SIDE004 positioned*

Choose the **Create** button from the **Keyboard Entry** rollout; a box is created. In the **Name and Color** rollout, enter **Top1** and press ENTER; the box is named as *Top1*.

4. Invoke the **Select and Move** tool from the **Main Toolbar** and align *Top1* in all viewports, as shown in Figure 3-40.

5. Make sure *Top1* is selected and the Top viewport is activated. Next, choose the **Modify** tab in the **Command Panel**. Select **Edit Poly** from the **Modifier List** drop-down list; the **Edit Poly** modifier is applied to *Top1* in the modifier stack.

6. Invoke the **Select Object** tool from the **Main Toolbar** and then select the **Polygon** sub-object level from the **Selection** rollout. Next, select middle polygons of *Top1* by dragging across window around the polygons, as shown in Figure 3-41. Next, delete them.

7. Choose **Create > Geometry** in the **Command Panel**. Select **Extended Primitives** from the drop-down list located below it. Next, invoke the **Hedra** tool from the **Object Type** rollout.

8. Click at a point in the Top viewport, drag the cursor, and then release the left mouse button; the hedra is created, as shown in Figure 3-42 and it is automatically named as *Hedra001*.

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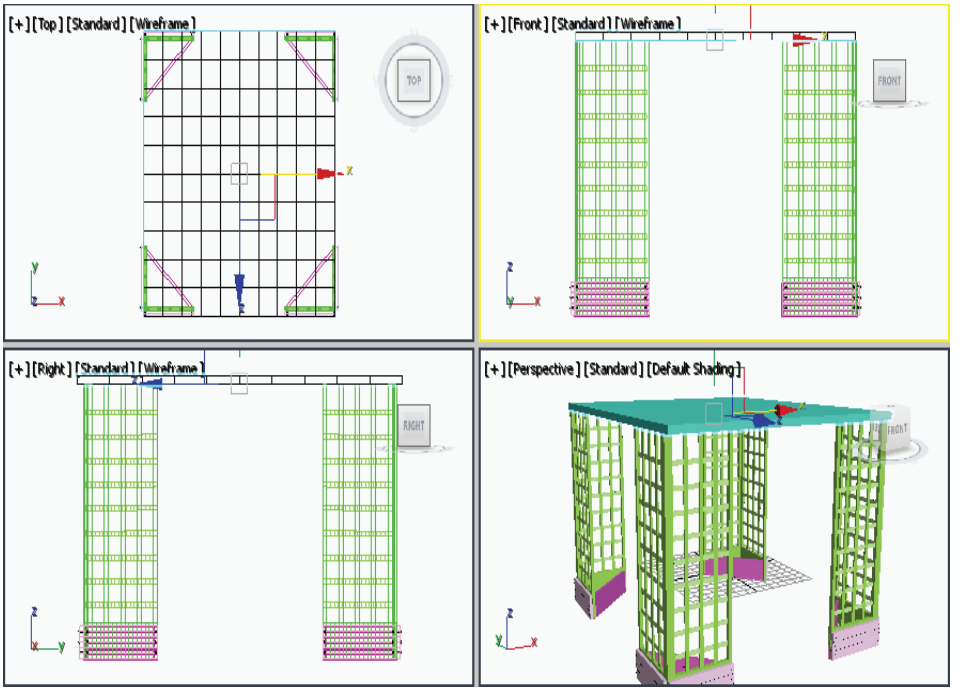

Figure 3-40 *Top 1 aligned in all viewports*

9. Choose the **Modify** tab in the **Command Panel**; various rollouts are displayed in the **Command Panel**. Make sure that the **Tetra** radio button is selected in the **Family** area of the **Parameters** rollout. Next, scroll down in this rollout and set the value of **150** in the **Radius** spinner. Also, rename *Hedra001* as *Top2* in the **Name and Color** rollout.

10. Select the **Edit Poly** modifier from the **OBJECT-SPACE MODIFIER** section in **Modifier List** drop-down list; the **Edit Poly** modifier is displayed in the modifier stack. In the modifier stack, click on the arrow on the left of the **Editable Poly** to view all sub-object levels.

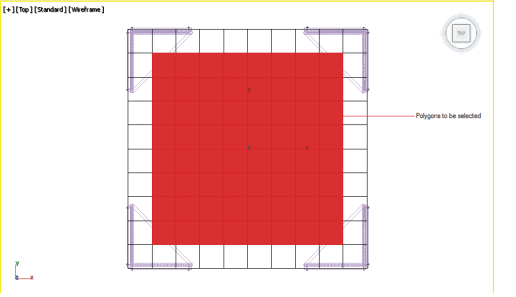

Figure 3-41 *The polygons selected*

11. Activate the Front viewport. Select the **Vertex** sub-object level from the modifier stack. Next, select the vertex of *Top2*, as shown in Figure 3-43. Invoke the **Select and Move** tool from the **Main Toolbar** and move the vertex, as shown in Figure 3-44.

12. Select the **Edge** sub-object level from the **Selection** rollout and then select all edges of *Top2*. Next, choose the **Settings** button on the right of the **Chamfer** button; the **Chamfer** caddy control is displayed, as shown in Figure 3-45. Set the value **2.5** in the **Chamfer-Amount** spinner and make sure that the value in the **Segments** spinner is set to 1. Choose the **OK** button to close the caddy control; all edges of *Top2* are chamfered, refer to Figure 3-46. Select the **Edge** sub-object level in the modifier stack again to deactivate it.

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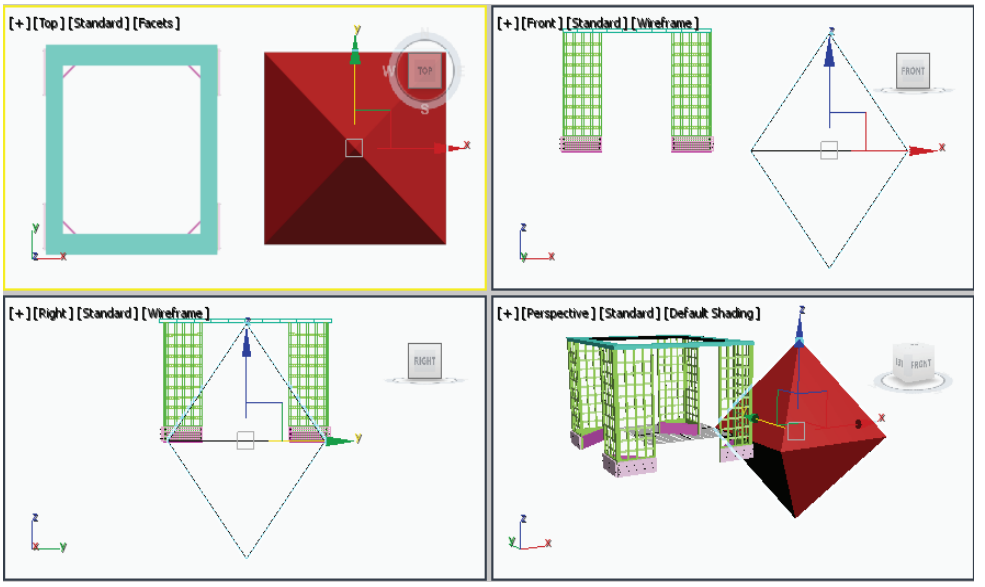

Figure 3-42 *Hedra001 created*

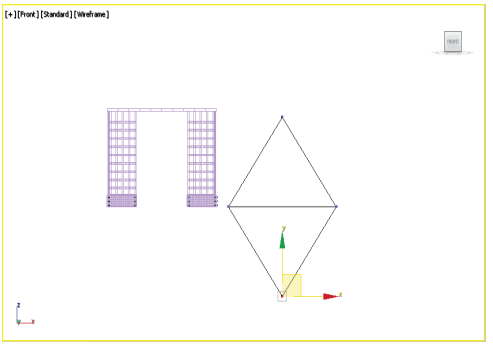

Figure 3-43 *The selected vertex*

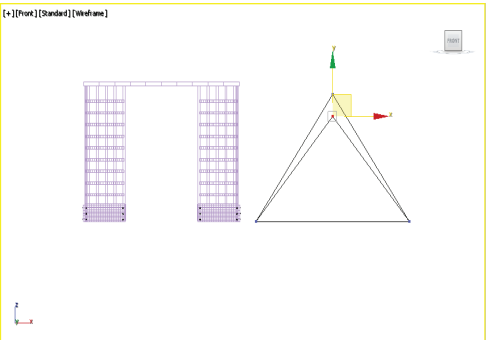

Figure 3-44 *The vertex moved*

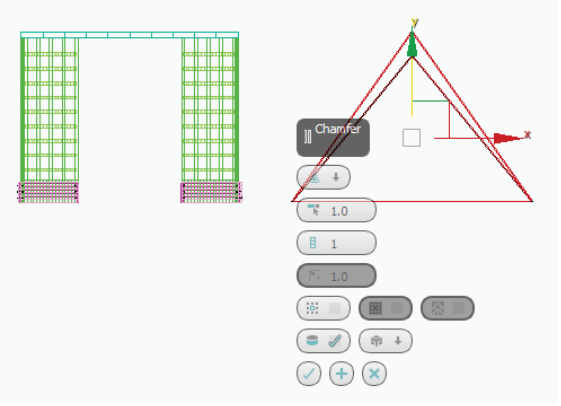

Figure 3-45 *The* ***Chamfer*** *caddy control*

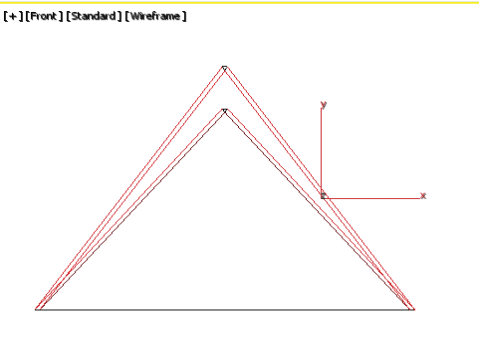

Figure 3-46 *All edges chamfered*

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13. Make sure *Top2* is selected. Right-click on the **Select and Uniform Scale** tool; the **Scale Transform Type-In** dialog box is displayed. In the **Absolute:Local** area of this dialog box, set the value **50** in the **Z** spinner and press the ENTER key; *Top2* is scaled, as shown in Figure 3-47.

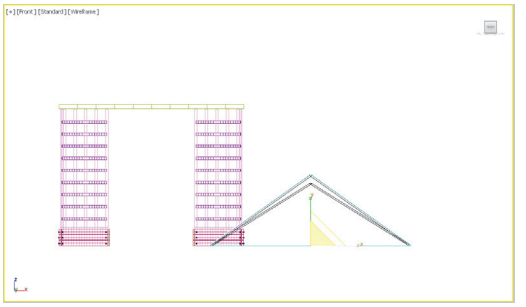

Figure 3-47 *The Top 2 scaled*

14. Close the **Scale Transform Type-In** dialog box.

15. Invoke the **Select and Move** tool from the **Main Toolbar** and align *Top2* in all viewports, as shown in Figure 3-48.

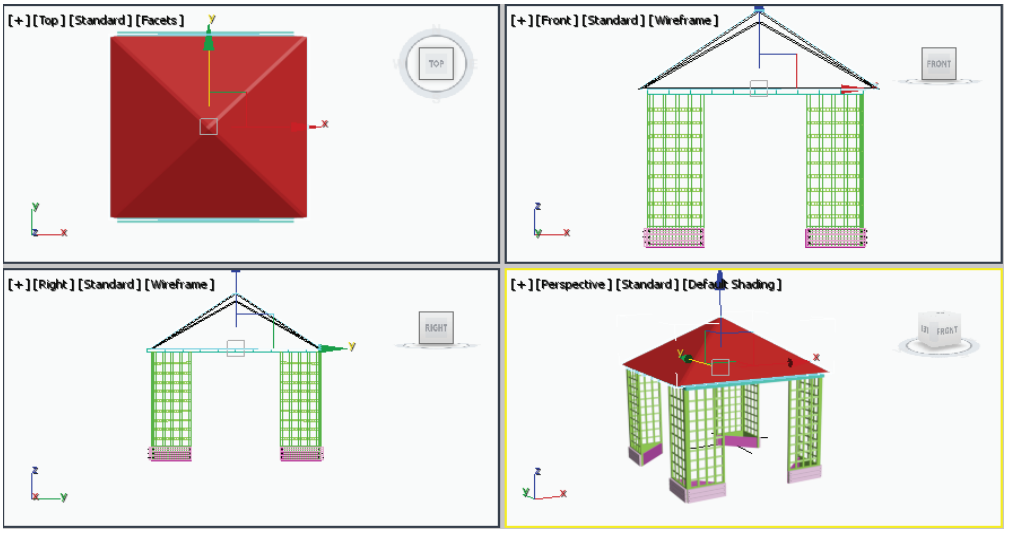

Figure 3-48 *The Top 2 aligned in all viewports*

Next, you will create a group of *Top1* and *Top2*.

16. Select *Top1* and *Top2* in the viewport and choose **Group > Group** from the menu bar; the **Group** dialog box is displayed. In this dialog box, enter **Top** in the **Group name** dialog box and choose the **OK** button to close the dialog box.

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Saving and Rendering the Scene

In this section, you will save the scene that you have created and then render it. You can also view the final rendered image of this model by downloading the *c03_3dsmax_2021_rndr.zip* file from *www.cadcim.com*. The path of the file is as follows: *Textbooks > Animation and Visual Effects > 3ds Max > Autodesk 3ds Max 2021 for Beginners: A Tutorial Approach*.

1. Change the background color of the scene to white by following the steps given in Tutorial 1 of Chapter 2.

2. Choose **Save** from the **File** menu.

3. Activate the Perspective viewport. Next, invoke the **Render Production** tool from the **Main Toolbar**; the rendered image of a shed is displayed, refer to Figure 3-49.

Figure 3-49 *The rendered image of a shed*

Self-Evaluation Test

Answer the following questions and then compare them to those given at the end of this chapter:

1. Which of the following buttons is chosen by default in the **Create** tab of the **Command Panel**?

   (a) **Geometry** (b) **Shapes**
   (c) **Lights** (d) **Helpers**

2. Which of the following tools in the **Main Toolbar** is used to rotate the object in increments?

   (a) **Spinner Snap Toggle** (b) **Percent Snap Toggle**
   (c) **Angle Snap Toggle** (d) None of these

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3. Which of the following options is selected by default in the **Reference Coordinate System** drop-down list?

   (a) **World** (b) **View**
   (c) **Screen** (d) **Grid**

4. The _____ tool in the viewport navigation controls is used to view all objects properly in all viewports.

5. You can use the _____ tool from navigation viewport controls to zoom in on a small portion of an object by enclosing it in a selection window.

6. Choose **Array** from the _____ menu to display the **Array** dialog box.

7. Choose **Group** from the _____ menu to display the **Group** dialog box.

8. You can use the **Render Production** tool from the **Main Toolbar** to render the active viewport. (T/F)

Review Questions

Answer the following questions:

1. Which of the following dialog boxes is invoked by right-clicking on the **Select and Move** tool?

   (a) **Scale Transform Type-In** (b) **Rotate Transform Type-In**
   (c) **Move Transform Type-In** (d) None of these

2. Which of the following dialog boxes is displayed by right-clicking on the **Snaps Toggle** tool?

   (a) **Select from Scene** (b) **Grid and Snap Settings**
   (c) **Preference Settings** (d) **Environment and Effects**

3. The _____ tool is used to zoom an object equally in all viewports.

4. The _____ tool is used to create the duplicate copies of the other sides of objects.

5. The _____ is used to select the objects in the scene.

6. The **Axis Constraints** tools in the **Axis Constraints** toolbar do not normally work with snaps on. (T/F)

7. The **Snaps Toggle** tool is used to rotate the object in the increments you set. (T/F)

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EXERCISE

The rendered output of the model used in the following exercise can be accessed by downloading the *c03_3dsmax_2021_exr.zip* from *www.cadcim.com*. The path of the file is as follows: *Textbooks > Animation and Visual Effects > 3ds Max > Autodesk 3ds Max 2021 for Beginners: A Tutorial Approach*

Exercise 1

Create the scene of an umbrella and table on the ground, as shown in Figure 3-50.

Figure 3-50 *The scene of an umbrella and a table*

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Answers to Self-Evaluation Test

1. a, **2.** c, **3.** b, **4. Zoom Extents All**, **5. Zoom Region**, **6. Tools**, **7. Group**, **8.** T

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