This tutorial is about modeling the dune buggy shown above. An effort has been made to use as many distinct form-Z tools as possible.

1. Building the Roll Cage with the Axial Sweep
   - Use the Vector Line tool to draw the cage shape shown below. Try to keep the lines as connected as possible. Then round some of the corners. If your cage is a bit different than the one we show, it does not really matter.
   - Draw a few small circles to use as sources and, with the Axial Sweep, sweep them along all the lines in the cage.
   - Optionally Union the pieces. The result should be as shown.

2. Modeling the Muffler as a 2-Source Sweep
   - Draw a path in the curving motion of the muffler, then draw two profile shapes—one in the shape of the front and the one in the shape of the rear of the muffler (see below).
   - With Two Source Sweep active, Click on the two source shapes and then on the path. The result is shown below.

3. Creating the Shocks with the Helix tool
   - Generate a wire helix along the Z axis and draw two circles, a smaller (red) and a larger (gray).
   - Axially sweep the small circle along the helix and extrude the larger circle perpendicular to the XY plane. The result should be as shown.

4. Modeling the Car Body as a Nurbz object
   - Draw cross sections for the car body, roughly as shown to the right, in front, top, and side projections. Again, these profiles suffice to be similar to the ones we show. They do not have to be exactly the same.
   - With the Pick tool select the profiles from front to rear. Then, with the Nurbz tool set to Nurbz By Lofting, click anywhere on the screen.
   - After the nurbz surface is generated, you can still edit it to make adjustments, as shown below right.

5. Cutting out the wheel-well and windows
   - Draw a 2D line in the shape of the wheel-well, as shown.
   - With the Trim/Split tool set to Trim By Line, click on the body of the car, then on the wheel-well line. The result is shown below.
   - To cut out the windows, draw two flat 2D shapes, one in front and the other in side view, to represent the windows.
   - With the Trim/Split tool set to Split By Line click on the body of the car, then on a window shape. Repeat this until you have trimmed all the windows. Note that the resulting trimmed surface is still editable.

6. Adding the scoop in the car body
   - Create a cylinder that overlaps the edge of the car body, as shown on the left.
   - With the Trim/Split tool set to Trim First Object click on the cylinder then the car body.
   - Select the outline of the indentation and round it by 2".
   - Do the same on the other side of the car body.
7. Trimming the body with molding
- With the Derive Surface tool set to **Boundary Of Surface Object**, click on the body and the three windows.
- Axially sweep a small circle to each of the three paths generated by the previous operation.

8. Modeling the wheel with revolutions and trims
- With the 2D drawing tools, draw the profile of the wheel and a line of revolution, as shown.
- With the Revolve tool, revolve the profile around the line. **The result is shown on the right.**
- Draw 2D profiles of the negative areas that will be used to cut out the spokes.
- After you draw them, use the Join tool to join them together. Then extrude this complex shape so that it is overlapping the front of the revolved wheel.
- Difference this shape from the wheel.
- With the Stitch Round tool set to 2", select the outside outlines of the spokes to round them.
- Draw a 2D profile for the tire and revolve it around the same axis you used for the wheel. **The result should be as shown to the right.**

9. Create a car seat by subdividing a cage
The car seat will be modeled by first generating a cage approximating the shape of the seat and then subdividing it to derive its final form. Again, it is not necessary for your form to be exactly the same as ours. Just try to be close enough.
- Generate a cage shape, roughly as shown below. We drew five boxes, unioned them together, and then moved some of its faces and edges to give it its final shape. Use snaps throughout this process.
- With the T-Subz tool, click on the cage to subdivide the rough shape. Experiment with different values and options, set in the T-Subz Options dialog, until you get the desired shape. **The result should be as shown to the right.**

10. Modeling the steering wheel with metaformz
- Working in the top view, draw a circle with a 14" radius (assuming the rest of the buggy is in real life scale). Then make a copy of the circle at a distance of 5/8" above the first circle.
- Working in front view, draw a spline whose projection corresponds to a radius of the circle. Make three more copies of the spline and position the four splines roughly as shown to the right.
- You will next generate a different metaform from each of these lines and you will group them into a single metaform to derive the complete steering wheel.
- With the Metaform Derive tool, click on the top circle. In the **Metaformz Parameters** dialog that is invoked, set **Metaform Type to Ball**, **Radius 1** to 1" and in the **Ball Chain** box select **Number Of Primitives** and set it to 47. Click **OK** to complete the operation.
- Next, with the Metaform Derive tool, click on the bottom circle. In the **Metaformz Parameters** dialog, set **Metaform Type to Cone** and **Radius 1** to 2".
- With the Metaform Derive tool, click on each of the four splines and in the **Metaformz Parameters** dialog set **Metaform Type to Conic Tube**, **Radius 1** to 2" and **Radius 2** to 1".
- Select the six unevaluated metaformz you just generated and with the Group tool click anywhere in the graphics window. When the **Metaformz Evaluation Parameters** dialog is invoked, for **Mesh Resolution X**, **Y**, and **Z** enter 1/4" and click **OK**. The whole composite metaform is evaluated and should be as shown.

11. Modeling the lights (housing and lens)
- In the **Sphere Options** dialog, set **Closure** to **None**, select **Partial**, and set **Horizontal** from 0° to 180° and **Vertical** from -90° to 90°. With the Sphere tool draw a 4" 4/2" half sphere, centered at the origin. Alternatively, a complete sphere can be drawn and then edited to open it to half.
- Draw an ellipsoid of less than 1" radius, centered at the origin. Extrude along the Y-axis to a distance sufficient for crossing the end of the light housing.
- Working in front view, with the Trim/Stitch tool active and the **Stitch** option on, click on the sphere and then on the cylinder.
- Set S-Round to 1/2" and click on the stitch. **Double Parallel this shape In by 1/8".** **The result should be as shown.**
- To model the lens, create an ellipsoid sphere of roughly 4"x 4/1/2", as shown.
- To model a ring that attaches the lens to the housing of the light, generate a PRESET torus with **Major Radius** set to 2", **Minor Radius X** to 1/8", and **Minor Radius Z** to 1/2". To give it the same orientation as the light, work on front view and click on the origin. **The shape is shown to the right.**