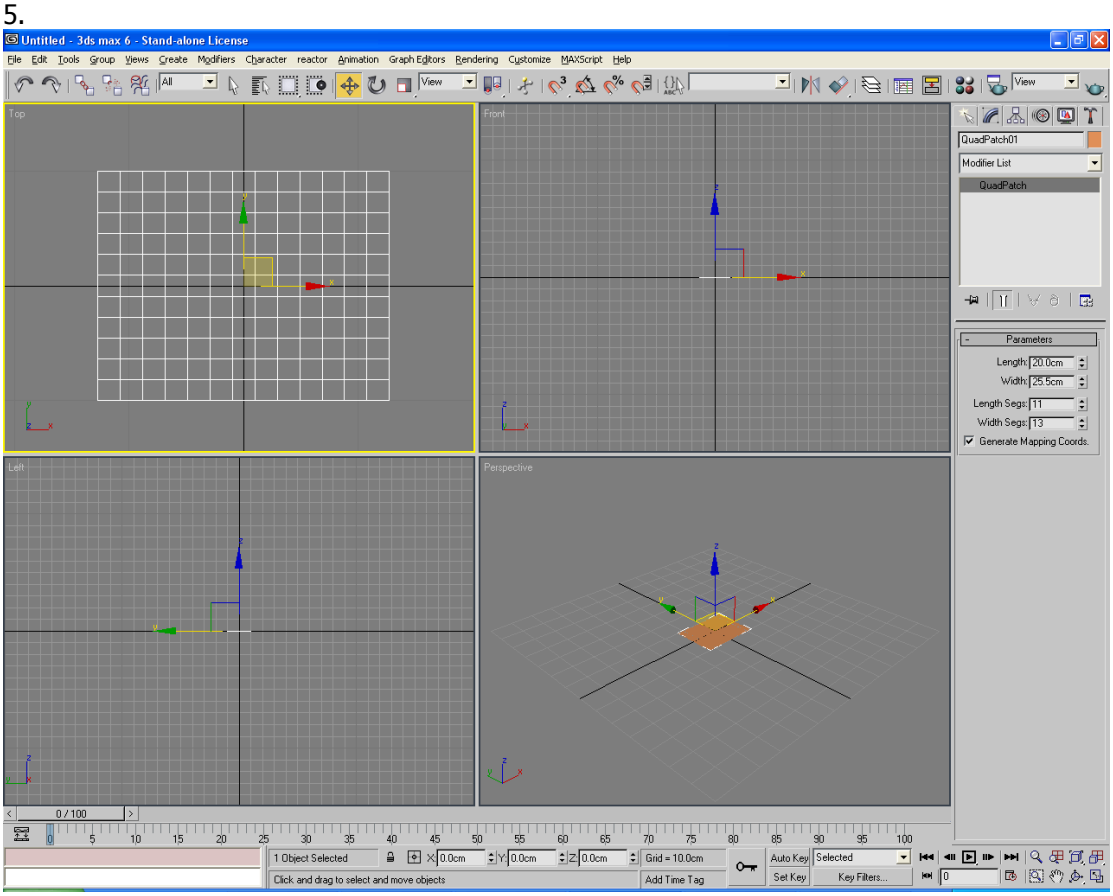
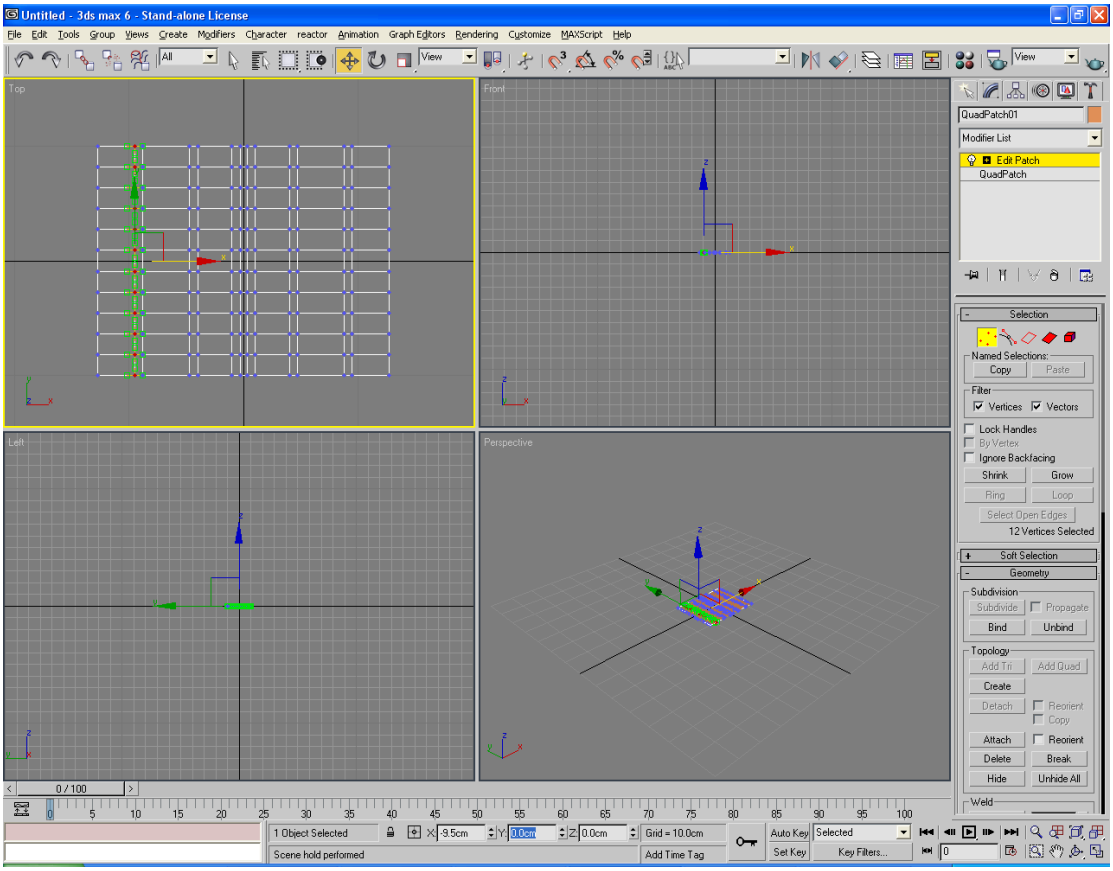
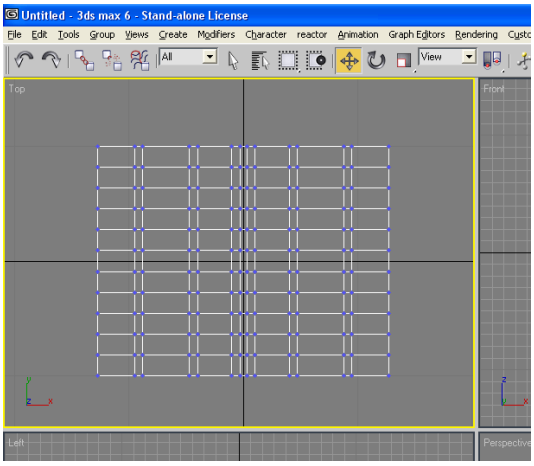
3DS Max Tyre Tutorial

1. Setup the units so 1 unit = 1cm
2. We'll make a tyre in the size of 255/35/18 – quite a sporty low profile. Tyre sizes are an annoying mix of metric and imperial measurements, so in our case, the tyre tread is 255mm across, the tyre sidewalls are 35% of 255mm (89.25mm), and the wheel the tyre sits on is 18 inches diameter.
3. We can now calculate the size of the tread as a whole – by working out the "rolling circumference of the wheel/tyre combination. To do this, we convert our wheel to metric (45.72cm) and add on twice our tyre sidewall. This gives an overall diameter of 63.57cm. To get the circumference we need to do 2Πr which comes to around 199.7cm. So our tyre tread is basically 2000x255mm in total. We will initially make a small segment of this and duplicate it – a segment 255x200mm will do.
4. In the top viewport, create a quad patch grid at the origin, with a length of 20cm and a width of 25.5cm. Change the width segs to 13 and the length segs to 11.
5. 

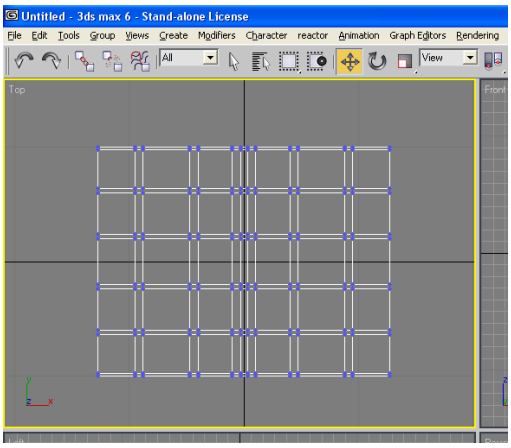
6. Now we can move the vertexes of the segments to begin our tread design… this part is up to you really depending on how you want the tyre to look! To do this, add an "Edit patch" modifier and choose vertex to operate on:



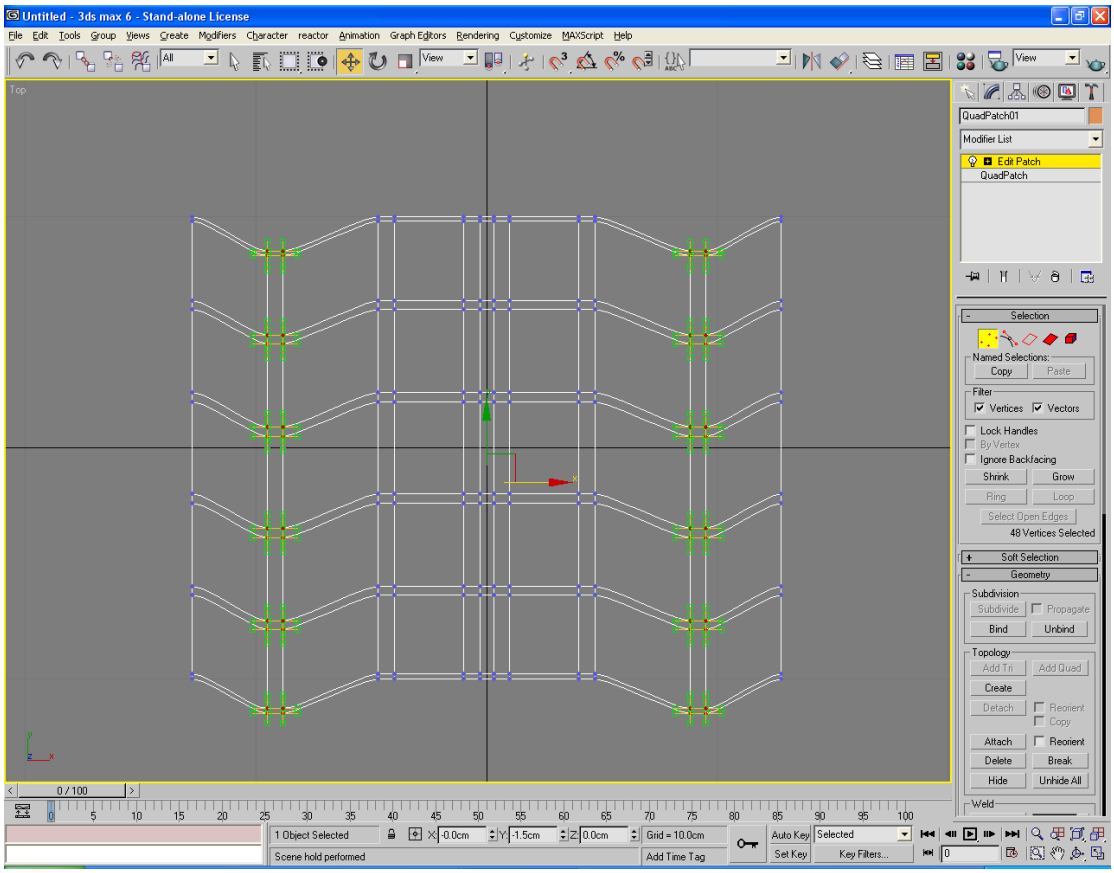
7. It is best to highlight a vertical row of vertexes and move them using the X modifier at the bottom of the screen – you should remember to keep each side symmetrical (unless you are doing an asymmetric tread pattern of course!) What we are trying to do is set up the blocks of tread and the grooves between them (which are thinner). In the shot below I've now completed the vertical rows of vertexes.



8. Now we can edit the horizontal rows. You might want to keep the pattern fairly straight as it already is, or you might wish to slope them a little – it all depends. Bear in mind we will be joining this patch to some copies later so at the edges you want to account for making the tread block (or indent) half the width you want or plan a block at one end and an indent the other. In the shot below we've completed making the block pattern. Notice the tread groove is thinner at each end to compensate for being joined later.

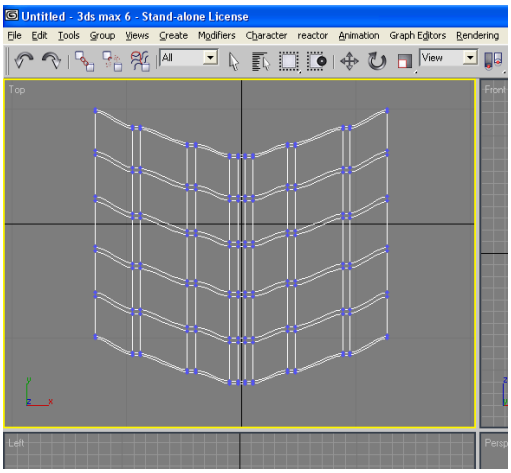


9. At this point I might slope some of the tread sections to make it look better. We can do this by highlighting vertexes on each side of centre and moving them down a little. This will cause some problems at each end though:

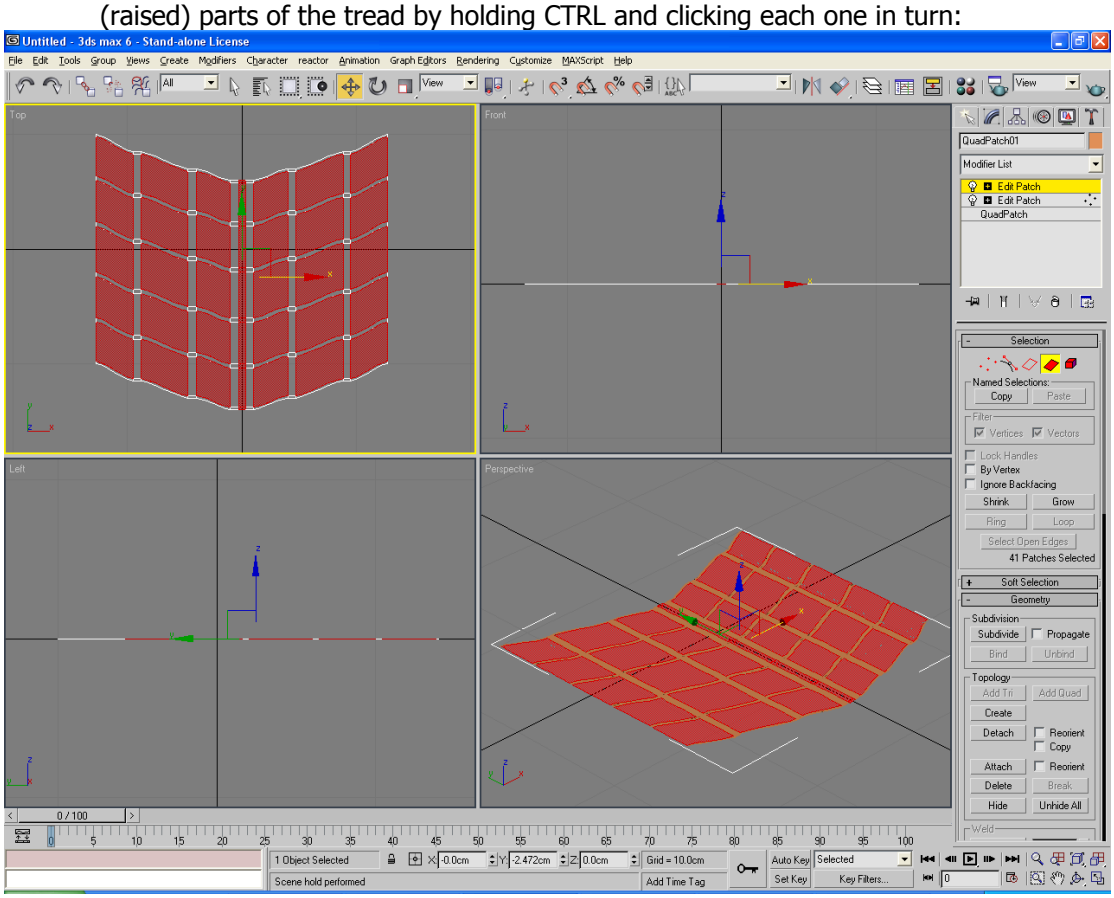


10. This is less of a problem than you would think – eventually we will have a complete circle of these and they should join up as long as the top and bottom move together so lets' carry on…

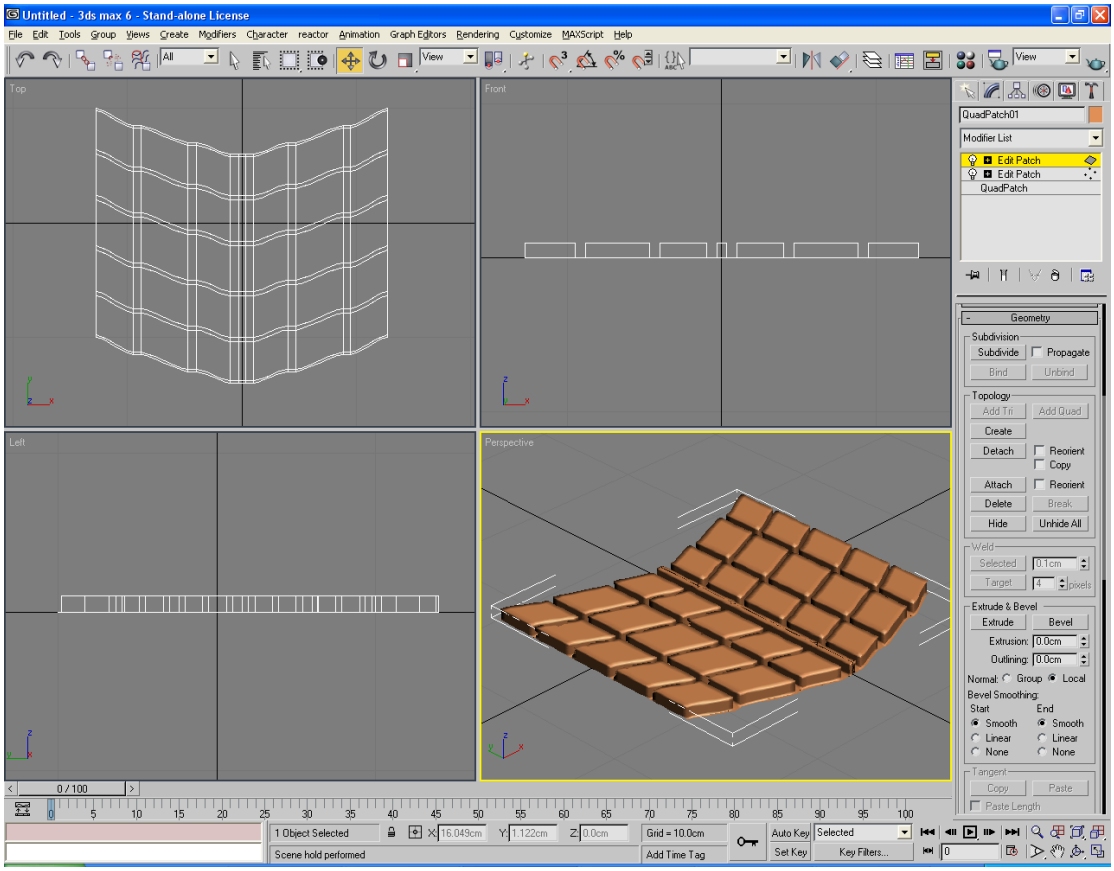
Here is what we now have:



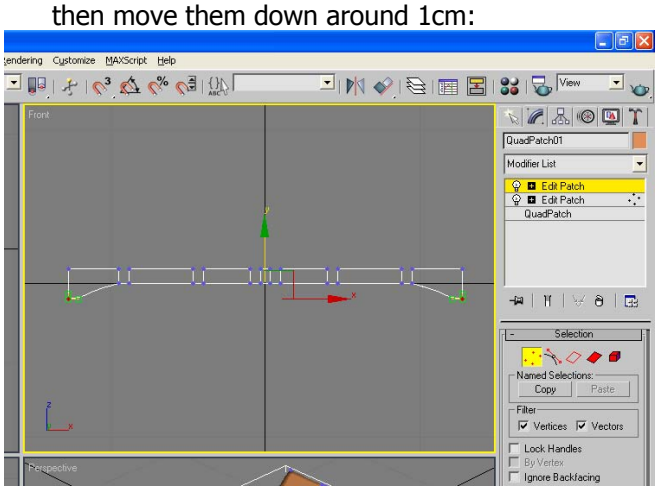
11. Now we can start getting this into 3D by extruding the block sections. To do this, add a new "Edit Patch" modifier, and choose to work on Patch. Next, select the block (raised) parts of the tread by holding CTRL and clicking each one in turn:



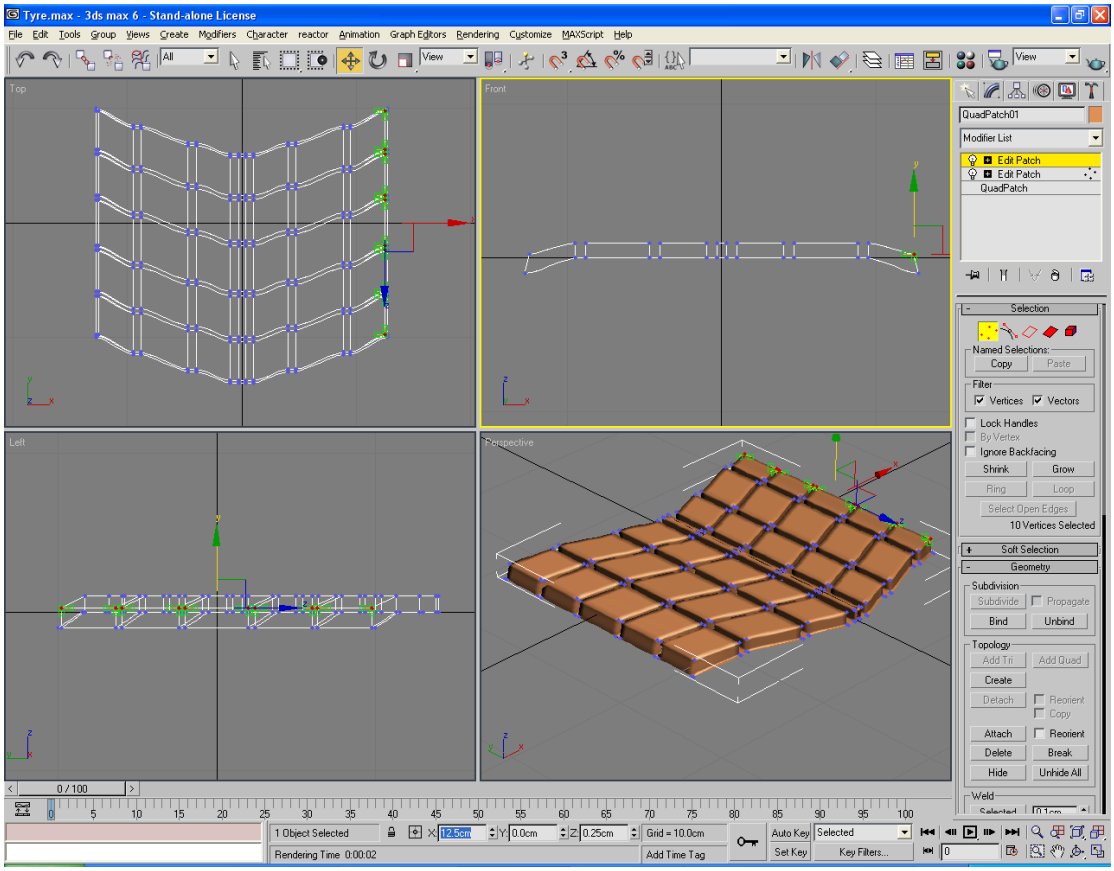
12. Notice that for the central section I highlighted all of the parts as most tyres will have a common long raised thin part down the middle. Now we can extrude these, so find the extrude option in the Edit Patch pane and enter a value – around 1cm is fine. We now have something like the following image.



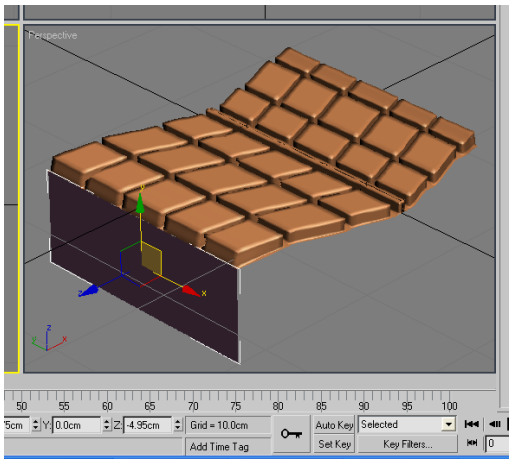
13. Next, we will want to create the sidewalls. For these to blend in, we'll do a little customising of the edge of the tread pattern to round it off. Firstly we want to drop the sides a little, so highlight the bottom corner vertexes in the front viewport and then move them down around 1cm:



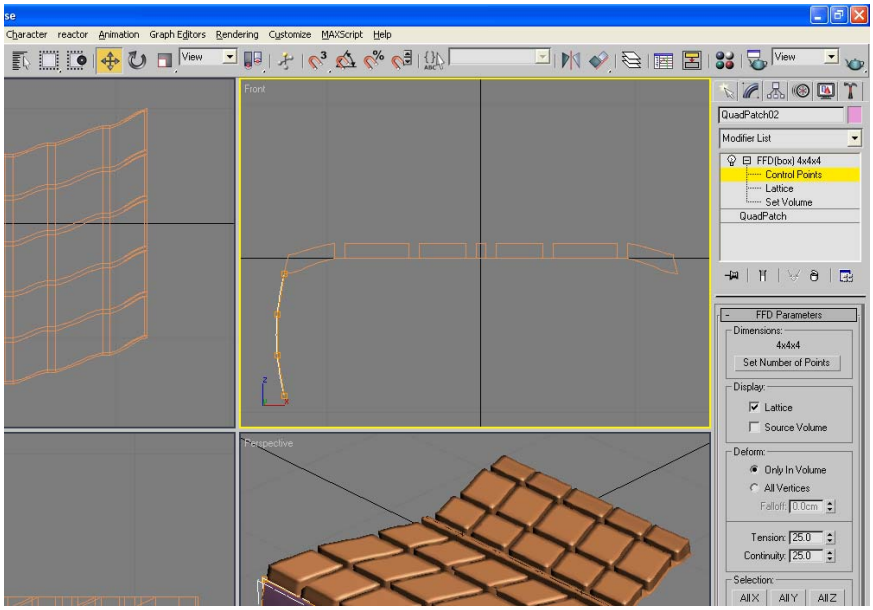
14. Next, select the top corner vertexes on one side and move them in a little – I used about 0.25cm. Then move them down a little (0.75cm in this case). Repeat for the other side, and we end up with the next image.



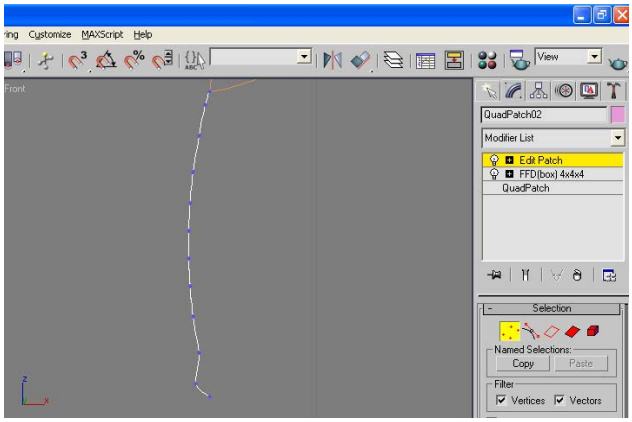
15. To begin the sidewall, create a new quad patch in the side viewport. Edit the values to 7.9cm height and 20cm width. Move it -12.75 in the X axis and -4.85 in the Z axis. Check the Y axis is 0. It should now line up with the edge of the tread blocks:



16. We want to get this to curve out so it matches the slope we introduced at the edge of the tread, so add a box FFD modifier and move the central control points out in the X axis to curve the side panel. Move them until the sidewall comes up to a similar angle to the tread slope as seen in the next image.

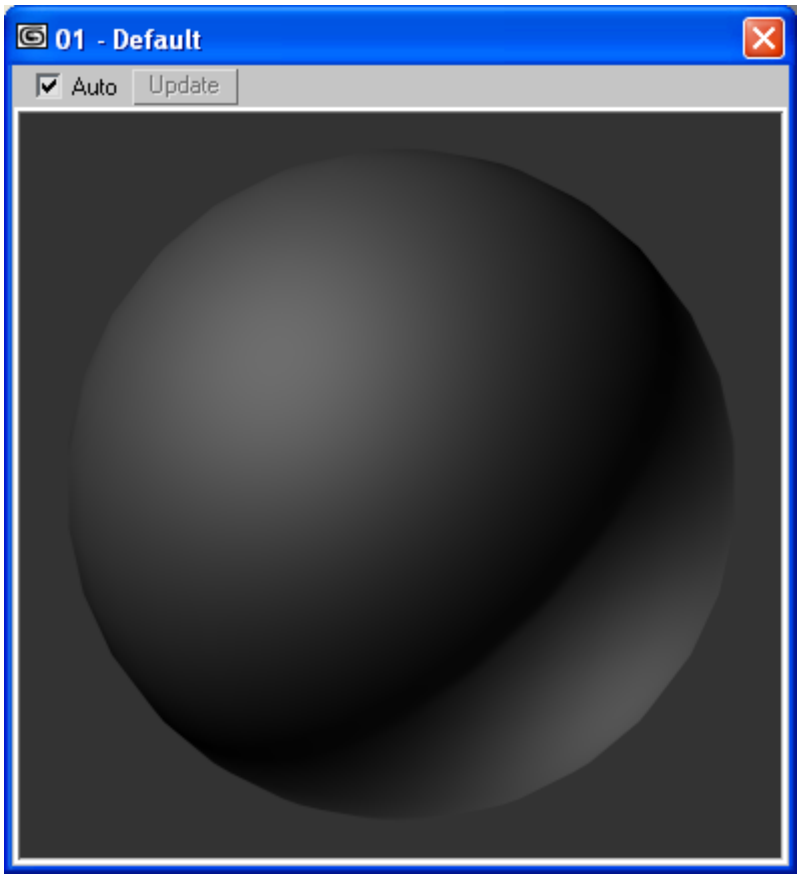


17. Now we can edit the sidewall a little to add the beading section where it meets the rim. Add an Edit Patch modifier, select the next vertex from the bottom and move it out a little. Check that "ignore backfacing" is off:

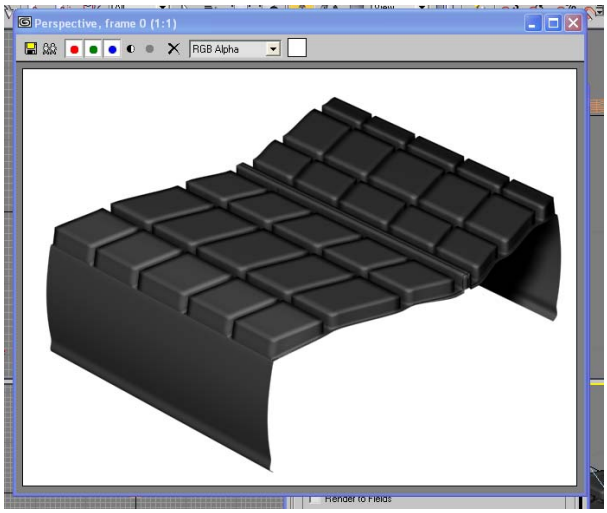


18. We can now clone the sidewall to add one to the opposite side. Go to Tools > Mirror. Mirror in the X axis, set Clone to Copy and make the offset 25.5cm. Now lets add a little more curve to the tread… reselect the tread object, and add an FFD Box modifier. Edit the central control points up a little in the Y axis (about 0.4 should do it).
19. Whilst we are here, select the Edit Patch modifier we used earler. Scroll down to "surface" and set the rendering steps to 15. This will give nicer tread blocks when the image is rendered.
20. Next, we need to attach the sides to the tread. Select the tread, then go to Create, Compound Object, Boolean. Set the operation to "Union", and click Pick Operand. Select one of the side pieces. When done, repeat this operation, selecting the other side piece. We now have one object. Rename it to "Tyre01".

21. We can now create a material for the tyre… We need a nice black rubbery texture. Open the Material Editor. Set the Ambient value to RGB 32,32,32. Set the Diffuse value to RGB 75,75,75. Set the Secular Level to 18. Your material should look like this:



22. Name the material "Rubber", tick 2-sided, and apply it to the Tyre object. Now, we can change the background to white and to a test render to see what we have!



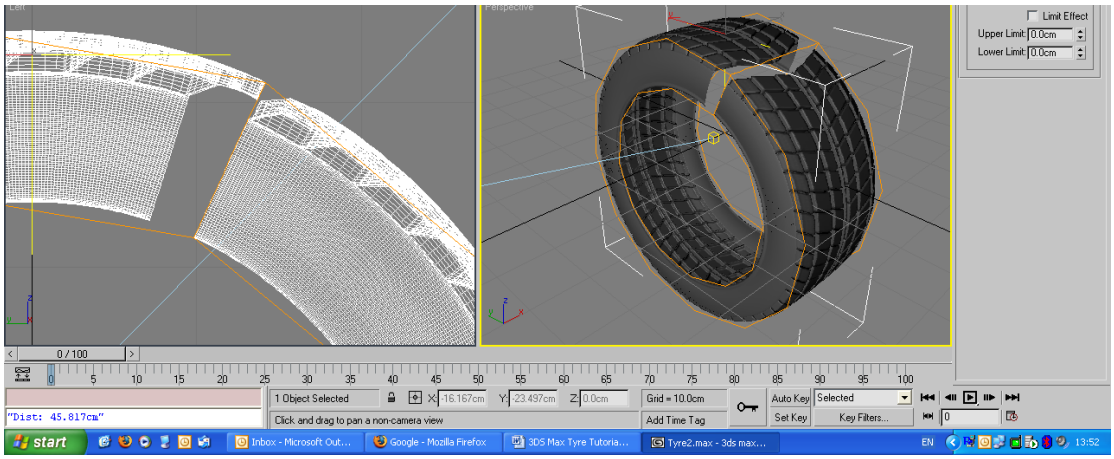
23. Not too bad. Now, we can copy this to make the whole tread. Start by going to Tools > Clone and make a new COPY.
24. Right click the Move Transform icon and enter 20. This will move the new tread object 20 units along so it butts up against the first.

25. Now we need to repeat this for the other 8 pieces. To make it easier, you can select all the objects once you get to 5 and clone them in one go and offset them by 100 in the Y axis ☺

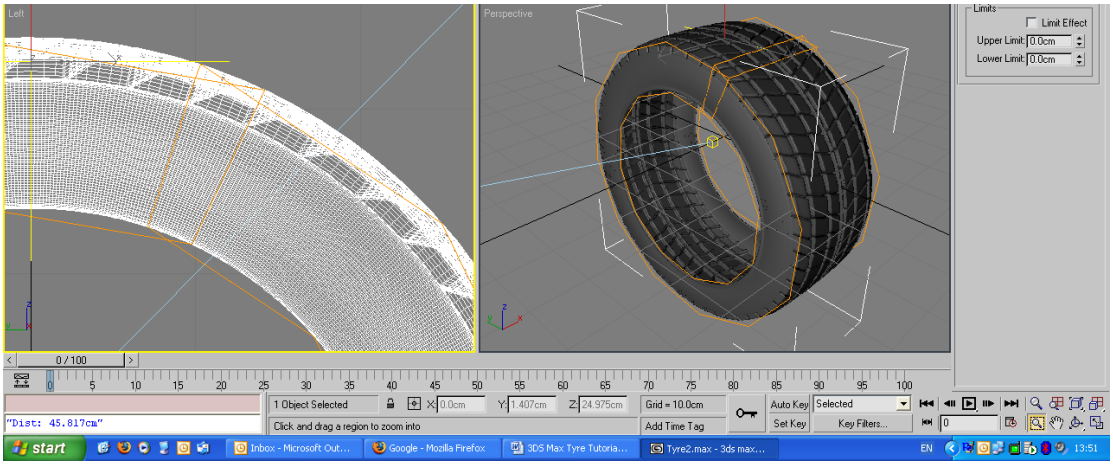
26. Now select the first and create a new Boolean. Union the second tread object to the first. Repeat this to join all 1. There are a lot of vertexes at this point so it might slow down a bit. Once done, we need to move the tyre assembly to the correct position. Centre the object in the X axis as viewed in the Top viewport. We can then move it up by the radius of our wheel. In this case we are going to make the wheelspace 18 inches. This is 45.72cm, half of which is 22.86.

27. We can now "bend" the tyre round into a circle. Add a Bend modifier.

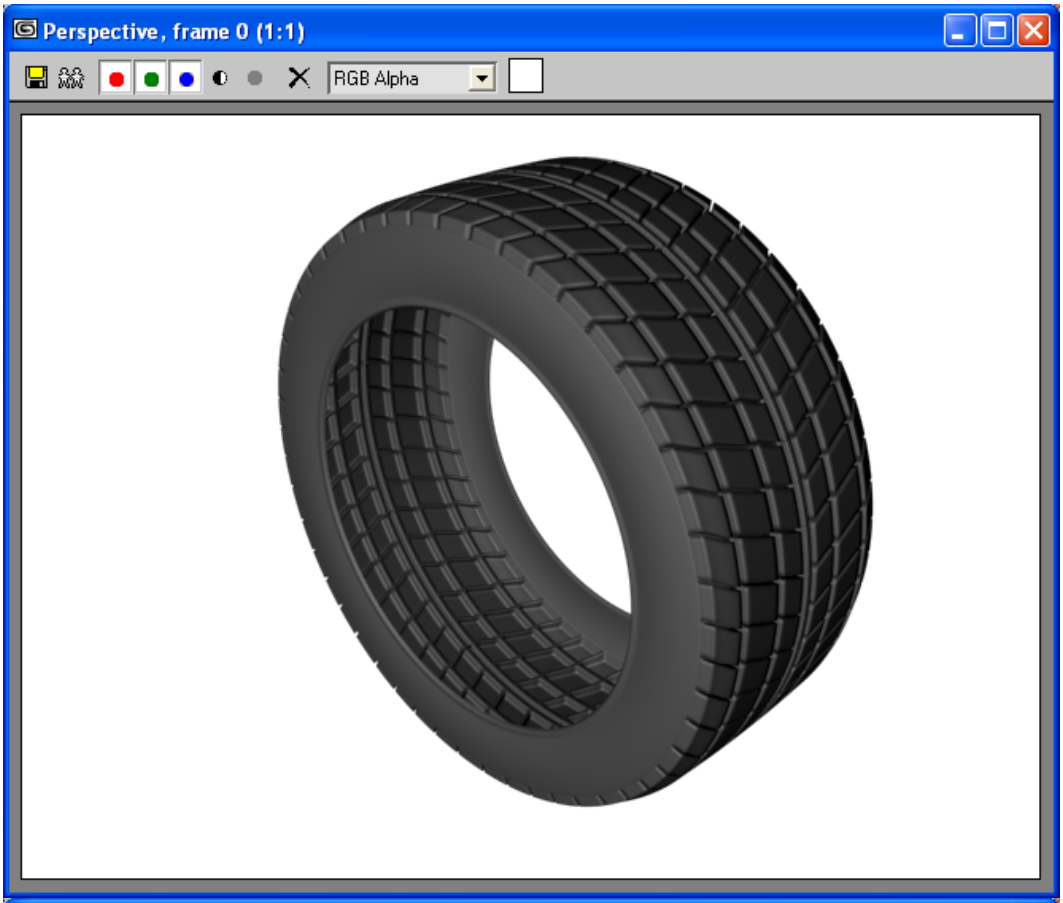
28. The next step is to define the bend angle to 360, the direction to -90 and the axis to Y. This should bend our tyre round to a circle – except in this example it doesn't quite as we had the sloping tread pattern!

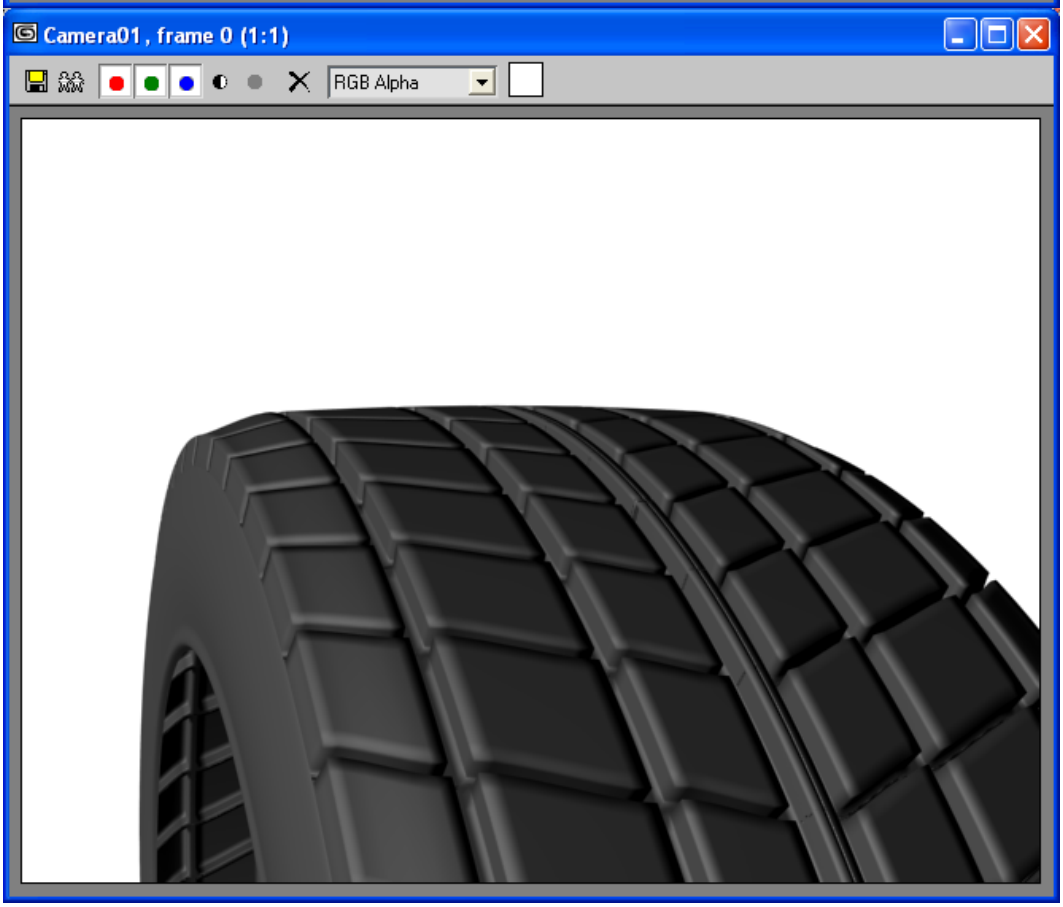


29. To fix this, we can simply increase the angle of the bend so it overlaps until the actual mesh joins up… Zooming in on the side viewport I found that a bend of 367.2 joined the tyre up:



30. Now we can zoom out a little and try a test render.


Perspective, frame 0 (1:1)
RGB Alpha


Camera01, frame 0 (1:1)
RGB Alpha

31. That concludes the tyre tutorial. You can of course experiment with your own tyre sizes and tread patterns and so on. The downside of this method is that the resulting object has a pretty huge polygon count making it slow to edit. A different method I might investigate is making a greyscale bitmap of the tread pattern and applying itto a base object as displacement mod. That can wait till another day though!