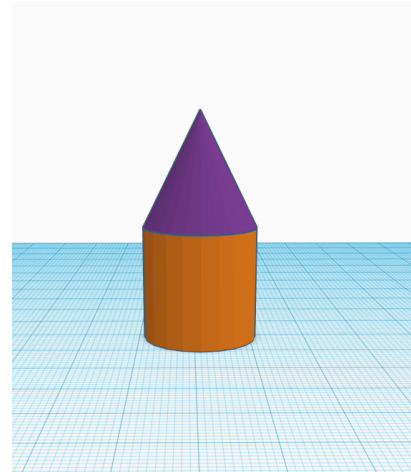


# Making a Rocket in TinkerCad

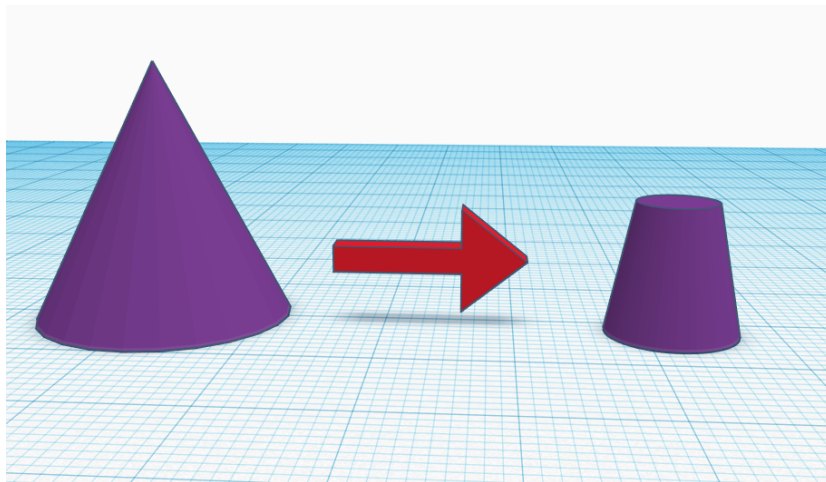
As part of this worksheet, we will be using TinkerCad (<https://www.tinkercad.com/>) to construct a model rocket.

1. Let us start with the cylinder and cone stacked together, as was used in the first worksheet to make a pencil
2. Now, smooth off the edges by giving each shape 64 sides (this is the maximum)

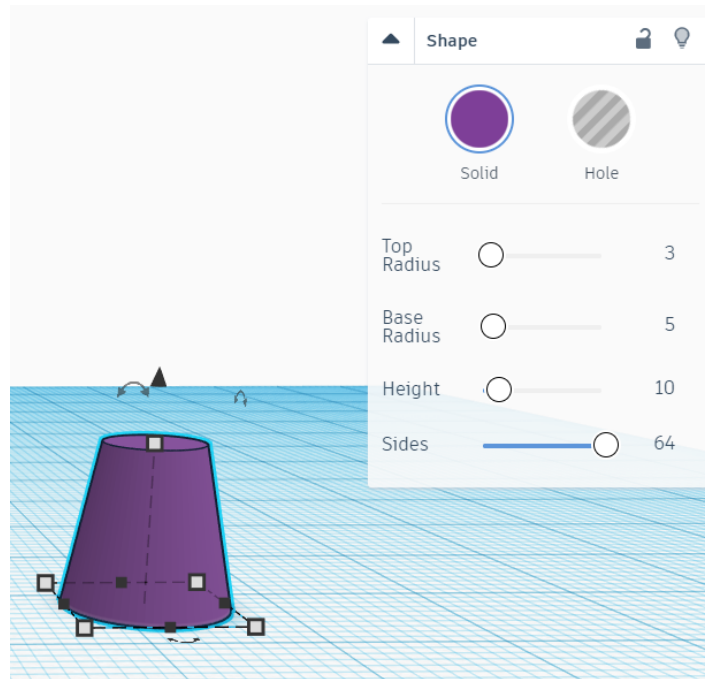


3. It still doesn't look like a rocket though. Let us make some thrusters for it:

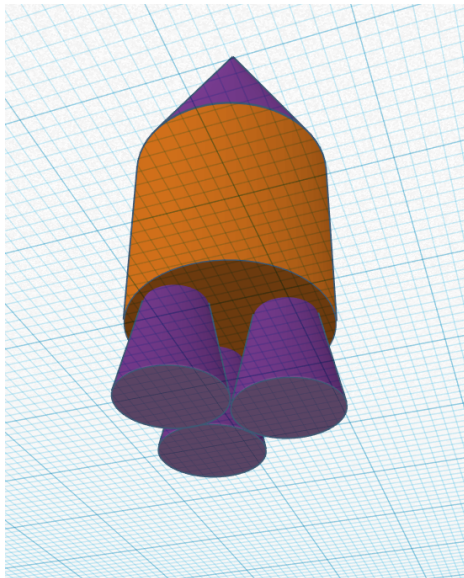
We can use another cone to make the first thruster, see if you can figure out how to do the below transformation. The new sizes should be top radius 3, base radius 5, height 10 and sides 64.



Hint:



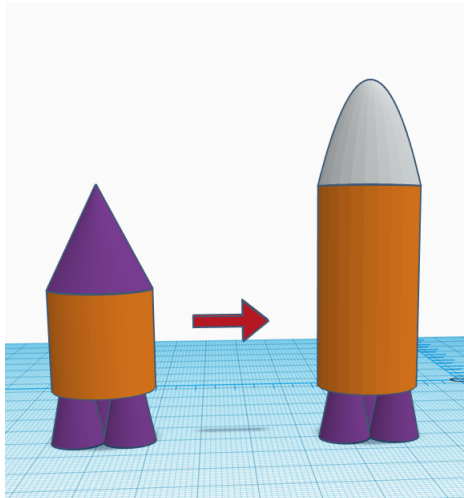
4. You will need three of these to produce the below design:



Hints:

To copy an object, you can use the option on the top toolbar or you can drag two more cones onto the workplace and repeat step 3 with both of them. The view provided is from below the workplace. The thrusters should be set to 0mm above the surface, the cylinder 10mm above and the cone 30mm above to have all the objects stacked correctly.

5. I think we should replace the cone with a paraboloid from the shape menu. The only problem is that the paraboloid can only have 24 bevels (sides) so you will also need to change the cylinder to 24 sides. For a smooth fit. Then increase the height of the cylinder to 40mm. Your rocket should then look like this:



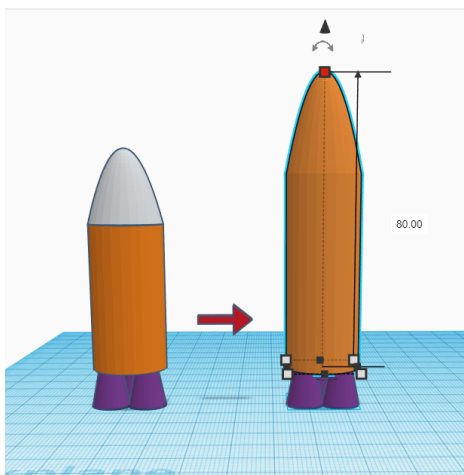
#### Hints:

To delete a shape from the workplace just left click on it to select and then press delete.

To change the number of sides on the cylinder select it and then change number of sides to 24 in the details box.

You will need to reposition all the objects once you've changed their sizes to match the provided image.

6. Now merge the paraboloid and cylinder together **before** changing this new shape's height to 80mm. See below image of the new changes:



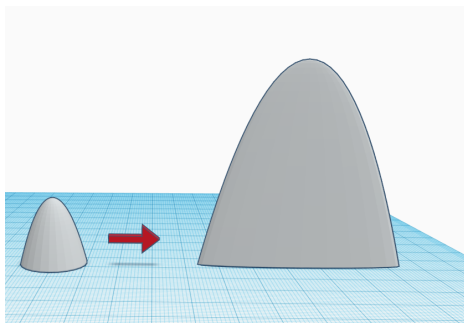
#### Hints:

To merge shapes, you can select the shapes you want to merge and then use Ctrl+G or click the merge icon on the toolbar.

You can tell when objects are merged as they become the same colour. The thrusters should still be different as they are not merged to your rocket.

You may need to lift the new shape after you've increased its height to 80 to keep it on top of the thrusters.

7. Let's now add some wings.

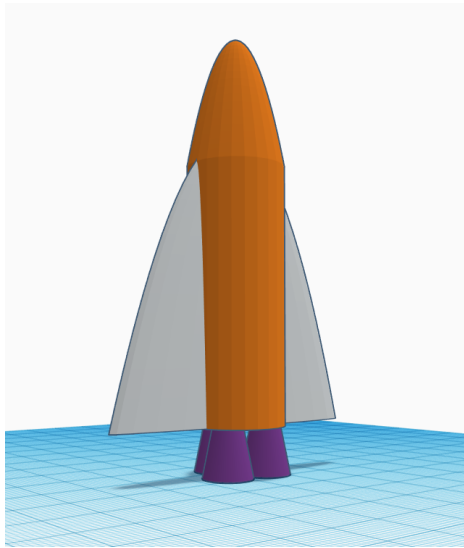


#### Hints:

Drag a new paraboloid from the shape menu to the workplace.

Stretch it so it's 60mm tall, 60mm across the base and only 6 mm wide.

8. Now move our new wing object into the correct location on our rocket.

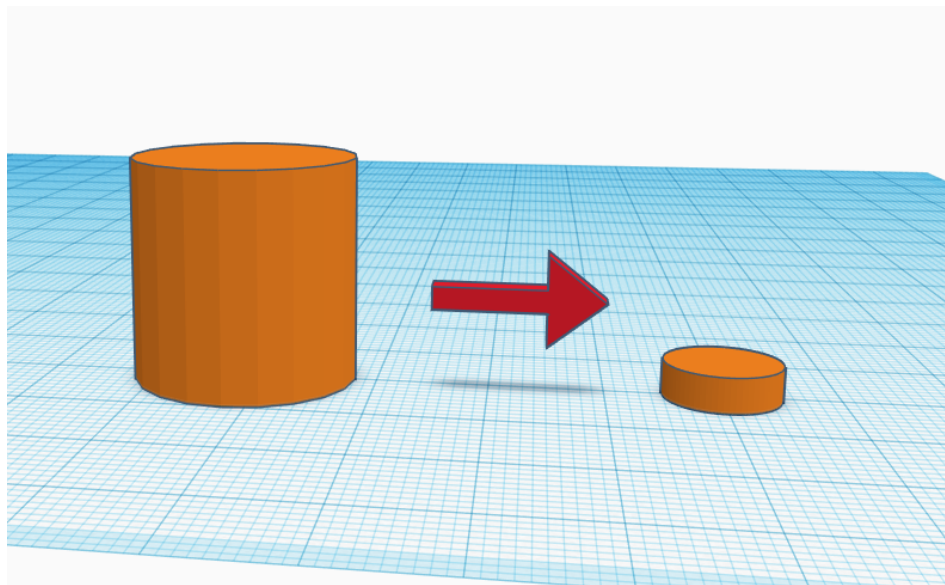


Hints:

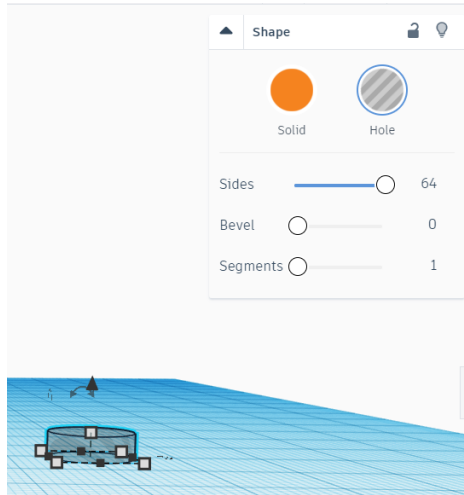
TinkerCAD requires quite a bit of fiddly repositioning of objects. The more you experiment and play around the easier it becomes. If you are really struggling to align objects, there is a ruler option you can have a play with that might help (the maker of this worksheet uses the ruler all the time).

9. So far, we have only added objects to the final shape, but what about cutting? Let's try something different for the port holes on our rocket.

Start by getting a new cylinder shape onto the workplace and change its height to 3mm, its diameter to 10mm and the number of sides to 64.



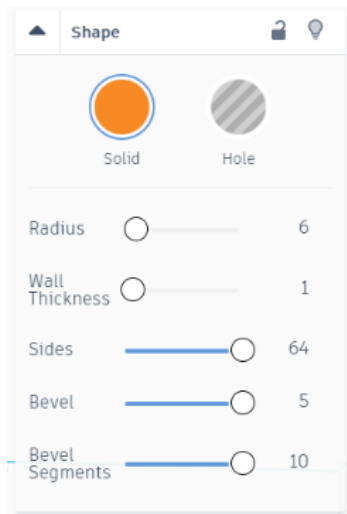
10. Once you've done this, select the new disc shape and in the details click on hole rather than solid:



Hint:

The disc will become hollow/transparent once you've selected the hole instead of solid.

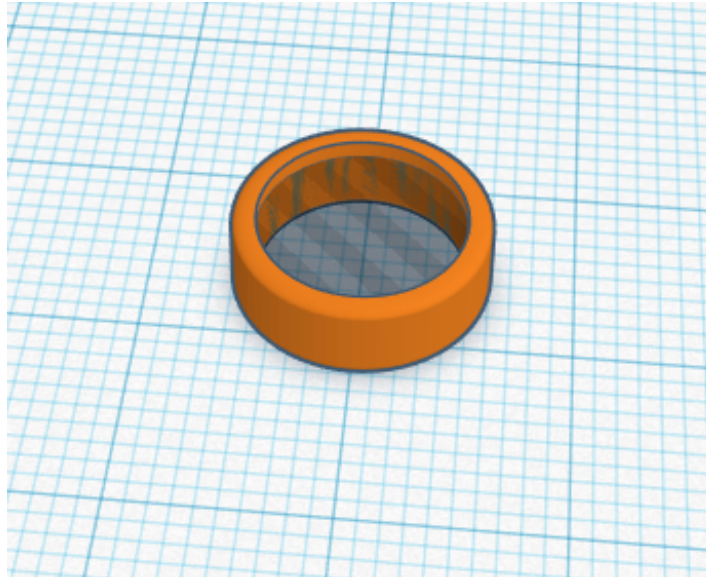
11. Now select a tube from the shape menu. First you need to reduce its height to 4mm, then radius to 6mm, wall thickness to 1mm and the other settings all at maximum. You can check against the below:



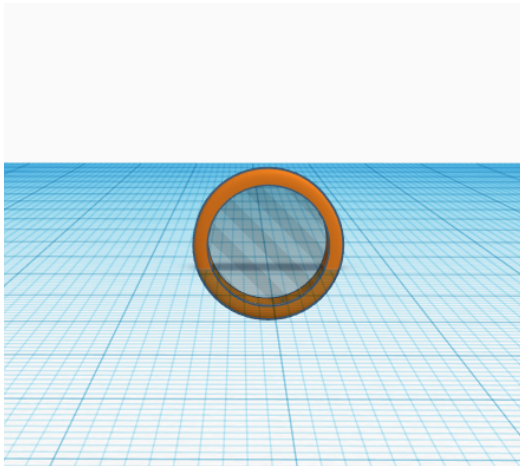
Hint:

You will need to adjust the height of the shape manually as its not a value you can alter in the details menu.

12. Now move the two new shapes together to produce the below (do not merge them).



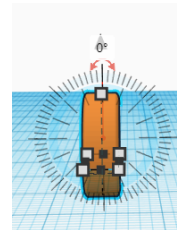
13. Now rotate both objects at the same time to stand like this:



Hints:

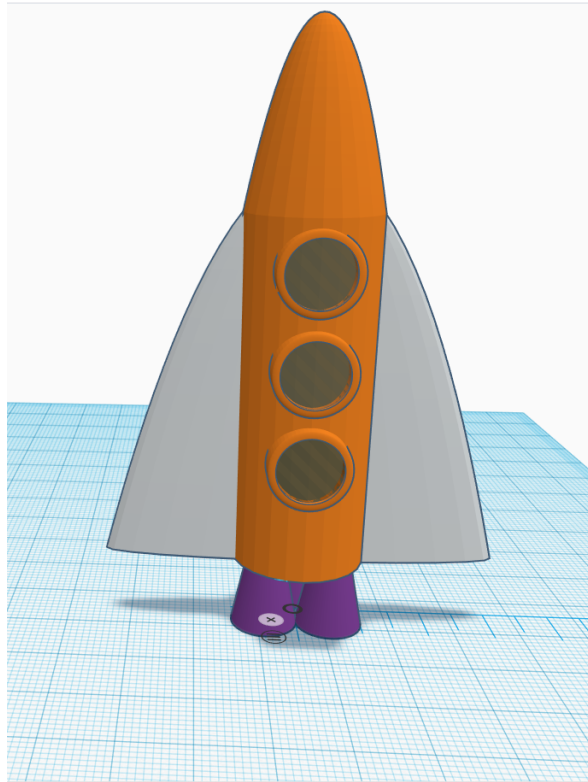
To rotate you need to use the object(s) curved double-headed arrow.

Remember shapes can be rotated in more than one direction so you will need to position the camera correctly to find the right arrows.

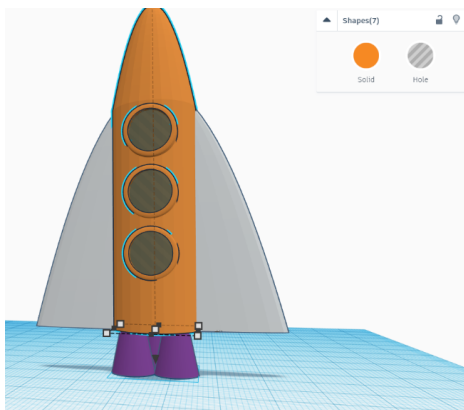




14. We need 3 of these portholes and they need to be positioned like so:



15. Now merge all the portholes with the rocket's body. You can do this by holding shift as you select each object. Remember to include the hollows – there should be seven objects overall to merge (the body, 3 port hole frames and 3 port hole hollows).



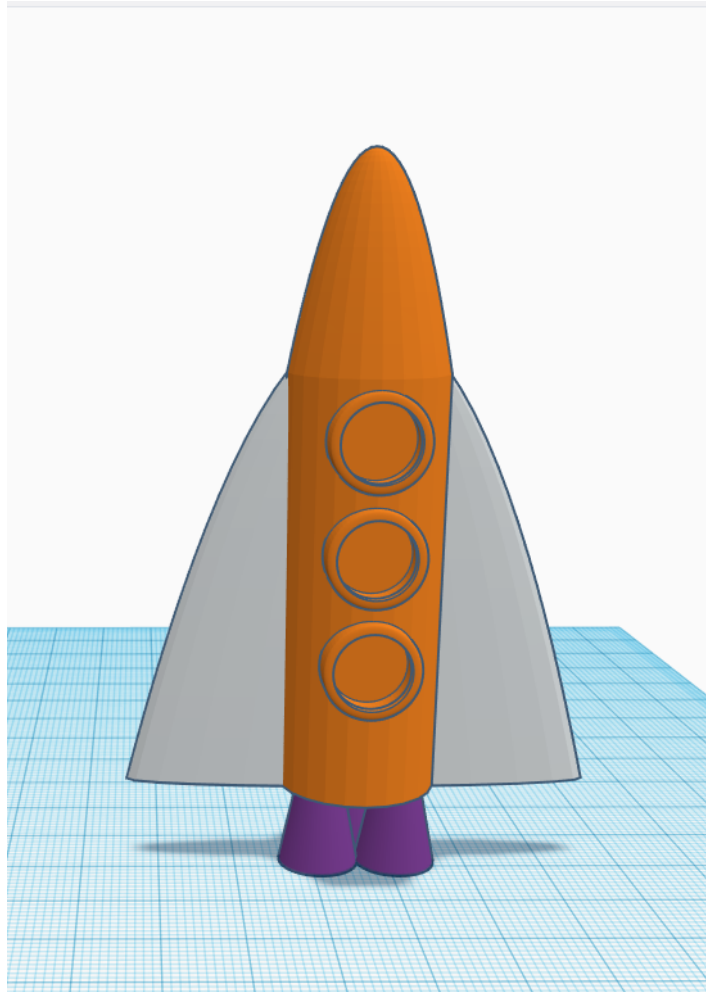
#### Hints:

You can see how many objects are selected in the details box. Your screen should look like this before pressing merge.

Take special note of the top right of this image where it shows Shapes (7). This is telling you that 7 shapes are selected.

Once ready, merge these using the toolbar icon or Ctrl+G.

16. The final design:



17. Don't forget to name your project. Now it is yours to alter or redesign as you please. Well done and have fun fiddling with the design and making the rocket your own.