

BlockSCAD : Making a Name Badge

Learning

In this project you will learn

- How to use the online BlockSCAD
- How to create simple shapes (cubes, cylinders) of different sizes
- How to place shapes in space
- How to create 3D text
- How to add shapes together and remove one shape from another

In this worksheet, read everything. Things you must DO are marked with to tick when done. *Hints are in italics*

Project

We all love to see our own name or our favourite team in print – even better in 3D. There are lots of different possible design so this is just the start.



Start a project in BlockSCAD

- Go to the BlocksCAD web site <https://blockscad.einsteinsworkshop.com/#> use a modern browser like Chrome or Firefox – it doesn't work in old versions of Internet Explorer.
- Register an account where your work will be saved
- Go to Projects then New.
- Give the project the name 'Name Badge'.

BlockSCAD interface

The Toolbox

The blocks to add to your code are under the tabs on the left.

Check out the tabs to see what blocks can be used *There are a lot and they will be introduced as we work through projects*

The Workspace

In the middle is the workspace where blocks can be added and connected to make your program. The workspace can be scrolled around with the mouse or scroll bars and zoomed with buttons on the left. *It's a bit easy to lose blocks and you may have to zoom out to find them.*

The Viewing space

A 3D image of the shape you have created is shown on the right.

To Update the image when you change the program: click RENDER

To Move the viewpoint : hold the left button down and mouse around

To Zoom : scroll with the touchpad or mouse wheel

To Move the viewpoint , hold Shift and left button down and mouse around

The Viewing space shows the 3 **axes** : X is red, Y is green , Z is black.

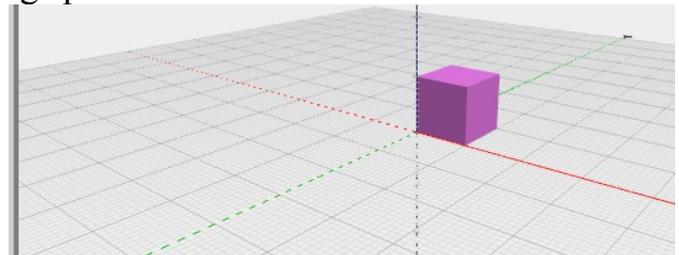
Each square of the grid is 10 x 10 millimetres

The axes meet at the **origin** [0,0,0]

Make a cube.

Locate the Cube shape in the Toolbox (3D Shapes tab) and drag it into the workspace. *(Left button down and drag with the mouse).*

Click RENDER to see it in the viewing space.

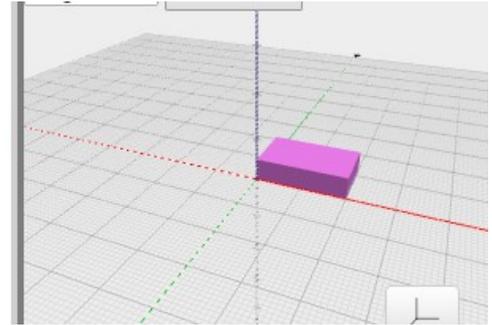


Use the viewing controls to change the viewpoint and zoom

This 'cube' has a slot for the size in each of the dimensions X, Y and Z (so technically it's a *cuboid*).

Change the value of each Number in turn to see how the shape changes. *To change a number, select the number by clicking on it – the boundary shows yellow when selected and enter a new value.*

- Make a 'Cube' 20 mm long (X), 12 mm wide (Y) and 5 mm high (Z).



Sometimes the number block itself gets deleted – when this happens, click Undo, or go to Maths and get another number block (the first block).

Centering (American spelling)

Shapes have the option to be centered or not. Centered shapes have their mid point (in all directions) located at the origin. Shapes which are not centered have one corner at the origin.

- Change the cube from 'not centered' to 'centered' to see the difference .

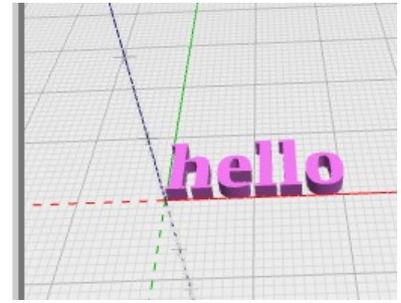
Deleting

To delete a block, select the block by clicking in the body somewhere – the outside edge changes to yellow to show it has been selected. Drag it back to the menu on the left or hit Backspace or Delete

- Delete the cube you have made

3D Text

- Locate the 3D Text block (in the Text Tab) *(remember to Render to see the object)*



- Try each of the fonts to see how they look. *(Some fonts may be easier to print than others – a fine Font like Liberation Serif might lose detail so better to choose a more solid font – I think Open Sans looks good)*
- Change 'hello' to your name, or someone else's name if you want to make a gift.
- The thickness is the height of the 3D Text - change this to see what happens

Badge Base

For the name badge we need a base to keep all the letters together. The cube would make a simple base for our name badge.

- Add a cube (*'not centered' since the 3D text is not centered*).



Now we have two shapes which share the same space, the 3D Text and the cube. Unlike real objects, these two shapes are merged (or Unioned) into one. We will see that there are other ways to combine shapes later.

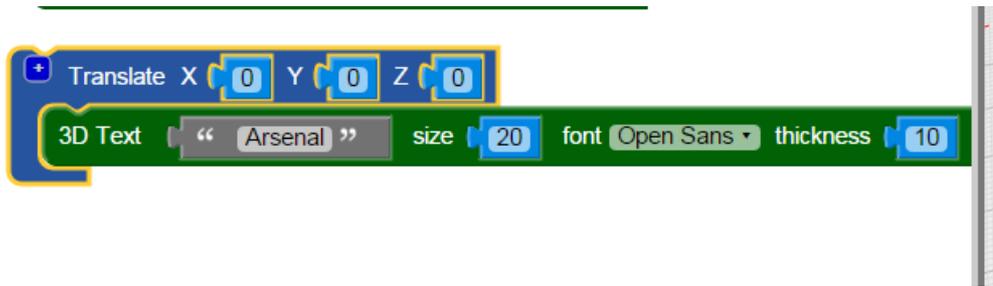
- Adjust the X,Y and Z dimensions of the cube and the thickness of the text so the text fits nicely on the base. Use the grid to measure the size of the text to work out the size of the base. *If you cannot see the text the block must be hiding it. Try increasing the thickness of the text.*

Adjusting the placement of text

To get the text centred in the base, you have to move it. The Translate Transform does this

Locate the Translate block , drag it onto the workspace and dock it over the 3D text block.

(as you near the docking point, it changes colour to green when you can release the left button and it will dock with an audible click)



Center the text on the base by adjusting the X and Y numbers. *how much will depend on how big your text and base are.*



Cylinder

Another very useful 3D shape is the Cylinder. Cylinder has 3 parameters – radius1 for the bottom , radius2 for the top and height for the ... height. To make a straight cylinder, radius1 and radius2 will be the same. If they are different you get a cone or part of a cone. A cylinder is centered on the X,Y origin – the centered option makes it centered on the Z axis too which you don't need here.

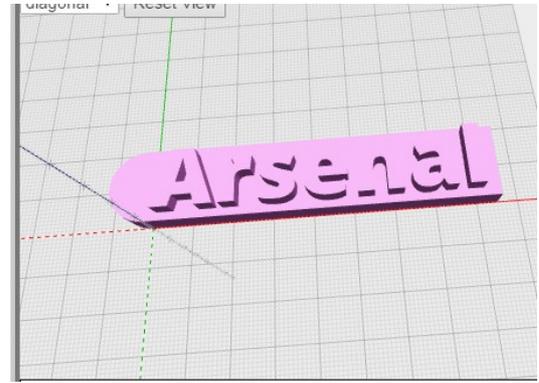
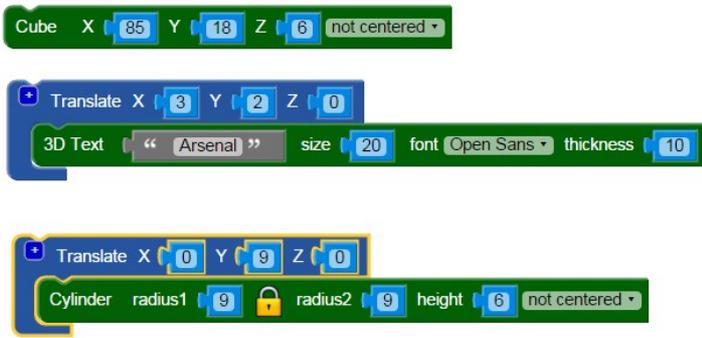
Keyring tag

In the badge there is nowhere to add a keyring. With cylinder we can add to one end and put a hole through the end:

Locate Cylinder in 3D shapes and add to the workspace

Change the Radius1 and height of the cylinder to match the base *The radius is half the diameter of a circle*

Add a Translate to move the cylinder so it fits at the end of the base



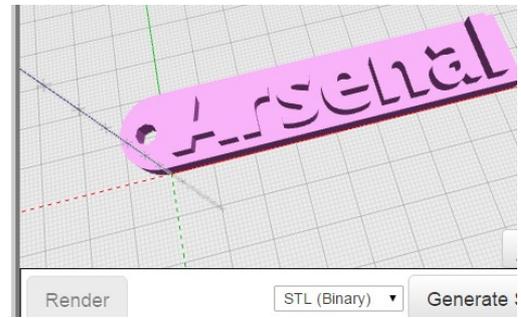
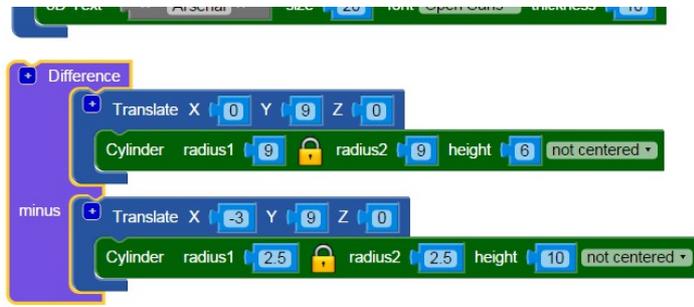
Difference (Set Ops)

So far we have added shapes together. We can make more complex objects if we can remove shapes as well. The **Difference** Set Op does this

To hang your name tag on a chain, you need a hole near the top. You *could* drill a hole in the printed name tag, but you could also make a hole in the tag before printing. Use Difference to remove a suitably sized cylinder.

- Decide on the size of the hole you want – 5 mm diameter might do. The height should be larger than the height of the base *Why?*
- Add another cylinder and adjust the radius to make the hole
- Move it to a suitable place on the tag *That's what Translate is for*
- To remove this cylinder instead of adding it, locate the Difference block and add to the workspace.
- Dock the block which makes the end of the base into the first slot *Make sure you drag the whole thing including the Translate block*
- Drag the block which makes the small cylinder into the second (minus) slot. *This will subtract the small cylinder from the big one.*

You should now see a tag with a hole



Printing

The name tag is now ready to print.

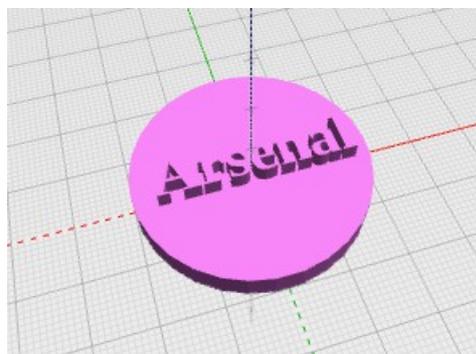
- Click the STL button and a file will be downloaded.
- Send this file to a company like Shapeways or give it to someone with their own printer. *In a later project we will see how this code is turned into instructions for the printer*

Challenges

There are some further suggestions for badges or you may want to come up with your own ideas.

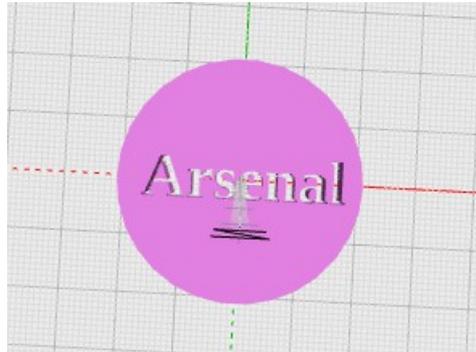
Round badges

Using the Cylinder shape you can make a disk to put the name on. *You will have to move the text block to centre it on the disk.*

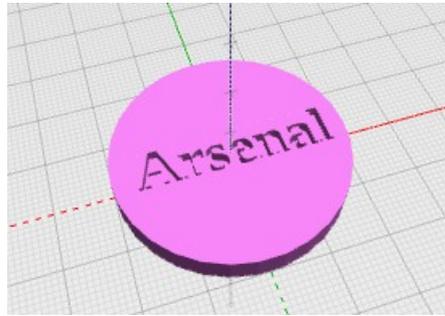


Engraving text

Instead of raised text (**embossed**), we might want to cut out (**engrave**) the text on the disk. To do this we will need to take the text block away from the base using the Difference block.



This has cut all the way through – to cut just part way through to leave a base, move the text block up in the Z direction.



Fridge Magnet

To make a fridge magnet you will need a small round magnet which you can get at a hardware store. Measure the diameter, calculate the radius and remove a cylinder half the height of the disk to make a hole to glue the magnet in.

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