Mathematical 3D Printed Exhibits

DIY Creation Kit

Sort your vegetables

Learning Objectives:

- Know how to manipulate simple shapes using tinkercad.com
- Understand how 3D printers work and the limitations of 3D printing.

Level of Difficulty: Level 1

List of Materials Required:

- A 3D printer
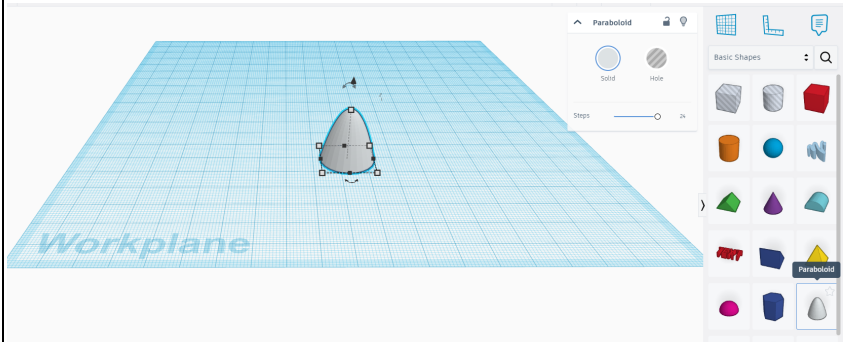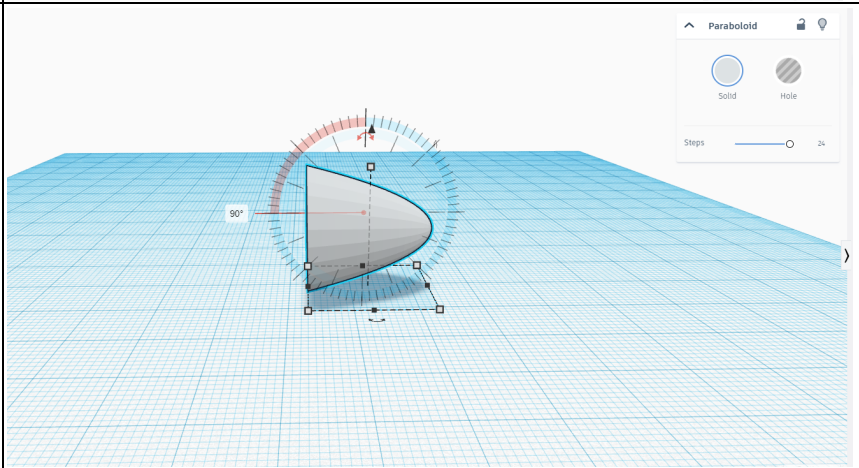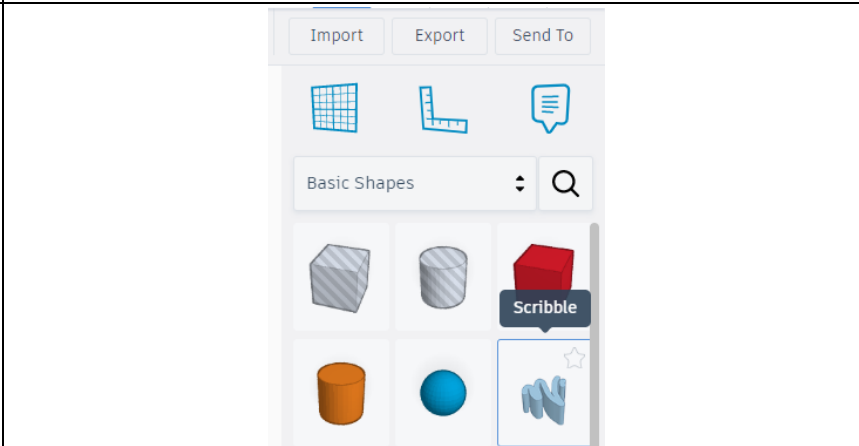- 4 or 2 colours of filament for the 3D printer
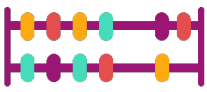
3D Modelling Skills Needed:

- Know how to move an object on the workplane
- Know how to resize an object
- Know how to group objects
- Know how to rotate objects
- Know how to elevate and lower objects on the workplane
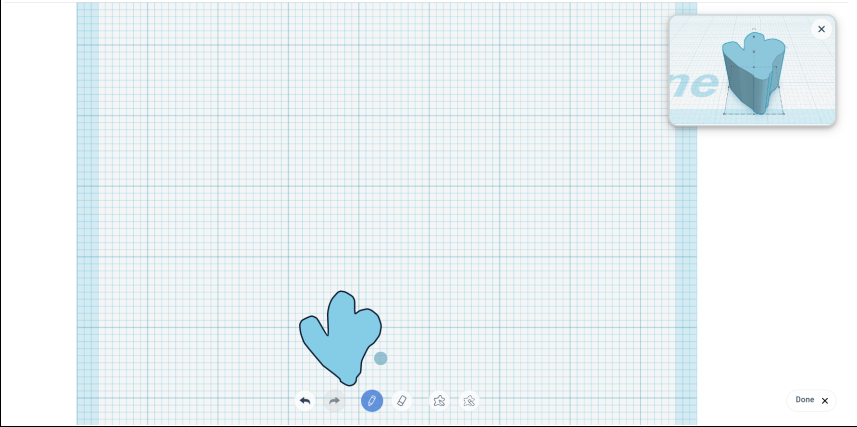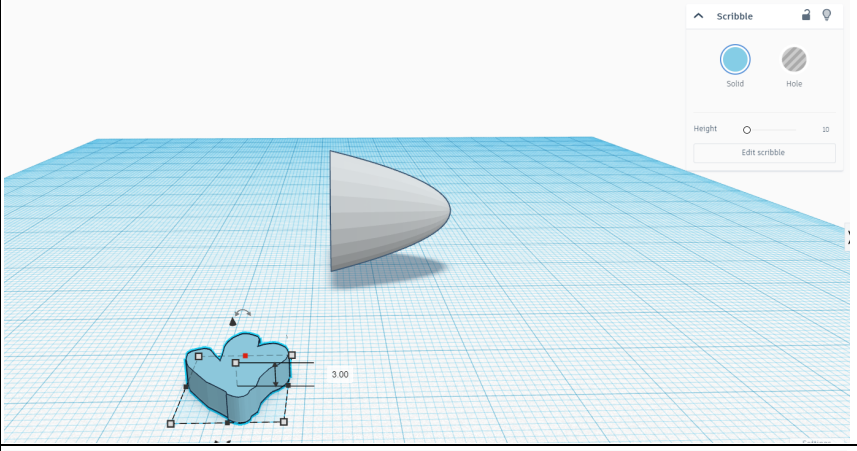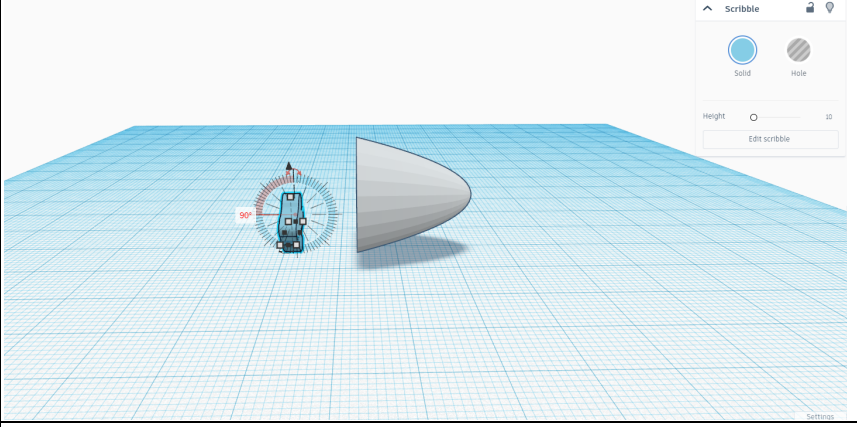- Know how to align objects

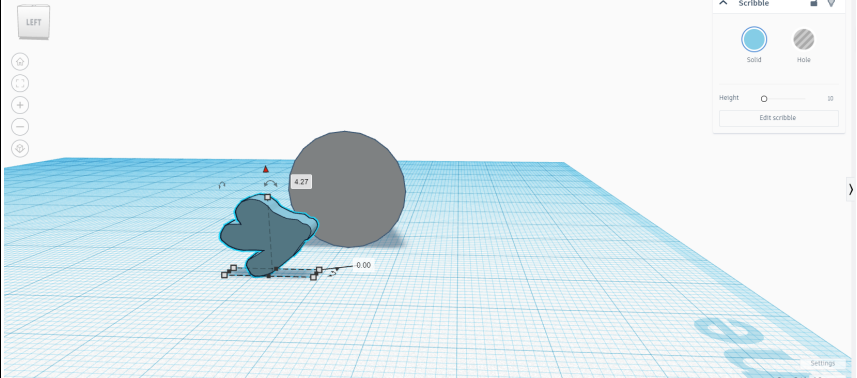# Step-by-step 3D Modelling

Carrot

Step 1	Select the paraboloid shape and put it on the workplane	
Step 2	Rotate the paraboloid to 90 degrees	
Step 3	Select the scribble shape and put it on the workplane. It will automatically take you to draw	

|		
Step 4	Draw the leaves of the carrot and select done.	
Step 5	Adjust the height to 3mm	
Step 6	Move the leaves and rotate it to 90 degrees	
Step 7	Use the red arrow pointing upwards to elevate the leaves to 0.00	

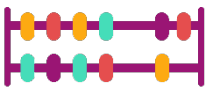| Step 8	Rotate it counter clockwise to 90 degrees.	
Step 9	Move it to touch the paraboloid shape. Select them and use the align tool to centre the leaves on the paraboloid shape.	
Step 10	As the items are already selected, use the group tool to group them.	
Step 11	Change the color to the one that you would like. Go to Shape -> Solid ->Presets or Custom	

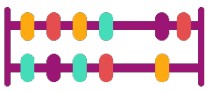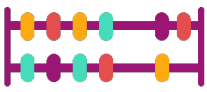| Step 12	Select the grouped item and adjust its size to make the carrot size smaller or bigger according to your needs. Copy and paste the carrot to create two same ones. **Suggestion:** Set it to 50mm for the big carrot and 30mm for the small one.	

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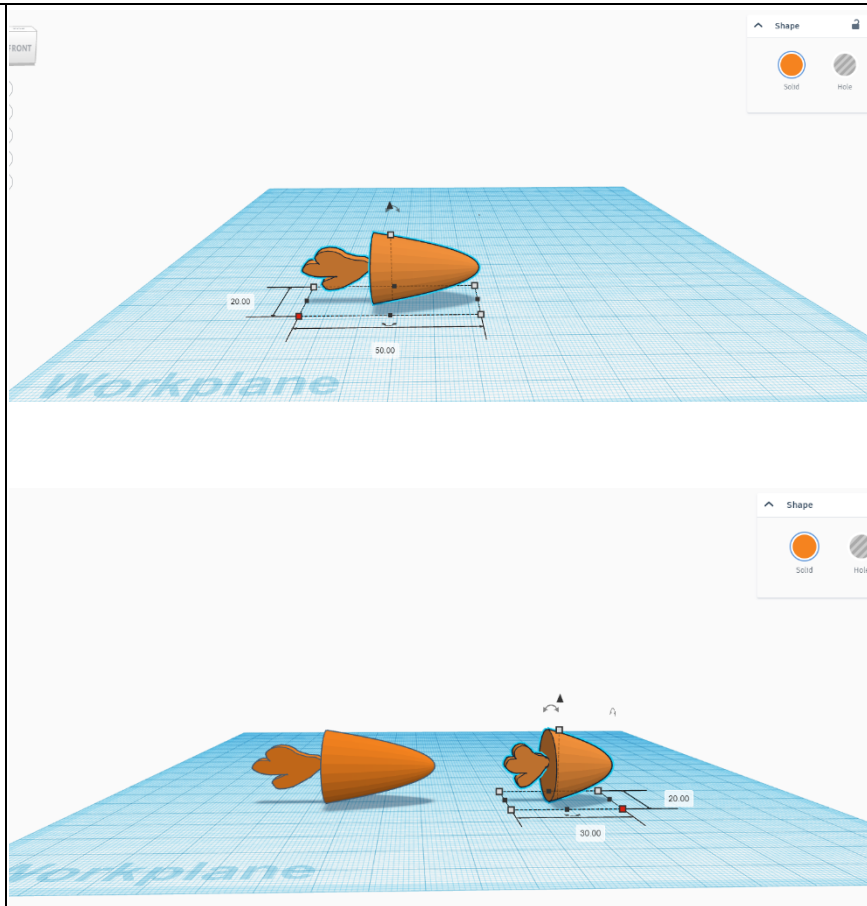
Corn

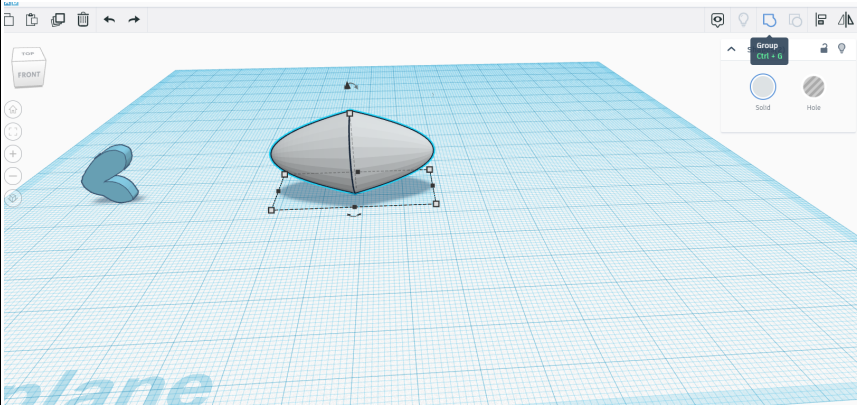|		
Step 1	Select the paraboloid shape and put it on the workplane	
Step 2	Rotate the paraboloid to 90 degrees	
Step 3	Select the scribble shape and put it on the workplane. It will automatically take you to draw.	
Step 4	Draw the corn leaves and select done.	

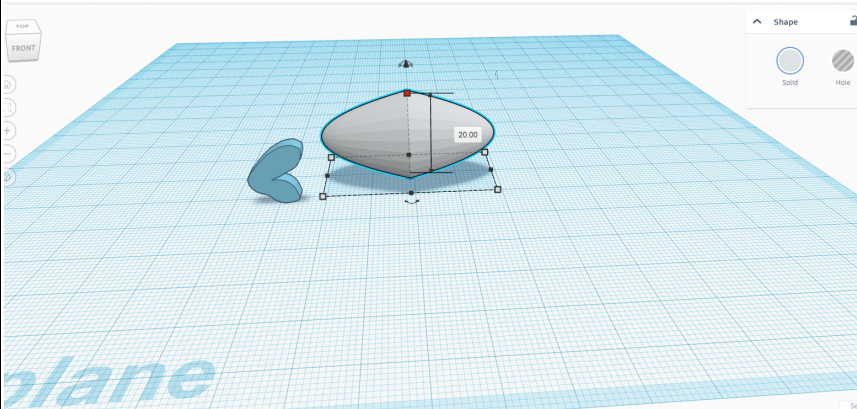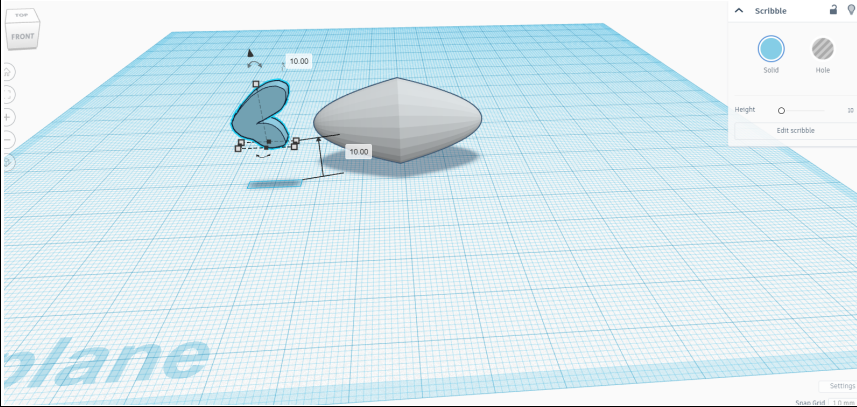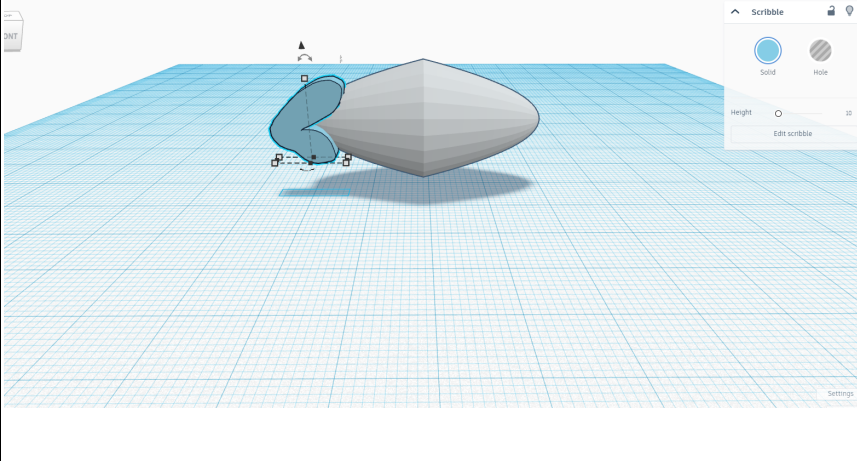|		
Step 5	Adjust the height to 3mm	
Step 6	Move the leaves and rotate it to 90 degrees	
Step 7	Use the red arrow pointing upwards to elevate the leaves to 0.00	
Step 8	Rotate it counter clockwise to 90 degrees.	

Step 9	Move the leaves further from the paraboloid shape. Copy and paste the paraboloid shape.	
Step 10	Rotate the copied paraboloid shape to 180 degrees to be facing the other paraboloid.	
Step 11	Select the two paraboloid shapes and align them to merge.	
Step 12	Move one of the two paraboloids close to the other. Hint: Check with the camera to make sure that their edges are touching.	

Step 13	Select the two paraboloids and group them.	
Step 14	Check the height of the merged paraboloids.	
Step 15	Elevate the leaves to 10mm.	
Step 16	Move the leaves around to find the position where they touch the joined paraboloid shape. **Tip:** Move your camera to check.	

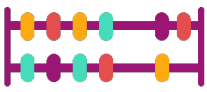|		
Step 17	Select them all and group them.	
Step 18	Use the arrow pointing upwards to lower the item to the workplane	
Step 19	Change the color to the one that you would like. Go to Shape -> Solid ->Presets or Custom	

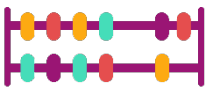|	
Step 20	Select the grouped item and adjust its size to make the corn size smaller or bigger according to your needs. Copy and paste the corn to create two same ones. **Suggestion:** Set it to 60mm for the big corn and 40mm for the small one.	

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Broccoli
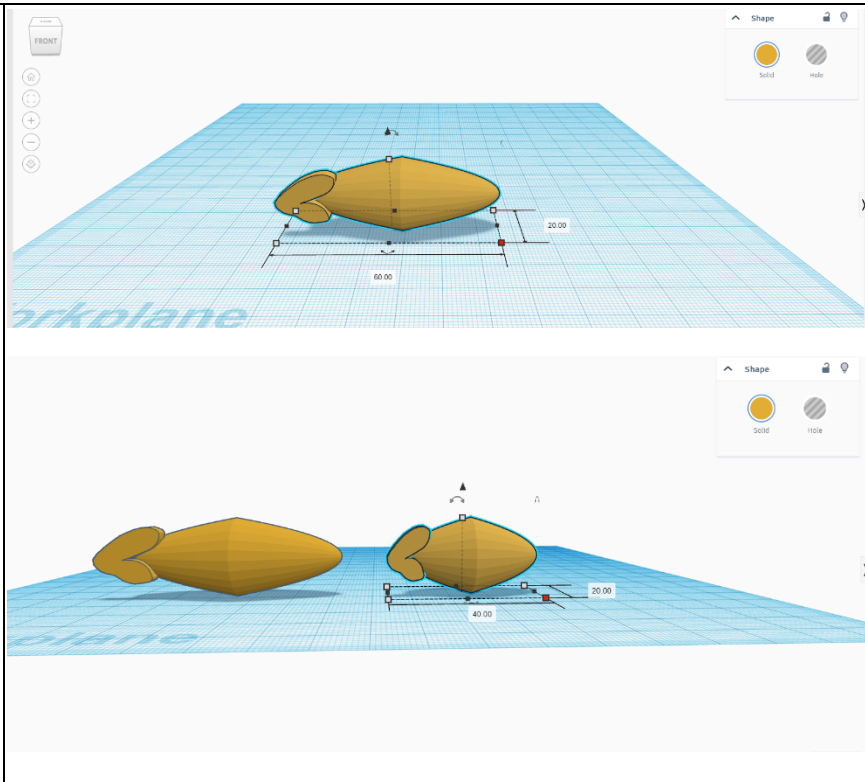
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Step 1	Select the cylinder shape and put it on the workplane	
Step 2	Select the sphere shape and put it next to the cylinder on the workplane	
Step 3	Elevate the sphere with the arrow pointing upwards to 20mm	
Step 4	Move the sphere and use the align tool to center it on top of the cylinder.	

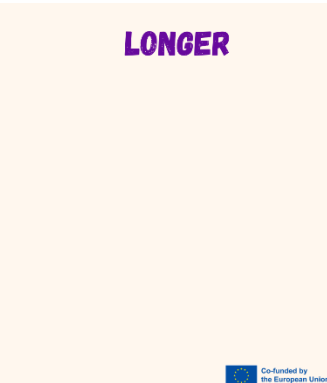|		
Step 5	Adjust the size of the sphere to 30mmx30mm and its height to 30mm.	
Step 6	Select all items and group them.	
Step 7	Change the color to the one that you would like. Go to Shape -> Solid ->Presets or Custom	

Step 8	Select the grouped item and adjust its size (width, length, height) to make the broccoli size smaller or bigger according to your needs. Copy and paste the broccoli to create two same ones. **Suggestion:** Set it to 40mm for the big broccoli and 20mm for the small one.
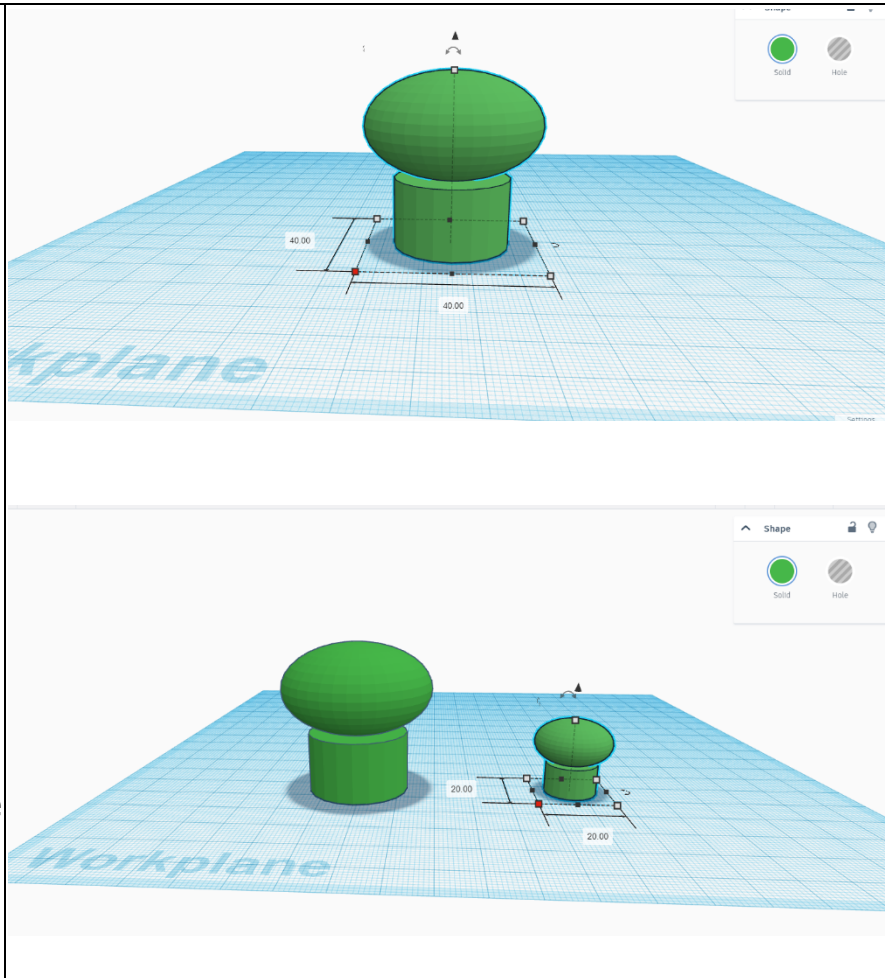
Creation of the Exhibit

Assemble/disassemble and store the exhibits, accompanied by the corresponding time-frames

Step 1	Print and laminate the Shorter-Longer worksheet	SHORTER	LONGER
Step 2	Print the vegetables in different sizes		

Design Map

OPEN TINKERCAD → CREATE THE CARROT

CREATE THE BROCCOLI ← CREATE THE CORN

PRINT ALL VEGETABLES IN DIFFERENT SIZES → PRINT AND LAMINATE THE SHORTER-LONGER BOARD

YOU ARE DONE!