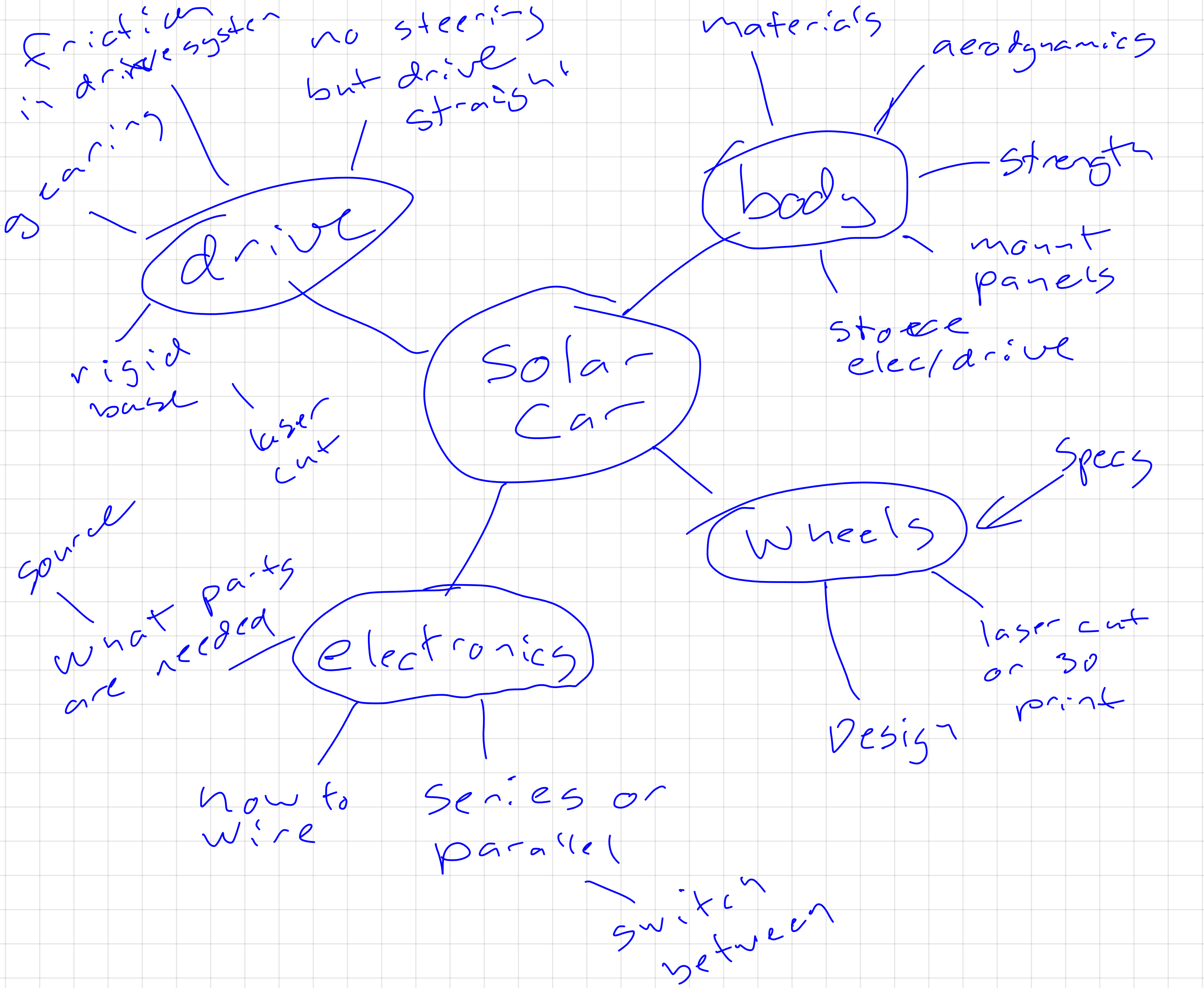
STEM Notebook

Example

STEM CENTRE

Entry Title	Entry Number	Entry Date
Deconstruction of the problem	1	21/11/20



Tasks

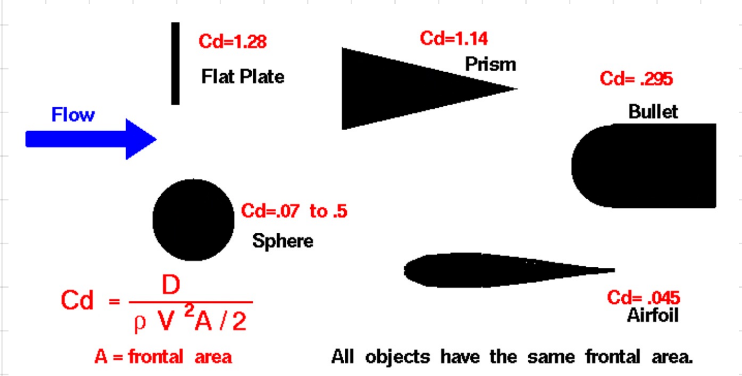
Body & wheels – Shane & Tegan

Electronics & Drive – Sarah & Wayne

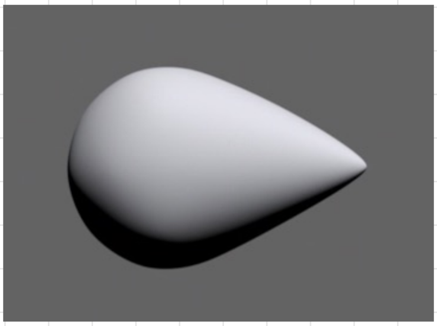
STEM CENTRE

Entry Title	Entry Number
Research into aerodynamic body shapes	2
	Entry Date
	22/11/20

https://www.grc.nasa.gov/www/k-12/airplane/shaped.html



https://www.pakwheels.com/blog/history-drag-coefficients-cars/

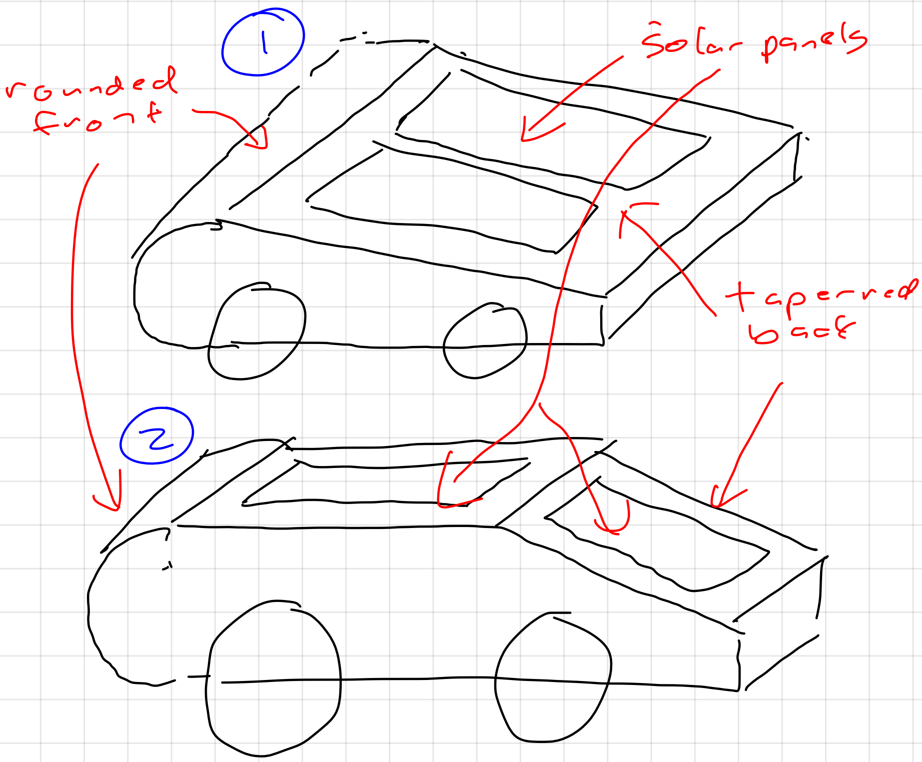


This tear-drop shape is the most aerodynamic but poses a range of issues in turning it into a functioning car

- There is no floor pan parallel to the road surface. This makes mounting seats and wheels difficult
- The shape tapers to a point making the mounting of the solar panels problematic

STEM CENTRE

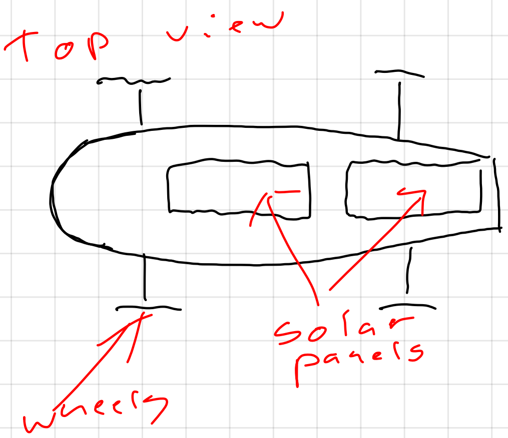
Entry Title	Entry Number
Possible car body designs	3
	Entry Date
	23/11/20



Both designs ① & ② have rounded fronts, tapered backs and room for 2 panels

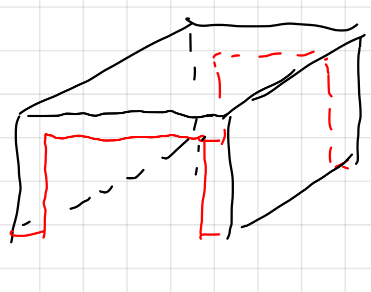
design ① is more compact with a larger frontal area. where-as design ② is much longer with a smaller frontal area

We will investigate design ② in more depth as the smaller frontal area means less drag and potentially better aerodynamics



The top view show indicates how the teardrop shape can be maintained and therefore directing air smoothly around the car. This will give the nose of the car a spherical rather than cylindrical shape

With the size of the solar panels being 170 x 85 mm The car is too big to be printed in one piece (bed size 200x200) therefore the body pieces will be split as shown

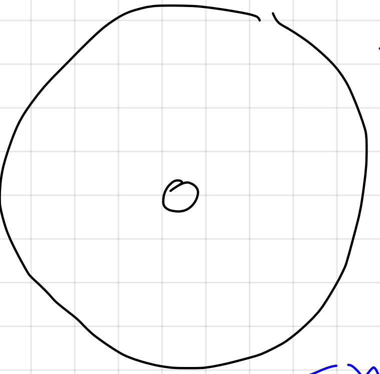


At each end section collars (red) will be printed to reinforce the thin shell (black) allowing it to have strength and a void for mechanical parts

STEM CENTRE

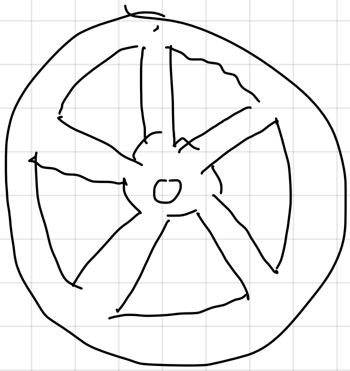
Entry Title	Entry Number	Entry Date
Wheel Design	4	24/11/20

Below are some possible wheel designs and profiles



- heavier
- more aerodynamic
- more rigid

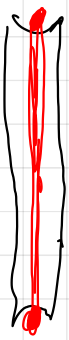
This will be the wheel design



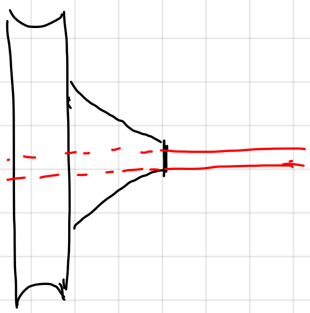
- lighter
- create drag
- less rigid

- Can be laser cut
- if lasered wheels will be hard wearing
- good surface for friction
- added tread will slip off

- must be 3D printed
- small running surface means less friction
- wheels may slip against the ground.



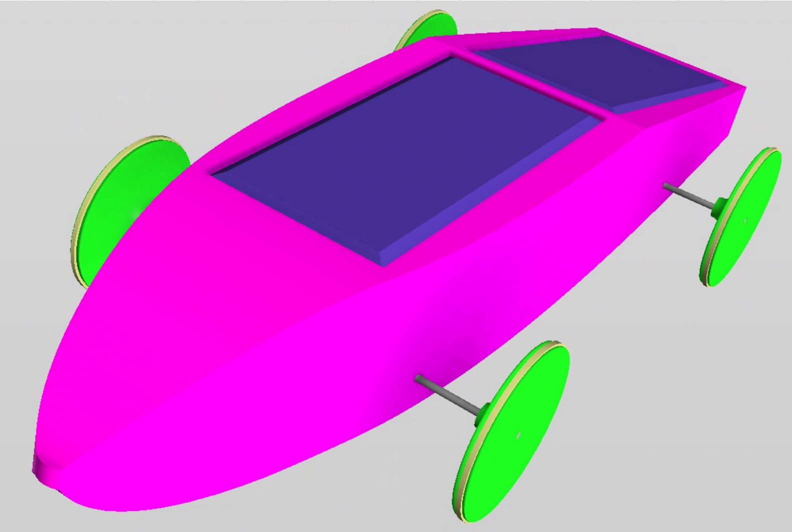
- must be 3D printed
- creates a track for a rubber band as tread
- edges will be fragile



With the wheels being quite thin they may wobble slightly on the axles which will lead to problems in it travelling straight. Extending the hub will significantly reduce this from happening

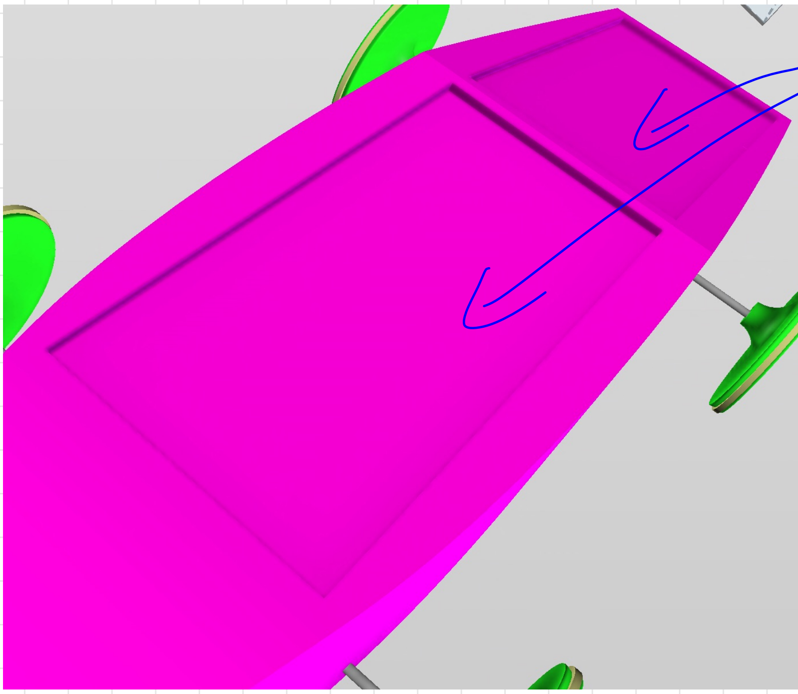
STEM CENTRE

Entry Title	Entry Number	Entry Date
Finished CAD designs	5	25/11/20

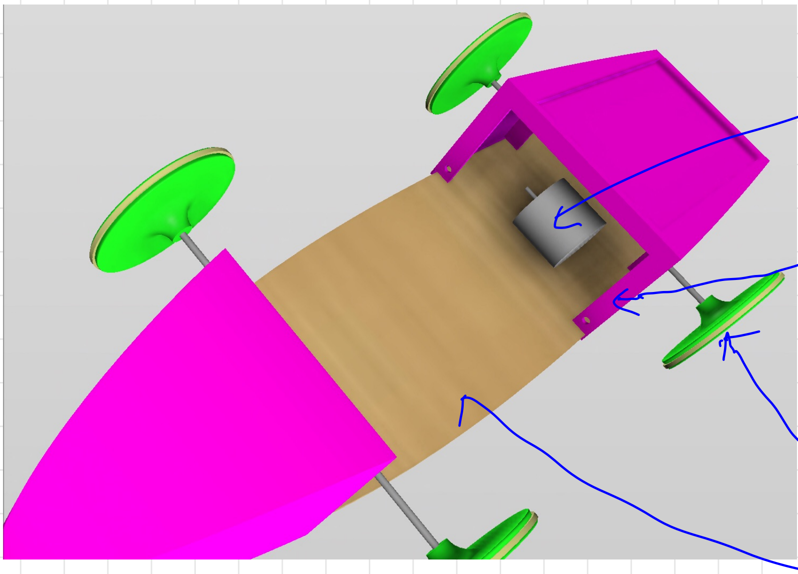


This is the final, rendered CAD design of the car body. These files will be 3D printed over the coming days.

Overall the design sucessfully meets, and builds on, the ideas from early in this project



During the modelling process these indentations were added. The purpose of these was to sit the solar panels flush with the body of the car and therefore limiting drag.



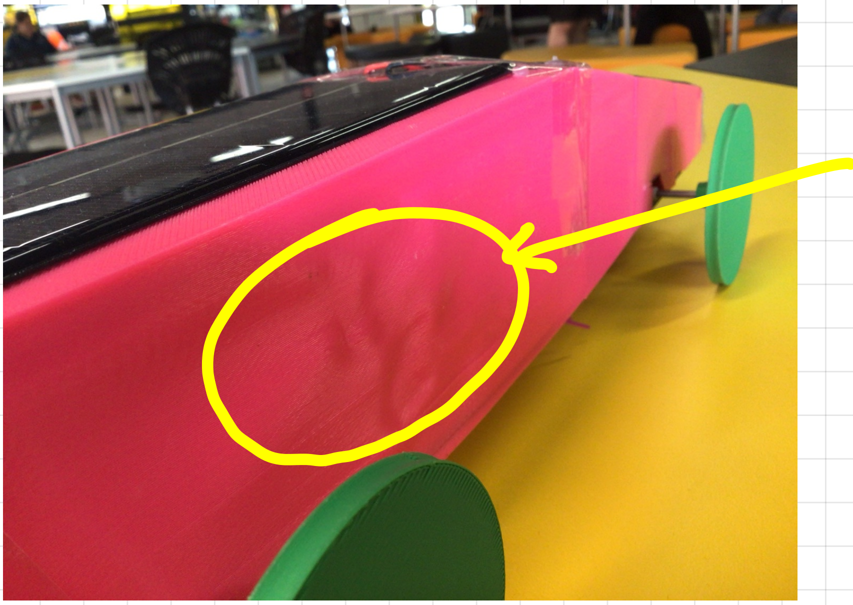
This image shows the location of the motor in the body of the car.

The collar for each section used to join and support each section is also visible

The wheels with extended hubs and rubber band tread is also evident here as is the laser cut base

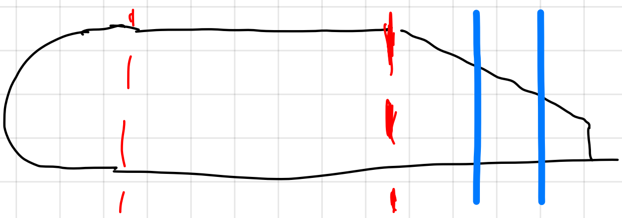
STEM CENTRE

Entry Title	Entry Number	Entry Date
3D printing	6	26/11/20

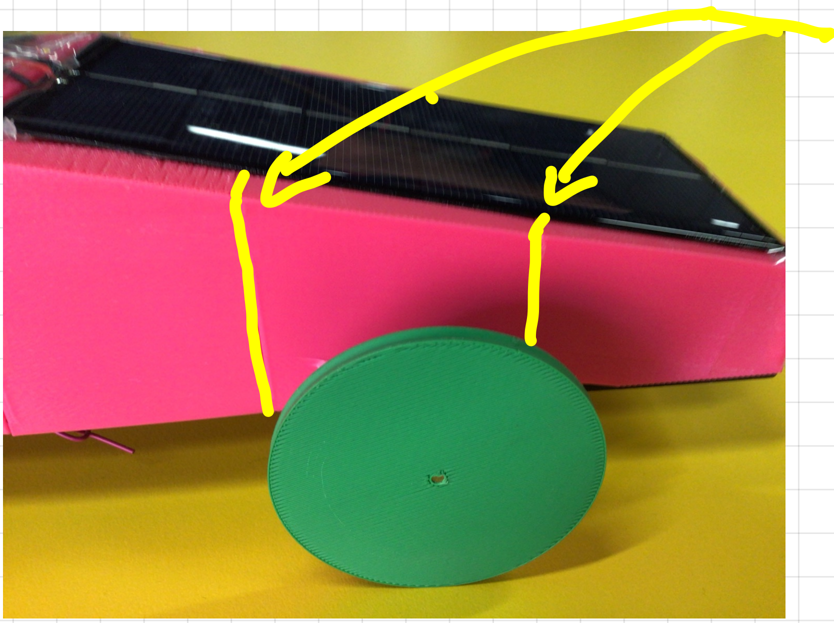


Along this side the wall of the print warped due to being so thin and having a long distance to span

I attempted to fix this using a heat gun and flattening it, however that resulted in the finish seen



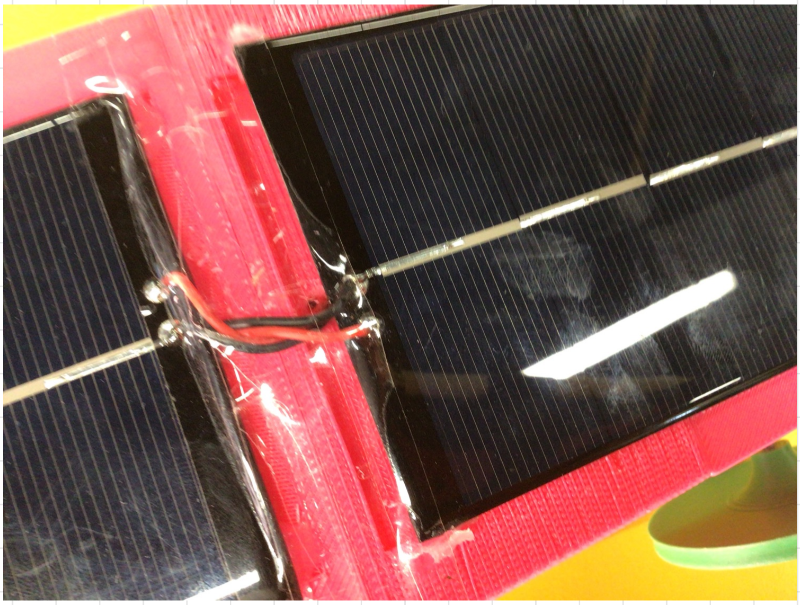
splitting the last section of the print into 3 separate prints aimed to reduce warping by reducing the span



with the smaller span between the reinforcing sections this resulted in a much better print quality

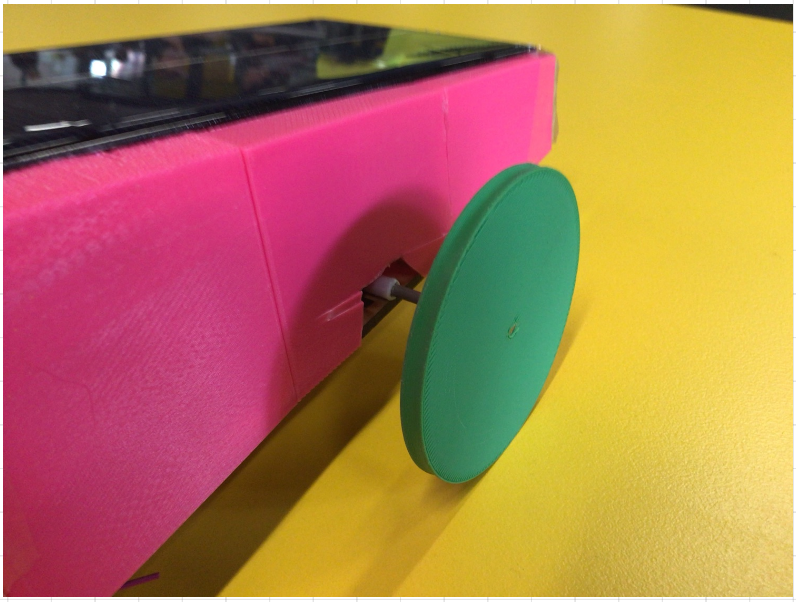
Entry Title	Entry Number
3D Printing	6
	Entry Date
	26/11/20

STEM CENTRE



When we recieved the solar panels we found that they were larger than stated and hence did not fit in the voids. This resulted in having to mount the panels on top

I also discovered that I had not left holes to allow the wires to get inside the car. A drill was used to make a small hole for these



Another issue that was discovered with these plans was that I had not left a hole for the axle.

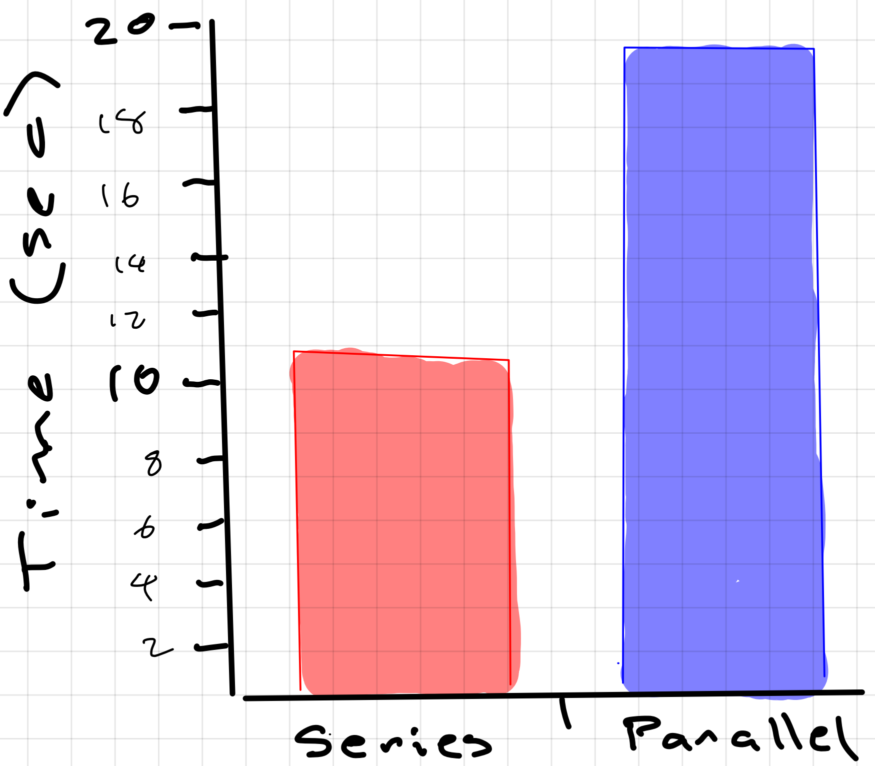
The body was cut using side cutters and sealed using a soldering iron. It was a bit messy as a solution, but solved the problem

STEM CENTRE

Entry Title	Entry Number	Entry Date
Data Collection	7	27/11/20

To test the function of the car it was run 3 times over the same distance in both series and parallel. The times for this test are in the table below.

Run	Series	Parallel
1	9.59	20.09
2	11.05	18.51
3	10.70	19.91
Avg	10.45	19.50



The experimental results appear to confirm the predicted ones. By running the panels in series rather than parallel the voltages are added, sending double the voltage to the motor and approx halving the time