Raging Ducks

MMAE 432

Team

Joseph Duggal

Abdallah Shouli

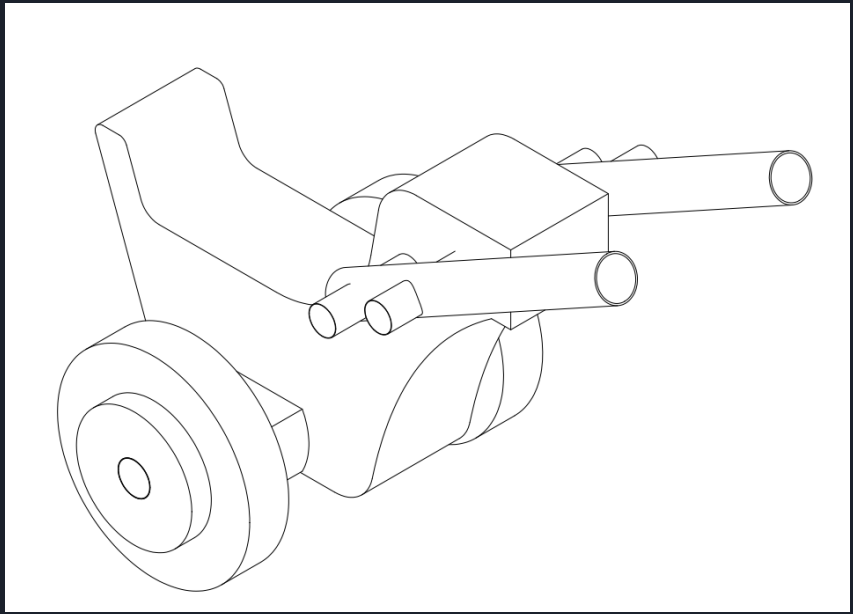
Shannon Bachmeier

Ante Kulas

Kana Nagai

Jaymin Patel

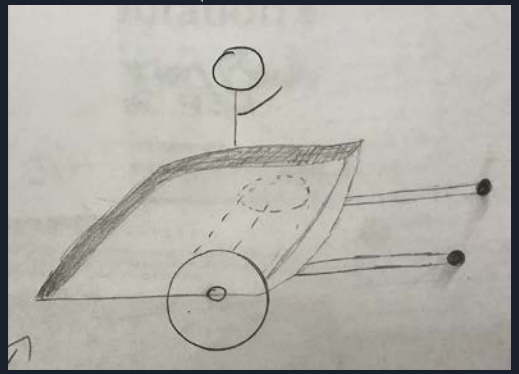
Model



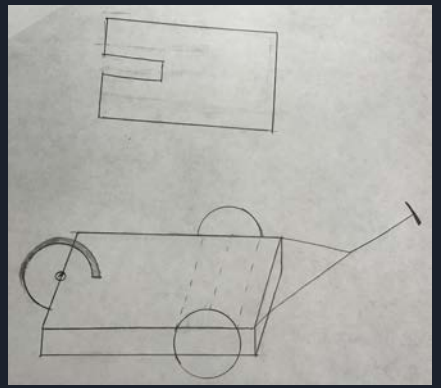
Functional Requirements

Requirement	Did we meet it?
● Support weight of biggest rider: 225lbs	● Yes
● Be large enough to support tallest rider: >6ft	● Yes
● Be small enough to fit smallest rider: ~5ft	● Yes
● Turn 360 degrees in less than 5 sec.	● Yes
● Two different seating positions for rider	● Yes

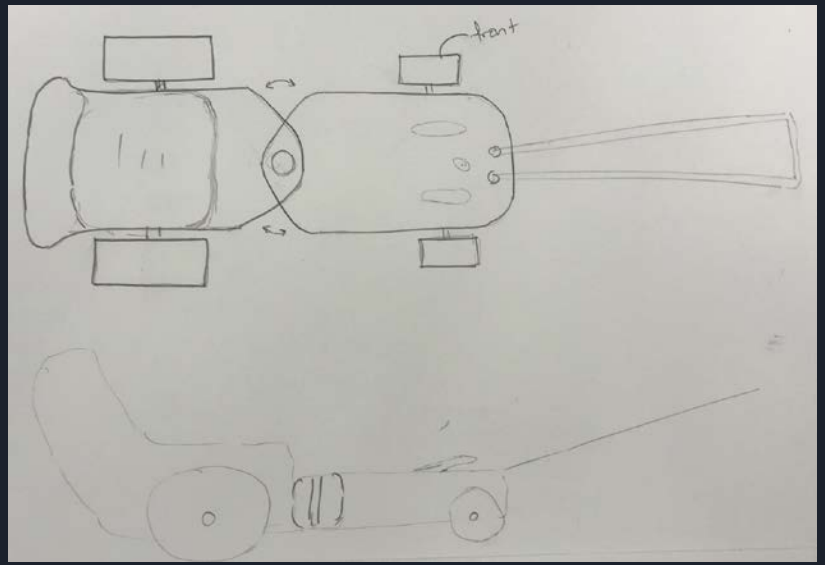
Initial Concept Generation & Beginning Ideas



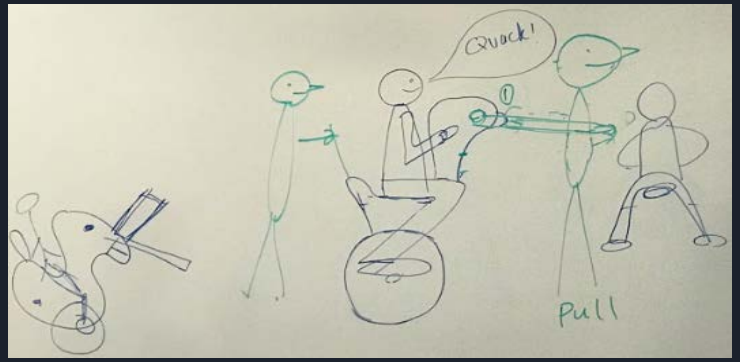
"Chariot-Tricycle" Model

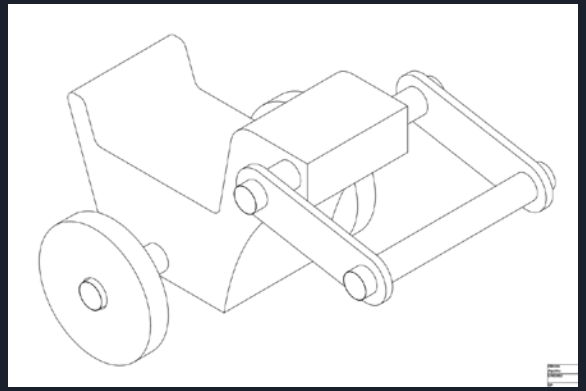


"Nascar" Model

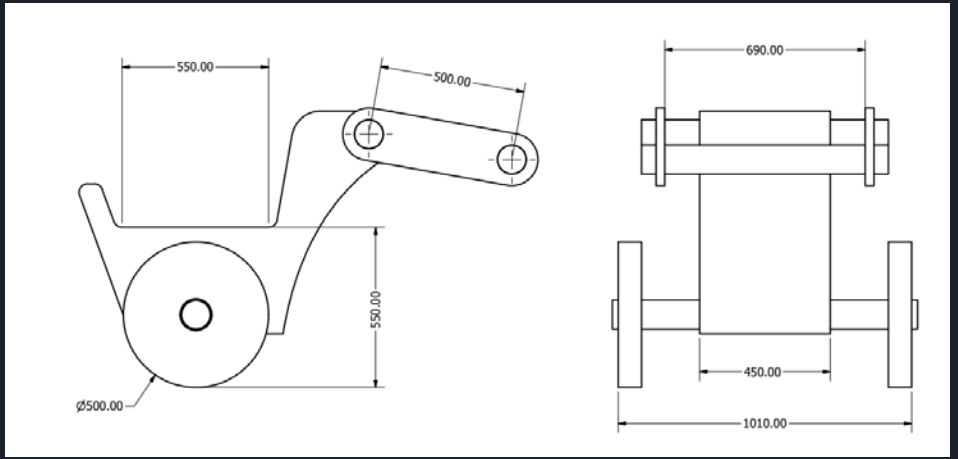


Final Idea and First CAD Model





Raging Duck Cart

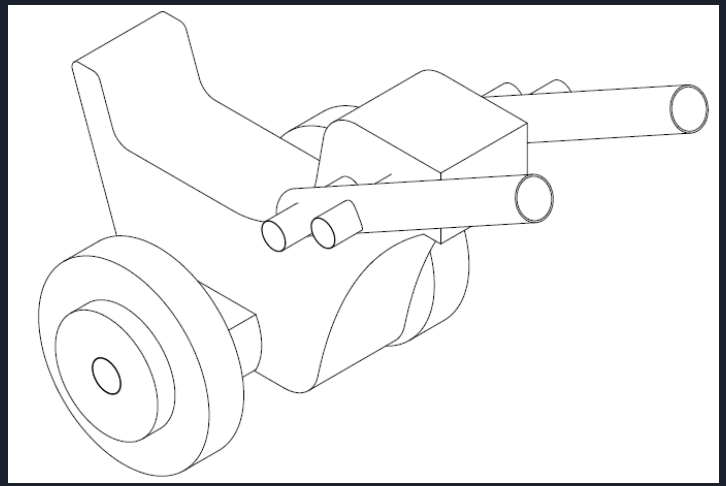


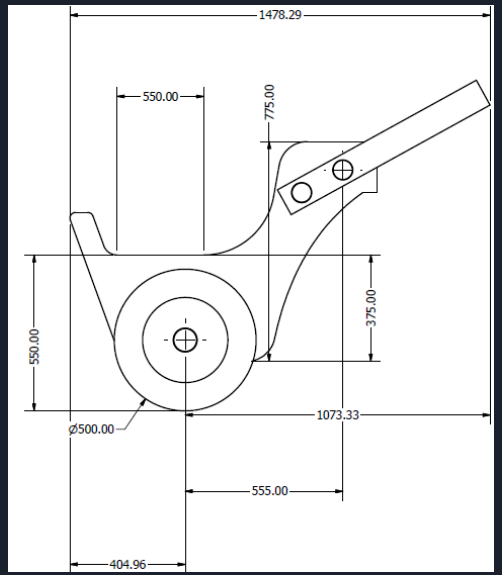
Visualization – Cart With Dummy

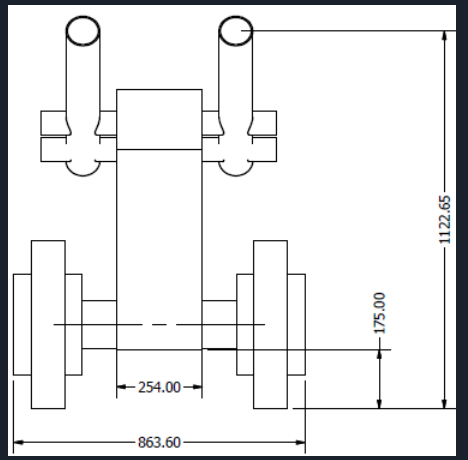
Cart with 5ft 10in Dummy

Evolved Final Idea – Ready to be Fabricated

Raging Duck Cart







Concept Evaluation

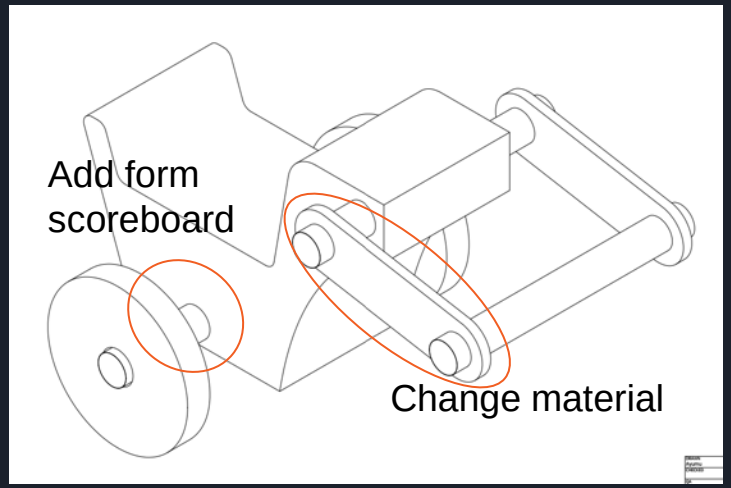
- Deemed that the nascar model would be too complicated
- Axles were becoming too difficult to design
- Thought the duck style would be more supportive for larger riders
- Wanted two wheels that spin independently of each other in order to allow for tighter turns
- Less force on the cart and driver if the handles were up higher as opposed to how low they were on the nascar model

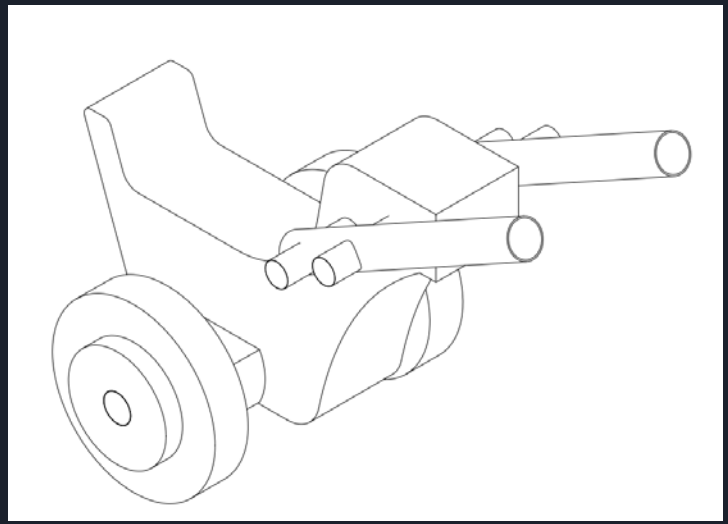
Analysis

Quick Experiments

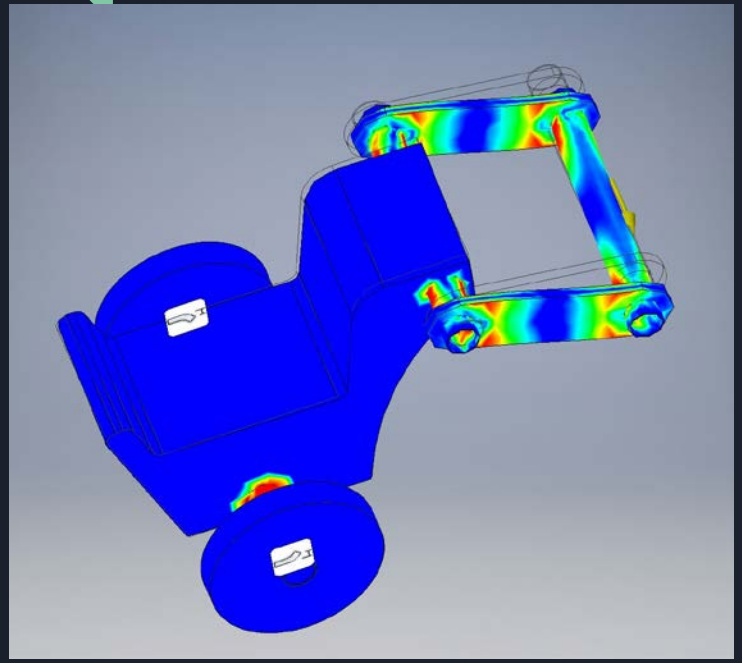
- Cardboard tubes were placed with both ends on a solid object while Jay and Ante placed pressure in the center to test their strength
- Small pieces of foam were also tested for strength by simply standing on them to see how much they could hold
- Ante and Kana sat on a backwards chair in order for us to generate some ballpark numbers for the size of the kart
- Kana simulated some tests using the CAD models that she created

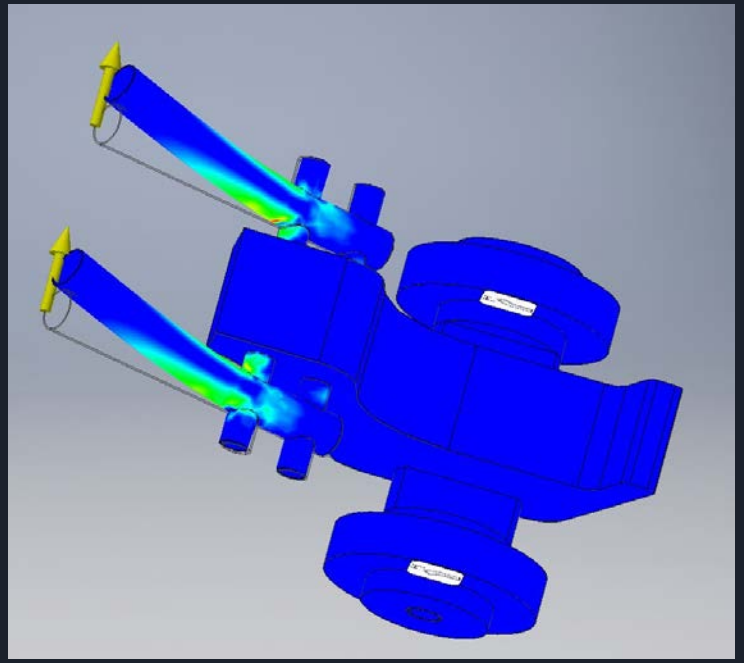
Analysis / identify stress concentration





Analysis / identify stress concentration





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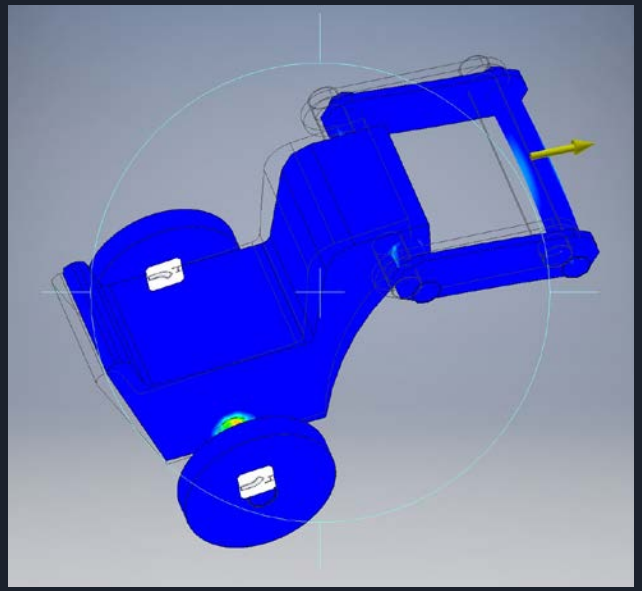
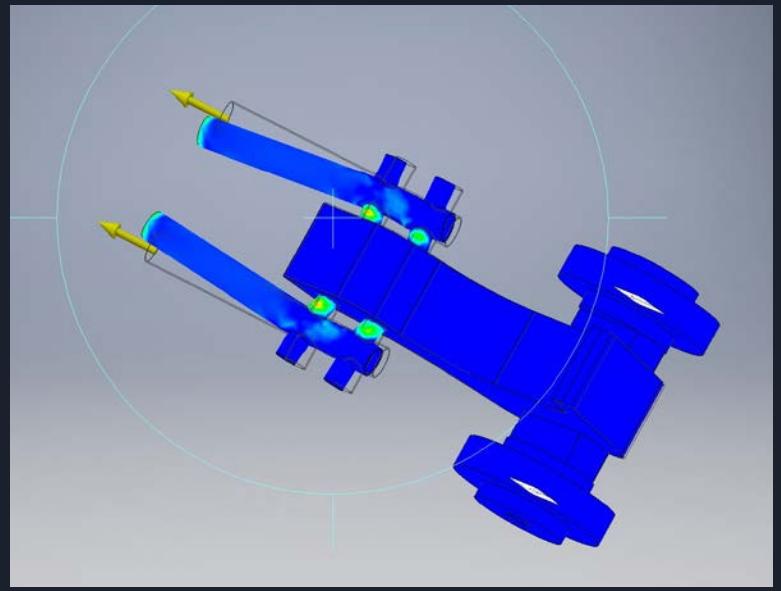
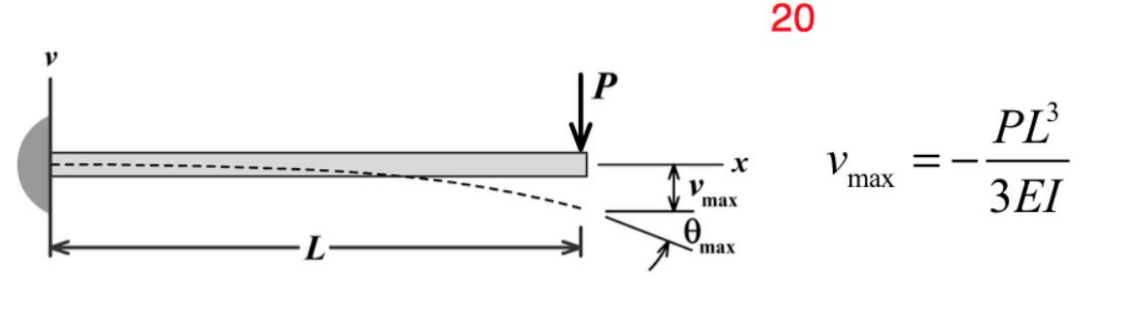
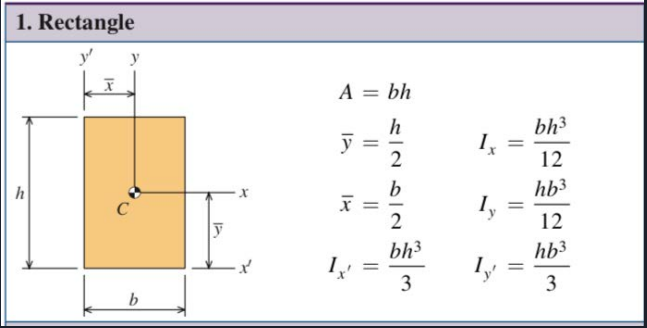
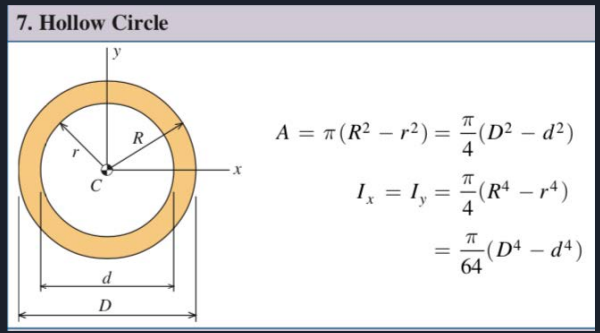




Analysis / Young's modulus Experiment







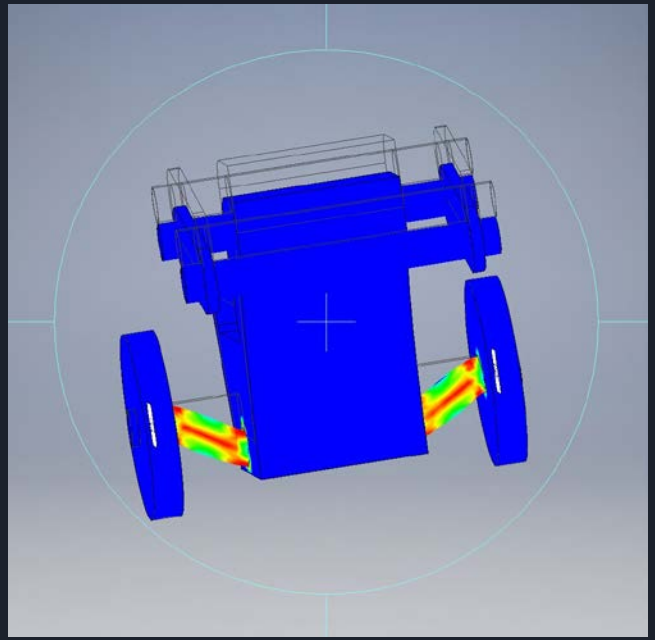
Analysis / Young's modulus Experiment

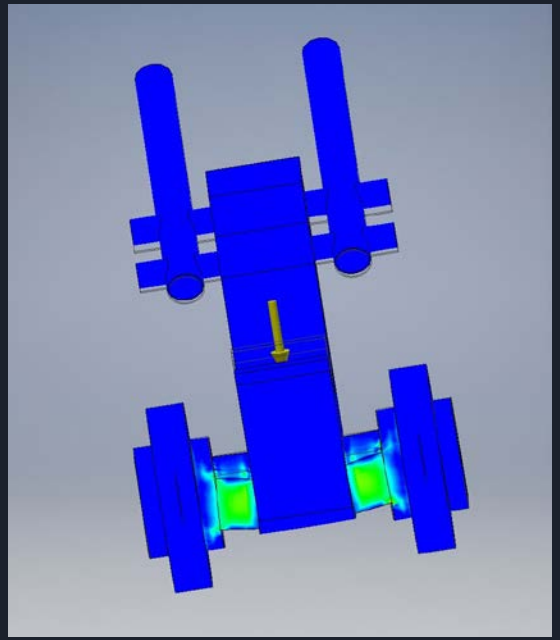
	Form Core Bode		Paper Tube
L (m)	0.4	L (m)	0.6
b (m)	0.11	OD(m)	0.07
h (m)	0.05	ID (m)	0.062
v (m)	0.017	v (m)	0.004
I (m^4)	1.146E-06	I (m^4)	4.530E-07
P (N)	17.64	P (N)	17.64
E (Pa)	1.932E+07	E (Pa)	7.009E+08
E (MPa)	19.32	E (MPa)	700.89

Analysis / Young's modulus Experiment

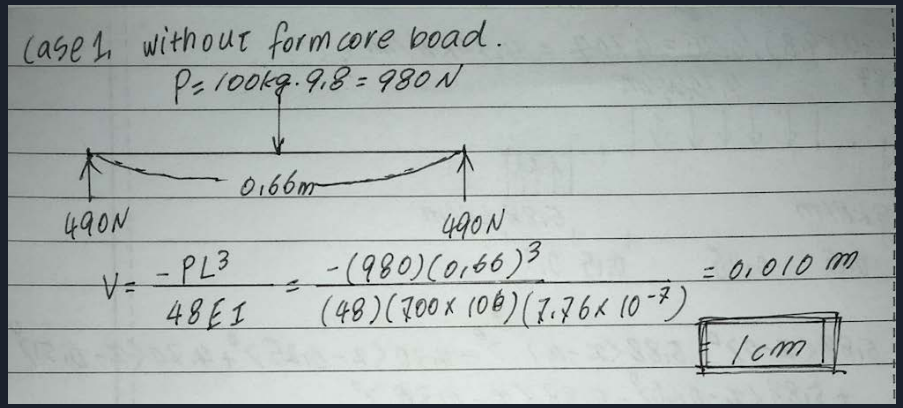
- Foam Core Board / E = 19 MPa
- Paper Tube / E = 700 MPa
- Paper Tube is 36 times stronger

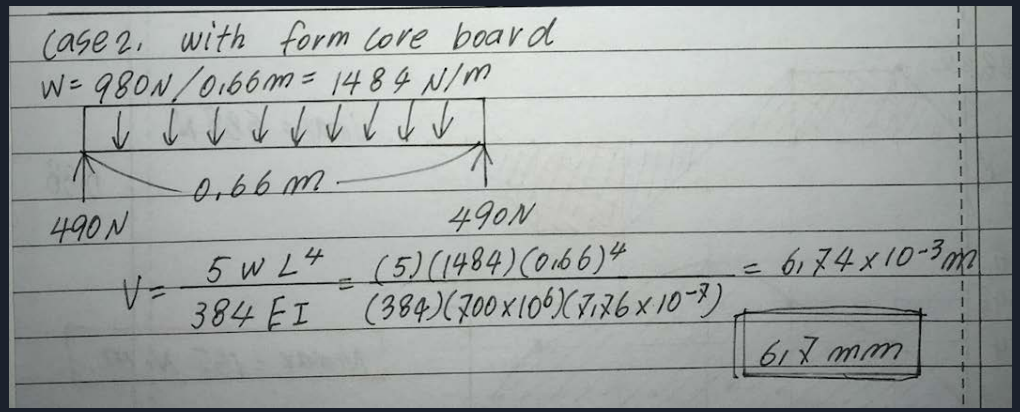
Analysis / identify stress concentration





Analysis / Young's modulus Experiment

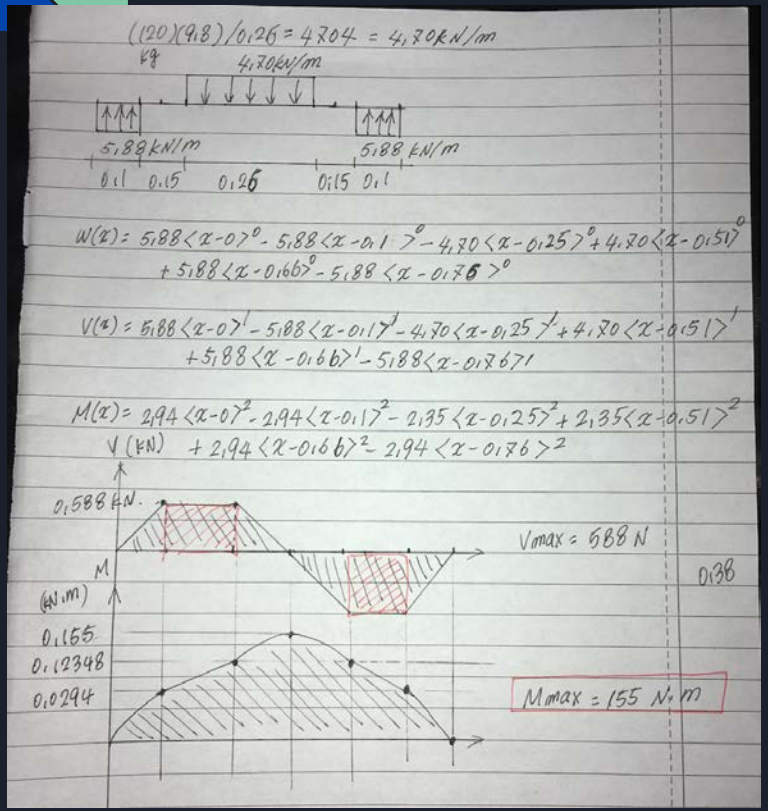


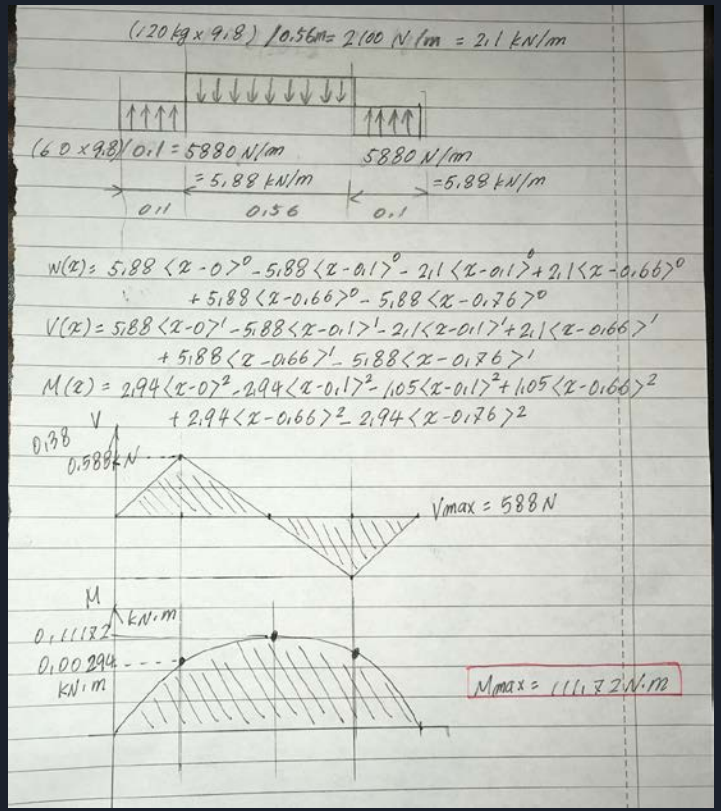


Analysis / Maximum deffrection

- Only Paper Tube/ v = 1cm
- Paper Tube + foam core board / v = 6mm

Analysis / Shear stress and Moment





Analysis / Shear stress and Moment

- Without Foam Core Board / M max = 155 Nm
- With Foam Core Board / M max = 112 Nm
- Maximum Moment 27% Down

Reflection

What did we learn?

- Everyone’s unique ideas are crucial to the end result
- Sometimes trial and error is the best method
- It is important to work with peers sometimes because their strengths differ from yours

What changes would we make if we had more time?

- Make the cart look “prettier”
- Run some more testing with the cardboard tubes and foam to see the best way to design the wheels
- Test out other types of adhesives