



Canadian Fluid  
Power Association

Association canadienne  
d'énergie des fluides



# National Fluid Power Challenge

## Hints for Success

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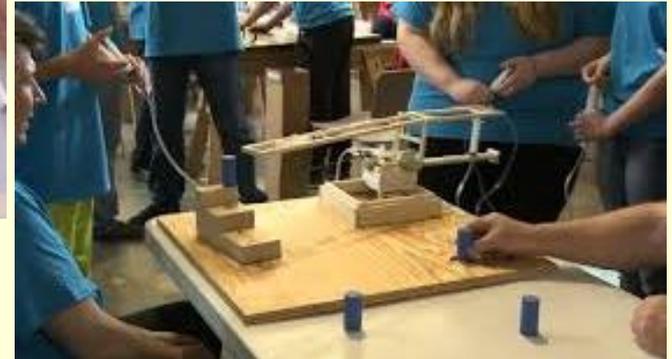
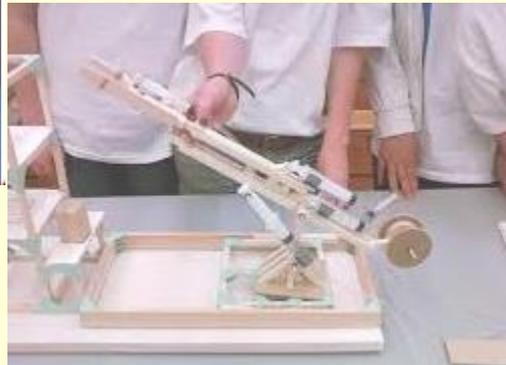
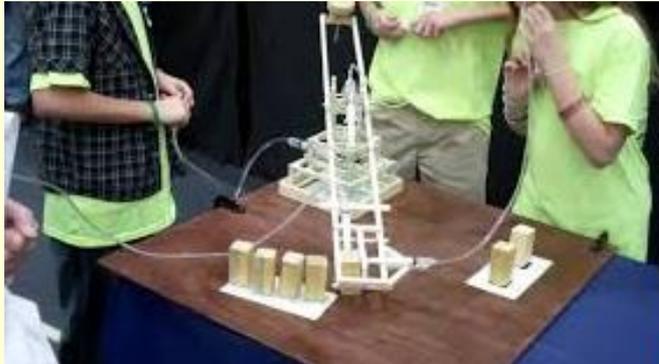
*Mechanical Kits Ltd.*

Science, Technology, Engineering & Math

# Safety

- Safety is everyone's responsibility!
- Always wear safety glasses
  - Yes - even when not cutting or drilling
- No Running, No Throwing, No Horse Play!
- When sawing, drilling, filing or sanding;
  - Ensure mitre box is securely clamped down
  - Ensure each workpiece is secure & stable
  - Ensure your hands/fingers are out of harm's way
  - Wipe sawdust – don't' blow!
- Demonstrations
- Questions?

# Examples



YouTube & Google  
Fluid Power Challenge

# Teamwork

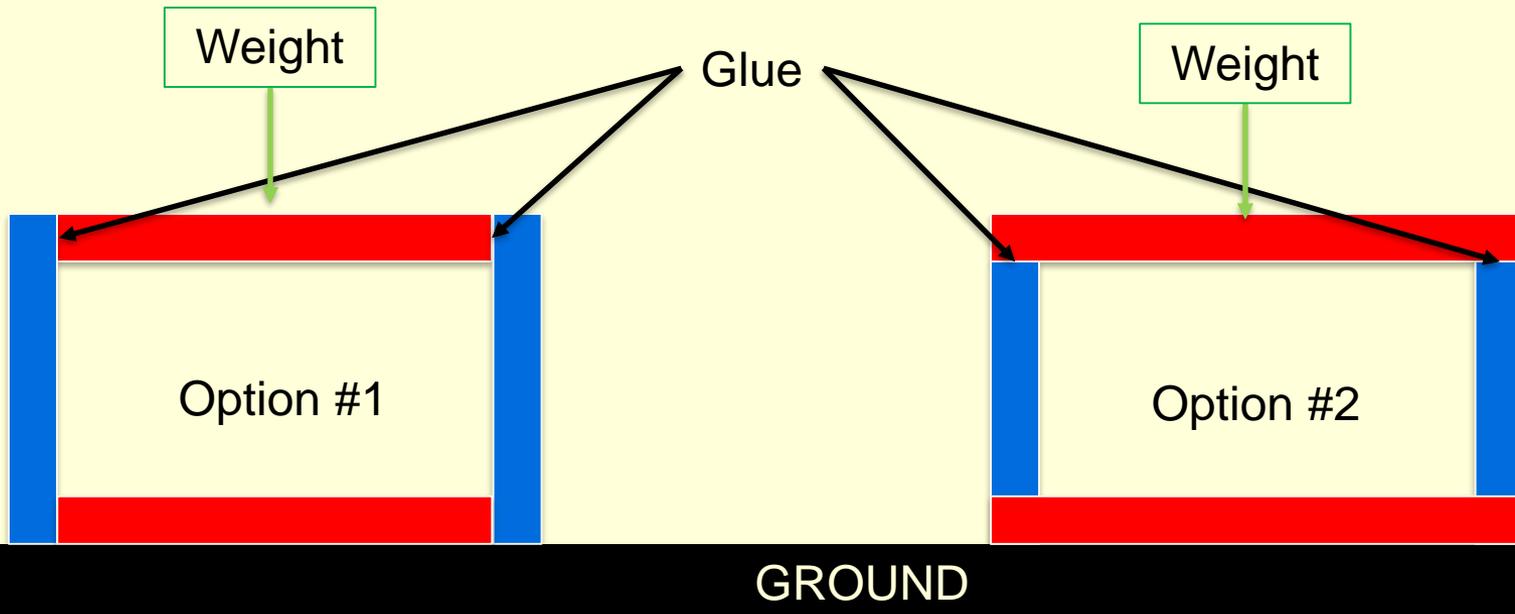
- This project relies on teamwork to be successful
- Successful teams:
  - Work together
  - Assign & divide tasks
  - Plan their work & work their plan
  - Complete tasks in parallel
  - Leverage individuals strengths
  - Don't mess with other teams' materials without permission

# Construction Tips

- Have a plan
- Measure twice, cut once
- Accuracy is important - variation is compounding!
- Use gussets and structural members for strength
- Consider Centre of Gravity

# Working with Wood Glue

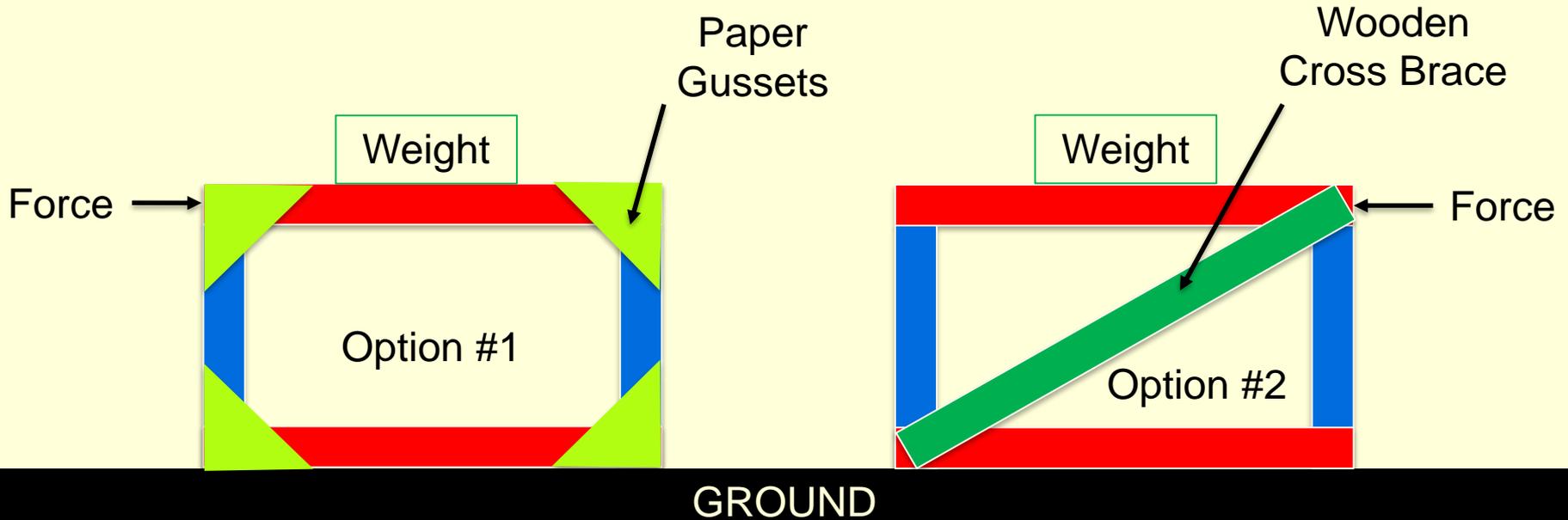
- Less is more!
- Excessive glue takes longer to dry and does NOT result in a stronger joint
- Use stick to spread out glue on contact surfaces
- Tip of hot melt glue gun is HOT & can **BURN** YOU!



## Structural Strength

Which option is a more structurally sound design? -- Why?

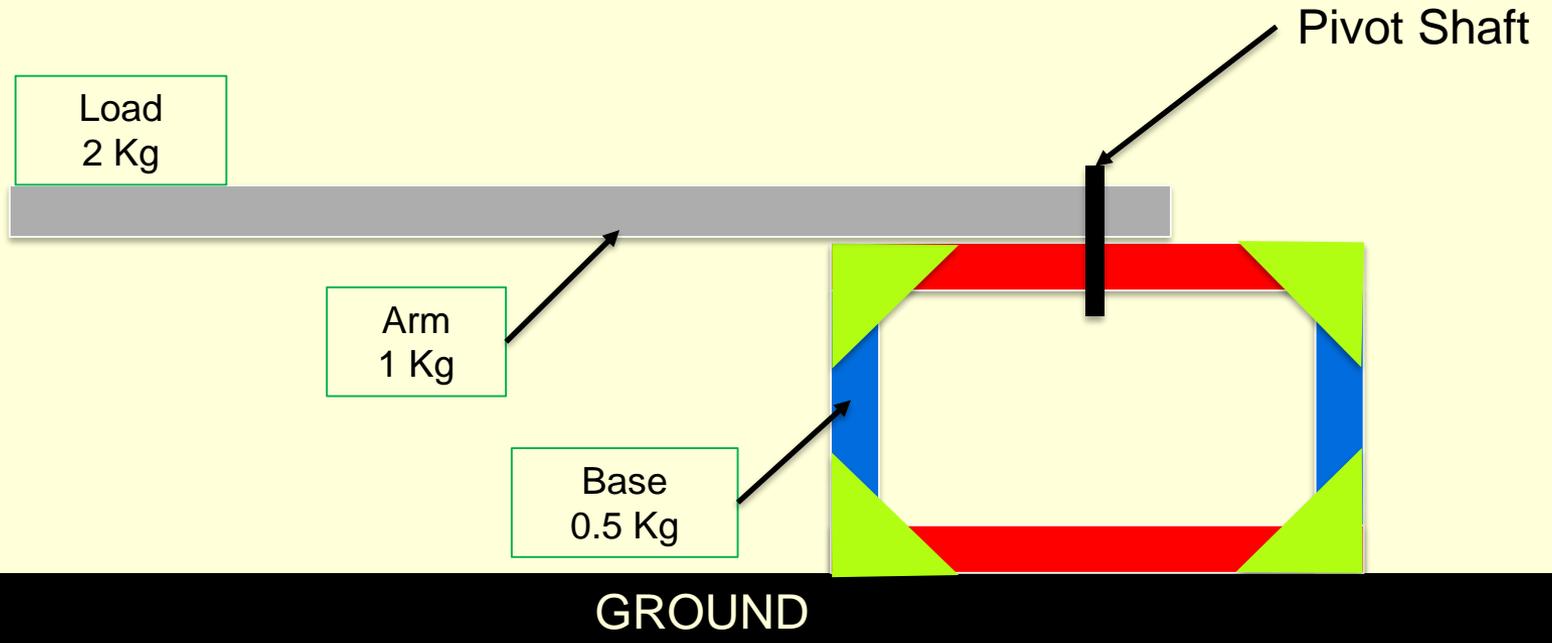
What else can go wrong and how can we improve it?



## Structural Strength

Observations? Pro's and con's of each option?

Reasons to use one option vs another? Other considerations?



## Structural Stability

Any concerns with this structure?



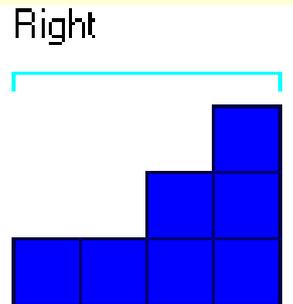
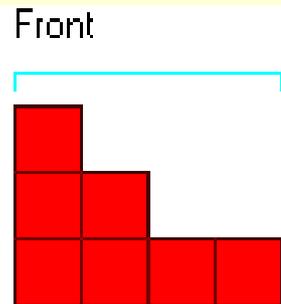
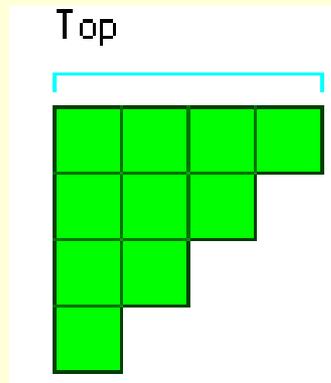
GROUND

## Structural Stability

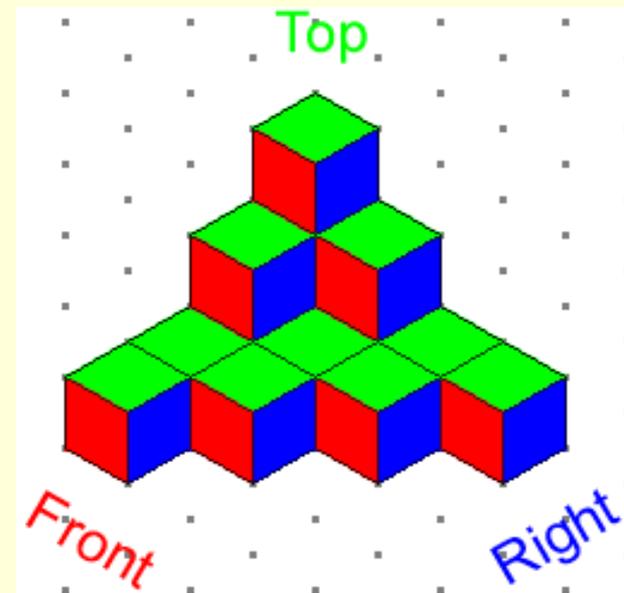
The device will tip over - Why?

How do we prevent this?

## Orthographic Projection



## Isometric View



# The Challenge Scenario

# The Challenge Scenario

## Objective

To design a prototype robot using only the supplied tools and materials, that can score as many points as possible.

## Deliverables

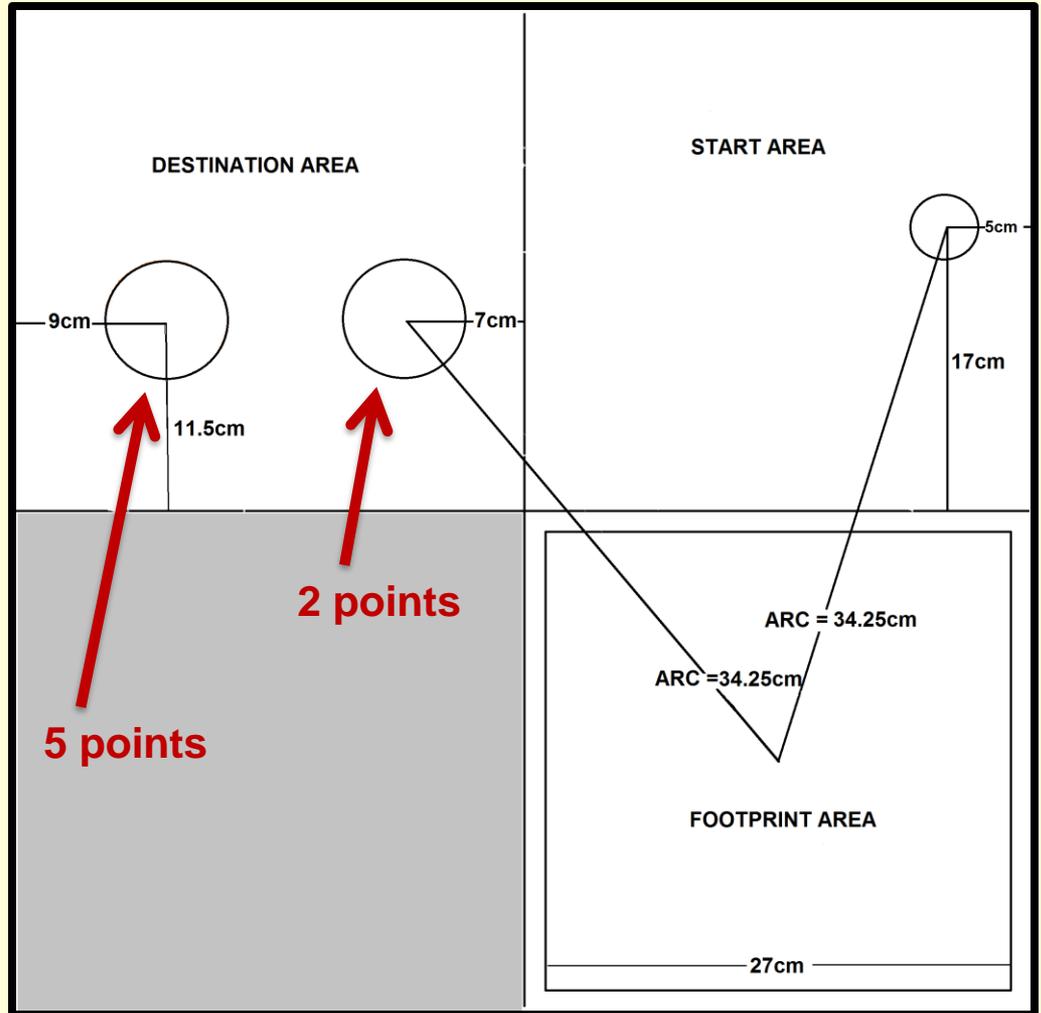
- An electronic copy of the Design Portfolio
- Video of the two-minute demo of your device
- Local judges' scoresheet

## Hints for the School Challenge Day

- ALL motion must be controlled by fluid power
- USE your materials wisely
- DOCUMENT everything in your portfolio
- All materials are provided except for tools
- Use your time efficiently
- Have fun and work well
- *Remember: SAFETY is our number 1 concern!*

Shown on the right is a typical **Challenge Scenario layout**.

It may not be the same as the one in your Challenge!



## DISCUSSION

- Why is one destination position worth more points than the other?
- What if you design a robot that only works when using your hands?
- How long will you have to move cylinders?
- What tools/materials can you use?
- Why is the Design Portfolio so important?

# How to Maximize your Points!



## National Challenge Rubric

(short version)

	Criteria	Points
<b>Portfolio Rubric</b>  <i>Total possible points: 45</i>	<ul style="list-style-type: none"> <li>A detailed outline of each team member's participation in the production of the portfolio and planned production of the device</li> </ul>	0 – 5
	<ul style="list-style-type: none"> <li>At least three illustrations of the initial design concepts of a possible device</li> </ul>	0 – 5
	<ul style="list-style-type: none"> <li>List of materials used to build a prototype</li> </ul>	0 – 5
	<ul style="list-style-type: none"> <li>Description of the use of principles of structural strength and stability</li> </ul>	0 – 5
	<ul style="list-style-type: none"> <li>Explanation of the placement of fluid systems</li> </ul>	0 – 5
	<ul style="list-style-type: none"> <li>An isometric hand drawing of the portion of the prototype used to grab the object</li> </ul>	0 – 5
	<ul style="list-style-type: none"> <li>An orthographic drawing showing dimensions and construction notes</li> </ul>	0 – 5
	<ul style="list-style-type: none"> <li>A list of alternative materials that would have been useful with reasons why they would have been so</li> </ul>	0 – 5
<b>Teamwork &amp; Work Habits</b>  <i>Total possible points: 10</i>	<ul style="list-style-type: none"> <li>Members of the team work independently and co-operatively in an organized way</li> </ul>	0 – 5
	<ul style="list-style-type: none"> <li>Members of the team demonstrate safe working practices</li> </ul>	0 – 5
<b>Device Design, Construction &amp; Operation</b>  <i>Total possible points: 10 + placement points</i>	<ul style="list-style-type: none"> <li>The device uses materials effectively and is well constructed with parts securely attached</li> </ul>	0 – 5
	<ul style="list-style-type: none"> <li>The device itself operates efficiently and is operated in an organized way</li> </ul>	0 – 5
	<ul style="list-style-type: none"> <li>Object placement points accumulated in designated time period</li> </ul>	
<b>Interview Questions</b>  <i>Total possible points: 20</i>	<ul style="list-style-type: none"> <li>See detailed <i>Challenge Rubric</i> for wording of questions</li> </ul>	0 – 20

Awards are given for each sub-category and for overall.

### Discussion

How many points can you earn if your device cannot complete a single cycle?

What pre-challenge action can you take to get the most Teamwork Skills points?

Or the most Interview Question points? (See below.)

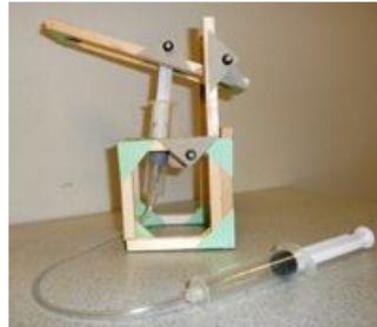
**Know the Rubric**

**e.g.**

Description of the use of the principles of a strong and stable structure  
1-5 points.

Team 1 ->

Our Robot  
It's good.

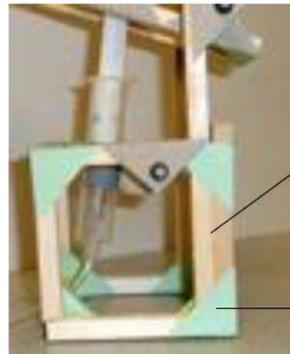


Team 2 ->

Which team is likely to get points?

**Question 1: Structural Support**

We have reinforced the structure of our robot in the following ways:



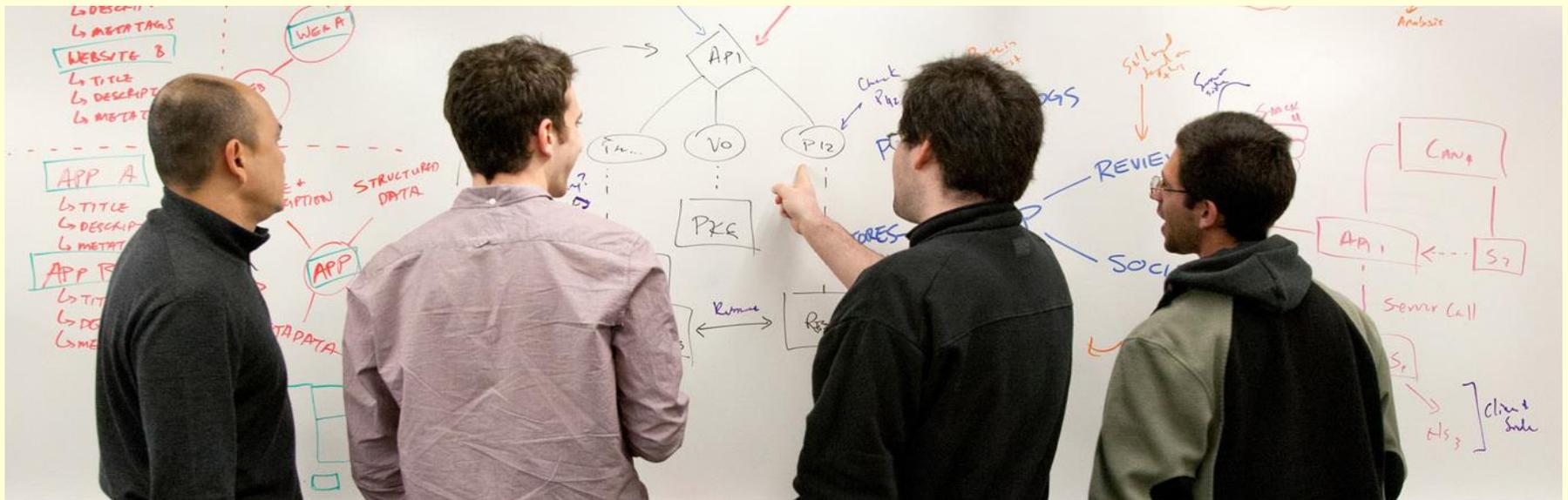
Wooden dowels are doubled in heavily loaded areas.

All corners are reinforced with paper gussets

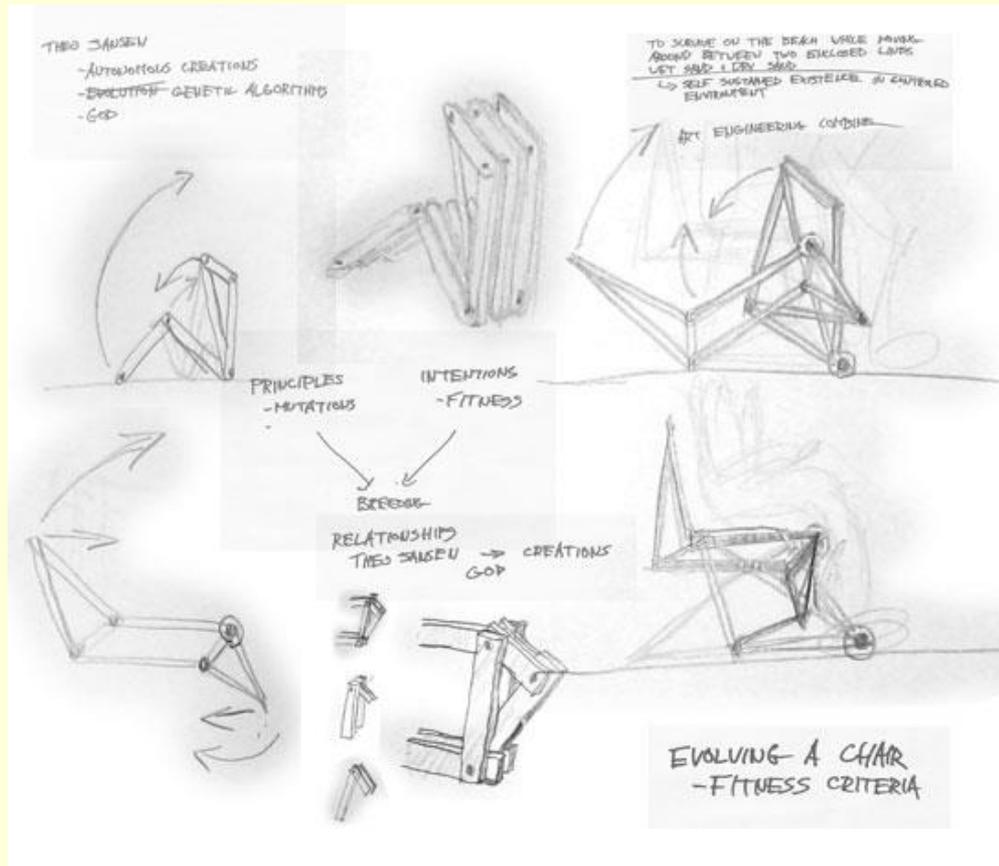
## INTERVIEW QUESTIONS

1. What **alternative designs** did you look at before selecting the design you are building today?
2. Why did you **select** this design to use for the Challenge?
3. What did you find **most difficult** with the project overall?
4. How did you decide **who on your team would be responsible** for which parts of the project?

# Sketching is a way of communicating ideas



# Sketching is a way to explore new ideas.



# Examples of tasks

- Read project rules
- Research clamping mechanisms
- Sketch ideas for clamping mechanisms
- Research rotating mechanisms
- Sketch ideas for rotating mechanisms
- Build prototype mechanisms
- Sketch whole robot design
- Build robot prototype
- Practice challenge activity
- Read portfolio scoring rubric
- Generate final sketches of design for portfolio
- Write a description of the principles of strength and stability
- Write an explanation of the chosen location of your syringes
- Have writing reviewed by a mentor
- Assemble all portfolio elements into a final report

## Identify concrete tasks and milestones

Read rules  
and  
scoring  
rubrics

Build  
prototype  
rotating  
mechanism

Have draft  
portfolio  
reviewed by  
a mentor

Milestone:  
Assemble  
writings and  
sketches into  
final portfolio

Research  
clamping  
mechanisms

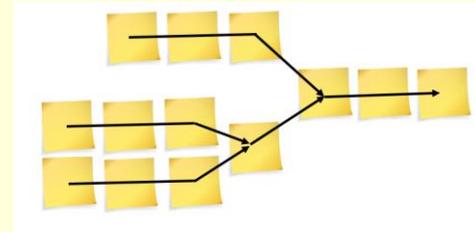
Milestone:  
Finalize  
robot  
design

## What you should be doing right now

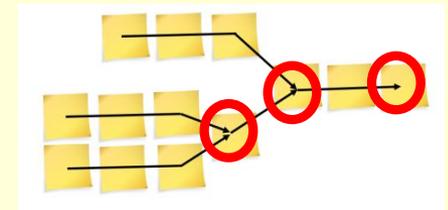
- Identify 3 tasks or milestones



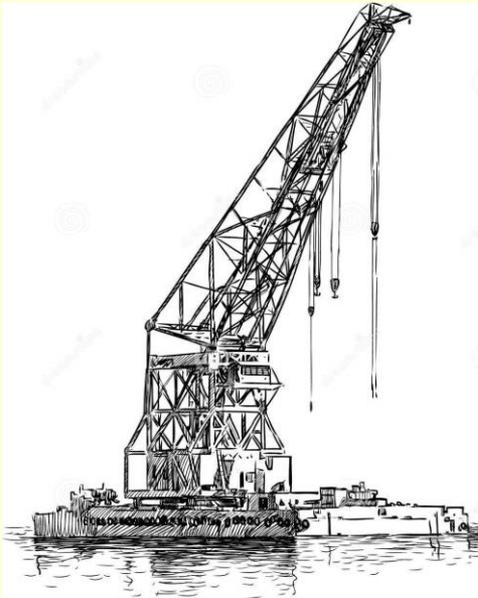
- Lay out the schedule



- Choose dates for your milestones



Watch videos from previous Fluid Power Challenges on YouTube or Google “Fluid Power Challenge”



Successful products are always made by carefully researching existing products.

**Good luck!**