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Basic Building Techniques for LEGO Robots

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SESHAN BROTHERS

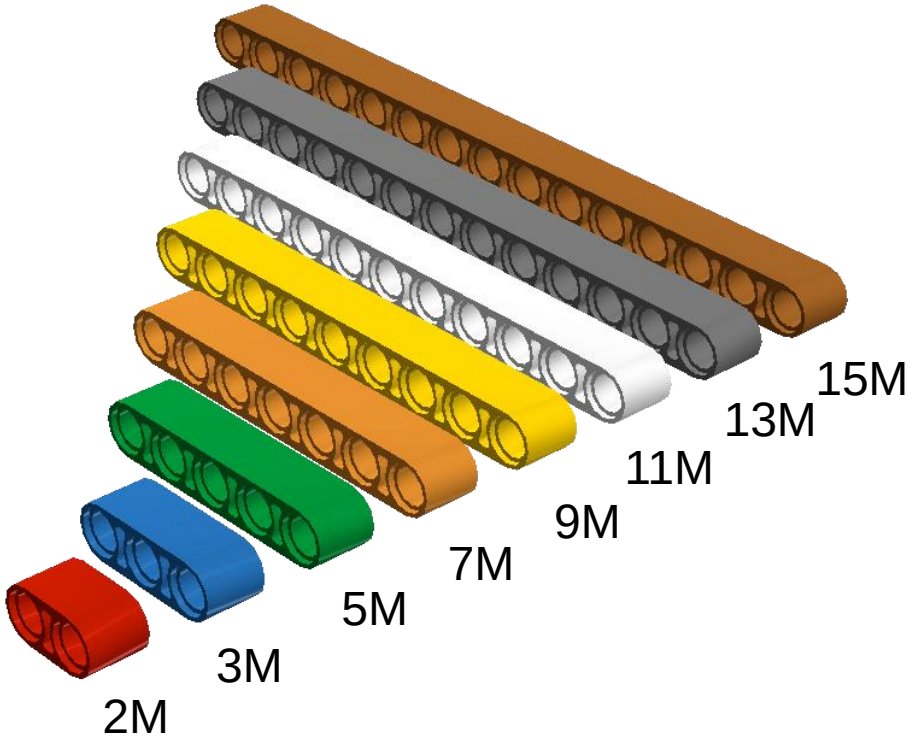
ROBOT DESIGN LESSON

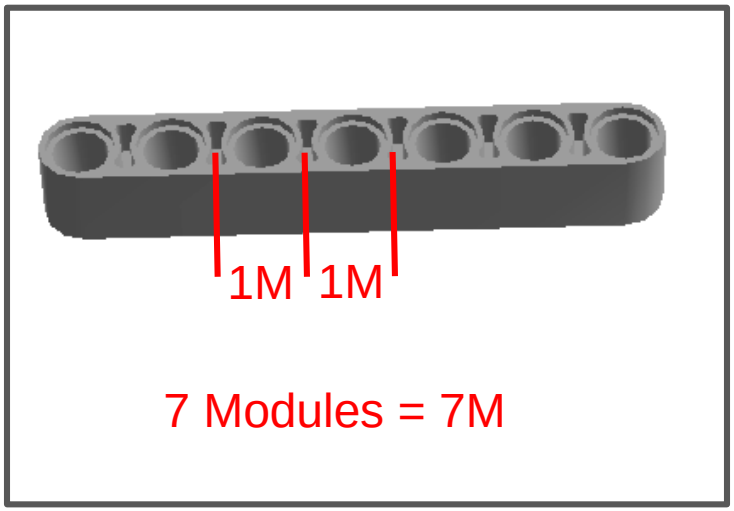
ARE YOU NEW TO TECHNIC?

- **This lesson is an introductory lesson to common technic pieces**
- **This lessons does not cover every Technic part. It is just an introduction to commonly used parts in MINDSTORMS robots**

LIFTARMS

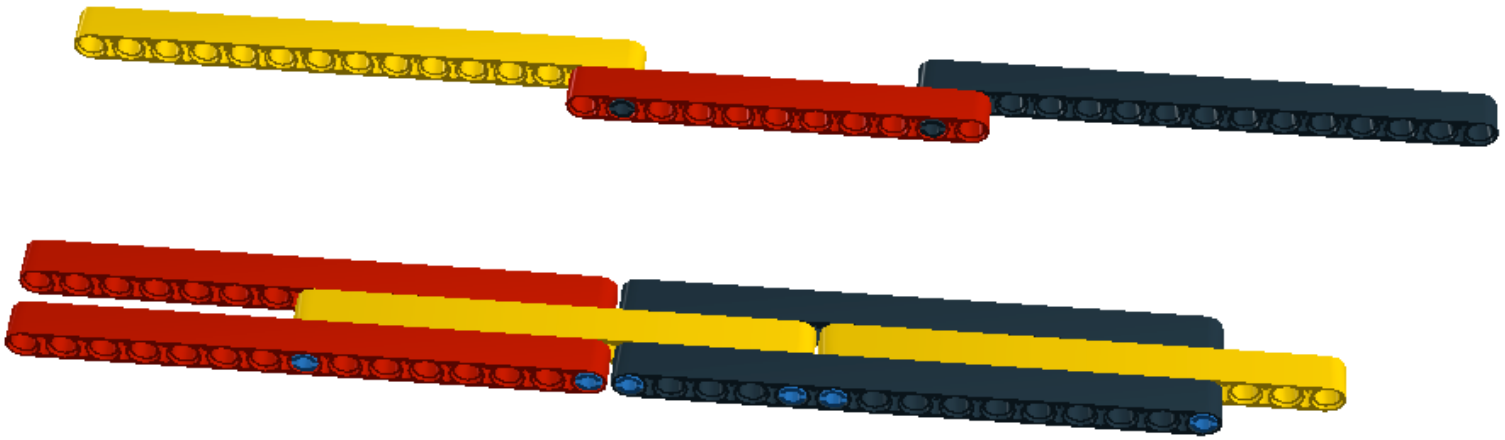
- Liftarms come in various sizes from 2M to 15M length
- Technic is measured in Modules (M)
- The number of holes corresponds to the Modules





TEST: MAKING SOMETHING LONG

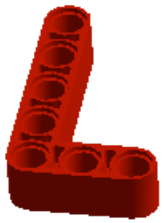
- What if you want to build something long
- Build both models below. Which one is stronger?



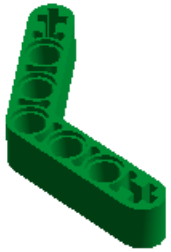
LIFTARMS – ANGLES

T-beam
3X3

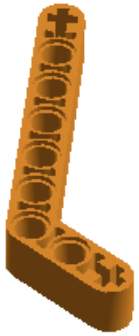
4X2
90 degrees



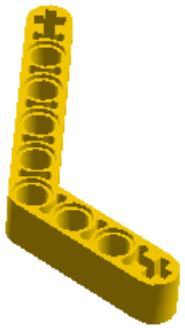
4X3
90 degrees



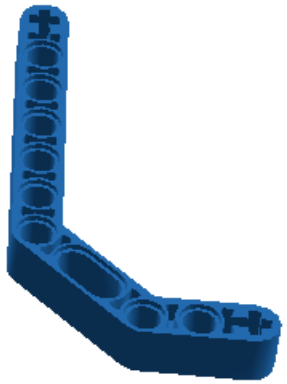
Angle
4X4



Angle
4X2



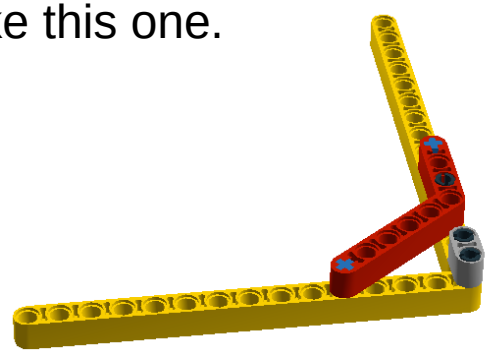
Angle
3X7



Double
Angle
3X7

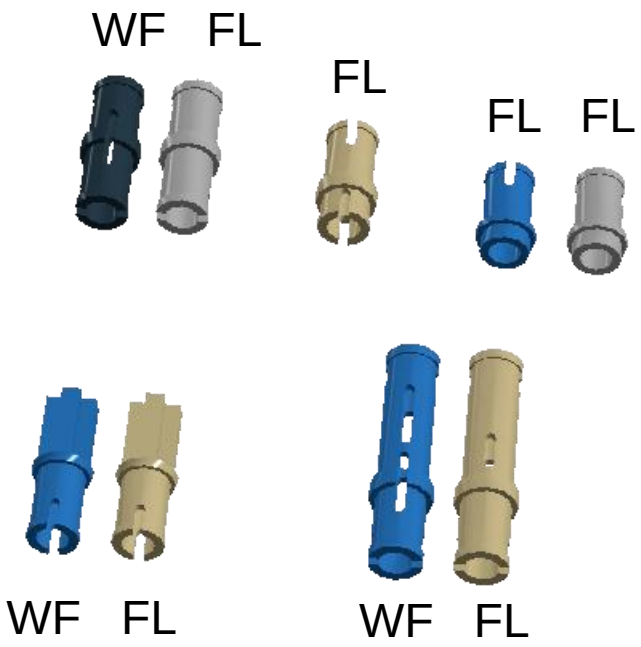
- Don't force LEGO into angles they are not meant for. You will put stress on the liftarms and the pegs

These beams all have a 53.1° angle. This angle makes 3:4:5 right triangles like this one.



TECHNIC PEGS

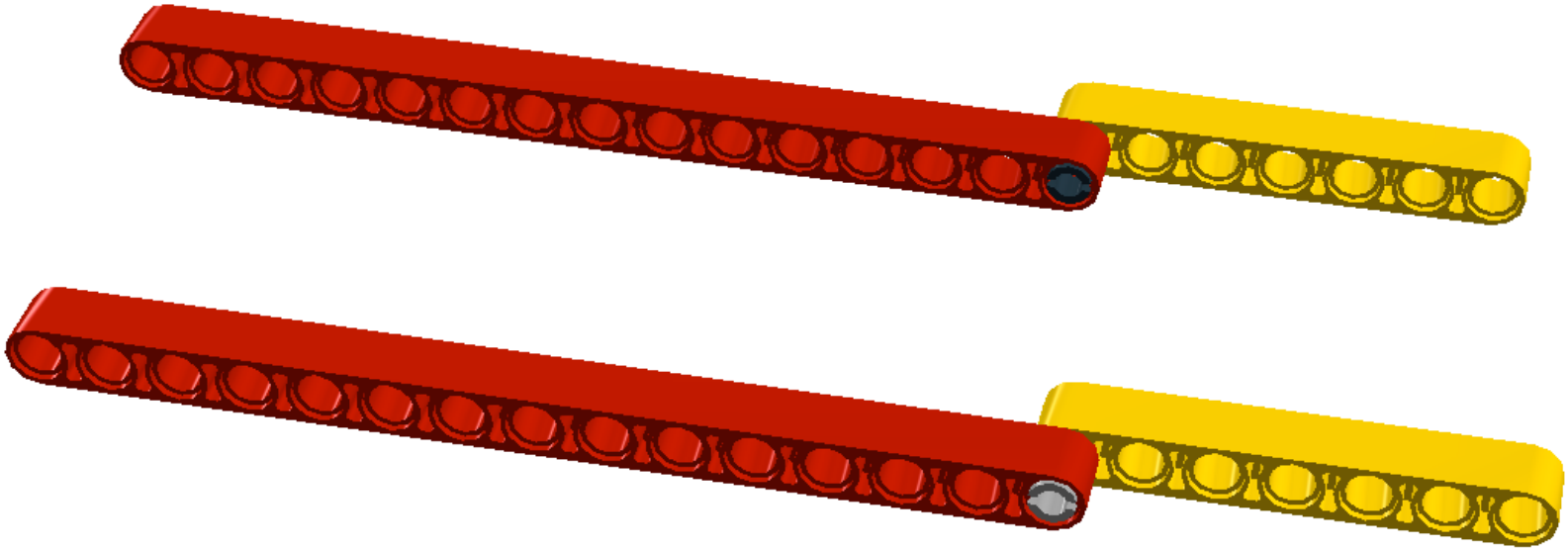
- LEGO makes two type of pegs: With Friction and Frictionless pegs
- A common mistake is to use either peg in builds
- However, which peg you use does matter!



FL – Frictionless
WF- Friction

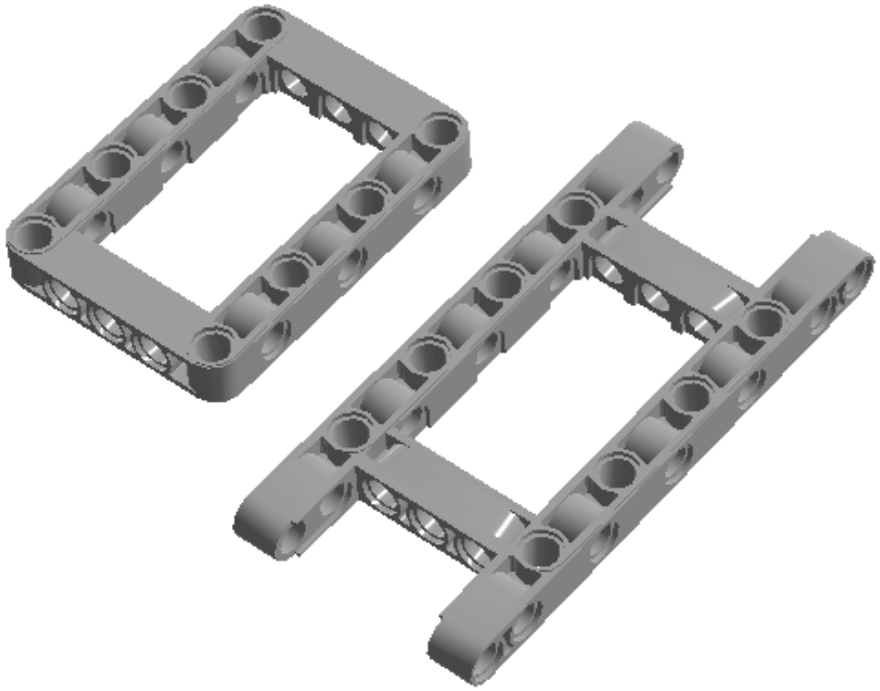
TECHNIC PEG TEST

- Build both these models. One uses a black peg with friction and the other uses the grey frictionless peg
- What is different?



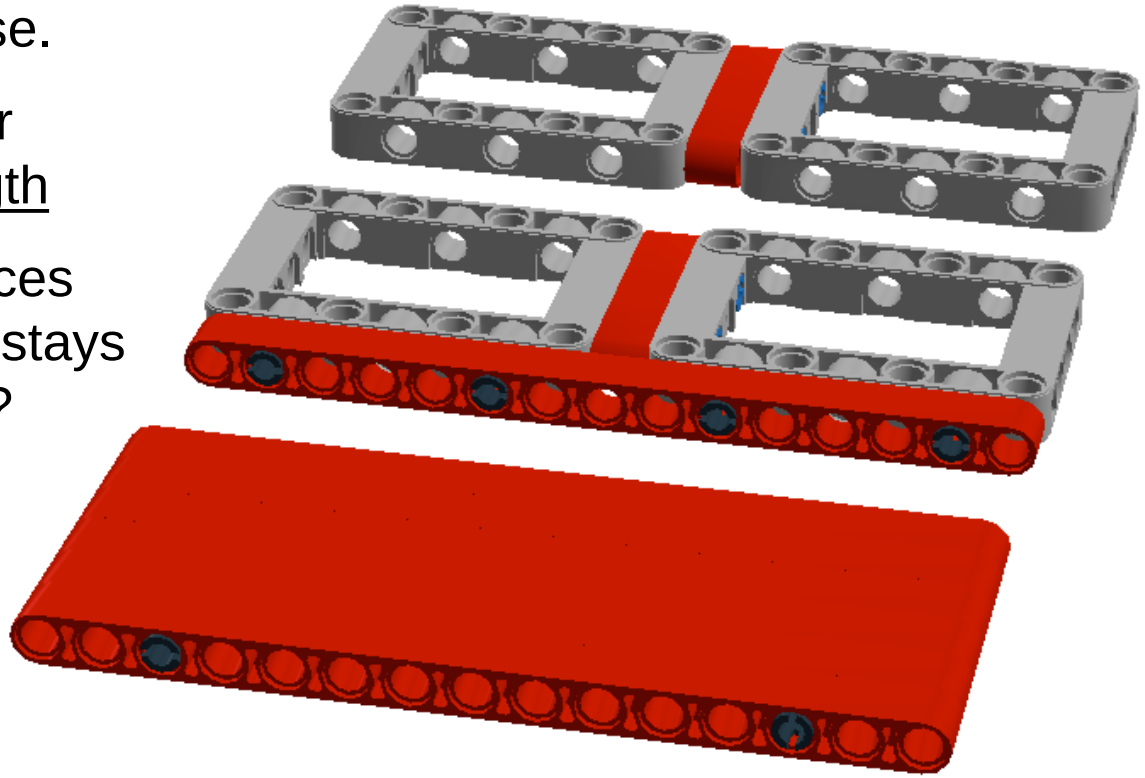
FRAMES

- Open frames and H- frames can add strength to your builds without as much weight



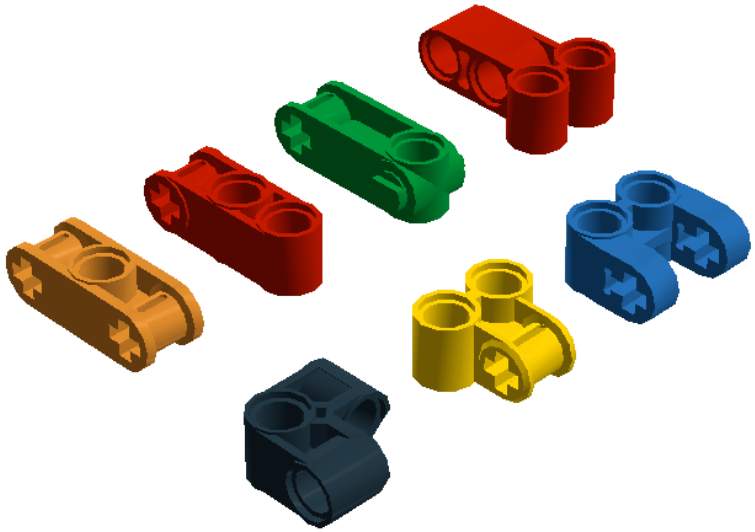
FRAMES TEST

- Build each of these.
- Compare them for weight and strength
- Try to pull the pieces apart. Which one stays together the best?



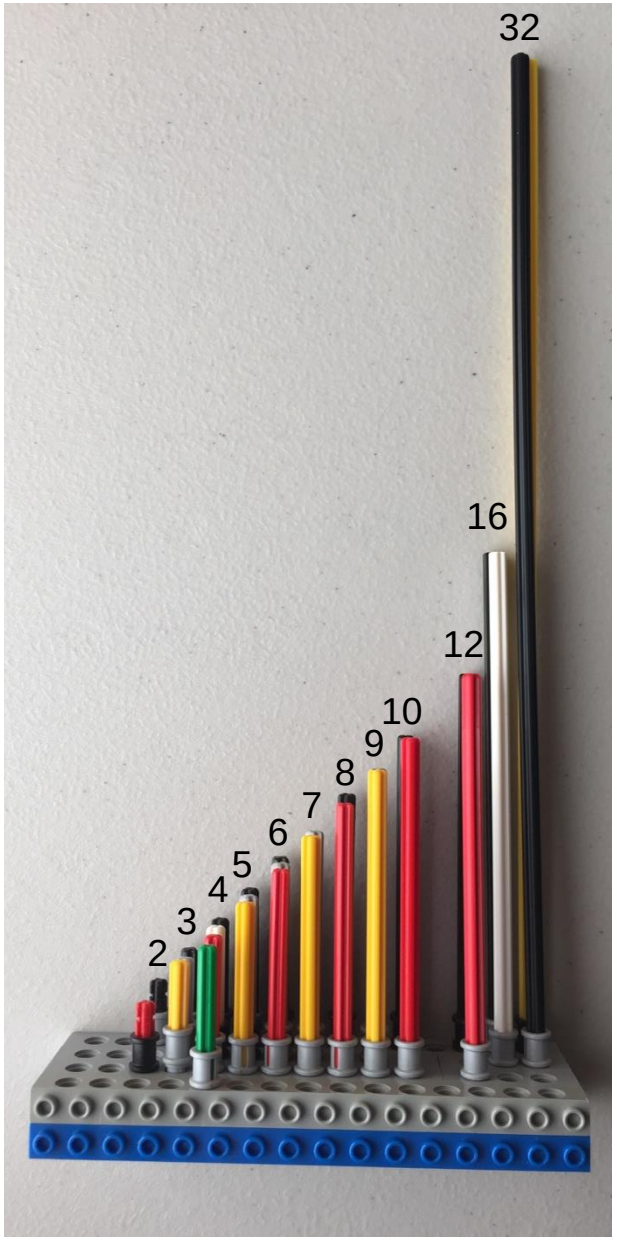
CHANGING DIRECTIONS

- These connectors can be used to change directions
- You might sometimes need to be a ½ module off. Some of these connectors can come in handy for this.



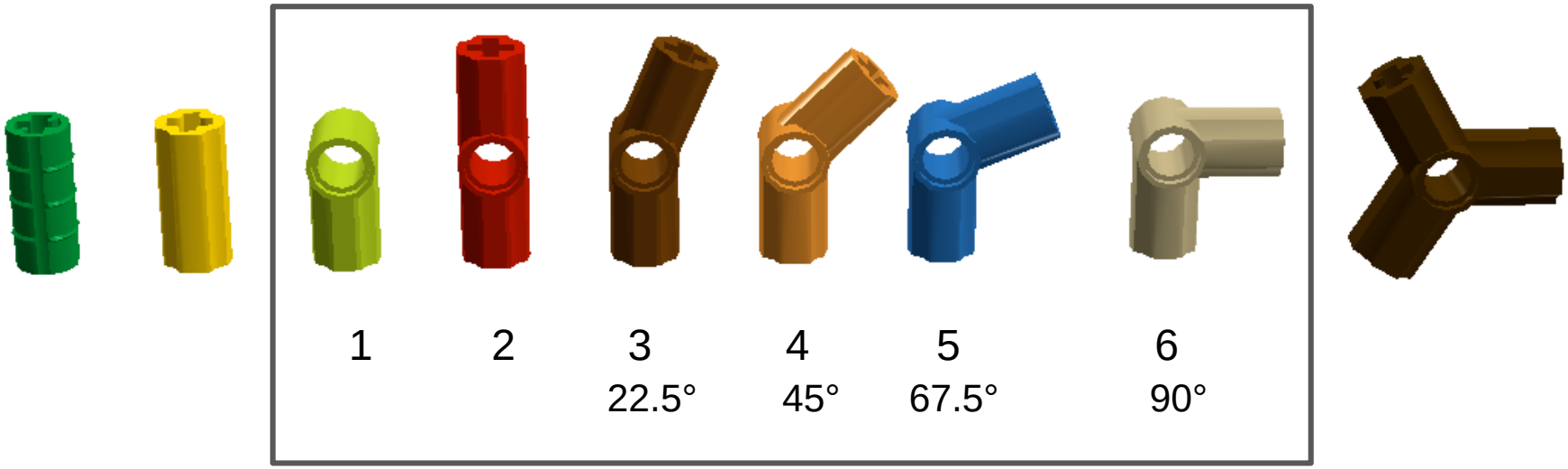
AXLES

- Axles come in lengths of 2M to 32M in various colors
- The MINDSTORMS set generally has black, red (2 length), and grey axles, but newer technic sets are changing to all red and yellow



AXLE CONNECTORS

- Axle connectors come in various angles. Many of them are labeled with a number
- Don’t force LEGO into angles they are not meant for. You will put stress on the axles and connectors



AXLE TEST

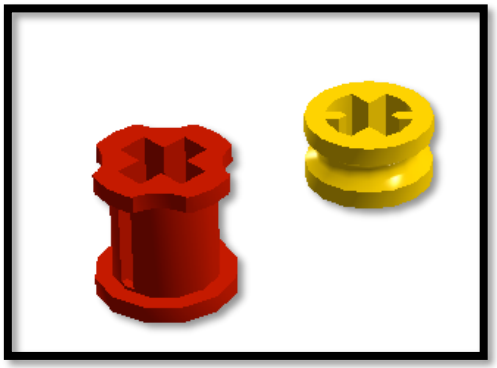
- Sometimes, shorter axles with connectors are a lot stronger than one long axle
- Construct both builds below. Try bending/twisting them. Which one is stronger?

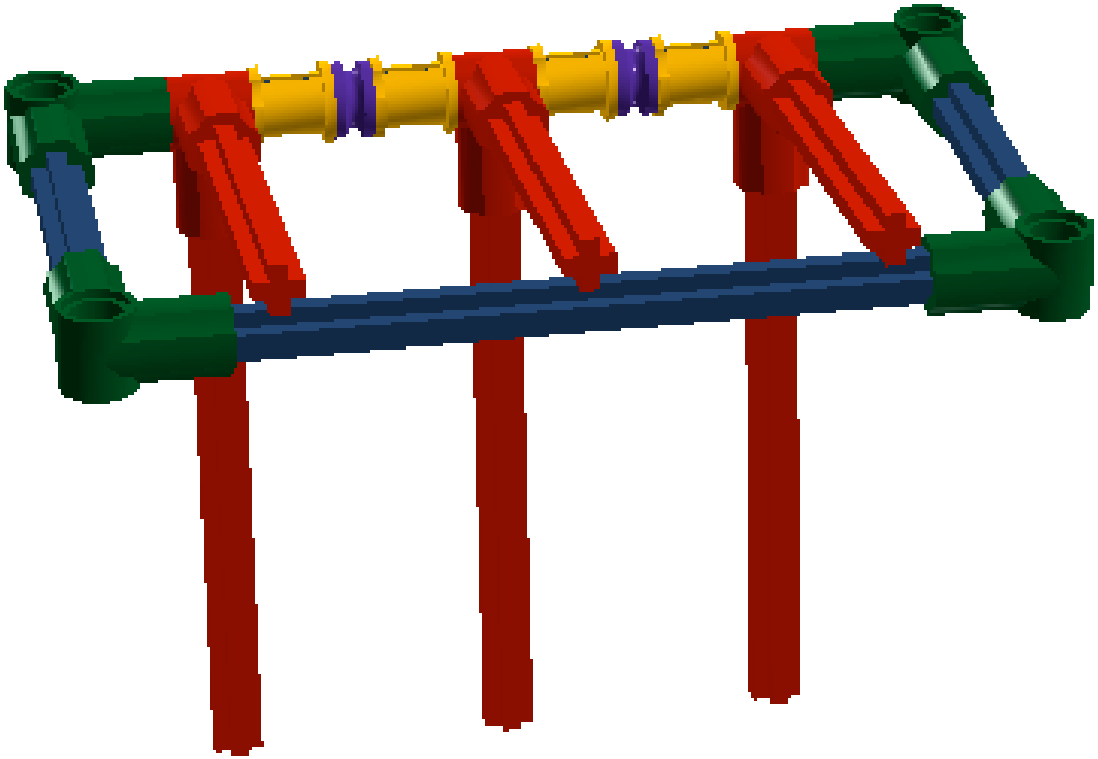
Three length axles with connectors

12 length axle

BUSHINGS

- Bushings can come in very handy
- They are used in axles like a space holder





CREDITS

- **This tutorial was created by Sanjay Seshan and Arvind Seshan**
- **More lessons at www.ev3lessons.com and www.flltutorials.com**