Sandpiper Training Session Building Arms and basic tips

10/8/22

Presented by Rien Gupta, Kevin Li, and Rick Taylor

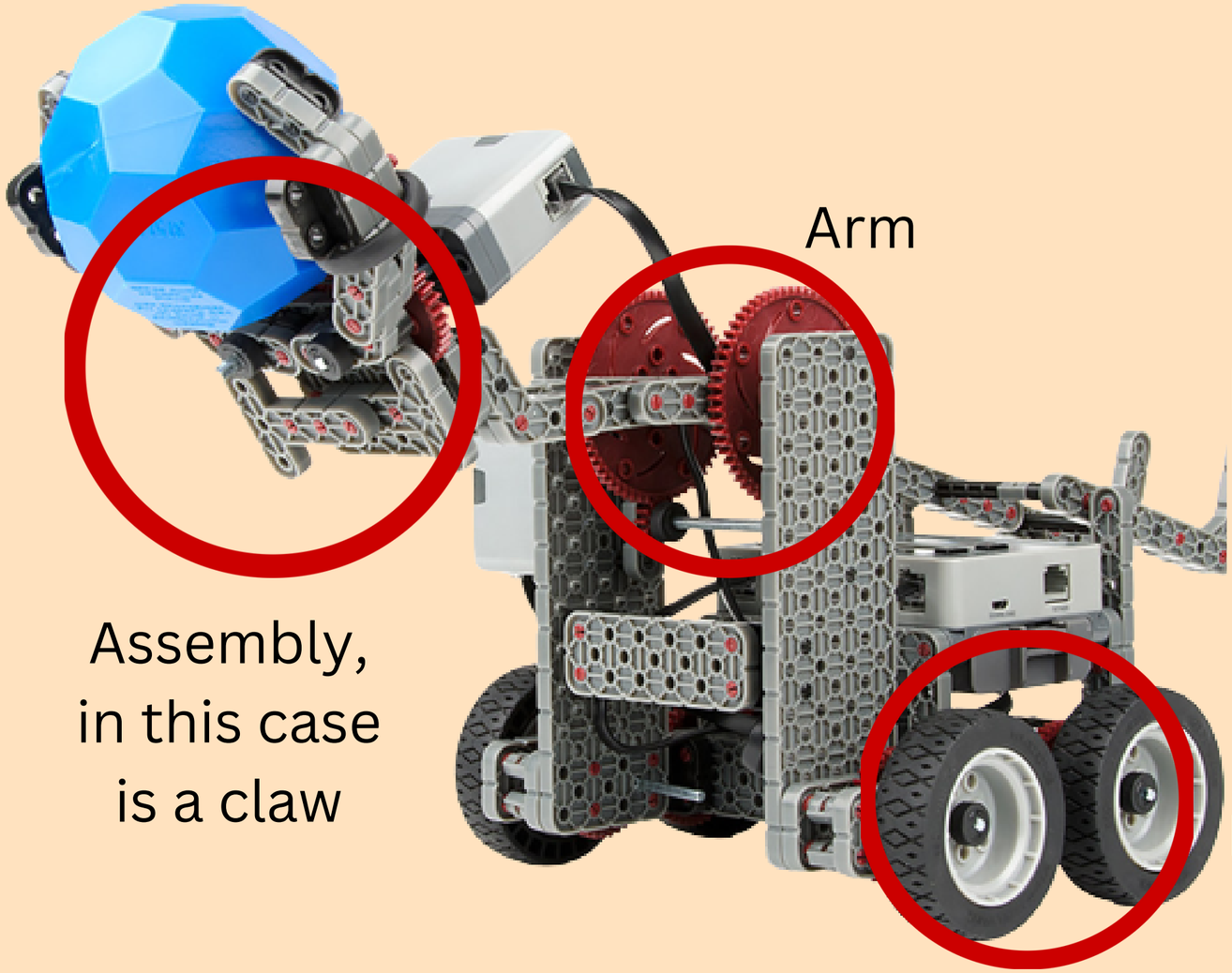
What is the progress of your team?

In the last few meetings, we have been talking about building a drive base and programming it to have basic controls. If you have done that so far, that is good, but you should still get a good function-packed robot! Let's get started.

Presentations
=>

Presentations
<=

How is a robot made?



Assembly, in this case is a claw

Arm

Drive Base

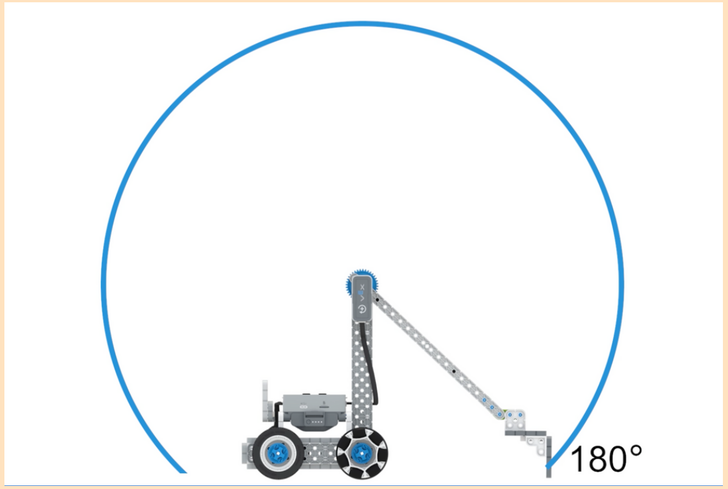
Using Vex IQ pieces, Vex has a numerous amount of configurations. Robots consist of a **Drive base, Arm, and Assemblies.** With the Vex game being different, teams gather around to brainstorm different ideas each year.

What is an Arm?

The arm is an important concept to understand in ALL Robotics. On a crane, the arm is the long area stretching out. In Vex, there are a few important arms.

The Swing Arm: Simplicity at its finest

The single swing arm is perhaps the easiest arm to assemble. This is the type of arm which is found on the Claw Bot IQ (1st gen) build. The manipulator on the end follows the arc of the swing arm motion. It is possible for a swing arm design to pass over the top of the tower and reach the other side of the robot.



The Swing Arm:
Simplicity at its finest

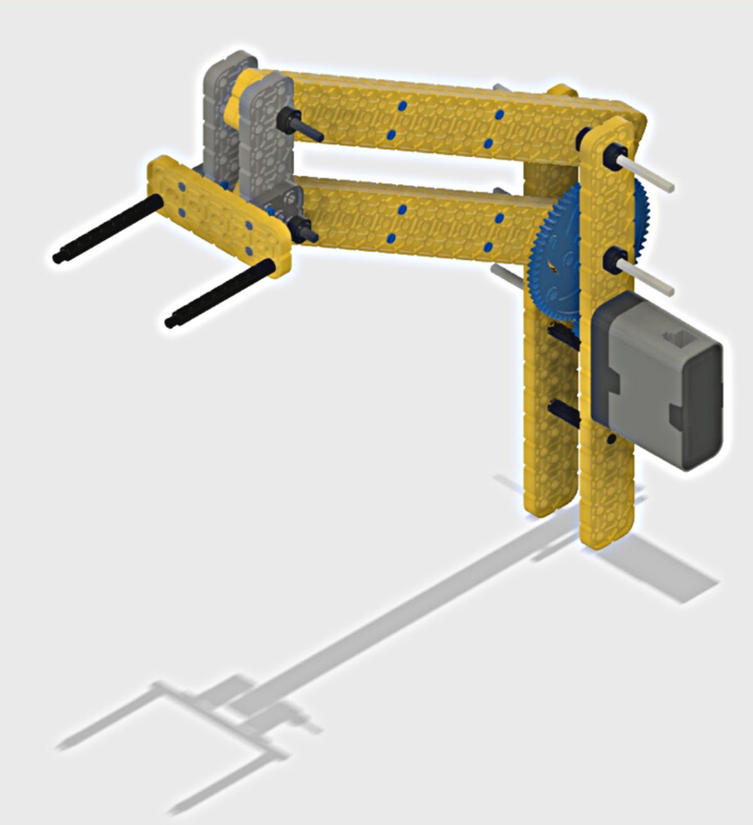
Pros

- Very simple to create
- Very easy to access
- Very high degree of rotation

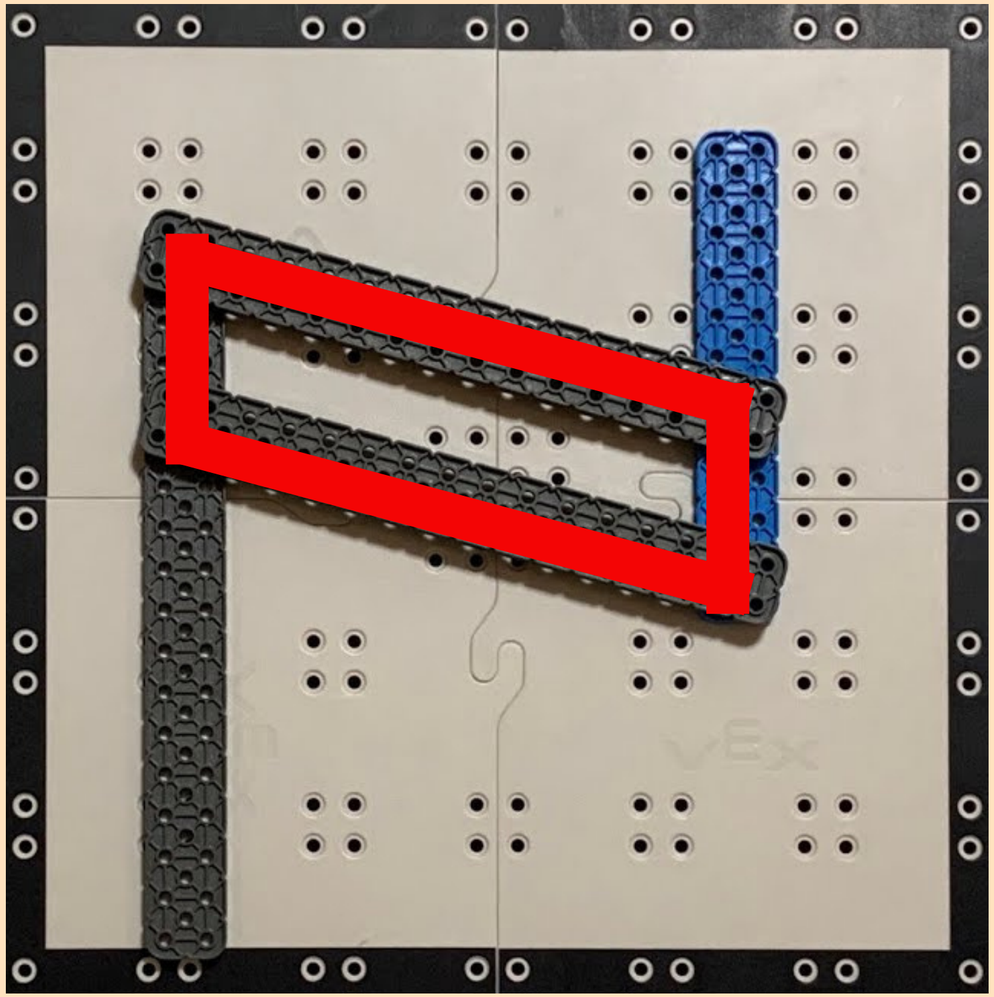
Cons

- Extremely flimsy when built with Clawbot
- Cannot keep an assembly straight when attatched

Linkage Bars, starting with the 4-Bar



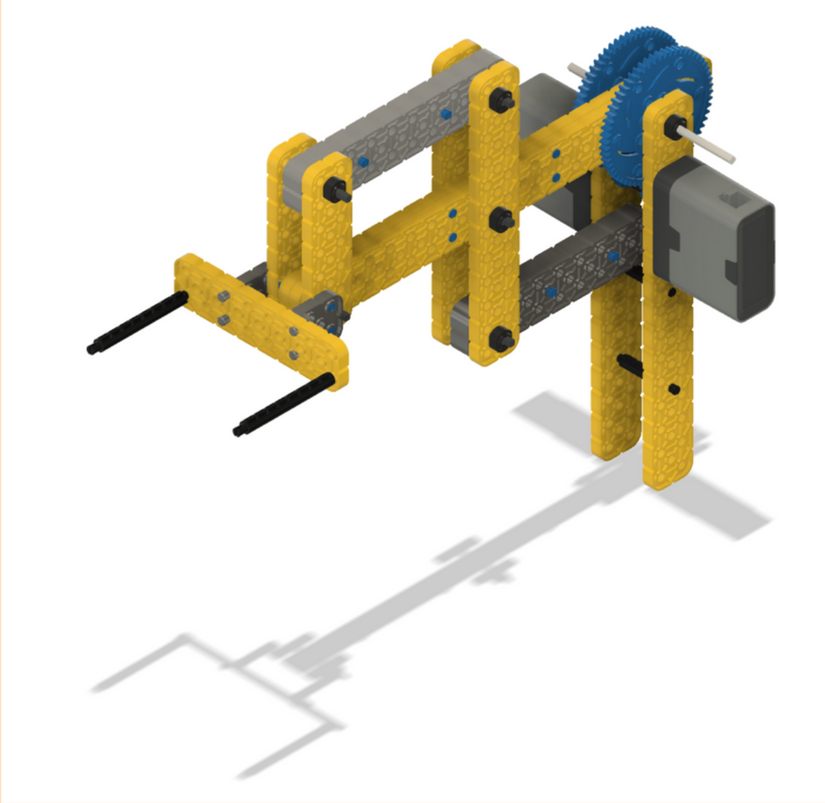
The easiest way to solve the swing arms problems are to use linkage bars. While not being able to turn backwards, the linkage bars are robust, and work very well. In this image, the 4-Bar is the most basic yet functional bar to make.



How do Linkage Bars work?

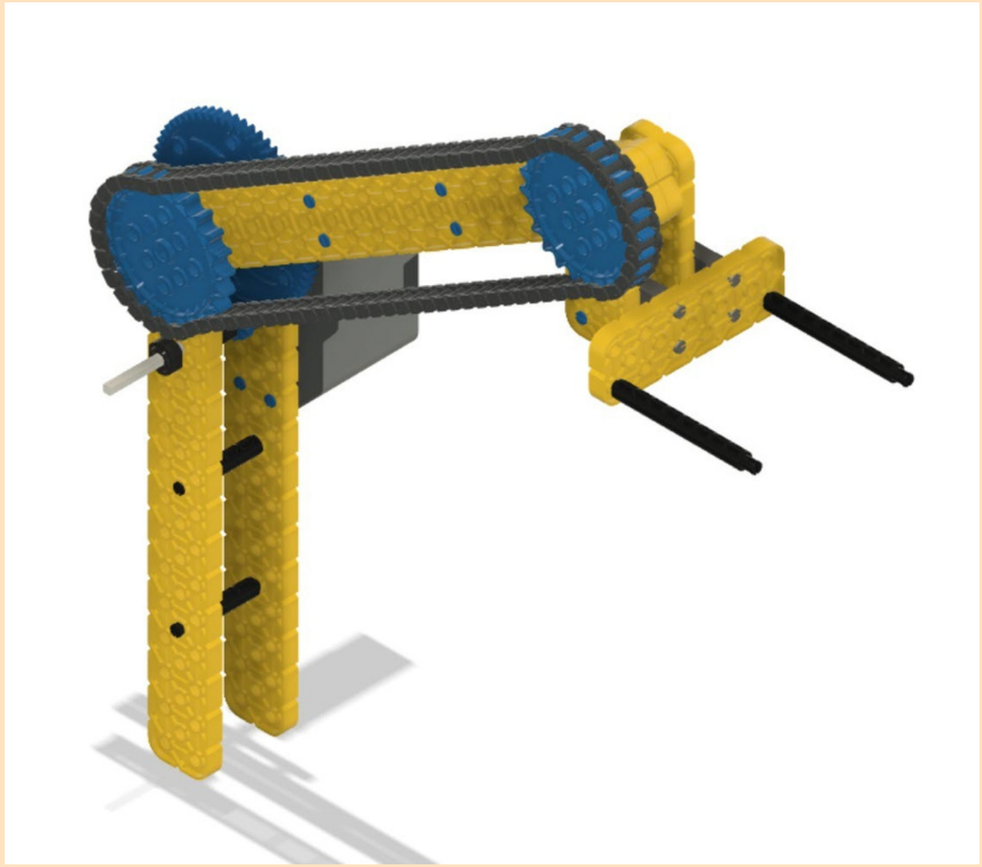
Linkage bars are formed through basic Geometry. In sturdy Linkage bars, you will find perfect basic parallelograms. No matter how much you move the arm, you will still find a parallelogram. If you do not see a basic parallelogram, something was done wrong.

6-Bar



Much like it's 4-Bar counterpart, the 6-Bar is an equivalent higher class Arm. The 6-Bar uses the similar parallelogram form the 4-bar does, but has a second level of arms to make the assembly go even higher.

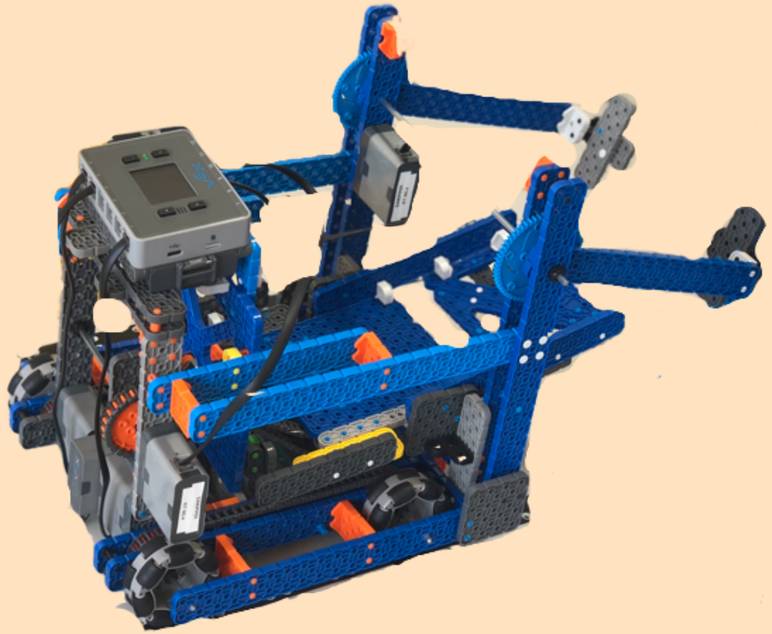
Chain-Link Bar



The chain-link bar is a rather difficult linkage arm, but can be useful in some scenarios. It is a single bar with a sprocket and chain connected from both sides. The sprockets are connected to the bases of the arm, and the axel is placed It is looked down on because it is flimsy and not very strong much like the swing arm, but it is good for conventional usage

Is it required to have a linkage arm?

Hint: Not all do!



It is very much possible to make a sturdy swing arm, you just need to understand some basic arm concepts when building

Yes

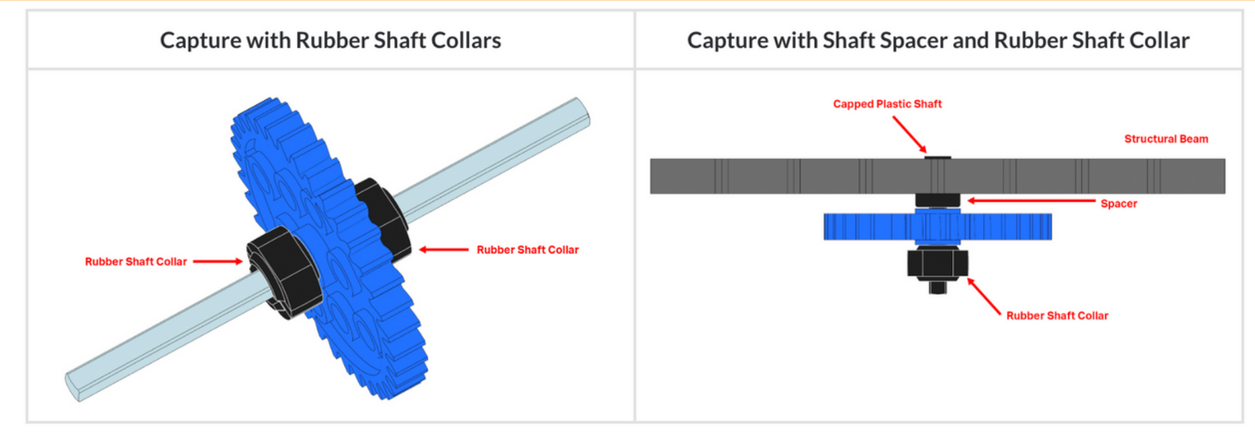
- Your assembly requires being straight
- Your assembly is heavy
- You need to start somewhere on a robot

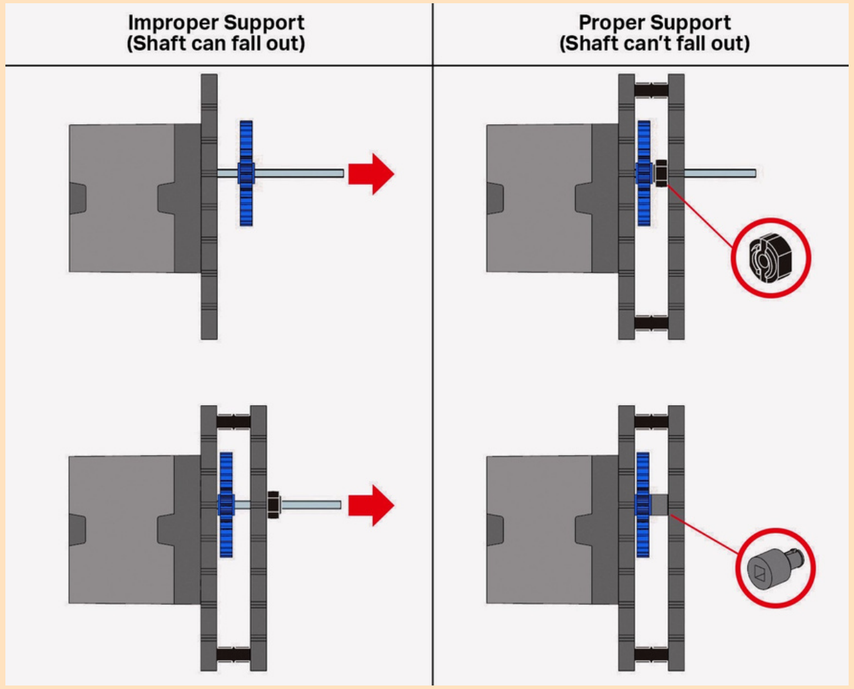
No

- Your assembly does not require being straight
- Your assembly is not heavy
- You have **an idea** for using a swing arm

Important concepts

1 Proper Support for axel movement

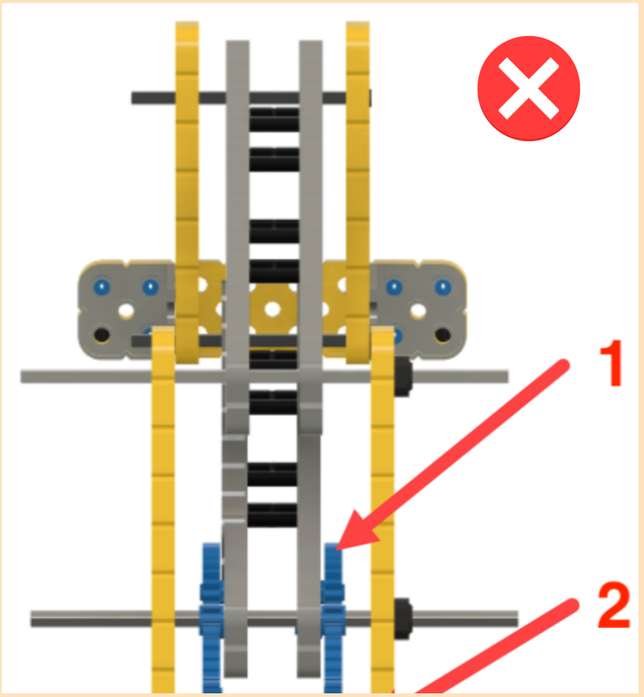




Important concepts

1. Proper Support for axel movement
2. Proper spacing of Arms to Structure

The structure shown has gaps in between the arms and on the exterior of the gears. Fill that space in with spacers. Even if your structure is smaller and stronger, use washers to separate the friction.



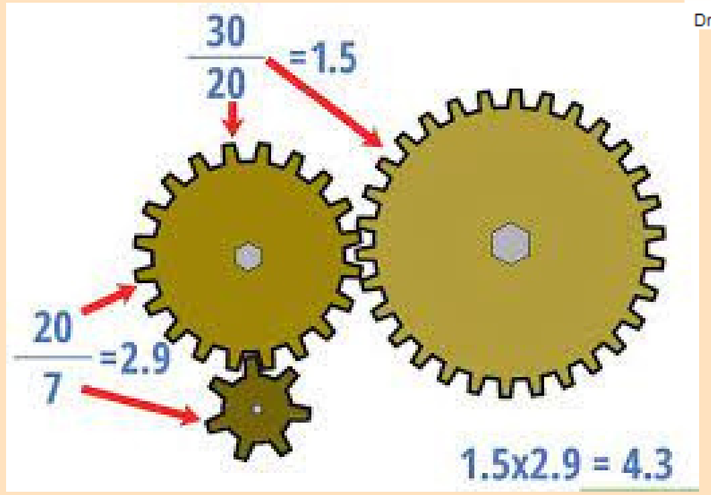
Important concepts

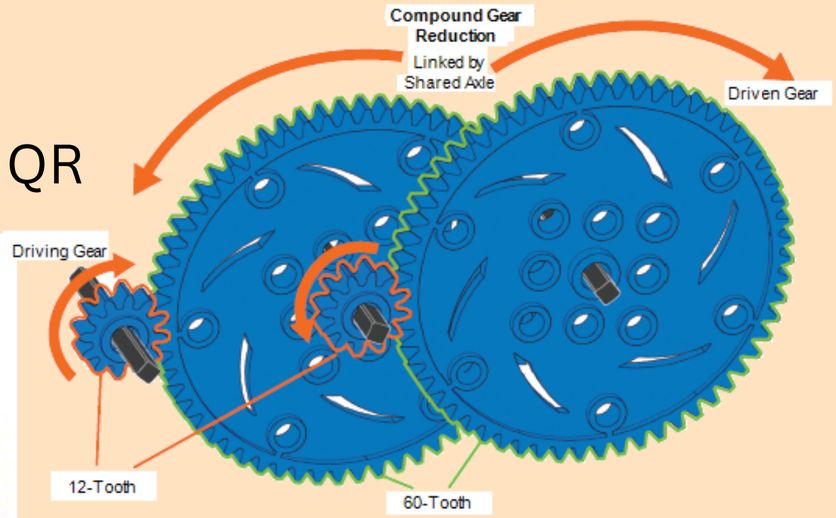
1. Proper Support for axel movement
2. Proper spacing of Arms to Structure
3. Gear Ratio: The big step!

Let's talk about gear ratio on the next slide

Gear Ratio

- Used to alter the speed or power of a motor
- Very useful in heavy-duty arms or drivebases
- Requires rigorous support for axles
- Can also use complex gear ratio to get more speed or torque
- Test your kids with this quick test on gear ratios! (Scan QR Code Above





What to do now?

One thing we did not talk about was what you should do now with the information given. Here are some things we recommend!

1. Figure out what mechanisms on your Vex Challenge require an arm
2. Prototype with an arm that appeals to you
3. Look online for the different arms being used and get ideas!