



ROBOEAGLES
3568

RAPID REACT™

PRESENTED BY  **BOEING**

INFINITE RECHARGE™



DESTINATION:

DEEP SPACE



Presented By



FIRST® POWER UP™



FIRST STRONGHOLD™



RECYCLE
rush SM



aerial
assist SM



ULTIMATE
ASCENT SM



REBOUND
Rumble SM



LOGO
MOTION
Honoring Jack Kamen



BREAKAWAY

LUNACY



FIRST OVERDRIVE

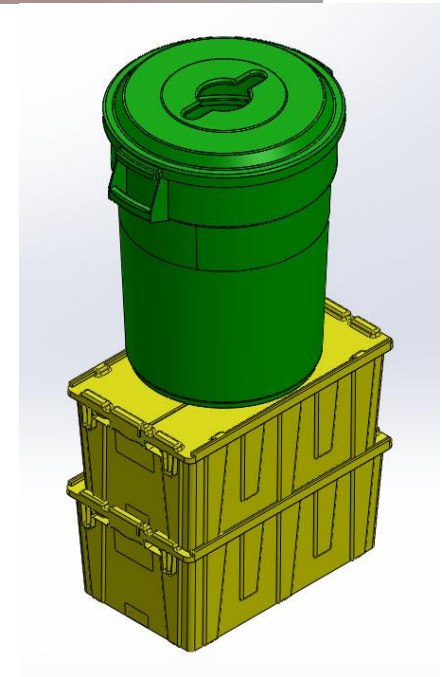
2008 FIRST ROBOTICS COMPETITION



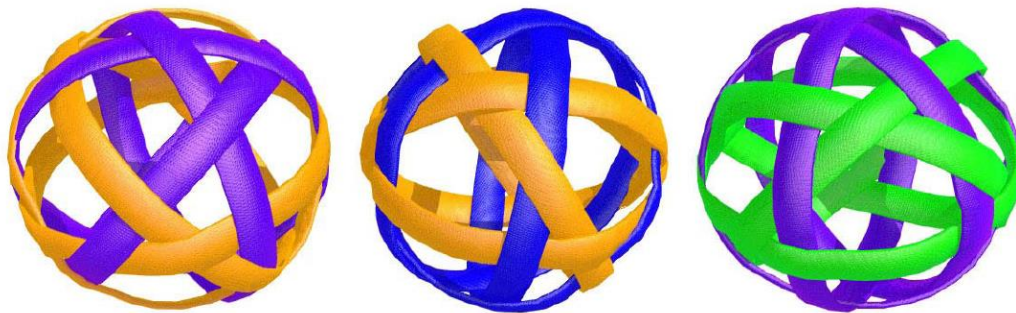
Previous Game Elements



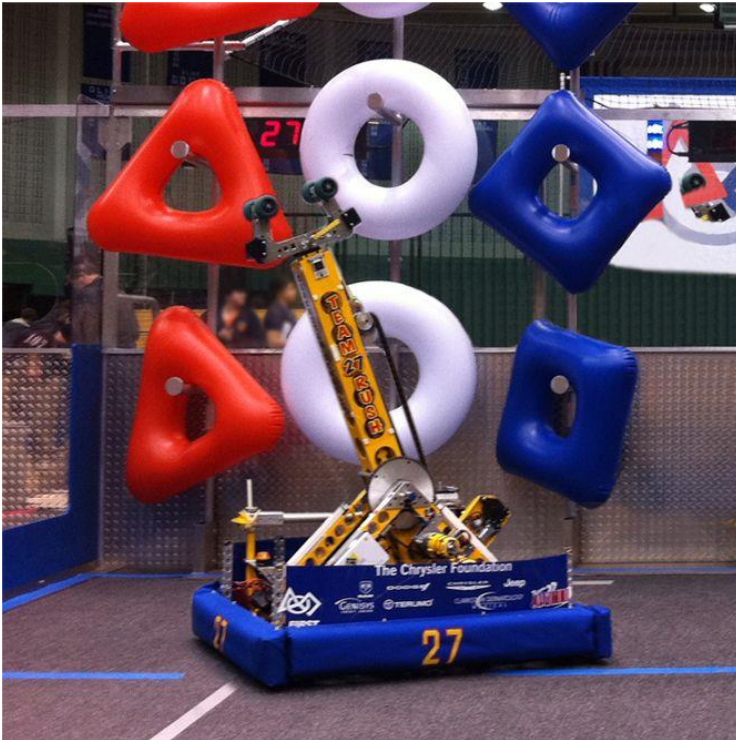
Previous Game Elements



Previous Game Elements



Previous Game Elements



Strategy

AUTO	TELEOP	END GAME
15 sec	1 min 45 sec	30 sec

4.4.5 Point Values

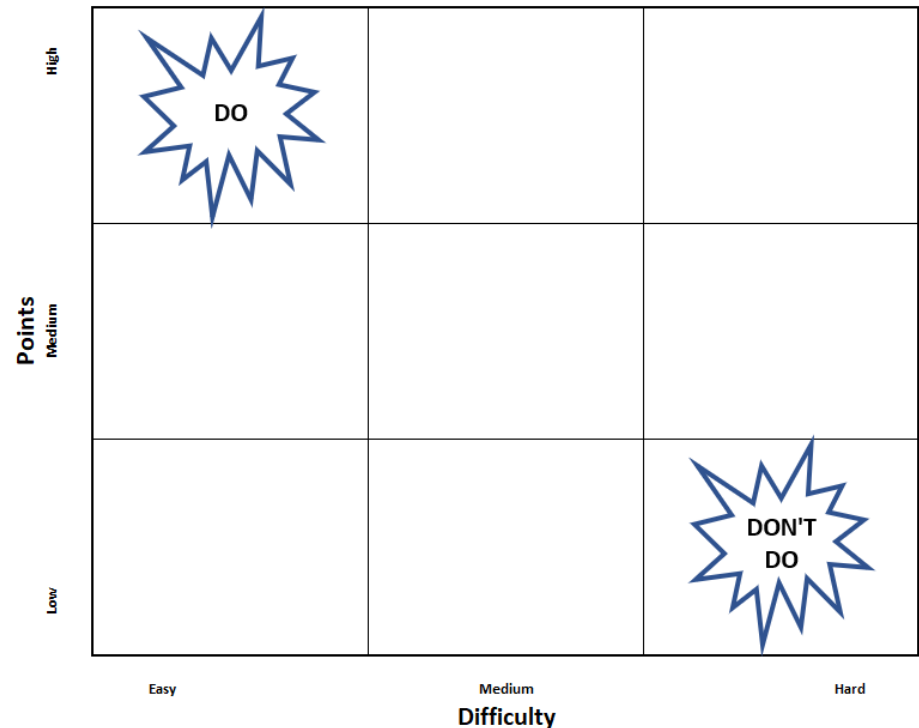
Point values for tasks in INFINITE RECHARGE are detailed in Table 4-2.

Table 4-2: Point values

Award	Awarded for...	AUTO	TELEOP	Qual.
INITIATION LINE	exit the infinite vertical volume created by the corresponding ALLIANCE'S INITIATION LINE any time before the end of AUTO (per ROBOT)	5	-	-
POWER CELLS	scored in BOTTOM PORT	2	1	-
	scored in OUTER PORT	4	2	-
	scored in INNER PORT	6	3	-
CONTROL PANEL	ROTATION CONTROL	-	15	-
	POSITION CONTROL	-	20	-
ENDGAME Points	HANG (per ROBOT)	-	25	-
	PARK (per ROBOT)	-	5	-
	LEVEL with 1-3 ROBOTS HANGING (per ALLIANCE)	-	15	-
SHIELD GENERATOR OPERATIONAL	earning at least sixty-five (65) ENDGAME points	-	-	1 Ranking Point
SHIELD GENERATOR ENERGIZED	Stage 3 ACTIVATED	-	-	1 Ranking Point
Tie	completing a MATCH with the same number of points as your opponent	-	-	1 Ranking Point
Win	completing a MATCH with more points than your opponent	-	-	2 Ranking Point

An ALLIANCE can earn up to four (4) Ranking Points (RP) per Qualification MATCH, as described in Table 4-2. There are no RP, or comparable point bonuses, in Playoff MATCHES.

Strategy Dictates Design



Ranking Points / Placement

Table 11-2 Qualification MATCH ranking criteria

Order Sort	Criteria
1 st	Ranking Score
2 nd	Cumulative AUTO points
3 rd	Cumulative ENDGAME points
4 th	Cumulative TELEOP POWER CELL and CONTROL PANEL points
5 th	Random sorting by the FMS

Ranking Points are earned during the match.

Ranking Score is the average amount of RP's the team scores.

Autonomous & End Game Points are used as Tiebreakers.

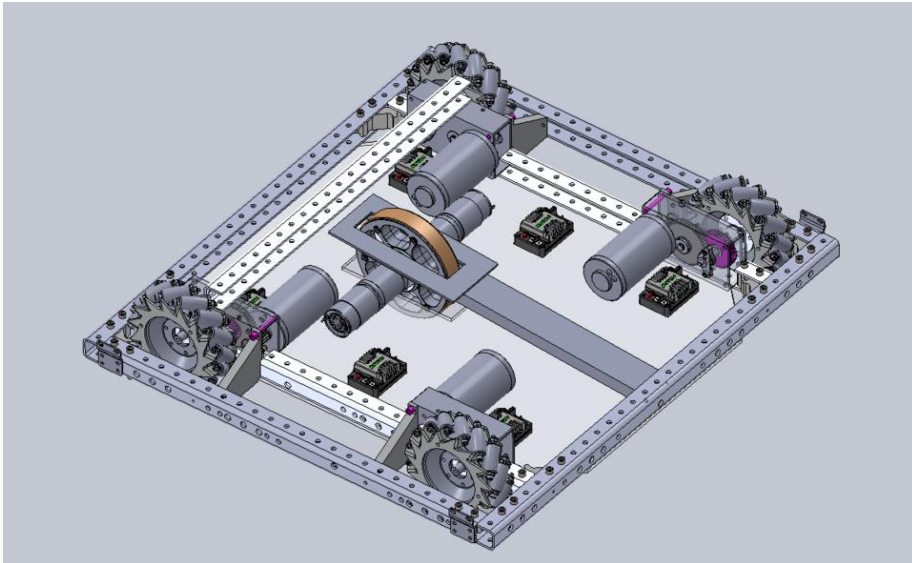
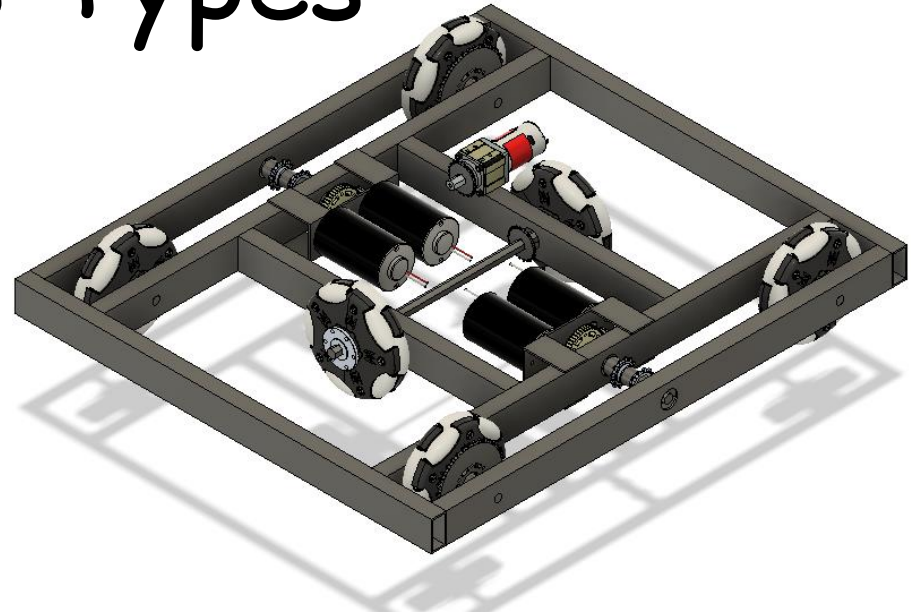
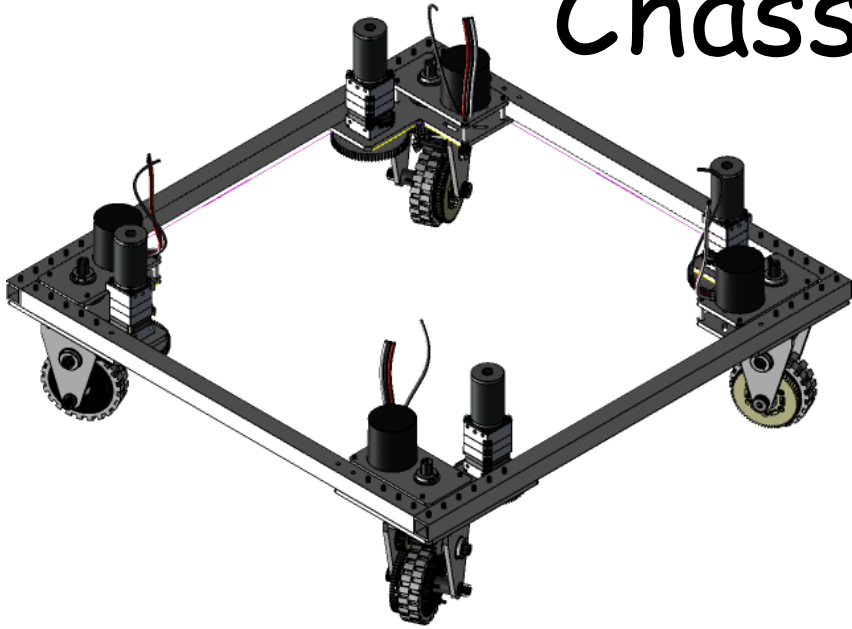
Table 11-3 Playoff MATCH Tiebreaker Criteria

Order Sort	Criteria
1 st	Cumulative FOUL and TECH FOUL points due to opponent rule violations
2 nd	Cumulative AUTO points
3 rd	Cumulative ENDGAME points
4 th	Cumulative TELEOP POWER CELL and CONTROL PANEL points
5 th	MATCH is replayed

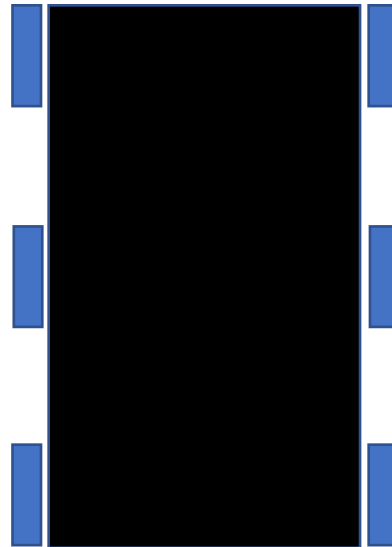
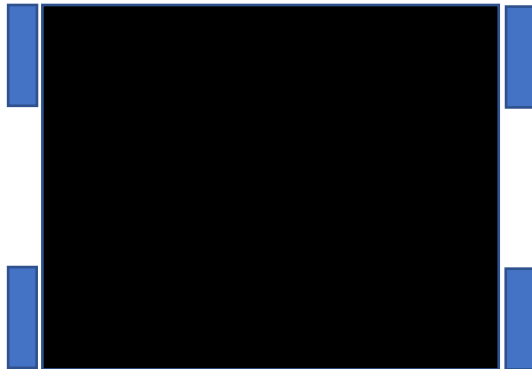
Foul points are given to the other alliance and used as Tiebreaker.

Autonomous & End Game Points are used as Tiebreakers.

Chassis Types

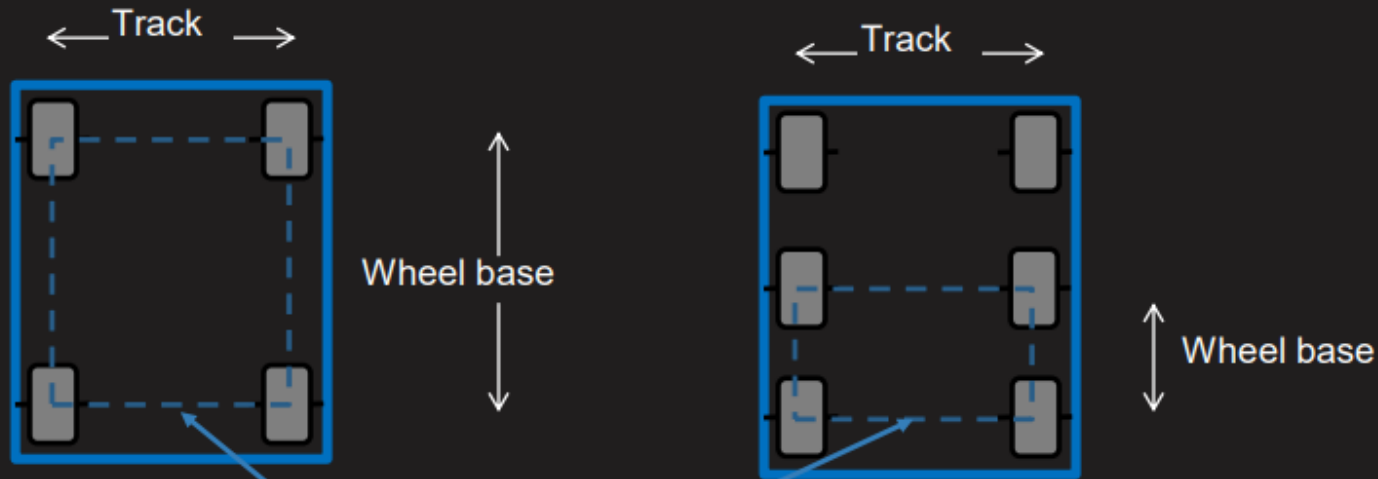
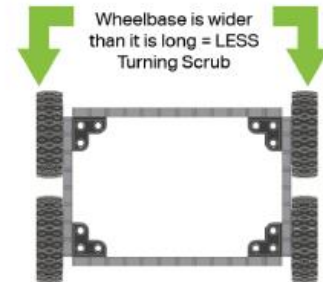
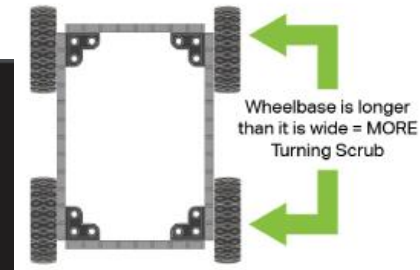


Chassis Shapes



Chassis Wheelbase


Chassis Wheel Base

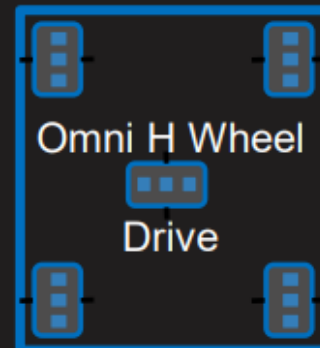
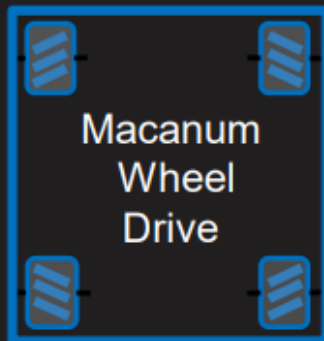
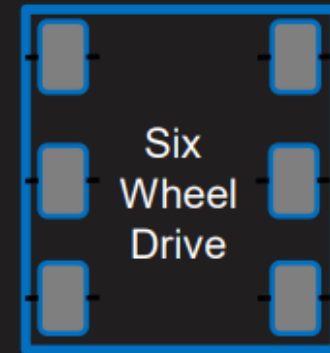
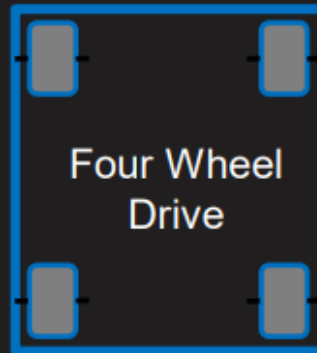
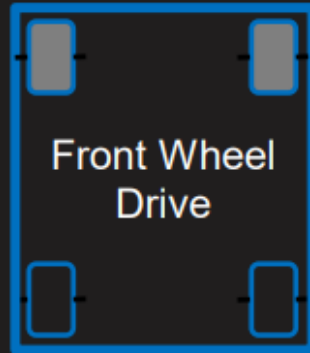
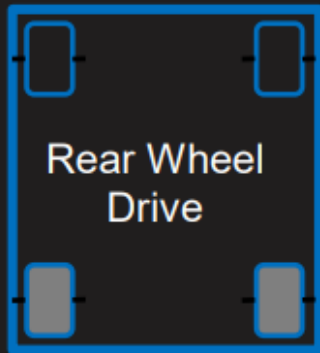


For agile turning
Ratio of Track to Wheel base length: (2.0 to 2.5) : 1

Chassis Drive Types

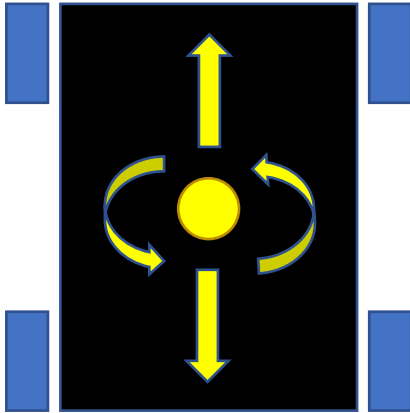
Chassis Wheel Configurations

 Driven Wheel

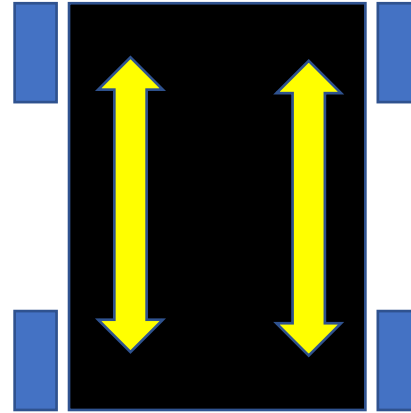


Chassis Drive Types

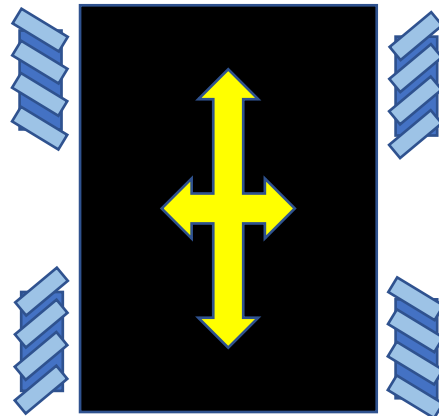
Arcade Drive



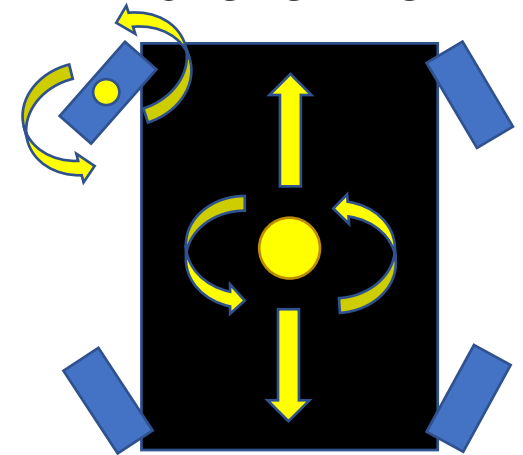
Tank Drive



Mecanum Drive

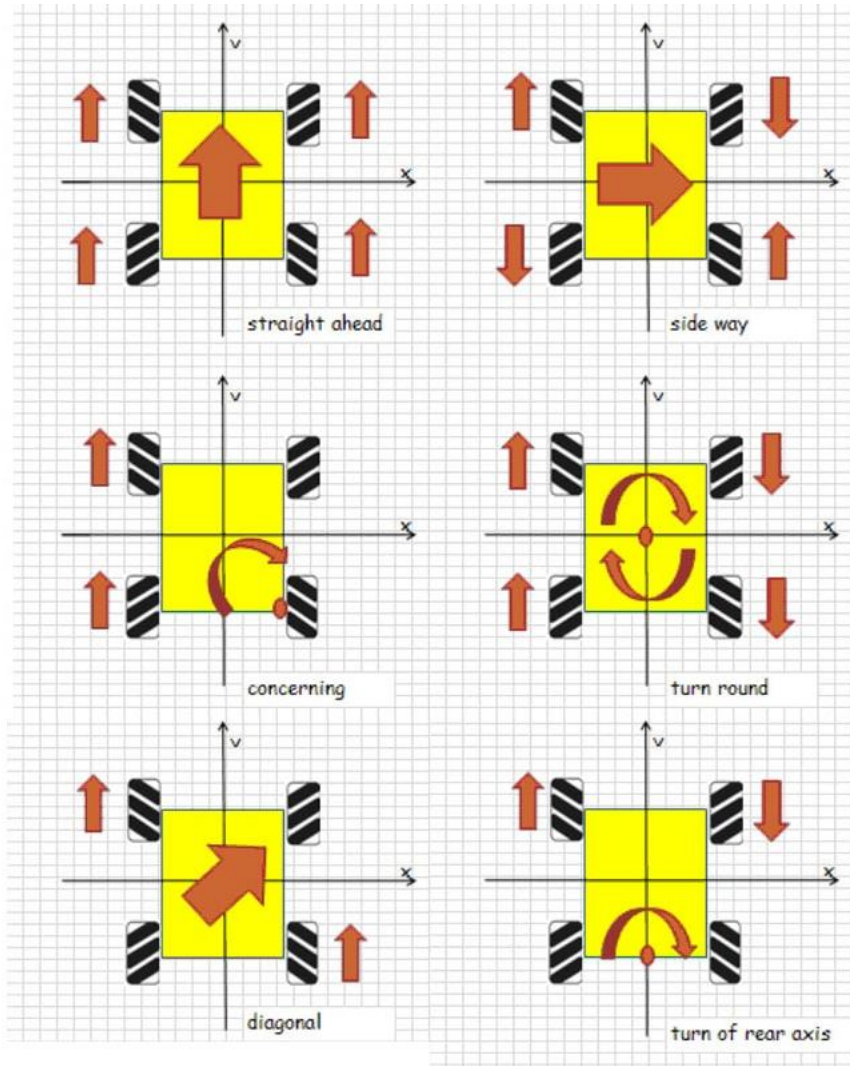
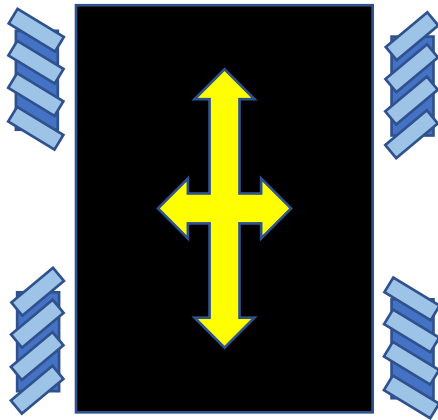


Swerve Drive



Chassis Drive Types

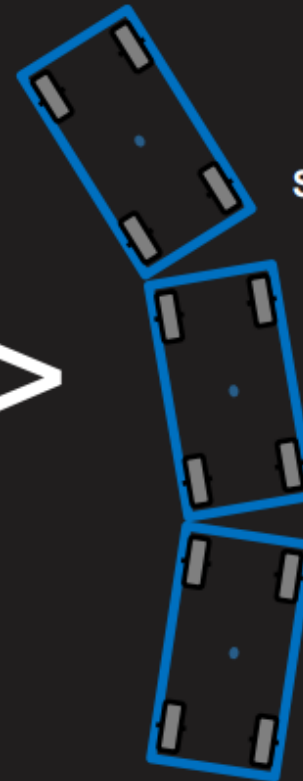
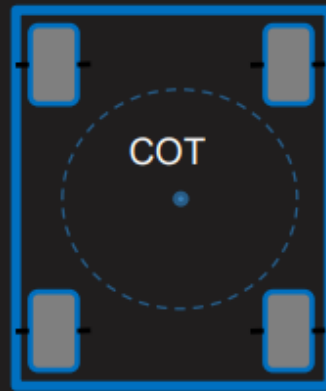
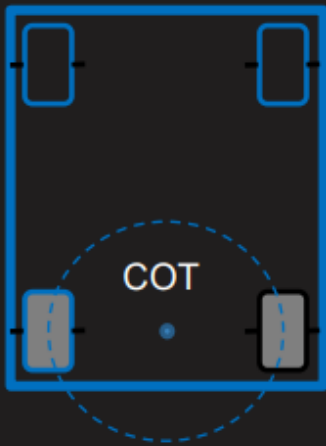
Mecanum Drive



Center of Turning / Pivot

2-wheel Drive 4-Wheel Drive Rotation

COT-Center Of Turning



Skid Steering

Decreasing the distance between the front and rear set of wheels, results in better zero-radius turning in any direction with 4 wheel drive robot.

Center of Gravity / Mass

Newton's first law of motion states:

"An object at rest stays at rest and an object in motion stays in motion with the same speed and in the same direction unless acted upon by an unbalanced force." Objects tend to "keep on doing what they're doing."

For example: You are driving in a car at high speed and stop quickly. What happens to you?

Momentum:

When something is moving it has momentum. The heavier it is and the faster it is moving, the harder it is to stop. So, momentum is a kind of measurement of how hard it is to stop something in motion

Center of Gravity / Mass

Definition of CENTER OF GRAVITY

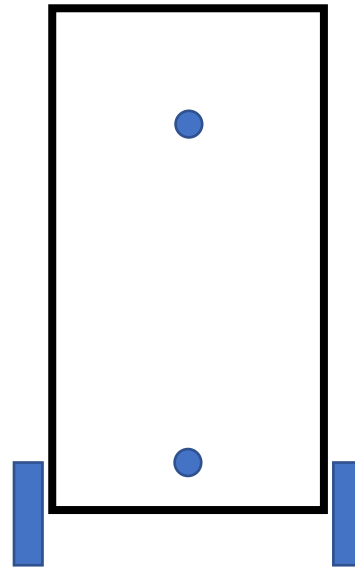
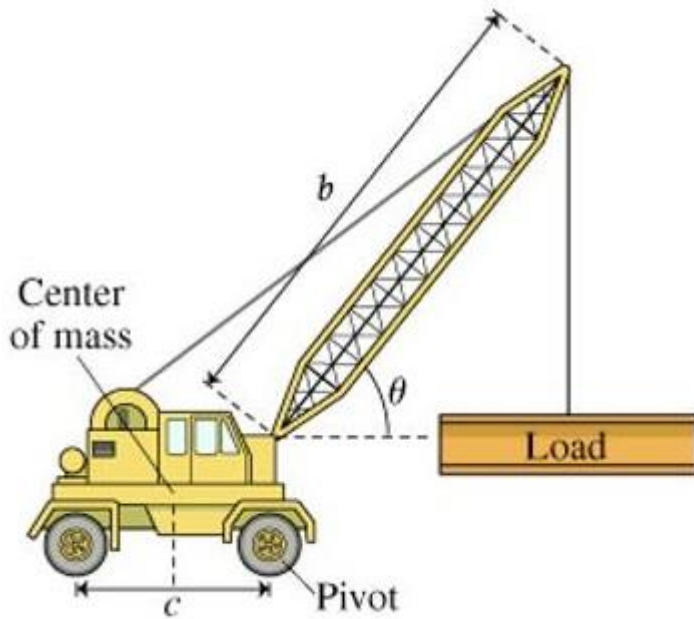
The point at which the entire weight of a body may be considered as concentrated so that if supported at this point the body would remain in equilibrium in any position(Merriam-Webster)

For example: The center of mass for a cube is the center of the cube.

Some rules for stability:

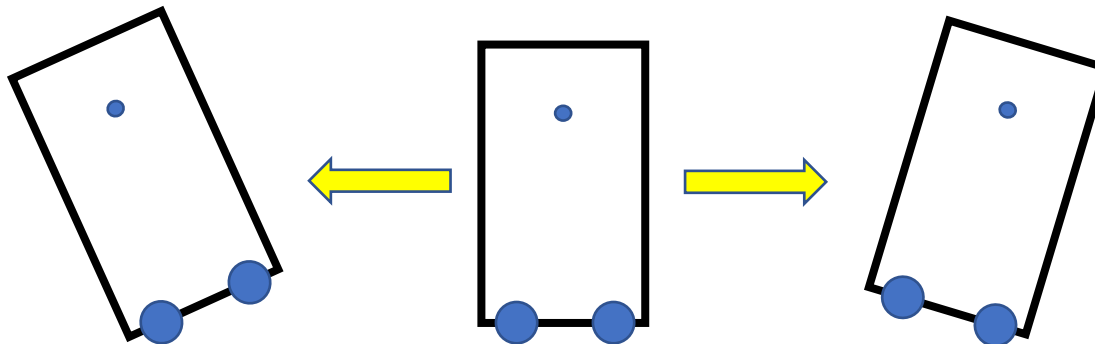
- It is more difficult to make an object with a low center of gravity topple than a structure with a high center of gravity.
- A structure with a wide base is generally more stable than a structure with narrow base.

Center of Gravity / Mass

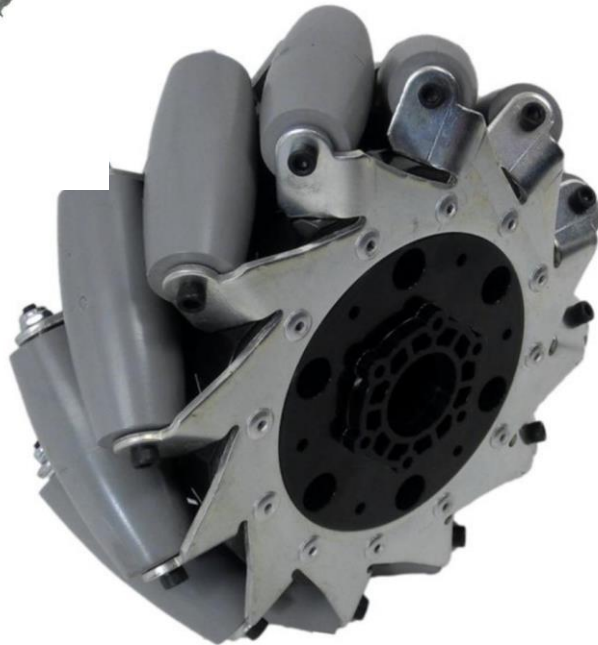


High CoG – Robot will be more likely to tip over.

Low CoG – Robot will be more stable and will allow higher speeds and mobility.



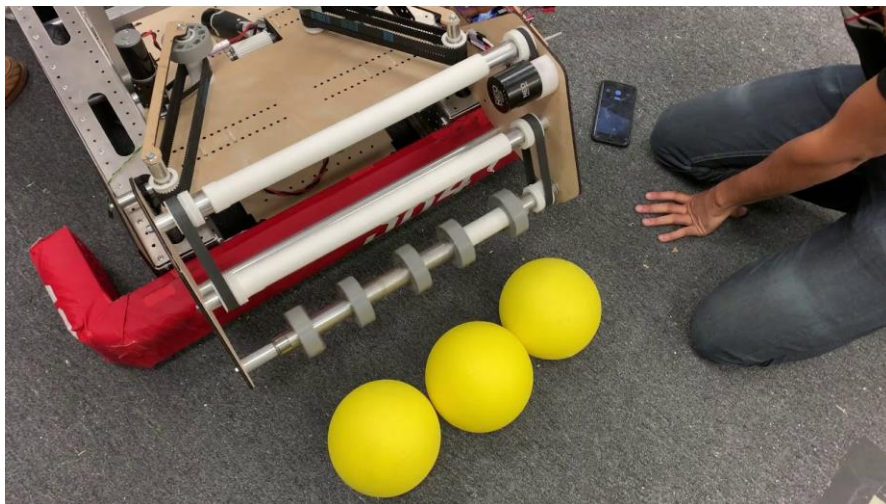
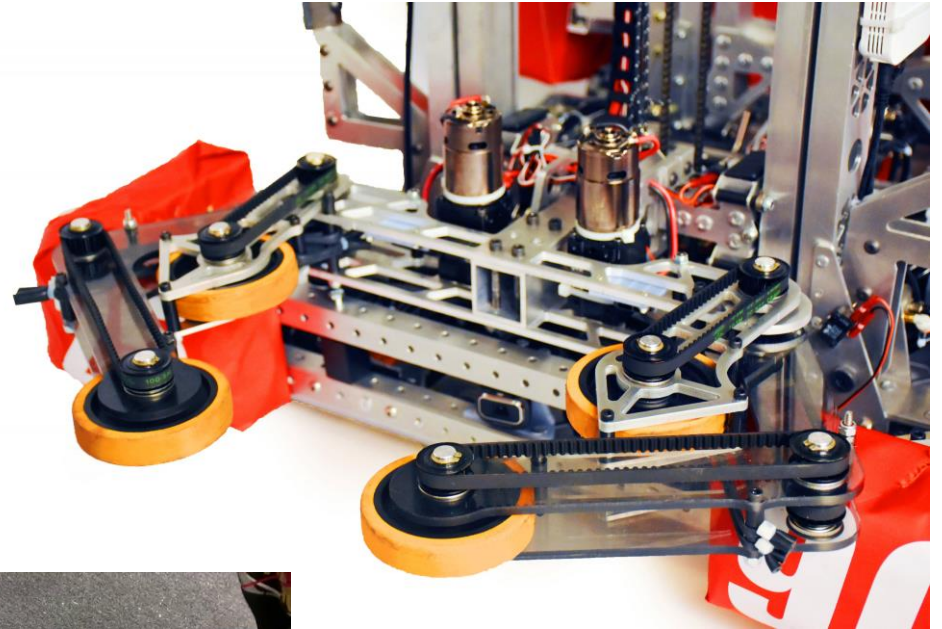
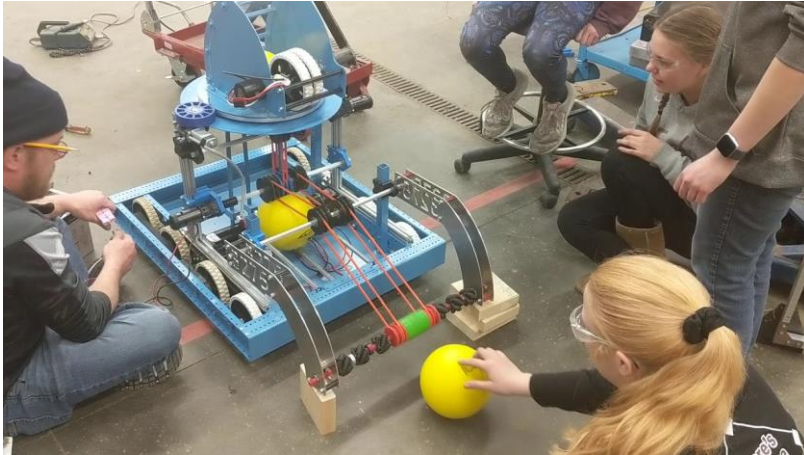
Wheel Types



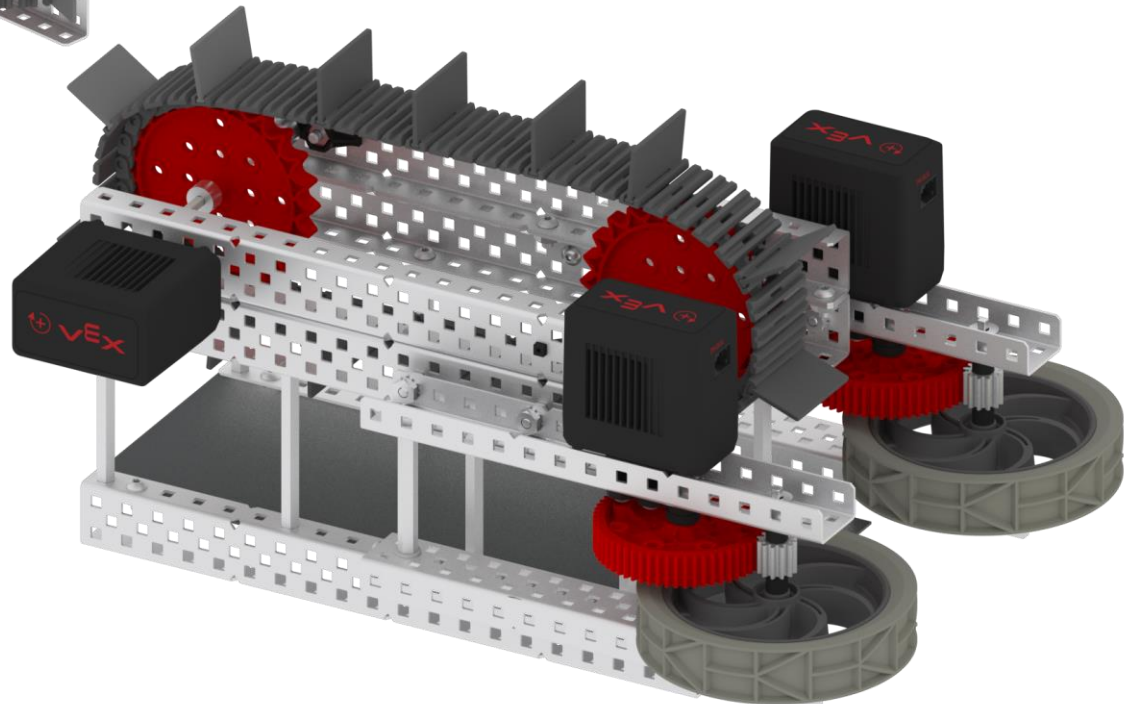
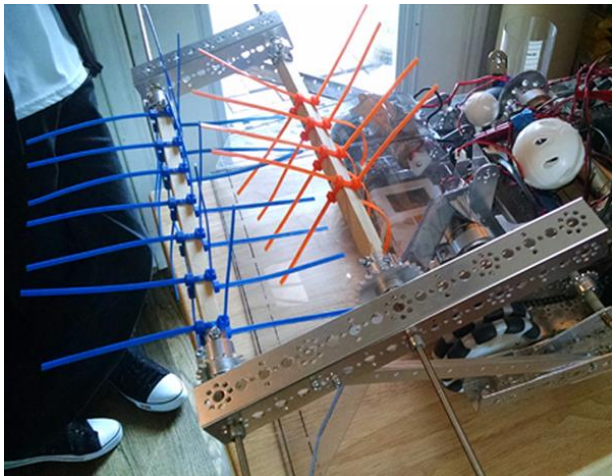
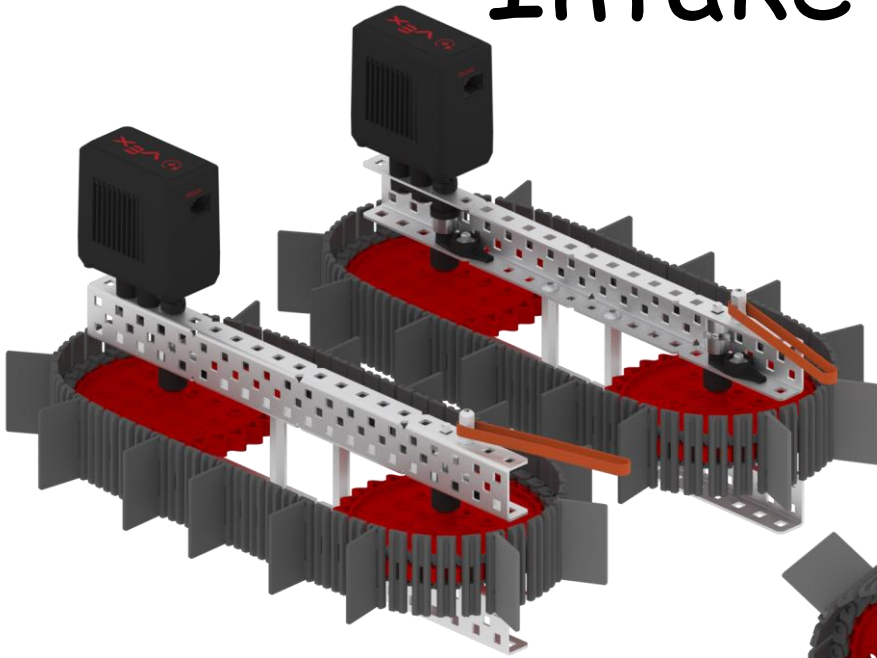
Wheel Types



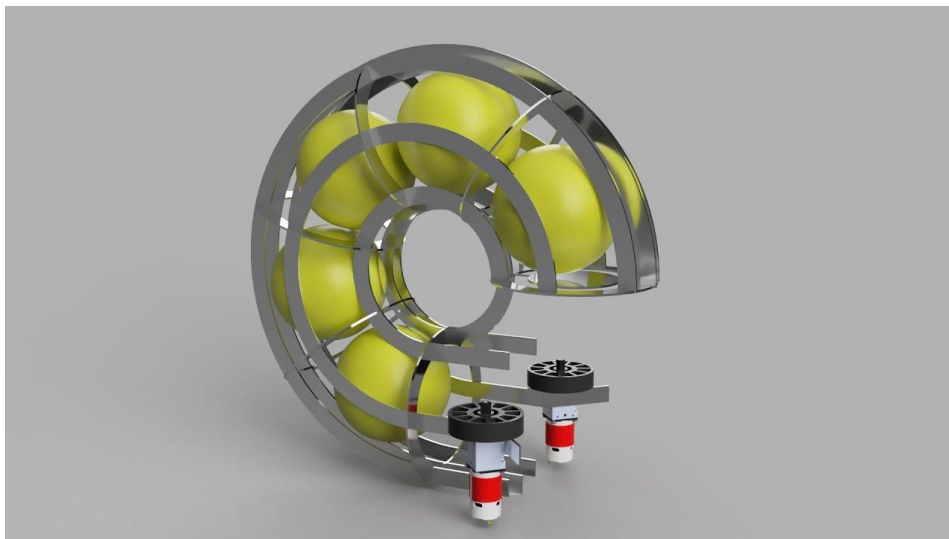
Intake Methods



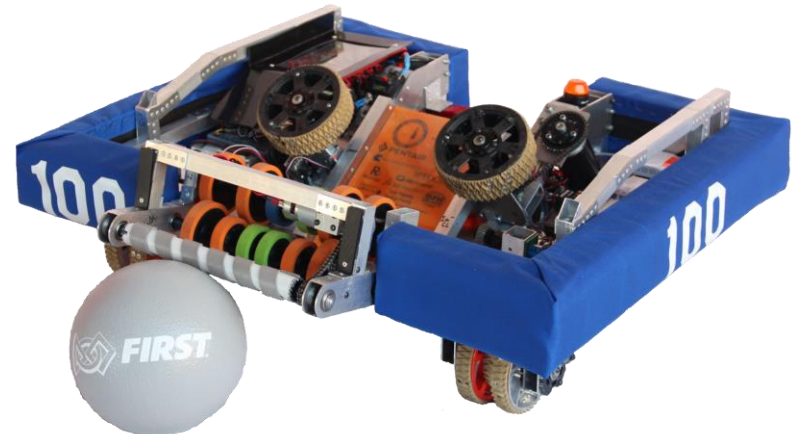
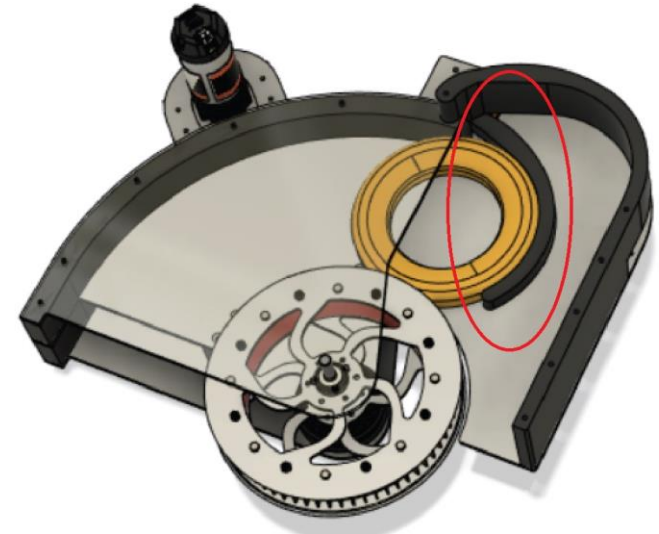
Intake Methods



Shooters



Shooters



Lifts, Linear Slides, & Ball Screws

Continuous

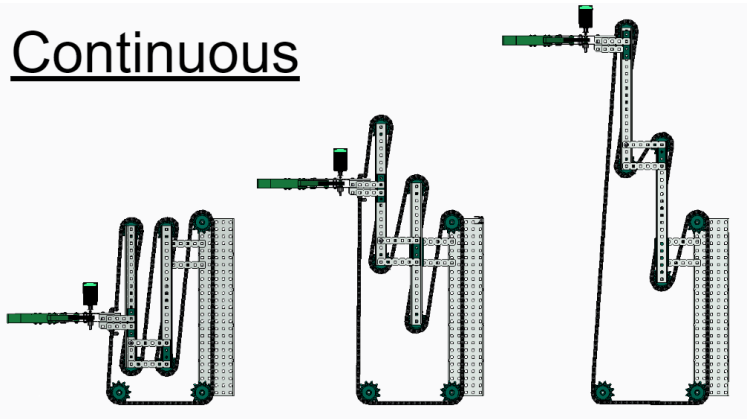
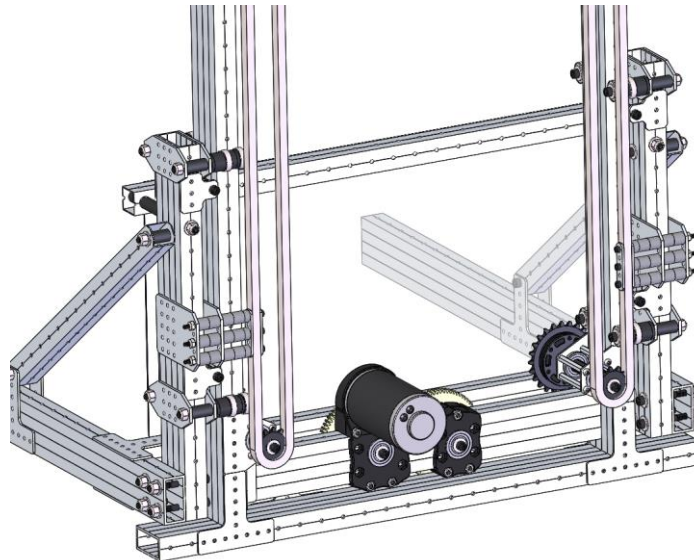
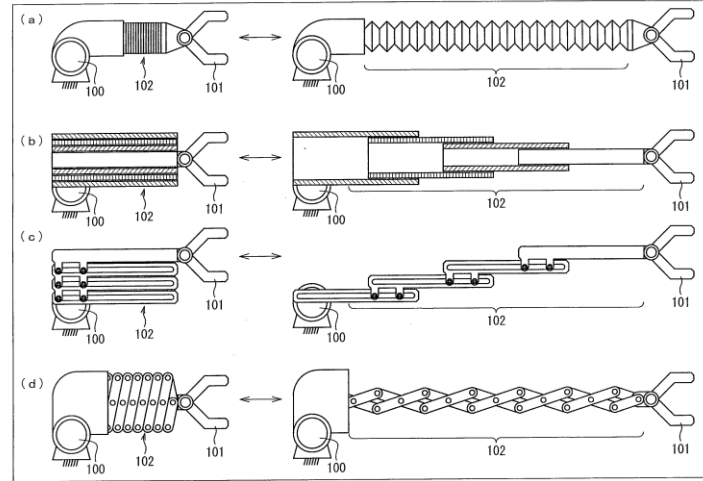


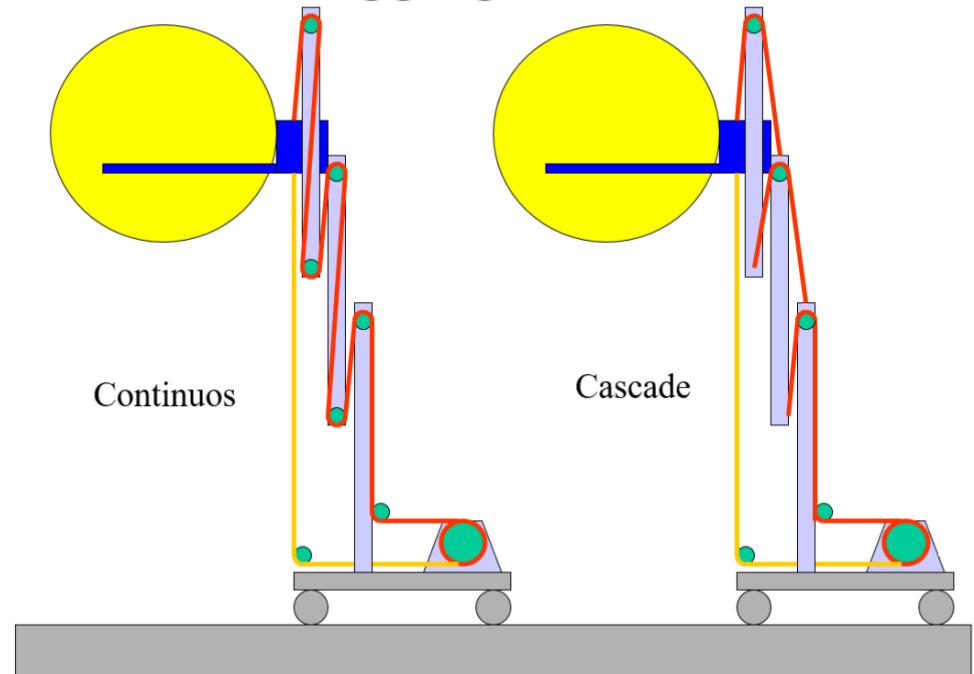
FIG. 28



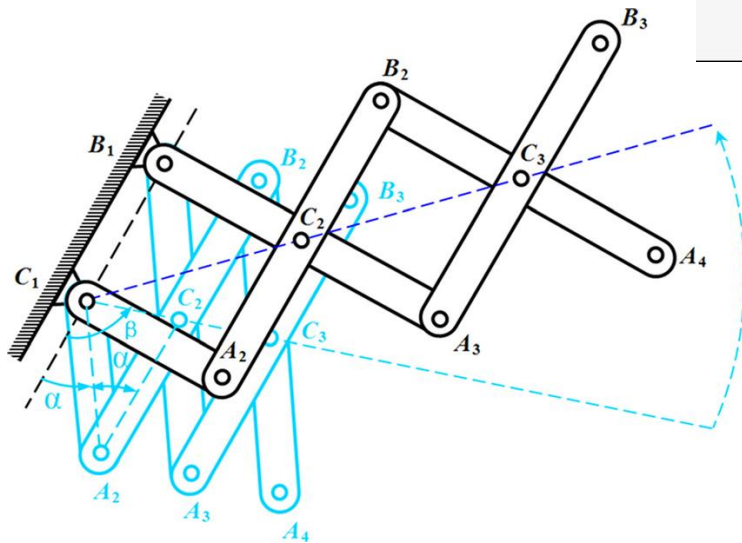
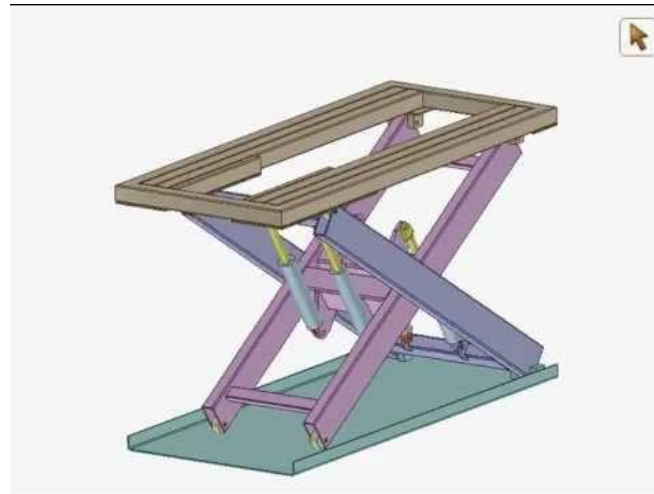
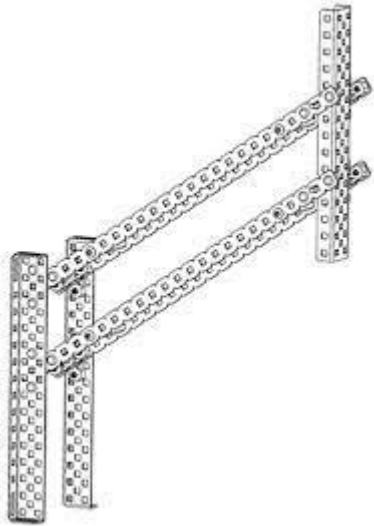
Lifts, Linear Slides, & Ball Screws



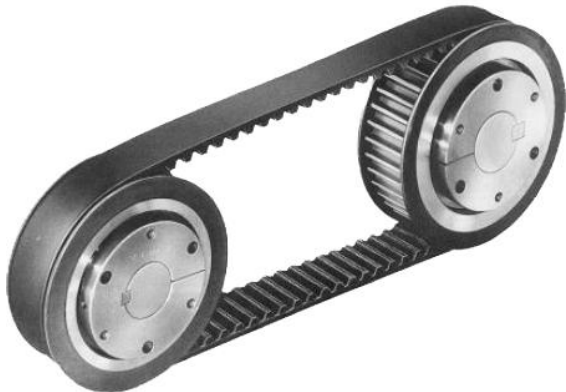
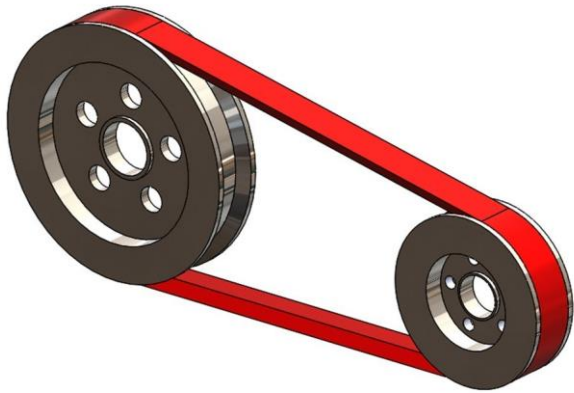
Forklift - Rigging



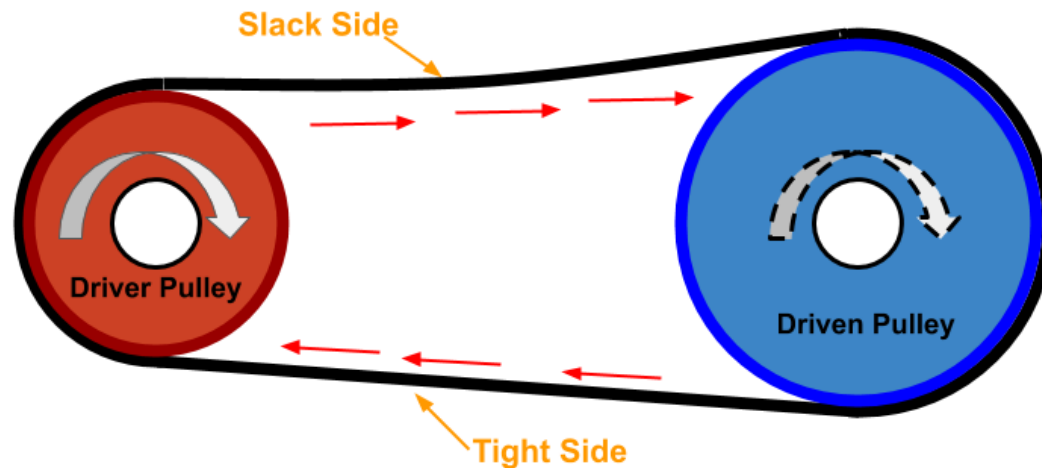
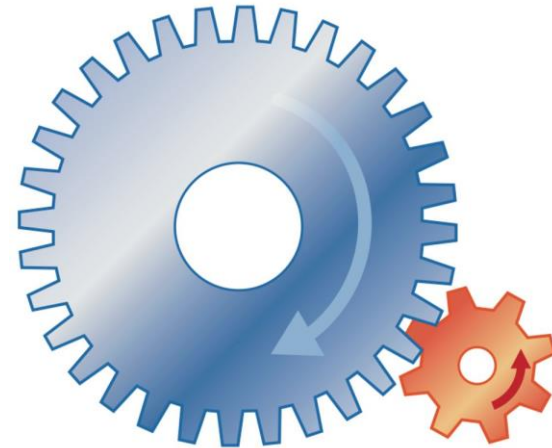
Lifts, Linear Slides, & Ball Screws



Pulleys, Sprockets & Gears



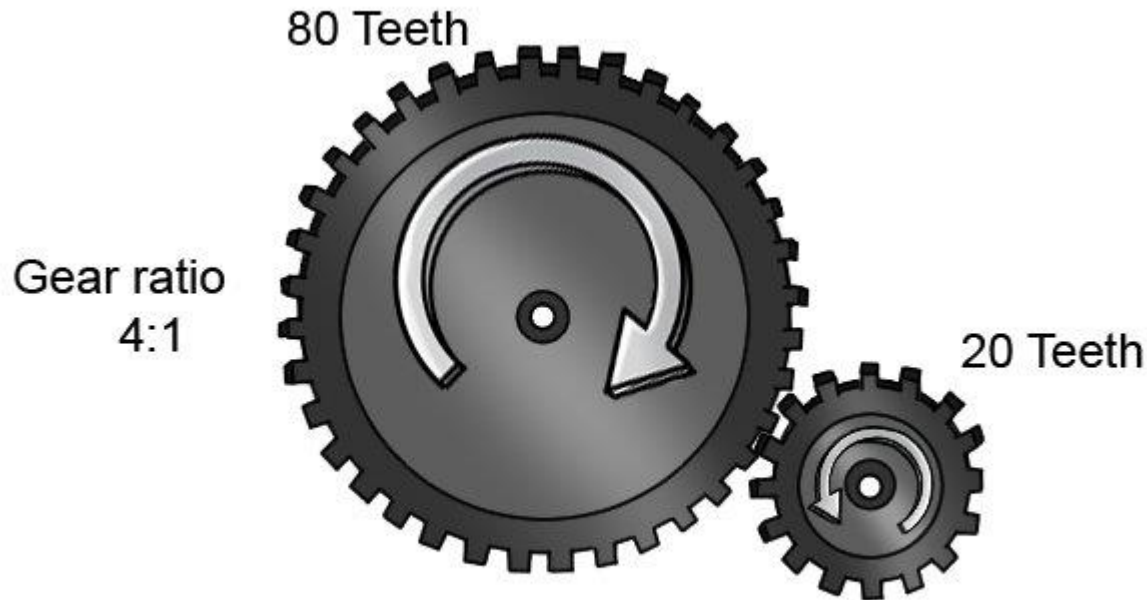
Pulleys, Sprockets & Gears



Gear Ratios

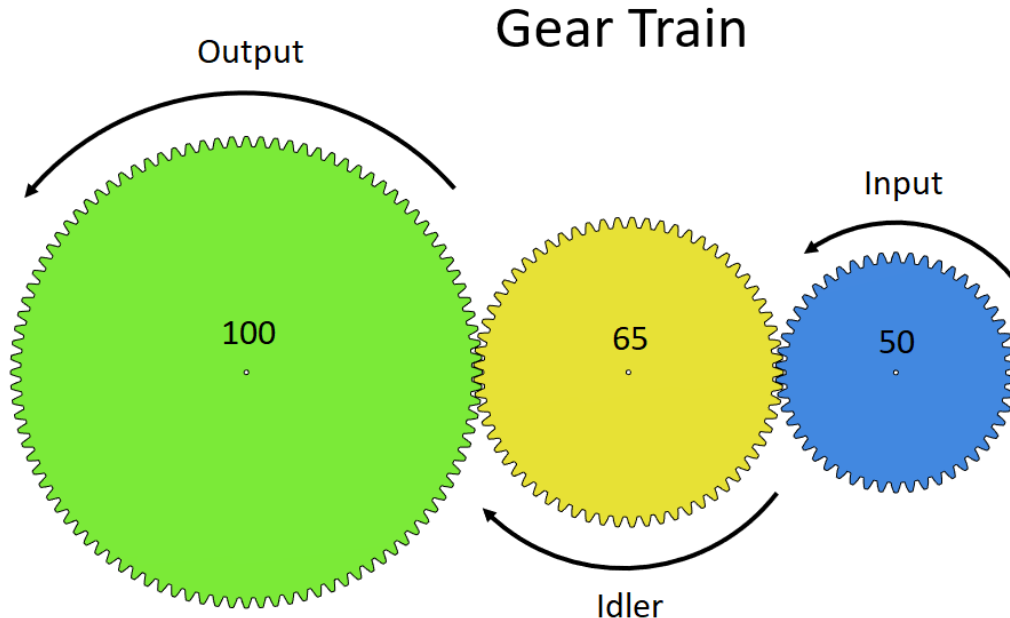
A **gear ratio** is the ratio of the number of rotations of a driver gear to the number of rotations of a driven gear.

gear ratio = rotations of a driver gear : rotations of a driven gear



Gear Ratios

What is the gear ratio? (gear ratio = rotations of a driver gear : rotations of a driven gear)



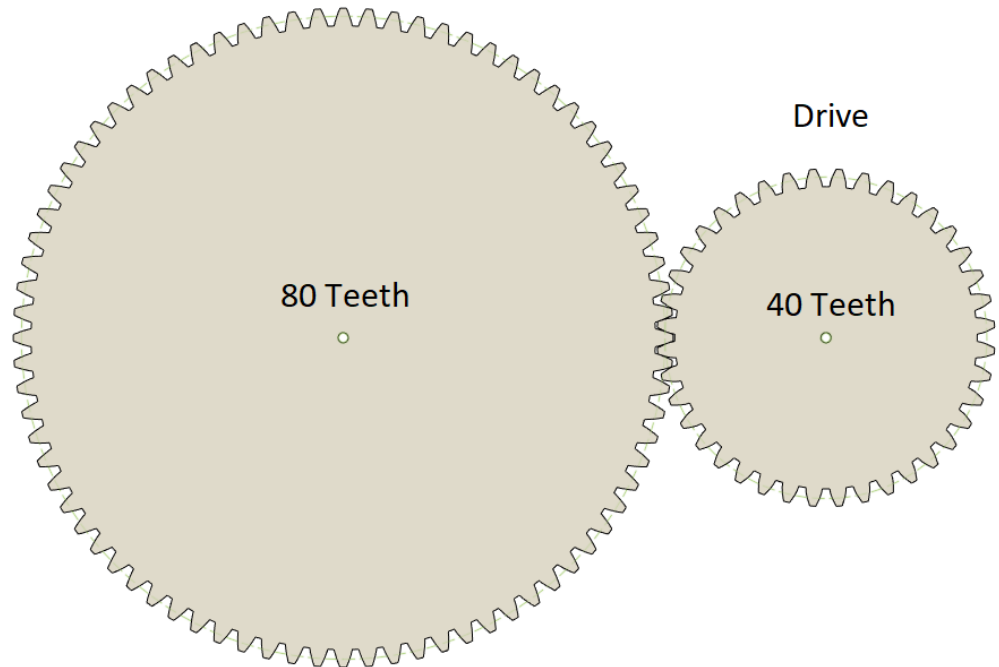
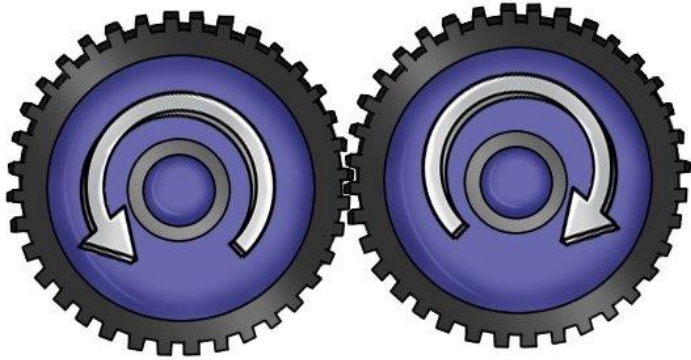
$$\text{Ratio} = \text{output} / \text{input} = 2/1$$

$$\text{Gear Ratio} = \text{driver} : \text{driven} = 2:1$$

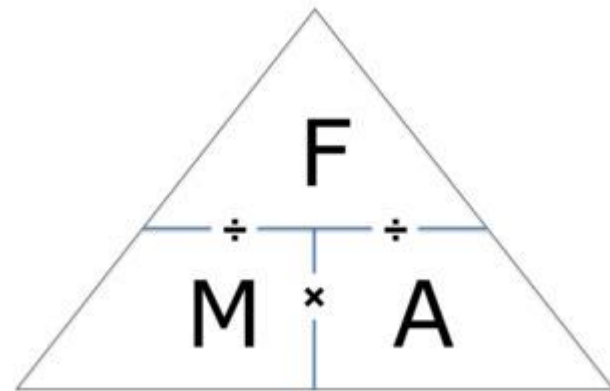
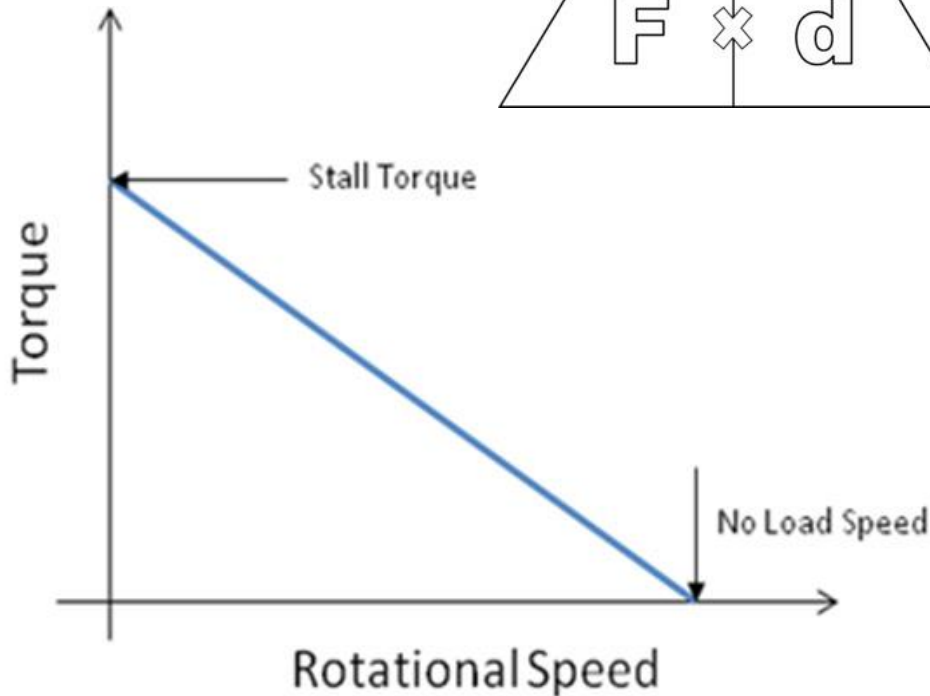
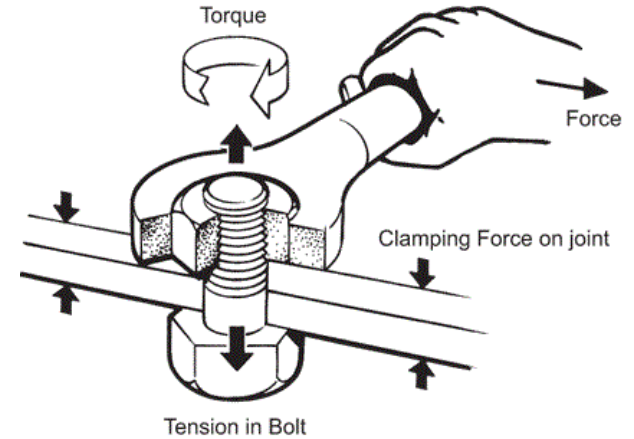
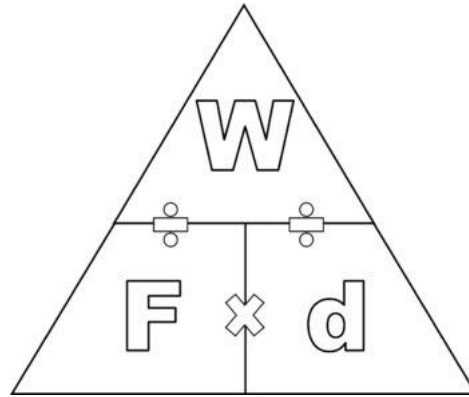
Middle gear has no effect on the ratio of the gear train but does effect the rotation on the driven gear. Note that both gears are turning in the same direction now due to the idler gear.

Torque vs Speed

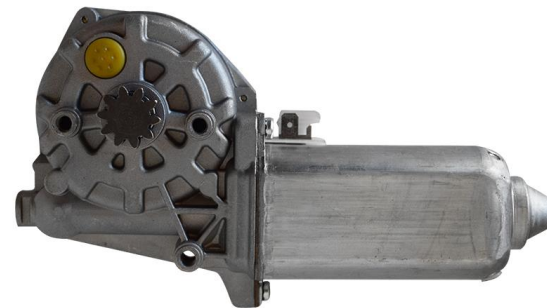
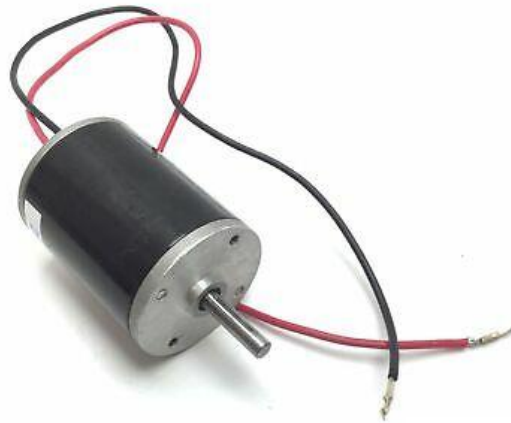
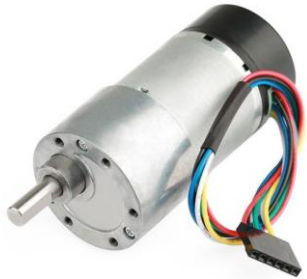
1:1 Gear ratio



Torque vs Speed



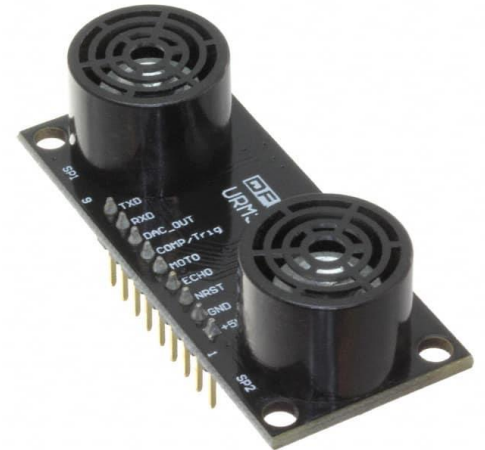
Motors & Servos



FTC Legal

FTC Legal

Sensors, Limits & Stops





 **AndyMark**[®]

SERVOCITY.COM
WE HAVE THE PARTS FOR YOUR IDEAS

REV
ROBOTICS

ACTOBOTICS[®]
DREAM • DESIGN • BUILD • REPEAT

vEX[®]
ROBOTICS

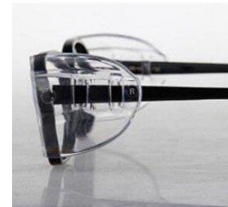
PITSCO
EDUCATION

ARMABOT

Tool Safety



Side Shields



Tool Safety



Tool Safety



Tool Safety



Tool Safety



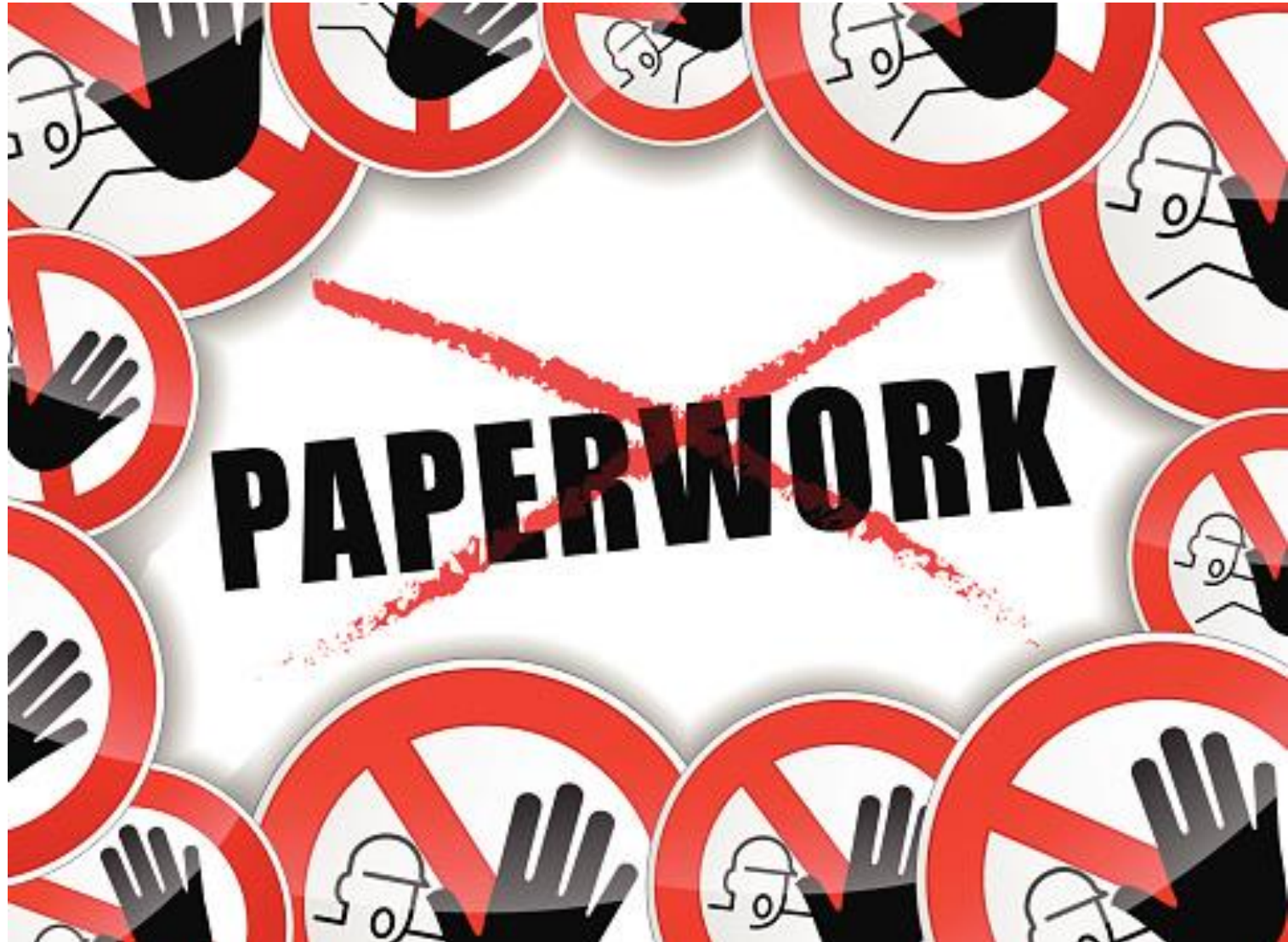
Tool Safety



Tool Safety



Tool Safety



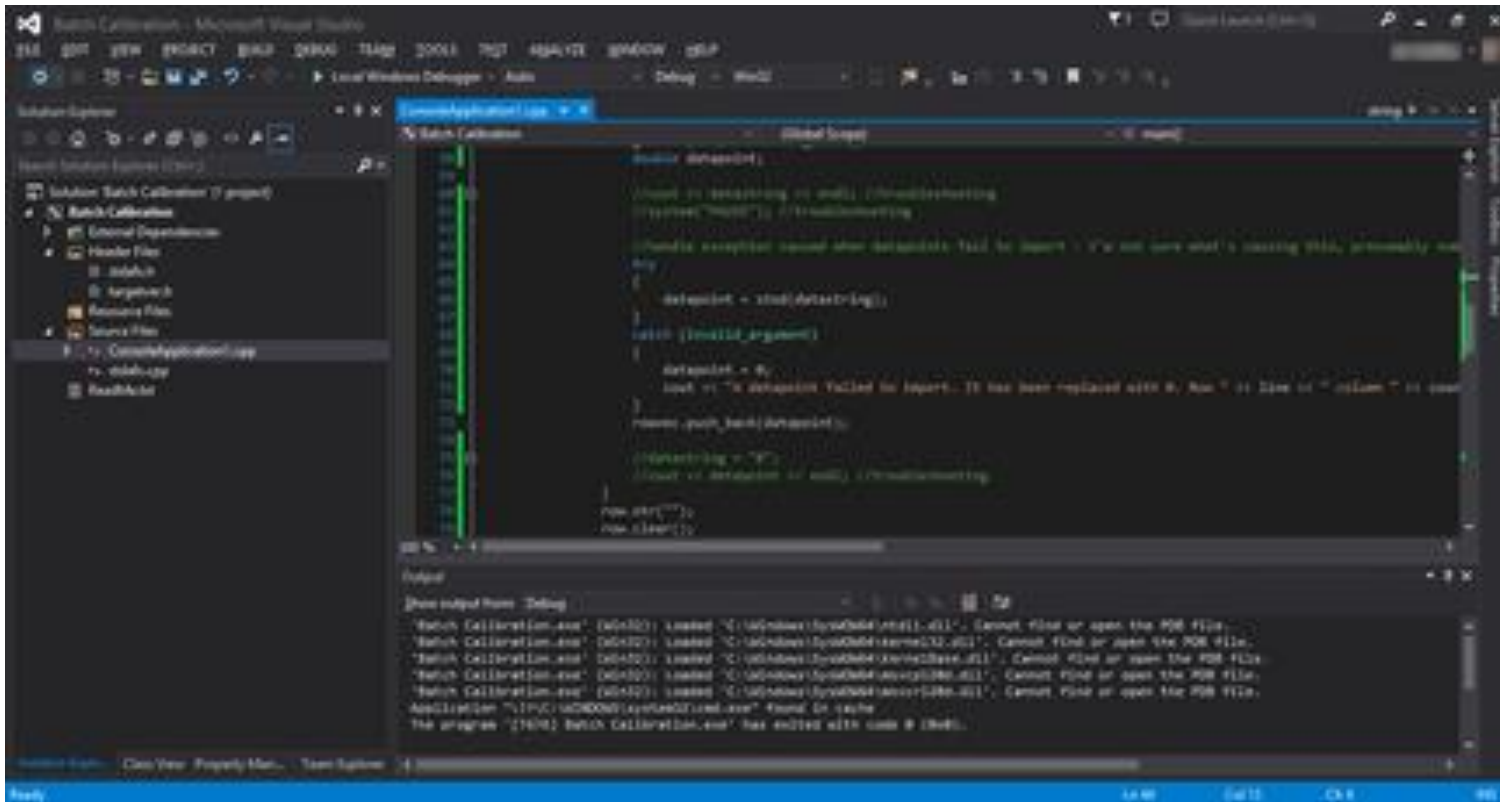
JAVA Programming



WPI



Visual Studio



CAD & 3D Modeling

F AUTODESK® FUSION 360™



A AUTODESK.

AUTODESK®
A AUTOCAD®
2020



Scouting

FTC-7031 LINDEN BATTLE BLAZERS
TEAM SCOUTING SHEET
2021 FREIGHT FRENZY

Team Name: _____ **Match Number:** _____

Autonomous

Duck via Carousel
 Attempted Partially Fully **Team Shipping Element**
 Used on Barcode

Park in Storage Unit
 Attempted Partially Fully **Duck Element**
 Used on Barcode

Park in Warehouse
 Attempted Partially Fully **No Autonomous**

Freight in Storage Unit
 Attempted Correct Level Wrong Level Missed

Freight in Shipping Hub
 Attempted Missed

Driver Controlled

Scoring Example Scored / Missed /

Scored / Missed Freight Storage Unit
 Level 1 (Bottom) / Level 2 (Middle) / Level 3 (Top)

Shipping Hub
 Scored / Missed /

Shared Shipping Hub
 Scored / Missed /

End Game

Duck via Carousel
 Attempted 1 2 3 4 5 6 7 8 9

Balance Shipping Hub
 Attempted Balanced Failed Attempt

Shared Shipping Hub
 Attempted Tipped Failed Attempt

Parked in Warehouse
 Attempted Partially Fully

Capped Shipping Element
 Attempted Capped Failed Attempt

Shipping Element

Score Keeper Name _____

Match Data Recorded

Notes -

Playoffs –
 Semi-Finals / Finals, 6 Teams of 3

Top 11 teams may be Alliance Team Captains.

What teams compliment your abilities?

2021_FTC_ScoringSheet_NOV1xitem - Excel

Team Name: _____

Team	Duck via Carousel			Park in Storage Unit			Park in Warehouse			Freight in Storage Unit			Freight in Shipping Hub			Storage Unit		Shipping Hub					Driver Controlled		
Shipping Element	Attempted	Delivered	Failed	Attempted	Partially	Fully	Attempted	Partially	Fully	Attempted	Partially	Fully	Attempted	Correct	Wrong	Missed	Scored	Missed	Level 1 Scored	Level 1 Missed	Level 2 Scored	Level 2 Missed	Level 3 Scored	Level 3 Missed	
1	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	3
2	FALSE	TRUE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	3	
3	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	3	

Summary Row:

Park Storage %	Park Warehouse %	Freight Storage Unit %	Freight Shipping Hub %	Storage Unit Score %	Hub Level 1 Score %	Hub Level 2 Score %	Hub Level 3 Score %	Shared Hub Score %	Duck Delivery / Attempt	Shipping Element Use %	Balanced Shipping Hub %	Shared Shipping Hub %	Parked in Warehouse %	Capped Shipping Element %	Average Auton Points	Average ToteOp Points	Average End Game Points
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	15.92/29.09	6.8	0.00	0.00	0.00	0.00	35.46	35.28	65.95

Game Notes: Had an Autonomous, but just drove, seemed incomplete, good communication but stalled

Ready

Community Outreach

Working in our community to promote STEM and FIRST Robotics.

- Homecoming Parade
- National Night Out
- Linden's Holiday Happening Events
- Farmer's Market
- Cub Scouts
- Elementary Schools FIRST Curriculum
- Wreaths Across America / Scholarships

Social Media



YouTube



facebook[®]



Instagram

Sustainability & Business Planning

- What do we do to make sure Linden Robotics will be here after we leave?
 - Elementary STEM activities
 - Middle School Program
 - Sponsorships & Local Partners
- We are a “business”, a 501(3)(C) non-profit organization. We sell “advertising” to raise money to provide the programs.
- The cost to register a FRC team per season is \$5,000. Supplies, robot parts, uniforms, etc. are all extra expenses.

Sponsorships & Budget

- We have to have sponsors to keep the cost for each team member low.
- Sponsors can be local businesses, corporations, or organizations that promote educational opportunities.
- Parents offer opportunities to raise money for the programs. (ex. FORD, GM Dollars for Doers, etc.)
- We have to be mindful of how we spend the money we have available and to not be wasteful.

Robotics Board & Meetings

- There is a group of parents that are responsible to manage the assets of the Linden Robotics 501(3)(c).
- There are monthly Board Meetings where they decide what we do and how we spend the money.
- FRC team members must attend the meetings and provide a status for your season, and to request funds based on the team's needs.
- We may also need to attend School Board Meetings depending on current events or needs.

Coaches & Backgrounds

- Your Coaches and Mentors have varied backgrounds and abilities. We are here to help the team achieve your goals, not to build or design your robot.
- Coach Bonasse is a Senior Controls Engineering Supervisor with an Bachelor's of Science and Electrical Engineering degree(BSEE) from GMI.
- Coach Padilla is a Vehicle Performance Engineer.
- Coach Bucknam manages the outreach, sponsorships, and other background coordination for the team.
- Is there anyone that might want to help out?

Competitions & Judging

- First Qualifier – Kettering, March 3rd – 5th
- Second Qualifier – Saline, March 25th – 27th
- State Championship – SVSU, April 13th – 16th
- National Championship – Houston, April 20th – 23rd
- You have 2 chances to qualify for States.
- You will be judged several times in the pits. These interviews are what earn teams awards so it's imperative that everyone knows the **robot, how the team functions**, and can explain what we do and **how we're active in our community**.
- Our behavior on and off the field is critical.