

[illegible]

Game Definitions:

Adult- Anyone who is not a *Student*.

Alliance- A pre-assigned grouping of two (2) *Teams* that are paired together during a given *Match*.

Alliance Home Row- The three (3) *Goals* in each *Alliance's Home Zone*.

Alliance Station- The designated region where the *Drive Team Members* must remain for the duration of the *Match*.

Autonomous Bonus- A point bonus of six (6) points awarded to the *Alliance* that has earned the most points at the end of the *Autonomous Period*.

Note: If the *Autonomous Period* ends in a tie, including a zero-to-zero tie, each *Alliance* will receive an *Autonomous Bonus* of three (3) points.

Autonomous Line- The pair of white tape lines that run across the center of the field. Per <SG2>, *Robots* may not contact the foam field tiles on the opposite *Alliance's* side of the *Autonomous Line* during the *Autonomous Period*.

Ball- A hollow plastic spherical-shaped, dimpled object, with a diameter of 6.3" (160mm), that can be Scored in *Goals*.

Builder- The *Student(s)* on the *Team* who assemble(s) the *Robot*. An *Adult* cannot be the *Builder* on a *Team*. *Adults* are permitted to teach the *Builder* associated concepts, but may never be working on the *Robot* without the *Builder* present and actively participating.

Connected Row- A *Row* where all three (3) *Goals* in the *Row* are *Owned* by the same *Alliance*.

Designer- The *Student(s)* on the *Team* who design(s) the *Robot* to be built for competition. An *Adult* cannot be the *Designer* on a *Team*. *Adults* are permitted to teach the *Designer* associated concepts, but may never be working on the design of the *Robot* without the *Designer* present and actively participating.

Disablement- A penalty applied to a *Team* for a rule violation. A *Team* that is Disabled is not allowed to operate their *Robot* for the remainder of the *Match*, and the *Drive Team Members* will be asked to place their controller(s) on the ground.

Disqualification: A penalty applied to a *Team* for a rule violation. A *Team* that is Disqualified in a Qualification *Match* receives zero (0) *Win Points*, *Autonomous Win Point*, *Autonomous Points*, and *Strength of Schedule Points*. When a *Team* is Disqualified in an Elimination *Match*, the entire *Alliance* is Disqualified and they receive a loss for the *Match*. At the Head Referee's

discretion, repeated violations and *Disqualifications* for a single *Team* may lead to its *Disqualification* for the entire tournament.

Drive Team Members: A *Student* who stands in the *Alliance Station* during a *Match* for each *Team* per <G7> . Only *Drive Team Members* are permitted to stand in the *Alliance Station* and allowed to touch the controls during the *Match* or interact with the *Robot* as per <G9>. *Adults* are not allowed to be *Drive Team Members*.

Entanglement: A *Robot* status. A *Robot* is Entangled if it has grabbed, hooked, or attached to an opposing *Robot* or a *Field Element*.

Field Element: The foam field tiles, field perimeter, white tape, *Goal*, and all supporting structures or accessories (such as driver station posts, field monitors, etc).

*Once declared and playing as a High School *Team*, that *Team* may not change back to a Middle School *Team* for the remainder of the season. *Teams* may be associated with schools, community/youth organizations, or a group of neighborhood *Students*.*

Match- A *Match* consists of an *Autonomous Period* followed by a *Driver Controlled Period* for a total time of two minutes (2:00).

- **Autonomous Period:** A fifteen second (0:15) time period during which *Robots* operate and react only to sensor inputs and to commands pre-programmed by the *Students* into the *Robot* control system.
- **Driver Controlled Period:** The one minute and forty-five second (1:45) time period during which *Drive Team Members* operate their *Robots*.

Match Affecting- A rule violation status determined by the head referee. A rule violation is *Match Affecting* if it changes the winning and losing *Alliances* in the *Match*. Multiple rule violations within a *Match* can cumulatively become *Match Affecting*.

Owned- A *Goal* status. A *Goal* is considered *Owned* by an *Alliance* if its colored *Ball* is the vertically highest *Scored Ball* in that *Goal*.

Possession- A *Robot* is considered to be *Possessing* a *Ball* if a *Ball* is in an unscored position and any one of the following criteria are met:

- The *Robot* is carrying, holding or controlling the movement of a *Ball* such that if the *Robot* changes direction, the *Ball* will move with the *Robot*. Pushing/plowing *Balls* is not considered *Possession*, however using concave portions of your *Robot* to control the movement of *Balls* is considered *Possession*.
- The *Robot* is blocking opposing *Robots*' access to *Balls*, such as by expanding horizontally and restricting access to a portion of the field (e.g. a "wallbot").
- *Robots* on the same *Alliance* working in tandem to block access to *Balls* would share the *Possession* of the *Balls*.

Note: *Balls* that are *Scored* in *Goals* cannot be considered *Possessed* until the *Robot* removes the *Ball* from that *Scored* position and is carrying, holding, controlling or blocking opposing *Robots'* access to that *Ball*.

Preload- The *Ball*, one (1) per *Robot*, that must be placed on the field such that it satisfies the conditions in <SG1> prior to the start of the *Match*.

Note: The red *Alliance* always uses red *Balls* as their *Preloads*. The blue *Alliance* always uses blue *Balls* as their *Preloads*.

Programmer- The *Student(s)* on the *Team* who write(s) the computer code that is downloaded onto the *Robot*. An *Adult* cannot be the *Programmer* on a *Team*. *Adults* are permitted to teach the *Programmer* associated concepts, but may never be working on the code that goes on the *Robot* without the *Programmer* present and actively participating.

Robot- A machine that has passed inspection, designed to execute one or more tasks autonomously and/or by remote control from a human operator.

Row- Three (3) *Goals* that make up a straight line. There are a total of eight (8) *Rows* including two (2) *Alliance Home Rows*.

Scored- A *Ball* status. A *Ball* is considered *Scored* in a *Goal* if it is not touching a *Robot* of the same color as the *Ball* and meets all of the following criteria.

- The *Ball* is fully or partially within the outer edge of the *Goal*.
- The *Ball* is fully below the upper edge of the *Goal*.
- The *Ball* is not contacting the foam tiles outside of the *Goal*.

Note: In the act of removing a *Ball* from the bottom of a *Goal* with three *Scored Balls* inside, it is possible for the top *Ball* to momentarily break criteria 2 above. If this occurs at the end of the *Match*, this *Ball* should still be considered *Scored*. The intent of this note is to avoid unintended de-scoring via the top of the *Goal*. The intent is not to encourage *Teams* to seek unique scenarios that would not typically be considered *Scored*. This would be considered a violation of rule <SG5>.

Student- A person is considered a *Student* if he/she meets both of the following criteria:

1. Anyone who is earning or has earned credit toward a high school diploma/certificate or its equivalent during the six (6) months preceding the VEX Robotics World Championship. Courses earning credits leading up to high school would satisfy this requirement.
2. Anyone born after May 1, 2001 (i.e. who will be 19 or younger at VEX Worlds 2021). Eligibility may also be granted based on a disability that has delayed education by at least one year.

- **Middle School Student:** A *Student* born after May 1, 2005 (i.e. who will be 15 or younger at VEX Worlds 2021). *Middle School Students* may “play up” and compete as a *High School Student*.
- **High School Student:** Any eligible *Student* that is not a *Middle School Student*.

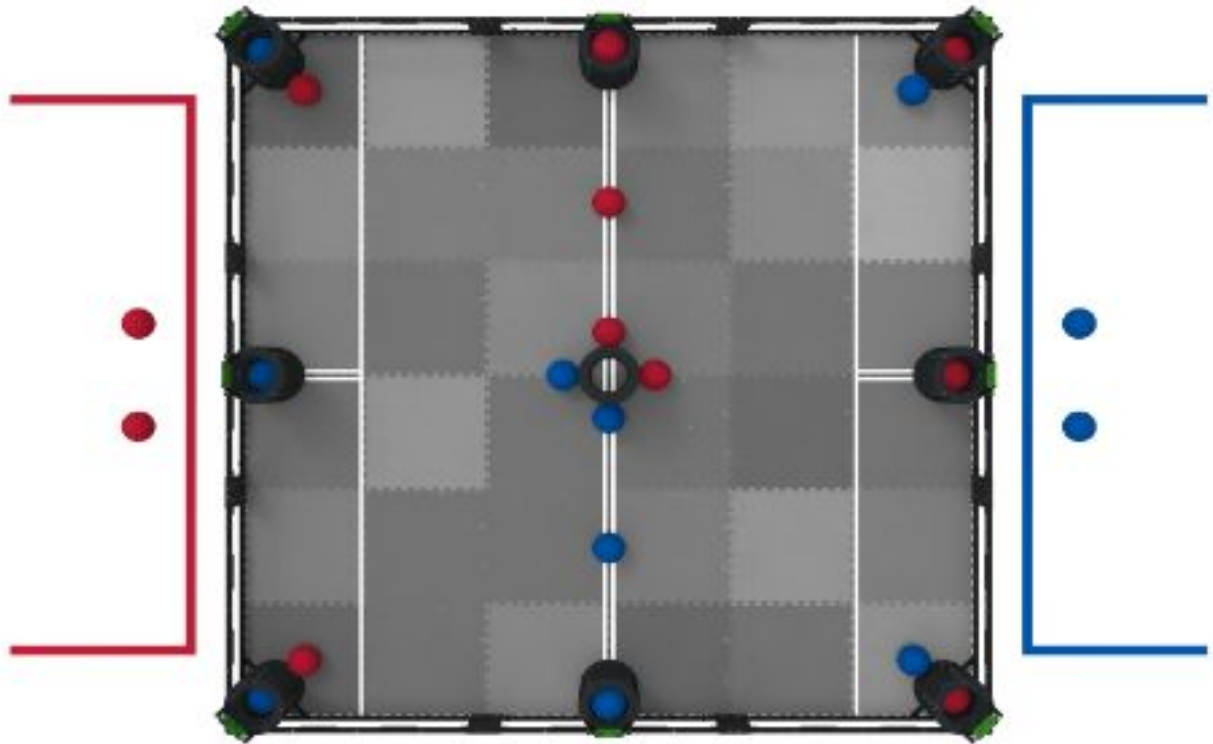
Team- One or more *Students* make up a *Team*. A *Team* is classified as a *Middle School Team* if all members are *Middle School Students*. A *Team* is classified as a *High School Team* if any of its members are *High School Students*, or made up of *Middle School Students* who declare themselves “playing up” as *High School Students* by registering their *Team* as a *High School Team*.

Once declared and playing as a *High School Team*, that *Team* may not change back to a *Middle School Team* for the remainder of the season. *Teams* may be associated with schools, community/youth organizations, or a group of neighborhood *Students*.

Trapping– A *Robot* status. A *Robot* is *Trapping* if it has restricted an opposing *Robot* into a small, confined area of the field, approximately the size of one foam field tile or less, and has not provided an avenue for escape. *Trapping* can be direct (e.g. pinning an opponent to a field perimeter wall) or indirect (e.g. preventing a *Robot* from escaping from a corner of the field).

Note: If a *Robot* is not attempting to escape, that *Robot* has not been *Trapped*.

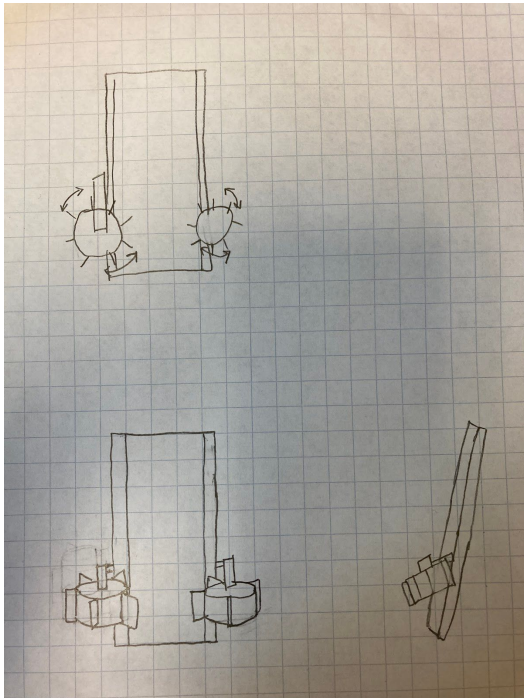
Game Details



There are a total of 32 balls, with each team having 16 balls including 2 preload balls for either side. There are 9 total goals which either side can score in. The game will begin with a 15 second autonomous period. An Auton Win Point is awarded to any Alliance that completes a Connected Row using their Alliance Home Row at the end of the Autonomous Period. Whichever team has the most Auton Win Points by the end of autonomous will receive an extra 6 points. If there is a tie at the end of autonomous, each team will receive 3 points. After the autonomous period has ended, there will be a 1 minute 45 second driver period, in which teams may pilot their robot manually.

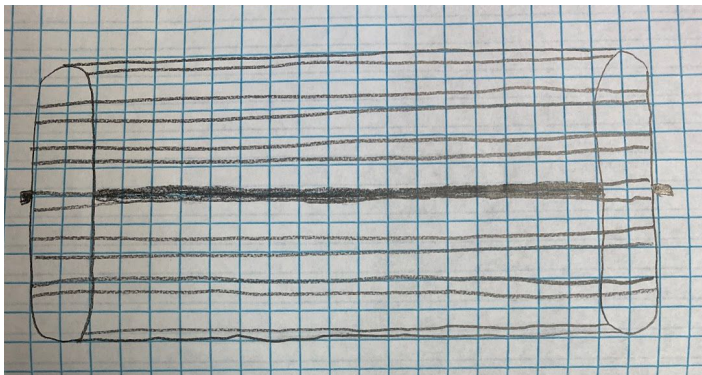
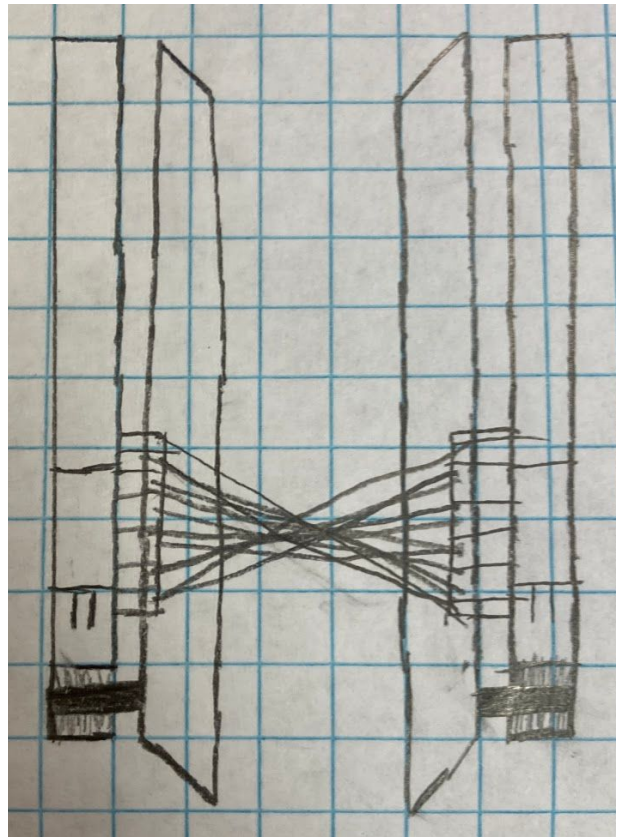
Game Definitions:

Intake and Scoring Mechanism Brainstorming:



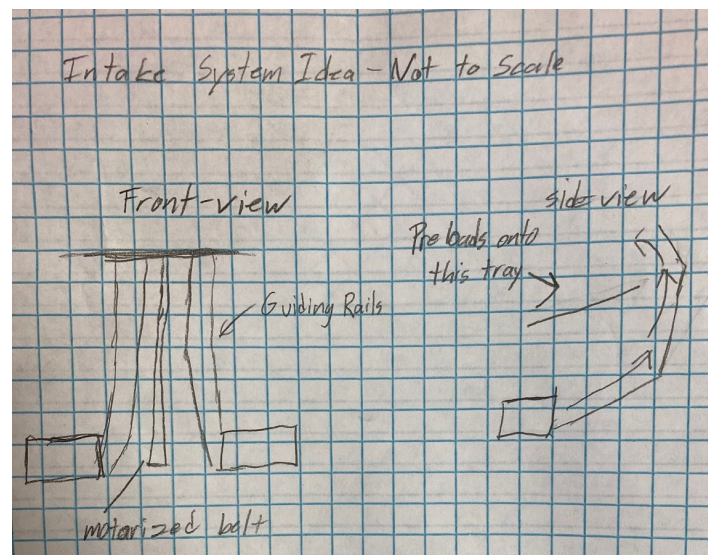
This design shows a design for the lift and the intake. The idea is that we would use circular rollers to draw in the ball and load it onto the flat tray. From there we would take in up to three balls onto the tray, then lift the tray and unload all three balls directly into the goals. - Sullivan

The design to the right shows a different potential intake and tray design where an over-the-tray rubber band intake would load balls onto the tray and then we could raise the tray and unload all the balls simultaneously. The image below shows a more in-depth look at the rubber band intake. - Paul



The image to the right shows a final idea in which we have two tank tread intakes - one on either side - that intake balls onto rails that guide it up and onto a track. - Tate

Intake Design (Cont.)



Design #	Intake Efficiency (Worst 1, Best 3)	Scoring Efficiency (Worst 1, Best 5)	Can Hold Up To 3 Balls (Yes: 2, No :1)	Total (Up to 10pts)
Design 1 (Sullivan)	1	3	2	6
Design 2 (Paul)	3	2	2	7
Design 3 (Tate)	1	5	2	8

We made a decision matrix to choose which of our designs would be best for our robot. Tate's scoring mechanism design had the best overall score but we found that Paul's design had the most efficient intake. We tried to create a new design which combines the best parts of each of the designs to make the best design.

Various sketches

