# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Game</td>
<td>3</td>
</tr>
<tr>
<td>Robot Inspection</td>
<td>15</td>
</tr>
<tr>
<td>The Event</td>
<td>21</td>
</tr>
<tr>
<td>Teamwork Challenge</td>
<td>22</td>
</tr>
<tr>
<td>Robot Skills Challenge</td>
<td>24</td>
</tr>
</tbody>
</table>
The Game

Game Description

Matches are played on a field set up as illustrated in the figures throughout. The Robot Skills Challenge and the Teamwork Challenge use the exact same field and set up.

In the Teamwork Challenge, an Alliance of two (2) Robots, operating under driver control, work together in each Match.

In the Robot Skills Challenge, one (1) Robot attempts to score as many points as possible. These matches consist of Driving Skills Matches, which will be entirely driver controlled, and Programming Skills Matches, which will be autonomous with limited human interaction.

The object of the game is to attain the highest score by Scoring Hubs in Building Zones, by Removing Hubs from the Hanging Structure, and by Hanging Robots at the end of the Match.

Figure 1 – Starting Configuration of the Field
Each VEX IQ Challenge Next Level Match includes the following:

- Seventeen (17) Hubs
  - Fifteen (15) Standard Hubs that start on the Floor
  - Two (2) Bonus Hubs that start atop the Hanging Structure
- Two (2) Building Zones
- One (1) Hanging Bar
- One (1) Parking Zone

Figure 2 – Overhead view of the Field. The Starting Positions, Building Zones, Parking Zone, and Driver Station are highlighted.
Game Definitions

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

**Alliance Score** – Points scored in a Teamwork Match awarded to both Teams.

**Autonomous** – A Robot that is operating and reacting only to sensor inputs and to commands pre-programmed by the Students into the Robot control system. The Robot is operating without input from a VEX IQ Controller.

**Barrier** – The blue and/or white VEX IQ parts that outline the Building Zones. See Figures 2 and 3.

**Bonus Hub** – One of two (2) yellow Hubs that begin the Match on Bonus Pegs.

**Bonus Peg** – One of two (2) pegs built out of VEX IQ pieces on the top of the Hanging Structure, where Bonus Hubs start the Match. Bonus Hubs can be Removed by Robots to earn points.

**Building Zone** – One of the two (2) infinitely tall 3-dimensional volumes on the corners of the Floor bordered by the Floor and the Barriers. The Barriers are part of the Building Zone. See Figure 3.

**Disablement** – A penalty applied to a Team for a rule violation. During Disablement, a Team is no longer allowed to operate their Robot, and the Drivers will be asked to place their Controller on the ground. A Disablement is not the same as a Disqualification.

*Figure 3 – View of the field depicting the two Building Zones. These 3D volumes extend infinitely upwards.*
**Disqualification** – A penalty applied to a Team for a rule violation. A Team that is Disqualified in a Match receives zero (0) points. If a Team is Disqualified in a Match, the Head Referee will notify the Team of their violation at the end of the Match. At the Head Referee’s discretion, repeated violations and Disqualifications for a single Team may lead to Disqualification for the entire event.

**Driver** – A Student team member responsible for operating and controlling the Robot.

**Driver Controlled** – A Robot operating under the control of a Driver.

**Driving Skills Match** – A Driver Controlled period that is sixty seconds (1:00) long with only one (1) Robot on the Field.

**Driver Station** – The region behind the Field, where the Drivers must remain during their Match unless legally interacting with their Robot.

**Field** – The entire playing field, including the field perimeter and field tiles.

**Field Element** – The field perimeter, Floor, Hanging Bar, Hanging Structure, Building Zones, Barriers, and any other supporting structures.

**Floor** – The part of the playing field that is within the field perimeter.

**Hanging Bar** – The horizontal yellow PVC pipe in the center of the Field. The Hanging Bar is 16” (406.4mm) high, 34” (863.6mm) wide, and 0.86” (21.84mm) in diameter.

**Low Hanging** – A Robot is Low Hanging if it is contacting the Hanging Bar, not contacting the Floor, and not Supported by any Hubs. Referees can check to see if a Robot is Low Hanging by sliding a piece of paper between the Robot and the Floor, and can check to see if a Robot is supported by any Hubs by gently removing the Hub in question.

**High Hanging** – A Robot is High Hanging if it is contacting the Hanging Bar, is not supported by any Hubs, and is completely above a horizontal plane that is the height of an upright Hub above the Floor (roughly 4.0” or 101.6mm). Referees can check to see if a Robot is High Hanging by sliding a Hub underneath it, or by comparing its height to the bottom of the yellow decorative “4” plate on the Hanging Structure. Referees can check to see if a Robot is supported by any Hubs by gently removing the Hub in question. A High Hanging Robot does not also count as a Low Hanging Robot.
**Hanging Structure** – The structure made of VEX IQ parts in the center of the Field that supports the Hanging Bar. The Bonus Pegs and decorative plates used to judge High or Low Hanging Robots are part of the Hanging Structure.

**Hub** – A hollow cylindrical plastic scoring object that can be manipulated by Robots and Scored in the Building Zone. Hubs are roughly 4.0” (101.6mm) tall, with a diameter of 5.0” (127mm) at their widest point, a diameter of 2.84” (72mm) at their narrowest point, and weigh roughly 0.187 lb (85 g).

**Match** – A Driving Skills Match, Programming Skills Match, or Teamwork Match.

**Parked** – A Robot is considered Parked if it is contacting the Parking Zone.

**Parking Zone** – The area of the Floor underneath the Hanging Bar bordered by the Hanging Structure and the black lines that run parallel to the Hanging Bar. The black lines are part of the Parking Zone; the Hanging Structure itself is not part of the Parking Zone. See Figure 2.

**Programming Skills Match** – An Autonomous period that is sixty seconds (1:00) long with only one (1) Robot on the Field.

**Removed** – A Bonus Hub is considered Removed from its Bonus Peg if the Bonus Hub is not contacting the Bonus Peg at the end of the Match.

**Robot** – Anything that has passed inspection that a Team places on the Field prior to the start of a Match.

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Figure 4 (left) – Example of a Low Hanging Robot. Note that the Robot is off of the Floor, but below the bottom edge of the decorative “4” plate.

Figure 5 (right) – Example of a High Hanging Robot. Note that the Robot is above the bottom edge of the decorative “4” plate.
Scored – A Hub that is Low Scored or High Scored.

Low Scored – A Hub is Low Scored at the end of a Match if it meets the following criteria:
1. The Hub is contacting a Barrier or the Floor inside of a Building Zone.
2. The Hub is not contacting the Floor outside of a Building Zone.
3. The Hub is not contacting a Robot.

Note: A maximum of four (4) Hubs can be Low Scored in each Building Zone.

High Scored – A Hub is High Scored at the end of a Match if it meets the following criteria:
1. The Hub is within a Building Zone.
2. The Hub is not contacting the Floor or a Barrier.
3. The Hub is contacting at least one Scored Hub.
4. The Hub is not contacting a Robot.

Skills Match – A Driving Skills Match or Programming Skills Match.

Starting Positions – The two (2) designated 11” x 20” spots on the field where Robots must start the Match. Starting Positions are bounded by the inner edges of the long black lines, outer edge of the short black line, and the top most outer edge of the field perimeter. See Figures 2 and 7.
**Student** – Anyone born after April 30, 2005 (age 13 or lower) or enrolled in grade 8 or lower on April 30, 2019. Anyone enrolled in grade 9 on April 30, 2019 is only eligible to participate on a VEX IQ Challenge team when enrolled in a middle school or district, which includes grade 8, but not grade 10. **Students are the individuals who design, build, repair, and program the Robot with minimal adult assistance.**

- **Elementary School Student** - A Student enrolled in grade 5 or lower, or enrolled in grade 6 in a school which includes grade 5, but not grade 7 (e.g., K-6, 2-6, 3-6, 4-6, 5-6).
- **Middle School Student** – Any eligible Student that is not an Elementary School Student.

**Team** – Two or more Students make up a team. A Team is classified as an Elementary School Team if all members are Elementary School Students. A Team is classified as Middle School if any members are Middle School Students. Teams may be associated with schools, community/youth organizations, or a group of neighborhood Students.

**Teamwork Match** – A Driver Controlled period that is sixty seconds (1:00) long with one (1) Alliance on the Field.
VEX IQ Challenge Next Level Game Rules

Scoring
- A Hub that is Low Scored in a Building Zone is worth one (1) point.
- A Hub that is High Scored in a Building Zone is worth two (2) points.
- A Bonus Hub that is Removed from its Bonus Peg is worth one (1) point.
- A Bonus Hub that is Low Scored in a Building Zone is worth two (2) points.
- A Bonus Hub that is High Scored in a Building Zone is worth four (4) points.
- A Parked Robot is worth one (1) point.
- A Low Hanging Robot is worth two (2) points.
- A High Hanging Robot is worth four (4) points.

Safety Rules
<S1> If, at any time, the Robot operation or Team actions are deemed unsafe or have damaged any Field Elements or Hubs, the offending team may be Disabled and/or Disqualified at the referees’ discretion. The Robot will require re-inspection before it may again take the field.

General Game Rules
<G1> Treat everyone with respect. All Students and adults associated with a Team are expected to conduct themselves in a respectful and positive manner while participating in the VEX IQ Challenge. If Team members are disrespectful or uncivil to staff, volunteers, or fellow teams at an event, the team may be Disqualified from their current or upcoming Match. Judges may also consider team conduct and ethics when determining awards.

In all aspects of the VEX IQ Challenge program, the Students make the decisions and do the work with adult mentorship. The VEX community prides itself on being a positive learning environment where no one is bullied, harassed, or berated. Teams avoid placing unnecessary stress upon students and/or event volunteers; instead, challenging situations are viewed as teachable moments to model positive behaviors and good sportsmanship.

This rule exists alongside the REC Foundation Code of Conduct. Violation of the Code of Conduct can be considered a violation of <G1> and can result in Disqualification from a current Match, an upcoming Match, an entire event, or (in extreme cases) an entire competition season. The Code of Conduct can be found at https://www.roboticseducation.org/competition-teams/vex-iq-challenge/.
<G2> VEX IQ is a student-centered program. Adults may assist Students in urgent situations, but adults should never work on or program a Robot without Students on that Team being present and actively participating.

<G3> Use common sense. When reading and applying the various rules in this document, please remember that common sense always applies in the VEX IQ Challenge.

<G4> Pre-match setup. At the beginning of a Match, each Robot must meet the following criteria:

1. Only be contacting the Floor.
2. Fit within an 11” x 20” area, bounded by the Starting Position.
3. Be no taller than 15”.

An offending Robot will be removed from the Match at the Head Referee's discretion. They will not receive a Disqualification, but they will not be permitted to play in the Match.

<G5> Expansion is limited during a Match. During the Match, Robots may not expand beyond an 11” x 20” area. However, Robots are permitted to expand beyond the 15” high starting requirement.

Violations of this rule will result in a warning for minor offenses that do not affect the Match. Major and/or score affecting offenses will result in a Disqualification. Teams who receive multiple warnings may also receive a Disqualification at the Head Referee's discretion.

<G6> Drivers switch Controllers midway through the Match. Each team shall include two Drivers. Teams with only one Student in attendance at an event are granted an allowance to use another qualified Driver from the event. No Driver may fulfill this role for more than one Team.

During a Match, Robots may only be operated by the Drivers. No Driver shall operate a Robot for more than thirty-five (:35) seconds. The two Drivers must switch their controller between twenty-five (:25) seconds and thirty-five (:35) seconds remaining in the Match. The second Driver may not touch his/her Team’s controls until the controller is passed to him/her. Once the controller is passed, the first Driver may no longer touch his/her Team’s controls.
Violations of this rule will result in a warning for minor offenses that do not affect the *Match*. Score affecting offenses will result in a *Disqualification*. Teams who receive multiple warnings may also receive a *Disqualification* at the Head Referee's discretion.

**<G7> Only Drivers, and only in the Driver Station.** During a *Match*, *Drivers* must remain in their *Driver Station*, except when legally interacting with their *Robot* as per <G16>. *Drivers* are not allowed to use any communication devices during their *Match*. Devices with communication features turned off (e.g. a phone in airplane mode) are allowed.

**<G8> Hands out of the Field.** *Drivers* are prohibited from making intentional contact with any *Field Element* or *Robots* during a *Match*, except for the allowances in <G16>. Any intentional contact may result in a *Disqualification*. Accidental contact will not be penalized. However, accidental contact which affects the score of the *Match* may result in a *Disqualification* at the Head Referee’s discretion.

**<G9> Keep Hubs in the Field.** *Hubs* that leave the *Field* during a *Match* will not be returned.

**<G10> When it’s over, it’s over.** Scores will be calculated for all *Matches* immediately after the *Match* is complete and once all objects on the *Field* come to rest. Any *Scoring*, *Removing*, *Parking*, or *Hanging* that takes place after the *Match* due to *Robots* continuing to drive will not count.

a. Referees or other event staff are not allowed to review any videos or pictures from the *Match*.

b. If there is a concern regarding the score of a *Match*, only the *Drivers* from that *Match*, not an adult, may share their questions with the referee.

**<G11> Keep your Robot together.** *Robots* may not intentionally detach parts or leave mechanisms on the *Field* during any *Match*. If an intentionally detached component or mechanism affects game play, the *Team* may be *Disqualified* at the Head Referee’s discretion.

**<G12> Don’t clamp your Robot to the field.** *Robots* may not grasp, grapple, or attach to any *Field Elements* other than the *Hanging Bar*. Strategies with mechanisms that react against multiple sides of a *Field Element* (other than the *Hanging Bar*) in an effort to latch or clamp onto said *Field Element* are prohibited.

The intent of this rule is to prevent *Robots* from unintentionally damaging the *Field* or from anchoring themselves to the *Field*. Minor violations of this rule that do not affect the *Match* will result in a warning. Score affecting offenses will result in a *Disqualification*. Teams that receive multiple warnings may also receive a *Disqualification* at the Head Referee’s discretion.
Note: While the Hanging Bar is excluded from this rule, the Hanging Structure is not. Incidental contact with the Hanging Structure while Hanging will not be penalized, but Teams are not permitted to grapple, clamp, or attach to the Hanging Structure.

**<G13> Let go of Hubs after the Match is over.** Robots must be designed to permit easy removal of Hubs from their Robot without requiring that the Robot have power or remote control after the Match is over.

**<G14> Be prepared for minor field variance.** Field tolerances may vary by as much as ±1” unless otherwise specified. Teams must design Robots accordingly.

**<G15> Replays are allowed, but rare.** Match replays are at the discretion of the Event Partner and Head Referee, and will only be issued in the most extreme circumstances.

**<G16> Handling the Robot mid-match is allowed, under certain circumstances.** If a Robot goes completely outside the playing field, gets stuck, tips over, or otherwise requires assistance, the Team’s Drivers may retrieve & reset the Robot. To do so, they must:

1. Signal the Referee by placing their VEX IQ Controller on the ground.
3. Any Hubs in possession of the Robot while being handled must be removed from the Robot and taken out of play for the remainder of the Match.

Note: Any Hubs in the Starting Position may be moved out of the Starting Position, provided that they are not moved into a Scored position and are not moved as part of a strategy to gain an advantage.

This rule is intended so Teams can fix damaged Robots or help get their Robots "out of trouble." It is not intended for Teams to use as part of a strategy to gain an advantage during a Match. If a Head Referee sees Teams strategically exploiting this rule, they may be Disqualified from said Match.

**<G17> Hub control is limited.** Robots may not directly or indirectly lift or hold more than one (1) Hub off of the Floor at a time. Pushing, shoving, or plowing multiple Hubs along the Floor, field perimeter, or Field Elements is not considered a violation, as long as these Hubs remain in contact with the Floor.

Minor, momentary, or incidental violations of this rule that do not affect the Match will result in a warning. Score affecting offenses will result in a Disqualification. Teams that receive multiple warnings may also receive a Disqualification at the Head Referee’s discretion.
<G18> **This manual will have three scheduled updates.** All rules in this manual are subject to changes, and not considered official until August 17th, 2018. There will also be scheduled manual updates on June 15th, 2018 and April 5th, 2019. While we do not expect there to be major changes outside of these scheduled updates, **Teams** are strongly encouraged to review the VEX IQ Forum and/or the Q&A system (see <G20>) for rule updates and clarifications: [www.vexiqforum.com](http://www.vexiqforum.com)

a. The Game Design Committee reserves the right to make changes to this manual in the April 5th, 2019 release specifically for the VEX Robotics World Championship. The specific item that will be considered for changes is the number of **Hubs** on the **Field**.

**<G19> The Q&A system is an extension of this Game Manual.** All **Teams** must adhere to all VEX IQ Challenge Rules as written and must abide by the stated intent of the rules. Every **Team** has the opportunity to ask for official rules interpretations in the VEX IQ Challenge Question & Answer System. All responses in this Q&A system should be treated as official rulings from the VEX IQ Challenge Game Design Committee, and they represent the correct and official interpretation of the VEX IQ Challenge Rules. The Q&A system is the only source for official rulings and clarifications. The Q&A system can be found at the following URL:

Robot Inspection

**Description**

Every *Robot* will be required to pass a full inspection before being cleared to participate in the Challenge. This inspection will ensure that all *Robot* rules and regulations are met. Initial inspections will typically take place during team registration/practice time. Every *Team* should use the rules below as a guide to pre-inspect their *Robot* and ensure that it meets all requirements.

**Definitions**

*Robot* – An operator controlled vehicle designed and built by a VEX IQ Challenge team to perform specific tasks on the *Field*. The *Robot* may be constructed using only the VEX IQ platform parts and mechanical/structural components from the VEX Robotics by HEXBUG product line. No other parts will be allowed on the *Robot*. Prior to participating in matches, each *Robot* will be required to pass an inspection. Additional inspections may be required at the discretion of event personnel.

**Inspection Rules**

<R1> The *Team’s Robot* must pass inspection before being allowed to participate in any *Matches*. Noncompliance with any *Robot* design or construction rule may result in *Disqualification* of the *Robot* at an event.

a. If significant changes are made to a *Robot*, it must be re-inspected before it will be allowed to participate in a *Match*.

b. If a robot has multiple functional configurations, all possible configurations must be inspected before being used in competition.

c. *Teams* may be requested to submit to random inspections by event personnel during the event. Refusal to submit will result in *Disqualification*.

d. Referees or inspectors may decide that a *Robot* is in violation of the rules. In this case, the *Team* in violation will be *Disqualified* and the *Robot* will be barred from the *Field* until it passes re-inspection.

<R2> Only one (1) *Robot* will be allowed to participate per *Team* in the VEX IQ Challenge. Though it is expected that *Teams* will make changes to their *Robot* at the event, a *Team* is limited to only one (1) *Robot*, and a given *Robot* may only be used by (1) *Team*. The VEX IQ system is intended to be a mobile robotics design platform. As such, a VEX IQ Challenge *Robot*, for the purposes of the VEX IQ Challenge, has the following subsystems:
Subsystem 1: Mobile robotic base including wheels, tracks, or any other mechanism that allows the Robot to navigate the majority of the flat playing Field surface. For a stationary Robot, the robotic base without wheels would be considered Subsystem 1.

Subsystem 2: Power and control system that includes a VEX IQ legal battery, a VEX IQ control system, and associated Smart Motors for the mobile robotic base.

Subsystem 3: Additional mechanisms (and associated Smart Motors) that allow manipulation of Hubs or navigation of Field obstacles.

Given the above definitions, a minimum Robot for use in any VEX IQ Challenge event (including Skills Challenges) must consist of subsystem 1 and 2 above. Thus, if you are swapping out an entire subsystem of either item 1 or 2, you have now created a second Robot and are no longer legal.

- Teams may not participate with one Robot while a second is being modified or assembled.
- Teams may not switch between multiple Robots. This includes using different robots for Skills Challenge and Qualification / Elimination Matches.
- Multiple Teams may not use the same Robot during a competition or season.

<R3> To participate in an official VEX IQ Challenge Event, a Team must first register on robotevents.com. Upon registering they will receive their VEX IQ Challenge Team Number and two (2) VEX IQ Challenge License Plates. Every Robot should have their VEX IQ Challenge License Plates displayed on two opposing sides with their VEX IQ Challenge Team Number clearly written or printed upon it.

- The VEX IQ Challenge License Plates are considered a non-functional decoration, and cannot be used as a functional part of the Robot.
- These number plates must fulfill all Robot rules.
- License Plates must be clearly visible at all times. For example, License Plates must not be in a position that would be easily obstructed by a Robot mechanism during standard Match play.

Figure 10 – A VEX IQ Challenge License Plate with a VEX IQ Challenge Team Number written upon it.
At the start of each Match, the Robot must satisfy the following constraints:

a. Only contact the Floor.
b. Fit within an 11” x 20” area, bounded by the Starting Position.
c. Be no taller than 15”.

A Robot may not expand beyond its 11” x 20” constraint at any time during the Match. However, Robots are permitted to expand beyond their 15” starting height constraint at any time during the Match.

Note: The 11” x 20” limit includes the full range of motion by any appendages. For example, an arm that extends out of these constraints while operating during the Match would make the Robot illegal.

Figures 11 & 12 – A Robot which starts the match with the legal size constraints (left), but becomes too large as the arm rotates (right).

Note 2: The 11” x 20” limit is not restricted to the same orientation or relative position to the Robot as the 11” x 20” Starting Position. For example, a Robot with a mechanism that can extend out of two sides of the Robot is legal, so long as the Robot never exceeds 11” x 20” at any point during the Match.

Figures 13 & 14 – A Robot with a mechanism that can extend in multiple directions, but never exceeds the maximum size constraint.
The starting configuration of the Robot at the beginning of a Match must be the same as a Robot configuration inspected for compliance, and within the maximum allowed size.

a. Teams using more than one Robot configuration at the beginning of Matches must tell the Inspector(s) and have the Robot inspected in its largest configuration(s).
b. A Team may NOT have its Robot inspected in one configuration and then place it in an uninspected configuration at the start of a Match.

Robots may be built ONLY from Official Robot Components from the VEX IQ product line, unless otherwise specifically noted within these rules.

a. Official VEX IQ products are ONLY available from VEX Robotics & official VEX Resellers. To determine whether a product is “official” or not, consult www.vexiq.com.
b. If an Inspector or event official questions whether something is an official VEX IQ component, the Team will be required to provide documentation to an Inspector that proves the component’s source. Such types of documentation include receipts, part numbers, or other printed documentation.
c. Only the VEX IQ components specifically designed for use in Robot construction are allowed. Using additional components outside their typical purpose is against the intent of the rule (i.e. please don’t try using VEX IQ apparel, team or event support materials, packaging, Field Elements, or other non-robot products on a VEX IQ Challenge Robot).
d. Products from the VEX EDR or VEXpro product line cannot be used for Robot construction. Products from the VEX product line that are also cross-listed as part of the VEX IQ product line are legal. A “cross-listed” product is one which can be found in both the VEX IQ and VEX EDR sections of the VEX Robotics website.
e. Mechanical/structural components from the VEX Robotics by HEXBUG product line are legal for Robot construction. However, electrical components from the VEX Robotics by HEXBUG product line are illegal for Robot construction.
f. Official Robotics Components from the VEX IQ product line that have been discontinued are still legal for Robot use. However, Teams must be aware of <R7a>.
g. 3D printed components, such as replicas of legal VEX IQ parts or custom designs, are not legal for Robot use.

Note: A comprehensive list of legal parts can be found in the VEX IQ Challenge Legal Parts Appendix, at https://www.vexrobotics.com/vexiq/competition/viqc-current-game.
Robots are allowed to use the following additional “non-VEX IQ” components:

a. Appropriate non-functional decorations, provided that these do not affect the Robot performance in any significant way or affect the outcome of the Match. These decorations must be in the spirit of the event. Inspectors will have the final say in what is considered “nonfunctional”.
   i. Any decorations must be backed by legal materials that provide the same functionality, (i.e. if your Robot has a giant decal that prevents Hubs from falling out of the Robot, the decal must be backed by VEX IQ material that also prevents the Hubs from falling out).
   ii. The use of non-toxic paint is considered a legal non-functional decoration. However, any paint being used as an adhesive or to impact how tightly parts fit together would be classified as functional.

b. Rubber bands that are identical in length and thickness to those included in the VEX IQ product line (#32 & #64).

Additional VEX IQ products that are released during the season are legal for use.

a. Some “new” components may have certain restrictions placed on them upon their release. These restrictions will be documented on their VEX IQ product webpage, or in the VEX IQ Legal Parts appendices.

Robots are limited to ONE (1) VEX IQ Robot Brain.

a. Robot Brains, microcontrollers, or other electronic components that are part of the VEX Robotics by HEXBUG, VEX EDR, or VEXpro product lines are not allowed.
   a. The Robot AA Battery Holder (228-3493) is the only exception to this rule, per <R12>.
   b. Robots must use one (1) VEX IQ 900 MHz radio, VEX IQ 2.4 GHz radio, or VEX IQ Smart Radio in conjunction with their VEX IQ Robot Brain.
   c. The only legal method of driving the Robot during Teamwork and Driving Skills Matches is the VEX IQ Controller.

Robots may use up to six (6) VEX IQ Smart Motors.

a. Additional motors cannot be used on the Robot (even ones that aren’t connected).

The only allowable sources of electrical power for a VEX IQ Challenge Robot is one (1) VEX IQ Robot Battery or six (6) AA batteries via the Robot AA Battery Holder (228-3493).

a. Additional batteries cannot be used on the Robot (even ones that aren’t connected).
<R13> Parts may NOT be modified.
   a. Examples of modifications include, but are not limited to, bending, cutting, sanding, or melting.

<R14> The following types of mechanisms and components are NOT allowed:
   a. Those that could potentially damage Field Elements or Hubs.
   b. Those that could potentially damage other Robots.
   c. Those that pose an unnecessary risk of entanglement.

<R15> A Robot is deemed successfully inspected when it has been recorded as “passed” by an Inspector and the inspection form has been signed by the Inspector and a Student Team member.

<R16> Teams must be prepared to play when they bring their Robots to the Field. For example, Teams should ensure that their batteries are charged and their VEX IQ Controller is paired with their Robot before placing the Robot on the Field.

<R17> Teams should make sure that their VEX IQ firmware (VEXos) is up to date. Teams can download the latest version of VEXos at www.vexiq.com/vexos.
The Event

Description
The VEX IQ Challenge will consist of:

- Teamwork Challenge
  - Each Teamwork Challenge Match consists of two Teams, operating as an Alliance, to score points. The Teamwork Challenge may include Practice, Qualifying, and Finals Matches. After the Qualifying Matches, Teams will be ranked based on performance.
  - Typically, the top Teams will then participate in Finals Matches to determine the Teamwork Challenge champions. The number of Teams participating in the Finals Matches is determined by the Event Partner.

- Robot Skills Challenge
  - In this challenge, Teams will compete in sixty second (1:00) long Matches in an effort to score as many points as possible. These Matches consist of Driving Skills Matches, which will be entirely Driver controlled, and Programming Skills Matches, which will be autonomous (no VEX IQ Controller) with limited human interaction.
  - Each Match will consist of only one Robot.

Awards may be given to top Teams in each format, as applicable. Awards may also be given for overall performance in the judged criteria. Please review the Awards Appendix for more details, available in the VEX IQ Challenge Next Level section of www.vexrobotics.com or www.roboticseducation.org.

Definitions

Disqualification – A penalty applied to a Team for a rule violation. A Team that is Disqualified in a Match receives zero (0) points. If a Team is Disqualified in a Match, the Head Referee should notify the Team of their violation at the end of the Match and record it on their score sheet. At the Head Referee’s discretion, repeated violations and Disqualifications for a single Team may lead to its Disqualification for the entire event.

Finals Match – A Teamwork Match used to determine the Teamwork Challenge champions.

Practice Match – An un-scored Match used to provide time for teams to get acquainted with the official playing field.

Qualifying Match – A Teamwork Match used to determine the event rankings.
Teamwork Challenge

Practice Matches
At the event, Practice Matches may be played from registration time until the Team meeting begins. Every effort will be made to equalize practice time for all Teams, but these Matches may be held on a first-come, first-served basis. These Matches are not scored, and will not affect Team ranking.

Qualifying Match Schedule

- The Qualifying Match schedule will be available prior to opening ceremonies on the day of the event. This schedule will indicate Alliance partners and Match pairings. For events with multiple Fields, the schedule will also indicate on which Field the Match will take place.
- The Qualifying Matches will start immediately after opening ceremonies in accordance with the Qualifying Match schedule.
- Teams will be randomly assigned an Alliance partner to collaborate in each Qualifying Match.
- All Teams will be scored on the same number of Qualifying Matches.
  - In some cases, a Team will be asked to play in an additional Qualifying Match, but this extra Match will not count towards their overall ranking.

Teamwork Challenge Rankings

- At the conclusion of each Match, the Alliance Score will be determined.
  - Each Team will receive the points scored for the Alliance Score.
- If no member of a Team is present in the Driver Station at the start of a Qualifying Match, that Team is considered a “no show” and will receive zero (0) points.
  - The Alliance partner that does play will still receive all points scored in this Match.
- Points earned in each Qualifying Match are added to get the Team’s total qualifying points.
- A certain amount of a Team’s lowest scores will not count towards their rankings.
  - If an event has between four (4) and seven (7) Qualifying Matches per Team (i.e. “rounds”), then each Team’s lowest score will not be counted towards their rankings.
  - If an event has between eight (8) and eleven (11) rounds, then each Team’s two (2) lowest scores will not be counted.
  - If an event has twelve (12) or more rounds, then each Team’s three (3) lowest scores will not be counted.
- Teams are ranked by their average Match points. This average is calculated using the total qualifying points, excluding the lowest-scoring Matches, as explained above.
- Ties in ranking are broken by:
  - Removing each Team’s lowest score and comparing the new average score.
  - If still tied, the next lowest score will be removed (on through all scores).
  - If still tied, teams will be sorted by a random electronic draw.
Teamwork Challenge Finals Matches

- At the conclusion of Qualification Matches, the top Teams will advance to Finals Matches.
- The number of Finals Matches will be determined by the event organizers.
- The first and second ranked Teams form an Alliance, third and fourth ranked Teams form another Alliance (and so on) for the Finals Matches.
- Starting with the lowest ranked Alliance, each Alliance participates in one (1) Finals Match. After all Finals Matches are played, the Alliance with the highest score of those Matches is the Teamwork Champion. The Alliance with the second highest score finishes in second place, and so on.
- If there is a tie for first place, the tied Alliances will each play one tiebreaker Match. The Alliance with the highest score in their tiebreaker Match will be declared the winner.
  - If there is a tie in the tiebreaker Matches, a second set of tiebreaker Matches (one (1) per Alliance) will take place. The Team with the highest score in the second tiebreaker Match will be declared the winner.
  - If they remain tied after the second set of Matches, then the higher seeded Alliance will be declared the winner. (Thus, the lower seeded Alliance must exceed the higher seeded Alliance in order to be declared the winner.)
- If there is a tie other than first place, the higher seeded Alliance will receive the higher rank. For example, if the #4 and #6 Alliances both post a score that ties them for 3rd place, the #4 Alliance will be considered the 3rd place Alliance, and the #6 Alliance would be considered the 4th place Alliance.

Teamwork Challenge Rules

<T1> Referees have ultimate authority during the event, including all three types of Matches. The Referees’ rulings are final.

a. Referees and event staff are not allowed to review any photo or video Match recordings to settle disputes.

b. Referees will review the Field at the end of each Match and accurately record the game score. If there is a disagreement with the scoring, only the Drivers, not an adult, may share their questions or concerns with the referee. Once the Field is cleared for the next Match, Drivers can no longer dispute the Match score.

<T2> The only people from a Team permitted to be by the playing Field are the two Drivers, who are identified by their drive team badges. These badges are interchangeable, but not during a Match.

<T3> During Matches, two (2) Teams form an Alliance that will play on the Field.

<T4> There are no time outs in Qualifying Matches or Finals Matches.
If an Alliance wants to end a Qualifying Match or a Finals Match early, both Teams should signal the referee by placing their controllers on the ground. The referee will then signal to the Teams that the Match is over and will begin to tally the score.

At many events, the playing Field will be placed on the ground. Some events may choose to elevate their Fields. At the 2019 VEX Robotics World Championship, the Fields will be 18” high.

Robot Skills Challenge

Robot Skills Challenge Rules
Please note that all rules from “The Game” section of the manual apply to Robot Skills, unless otherwise specified.

At the beginning of each Skills Match, the Robot may be placed in either of the two (2) Starting Positions on the Field.

Robot Skills Challenge Scoring
All scoring is the same as outlined in “The Game” section of this manual.

- A Hub that is Low Scored in a Building Zone is worth one (1) point.
- A Hub that is High Scored in a Building Zone is worth two (2) points.
- A Bonus Hub that is Removed from its Bonus Peg is worth one (1) point.
- A Bonus Hub that is Low Scored in a Building Zone is worth two (2) points.
- A Bonus Hub that is High Scored in a Building Zone is worth four (4) points.
- A Parked Robot is worth one (1) point.
- A Low Hanging Robot is worth two (2) points.
- A High Hanging Robot is worth four (4) points.

Robot Skills Challenge Format
- The Robot Skills Challenge Field is set up as described in “The Game” section of this manual.
- Teams will play Skills Matches on a “first come, first served” basis.
- The Event Partner will determine how many Skills Matches a given Team is allowed to play.
- There will be two (2) Drivers for a Driving Skills Match. Drivers must switch their controller with between thirty-five (:35) and twenty-five (:25) seconds remaining in the Driving Skills Match. If a Team only has one (1) Driver, that Student may only operate the Robot for a maximum of thirty-five (35) seconds.
Programming Skills Match Specific Rules

<PSC1> A Team may handle their Robot as many times as desired during a Programming Skills Match.

a. Upon handling the Robot, it must be immediately brought back to any legal Starting Position.
   i. Drivers may reset or adjust the Robot as desired from this position, including pressing buttons on the Robot Brain or activating sensors.

b. If the Robot is possessing any Hubs when the Robot is being handled, these Hubs will be removed from the Field and can no longer be used.

c. If there are any Hubs in the 11”x20” Starting Position where the Robot is being placed, these may be moved out of the Starting Position, provided that they are not moved into a Scored position and are not moved as part of a strategy to gain an advantage.

<PSC2> Teams must bring their VEX IQ Controller to the field with them. Although Drivers will start the Robot by pressing a button on the Robot Brain or manually activating a sensor, they may not otherwise engage the Robot with the VEX IQ Controller during the Programming Skills Match. The VEX IQ Controller must be turned OFF during the Programming Skills Match.

a. Because there is no VEX IQ Controller handoff, only one (1) Driver is required for Programming Skills Matches (though Teams may still have two (2) if desired). <G7> still applies to any Drivers participating in the Match.

Robot Skills Challenge Rankings

• For each Skills Match teams are awarded a score based on the above scoring rules.
• Teams will be ranked based on the sum of their highest Programming Skills Match score and Driving Skills Match score, with the team with the highest sum being declared the Robot Skills Challenge Winner.
• In the case where two teams are tied for the highest score, the tie will be broken by looking at both teams’ next highest Programming Skills Match score. If the teams remain tied, the tie will be broken by looking at both teams’ next highest Driver Skills Match score. This process will repeat until the tie is broken.
• If the tie cannot be broken (i.e. both teams have the exact same scores for each Programming Skills Match and Driver Skills Match), then the following ordered criteria will be used to determine which team had the “best” Programming Skills Match:
  • Number of points for High Scored Hubs and Bonus Hubs
  • Number of points for Low Scored Hubs and Bonus Hubs
  • Number of points for High Hanging
  • Number of points for Parking
• If the tie still cannot be broken, the same process in the step above will be applied to the teams' highest Driver Skills Match.
• If the tie still isn't broken, events may choose to allow teams to have one more deciding match or both teams will be declared the winner.