

TCEA Mindstorms Robotics Challenge 2014-2015

"Food Frenzy"



Designed for TCEA by:

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FINAL VERSION

Revision History

7/31/2014 (**ROUGH** Draft Version 1)

1. Original Release of Game Rules

8/31/2014 (Draft Version 2)

1. Modified penalty from time penalty to touch penalty.
2. Changed number of allowed touch penalties.
3. Corrected inconsistent nomenclature.
4. Provided additional option for how Food Pods are introduced to the robot.
5. Updated Game Background section.
6. Added Game Intent FAQ in Section 3.

10/20/2014 (Draft Version 3)

1. Cleaned up language in Section 1.3.5, removing a stale reference to "double points".
2. Added clarifying language to Rule 2.0.9 to more specifically state allowed location(s) of Food Pod placement when placing under option (2).
3. Added Section 2.0.12 to clarify Team-Supplied Game Piece interactions.
4. Modified 1.4.4 to include stipulation that Food doesn't leave the Field.
5. Added FAQ 3.15 to clarify Food Pod placement rules.

3/1/2015 (Final Version)

1. Added State Championship variation Section 2.1.5 to specifically disallow the use of any adhesives (tape, glue, etc.) from being used on Field Surfaces (walls, game mat, etc.).

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Section 1 Game Description

1.1 Game Background

The 2014-2015 TCEA Mindstorms Robotics Challenge game is titled, "Food Frenzy" and is designed around the theme of Food, growing food, and harvesting food.

Farmers have recently had a growingly difficult job (no pun intended) of managing their land, water, and fertilizer resources – even more so during times of drought – to raise their crops to feed the millions of people that each farm provides for. Farmers in the most drought-stricken areas of Texas have called out to TCEA to help them develop more efficient ways of managing these resources in an automatable and scalable fashion. TCEA has funded a research team to investigate biologic solutions, but has turned to you to help provide the robotic solutions.

TCEA has provided you access to a test farm facility, with "regular" food growing areas and "Super Food Pods" that their researchers have developed to grow food quickly (almost instantly). TCEA would like for you to help develop a low-cost robotics platform to bring water to the "regular" food growing areas, manage the Food Pod units in the super-fertile areas of the farm, grow the experimental food, and harvest the grown food.

With the increasing demand of food around the world and the dwindling supply of water, fertilizer, and incentives to take on this back-breaking task, being a farmer is becoming more and more difficult ... and important! In 2013 alone, the United States imported over 21 million metric tons of fruits and vegetables to feed its people - that's over 42 billion pounds of just fruits and vegetables! Therefore, investigating and implementing new ways to grow food, manage our resources, and bring the harvest to market can reduce our dependence on other countries (that are quickly becoming strained themselves) and feed our people better and cheaper. It's in all our interest to support the research being done and contribute where we can!

1.2 Game Pieces

For "Food Frenzy," the game pieces consist of Dura $\frac{3}{4}$ " schedule-40 PVC couplers and golfball-sized Wiffle balls. The Dura $\frac{3}{4}$ " schedule-40 PVC pipe couplers are "standard" $\frac{3}{4}$ " PVC pipe couplers that can be found at home improvement stores – such as the Home Depot – for less than 50 cents per coupler. The Dura $\frac{3}{4}$ " schedule-40 PVC pipe coupler is designed as a slip-slip coupler that "joins" two $\frac{3}{4}$ " PVC pipes. A coupler is roughly 2.125" long (2 $\frac{1}{8}$ " in height) and have a 1.3125" outer diameter (1 $\frac{5}{16}$ "). The height can vary +/- $\frac{1}{4}$ ", and the outer diameter can vary no more than $\frac{1}{16}$ ". "Food Frenzy" uses five (5) Dura $\frac{3}{4}$ " schedule-40 PVC pipe couplers for a single team. Finally, "Food Frenzy" also makes use of hollow golfball-sized (1 $\frac{5}{8}$ " diameter) perforated Wiffle-style balls. These balls are also called "practice golf balls" – they can be purchased at many toy stores, sporting goods stores, and online (for example, <http://amzn.com/B0019GK7LQ>). There is NO specific color designation – the balls can be ANY color, though the most popular colors are white, orange, yellow, and red. "Food Frenzy" uses five (5) practice golf balls for a single team.



In "Food Frenzy", the game field is a test farm specifically designed to grow a special kind of "super food" that is near-instantly grown within custom "food pods". In "Food Frenzy", the Dura PVC Coupler represents a "Food Pod", and the practice golf balls represent "Food."

"Food Frenzy" also makes use of two "team-provided" game pieces that teams will use during their matches; these game pieces – an "**Irrigation Channel**" and a "**Fertilizer Tower**" – may optionally be built by teams (requirements are provided in the Game Task descriptions that use them) and may be used to help complete specific game tasks. These two game pieces are brought with the team to the competition table when the team is scheduled to compete, used during the game, and are returned to the team after each competition match. These "team-provided" game pieces may be built using any allowed materials, but **must** be factored in the team's allowance and Bill of Materials.

1.3 Field Layout

The competition field for "Food Frenzy" is composed of a simple table frame, 2 competition mats (one for each team), 10 practice golf balls (5 per side), and 10 PVC Couplers (5 per side). The competition mat chosen for this year is SIMILAR to the "Race Against Time" mat PREVIOUSLY produced by LEGO Education – the mat has been discontinued, but TCEA was given the rights to reproduce the mat. Contact TCEA for info on ordering new mats.

WARNING: Teams that participated in TCEA Robotics in previous years may have purchased these mats already, but the mats made after the 2013 competition season have been **redesigned** and made of a **different** mat material due to LEGO Education discontinuing the product. The pattern printed on the mat is identical to previous years, and there are no distinguishing marks on the mat, so it may be difficult to distinguish a previous year's mat from the current year. It is recommended that teams mark the underside of their mats as "2014+" mats immediately upon receiving their mats to identify the mat as a post-2013 mat (taking caution not to mark in an area or in a way that shows through to the front of the mat).

The competition mat was chosen to provide a uniform field layout for the game so that teams and tournaments would be able to reproduce the same field environment for practice and competition. The mat has 5 primary areas that are of interest to "Food Frenzy" – the Garden Zone, the Pod Collection Zone (Barn), Fertile Ground Zone, Robot Start Zone, and the Pod Growing Site. The next several sections describe each area in detail.

1.3.1 The Garden Zone

The Garden is a location within the TCEA test farm where specially-cultivated seeds are planted. Unfortunately, a drought has prevented the planted seeds from getting enough water to be able to grow, and thus this area is completely barren. There are 10 Seed Planting Marks, and these locations indicate where an irrigation system must be placed in order to provide enough water to the seeds for them to grow. Teams are asked to design an irrigation system – the Irrigation Channel - that spans as many of these Seed Planting Marks as possible to provide water to the Garden. The Irrigation Channel is a team-supplied game piece. The only requirement of the game piece is that the Irrigation Channel must be a "continuous" object – meaning that if the Irrigation Channel is made up of multiple parts, each part must be directly touching one or more parts such that there is a continuous "chain" from the first part to the last. To span the Seed Planting Marks, the Irrigation Channel must be either TOUCHING a Seed Planting Mark or be "OVER" the Seed Planting Mark.

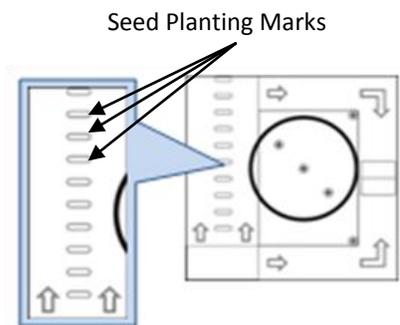


Figure 1 –The Garden Zone

1.3.2 The Fertile Ground Zone

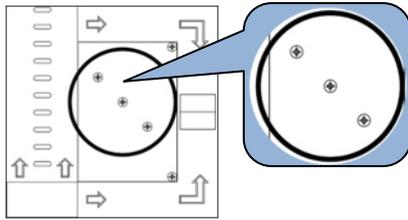


Fig 2 – Fertile Ground Zone

The Fertile Ground Zone is the primary area of the TCEA test farm that is used to grow food. Pretty much anything planted in this area is guaranteed to grow and flourish, thanks to a patented system of compost and fertilization techniques. This area is defined by the interior of the large black circle on the mat – the black circle is NOT part of this zone, but everything within the circle is.

1.3.3 Pod Growing Sites

The Pod Growing Site is a location where a Food Pod is placed in order for the Food Pod to create Food. There are five (5) Pod Growing Sites on the competition field; two outside the Fertile Ground Zone, and three inside the Fertile Ground Zone. Pods that are touching a unique Pod Growing Site (meaning only one Pod is touching a given Site) will grow Food when a “Growth Spurt” is activated by a team. A “Growth Spurt” is activated when a team signals to the referee to trigger the “Growth Spurt” – teams may only trigger a “Growth Spurt” once per game. Pods not touching a Pod Growing Site during a “Growth Spurt” cannot grow Food.



Fig 3 – Pod Growing Site

1.3.4 Robot Start Zone

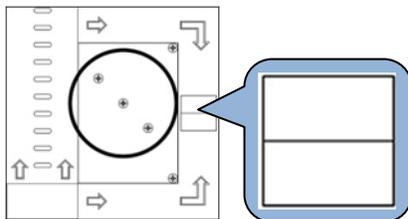


Figure 4 – Robot Start Zone

The Robot Start Zone is where your robot starts the game, and where your robot can be serviced during the game. Robots must have at least one Drive Wheel touching the Robot Start Zone area on the mat, AND the robot must be touching the wall closest to the Robot Start Zone to be considered “IN” the Robot Start Zone (drive wheels are defined as wheels that move when the robot is lifted off the surface of the field). The wall closest to the Robot Start Zone is defined as the “South” border wall, and the wall opposite

the South border wall is the “North” border wall – the North border wall is also the “Center” wall that separates the two game fields.

1.3.5 The Pod Collection Zone (AKA "Barn")

The Pod Collection Zone (also known as the "Barn") is where Food Pods need to be placed for analysis and recycling at the end of the match. Food Pods need to be TOUCHING this area by the end of the match in order to be worth points. It doesn't matter if a Food Pod was used to grow Food or not to be considered for points in the Barn.

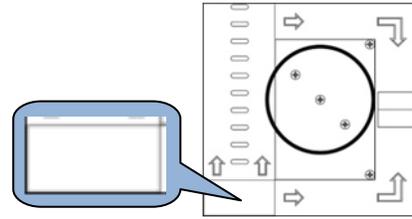


Figure 5 – The "Barn."

1.3.6 Field Setup

The Field Mat for "Food Frenzy" should be oriented such that the Garden Zone is closest to the center wall. Images depicting the mat in sections 1.3.1, 1.3.2, 1.3.4, and 1.3.5 would all have the center wall running vertically along the left (western) edge of the image. If the mat you're provided with is not exactly 4'x4', the mat should be centered on the field such that there is an equal amount of space between the wall and the mat on the 3 sides that does NOT include the center wall; in these cases, double-sided tape (such as double-sided carpet tape) is recommended to help keep the mat in place.

"Food Frenzy" starts with a completely empty game field – no game pieces are set up, configured, or placed onto the game field prior to the start of the game.

Each team is provided five (5) Dura PVC couplers prior to the start of the match. Each team is also provided five (5) practice golf balls prior to the start of the match. One team member must be responsible for managing game pieces.

The team must place the **Irrigation Channel** and **Fertilizer Tower**, if the team has elected to build and use these two team-built game pieces, onto the robot PRIOR to being measured for compliance. These two game pieces must be considered "part of the robot" until they are no longer in contact with the robot. This means these two game pieces must be touching the robot prior to the start of the match, and must be included when measuring the robot for starting compliance. The Team Captain must indicate to the referee what comprises the **Irrigation Channel** and **Fertilizer Tower**, respectively, and also show the referee how these are represented on the Bill of Materials.

Once the **Irrigation Channel** and **Fertilizer Tower** are no longer in contact with the robot, these items are considered Game Pieces from that point on (and NOT as part of the robot). Game Pieces are NEVER allowed to be touched during the match by human hands once they are on the game field.

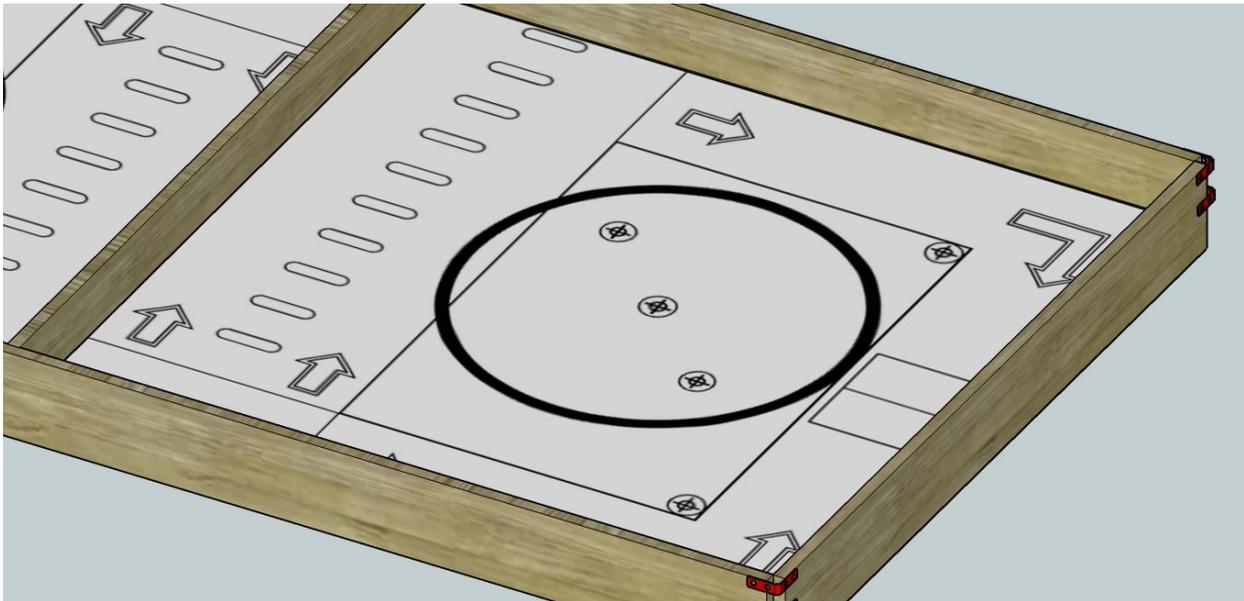


Figure 6 – Example of a properly set up game board

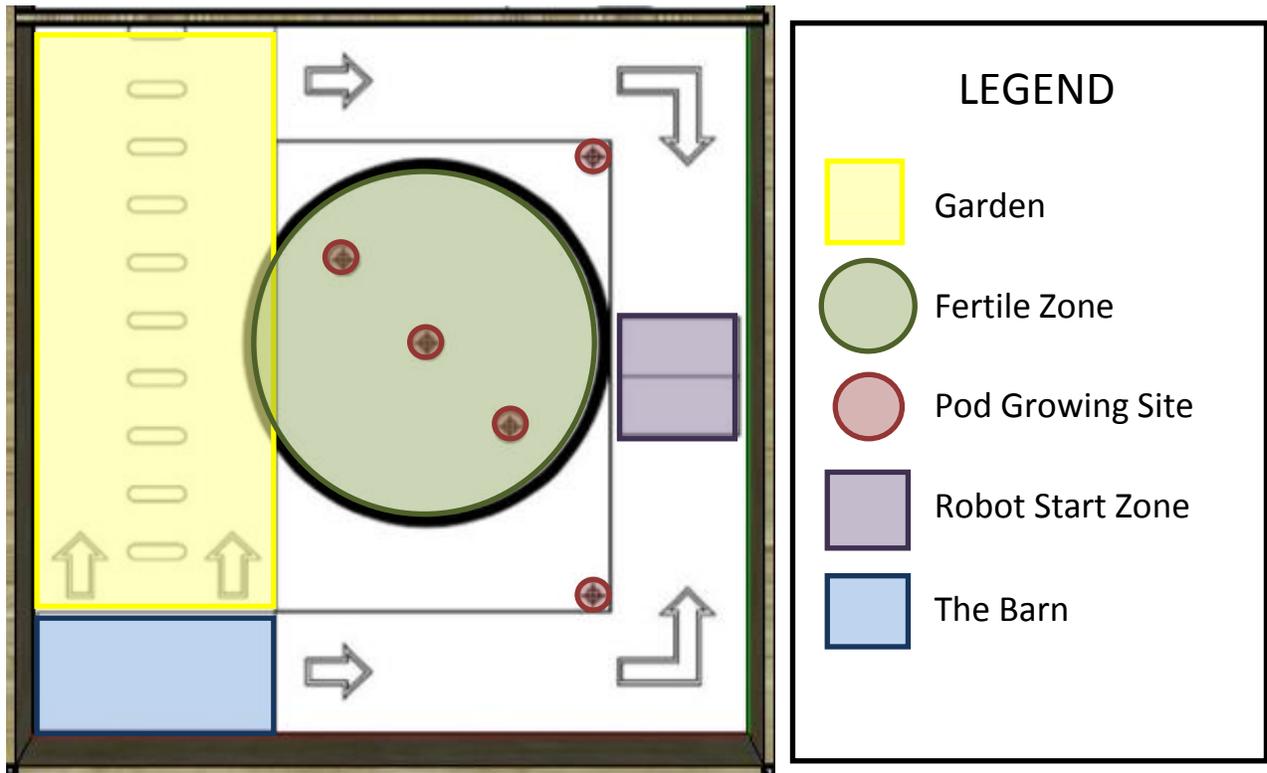


Figure 7 – Zone Breakdown of Game Board (not rotated to represent correct orientation)

1.4 Game Tasks

In "Food Frenzy," a team's robot must perform specific tasks on the challenge field. In Food Frenzy, there are six (6) major tasks to perform. These tasks can be completed in any order (unless the Task specifies otherwise), and not all tasks must be performed. Each task completed by the robot accumulates points, though the tasks are not evaluated until the END of the match (unless the Task specifies otherwise) – if a task is completed, and then undone by robot action before the end of the match, then the task is obviously not completed. Some tasks will grant partial points for completing them partially, while others require the entire task to be completed before any points are awarded.

1.4.1 Erect a Fertilizer Tower

A Fertilizer Tower is essential for a high-throughput farm, especially the TCEA test farm. The Fertilizer Tower stores fertilizer and is used as a compost location. The Fertilizer Tower is essential to the success of the Fertile Ground Zone – it allows the fertilizer to be stored on-site rather than be delivered, saving money and time for the farm.

A Fertilizer Tower is a team-supplied item that must be made from Allowable Materials. For a list of Allowable Materials, please see the Administration Manual – all materials used for the Fertilizer Tower must be included on the team's Bill of Materials. Fertilizer Towers are not allowed to be used without a correctly-formatted and properly completed Bill of Materials. A Fertilizer Tower is considered "Erected" if it is FULLY SUPPORTED by a single wall and extends NO LESS than six (6) inches above the TOP of the wall.

A Fertilizer Tower may be Erected on the East, West, or North (center) walls. Fertilizer Towers Erected on the East or West walls are worth 25 points to the team that Erected the tower, and Fertilizer Towers Erected on the North (center) wall is possibly worth 50 points to both teams. Only one Fertilizer Tower counts per team – the lowest-point tower within the team's area (the center wall is considered part of both team's areas) is the only tower that counts for a team.

For example, Team A erects a Tower on their East Wall, and Team B erects a Tower on the Center wall. Team A will receive 25 points for their Tower, but Team B will receive 50 points for their Tower. If Team A had not erected a tower at all, Team A would have also received 50 points for the tower that Team B Erected. If both teams Erect a tower on the North (center) wall, both teams receive 50 points. If neither team Erects a tower, neither team will receive any Fertilizer Tower points. Opposing teams are NEVER allowed to de-score Fertilizer Towers.

Points Awarded for Erecting a Fertilizer Tower on the East or West Walls: **25 points**

Points Possibly Awarded for a Fertilizer Tower Erected on the Center Wall: **50 points**

Maximum Possible Points Awarded for this Task: **50 points**

1.4.2 Trigger Growth Spurt

Once per match, teams may signal to the referee that they would like to trigger a "Growth Spurt." In order to trigger a "Growth Spurt", the following conditions must be true:

1. The robot is touching the South Wall and is NOT in motion.
2. The robot is not touching any game pieces.
3. There are one or more Food Pods in the Fertile Ground Zone.

When the team triggers a "Growth Spurt", and the referee agrees the conditions are met, any Food Pods uniquely touching a Pod Growing Site may have a Food game piece placed on top of the Food Pod (to represent the Food having been grown on the Food Pod) by the team. This is the ONLY time the team is allowed to place Food on top of Food Pods. The team will also receive 50 points for triggering the Growth Spurt, even if no Food Pods receive Food.

Points Awarded for triggering a Growth Spurt: **50 points**
Maximum Possible Points Awarded for this Task: **50 points**

1.4.3 Irrigate Garden Seeds

The Garden needs watering, and to do this an Irrigation Channel must be erected to support the Seed Planting Marks. In order for a Seed Planting Mark to be considered "supported" by an Irrigation Channel, the following conditions must be true:

1. The Irrigation Channel must be a continuous part – meaning the Irrigation Channel game piece is not separated at any point (all elements are touching other elements to form a "chain" from the first element to the last element).
2. The Irrigation Channel must be either TOUCHING or OVER the mark on the mat – to be OVER, the Irrigation Channel must be breaking the plane of the mark projected up.

An Irrigation Channel is a team-supplied item that must be made from Allowable Materials. For a list of Allowable Materials, please see the Administration Manual – all materials used for the Irrigation Channel must be included on the team's Bill of Materials. Irrigation Channels are not allowed to be used without a correctly-formatted and properly completed Bill of Materials.

Points Awarded for each Seed Planting Mark supported by an Irrigation Channel: **10 points**
Maximum Possible Points Awarded for this Task: **100 points**

1.4.4 Harvest Food

If a team is able to grow Food during a "Growth Spurt", the robot should attempt to Harvest the Food. Food is considered "Harvested" if the following conditions are met:

1. The Food was placed on a valid Food Pod during a "Growth Spurt."
2. The Food is NOT TOUCHING a Food Pod nor the Game Mat.
3. The Food does not leave the Field.

Points Awarded for each Harvested Food: **20 points**

Bonus Awarded for having 3 or more Food Harvested: **50 points**

Maximum Possible Points Awarded for this Task: **150 points**

1.4.5 Collect Food Pods

The Barn is a place to store Food and Food Pods. Food Pods should be taken to the Barn by the end of the match in order for the Food Pods to be analyzed, re-seeded, and fertilized. Food Pods are considered "Collected" if the Food Pod is TOUCHING the area of the mat defined by the Barn at the end of the match.

Points Awarded for each "Collected" Food Pod: **20 points**

Bonus Awarded for having 3 or more "Collected" Food Pods: **50 points**

Maximum Possible Points Awarded for this Task: **150 points**

1.4.6 Bring Food to the Barn

The Barn is a place to store Food and Food Pods. Food should be taken to the Barn to be stored, processed, and taken to market. Food is considered "In the Barn" if the following conditions are met:

1. The Food is considered "Harvested."
2. The Food, or any container the Food is contained within, is OVER the region of the mat designated as the Barn. To be OVER, the Food must be breaking the plane of the mark on the mat projected UP.

Points Awarded for each Food "In the Barn": **20 points**

Maximum Possible Points Awarded for this Task: **100 points**

Section 2 Game Specific Rules

These rules are here to define game-specific actions or specifications, on top of or in replacement of any general rule that might be in place.

Starting Points

- 2.0.1 Teams start out with 100 points.

Robot Start Configuration

- 2.0.2 Robots must start the match with at least one drive wheel touching the Robot Start Zone AND must be touching the wall closest to the Robot Start Zone. Robots may start the match at any location within the Robot Start Zone and in any orientation as long as these rules are followed.
- 2.0.3 At the beginning of the match, the robot shall be no larger than a 12 inch cube, unrestrained – the "Robot" is defined by everything the team brings to the table for the game (including team-supplied game pieces). This means that at rest, with nothing holding any part of the robot back, the robot's dimensions measure no more than 12" x 12" x 12" in size. There is no weight limit on the robot. While the robot is active in play, there is no restriction on the size of the robot.

Robot Recovery and Restarts

- 2.0.4 During match play, team members are allowed to "recover" their robot during play from anywhere on the game field – this is equivalent to having a recovery team retrieve the robot from the test facility. If a team decides to recover their robot (by initiating touch contact with the robot):
- Any game pieces touching the robot (except team-supplied game pieces and "Harvested" food) are **removed from play**.
 - The robot is "disabled" and immediately returned to the Robot Start Zone.
 - The team will incur a touch penalty of 10 points.

A team is allowed to "recover" their robot **up to 10 times**. Once a robot begins motion, the robot is considered "active" and if touched will incur this touch penalty.

- 2.0.5 Food that is "Harvested" and touching the Robot is considered "part of the robot" for purposes of robot recovery, and is not removed from play during a robot recovery. Food is considered "contained within the robot" if the Food is in physical contact with the robot, but not in contact with any game piece, field element, or the mat.
- 2.0.6 While the robot is "disabled" within the Robot Start Zone, the team may change programs or repair/rebuild the robot. No new outside parts may be added to the robot, but parts may be removed – and once they are removed,

and the robot restarted, they may not be re-added to the robot. The robot may be started again anywhere within the Robot Start Zone as long as ALL of these following conditions have been met:

1. Some part of the robot is physically touching the Robot Start Zone AND the wall closest to the Robot Start Zone.
2. **The robot is no larger than 12" cubed** – referees will estimate robot size, and if the referee determines the robot is likely still within size the team may immediately restart the robot. If the referee feels the robot is not within size, the referee will quickly remeasure the robot.

Field Variance and Game Debris

- 2.0.7 Robots must be able to handle some field variances, such as tolerances in board length/width/height and slight waviness in the field mat. Teams should not rely on specific field attributes that can vary with tolerances (such as the amount of spacing under the center wall, the vertical angle of the field walls, etc...) when designing their robots.
- 2.0.8 Teams may request that any element - that is not a part of their robot or was not presented to the team at the start of the match (e.g. their Food or Food Pods) – be immediately and permanently removed from the field of play at any time during a match if that element resides on their half of the playing field. Such elements would be considered, "debris," and could be (but is not limited to) stray parts from the opposing team's robot and/or game pieces from the opposing side of the playing field. These elements are to be held by the referee until the end of the match.

Special Game Piece Interactions

- 2.0.9 Food Pods are given to teams prior to the beginning of the match. Teams may "introduce" a single Food Pod to the robot in either of two ways:
- (1) Each time the robot is recovered and disabled via a touch penalty, or prior to the beginning of the match, a single Food Pod may be placed such that it is touching your robot (may be on top of the robot, on the mat next to the robot, etc...). Food Pods do NOT get included in the size restriction for a robot.
- OR**
- (2) Whenever there is NOTHING within the Robot Start Zone, a single Food Pod may be placed anywhere **completely within** the Robot Start Zone by a team member.
- 2.0.10 Teams must have a properly formatted and correct Bill of Materials to be allowed to score any points for tasks 1.4.1 and 1.4.3, whether the team uses any of their own team-supplied game pieces or not. Even if the scoring conditions are met without any input from the team, the absence of a

properly formatted and correct Bill of Materials negates any score for those tasks.

- 2.0.11 Fertilizer Towers successfully erected on the Center Wall may not be intentionally or unintentionally de-scored. If a Fertilizer Tower is successfully erected (and meets all of the requirements of a successfully erected Fertilizer Tower) - and either robot then de-scores the Fertilizer Tower - the opposing team (from the team who de-scored the Tower) will receive points for an erected Tower but the team who de-scored the Tower will not; unless, of course, a tower is successfully erected on the center wall *by either team* by the end of the match.
- 2.0.12 Team-Supplied Game Pieces are considered PART OF THE ROBOT until they are intentionally removed/dropped/detached from the robot. Once a Team-Supplied Game Piece has been intentionally removed/dropped/detached, the Game Piece can no longer be touched/recovered by Team Members and may no longer be considered PART OF THE ROBOT for the remainder of the match.

2.1 State Championships Variation

It has become a kind of tradition to have a variant to the rules for the State Championships. This gives teams an extra "something" to strive for, and if known in advance teams can design for it in the beginning.

- 2.1.1 In the State Championships ONLY, there will be a 20 point bonus for each Food grown during a "Growth Spurt."
- 2.1.2 In the State Championships ONLY, robots that are COMPLETELY OUTSIDE any defined area on the game field at the end of time are awarded 50 extra points. This means robots cannot be partially or completely within the Garden, Barn, Fertile Ground Zone, Robot Start Zone, or a Pod Growing Site.
- 2.1.4 In the State Championships ONLY, the ranking score will be determined by averaging ALL THREE (3) matches played by a team – no scores are dropped.
- 2.1.5 In the State Championships ONLY, teams are not allowed to use adhesives on ANY field surfaces (walls, game mat, etc...).

Section 3 Game Intent FAQ

In this section, the game designer answers some of the most frequently asked questions about the Food Frenzy game (and some questions the game designer knows is going to be asked before they're actually asked). This is designed to help teams and referees understand the task rules, scoring methods, and anything else related to the game and its mechanics.

3.1 Did you just completely "rinse and repeat" the towers from last year?

Yup, pretty much. I removed the emphasis on the towers from the State Variations, but for the most part left everything mostly intact. The survey I sent out seemed to indicate that most sponsors liked the team-supplied game piece concept, though less than half of the teams actually made use of it last year. So I'm giving teams another chance. Do I worry that teams who played last year have an advantage? Nope, I mostly worry that teams who didn't try it last year won't try it again this year.

3.2 Is it intentional that there's no Intermediate vs Advanced difference?

You betcha. I generally reserve those kinds of differences for tasks that I deem as being "too difficult" for Intermediate teams to accomplish outright, and so would then offer something more attainable via a rule difference. I found this year everything was pretty much doable by everyone, so I spared the referees/sponsors/teams from having to keep track of a set of rule differences.

3.3 Why are there two methods for introducing the Food Pods to the field/robot?

Originally there was just one, but a sponsor who reviewed the game rules before they were released suggested offering a variance for teams who wanted to go penalty-free and get creative with additional autonomous programming. I loved the idea, and thus added the entire suggestion into the rules.

3.4 Why does it feel like Tasks 1.4.4, 1.4.5, and 1.4.6 are the same thing?

I agree, the wording of those tasks seem eerily similar, but I promise they are indeed rewarding different behavior. These tasks, along with task 1.4.2, are part of a single "story arc" within the rules of the game. There are, in essence, 3 different "story arcs" within this game: (1) Set up a Fertilizer Tower, (2) Set up an irrigation system, and (3) grow food, harvest the food, and take everything to the Barn. Arcs (1) and (2) have a single task that is completely independent of any other task in the game, but arc (3) almost requires tasks to be done in a specific order (and complete each) for the tasks to be completed. For instance, you've got to place Food Pods and cause a Growth Spurt

(Task 1.4.2) in order to grow food. You cannot Harvest Food (Task 1.4.4) without having caused food to grow, so Task 1.4.4 is dependent upon getting results from Task 1.4.2. And you cannot bring Food to the Barn (Task 1.4.6) without Growing and Harvesting the food (Tasks 1.4.2 and 1.4.4). However, you CAN take Food Pods to the Barn (Task 1.4.5) without having caused a Growth Spurt nor Harvesting Food. I tried to give teams of all difficulty level something they can easily do, and also something to strive for, while maximizing variability in how teams solve the challenge(s) put forth to them. Rookie teams can find multiple tasks that they can easily accomplish, and the veteran teams will certainly put forth the extra effort required to make their robots more reliable and repeatable – the long story arc provides lots of room for making mistakes (thus minimizing the need for tie breakers).

3.5 Why doesn't a Food Pod have to be on a Pod Growing Site, instead of being within the Fertile Ground Zone, in order to trigger a "Growth Spurt"?

It's true that Food Pods that are NOT on a Pod Growing Site will not create Food when a Growth Spurt is triggered. However the Pod Growing Sites are really small, the Fertile Ground Zone is so big, and you don't have to actually create any food in order to get points for triggering the Growth Spurt (Task 1.4.2). So I "gave" this one to intermediate teams who might not be so consistent with always hitting the Pod Growing Sites with the Food Pod (PVC tubes), so hopefully now it's likely they'll always be able to get points for the Growth Spurt (Task 1.4.2), but it's not always guaranteed they'll be able to follow the entire third story arc.

3.6 So what's the game this year?

Yeah, I get this question every year. In the rules I specify the scoring condition as specific and clear as I can, but try to leave more of the details of how it's done to the reader (so as to not give away too many solutions). However, those who don't carefully take the time to analyze the game can get lost in those details, so sponsors have always asked on the forums for a "high level view" of the game. Maybe one day we'll have a Game Animation that shows how the game works while providing outlandish scenarios that teams would never attempt to replicate while still explaining how things are expected to be done. And maybe one day I will win the lottery and have time to do that. Until then, this brief section will have to suffice.

As I've tried to allude to throughout this FAQ, there are 3 unique story arcs in the game. The first two deal with team-supplied game pieces, and the third follows a sequence of tasks intended to mostly be done sequentially. The first thing teams are asked to do (**Task 1.4.1**) is erect a Fertilizer Tower on the North border wall (the North border wall is the center wall between the two fields). A team must have a valid Bill of Materials

(BOM) that accurately depicts the non-LEGO parts used on the robot (while also indicating that LEGO parts are used) in order to be allowed to score points for this task. The second thing teams are asked to do (**Task 1.4.3**) is create an Irrigation Channel to connect as many marks as possible in the Garden Zone – no, there's no "start" or "finish" or "required marks to connect", just the longest chain of connected marks is all that's required. BOM rules apply here as well. Both the Tower and the Channel can be made out of "whatever" as long as it's indicated on the BOM (and is legal to the BOM rules regarding price). The third thing the robot has to do is "everything else" – for full points, the robot is expected to: (1) Place the PVC pipes (Food Pods) on the Food Pod Sites, (2) Put the wiffle golf balls (Food) on the Food Pods (**Task 1.4.2**), have the robot collect the Food off the Food Pods (**Task 1.4.4**), and take both the Food Pods to the Barn (**Task 1.4.5**) and the Food itself to the Barn (**Task 1.4.6**). All in under 2 minutes while trying to rack up as few touch penalties as possible (**Rule 2.0.4**).

3.7 You gotta be kidding me – my team has to hold on to PVC tubes and Wiffle Golf Balls during the match?

Yeah, I recommend you bring a box or something to put everything in. And make sure the referee gets everything back at the end of the match.

3.8 What is a Bill of Materials, and why do you require it?

Every year I get this question, and sometimes even at the events. Sometimes even the State Championships. So for once and for all, here it is. I understand that it's tough to make robots entirely out of LEGO pieces. Sometimes a creative solution can be had by just adding one or two non-LEGO items. TCEA allows you to do that, but you have a spending limit in order to keep things fair, and a requirement to track this. Even if you use no non-LEGO items, the Bill of Materials is like testimony saying, "Hey, I only used LEGO parts in my robot." Please review the Admin Manual to see the correct format for a Bill of Materials. The document is even searchable, please make sure you search for it.

3.9 Is there a place where I can ask questions if this FAQ isn't enough?

You betcha! Check out the TCEA Robotics Forum on the web!
<http://forum.tcea.org/>

3.10 What happened to Danny?

I'm sad and excited to say that Danny followed his passion for robotics and took a job in New Hampshire (yes, he's quite aware it gets very cold there) working for **FIRST**. While he'll miss Texas and everything that goes with it, he'll miss TCEA the most. He'll still be

around, remotely, but his geographic distance will prevent him from participating in the same way he has in the past. More than ever TCEA needs a "few good ladies/gents" who can step up and follow in Danny's footsteps. If you're interested in helping out, please contact Katie Treat (treat@tcea.org).

3.11 Is there any expectation that the fields will be level? I mean, you've introduced balls into the competition that roll...

No, there is no expectation that the fields will be level. The expectation is that you'll figure out how to manage the balls without allowing them to escape you. Once the balls are out of your control, they can go pretty much anywhere on their own.

3.12 What happens when a team calls for a Growth Spurt, but their robot begins moving and displaces the Food Pods before the Food has been placed?

When a team calls for a Growth Spurt, it's assumed the team is in control of their robot and that their robot will generally not contact the Food Pods until the Food has been placed. The Growth Spurt is intended to be valid for only the Food Pods in their correct positions at the time the Growth Spurt is called. If the robot touches a Food Pod after calling for the Growth Spurt but prior to the Food being placed on the Food Pod, the Food (ball) for that Food Pod is considered out of play and must be returned to the Referee as unplayable.

3.13 I understand that the rules start off as DRAFT, and can be changed until they are finalized. When will the rules be finalized?

The rules are generally finalized towards the middle of October. If you find rules that don't make sense after that point, the rules will be followed to the letter of the rule as written. So it's in everyone's best interest to make sure the rules are bullet-proof by then – so please help us vet the rules and make suggestions/corrections/questions on the forums (<http://forum.tcea.org/>) ASAP! The final rules will be marked as such on the title page, and have a history which includes the Final rules changes. The FINAL rules are the only ones that will be accepted/referenced at competition – BE SURE to bring a copy of the final rules to the competition with you!

3.14 If the robot comes back to the Robot Start Zone on its own, can I grab the robot and reset it without penalty?

No. The last time this was allowed was in 2011 ("Hot Rod"). There is absolutely no provision for this behavior in "Food Frenzy." Any human contact with a robot will incur a penalty, and will be subject to Rules 2.0.4 and 2.0.6 without exception.

3.15 When I place a Food Pod on the field, can I place something on top of the Food Pod so that the Food isn't touching the Food Pod?

No. The Food and Food Pods are considered Game Pieces – you cannot place items on top of the Food Pods because everything you “own” must start out on the ROBOT, not in your hand. Can your robot place something on the Food Pod before it positions the Food Pod on the board? Yes, it can. However, Food may ONLY be placed on UNMODIFIED Food Pods. So if the Food Pod has anything on it, touching it (except the Game Mat), or in it, Food is not allowed to be placed on it. Good attempt at busting the “Harvest” rule, but I must disallow this behavior.