

## Flora vs. the Undead

**TIME: 2 hours**



Just in time for the 2013 IT Olympics, we have created an interactive “Plants vs. Zombies”-style video game for you to enjoy. The catch is, in order to play (and win), you have to learn a new programming language, the Flora Programming Language (FPL).

The gameplay is simple, yet addictive. You are in control of defending Hilton Coliseum from a ravenous horde of zombies. Luckily for you, there are many helpful plants that you can use to defend against the onslaught. The FPL syntax allows you to select your plants, strategically place them in the scene, fire at oncoming zombies, and move and replace plants as necessary. Additionally, a portal may be purchased and placed to redirect zombies to opposing team’s sides. All teams’ scores will be calculated as follows:

- If a zombie is killed, that team receives 5 points.
- If a zombie makes it into Hilton, that team loses 10 points.

You are given the FloraVsUndead game executable, as well as sample FPL files that you can edit. The game can either be run using a single FPL file (for testing your individual team), up to four FPL files (for the competition part). Let’s explore the syntax of the default.fpl file:

```
select P1.wallnut
```

allocates a Wall-Nut (they are used for defense, see below) to be purchased and sets its name to P1. Your FPL program should allocate as many plants/portals as you like, given a total cost constraint that is map-specific.

```
select P6.peashooter
```

This allocates a Peashooter to be purchased. These plants are offensive and must be fired (see below) to prove useful.

```
select P3.portal
```

allocates a Portal to be purchased that will redirect zombies to the opponent situated horizontally from you (other options are v\_portal and d\_portal for vertical and diagonal – if no direction is given, h\_portal is the default). These devices score no points, but can be used to redirect zombies over to your enemies' side. Portals are relatively expensive and have limited health, so must be used strategically to maximize effectiveness.

Both offensive and defensive plants and portals contribute to the overall budget, so as part of your FPL program you will have to decide to what extent you want to allocate defensive versus offensive resources.

```
place P1 1, 7
```

is a command that places a plant in your team's allocation (selected above as a Wall-Nut), specifically at location Row 1, Column 7. The valid coordinate range for plant/portal placement is rows in the range [1, 5] and columns in the range [1, 9], with location [1,1] reserved for the Hilton scoreboard. Experiment with these parameters to see which placements work best for your team!

All plant/portal allocation and initial placement must be conducted in the very beginning of your program before the “Start” label, and then can be used later in the code. Plants can then be dynamically placed and moved as the game progresses, so keep this in mind as you plan your strategy!

```
Start: if P6.ready, fire P6
```

is the first command of the file that will execute once the game has begun. This command begins with a label (“Start”), ensures that a plant P6 exists and is ready, and fires it once. Each command is executed line-by-line, so to guarantee a perpetual loop, you will want to end with

```
goto Start
```

(or something comparable), which will ensure that commands such as “fire” that are desired to be repeated are executed more than once.

# CHALLENGE 2

Experiment with the FPL syntax on your own for the first half of this challenge. You can find more helpful tips commented in the various example FPL files provided for you.

After some preliminary tests, your team will be entered into a double-elimination style tournament against the other competitors. It is recommended to create separate scripts for each round as more money is allowed in later rounds and the zombies become much harder to stop!

The selectable plant classes are a subset of the familiar choices from the original Plants vs. Zombies game, each with their own abilities and benefits to explore.

Name	Ability	Cost
<b>Peashooter</b>	Shoots peas at zombies. Each pea does one point of damage.	100
<b>Repeater</b>	Shoots peas at twice the rate of the Peashooter.	300
<b>Gatling Pea</b>	Shoots peas at twice the rate of the Repeater.	450
<b>Snow Pea</b>	Shoots frozen peas that damage and slow zombies.	175
<b>Wall-nut</b>	Much stronger than most plants and protects anything behind it.	75
<b>Tall-nut</b>	Stronger than a Wall-nut and can't be jumped over.	200
<b>Chomper</b>	Eats any zombie in front of itself, but is vulnerable while chewing.	150
<b>Portal</b>	Sends zombies to other teams, either horizontally (h_portal, default), vertically (v_portal), or diagonally (d_portal).	500

# CHALLENGE 2

The plants are not the only things in the game with special abilities, though. In order to succeed, you will have to defeat a number of different types of zombies.

Name	Characteristics	Health
<b>Zombie</b>	A normal zombie	10 (10 hits by normal peas)
<b>Flag Zombie</b>	Moves slightly faster and signals a huge wave incoming	10
<b>Conehead Zombie</b>	Headwear Zombie, uses a traffic cone to protect itself	28 (18 for Roadcone)
<b>Pole Vaulting Zombie</b>	Vaulting Zombie, single jump; jumps over the first plant it encounters with a fiberglass pole	17
<b>Buckethead Zombie</b>	Headwear Zombie, has a bucket that is extremely resistant to damage	65 (55 for Bucket)
<b>Newspaper Zombie</b>	Shield zombie, moves slowly at first, moves twice as fast and grunts after his Newspaper is destroyed	16 (8 for Newspaper)
<b>Screen Door Zombie</b>	Shield zombie, is not affected by Snow Peas unless the Screen Door is removed	65 (55 for Screen Door)
<b>Football Zombie</b>	Headwear Zombie, very durable, moves fast	80 (70 for Football Helmet)
<b>???</b>	A special surprise!	???

Your task is to build a team that can score the most points in a given round. The basic rules will not change, but some aspects like the amount and types of zombies and the budget constraints will be modified as the competition progresses.

Please test your FPL files before submitting, to make sure that they compile correctly.

Most importantly, have fun!