Algebra 055 Project

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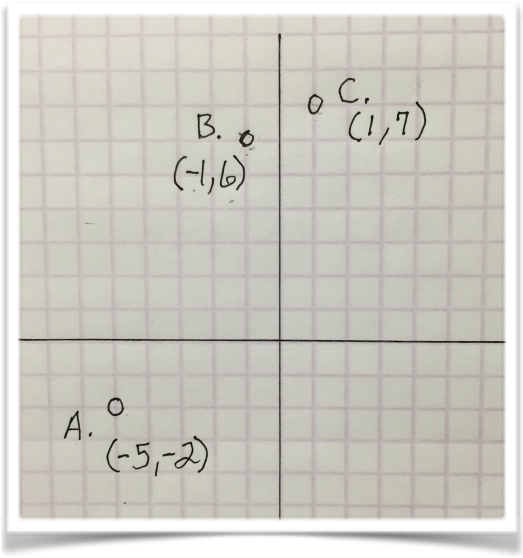
Laser Beams in Space

(or, Do points intersect a given line?)

When I'm not doing homework I spend my time writing computer games for mobile devices, so choosing a project that was "game based" was a given. While there are many ways to accomplish the task I'll be using as an example, this solution shows how plotting points and using linear equations can get the job done.

Question: If we have a laser cannon pointing in a certain direction, can we tell whether an enemy ship will be hit when we fire the laser?

Here's the graph we'll be using:



The point marked A is the laser gun and points B and C are the enemy ships. The laser at A is set up with this equation:

$$y=\frac{3}{2}x+5\frac{1}{2}$$

Using that equation we need to determine whether either of the enemy ships will be blasted to smithereens when we fire the laser. This is easily shown by plugging the point for each enemy ship into the equation to see if we get a true or false statement.

- A true statement means the enemy ship is on the line given by the linear equation and it will be killed by the laser blast.
- A false statement means the enemy ship is NOT on the line and so the laser blast will miss.

Let's try the B enemy ship found at the (-1, 6) location. We can rewrite the equation using those values for x and y:

$$6 = \frac{3}{2}(-1) + \frac{11}{2}$$

Notice that I turned the 5 and 1/2 into a fraction since our slope is already a fraction.

On the right side of the equation we end up with 8/2, or 4, and that does not equal the 6 on the left side of the equation. So this statement is false which means the laser blast missed the B enemy ship! Crimeny!

Plugging in the values of the C enemy ship found at (1, 7) gives us this equation:

$$7 = \frac{3}{2}(1) + \frac{11}{2}$$

Handling the right side of the equation gives us 14/2, or 7 and since that equals the 7 on the left side of the equation it's a true statement — the point is on the line from the laser cannon — and it means we blasted the C ship out of the galaxy! Hoorah!

This is a simple example of using algebra in a real world situation. Well, a real world situation if you're repelling aliens from your home world — or, making fun video games!

A video version of this example can be found on YouTube:
http://youtu.be/4nEMbNV-Fqw