

## IGN Application

<http://code.ign.com/foo>

Answer the questions below and push them to a github repository. Then, send us an email with a link to your repository at [code-foo@ign.com](mailto:code-foo@ign.com) by April 30th 2012. We'll notify you by May 18th if you've made the cut.

1. How many ping pong balls would it take to fill an average-sized school bus? Describe each step in your thought process.
2. Create a liquid layout with HTML, CSS, and Javascript. This layout must support the following resolutions: 1024x768, 1680x1050. Explain why you would use a liquid layout.
3. You own a license plate manufacturing company. Write a program that takes a population and determines the simplest pattern that will produce enough unique plates. Since all the plates that match the pattern will be generated, find the pattern that produces the least excess plates. Use a combination of letters (A-Z) and numbers (0-9).

### Example 1

Population: 10

Pattern: 1 number

Total Plates: 10

Excess Plates: 0

### Example 2

Population: 25

Pattern: 1 letter

Total Plates: 26

Excess Plates: 1

Bonus 1 - Submit a short video (less than 2 minutes) introducing yourself, showing your passion for IGN, and telling us why you're a good fit for Code-Foo.

Bonus 2 - Programmatically create a game of Connect 4 with one AI-controlled opponent and a human-controlled player.

## Answers

1. First of all, I need to know how big is an school bus. According to some websites I found out that it's approximately 2.5m height, 2.5m width and 12m long.

The ping pong ball diameter is 40mm.

I am going to use the Kepler Conjecture. From Wikipediadia we have: "The Kepler conjuecture, named after the 17-century German astronomer Johannes Kepler, is a mathematical conjecture

about sphere packing in three-dimensional Euclidean space. It says that no arrangement of equally sized spheres filling space has a greater average density than that of the cubic close packing and hexagonal close packing arrangements. The density of these arrangements is slightly greater than 74%."

The wikipedia also says that the density achieve if the spheres are dropped randomly in the cube would be about 65%.

So I am going to consider a value between these two: 70%.

If I consider that the seats and other objects can occupy 15% of the interior space we have:

Total volume inside the bus =  $2.5 * 2.5 * 12 = 75$  cubic meters.

Volume considered (without the seats) =  $75 * 0.85 = 63.75$  cubic meters.

Total volume of ping pong balls =  $63.75 * 0.7 = 44.625$  cubic meters.

The volume for a single ping pong ball =  $(4 * \text{PI} * \text{pow}(0.2, 3)) / 3 = 0.0335$  cubic meters

The aproximate number of ping pong balls inside the school bus is:  $44.625 / 0.0335 \sim = 1332$  balls (ignoring decimal digits).

2. The liquid layout is largely used specially by e-commerce websites. It is useful to display as many products as possible in the browser window because it expands and contracts to fill all the available space. It is also useful for those who likes to resize the page font size, so the layout won't break with this.

3. There are 10 options for numbers and 26 options for letters.

If you think about this as a math problem, you would have:

$26^x * 10^y = \text{population} + \text{excess}$

We need to find x and y in a way that excess is minimum.