

**Question 1:**

How many pennies could you put on the Golden Gate Bridge without any of them overlapping?

**Thought Process:**

**Step 1:** Calculate the surface area of one side of a penny.

The area of a circle is  $\pi r^2$

According to [usmint.gov](http://www.usmint.gov), the diameter of a penny is 19.05mm.

[http://www.usmint.gov/about\\_the\\_mint/?action=coin\\_specifications](http://www.usmint.gov/about_the_mint/?action=coin_specifications)

The radius of a penny is 9.525mm.

The surface area of the penny is 285.022957mm or 2.85 cm<sup>2</sup>.

**Step 2:** Calculate the surface area of the golden gate bridge.

Here I assume that “on the Golden Gate Bridge” means on the road and NOT every surface of the bridge(covering the entire bridge with pennies). Calculating the surface area of the entire bridge is significantly more difficult than simply calculating the surface area of the road so I believe that this is a logical assumption. Therefore I am only finding the surface area of the road.

According to Wikipedia the Golden Gate Bridge is 2,737.4m long and 27.4m wide.

[http://en.wikipedia.org/wiki/Golden\\_Gate\\_Bridge](http://en.wikipedia.org/wiki/Golden_Gate_Bridge)

Therefore surface area of the road of the Golden Gate Bridge is (2,737) \* (27.4) or 74,993.8 m<sup>2</sup>

**Step 3:** Divide the surface area of the Golden Gate Bridge by the surface area of a penny.

The surface area of a penny in meters is 0.0285m<sup>2</sup>.

74,993.8 / 0.0285 = 2631361.4

**Answer:** 2,632,361 pennies

**Question 2:**

Our images have a ratio of 16:9, and our design layouts have 12 pixel wide increments (there are no limits on height). Give examples of three image sizes that would have the correct ratio and would fit the design layout.

The image sizes that would work here are images with widths that are common multiples of 16 and 12. In order to find these widths you must first find the least common multiple of 16 and 12 which is 48. From here you can multiply 48 by any positive number to get width values that are multiples of 16 and 12. To find the heights of the width values you can simply divide the width value by 16 and multiply the result by 9. Here are three image sizes that meet these requirements:

1. 720 x 405
2. 480 x 270
3. 240 x 135

### **Question 3:**

What is the minimum number of moves required for a knight to cover the entire chess board? Write a program to prove it. Provide a graph with the move number on the x axis and the number of squares covered on the y axis.

The minimum number of moves required for a knight to cover the entire chess board (Knight's Tour) is 64 moves (This assumes that the starting tile counts as one move). It is possible for the knight to cover all 64 squares of the chessboard without ever moving to a previously visited square.

One way to prove this is by using Warnsdorff's Algorithm. This algorithm states that you should start at any square on the board and choose moves that give you the least amount of subsequent moves all without moving to any squares that have already been visited.

I have designed a program in Java that proves that a Knight's Tour can be done in 64 moves.

The program prompts the user for a starting position and then proceeds to traverse the board using Warnsdorff's Algorithm and announces each move that is made. I represented the chess board as graph using an `ArrayList<ArrayList<Integer>>`. Each `ArrayList` with `ArrayList` contains two integers representing the x and y coordinates of a space. I set up the graph to be numbered from 0 to 7, so I could use the indexes of the `ArrayLists` for several purposes. Although this numbering system isn't what you would normally see on a chessboard, it does not affect the results of the program.

Once the program is done traversing the board, I call a method called `validate` that checks to make sure that every square on the board has been visited. This method confirms the results by printing "All Squares Visited!"

I'm not really sure what you guys meant when you said wanted a graph. Maybe if someone was using a brute force method for proving the answer, a graph of each attempt would be helpful to show that the minimum is 64. However, it is impossible to cover 64 spaces in less than 64 moves, and I have proven that a knight can achieve this minimum.

**Question 4:**

It's very hard to express how much I would love to work for IGN. I have visited the site almost every day for at least the last ten years if not longer. I can't even remember how long it has been anymore. I know that you guys work very hard and have lots of fun and I would consider it an utmost honor to join your team. Now I know you guys want this response to be creative, so I called upon the powers of PhotoShop and made something cool. I hope that the image I've included in my repository shows that I have the passion that you guys are looking for. Thank you for your consideration.