**Question 1 - Pennies**

**NOTE:** In calculating my answer, I treat the bridge as a flat surface with no walls at the edges (kind of like a very long table). Also I don’t use the total width of the bridge in my calculations, which is reported to be 27 meters. Instead, I add the width of both sidewalks and the roadway together to get 25 meters. I consider this to be the usable width of the bridge for the purposes of this problem.

First of all, let’s find out how many pennies fit across the length of bridge in one column.

**Golden Gate Bridge stats:**

L = 2737m

W = 27m

wsidewalk = 3m

wroadway = 19m

d = 1.9cm

∆d = 1.7cm

You can actually fit 144053 pennies in every odd column and 144052 pennies in every even column using the placement technique shown above. The end pennies in the odd columns would partly be extending past the length of the bridge but not by more than 1/3 of the diameter or so. Next, we determine how many pennies can fit across the bridge in one row

As far as rows go, you could fit 1469 pennies across the width of the bridge. However, there would still 0.471 \* 1.7cm = 0.8cm of room left to spare. Assuming you could move all the pennies a little bit (about 0.45cm) in one direction, you could fit another column of pennies on the bridge. Thus, you have 1470 columns of pennies across the bridge, with odd columns containing 144053 pennies and even columns with 144052 pennies. Ignoring any support structures that would take up small areas of the bridge, my best estimate is that

pennies could be placed on the Golden Gate Bridge without any overlapping