**Computational Thinking Assignment PART 3 – Report**

Billy Bonka set out a number of restraints with which the optimal box of chocolates had to follow.

These restraints were:

1. Production Cost was less than or equal to £1.96
2. Number of Chocolates was more than or equal to 14
3. Chocolates could not be duplicated

The “optimal box” in this case was the box that had the highest retail value from the chocolates it had.

I found the optimal solution by enumerating through all possible combinations and comparing the total retail value of the combinations. If the box met the restraints and had a higher retail value than the previous best solution, it was set as the new best solution.

This solution has a Big O of n2 ( O(n2) ), so for a potential combination of 20 chocolates total, which was the selection Billy Bonka allowed, it is definitely applicable, and modern systems can go through the solutions in a short time space, however this solution scales very poorly, with more items creating a large amount of extra solutions, due to how squared numbers increase exponentially, to the point it would take far too long to sort through every possible solution.

To circumvent this issue, a different method of finding the solution could be used, such as Branch and Bound, which “branches out” from the first term to consider the next terms, ignoring a specific term and all solutions with it if that overall solution is worse than an alternative choice or if including that term breaks any of the constraints. By cutting out certain “paths”, it greatly reduces the amount of solutions it checks, making processing time much faster.

Another issue is that Billy optimised for retail value rather than total profits. To change this, the algorithm could check the Retail Price minus Production Cost to find the Profit, and select the solution that fits the restraints with the highest Profit value rather than the highest Retail Price, so the solution given would have maximised profits.