**Modelling of the problem**

The function that describes the coins received by each pirate (tc) is:

Where:

* t = total amount of coins (treasure)
* tc = amount of coins the captain receives
* p = number of pirates that receive loot

The conditions given are:

1. t < 1000
2. tp != 0 and p != 0; pirates must have at least 1 coin each, and the solution is non trivial
3. ; he chooses a group of 99 pirates and he receives 51
4. ; he chooses a group of 77 pirates and he receives 29
5. all variables are discreet variables (can’t divide coins or pirates[[1]](#footnote-1)).

**Solving**

The first thing I tried was to think this as an optimization problem and applying some calculus to find extrema, however, as variables are discreet, I preferred not to continue with that.

Knowing that there were not many values t can get (t<1000), and that there is a unique value for t that both conditions 3) and 4) should satisfy, decided the easiest way to solve this was to try every possibility for t to find the answer.

In the excel file (math.xls) that comes with this file, I calculated tp for each t = 999, 998, 997… and so on for both conditions 3) and 4).

Then, for each condition I found only the values of tp that are integers, and then, the values of t which have an integer value for tp in both condition.

The only value of t that satisfy this, is t = 645. And now our function is:

Satisfying condition 3), he chooses a group of 99 pirates that receive 6 coins each, and he receives 51.

**Satisfying condition 4), he chooses a group of 77 pirates that receive 8 coins each, and he receives 29, and this answers the questions as the amount of coins given is maximized.**

1. A pirate with a wooden leg or an eyepatch still counts as p=1. [↑](#footnote-ref-1)