COMP526 Programming Puzzle 1
Part 1: Report

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At the beginning, I cannot found the best solution to calculate the smallest height, so the most nature strategy is always cut the highest bamboo(Gąsieniec et al., 2017), but the problem is this strategy cannot programming a suitable perpetual schedule, fortunately, question Equals is not complex question, so I found the solution after just a couple of attempts, the minimum height is 40 and since the growth rate is only 10 and 5, it's easier to just cut the bamboo and cut it again after three days. The second question is basically the same the solution, but other question is difficult to guess the solution. Since the main challenge, keeping all bamboos as low as possible to finding the smallest, so I wanted to find the patterns, such as set a value that I think is reasonable and calculate whether it is reasonable by how often it is cut.

Secondly, I wanted to find a formula that would automatically help me find the minimum height, which I anticipated by calculating how often the bamboo would need to be pruned every few days that passed and extrapolating the maximum height from the maximum growth rate. Assume we have bamboos $b_0\ to\ b_{i,}$, and set each one to have a cut frequency and set a theoretical smallest height t, which is said to be feasible if the frequency P is less than 2 on the same day. We can use a formula to verify that:

$$P = \sum \frac{1}{t/b_i}$$

The theoretical smallest height divided by the growth rate gives the result, which needs to be cut every few days to find the inverse of this, the sum of each item in the array must not be greater than 2. If it is greater than 2, it means that more than 2 bamboos must be cut at the same time on the same day, which exceeds the requirement of only 2 bamboos per day as specified in the question. I made a program "Max height.py" in the second part to test my suspicion and repeatedly experimented with it to iterate its correctness, after which it helped me to calculate the theoretical maximum height and under.
For the question Power and question Fibonacci are 192 and 105, but unfortunately, I couldn't come up with any fixed schedule to complete the cycle.

Finally, the number of days seen in the schedule while achieving the same height was also an issue that had to be considered. For this reason, I experimented several times with Excel and did a number of manual exhaustive tests for all the problems for which I gave a fixed schedule, eventually reducing the minimum schedule for the Fibonacci problem to eight days, by the way, in the same problem I have calculated that the minimum height will be 105 and have created a schedule that satisfies the height, but

when I write it down to 360 days it still does not become a cycle.

Reference

Gąsieniec, L. et al. (2017) *Bamboo garden trimming problem (perpetual maintenance of machines with different attendance urgency factors)*, *SpringerLink*. Springer International Publishing. Available at: https://link.springer.com/chapter/10.1007/978-3-319-51963-0_18?utm_source=getftr&utm_medium=getftr&utm_campaign=getftr_pilot#ref-CR13 (Accessed: November 4, 2022).