



Problem of the Week

Problem B and Solution

Picking Fruit

Problem

Kelvin has a part-time job picking apples. Each day, he starts with an empty container, which can hold 960 apples, and puts the apples that he picks into the container. Kelvin is finished his work for the day if either 3 hours have passed or he has filled the container.

Kelvin picks 400 apples on the first day, and each day steadily improves the rate at which he picks apples by picking 21 more apples than the day before.

After how many days of working can he fill the container in less than 3 hours?

Solution

Kelvin picks 400 apples the first day, 421 apples the second day, 442 apples the third day, and so on, increasing each day by 21 apples. To find the first day he can completely fill the container in less than 3 hours, we need to determine the number of days it takes for him to increase his productivity by $960 - 400 = 560$ apples.

Since, $560 \div 21 \approx 26.6$, there are 26 days of *increase* in apple picking, but where Kelvin picks an amount that is still less than 960 apples. That is, on day 1 through day 27, Kelvin picks less than 960 apples. Then on day 28, Kelvin picks 960 or more extra apples. That is, on day 28 and thereafter, he can fill the container in less than 3 hours.

Indeed, we can check that on day 27 Kelvin picks $21 \times 26 = 546$ extra apples, for a total of $400 + 546 = 946$ apples. On day 28, Kelvin picks $21 \times 27 = 567$ extra apples, for a total of $400 + 567 = 967$ apples in 3 hours.