

06	3c	On the first day of the harvest, an orchard produces 560 kg of fruit. On the next day, the orchard produces 543 kg, and the amount produced continues to decrease by the same amount each day. (i) How much fruit is produced on the fourteenth day of the harvest? (ii) What is the total amount of fruit that is produced in the first 14 days of the harvest? (iii) On what day does the daily production first fall below 60 kg?	2 1 2
<p>i. The series is 560, 543, ... with $a = 560$, $d = -17$, $n = 14$</p> $T_n = a + (n - 1)d$ $= 560 + (14 - 1) \times -17$ $= 560 + 13 \times -17$ $= 339 \quad \therefore 339 \text{ kg of fruit}$ <p>ii. Using $S_n = \frac{n}{2}[a + l]$ with $a = 560$, $l = 339$ and $n = 14$</p> $S_{10} = \frac{14}{2}[560 + 339]$ $= 6293 \quad \therefore 6293 \text{ kg of fruit}$ <p>iii. Using $T_n = a + (n - 1)d$ with $a = 560$, $d = -17$ and $T_n < 60$</p> $560 + (n - 1) \times -17 < 60$ $560 - 17n + 17 < 60$ $577 - 17n < 60$ $-17n < -517$ $\frac{-17n}{-17} > \frac{-517}{-17}$ $n > 30.41176471 \quad \therefore \text{on the } 31^{\text{st}} \text{ day}$			

* These solutions have been provided by *projectmaths* and are not supplied or endorsed by the Board of Studies

Board of Studies: Notes from the Marking Centre

Candidates providing the better responses recognised that the question involved arithmetic progressions and used formulae correctly or carefully listed terms, enabling many to answer all parts of the question correctly. A number of candidates incorrectly assumed that the series was geometric or even that it was exponential decay. It was apparent that solving equations and inequations involving the substitution of a negative into a formula was an area of revision that would have benefited many candidates.

- (i) Responses that recognised the common difference was -17 and correctly found the 14th term received full marks.
- (ii) Those candidates who found the sum to 14 terms correctly, or correctly applied the sum to n terms formula using their result from part (i), received full marks.
- (iii) Better responses involved candidates successfully solving $T_n < 60$. The methods used included: solving $T_n = 60$ and then testing the solution to arrive at the conclusion that the required number of days was 31; successfully solving $T_n < 60$ and remembering to change the inequality sign when dividing by a negative; and using a trial-and-error method to find the first term under 60 and then correctly concluding that the number of days was 31.

Source: http://www.boardofstudies.nsw.edu.au/hsc_exams/