08	**4b**	The zoom function in a software package multiplies the dimensions of an image by 1.2. In an image, the height of a building is 50 mm. After the zoom function is applied once, the height of the building in the image is 60 mm. After a second application, its height is 72 mm. (i) Calculate the height of the building in the image after the zoom function has been applied eight times. Give your answer to the nearest mm. (ii) The height of the building in the image is required to be more than 400 mm. Starting from the original image, what is the least number of times the zoom function must be applied?	**2** **2**

The series is 60, 72, … with $a = 60$, $r = 1.2$

i. Using $T_n = ar^{n-1}$ and $n = 8$:

$$T_8 = 60 \times 1.2^7$$
$$= 214.990848$$
$$= 215 \text{ (nearest whole)}$$
$$\therefore 215 \text{ mm}$$

ii. Using $T_n = ar^{n-1}$ and let $T_n > 400$:

$$60 \times 1.2^{n-1} > 400$$
$$1.2^{n-1} > \frac{400}{60}$$
$$1.2^{n-1} > \frac{20}{3}$$
$$\log 1.2^{n-1} > \log \frac{20}{3}$$
$$(n-1)\log 1.2 > \log \frac{20}{3}$$
$$n - 1 > \frac{\log \frac{20}{3}}{\log 1.2}$$
$$> 10.40535205$$
$$n > 11.40535205$$

As n is integer, the next value of n is 12

$\therefore$ 12 zooms

* 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

Most candidates recognised the series as geometric.

(i) The most common error was the inclusion of the original height as part of the zoom sequence, that is, using the n^{th} term of a geometric progression with $a = 50$ and $n = 8$.

(ii) The link between parts (b)(i) and (b)(ii) was recognised in most responses. Clear setting out was an advantage and most candidates demonstrated good knowledge of the logarithm laws when solving their exponential equation. Many responses that listed the terms of the sequence were successful. A common error was to assume the solution involved the sum of a geometric progression. A large number of responses contained working that did not lead to the answer.

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