## **Question 3**

(a) A security code consists of six digits chosen at random from the digits 0 to 9. The code may begin with zero and digits may be repeated.

For example  $\begin{bmatrix} 0 & 7 & 1 & 7 & 3 & 7 \end{bmatrix}$  is a valid code.

(i) Find how many of the possible codes will end with a zero.

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(ii) Find how many of the possible codes will contain the digits 2 0 1 8 together and in this order.

**(b)** Find *a*, *b*, *c*, and *d*, if  $\frac{(n+3)!(n+2)!}{(n+1)!(n+1)!} = an^3 + bn^2 + cn + d$ , where *a*, *b*, *c*, and  $d \in \mathbb{N}$ .

