8 A photographer takes 12 different photographs. There are 3 of sunsets, 4 of oceans, and 5 of mountains.

(a) The photographs are arranged in a line on a wall.

(i) How many possible arrangements are there if there are no restrictions? [1]

(ii) How many possible arrangements are there if the first photograph is of a sunset and the last photograph is of an ocean? [2]

(iii) How many possible arrangements are there if all the photographs of mountains are next to each other? [2]

(b) Three of the photographs are to be selected for a competition.

(i) Find the number of different possible selections if no photograph of a sunset is chosen. [2]

(ii) Find the number of different possible selections if one photograph of each type (sunset, ocean, mountain) is chosen. [2]

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9 **(a)** In the expansion of $\left(2k-\frac{x}{k}\right)^5$, where k is a constant, the coefficient of x^2 is 160. Find the value of k. [3]

(b) **(i)** Find, in ascending powers of x, the first 3 terms in the expansion of $\left(1+3x\right)^6$, simplifying the coefficient of each term. [2]