MARKS

7

(2, 3, 2)

4. Eight people board an elevator at the first floor of a 12-storey building. If each person is equally likely to get off the elevator at any of the eleven upper floors and is not influenced by the floor at which any *other* person gets off, find the probability:
   (a) nobody gets off at the first five stops (*i.e.*, the second through sixth floors);
   (b) four people get off at the third floor and four at the twelfth floor;
   (c) all eight people get off at *different* floors.

(a) Throughout this question, there are 11 floors where each of the eight people might get off the elevator, so there are 11^8 points in the sample space.

If nobody gets off at the first five floors, each of the eight people has 6 floors remaining where they might get off;

hence: Pr(nobody gets off at the first five stops) = $\frac{6^8}{11^8} \simeq 0.007\,836$.

$\frac{6^8}{11^8} \simeq 0.007\,836$ (a)

Probability

(b) Order is **un**important among the four people who get off at the two specified floors;

hence: Pr(4 get off at third floor, 4 at the twelfth floor) = $\frac{\binom{8}{4}\binom{4}{4}}{11^8} = \frac{70}{11^8} \simeq 3.266\times10^{-7}$.

$\frac{70}{11^8} \simeq 3.266\times10^{-7}$ (b)

Probability

(c) The first person to get off the elevator has 11 choices of floor and, to satisfy the restriction, each successive person has one **fewer** choices;

hence: Pr(all eight people get off at *different* floors) = $\frac{11^{(8)}}{11^8} = \frac{66{,}652{,}800}{11^8} \simeq 0.031\,036$.

$\frac{11^{(8)}}{11^8} \simeq 0.031\,036$ (c)

Probability