Marked example 3

Paper 2 style · Graphic display calculator

3 7 marks AHL 1.10 ●●○ Typical

A choir of six singers is chosen from seven sopranos and eight altos.

(a) Find the number of choirs that contain at least two sopranos. [3]

(b) The choir is chosen at random. Find the probability that it contains exactly three sopranos. [2]

(c) A choir of three sopranos and three altos stands in a line, sopranos and altos alternating. Find the number of possible lines. [2]

MARKSCHEME (a)

$\binom{15}{6} = 5005$ in total (A1)

none: $\binom{8}{6} = 28$; one: $7 \times \binom{8}{5} = 392$ (M1)

$5005 - 28 - 392 = 4585$ A1

Total 3 marks

Note The complement of "at least two" is "none or exactly one".

MARKSCHEME (b)

$\dfrac{\binom{7}{3}\binom{8}{3}}{\binom{15}{6}} = \dfrac{35 \times 56}{5005}$ (M1)

$= 0.392$ A1

Total 2 marks

Note Exact value $\frac{56}{143}$.

MARKSCHEME (c)

$2 \times 3! \times 3!$ (M1)

$= 72$ A1

Total 2 marks

Note The line starts with a soprano or with an alto.

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