

Perms and Coms 2

1)	(i) 40320	B1
	(ii) $\frac{8 \times 7 \times 6 \times 5 \times 4}{5 \times 4 \times 3 \times 2(\times 1)}$ or $\frac{8!}{5! \times 3!}$ 56	M1 A1
	(iii) uses 5, 4 and 3 only 60	M1 A1 [5]
2)	(i) $\frac{9 \times 8 \times 7 \times 6}{4 \times 3 \times 2(\times 1)}$ 126	M1 A1
	(ii) $\frac{4 \times 3}{2(\times 1)}$ $\left(\frac{4 \times 3}{2(\times 1)}\right) \times 3 \times 2$ 36	B1 M1 A1
	(iii) adds number of arrangements of 2,1,1 and 1,2,1 and 1,1,2 only multiplies for each selection $(36) + 4 \times 3 \times 2 + 4 \times 3 (\times 1)$ 72	M1 M1 A1✓ A1
3)	2 (i) ${}^{10}C_5 = 252$	B1 [1]
	(ii) 4 women, 1 man: 6 3 women, 2 men: ${}^4C_3 \times {}^6C_2 = 60$ Total = 66	M1 B1 B1 A1 [4]
		M1 for a plan B1 for 6 B1 for 60 A1 for total Allow marks for other valid methods
4)	4 [5] (i) ${}^{10}C_4 = 210$ (ii) $4w \Rightarrow {}_6C_4 = 15$ $3w + 1o \Rightarrow {}_6C_3 \times {}_4C_1 = 60$ Total = 95	
5)	7 [7] (a) Positions for A,B X...X.. or .X...X. or ...X...X $\Rightarrow 3$ Arrangements of A,B $\Rightarrow 2$ Total number of arrangements = $3 \times 2 \times 5! = 720$ (b) 3 different $\Rightarrow {}^6C_3 = 20$ 2 of 1 kind + 1 $\Rightarrow 6 \times 5 = 30$	B1 B1 M1 A1 B1 B1 DB1

Perms and Coms 2

6)	2 9 CDs → 4 Beatles, 3 Abba, 2 Rolling (i) ${}_8C_3 = (8 \times 7 \times 6) \div (3 \times 2 \times 1) = 56$ (ii) 2B 2A ${}_4C_2 \times {}_3C_2 = 18$ 2B 2R ${}_4C_2 \times 1 = 6$ 2A 2R ${}_3C_2 \times 1 = 3$ → Total of 27	M1 A1 [2] M1 M1 A1	2 if correct without working ${}_9C_3$ M0. $4 \times {}_8C_3$ gets M1 A0 One correct product with ${}_nC_r$ s 3 products added – even if ${}_nP_r$ CAO
----	---	---	--

7)	7 (i) $6! = 720$ (ii) M ... $\Rightarrow 5! = 120$ (iii) $4! = 48$ (iv) $6!/4! 2! = 15$ Accept ${}_6C_4$ or ${}_6C_2 = 15$ (v) $5!/3! 2! = 10$ (or, answer to (iv) less ways M can be omitted) (Listing – ignoring repeats ≥ 8 [M1] $\Rightarrow 10$ [A1]) [8]	B1 M1 A1 M1 A1 B1 M1 A1
----	--	--