

15	(a)		DR $\frac{15}{64} \times \frac{2^2}{2!}$ oe eg $\frac{15}{64} \times \frac{4}{2}$ (= $\frac{15}{32}$ AG)	B1 [1]	1.1	Must see this expression and result
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Question			Answer	Mark	AO	Guidance
15	(b)		DR 2, 2, 5 2, 3, 4 3, 3, 3	M1	3.1a	Any two seen, with no more than 2 extra different combinations. eg 0, 4, 5 and 0, 5, 4 count as <u>one</u> extra
			$P(X_1 + X_2 + X_3 = 9) =$ $3 \times (\frac{15}{32})^2 \times \frac{5}{80} + 6 \times \frac{15}{32} \times \frac{5}{16} \times \frac{5}{32} + (\frac{5}{16})^3$ 0.0412 + 0.1373 + 0.0305	M1	2.1	M2: ≥ 1 correct product actually seen & all three products correct M1: 1 correct product seen
			$3 \times \frac{225}{16384} + 6 \times \frac{375}{16384} + \frac{125}{4096}$ $\frac{675}{16384} + \frac{1125}{8192} + \frac{125}{4096}$ (= 0.209045)	M1	2.1	or all correct except omission of, or incorrect, multiple(s) or all three results or total correct, but without working
			$P(X_1 + X_2 + X_3 = 9 \text{ and at least 1 } X \text{ value} = 2)$ $= 3 \times (\frac{15}{32})^2 \times \frac{5}{80} + 6 \times \frac{15}{32} \times \frac{5}{16} \times \frac{5}{32}$ (= 0.178528)	M1	1.1	Allow M1 for 1 correct product or omit, or incorrect, multiple(s) or fit their probabilities from their previous calculation
			$\frac{'0.178528'}{'0.209045'}$	M1	2.1	÷ their attempted probs of correct events
			= 0.854 (3 sf) or $\frac{117}{137}$	A1	2.2a	
			$P(X_1 + X_2 + X_3 = 9 \text{ and no } X \text{ value} = 2)$ $= (\frac{5}{16})^3$ (= 0.030518 or $\frac{125}{4096}$)	M1		fit their $P(3, 3, 3)$
			$1 - \frac{'0.030518'}{'0.209045'}$ = 0.854 (3 sf) or $\frac{117}{137}$	M1		÷ their attempted probabilities of correct events & subtract from 1
			A1		NB $1 - (\frac{5}{16})^3$ alone scores M1	
			[6]			

Question			Answer	Mark	AO	Guidance
15	(c)		P(two 2's in nine vales of X) or 0.094466 or ${}^9C_2 \times (1 - \frac{15}{32})^7 \times (\frac{15}{32})^2$	M1	3.1a	soi eg by 9C_2 seen
			P(two 2's in nine vales of X) \times P($X = 2$) or $0.094466 \times \frac{15}{32}$ or ${}^9C_2 \times (1 - \frac{15}{32})^7 \times (\frac{15}{32})^3$	M1	2.1	soi NB $(\frac{17}{32})^7 \times (\frac{15}{32})^3$ scores 0, unless multiplied by 9C_2
			0.0443 (3 sf)	A1 [3]	1.1	