Mock Exam 2

MATHEMATICS **9709**

Paper 5 Probability & Statistics 1 **1 hour 15 minutes**

MARK SCHEME

Maximum Mark: 55

Published

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1

1 median $47000 data have an outlier, are skew etc	B1 B1 B1	**3**	Must have 47000 Accept any equivalent reason

2

3	(a)	$\frac{5.2-2s}{s}=-1.282$	M1	Equation with $\pm$ correct LHS seen here or later, can be μ or s, no cc
			B1	± 1.282 seen accept ± 1.28 or anything in between
			M1	solving their equation with recognisable z-value and only 1 unknown occurring twice
		$s = 7.24$ or 7.23	A1 **4**	correct final answer
	(b)	$\Phi\left(\frac{\mu+\sigma-\mu}{\sigma}\right)=0.8413$	B1	0.8413 (p) seen or implied (can use their own numbers)
		$P(\lvert z\rvert<1)=0.3413\times 2=0.6826$	M1	finding the correct area i.e. $2p-1$
		$0.6826\times 800=546$ (accept 547)	A1 **3**	correct answer, must be a positive integer
		OR *SR* $800\times 2/3=533$ or 534	SR B1	for 2/3
			B1	for 533 or 534 or B2 if 533 or 534 and no working

3

5 (i) 30-35 years	B1	**1**	
(ii) 4.8×5 $= 24$	M1 A1	 **2**	Multiplying by 5 Correct answer
(iii) $4 + 18 + 24 + 28 + 26 + 10$ $= 110$	M1 A1	 **2**	Summing their 6 attempts at frequencies Correct answer
(iv) $24 / 88$ $= 0.273$	M1 A1ft	 **2**	Dividing their (ii) by their attempt at > 25 group Correct answer, ft on above

4

6	(i) $^{10}C_1 + {}^{10}C_3 + {}^{10}C_5 + {}^{10}C_7 + {}^{10}C_9$	M1	Summing some ^{10}C combinations with odd numbers, all different
		A1	At least 3 correct unsimplified expressions
	= 512	A1	Correct answer
		[3]	
	(ii) $6! \times 7 \times 6 \times 5$	B1	6! seen
		M1	multiplying by $^7P_3$ o.e.
	= 151200	A1	correct answer
		[3]	
	(iii) $12! / (4! \times 7!)$	B1	12! Seen
		M1	dividing by 4!7!
	= 3960	A1	correct answer
		[3]	

5

5 (a) (i)	$1 \times 5 \times 4 \times 3$ or ${}^5C_3 \times 3!$ or ${}^5P_3$ $= 60$	M1 A1	[2]	One of these oe Correct final answer
(ii)	$1 \times 6^3 = 216$	M1 A1	[2]	Seeing 6^3 Correct answer
(b) (i)	5G 0B = ${}^8C_5 = 56$ ($\times {}^6C_0$) 4G 1B = ${}^8C_4 \times {}^6C_1 = 420$ 3G 2B = ${}^8C_3 \times {}^6C_2 = 840$ total = 1316	M1 B1 A1 A1	[4]	Σ 2 or three 2-factor products, C or P Any correct option unsimplified A second correct option unsimplified Correct answer
(ii)	${}^{11}C_2 + {}^{11}C_5$ $= 55 + 462$ $= 517$	M1 B1 A1		Adding two single perm or comb options ${}^{11}C_x + {}^{11}C_y$ One correct unsimplified option Correct answer
	OR cousins in P(3B, 2G) + P(4B, 1G) + P(5B, 0G) + cousins out P(3B, 2G) + P(2B, 3G) + P(1B, 4G) + P(0B, 5G) $= 28 + 24 + 3 + 28 + 168 + 210 + 56$ $= 517$	M1 B1 A1	[3]	Σ 5 or more 2-factor perm or comb terms 3 or more correct unsimplified options Correct answer

6

5	**(i)** $P(X = 2)) = (0.25)^2 \times (0.75)^6 \times {}^8C_2$	M1	3 term binomial expression involving ${}^8C$ something, powers summing to 8
	$= 0.311$	A1 **[2]**	correct answer
	(ii) $12 \times 0.25 = 3, < 5$ so not possible	B1 **[1]**	
	(iii) mean $= 40 \times 0.25$ $(= 10)$		
	variance $= 40 \times 0.25 \times 0.75$ $(= 7.5)$	B1	40×0.25 and $40 \times 0.25 \times 0.75$ seen, o.e.
	$P(X \text{ at least } 13) = P\left(z > \dfrac{12.5 - 10}{\sqrt{7.5}}\right)$	M1	standardising, ±, with or without cc, must have sq rt
	$= P(z > 0.913)$	M1	continuity correction 12.5 or 13.5
	$= 1 - \Phi(0.913)$	M1	correct area, i.e. < 0.5 legit
	$= 1 - 0.8194$		
	$= 0.181$	A1 **[5]**	correct answer

7

6 (i)	$(0.75)^n < 0.06$	M1*		Equation or inequality with 0.75^n and 0.06 or 0.94 seen
	$n > 9.78$	M1dep*		Attempt at solving by trial and error (can be implied) or using logarithms correctly
	$n = 10$	A1	[3]	Correct answer
(ii)	$E(X) = 14 \times 0.75$ or 10.5 Try $P(10) = {}^{14}C_{10}(0.75)^{10}(0.25)^4 = 0.220$	M1		Evaluating binomial probability for an integer value directly above or below their mean
	$P(11) = {}^{14}C_{11}(0.75)^{11}(0.25)^3 = 0.240$	M1		Evaluating the other binomial probability
	(mode is) 11	A1	[3]	Correct answer
	OR	M1		Evaluating binomial $P(n)$ and $P(n + 1)$
		M1		Evaluating binomial P(10), P(11) and P(12)
		A1		Correct answer
(iii)	$P(> 11)$ $= {}^{14}C_{12}(0.75)^{12}(0.25)^2 + {}^{14}C_{13}(0.75)^{13}(0.25)^1 + (0.75)^{14}$	M1		A binomial term of the form ${}^{14}C_n p^n(1-p)^{14-n}$ seen, $n \neq 0$ or 14
		M1		Summing binomial P(12, 13, 14) or P(11, 12, 13, 14,)
	$= 0.281$	A1		Correct answer 0.280 – 0.282
	$P(3) = {}^5C_3\,(0.2811)^3(0.7189)^2$	M1		A binomial term of the form ${}^5C_3 p^3(1-p)^2$ seen, any p
	$= 0.115$	A1	[5]	Correct answer

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