

NOVEMBER 2001

ADVANCED SUBSIDIARY LEVEL

MARK SCHEME

MAXIMUM MARK : 50

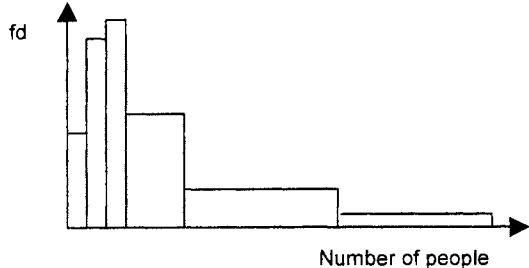
SYLLABUS/COMPONENT : 8709/6

MATHEMATICS



UNIVERSITY *of* CAMBRIDGE
Local Examinations Syndicate

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1	$\Sigma x = 105$ $\Sigma x^2 = 1439$ mean = 13.1 sd = 2.76	B1 B1 B1 3	For $\Sigma x^2 = 1439$ For answer For answer
2	(a) Number of ways is ${}_{10}P_6$ or $10 \times 9 \times 8 \times 7 \times 6 \times 5$ = 151200 (b) $4! \times 3!$ = 144	B1 B1 2 B1 B1 B1 3	May be implied For 4! For 3! For answer
3	(i) $P(\text{receives message}) = 0.4 \times 0.6 + 0.5 + 0.1 \times 0.8$ = 0.82 (ii) $P(\text{Email} \text{Receives})$ = 0.293	M1 M1 A1 3 B1 M1 A1 3	For two 2-factor terms For adding 0.5 For correct answer For correct expression for numerator For dividing by their 0.82 For correct answer
4	(i) Class width 20, 20, 20, 40, 100, 100 Frequency density: 2.3, 5.5, 6.1, 2.5, 0.86, 0.36  (ii) $\left(\frac{122 + 110 + 46}{500} \right)^3 = 0.172$	B1 M1 M1 A1 A1 5 M1 A1 2	For class widths Attempt at frequency density or scaled frequency Graph with 6 bars of appropriate relative widths (any height) For x-axis going from 0 – 300 properly All correct including axes labelled For cubing their probability For correct answer

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5	(i)	$z = \frac{10 - 15}{4.2} = -1.190$	M1	Standardising and using tables
		$P(X < 10) = \Phi(-1.190) = 1 - 0.883 = 0.117$	M1	For subtracting a probability from 1
			A1 3	For correct answer
	(ii)	$z = 1.282$	B1	For correct z-value
		$\frac{T - 15}{4.2} = 1.282$	M1	For an equation relating T and their z
		$T = 20.4$	A1 3	For correct answer
	(iii)	$P(z > 1.19) = 1 - \Phi(1.19) = 1 - 0.8830 = 0.117$	B1	For 0.883 seen (or symmetry)
		Number of people = $0.117 \times 200 (= 23.4)$	M1	For multiplying a probability by 200
		Answer = 23	A1 3	For correct answer 23
	6	$1 - \{ 0.65^{10} \times 0.35^2 \times {}_{12}C_{10} + 0.65^{11} \times 0.35^1 \times {}_{12}C_{11} + 0.65^{12} \}$	M1	For calculating $P(10)$, $P(11)$, $P(12)$
			M1	For correct use of binomial coefficients
			A1	For correct numerical expression
		$= 0.849$	A1 4	For correct answer
		$\mu = 120 \times 0.65 = 78;$	B1	For both mean and variance correct
		$\sigma^2 = 120 \times 0.65 \times 0.35 = 27.3$	M1	For correct standardising process with or without cc
		$P(X < 70) = \Phi\left(\frac{69.5 - 78}{\sqrt{27.3}}\right)$	A1	For correct use of continuity correction
		$= \Phi(-1.627)$	M1	For correct use of tables
		$= 1 - 0.9481$		
		$= 0.0519$	A1 5	For correct answer

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7	(i)	EITHER $P(X=0) = \frac{7}{10} \times \frac{6}{9} \times \frac{5}{8} \times \frac{4}{7} = \frac{1}{6}$ and $P(X=1) = \frac{3}{10} \times \frac{7}{9} \times \frac{6}{8} \times \frac{5}{7} \times 4 = \frac{1}{2}$ OR ${}_7C_4 \div {}_{10}C_4 = 1/6$ ${}_7C_3 \times {}_3C_1 \div {}_{10}C_4 = 1/2$	M1	For multiplying 4 probabilities together										
			A1	For correct given answer										
			M1	For multiplying by 4										
			A1	For obtaining given answer legitimately										
			B2	For showing given answer legitimately										
			B2	4										
	(ii)	<table border="1"> <tr> <td>X</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>Prob</td> <td>0.167</td> <td>0.5</td> <td>0.3</td> <td>0.0333</td> </tr> </table>	X	0	1	2	3	Prob	0.167	0.5	0.3	0.0333	M1	For attempting to find $P(X=0,1,2,3)$
	X	0	1	2	3									
	Prob	0.167	0.5	0.3	0.0333									
			A1	For 0.3 or 3/10										
		A1	3											
			For 0.0333 or 1/30											
(iii)	$E(X) = 1.2$ $\text{Var}(X) = \sum x_i^2 p_i - \text{their } 1.2^2$ $= 0.56$	M1	For $\sum x_j p_j$											
		A1	For correct answer (must be exact)											
		M1	For $\sum x_i^2 p_i - \text{their } 1.2^2$											
		A1	4											
			For correct answer											