CAMBRIDGE
INTERNATIONAL EXAMINATIONS

NOVEMBER 2001

ADVANCED SUBSIDIARY LEVEL

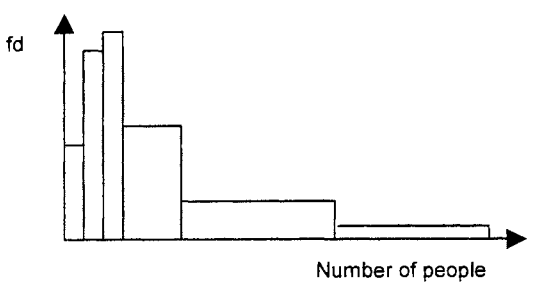
MARK SCHEME

MAXIMUM MARK : 50

SYLLABUS/COMPONENT : 8709/6

MATHEMATICS

UNIVERSITY of CAMBRIDGE
Local Examinations Syndicate

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

5	(i)	$z = \frac{10-15}{4.2} = -1.190$	M1		Standardising and using tables
			M1		For subtracting a probability from 1
		$P(X<10) = \Phi(-1.190) = 1 - 0.883 = 0.117$	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 x 200 (= 23.4)	M1		For multiplying a probability by 200
		Answer = 23	A1	3	For correct answer 23
6	(i)	$1 - \{ 0.65^{10} \times 0.35^{2} \times {}_{12}C_{10} + 0.65^{11} \times 0.35^{1} \times {}_{12}C_{11} + 0.65^{12} \}$	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
	(ii)	$\mu = 120 \times 0.65 = 78$;	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

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