

NOVEMBER 2001

ADVANCED SUBSIDIARY LEVEL

MARK SCHEME

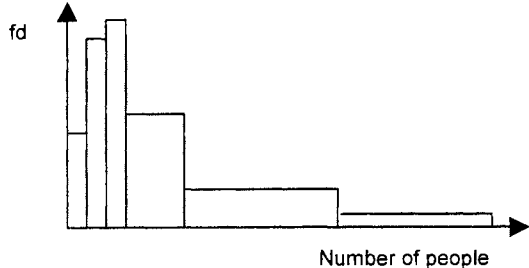
MAXIMUM MARK : 50

SYLLABUS/COMPONENT : 8709/6

MATHEMATICS



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	AS Level Examinations – November 2001	8709	6

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	(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
			M1	For correct use of binomial coefficients
$= 0.849$			A1	For correct numerical expression
			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)	<p>EITHER $P(X = 0) = \frac{7}{10} \times \frac{6}{9} \times \frac{5}{8} \times \frac{4}{7} = \frac{1}{6}$</p> <p>and $P(X = 1) = \frac{3}{10} \times \frac{7}{9} \times \frac{6}{8} \times \frac{5}{7} \times 4 = \frac{1}{2}$</p> <p>OR ${}^7C_4 \div {}^{10}C_4 = 1/6$</p> <p>${}^7C_3 \times {}^3C_1 \div {}^{10}C_4 = 1/2$</p>	<p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>B2</p> <p>B2 4</p>	<p>For multiplying 4 probabilities together</p> <p>For correct given answer</p> <p>For multiplying by 4</p> <p>For obtaining given answer legitimately</p> <p>For showing given answer legitimately</p>										
	(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	<p>M1</p> <p>A1</p> <p>A1 3</p>	<p>For attempting to find $P(X = 0, 1, 2, 3)$</p> <p>For 0.3 or 3/10</p> <p>For 0.0333 or 1/30</p>
	X	0	1	2	3									
Prob	0.167	0.5	0.3	0.0333										
(iii)	<p>$E(X) = 1.2$</p> <p>$\text{Var}(X) = \sum x_i^2 p_i - \text{their } 1.2^2$</p> <p>$= 0.56$</p>	<p>M1</p> <p>A1</p> <p>M1</p> <p>A1 4</p>	<p>For $\sum x_j p_j$</p> <p>For correct answer (must be exact)</p> <p>For $\sum x_i^2 p_i - \text{their } 1.2^2$</p> <p>For correct answer</p>											