CAMBRIDGE
INTERNATIONAL EXAMINATIONS

November 2003

GCE A AND AS LEVEL
AICE

MARK SCHEME
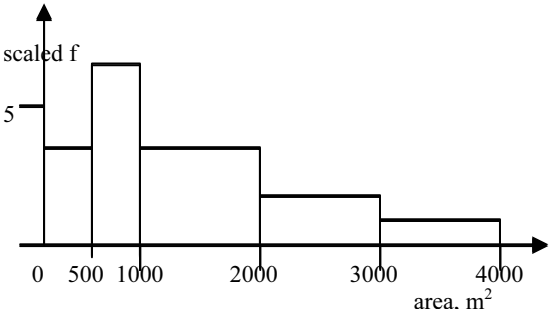
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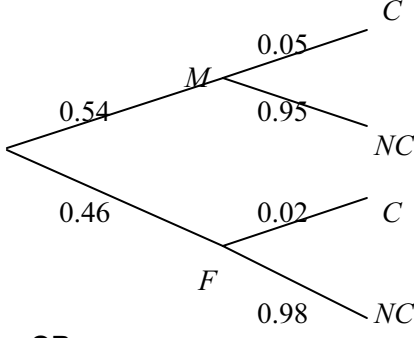**SYLLABUS/COMPONENT: 9709/06, 0390/06**

MATHEMATICS
Paper 6 (Probability and Statistics 1)

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Page 1	Mark Scheme	Syllabus	Paper
	AICE AND A AND AS LEVEL – NOVEMBER 2003	**9709/0390**	**6**

1		
$\begin{array}{ccc} x & 0 & 2 \\ \text{freq} & 23 & 17 \end{array}$ OR $P(0) = 23/40, \quad P(2) = 17/40$ Mean $= 34/40 = 0.850$ Variance $= (4\times17)/40 - (0.85)^2$ $= 0.978$ (exact answer 0.9775) (391/400)	M1 A1 M1 A1ft **4**	For reasonable attempt at the mean using freqs or probs but not using prob=0.5 For correct mean For correct variance formula For correct answer
frequencies: 3, 7, 6, 3, 1 scaled frequencies: 3, 7, 3, 1.5, 0.5 or 0.006, 0.014, 0.006, 0.003, 0.001 	M1 A1 B1 B1 **4**	For frequencies and attempt at scaling, accept cw/freq but not cw × freq , not cw/mid point For correct heights from their scaled frequencies seen on the graph For correct widths of bars, uniform horiz scale, no halves or gaps or less-than-or-equal tos Both axes labelled, fd and area or m^2. Not class width
3 $28 - \mu = 0.496\sigma$ (accept 0.495 or in between) $35 - \mu = 1.282\sigma$ (accept 1.281 or in between, but not 1.28) $\sigma = 8.91$ (accept 8.89 to 8.92 incl) $\mu = 23.6$	M1 A1 A1 M1 A1 A1 **6**	For any equation with μ and σ and a reasonable z value not a prob. Allow cc, $\sqrt{\sigma}$, σ^2, or – and give M1 A0A1ft for these four cases For 2 correct equations For solving their two equations by elim 1 variable sensibly For correct answer For correct answer
4 **(i)** $(0.95)^5$ $= 0.774$ **(ii)** $(0.95)^4 \times (0.05)^1 \times {}_5C_1$ $= 0.204$ **(iii)** $(0.95)^2 \times (0.05)$ $= 0.0451 (361/8000)$	M1 A1 **2** M1 A1 **2** M1 A1 **2**	For 0.95 seen, can be implied For correct final answer For any binomial calculation with 3 terms, powers summing to 5 For correct answer For no Ps, no Cs, and only 3 terms of type $p^2(1-p)$ For correct answer

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5

OR

$$P(M|C) = \frac{0.54 \times 0.05}{0.54 \times 0.05 + 0.46 \times 0.02}$$

$$= 0.746 \ (135/181)$$

M1		For correct shape ie *M* and *F* first
A1		All correct, ie labels and probabilities, no labels gets M1 only for (implied)correct shape
M1		For finding P(*M* and *C*) and P(*F* and *C*)
A1		For using 4 correct probs
M1		For correct conditional probability
B1		For correct numerator
M1		For summing two two-factor 'terms'
A1	**6**	For correct answer

6 (a) (i) 18564

(ii) $_{17}C_5$ or $6/18 \times$ their (i) or $_{18}C_6 - _{17}C_6$

= 6188

(b) (i) 40320

(ii) $5! \times 3! \times _4C_1$

= 2880

B1	**1**	For correct final answer
M1		For using 17 and 5 as a perm or comb
A1	**2**	For correct answer
B1	**1**	For correct final answer
B1		For 5!or $_5P_5$ used in a prod or quotient with a term ≠ 5!
B1		For 3!
B1		For $_4C_1$, may be implied by 4!
B1	**4**	For correct final answer

7 (i) z = ± 1.143

P(7.8<T<11)= Φ(1.143) – 0.5

= 0.8735 – 0.5

= 0.3735 (accept ans rounded to 0.37 to 0.374)

(ii) $(0.1265)^2 \times (0.8735) \times _3C_2$

= 0.0419

(iii) Not symmetric so not normal

Does not agree with the hospital's figures

M1		For standardising, can be implied, no cc, no σ^2 but accept $\sqrt{\sigma}$
A1		For seeing 0.8735
M1		For subtracting two probs, $p_2 - p_1$ where $p_2 > p_1$
A1	**4**	For correct answer
M1		For any three term binomial-type expression with powers summing to 3
A1ft	**2**	For correct answer ft on their 0.8735/0.1265
B1		For any valid reason
B1dep	**2**	For stating it does not agree, with no invalid reasons

8 (i) 18c = 1

c = 1/18 = 0.0556

(ii) E(X) = 2.78 (= 25/9)(= 50c)

Var (X) = 1.17 (= 95/81) (=160c – 2500 c^2)

(iii) P(X > 2.78) = 11c

= 0.611 (= 11/18)

M1		For $\sum p_i = 1$
A1	**2**	For correct answer
M1		Using correct formula for E(X)
A1ft		For correct expectation, ft on their c
M1		For correct variance formula
A1ft	**4**	For correct answer ft on their c
M1		For using their correct number of discrete values of X
A1	**2**	For correct answer

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