CAMBRIDGE
INTERNATIONAL EXAMINATIONS

November 2003

GCE A AND AS LEVEL
AICE

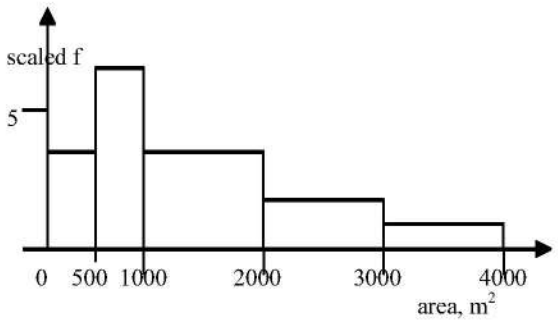
MARK SCHEME

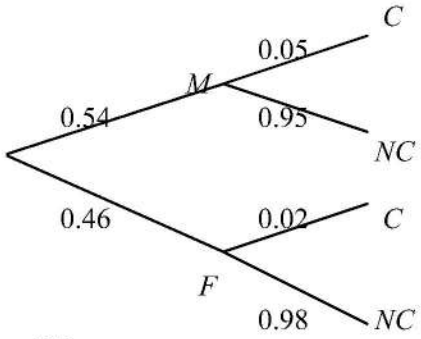
MAXIMUM MARK: 50

SYLLABUS/COMPONENT: 9709/06, 0390/06

MATHEMATICS
Paper 6 (Probability and Statistics 1)

UNIVERSITY of CAMBRIDGE
Local Examinations Syndicate

1 x 0 2 freq 23 17 OR $P(0) = 23/40$, $P(2) = 17/40$ 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

5 	M1 A1		For correct shape ie M and F first All correct, ie labels and probabilities, no labels gets M1 only for (implied)correct shape
OR	M1 A1		For finding P(M and C) and P(F and C) For using 4 correct probs
$P(M\|C) = \dfrac{0.54 \times 0.05}{0.54 \times 0.05 + 0.46 \times 0.02}$	M1 B1 M1		For correct conditional probability For correct numerator For summing two two-factor 'terms'
$= 0.746$ (135/181)	A1	**6**	For correct answer
6 (a) (i) 18564	B1	**1**	For correct final answer
(ii) $_{17}C_5$ or 6/18 × their (i) or $_{18}C_6 - {}_{17}C_6$ $= 6188$	M1 A1	**2**	For using 17 and 5 as a perm or comb For correct answer
(b) (i) 40320	B1	**1**	For correct final answer
(ii) $5! \times 3! \times {}_4C_1$	B1 B1 B1		For 5!or $_5P_5$ used in a prod or quotient with a term $\neq 5!$ For 3! For $_4C_1$, may be implied by 4!
$= 2880$	B1	**4**	For correct final answer
7 (i) $z = \pm 1.143$ $P(7.8<T<11) = \Phi(1.143) - 0.5$ $= 0.8735 - 0.5$	M1 A1 M1		For standardising, can be implied, no cc, no σ^2 but accept $\sqrt{\sigma}$ For seeing 0.8735 For subtracting two probs, $p_2 - p_1$ where $p_2 > p_1$
$= 0.3735$ (accept ans rounded to 0.37 to 0.374)	A1	**4**	For correct answer
(ii) $(0.1265)^2 \times (0.8735) \times {}_3C_2$	M1		For any three term binomial-type expression with powers summing to 3
$= 0.0419$	A1ft	**2**	For correct answer ft on their 0.8735/0.1265
(iii) Not symmetric so not normal Does not agree with the hospital's figures	B1 B1dep	**2**	For any valid reason For stating it does not agree, with no invalid reasons
8 (i) $18c = 1$	M1		For $\sum p_i = 1$
$c = 1/18 = 0.0556$	A1	**2**	For correct answer
(ii) $E(X) = 2.78$ $(= 25/9)(= 50c)$ $\text{Var}(X) = 1.17$ $(= 95/81)$ $(= 160c - 2500c^2)$	M1 A1ft M1 A1ft	**4**	Using correct formula for $E(X)$ For correct expectation, ft on their c For correct variance formula For correct answer ft on their c
(iii) $P(X > 2.78) = 11c$ $= 0.611$ $(= 11/18)$	M1 A1	**2**	For using their correct number of discrete values of X For correct answer