CAMBRIDGE
INTERNATIONAL EXAMINATIONS

NOVEMBER 2002

GCE Advanced Subsidiary Level
Advanced International Certificate of Education

MARK SCHEME

MAXIMUM MARK : 50

SYLLABUS/COMPONENT :9709 /6, 0390 /6

MATHEMATICS
(Probability and Statistics 1)

UNIVERSITY of CAMBRIDGE
Local Examinations Syndicate

1 (i) $a+b=0.45$	B1	1	Accept unsimplified equation
(ii) $0.3+3a+5b+7\times0.25=4$	M1		For an equation involving $\sum x_i p_i = 4$ must be correct unsimplified version, seen anywhere
	M1		For sensible attempt to solve the two equations ie eliminating one letter
$a=0.15 \quad b=0.3$	A1	3	For correct a and b.
2 (i) options (122), (212), (221), (113), (131), (311)	M1		For an option involving(1,2,2) and an option involving (1,1,3)
	A1		For all six correct options
prob = 6 /216 (AG)	A1	3	For legitimately obtaining answer given
(ii) (133)× 3, (223)× 3, (115)× 3, (124)× 6	M1		For listing 3 or 4 different correct options or tree diagram
	M1 ind		For multiplying 4 prob options by a relevant number or listing ≥ 12 correct options
prob = 15 / 216 (= 5/72)	A1	3	For correct answer
3 (i) $z = \pm\dfrac{40-35.0}{11.6} = \pm0.431$	M1		For standardising ($\sqrt{11.6}$ in denom M1, ccM0 11.6^2 M0)
	M1		For subtracting two relevant probabilities or equivalent
$\Phi(0.431) - \{1 - \Phi(0.431)\} = 0.334$	A1	3	For correct answer
(ii) $z = \pm 1.282$ or ±1.281 only	B1		For stating z
$1.282 = \dfrac{x-35.0}{11.6}$	M1		For solving an equation for x with some z value from tables, allow cc, $\sqrt{11.6}$, 35-x, not 11.6^2
$x = 49.9$ or 49.8 on $z = 1.28$	A1	3	For correct answer
4 (i) ${}_8C_2 = 28$ or 7+6+5+4+3+2+1	B1	1	For ${}_8C_2$
(ii) ${}_8C_1 + {}_8C_2 + {}_8C_3 + {}_8C_4$	M1		For listing 4 Combination options (can be added or multiplied here)
$= 8 + 28 + 56 + 70$	A1		For ${}_8C_1 + {}_8C_2 + {}_8C_3 + {}_8C_4$
	A1		For at least 3 correct numbers, can be implied by seeing 878080 (mult)
$= 162$	A1	4	For correct answer SR ${}_8C_1+{}_8C_2+\ldots+{}_8C_8$ M1 only SR ${}_8C_3\times{}_8C_3\times{}_8C_1\times{}_8C_2$ M1 only
(iii) $(162)^4$	M1		For (their (*ii*))^4 or ${}_8C_3+{}_8C_3+{}_8C_1\times{}_8C_2$
$= 688\,747\,536$ or 3s	A1ft	2	For correct answer in any form

5 (i) $P(W_1 \mid L_2) = \dfrac{0.6\times0.3}{0.6\times0.3+0.4\times0.6}$ $= \dfrac{0.18}{0.42} = 0.429$	B1 B1 M1 A1 A1 5	For 0.6×0.3 seen anywhere in isolation For correct numerator For summing two 2 factor products in denom For correct denominator unsimplified For correct answer
(ii) $P(W_1W_2L_3) = 0.6\times0.7\times0.3 = 0.126$ $P(W_1L_2W_3) = 0.6\times0.3\times0.4 = 0.072$ $P(L_1W_2W_3) = 0.4\times0.4\times0.7 = 0.112$ Probability = 0.31	M1 B1 B1 A1 4	For summing three probability options For one correct probability option For two correct probability options For correct answer
6 (i) $P(\text{equal}) = (0.25)^5\times(0.75)^5\times {}_{10}C_5$ $= 0.0584$	M1 A1 2	For $(0.25)^5\times(0.75)^5$ must be 0.25, 0.75 For correct answer. A0 if subsequently doubled
(ii) $(0.0584)^1\times(0.9416)^7\times {}_8C_1$ $= 0.307$	M1 A1ft 2	For $(\text{their(a)})^1\times(1-\text{their(a)})^7\times {}_8C_1$ For correct answer from their ans to (i) Accept anything from 0.304 to 0.307 for the ft if they have lost the A1 in (i) from PA
(iii) $\mu = 120\times0.25 = 30$, $\sigma^2 = 30\times0.75 = 22.5$ $P(X<35) = \Phi\left(\dfrac{34.5-30}{\sqrt{22.5}}\right) = \Phi(0.949)$ $= 0.829$	M1 M1 B1 M1 A1 5	For both mean and variance correct from any sensible p For correct standardisation with or without cc For correct use of continuity correction 34.5 For use of tables based on their z value either end NB can't get if z is too large or too small For correct answer
7 (i) LQ = 72, or 73 or 71.5 only median = 78, UQ = 88 or 87.75 only	B1 B1 B1 3	Accept Q_1, Q_2, Q_3 LQ UQ muddle scores B1 B0 and possibly B1 for median
(ii) *P* *Q* 50 60 70 80 90 100 110 wts	B1 B1 B1ft B1 4	For only one numbered linear scale For country *P* all correct on linear scale For Q all correct on linear scale For P and Q labelled, weights or kg shown SR non linear scale max B0 B0 B0 B1 Or max B0 B1 B0 B1 if one error in an otherwise linear scale NB No outliers
(iii) people heavier in *P* than in *Q* weights more spread out in *Q*	B1 B1 2	Or equivalent statement Or equivalent statement Cannot have two statements saying the equivalent of the same category (wts, spread, skewness). Must have the same statement relating to P and to Q.