

JUNE 2002

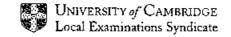
GCE Advanced Subsidiary Level Advanced International Certificate of Education

MARK SCHEME

MAXIMUM MARK: 50

SYLLABUS/COMPONENT: 9709 /6, 0390 /6

MATHEMATICS (Probability and Statistics 1)





Page 1	Mark Scheme	Syllabus	Paper
1	AS Level & AICE Examinations – June 2002	9709, 0390	6

1 (i) not independent $P(A) \times P(B) \neq P(A \text{ and } B)$	B1 B1dep	2	
(ii) not mutually exclusive P(A and B) ≠ 0	B1 B1	2	Can be stated in words
2 both axes correct	B1		For correct scales and labels on at least one axis
points	M1 Al		For points at upper bounds or 15.5 or 14.5 All correct and smooth curve or straight lines
median IQ range	Bift M1		On mid-points or upper bounds For evaluating their UQ – theirLQ
	Alft	6	For correct answer, ft on correct upper bounds only
3 (i) a 1 4 9 16 $P(A=a)$ $\frac{1}{2}$ $\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{6}$	M1 A1		For $A = 1, 4, 9, 16$, or $1,1,1,4,9,16$ Any three correct probabilities for 3 different vals of A
	Αl	3	All correct
(ii) $E(A) = 1 \times 1/2 + 4 \times 1/6 + 9 \times 1/6 + 16 \times 1/6$ = 5.33 $Var(A) = 1^2 \times \frac{1}{2} + 4^2 \times \frac{1}{6} + \dots - (5.33)^2$ = 30.9	MI AI MI	4	For calculation of $\sum p$ where $\sum p$ must be 1 For correct answer For calculation of $\sum x^2p$ – (their $E(A)$) ² $\sum p$ need not be 1 For correct answer
4 (i) - 47.2/30 = -1.573 OR $\Sigma x - \Sigma 110 = -47.2$ and $\Sigma 110 = 3300$			
$\bar{x} = 110 - 1.573 = 108 (108.4)$ standard deviation = $\sqrt{\frac{5460}{30} - (-1.573)^2}$ = 13.4	BI MI AI	4	For correct answer For $\frac{5460}{30}$ – (their coded mean) ² For correct answer
(ii) $z = \frac{110 - 107.6}{13.8} = 0.174$ $P(X > 110) = 1 - \Phi(0.174)$ = 1 - 0.5691	MI MI		For standardising, can have $\sqrt{13.8}$ on denom not 13.8^2 . For using tables correctly and finding a correct area from their z.
= 0.431	Al	3	For correct answer



Page 2	Mark Scheme	Syllabus	Paper
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+1	MI		The distribution by 2 on 21
5 (i) $\frac{7!}{2!} = 2520$	A!	2	For dividing by 2 or 2! For correct answer
(ii) $\frac{5!}{2!} \times 3! = 360$	Вl		For 5! or equivalent
(11) 21 25: -300	MI		For multiplying by 3! or dividing by 2! or both
	Αl	3	For correct answer
	M2		For 4/7 of their (i)
(iii) $4/7$ of $2520 = 1440$	Al		For correct answer
OR $6! + \frac{6!}{2!} + \frac{6!}{2!} = 1440$	Mi		For summing options for ending in 2, 6, 8
	A1		For correct options
	Al	3	For correct answer
(ii) (i) $\mu = 3.6$	Вι		Stated or can be calculated later on
$\frac{2.8 - their\mu}{\sigma} = -0.4$	MI		For equation relating μ or 3.6 and σ . Must be standardised, can have ± 0.4
σ = 2	Ml		Solving the correct equation or with a second correct equation relating μ and σ
0 · L	Αl	4	For correct answer
(ii) $(0.6554)^2 \times (0.3446)^2 \times {}_4C_2 + (0.6554)^3 \times (0.3446)^1 \times {}_4C_3 + (0.6554)^4$	Ml		For attempted binomial calculation of any 2 or 3 of P(2), P(3), P(4), needs 0.6554 in
(, (,	Bl		For correct numerical expression for P(2) or P(3)
= 0.879	Al		All in correct form
(= 0.3061 +0.3881 +0.1845)	Al		For correct answer
OR 1 - $(0.3446)^4$ - $(0.6554)^1$ × $(0.3446)^3$ × ${}_4$ C ₃	MI		For calculation of 1 - any 2 or 3 of P(0), P(1), P(2)
, (, ,, ,,	Bl		For correct numerical expression for P(1) or P(2)
(=1-0.0141-0.1072)	Αl		All in correct form
= 0.879	Al	4	For correct answer
7 (i) (a) np = 11	Bl		
np(1-p)=4.95	B1		
$n = 20 \ (p = 0.55)$	MI		For solving, need to find a value for n
	Al	4_	For correct answer
(b) $P(X = 12) = (0.55)^{12} \times (0.45)^8 \times {}_{20}C_{12}$	MI		For (their p) ¹² × (their q) ⁿ⁻¹² × $k \neq 1$
= 0.162	Al	2	For correct answer
(ii) $\mu = 100 \times 0.3 = 30$, $\sigma^2 = 100 \times 0.3 \times 0.7$	Bl		For both mean and variance correct, allow $\sigma = 21$
	MI		For standardising with or without cc, allow their
$P(X < 35) = \Phi\left(\frac{34.5 - 30}{\sqrt{21}}\right)$			21 or their $\sqrt{21}$ in denom
$= \Phi(0.9820)$	MI		For use of any continuity correction 34.5 or 35.5
= 0.837 (exact)	Al	4	For correct answer

