

CAMBRIDGE
INTERNATIONAL EXAMINATIONS

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)



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1 (i) not independent $P(A) \times P(B) \neq P(A \text{ and } B)$	B1 B1dep 2	
(ii) not mutually exclusive $P(A \text{ and } B) \neq 0$	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 A1	For points at upper bounds or 15.5 or 14.5 All correct and smooth curve or straight lines
median	B1ft	On mid-points or upper bounds
IQ range	M1	For evaluating their UQ – theirLQ
	A1ft 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 A1 3	For $A = 1, 4, 9, 16$, or $1, 1, 1, 4, 9, 16$ Any three correct probabilities for 3 different vals of A All correct
(ii) $E(A) = 1 \times \frac{1}{2} + 4 \times \frac{1}{6} + 9 \times \frac{1}{6} + 16 \times \frac{1}{6}$ $= 5.33$ $\text{Var}(A) = 1^2 \times \frac{1}{2} + 4^2 \times \frac{1}{6} + \dots - (5.33)^2$ $= 30.9$	M1 A1 M1 A1 4	For calculation of $\sum xp$ where $\sum p$ must be 1 For correct answer For calculation of $\sum x^2 p - (\text{their } E(A))^2 \sum p$ need not be 1 For correct answer
4 (i) $-47.2/30 = -1.573$ OR $\sum x - \sum 110 = -47.2$ and $\sum 110 = 3300$ $\bar{x} = 110 - 1.573 = 108.427$ standard deviation = $\sqrt{\frac{5460}{30} - (-1.573)^2}$ $= 13.4$	B1 B1 M1 A1 4	For correct answer For $\frac{5460}{30} - (\text{their coded mean})^2$ For correct answer
(ii) $z = \frac{110 - 107.6}{13.8} = 0.174$ $P(X > 110) = 1 - \Phi(0.174)$ $= 1 - 0.5691$ $= 0.431$	M1 M1 A1 3	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. For correct answer

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5 (i) $\frac{7!}{2!} = 2520$	M1 A1 2	For dividing by 2 or 2! For correct answer
(ii) $\frac{5!}{2!} \times 3! = 360$	B1 M1 A1 3	For 5! or equivalent For multiplying by 3! or dividing by 2! or both For correct answer
(iii) $4/7$ of 2520 = 1440 OR $6! + \frac{6!}{2!} + \frac{6!}{2!} = 1440$	M2 A1 M1 A1 A1 3	For 4/7 of their (i) For correct answer For summing options for ending in 2, 6, 8 For correct options For correct answer
(ii) (i) $\mu = 3.6$ $\frac{2.8 - \text{their } \mu}{\sigma} = -0.4$ $\sigma = 2$	B1 M1 M1 A1 4	Stated or can be calculated later on For equation relating μ or 3.6 and σ . Must be standardised, can have ± 0.4 Solving the correct equation or with a second correct equation relating μ and σ For correct answer
(ii) $(0.6554)^2 \times (0.3446)^2 \times {}_4C_2$ $+ (0.6554)^3 \times (0.3446) \times {}_4C_3 + (0.6554)^4$ $= 0.879$ $(= 0.3061 + 0.3881 + 0.1845)$ OR $1 - (0.3446)^4 - (0.6554)^1 \times (0.3446)^3 \times {}_4C_3$ $(= 1 - 0.0141 - 0.1072)$ $= 0.879$	M1 B1 A1 A1 M1 B1 A1 A1 4	For attempted binomial calculation of any 2 or 3 of P(2), P(3), P(4), needs 0.6554 in For correct numerical expression for P(2) or P(3) All in correct form For correct answer For calculation of i – any 2 or 3 of P(0), P(1), P(2) For correct numerical expression for P(1) or P(2) All in correct form For correct answer
7 (i) (a) $np = 11$ $np(1 - p) = 4.95$ $n = 20$ ($p = 0.55$)	B1 B1 M1 A1 4	For solving, need to find a value for n For correct answer
(b) $P(X = 12) = (0.55)^{12} \times (0.45)^8 \times {}_{20}C_{12}$ $= 0.162$	M1 A1 2	For $(\text{their } p)^{12} \times (\text{their } q)^{n-12} \times k \neq i$ For correct answer
(ii) $\mu = 100 \times 0.3 = 30$, $\sigma^2 = 100 \times 0.3 \times 0.7$ $P(X < 35) = \Phi\left(\frac{34.5 - 30}{\sqrt{21}}\right)$ $= \Phi(0.9820)$ $= 0.837$ (exact)	B1 M1 M1 A1 4	For both mean and variance correct, allow $\sigma = 21$ For standardising with or without cc, allow their 21 or their $\sqrt{21}$ in denom For use of any continuity correction 34.5 or 35.5 For correct answer