

June 2004

**GCE A AND AS LEVEL
AICE**

MARK SCHEME

MAXIMUM MARK: 50

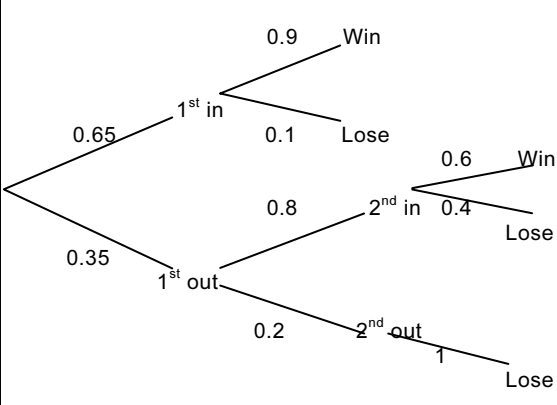
SYLLABUS/COMPONENT: 9709/06, 0390/06

**MATHEMATICS
Paper 6 (Probability and Statistics 1)**

Page 1	Mark Scheme	Syllabus	Paper
	A AND AS LEVEL – JUNE 2004	9709/0390	6

1 (i) $\bar{x}_A = 139$ (138.75) $\sigma_A = 83.1$	B1 B1 2	For the mean For the sd														
(ii) team B smaller standard deviation	B1 B1 dep 2	Independent mark Need the idea of spread SR If team A has a smaller sd then award B1 only for 'teamA, smaller sd'														
2 (i) axes and labels points (3,0) (15,160) (20,320) (35,480) (60,640)	B1 B1 B1 3	For correct uniform scales and labels on both axes, accept Frequency, %CF, Number of people, allow axes reversed, allow halves For 3 correct points All points correct and reasonable graph incl straight lines														
(ii) accept 60 – 70 for straight lines 40 – 70 for curve	M1 A1 2	For subtracting from 640 can be implied For correct answer, reasonably compatible with graph														
3 (i) <table><tr><td>x</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>P(X = x)</td><td>$\frac{11}{36}$</td><td>$\frac{9}{36}$</td><td>$\frac{7}{36}$</td><td>$\frac{5}{36}$</td><td>$\frac{3}{36}$</td><td>$\frac{1}{36}$</td></tr></table>	x	1	2	3	4	5	6	P(X = x)	$\frac{11}{36}$	$\frac{9}{36}$	$\frac{7}{36}$	$\frac{5}{36}$	$\frac{3}{36}$	$\frac{1}{36}$	M1 A1 A1 3	For 36 in the uncanceled denominator somewhere, accept decimals eg 0.305 recurring or 0.306 etc For 3 correct probabilities All correct
x	1	2	3	4	5	6										
P(X = x)	$\frac{11}{36}$	$\frac{9}{36}$	$\frac{7}{36}$	$\frac{5}{36}$	$\frac{3}{36}$	$\frac{1}{36}$										
(ii) $E(X) = 1 \times \frac{11}{36} + 2 \times \frac{9}{36} + 3 \times \frac{7}{36} + 4 \times \frac{5}{36} + 5 \times \frac{3}{36} + 6 \times \frac{1}{36} = \frac{91}{36}$	M1 A1 2	For calculation of $\sum xp$ where all probs < 1														
4 (i) $z = \frac{350 - 450}{120}$ = -0.833 % small = $1 - 0.7975 = 0.2025$ or 20.25%	M1 A1 A1 3	For standardising accept 120 or $\sqrt{120}$, no cc For correct z value, + or -, accept 0.83 For answer rounding to 0.202 or 0.203														
(ii) $0.7975 \div 2 = 0.39875$ each $\Phi z_2 = 0.60125$ $z_2 = 0.257$ $x = 120 \times 0.257 + 450$ = 481	M1 M1dep M1 M1dep A1 5	For dividing their remainder by 2 For adding their above two probs together or sub from 1 For finding the z corresponding to their probability For converting to x from a z value For answer, rounding to 481														

Page 2	Mark Scheme	Syllabus	Paper
	A AND AS LEVEL – JUNE 2004	9709/0390	6

5 (a) (i) $3 \times 5 \times 3 \times 2$ or ${}_3C_1 \times {}_5C_1 \times {}_3C_1 \times 2$ $= 90$	M1 A1 2	For multiplying $3 \times 5 \times 3$ For correct answer
(ii) $(3 \times 5 \times 2) + (3 \times 3) + (5 \times 2 \times 3)$ $= 69$	M1 M1 A1 3	For summing options that show S&M, S&D, M&D $3 \times 5 \times a + 3 \times 3 \times b + 5 \times 3 \times c$ seen for integers a, b, c For correct answer
(b) ${}_{14}C_5 \times {}_9C_5 \times {}_4C_4$ or equivalent $= 252252$	M1 M1 A1 3	For using combinations not all ${}_{14}C_5$... For multiplying choices for two or three groups For correct answer NB $14!/5!5!4!$ scores M2 and A1 if correct answer
6 (i) 	B1 B1 B1 B1 4	For top branches correct (0.65, 0.9, 0.1) For bottom branches correct (0.35, 0.8, 0.2) For win/lose option after 2 nd in (0.6, 0.4) For all labels including final lose at end of bottom branch
(ii) $0.65 \times 0.1 + 0.35 \times 0.8 \times 0.4 + 0.35 \times 2$ $= 0.247$	M1 M1 A1 3	For evaluating 1 st in and lose seen For 1 st out 2 nd in lose, or 1 st out 2 nd out lose For correct answer
(iii) $\frac{0.65 \times 0.1}{0.247}$ $= 0.263 (= 5/19)$	M1 A1ft 2	For dividing their 1 st in and lose by their answer to (ii) For correct answer, ft only on 0.65×0.1 /their (ii)

Page 3	Mark Scheme	Syllabus	Paper
	A AND AS LEVEL – JUNE 2004	9709/0390	6

7 (i) $P(0) = (0.8)^{15} (= 0.03518)$ $P(1) = {}_{15}C_1 \times (0.2) \times (0.8)^{14}$ $(= 0.1319)$ $P(2) = {}_{15}C_2 \times (0.2)^2 \times (0.8)^{13}$ $(= 0.2309)$ $P(X \leq 2) = 0.398$	B1	For correct numerical expression for P(0)
	B1	For correct numerical expression for P(1) or P(2)
	B1 3	For answer rounding to 0.398
 (ii) $1 - (0.8)^n \geq 0.85$ $0.15 \geq (0.8)^n$ $n = 9$	M1	For an equality/inequality involving 0.8, n, 0.85
	M1 dep	For solving attempt (could be trial and error or lg)
	A1 3	For correct answer
 (iii) $\mu = 1600 \times 0.2 = 320$, $\sigma^2 = 1600 \times 0.2 \times 0.8 = 256$ $P(X \geq 290) \text{ or } P(X < 350)$ $= 1 - \Phi\left(\frac{289.5 - 320}{\sqrt{256}}\right) = 1 - \Phi(-1.906)$ $= \Phi(1.906) = 0.972$	B1 M1	For both mean and variance correct For standardising, with or without cc, must have $\sqrt{\quad}$ on denom
	M1	For use of continuity correction 289.5 or 290.5
	M1	For finding an area > 0.5 from their z
	A1 5	For answer rounding to 0.972