

**CAMBRIDGE**  
INTERNATIONAL EXAMINATIONS

**JUNE 2002**

**GCE Advanced Level  
GCE Advanced Subsidiary Level**

**MARK SCHEME**

**MAXIMUM MARK : 50**

**SYLLABUS/COMPONENT :9709 /7, 8719 /7**

**MATHEMATICS  
(Probability and Statistics 2)**



UNIVERSITY of CAMBRIDGE  
Local Examinations Syndicate

Page 1	Mark Scheme	Syllabus	Paper
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1	$\bar{x} \pm 2.326 \times \frac{2.4}{\sqrt{90}}$ $\text{Width} = 2.326 \times \frac{2.4}{\sqrt{90}} \times 2$ $= 1.18$	B1 M1 M1 A1	4 For z value of 2.33 For expression of correct form involving $\sqrt{90}$ in denom For subtracting lower from upper, or multiplying half-width by 2 For correct answer
2	EITHER $0.275 \pm 1.96 \times \sqrt{\frac{0.275 \times 0.725}{120}}$ $0.195 < p < 0.355$ OR $33 \pm 1.96 \sqrt{120 \times 0.275 \times 0.725}$ $\frac{23.413}{120} < p < \frac{42.586}{120}$ $0.195 < p < 0.355$	M2 B1 A1 M1 M1 B1 A1	4 Calculation of correct form $p \pm z \sqrt{\frac{pq}{n}}$ (SR M1 if only one side of interval seen) Use of $p = 0.275$ For correct answer Calculation of correct form $np \pm z \sqrt{npq}$ (accept just one side of interval) Division by 120 (BOTH sides) Use of 0.275 Correct answer
3	3 sugar ~ N(1500, 1200) 5 coffee ~ N(1000, 720) Total weight ~ N(2850, 1920) or ~ N(2500, 1920) $P(W < 2900) = \Phi\left(\frac{2900 - 2850}{\sqrt{1920}}\right)$ $\text{Or } P(W < 2550) = \Phi\left(\frac{2550 - 2850}{\sqrt{1920}}\right) = 0.873$	B1 B1 M1 A1 M1 A1	6 For (normal dist with) correct means for both For (normal dist with) correct variance for both For adding their variances and means (+ purse) for coffee and sugar For correct mean and variance for their total weight ie with or without the purse For standardising and use of tables (consistent inclusion/exclusion of purse) For correct answer
4	(i) $\bar{x} = 14.2, s^2 = \frac{1}{149} \left( 37746 - \frac{2130^2}{150} \right) = 50.3(4)$ (ii) $H_0: \mu = 12$ and $H_1: \mu \neq 12$ Test statistic $z = \frac{14.2 - 12}{\sqrt{\frac{50.34}{150}}} = 3.798$ Compare with 1.645 or 1.282 for one-tail t Reject exam boards claim	B1 B1 B1 M1 A1 M1 A1	5 For correct mean For correct variance Both hypotheses correct For standardising attempt with se of form $\frac{s}{\sqrt{n}}$ For 3.80 Or comparing $\Phi(3.798)$ with 0.95 (or equiv. for one tail test) Signs consistent. Correct conclusion fit on their z and $H_1$
5	(i) $P(9 \text{ or } 10H) = (0.5)^9 \times (0.5) \times {}_{10}C_9 + (0.5)^{10}$ $(= 0.01074)$ $P(9T \text{ or } 10T) = 0.01074$ $P(\text{type I error}) = 0.0215$ AG (ii) $P(9 \text{ or } 10H) = (0.7)^9 \times (0.3) \times {}_{10}C_9 + (0.7)^{10}$ $(= 0.1493)$ $P(9 \text{ or } 10T) = (0.3)^9 \times (0.7) \times {}_{10}C_9 + (0.3)^{10}$ $= 0.000143$ $P(\text{type II error}) = 1 - 0.1493 - 0.000143$ $= 0.851$	M1 M1 M1 A1 M1 M1 M1 A1	4 For $P(9 \text{ or } 10H)$ For $P(9 \text{ or } 10T)$ For identifying outcome for Type I error For obtaining given answer legitimately For evaluating $P(9 \text{ or } 10H)$ with $P(H) = 0.7$ For evaluating $P(9 \text{ or } 10T)$ with $P(T) = 0.3$ For identifying outcome for Type II error For correct answer (SR 0.851 no working B2)

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