

**NOVEMBER 2002**

**GCE Advanced Subsidiary Level  
Advanced International Certificate of Education**

**MARK SCHEME**

**MAXIMUM MARK : 50**

**SYLLABUS/COMPONENT : 9709 /6, 0390 /6**

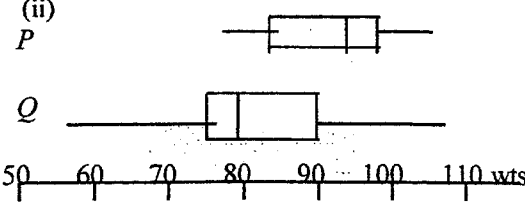
**MATHEMATICS  
(Probability and Statistics 1)**



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1 (i) $a + b = 0.45$ (ii) $0.3 + 3a + 5b + 7 \times 0.25 = 4$  $a = 0.15 \quad b = 0.3$	B1 1 M1 M1 A1 3	Accept unsimplified equation For an equation involving $\sum x_i p_i = 4$ must be correct unsimplified version, seen anywhere For sensible attempt to solve the two equations ie eliminating one letter For correct a and b.
2 (i) options (122), (212), (221), (113), (131), (311)  prob = 6 / 216 (AG)	M1 A1 A1 3	For an option involving (1,2,2) and an option involving (1,1,3) For all six correct options For legitimately obtaining answer given
(ii) (133) × 3, (223) × 3, (115) × 3, (124) × 6  prob = 15 / 216 (= 5/72)	M1 M1 ind A1 3	For listing 3 or 4 different correct options or tree diagram For multiplying 4 prob options by a relevant number or listing $\geq 12$ correct options For correct answer
3 (i) $z = \pm \frac{40 - 35.0}{11.6} = \pm 0.431$  $\Phi(0.431) - \{1 - \Phi(0.431)\} = 0.334$	M1 M1 A1 3	For standardising ( $\sqrt{11.6}$ in denom M1, ccM0 $11.6^2$ M0) For subtracting two relevant probabilities or equivalent For correct answer
(ii) $z = \pm 1.282$ or $\pm 1.281$ only $1.282 = \frac{x - 35.0}{11.6}$  $x = 49.9$ or $49.8$ on $z = 1.28$	B1 M1 A1 3	For stating $z$ For solving an equation for $x$ with some $z$ value from tables, allow cc, $\sqrt{11.6}$ , $35 - x$ , not $11.6^2$ For correct answer
4 (i) ${}_8C_2 = 28$ or $7+6+5+4+3+2+1$	B1 1	For ${}_8C_2$
(ii) ${}_8C_1 + {}_8C_2 + {}_8C_3 + {}_8C_4$ $= 8 + 28 + 56 + 70$  $= 162$	M1 A1 A1 A1 4	For listing 4 Combination options (can be added or multiplied here) For ${}_8C_1 + {}_8C_2 + {}_8C_3 + {}_8C_4$ For at least 3 correct numbers, can be implied by seeing 878080 (mult) For correct answer SR ${}_8C_1 + {}_8C_2 + \dots + {}_8C_8$ M1 only SR ${}_8C_3 \times {}_8C_3 \times {}_8C_1 \times {}_8C_2$ M1 only
(iii) $(162)^4$ $= 688\,747\,536$ or 3s	M1 A1ft 2	For (their (ii)) <sup>4</sup> or ${}_8C_3 + {}_8C_3 + {}_8C_1 \times {}_8C_2$ For correct answer in any form

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<p>5 (i) <math>P(W_1   L_2) = \frac{0.6 \times 0.3}{0.6 \times 0.3 + 0.4 \times 0.6}</math>  <math>= \frac{0.18}{0.42} = 0.429</math></p>	<p>B1 B1 M1 A1 A1</p>	<p>For <math>0.6 \times 0.3</math> seen anywhere in isolation For correct numerator For summing two 2 factor products in denom For correct denominator unsimplified For correct answer</p>
<p>(ii) <math>P(W_1 W_2 L_3) = 0.6 \times 0.7 \times 0.3 = 0.126</math>  <math>P(W_1 L_2 W_3) = 0.6 \times 0.3 \times 0.4 = 0.072</math>  <math>P(L_1 W_2 W_3) = 0.4 \times 0.4 \times 0.7 = 0.112</math>  Probability = 0.31</p>	<p>M1 B1 B1 A1</p>	<p>For summing three probability options For one correct probability option For two correct probability options For correct answer</p>
<p>6 (i) <math>P(\text{equal}) = (0.25)^5 \times (0.75)^5 \times {}_{10}C_5</math>  <math>= 0.0584</math></p>	<p>M1 A1</p>	<p>For <math>(0.25)^5 \times (0.75)^5</math> must be 0.25, 0.75 For correct answer. A0 if subsequently doubled</p>
<p>(ii) <math>(0.0584)^1 \times (0.9416)^7 \times {}_8C_1</math>  <math>= 0.307</math></p>	<p>M1 A1 ft</p>	<p>For <math>(\text{their}(a))^1 \times (1 - \text{their}(a))^7 \times {}_8C_1</math> 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</p>
<p>(iii) <math>\mu = 120 \times 0.25 = 30, \sigma^2 = 30 \times 0.75 = 22.5</math>   <math>P(X &lt; 35) = \Phi\left(\frac{34.5 - 30}{\sqrt{22.5}}\right) = \Phi(0.949)</math>   <math>= 0.829</math></p>	<p>M1 M1 B1 M1 A1</p>	<p>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</p>
<p>7 (i) LQ = 72, or 73 or 71.5 only median = 78, UQ = 88 or 87.75 only</p>	<p>B1 B1 B1</p>	<p>Accept <math>Q_1, Q_2, Q_3</math> LQ UQ middle scores B1 B0 and possibly B1 for median</p>
<p>(ii)</p>  <p>50 60 70 80 90 100 110 wts</p>	<p>B1 B1 B1 ft B1</p>	<p>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</p>
<p>(iii) people heavier in P than in Q  weights more spread out in Q</p>	<p>B1 B1</p>	<p>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.</p>