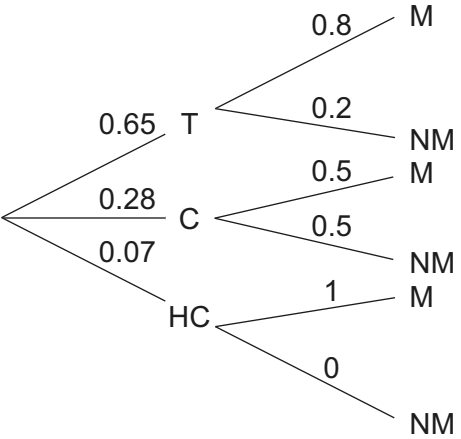


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Qu	Answer	Marks	Notes										
1 (i)		M1	Correct shape with either one branch after HC or 2 branches with 0 prob seen correct Labelled and clear annotation										
(ii)	$P(C \text{milk}) = \frac{P(\text{coffee} \cap \text{milk})}{P(\text{milk})}$ $= \frac{0.28 \times 0.5}{0.65 \times 0.8 + 0.28 \times 0.5 + 0.07(\times 1)}$ $= \frac{0.14}{0.73}$ $= 0.192$	M1 M1 A1 [3]	Attempt at $P(\text{coffee} \cap \text{milk})$ as a two-factor prod only seen as num or denom of a fraction Summing appropriate three 2-factor products seen anywhere (can omit the 1) Correct answer oe										
2 (i)	0.72	B1 [1]											
(ii)	$np = 180 \times 0.72, npq = 180 \times 0.72 \times 0.28$ $X \sim N(129.6, 36.288)$ $P(x > 115) = P\left(z > \frac{115.5 - 129.6}{\sqrt{36.288}}\right)$ $= P(z > -2.341)$ $= 0.990$	B1 st M1 M1 M1 A1 [5]	$180 \times 0.72, 180 \times 0.72 \times 0.28$ seen, their values or correct Standardising (\pm) must have sq rt cc either 115.5 or 114.5 seen Correct area, Φ from final answer attempt fully correct method										
3 (i)	<table border="1" data-bbox="279 1601 853 1680"> <tr> <td>x</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td>$P(x)$</td> <td>k</td> <td>$2k$</td> <td>$3k$</td> <td>$4k$</td> </tr> </table> $10k = 1$ $k = 1/10$	x	1	2	3	4	$P(x)$	k	$2k$	$3k$	$4k$	B1 M1 A1 [3]	Probability Distribution Table, either k or correct numerical values Summing probs involving k to = 1, 3 or 4 terms
x	1	2	3	4									
$P(x)$	k	$2k$	$3k$	$4k$									
(ii)	$E(X) = 1/10 + 4/10 + 9/10 + 16/10 = 3$ $\text{Var}(X) = 1/10 + 8/10 + 27/10 + 64/10 - 3^2 = 1$	B1 M1 A1 [3]	Correct mean Correct method seen for var, their k and μ										

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4	(i)	$p = 0.66$ $X \sim B(15, 0.66)$ $P(\text{at least } 14) = P(14, 15) =$ ${}^{15}C_{14} (0.66)^{14} (0.34) + (0.66)^{15}$ $= 0.0171$	M1 M1 A1 [3]	Bin term ${}^{15}C_x p^x (1-p)^{15-x}$ seen any p Unsimplified correct expression for $P(14, 15)$												
	(ii)	$(0.87)^n < 0.04$ $n = 24$	M1 M1 A1 [3]	Eqn involving 0.87, power of n , 0.04 only Solving by logs or trial and error (can be implied). Must be exponential equation												
5	(i)	<table style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Bronlea</td> <td style="text-align: center;">Rogate</td> </tr> <tr> <td style="text-align: center;">6 3 0</td> <td style="text-align: center;">4 5 7 7</td> </tr> <tr> <td style="text-align: center;">7 4 3 1</td> <td style="text-align: center;">0 1 3 5 6 8</td> </tr> <tr> <td style="text-align: center;">8 7 5 4 2 1 2</td> <td style="text-align: center;">3 3 6</td> </tr> <tr> <td style="text-align: center;">3 2 3 4</td> <td></td> </tr> <tr> <td style="text-align: center;">5 4</td> <td></td> </tr> </table> <p style="text-align: center;">Key 3 1 5 represents 13 kph for Bronlea and 15 kph for Rogate</p>	Bronlea	Rogate	6 3 0	4 5 7 7	7 4 3 1	0 1 3 5 6 8	8 7 5 4 2 1 2	3 3 6	3 2 3 4		5 4		B1 B1 B1 B1 B1 [5]	Correct single stem Correct ordered leaves Bronlea Correct ordered leaves Rogate Correct overall shape Single key must have both towns and units consistent with their values
	Bronlea	Rogate														
	6 3 0	4 5 7 7														
7 4 3 1	0 1 3 5 6 8															
8 7 5 4 2 1 2	3 3 6															
3 2 3 4																
5 4																
(ii)	median Bronlea = 23 km per hour IQ range Rogate = $23 - 7$ $= 16$	B1 M1 A1 [3]	Units not necessary Subt their LQ < 14 from their UQ > 14 from Rogate leaf													
(iii)	Rogate is less windy than Bronlea	B1 [1]	Not a comparison of a statistic but interpretation of information													
6	(i)	$P(x > 10.2) = P\left(z > \frac{10.2 - 9.5}{1.3}\right)$ $= P(z > 0.53846)$ $= 1 - 0.7046$ $= 0.295$	M1 M1 A1 [3]	Standardising allow cc, sq rt, sq $1 - \Phi$ final solution attempt												
	(ii)	$z = -1.282$ $-1.282 = \frac{t - 9.5}{1.3}$ $t = 7.83$	B1 M1 A1 [3]	\pm rounding to 1.28 seen Standardising correctly can be $\pm z$ value here Correct answer from $z = -1.282$ only												
	(iii)	$P(x < 8.8) = 0.2954$ by symmetry Days = 365×0.2954 $= 107$ or 108	B1 M1 A1 [3]	oe method, FT <i>their 0.2954 from (i)</i> Mult a probability < 1 by 365 Correct answer (no decimals)												
7	(a) (i)	$\frac{10!}{2!3!} = 302400$	B1 [1]	Exact value only, isw rounding												

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<p>(ii)</p>	<p>e.g. *W*****W*, **W*****W, W*****W**</p> $\frac{8!}{3!} \times 3(\text{for the Ws})$ $= 20160$	<p>M1</p> <p>M1</p> <p>M1</p> <p>A1 [4]</p>	<p>8! Seen mult or alone. Cannot be embedded (arrangements of other 8 letters).</p> <p>Dividing by 3! (removing repeated L's)</p> <p>Mult by 3 (different W positions) may be sum of 3 terms</p>																								
<p>(b)</p>	<table style="border: none;"> <tr> <td style="padding-right: 10px;">S(5)</td> <td style="padding-right: 10px;">A(7)</td> <td>C(4)</td> <td></td> </tr> <tr> <td>1</td> <td>3</td> <td>2</td> <td>: $5 \times {}^7C_3 \times {}^4C_2 = 1050$</td> </tr> <tr> <td>1</td> <td>4</td> <td>1</td> <td>: $5 \times {}^7C_4 \times 4 = 700$</td> </tr> <tr> <td>2</td> <td>3</td> <td>1</td> <td>: ${}^5C_2 \times {}^7C_3 \times 4 = 1400$</td> </tr> <tr> <td>3</td> <td>2</td> <td>1</td> <td>: ${}^5C_3 \times {}^7C_2 \times 4 = 840$</td> </tr> <tr> <td colspan="2" style="padding-left: 20px;">(Outcomes</td> <td style="padding-left: 20px;">:</td> <td>Options)</td> </tr> </table> <p>Total = 3990</p>	S(5)	A(7)	C(4)		1	3	2	: $5 \times {}^7C_3 \times {}^4C_2 = 1050$	1	4	1	: $5 \times {}^7C_4 \times 4 = 700$	2	3	1	: ${}^5C_2 \times {}^7C_3 \times 4 = 1400$	3	2	1	: ${}^5C_3 \times {}^7C_2 \times 4 = 840$	(Outcomes		:	Options)	<p>M1</p> <p>A1</p> <p>M1</p> <p>A1 [4]</p>	<p>Mult 3 combinations, ${}^5C_x, {}^7C_y, {}^4C_z$ (not $5 \times 7 \times 4$)</p> <p>2 correct options unsimplified</p> <p>Summing only 3 or 4 correct outcomes involving combs or perms</p>
S(5)	A(7)	C(4)																									
1	3	2	: $5 \times {}^7C_3 \times {}^4C_2 = 1050$																								
1	4	1	: $5 \times {}^7C_4 \times 4 = 700$																								
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