1	$\Sigma x - 100n = 216$ $2416 - 100n = 216$ $n = 22$ OR $\frac{2416}{n} = \frac{216}{n} + 100$ $n = 22$	**B1** **B1** **B1** 3 **B1** **B1** **B1**	$\Sigma x - 100n$ seen Subst 2416 for their Σx Correct answer $2416/n$ seen or $216/n + 100$ oe eg $\Sigma x/n - 100 = 216/n$ correct equation Correct answer
2	P(no men) $\frac{{}^9C_6}{{}^{16}C_6} = \frac{84}{8008} = \frac{21}{2002} = \frac{3}{286}$ $= 0.0105$ OR $\frac{9}{16} \times \frac{8}{15} \times \frac{7}{14} \times \frac{6}{13} \times \frac{5}{12} \times \frac{4}{11} = 0.0105$	**B1** **B1** **B1** 3 **B1** **B1** **B1**	${}^9C_6$ seen anywhere ${}^{16}C_6$ seen as denom of fraction oe Correct final answer $(9 \times 8 \times 7 \times 6 \times 5 \times 4)$ seen anywhere Correct unsimplified denom Correct final answer
3 (i)	$\frac{1}{4}$	**B1** 1	
(ii)	$\left(\frac{3}{4}\right)^4\left(\frac{1}{4}\right) = \frac{81}{1024} = 0.0791$	**M1** **A1** 2	Expression of form $p^4(1-p)$ only, $p = 1/4$ or $3/4$ Correct answer
(iii)	P(all diff) $= \frac{1}{4} \times \frac{1}{4} \times \frac{1}{4} \times \frac{1}{4} \times 4!$ $= \frac{3}{32}$ (0.0938) OR $1 \times \frac{3}{4} \times \frac{2}{4} \times \frac{1}{4} = \frac{3}{32}$	**M1** **M1** **A1** 3	4! on numerator seen mult by $k \geqslant 1$ or $3\times2\times1$ on num oe, must be in a fraction. 4^4 on denom or 4^3 on denom with the $3\times 2\times 1$ Correct answer
4 (i)	Two in same taxi: ${}^6C_2 \times {}^4C_4 \times 2$ or ${}^6C_2 + {}^6C_4$ $= 30$	**M1** **M1** **A1** 3	${}^6C_4$ or ${}^6C_2$ oe seen anywhere 'something' $\times 2$ only or adding 2 equal terms Correct final answer
(ii)	MJS in taxi $({}^5C_1 \times 2 \times 2) \times {}^4P_4$ $= 480$	**M1** **M1** **M1** **A1** 4	${}^5P_1$, ${}^5C_1$ or 5 seen anywhere Mult by 2 or 4 oe Mult by ${}^4P_4$ oe eg 4! or $4\times{}^3P_3$ or can be part of 5! Correct final answer

5 (i)

team *A*		team *B*
	7	5 7 9
4 4 2	8	2 3 4 6
9 8 7 6 1	9	4 5 6
9 7 4 0	10	1 8
6 5	11	1 3 5
2	12	

key 1 | 9 | 4 means 91 kg for team *A* and 94 kg for *B*

B1 Correct stem can be upside down, ignore extra values, allow 70, 80 etc with suitable numerical key

B1 Correct team *A* must be on LHS, alignment ± half a space, no late entries squeezed in, no crossing out if shape is changed

B1 Correct team *B* in single diagram can be either LHS or RHS

B1 4 Correct key or keys for their diagram/s, need both teams, at least one kg.

(ii)

LQ = 91 UQ = 109
IQ range = 18

B1 Both quartiles correct
B1√ 2 Correct IQR ft wrong quartiles, LQ < UQ, not
12 – 4 etc

(iii)

$\Sigma x_{15} = 1399$
$\Sigma x_{16} = 16 \times 93.9 = 1502.4$
New wt = 1502.4 – 1399 = 103 (103.4)

M1 Attempt at Σx_{15} for either team
M1 Mult 93.9 by 16 attempt
A1 3 Correct answer

6 (i)

Spinner *A*

Spinner *B*	1	2	3	3
–3	(–2)	–1	0	0
–2	–1	0	(1)	1
–1	0	1	2	2
1	2	3	4	4

B1 1

(ii)

x	–2	–1	0	1	2	3	4
prob	$\frac{1}{16}$	$\frac{2}{16}$	$\frac{4}{16}$	$\frac{3}{16}$	$\frac{3}{16}$	$\frac{1}{16}$	$\frac{2}{16}$

M1 Their values in (i) as the top line, seen listed in (ii) or used in part (iii)
M1 Attempt at probs seen evaluated, need at least 4 correct from their table
A1 3 Correct table seen

(iii)

$E(X) = 1$
$\text{Var}(X) = ((-2)^2 + 2 + 3 + 12 + 9 + 32)/16 - 1^2$
$= \frac{62}{16} - 1$
$= \left(\frac{23}{8}\right)$ (2.875)

OR using $\Sigma p(x - \bar{x})^2 = (9 + 8 + 4 + 0 + 3 + 4 + 18)/16$
$= \frac{46}{16} = 2.875$

M1 Attempt at $E(X)$ from their table if $\Sigma p = 1$
M1 Evaluating $\Sigma x^2 p$ – [their $E(X)$]^2 allow $\Sigma p \neq 1$ but all p's <1
A1 3 Correct answer
M1
M1
A1

(iv)	P(even given +ve) $= \frac{5}{9}$	**M1** **A1** 2	Counting their even numbers and dividing by their positive numbers Correct answer
	OR P(even given +ve) $= \frac{\left(\frac{5}{16}\right)}{\left(\frac{9}{16}\right)}$	**M1**	Using cond prob formula not P(E) × P(+ve) need fraction over fraction accept any of $\frac{5/16 or 6/16 or 9/16}{9/16 or 10/16 or 13/16}$
	$= \frac{5}{9}(0.556)$	**A1**	Correct answer
7 (a) (i)	P $(x > 3900) = \text{P}\left(z > \frac{3900 - 4520}{560}\right)$ $= \text{P}(z > -1.107) = \Phi(1.107)$ $= 0.8657$ Number of days $= 365 \times 0.0.8657$ $= 315$ or 316 (315.98)	**M1** **M1** **A1** **B1**√ 4	Standardising no cc no sq rt no sq Correct area Φ ie > 0.5 Prob rounding to 0.866 Correct answer ft their wrong prob if previous A0, $p < 1$, ft must be accurate to 3sf
(ii)	$z = 1.165$ $1.165 = \frac{8000 - m}{560}$ $m = 7350$ (7347.6)	**B1** **M1** **A1** 3	± 1.165 seen Standardising eqn allow sq, sq rt, cc, must have z-value eg not 0.122, 0.878, 0.549, 0.810. Correct answer rounding to 7350
(iii)	P(0, 1) $= (0.878)^6 + {}^6\text{C}_1(0.122)^1(0.878)^5$ $= 0.840$ accept 0.84 Normal approx. to Binomial. M0, M0, A0	**M1** **M1** **A1** 3	Binomial term ${}^6\text{C}_x\, p^x(1-p)^{6-x}$ $0 < p < 1$ seen Correct unsimplified expression Correct answer
(b)	P$(< 2\mu) = \text{P}\left(z > \frac{2\mu - \mu}{\sigma}\right) = \text{P}(z < 1.5)$ $= 0.933$	**M1** **M1** **A1** 3	Standardising with μ and σ Attempt at one variable and cancel Correct answer