1	**(i)** stem and leaf shows shape / spread / range / all prices [OR box-and-whisker shows shape/spread/range SR histogram B1only	B1* B1dep* **[2]**	correct answer valid reason, e.g. small number of prices, easy to calculate median correct answer valid reason, e.g. can read median]
	(ii) histogram shows shape/spread/modal class [OR$_1$ cumulative frequency graph shows shape or large number of prices [OR$_2$ box-and-whisker shows shape/spread/range	B1* B1dep* **[2]**	correct answer valid reason, e.g. large number of prices, too many prices for stem-and-leaf correct answer valid reason, e.g. easy to calculate median] correct answer valid reason, e.g. can read median]
2	**(i)** $72/n + 100 = 104.8$ or $72 + 100n = 104.8n$ $n = 15$	M1 A1 **[2]**	$72/n$ or $100n$ and $104.8n$ seen or implied correct answer
	(ii) $sd^2 = 499.2/15 - (72/15)^2$ (= 10.24) $sd^2 = \sum(x-104.8)^2/15 -$ $(\sum(x-104.8)/15)^2$ $\sum(x-104.8)^2 = 153.6$ (154)	M1 M1 A1 **[3]**	numerical use of a correct sd/variance formula, their n numerical use of different correct sd/var formula, their n correct final answer
	[OR$_1$ $\sum(x-100)^2 - 2\times 4.8\times\sum(x-100)$ $+ 15\times 4.8^2$ $= 153.6$ (154)		numerical 1st and 2nd terms numerical 3rd term correct final answer]
	[OR$_2$ $\sum x^2 = \sum(x-100)^2 + 200\times\sum x -$ 150000 $\sum(x-104.8)^2 = \sum x^2 - 209.6\sum x +$ 15×104.8^2 $= 153.6$ (154)		numerical use of a correct expansion to find $\sum x^2$ numerical use of a correct expansion for $\sum(x-104.8)^2$ correct final answer]

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3	**(i)** $\frac{7!}{3!}\times 2$	B1		$\frac{7!}{3!}$ or 840 seen or implied
	= 1680	B1	**[2]**	correct answer
	(ii) ${}^6C_4 = 15$	B1	**[1]**	correct answer
	(iii) 1E in ${}^6C_3$ ways	M1		k × ${}^6C_a$ or k × ${}^bC_3$ (k a constant) or ${}^6P_d$ or ${}^eP_3$ seen
	= 20	A1	**[2]**	correct final answer
	(iv) need 2Es in ${}^6C_2$ ways = 15 ways need 3Es in ${}^6C_1$ = 6 ways total = 15 + 20 + 15 + 6 = 56 ways	M1 A1 M1 A1ft	**[4]**	attempt to find ways with 2Es or 3Es ${}^6C_2$ oe and ${}^6C_1$ oe seen summing ways for no Es, 1E, 2Es and 3Es correct final answer, ft on their four answers
4	**(i)** mean = 11/6 ($1\frac{5}{6}$, 1.83)	B1		correct answer
	sd = $\sqrt{(1+1+1+4+9+9)/6-(11/6)^2}$ = $\sqrt{29}/6$ (0.898)	M1 A1	**[3]**	numerical use of a correct sd/variance formula correct answer
	(ii)			
	x: 2 | 3 | 4 | 5 | 6 Pr: 9/36 | 6/36 | 13/36 | 4/36 | 4/36	B1 B1 M1 A1	**[4]**	all correct x values P(2) and P(6) correct considering more than 1 case for a sum of 3 or 4 or 5 P(3), P(4) and P(5) correct
	(iii) $p = 1/3$ $np = 8$ $n = 24$ Var = $24\times 1/3\times 2/3 = 16/3$ (5.33)	B1 M1 A1ft	**[3]**	correct p using np = 8 to find n or 8(1 − p) to find var, $0<p<1$ correct answer, ft their p

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5 (i)

	Designer	Not designer	Total
H-h shoes	2	4	6
L-h shoes	1	3	4
Sports	5	5	10
Total	8	12	20

B1 one row or column correct

B1 **[2]** all correct

(ii) 1/20 (0.05) B1ft **[1]** correct answer, ft their table

(iii) 10/20 (1/2, 0.5) B1ft **[1]** correct answer, ft their table

(iv) 2/8 (1/4, 0.25) B1ft **[1]** correct final answer, ft their table

(v) P(D) = 8/20 (0.4) P(S) =10/20 (0.5) P($D \cap S$) = 5/20 (0.25) M1 finding P($D \cap S$) and comparing with their P(D) × P(S)

Not independent as P(D) × P(S) ≠ P($D \cap S$) A1ft **[2]** correct conclusion, ft their table

[OR$_1$ $P(D|S) = \frac{P(D \cap S)}{P(S)} = \frac{5}{10}$ $P(D) = \frac{8}{20}$ finding P($D|S$) and comparing with their P(D) correct conclusion, ft their table]

Not independent as P($D|S$) ≠ P(D)

[OR$_2$ $P(S|D) = \frac{P(S \cap D)}{P(D)} = \frac{5}{8}$ $P(S) = \frac{10}{20}$ finding P($D|S$) and comparing with their P(D) correct conclusion, ft their table]

Not independent as P($S|D$) ≠ P(S)

(vi) P(at most 4) = $1 - {}^7C_5(0.4)^5(0.6)^2 - {}^7C_6(0.4)^6(0.6)^1 - (0.4)^7$ M1 bin probability of form ${}^7C_r p^r(1-p)^{7-r}$, $r \neq 0$ or 7

= 0.904 M1 bin expression for 1 − P(5, 6, 7) or P(0, 1, 2, 3, 4), any p

A1 **[3]** correct answer

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6 (i) $\frac{34.1-\mu}{\sigma}=1.751$	B1		±1.751 seen
$\frac{26.7-\mu}{\sigma}=-0.524$	B1		±0.524 seen
	M1		a standardising equation with a z-value, μ and σ
$\mu = 28.4, \sigma = 3.25$	M1		valid attempt to eliminate μ or σ
	A1	**[5]**	correct answers
(ii) $\Phi\left(\frac{34.5-32.9}{2.4}\right)-\Phi\left(\frac{33.5-32.9}{2.4}\right)$	M1		one numerical standardising expression, no cc, no square root, can have 34
$=\Phi(0.667)-\Phi(0.25)$			
$=0.7477-0.5987$	M1		subtracting two areas
$=0.149$	A1	**[3]**	correct answer
(iii) $\Phi\left(\frac{t-32.9}{2.4}\right)-\Phi\left(\frac{31.8-32.9}{2.4}\right)=0.5$	M1		using 2 standardising expressions to give an equation involving subtraction and 0.5, oe
$\Phi\left(\frac{t-32.9}{2.4}\right)-(1-0.6765)=0.5$			
$\Phi\left(\frac{t-32.9}{2.4}\right)=0.8235$	M1		adding their tail to 0.5 oe
$\frac{t-32.9}{2.4}=0.929$	M1		solving a standardised equation, must be a z-value from their 0.8235
$t = 35.1$	A1	**[4]**	correct final answer

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