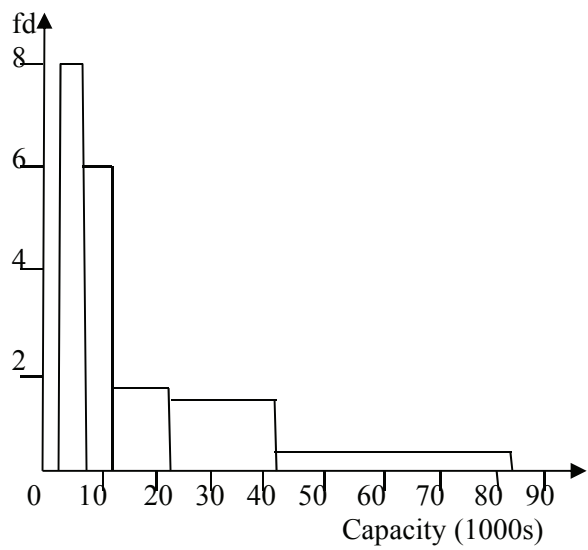


1	$P(C \text{ given } L) = \frac{P(C \cap L)}{P(L)}$ $= \frac{0.65 \times 0.1}{0.65 \times 0.1 + 0.3 \times 0.15 + 0.05 \times 0.6}$ $= \frac{0.065}{0.14}$ $= 0.464, \frac{13}{28}$	M1 A1 M1 A1 A1	[5] 	P(C∩L) seen as num or denom of a fraction Correct unsimplified P(C∩L) as numerator Summing three 2-factor products seen anywhere 0.14 (unsimplified) seen as num or denom of a fraction oe										
2 (i)	$P(1 \text{ T-shirt}) = \frac{{}^3C_1 \times {}^9C_2}{{}^{12}C_3}$ $= 27/55$ <p style="text-align: right;">AG</p> <p>OR $3/12 \times 9/11 \times 8/10 \times {}^3C_1$ oe</p> $= 27/55$ <p style="text-align: right;">AG</p>	B1 B1 B1 M1 M1 A1	[3] 	Correct num unsimplified Correct denom unsimplified Answer given, so process needs to be convincing Mult 3 probs diff denoms (not a/3 x b/4 x c/5) Mult by 3C_1 oe Answer given, so process needs to be convincing										
(ii)	<table border="1" style="width: 100%; text-align: center;"> <tr> <td>X</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>Prob</td> <td>84/220</td> <td>27/55</td> <td>27/220</td> <td>1/220</td> </tr> </table>	X	0	1	2	3	Prob	84/220	27/55	27/220	1/220	B1 B1 B1 B1	[4] 	0, 1, 2, 3 only seen in top line (condone additional values if Prob stated as 0) One correct prob, correctly placed in table One other correct prob, correctly placed in table One other correct prob ft $\Sigma p = 1$, 4 values in table
X	0	1	2	3										
Prob	84/220	27/55	27/220	1/220										
3 (i)	Bin (7, 0.8) $P(6, 7) = {}^7C_6 (0.8)^6 (0.2)^1 + (0.8)^7$ $= 0.577$	M1 M1 A1	[3] 	${}^7C_n p^n (1-p)^{7-n}$ seen Correct unsimplified expression for P(6,7)										
(ii)	mean = $100 \times 0.2 = 20$ Var = $100 \times 0.2 \times 0.8 = 16$ $P(\text{at most } 30) = P\left(z < \frac{30.5 - 20}{\sqrt{16}}\right)$ $= P(z < 2.625)$ $= 0.996$	B1 M1 M1 M1 A1	[5] 	Correct unsimplified mean and var Standardising must have sq rt, their μ , variance cc either 29.5 or 30.5 Correct area Φ , from final process										
4 (i)	$P(< 4.5) = P\left(z < \frac{4.5 - 4.2}{0.6}\right) = P(z < 0.5)$ $= 0.6915$ $P(< 3.5) = P\left(z < \frac{3.5 - 4.2}{0.6}\right) = P(z < -1.167)$ $= 1 - 0.8784 = 0.1216$ $0.6915 - 0.1216 = 0.570$	M1 M1 A1	[3] 	Standardising once no cc no sq no sq rt $\Phi_1 - (1 - \Phi_2)$ [$P_1 - P_2$, $1 > P_1 > 0.5$, $0.5 > P_2 > 0$] oe										

	(ii)	$z = 1.175$ $1.175 = \frac{t - 4.2}{0.6}$ $t = 4.91$	B1 M1 A1	±1.17 to 1.18 seen Standardising no cc, allow sq, sq rt with z – value (not ±0.8106, 0.5478, 0.4522, 0.1894, 0.175 etc.) [3] Correct answer from $z = 1.175$ seen (4sf)
	(iii)	$(0.88)^n < 0.003$ $n > \lg(0.003)/\lg(0.88)$ $n > 45.4$ $n = 46$	M1 M1 A1	Inequality or eqn in 0.88, power correctly placed using n or $(n \pm 1)$, 0.003 or $(1 - 0.003)$ oe Attempt to solve by logs or trial and error (may be implied by answer) Correct integer answer [3]
5	(i)	cw 5, 5, 10, 20, 40 fd 8, 6, 1.8, 1.7, 0.2 	M1 M1 A1 B1 B1	cw either 4 or 5 etc fd or scaled freq [f/their cw attempt] fd may be $\div 1000$ Correct heights seen accurately on diagram Correct bar ends, accurately plotted on axis [5] Labels fd and capacity (thousands) Correct horizontal scale required. Vertical scale linear from 0
	(ii)	$(5 \times 40 + 10 \times 30 + 17.5 \times 18 + 32.5 \times 34 + 62.5 \times 8) / 130$ $= 2420 / 130 = 18.6$ thousand	M1 A1	$\Sigma fx / 130$ where x is mid point attempt (value within class, not end pt or cw) [2]
	(iii)	median group = 8 – 12 thousand LQ group = 3 – 7 thousand	B1 B1	Thousands not needed [2]

6	(i)	e.g. (OAEE)(CPNHGN) or cv $\frac{4!}{2!} \times \frac{6!}{2!} \times 2 = 8640$	M1 M1 A1	[3]	4!/2! or 6!/2! seen anywhere All multiplied by 2 oe
	(ii)	First Method Total ways = $10!/2!2! = 907200$ EE together in $9!/2!$ ways = 181440 EE not together = $907200 - 181440 = 725760$ OR Second Method C P N H G N O A in $8!/2!$ ways ↑ Insert E in 9 ways Insert 2nd E in 8 ways, $\div 2$ Total = $8!/2! \times 9 \times 8 \div 2 = 725760$	B1 M1 M1 A1 B1 M1 M1 A1	[4]	Total ways together correct EE together attempt alone Considering total – EE together 8!/2! Seen Interspersing an E, x n where n=7,8,9. Condone additional factors. Mult by $9 \times 8 (\div 2)$, 9C_2 or 9P_2 only oe
	(iii)	First Method EN** in 6C_2 ways = 15 different ways EENN in 1 way Total 16 ways OR Second Method Listing with at least 8 different correct options Listing all correct options Total = 15 different ways EENN in 1 way Total 16 ways	M1 M1 A1 B1 A1 M1 M1 A1 B1 A1	[5]	6C_x or yC_2 seen alone or mult by $k > 1$, $x < 6$, $y > 2$ (1x1x) 6C_2 seen strictly alone or added to their EENN only Value stated or implied by final answer correct value stated Award 16 SRB2 if no method is present