Note: "(3 sfs)" means "answer which rounds to ... to 3 sfs". If correct ans seen to ≥ 3sfs, ISW for later rounding
Penalise over-rounding only once in paper.

1i	590	B1 1	Allow approximately 590
ii	Graph horiz (for ≥ 55 mks) oe	B1 1	or levels off, or grad = 0, grad not increase Allow line not rise, goes flat, plateaus, stops increasing, not increase, doesn't move
iii	39 to 41	B1 1	
iv	Attempt read cf at 26 or 27 Double & attempt read x Max C = 29 to 31.5	M1 M1 A1 3	eg 26 mks → 150th 27 mks → 180th eg read at cf = 300 or 360 Indep of first M1 May be implied by ans Answer within range, no working, M1M1A1 32 without working, sc B1
v	LQ = 25.5-26.5 or UQ = 34-35.5 IQR = 8-10 (German) more spread	M1 A1 B1ft 3	M1 for one correct quartile dep ≥ 1 correct quartile or no working or less consistent, less uniform, less similar, more varied, more variable, greater variance, more spaced apart, further apart ft their IQR; must be consistent with IQR Correct comment with no working: M0A0B1
Total		**9**	
2i	Opposite orders or ranks or scores or results or marks $r_s = -1$	 B1 1	or reversed, or backwards, or inverse or as one increases the other decreases Needs reason AND value
ii	Attempt Σd^2 (= 6) $1 - \frac{6\times\Sigma d^2}{3(3^2-1)}$ $= -\frac{1}{2}$ oe	M1 M1 A1 3	 dep 1st M1 Allow use wrong table for M1M1
iii	3! or ${}^3P_3$ or 6 1 ÷ their '6' $\frac{1}{6}$ oe eg $\frac{6}{36}$	M1 M1 A1 3	r attempt list possible orders of 1,2,3 (≥3 orders) 2nd M1 for fully correct method only or $\frac{1}{3}\times\frac{1}{2}(\times 1)$: M1M1
Total		**7**	
3i	If x is contr (or indep) or y depend't, use y on x If neither variable contr'd (or indep) AND want est y from x: use y on x	B1 B1 2	Allow x increases constantly, is predetermined, you choose x, you set x, x is fixed, x is chosen Allow y not controlled AND want est y from x Ignore incorrect comments
iia	$S_{xx} = 510000 - \frac{1800^2}{9}$ (= 150000) $S_{xy} = 4080 - \frac{1800\times 14.4}{9}$ (= 1200) $b = \frac{'1200'}{'150000'}$ (= 0.008) $y - \frac{14.4}{9} = 0.008(x - \frac{1800}{9})$ $y = 0.008x$ (+ 0)	 M1 M1 M1 A1 4	or $\frac{510000}{9} - 200^2$ (= 16666.7) or $\frac{4080}{9}$ - 200×1.6 (= 133.33) M1 for either S $b = \frac{'133.33'}{'16666.7'}$ dep correct expressions both S's or $a = \frac{14.4}{9} - 0.008 \times \frac{1800}{9}$ (= 0) Must be all correct for M1 CAO
iib	312.5 or 313	B1ft 1	ft their equn in (iia)
iic	–0.4	B1ft 1	ft their equn in (iia)

iid	Contraction oe	B1(ft)	or length decreased, shorter, pushed in, shrunk, smaller
	Unreliable because extrapolated oe	B1 2	or not in the range of x or not in range of previous results
Total		**10**	
4ia	0.299 (3 sf)	B1 1	
ib	0.2991 – 0.1040 = 0.195 (3 sf) or $\frac{1280}{6561}$ oe	M1 A1 2	Must subtract correct pair from table
iia	${}^{15}C_4\times(1-0.22)^{11}\times0.22^4$ = 0.208 (3 sf)	M1 A1 2	Allow M1 for ${}^{15}C_4\times0.88^{11}\times0.22^4$
iib	(15 × 0.22 =) 3.3 15×0.22×(1–0.22) or '3.3'×(1–0.22) = 2.57 (3 sf)	B1 M1 A1 3	Allow M1 for 15 × 0.22 × 0.88
Total		**8**	
5i	$\frac{1}{2}\times\frac{1}{3}$ or $\frac{2}{4}\times\frac{1}{3}$ or $\frac{1}{{}^4C_2}$ or $\frac{2}{12}$ (= $\frac{1}{6}$ **AG**)	B1	or 1 out of 6 or 2 out of 12 or $\frac{2!}{4!}\times2$
	$\frac{1}{4}\times\frac{2}{3}$ or $2\times\frac{1}{4}\times\frac{1}{3}$ or $\frac{1}{2}\times\frac{1}{3}$ or $\frac{2}{4}\times\frac{1}{3}$	B1	or $\frac{2}{12}$ or $\frac{1}{6}$ or $\frac{1}{3!}$ or $\frac{1}{{}^4C_2}$ or $\frac{2!}{4!}\times2$
	Add two of these or double one (= $\frac{1}{3}$ **AG**)	B1 3	or $\frac{2}{{}^4C_2}$ or $4\times\frac{1}{4}\times\frac{1}{3}$ or $\frac{2}{4}\times\frac{2}{3}$ or $\frac{4}{12}$ or $\frac{2!}{4!}\times4$ B1B1 or $\frac{2}{6}$ or $2\times\frac{1}{6}$ or $\frac{2}{3!}$ or $\frac{2!}{3!}$ B1B1
ii	X = 3, 4, 5, 6 only, stated or used	B1	Allow repetitions Allow other values with zero probabilities.
	P(X =5) wking as for P(X =4) above or 1 – ("$\frac{1}{6}$" + $\frac{1}{3}$ + $\frac{1}{6}$) or $\frac{1}{3}$	M1	
	P(X =3) wking as for P(X =6) above or 1 – ($\frac{1}{3}$ + "$\frac{1}{3}$" + $\frac{1}{6}$) or $\frac{1}{6}$	M1	or M1 for total of their probs = 1, dep B1
	3 4 5 6 $\frac{1}{6}$ $\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{6}$ oe	A1 4	or P(X =3)= $\frac{1}{6}$, P(X = 4)= $\frac{1}{3}$, P(X = 5)= $\frac{1}{3}$, P(X = 6)= $\frac{1}{6}$ Complete list of values linked to probs
iii	Σxp = $4\frac{1}{2}$	M1 A1	$\geq$ 2 terms correct ft
	Σx^2p (= $21\frac{1}{6}$) – '$4\frac{1}{2}$'^{2} = $\frac{11}{12}$ or 0.917 (3 sf)	M1 M1 A1 5	$\geq$ 2 terms correct ft Independent except dependent on +ve result
Total		**12**	

6	$m = (9 \times 6 + 3) \div 10$ $= 5.7$	M1 A1	or ((Sum of any 9 nos totalling 54) + 3) ÷ 10
	$2 = \frac{\Sigma x^2}{9} - 6^2$	M1	or $\frac{\Sigma(x-6)^2}{9} = 2$ M1
	$\Sigma x^2 = 2\times9 + 6^2\times9$ or 342	A1	or $\Sigma x^2 = 18 + 12\times54 - 36\times9$ or 342 A1
	$v = \frac{('342' + 3^2)}{10} - '5.7'^2$	M1	dep Σx^2 attempted, eg $(\Sigma x)^2$ (= 3249) or just state 'Σx^2'; allow √
	= 2.61 oe	A1 6	CAO
Total		**6**	
7i	${}^4C_2 \times {}^6C_3 \times {}^5C_4$ or $6\times20\times5$ = 600	M1M1 A1 3	M1 for any 2 correct combs seen, even if added
ii	$\frac{2}{4}$ or $\frac{{}^3C_1}{{}^4C_2}$ or $\frac{{}^3C_1\times{}^6C_3\times{}^5C_4}{{}^4C_2\times{}^6C_3\times{}^5C_4}$ or $\frac{{}^3C_1\times{}^6C_3\times{}^5C_4}{'600'}$ = $\frac{1}{2}$ oe	M1 A1 2	or $\frac{1}{4}\times1 + \frac{3}{4}\times\frac{1}{3}$ or $\frac{1}{4}\times2$ or $\frac{1}{4}+\frac{1}{4}$
iii	${}^3C_1 \times {}^6C_3$ (× ${}^4C_4$) + ${}^3C_2 \times {}^6C_3 \times {}^5C_4$ 360	M1M1 A1 3	M1 either product seen, even if × or ÷ by something
Total		**8**	

8			
8ia	Geo(0.3) stated or implied $0.7^3 \times 0.3$ = 0.103 (3 sf)	M1 M1 A1 3	by $0.7^n \times 0.3$
b	0.7^3 or 0.343 $1 - 0.7^3$ = 0.657	M1 M1 A1 3	0.7^3 must be alone, ie not $0.7^3 \times 0.3$ or similar allow $1 - 0.7^4$ or 0.7599 or 0.76 for M1 only or $0.3 + 0.7\times0.3 + 0.7^2\times0.3$: M1M1 1 term wrong or omitted or extra M1 or $1 - (0.3 + 0.7\times0.3 + 0.7^2\times0.3)$ or 0.343: M1
iia	State or imply one viewer in 1st four $^4C_1 \times 0.7^3 \times 0.3$ (= 0.412) $\times 0.3$ = 0.123 (3 sf)	M1 M1 M1 A1 4	or B(4, 0.3) stated, or $^4C_1$ used, or YNNNY dep 1st M1
b	$0.7^5 + {}^5C_1 \times 0.7^4 \times 0.3$ = 0.528 (3 sf)	M1 A1 2	or $1 - (0.3^2 + 2\times0.3^2\times0.7 + 3\times0.3^2\times0.7^2 + 4\times0.3^2\times0.7)$ Not ISW, eg 1 – 0.528: M1A0
Total		**12**	

Total 72 marks