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

iii S90. B1. I. Allow approximately, \$90. B1. I. Allow approximately, \$90. B1. I. Or levels of no grad = 0, grad not increase Allow line not rise, goes flat, plateaus, stops increasing, not increase, doesn't move allow line not rise, goes flat, plateaus, stops increasing, not increase, doesn't move allow line not rise, goes flat, plateaus, stops increasing, not increase, doesn't move allow line not rise, goes flat, plateaus, stops increasing, not increase, doesn't move allow line not rise, goes flat, plateaus, stops increasing, not increase, doesn't move allow line not rise, goes flat, plateaus, stops increasing, not increase, doesn't move allow line not rise, goes flat, plateaus, stops increasing, not increase, doesn't move allow line not rise, goes flat, plateaus, stops increasing, not increase, doesn't move allow line not rise, goes flat, plateaus, stops increasing, not increase, doesn't move allow line not rise, goes flat, plateaus, stops increasing, not increase, doesn't move allow line not rise, goes flat, plateaus, stops increasing, not increase, doesn't move sup flat, plateaus, stops increasing, not increase, doesn't move sup flat, plateaus, stops increasing, not increase, doesn't move sup flat, plateaus, stops increasing, not increase, doesn't move sup flat, plateaus, stops increasing, not increase, doesn't move sup flat, plateaus, stops increasing, not increase, doesn't move sup flat, plateaus, stops increasing, not increase, allow increase flatow increase flatow increase flatow within range, no working, MIMAI allow vorking, se B1  V LQ = 25.5-26.5 or UQ = 34-35.5 M1  M1 M1 M2 be implied by ans Answer within range, no working, MIMAI Allow vorking, se B1  V LQ = 25.5-26.5 or UQ = 34-35.5 or MI  Answer within range, no working, MIMAI Allow vorking, se B1  M1 M2 per lead at C = 000 prove se mithin range, no working, MIMAI Allow vorking, se B1  M1 M2 per lead at C = 000 prover expectation or no working or leavest dept or no working or reversed, or beacturers with no working within range, no working dept	Penalise over	er-rounding only once in paper.		
iii Graph horiz (for ≥ 55 mks) oe BI I of levels off, or grad = 0, grad not increase Allow line not rise, goes flat, plateaus, stops increasing, not increase, doesn't move BI I iv Attempt read cf at 26 or 27 MI ouble & attempt read $x$ MI was C = 29 to 31.5 MI way be implied by ans Answer within range, no working, MIMIA1 32, without working, se BI MI for one correct quartile or no working (German) more spread BIf 1 MI for one correct quartile or no working (German) more spread BIf 3 or levels consistent, less uniform, less similar, more variable, greater variance, more spaced apart, further apart fit their IQR; must be consistent with IQR Correct comment with no working: MOA0B1    Total 9 or reversed, or backwards, or inverse or as one increases the other decreases $r_r = -1$ and $r_s = -\frac{6.5 L^2}{3(3^2 - 1)}$ and $r_s = -\frac{1}{2}$ oc AI 3 or levels off, or indep) $r_s = -\frac{1}{3}$ or levels off, or grad = 0, grad not increase Allow use wrong table for MIM1 Allow use MIM1 Allow use wrong table for MIM1 Allow use MIM1 Allow use wrong tab	1i	590	B1 1	Allow approximately 590
iii 39 to 41  iv Attempt read cf at 26 or 27  Double & attempt read x  MI  Max C = 29 to 31.5  V  LQ = 25.5-26.5 or UQ = 34-35.5  IQR = 8-10  (German) more spread  B1ft 3  Opposite orders or ranks or scores or results or marks $r_s = -1$ B1 1  Attempt $\Sigma d^a$ Total  iii Attempt $\Sigma d^a$ 1iii Attempt $\Sigma d^a$ 1iiii Attempt $\Sigma d^a$ 1iii Attempt $\Sigma d^a$ 1iiii Attempt	ii	Graph horiz (for $\geq$ 55 mks) oe		
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$S_{xy} = 310000 - \frac{1800 \times 14.4}{9}  (= 1200)$ $S_{xy} = 4080 - \frac{1800 \times 14.4}{9}  (= 1200)$ $M1  \text{or } \frac{4080}{9} - 200 \times 1.6  (= 133.33)$ $M1 \text{ for either } S$ $b = \frac{1200}{150000}  (= 0.008)$ $M1  b = \frac{133.33}{16666.7}  \text{dep correct expressions both } S \text{ is } S$ $y - \frac{14.4}{9} = 0.008(x - \frac{1800}{9})$ $y = 0.008x  (= 0.008)$ $M1  \text{or } a = \frac{14.4}{9} - 0.008 \times \frac{1800}{9}  (= 0)$ $\text{Must be all correct for M1}$ $\text{CAO}$ $\text{iib}  312.5 \text{ or } 313$ $\text{B1ft 1}  \text{ft their equn in (iia)}$	iio	1002		
$b = \frac{1200'}{150000'} \qquad (= 0.008) \qquad \text{M1} \qquad b = \frac{133.33'}{16666.7'}  \text{dep correct expressions both } S's$ $y - \frac{14.4}{9} = 0.008(x - \frac{1800}{9}) \qquad \text{M1} \qquad \text{or } a = \frac{14.4}{9} - 0.008 \times \frac{1800}{9}  (= 0)$ $y = 0.008x  (+ 0) \qquad \text{A1} \qquad 4 \qquad \text{CAO}$ $\text{iib} \qquad 312.5 \text{ or } 313 \qquad \qquad \text{B1ft } 1  \text{ft their equn in (iia)}$	11a	$S_{xx} = 510000 - \frac{1800^2}{9}$ (= 150000)		or $\frac{520000}{9} - 200^{2}$ (= 16666.7)
$b = \frac{1200'}{150000'} \qquad (= 0.008) \qquad \text{M1} \qquad b = \frac{133.33'}{16666.7'}  \text{dep correct expressions both } S's$ $y - \frac{14.4}{9} = 0.008(x - \frac{1800}{9}) \qquad \text{M1} \qquad \text{or } a = \frac{14.4}{9} - 0.008 \times \frac{1800}{9}  (= 0)$ $y = 0.008x  (+ 0) \qquad \text{A1} \qquad 4 \qquad \text{CAO}$ $\text{iib} \qquad 312.5 \text{ or } 313 \qquad \qquad \text{B1ft } 1  \text{ft their equn in (iia)}$		$c = 4080  1800 \times 14.4  (= 1200)$	M1	or $\frac{4080}{9}$ - 200×1.6 (= 133.33)
$b = \frac{1200'}{150000'} \qquad (= 0.008) \qquad M1 \qquad b = \frac{133.33'}{16666.7'} \qquad \text{dep correct expressions both $S$'s}$ $y - \frac{14.4}{9} = 0.008(x - \frac{1800}{9}) \qquad \qquad M1 \qquad \text{or } a = \frac{14.4}{9} - 0.008 \times \frac{1800}{9}  (= 0)$ $y = 0.008x  (+ 0) \qquad \qquad A1  4 \qquad CAO$ $\text{iib} \qquad 312.5 \text{ or } 313 \qquad \qquad \text{B1ft 1} \qquad \text{ft their equn in (iia)}$		$S_{xy} = 4000 - \frac{1200}{9}$ (= 1200)	1/11	2
$y - \frac{14.4}{9} = 0.008(x - \frac{1800}{9})$ $y = 0.008x (+ 0)$ $iib$ $312.5 \text{ or } 313$ $M1$ $or \ a = \frac{14.4}{9} - 0.008 \times \frac{1800}{9} \ (= 0)$ $Must \ be \ all \ correct \ for \ M1$ $CAO$ $B1ft \ 1  ft \ their \ equn \ in \ (iia)$				IVI I for eitner S
$y - \frac{14.4}{9} = 0.008(x - \frac{1800}{9})$ $y = 0.008x (+ 0)$ $iib$ $312.5 \text{ or } 313$ $M1$ $or \ a = \frac{14.4}{9} - 0.008 \times \frac{1800}{9} \ (= 0)$ $Must \ be \ all \ correct \ for \ M1$ $CAO$ $B1ft \ 1  ft \ their \ equn \ in \ (iia)$		h = '1200' ( 0.000)	M1	b = 133.33' den sommet evenussions both $C'$
y = 0.008x (+ 0) $y = 0.008x (+ 0)$ $A1$		$b = \frac{1200}{150000'} \qquad (= 0.008)$	IVII	$v = \frac{1}{16666.7}$ dep correct expressions both 3 s
y = 0.008x (+ 0) $y = 0.008x (+ 0)$ $A1$				
y = 0.008x (+ 0) $y = 0.008x (+ 0)$ $A1$		14.4 - 0.008 (* 1800 )	M1	or $a = \frac{14.4}{2} - 0.008 \times \frac{1800}{5}$ (= 0)
y = 0.008x (+ 0) A1 4 CAO iib 312.5 or 313 B1ft 1 ft their equn in (iia)		$y - {9} = 0.008(x - {9})$	1411	,
iib 312.5 or 313 B1ft 1 ft their equn in (iia)		0.000 (0)		
		y = 0.008x (+ 0)	A1 4	CAU
iic   -0.4   B1ft 1   ft their egun in (iia)	iib	312.5 or 313	B1ft 1	ft their equn in (iia)
	iic	-0.4	B1ft 1	ft their equn in (iia)

4732		Mark S	cheme June 201
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	$^{15}\text{C}_4 \times (1-0.22)^{11} \times 0.22^4$ = 0.208 (3 sf)	M1 A1 2	Allow M1 for ${}^{15}C_4 \times 0.88^{11} \times 0.22^4$
iib	$(15 \times 0.22 =) 3.3$ $15 \times 0.22 \times (1-0.22)$ or '3.3'×(1-0.22) = 2.57 (3 sf)	B1 M1 A1 3	Allow M1 for $15 \times 0.22 \times 0.88$
Total		8	
5i	$\frac{1}{2} \times \frac{1}{3} \text{ or } \frac{2}{4} \times \frac{1}{3} \text{ or } \frac{1}{{}^{4}C_{2}} \text{ or } \frac{2}{12}$ $(=\frac{1}{6} \mathbf{AG})$	B1	or 1 out of 6 or 2 out of 12 or $\frac{2!}{4!} \times 2$
	$\frac{1}{4} \times \frac{2}{3}$ 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 $\frac{1}{{}^{4}C_{2}}$ or $\frac{2!}{4!} \times 2$
	Add two of these or double one $(=\frac{1}{3} \mathbf{AG})$	B1 3	or $\frac{2}{^{4}C_{2}}$ or $4 \times \frac{1}{4} \times \frac{1}{3}$ or $\frac{2}{4} \times \frac{2}{3}$ or $\frac{4}{12}$ or $\frac{2!}{4!} \times 4$ 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 $1 - (\frac{1}{6}^{n} + \frac{1}{3} + \frac{1}{6})$ or $\frac{1}{3}$	M1	Timow outer values with zero procuomition
	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		or $P(X = 3) = \frac{1}{6}$ , $P(X = 4) = \frac{1}{3}$ , $P(X = 5) = \frac{1}{3}$ , $P(X = 6) = \frac{1}{6}$
	$\frac{1}{6} \frac{1}{3} \frac{1}{3} \frac{1}{6}$ oe	A1 4	Complete list of values linked to probs
iii	$\sum xp = 4\frac{1}{2}$	M1 A1	≥ 2 terms correct ft
	$\sum x^2 p \qquad (= 21 \frac{1}{6})$ $- 4 \frac{1}{2}$	M1 M1	$\geq$ 2 terms correct ft Independent except dependent on +ve result
	$=\frac{11}{12}$ or 0.917 (3 sf)	A1 5	

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4732	Mark Sc		cheme June 2010
6	$m = (9 \times 6 + 3) \div 10$	M1	or ((Sum of any 9 nos totalling 54) + 3) $\div$ 10
	= 5.7	A1	
	$2 = \frac{\Sigma x^2}{9} - 6^2$	M1	or $\frac{\Sigma(x-6)^2}{9} = 2$ M1
	$\Sigma x^2 = 2 \times 9 + 6^2 \times 9 \text{ or } 342$	A1	or $\Sigma x^2 = 18 + 12 \times 54 - 36 \times 9$ or 342 A1
	$v = \frac{('342' + 3^2)}{10} - '5.7'^2$	M1	dep $\Sigma x^2$ attempted, eg $(\Sigma x)^2$ (= 3249) or just state ' $\Sigma x^2$ '; allow $$
	= 2.61 oe	A1 6	CAO
Total		6	
7i	$^{4}\text{C}_{2} \times ^{6}\text{C}_{3} \times ^{5}\text{C}_{4} \text{ or } 6 \times 20 \times 5$	M1M1	M1 for any 2 correct combs seen, even if added
	= 600	A1 3	
ii	$\frac{2}{4}$ or $\frac{{}^{3}C_{1}}{{}^{4}C_{2}}$ or $\frac{{}^{3}C_{1} \times {}^{6}C_{3} \times {}^{5}C_{4}}{{}^{4}C_{2} \times {}^{6}C_{3} \times {}^{5}C_{4}}$ or	M1	or $\frac{1}{4} \times 1 + \frac{3}{4} \times \frac{1}{3}$ or $\frac{1}{4} \times 2$ or $\frac{1}{4} + \frac{1}{4}$
	$\frac{{}^{3}C_{1}\times^{6}C_{3}\times^{5}C_{4}}{{}^{6}00'}$		
	$=\frac{1}{2}$ oe	A1 2	
iii	${}^{3}C_{1} \times {}^{6}C_{3} \times {}^{4}C_{4} + {}^{3}C_{2} \times {}^{6}C_{3} \times {}^{5}C_{4}$	M1M1	M1 either product seen, even if $\times$ or $\div$ by something
	360	A1 3	
Total		8	

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

Total 72 marks