

Mark Scheme (Results)

January 2023

Pearson Edexcel International Advanced Level In Statistics S1 (WST01) Paper 01

Question		Sche	eme					Ma	ırks
	Time	taken (t minutes)	5 – 10	10 – 14	14 – 18	18 – 25	25 – 40		
1 (a)	Fragu	ionov (f)	10	16	24	35	15	B1	
	Frequ	iency (f)	10	10	24	33	13		(1)
			24	r_26	16_1/				(1)
(b)	(b) $10 + 16 + (2 \times 6)$ or $10 + 16 + \frac{24}{2}$ or $\frac{x - 26}{50 - 26} = \frac{16 - 14}{18 - 14}$							M1	
	2 30-26 18-14 = 38						A1		
									(2)
(c)	$\int \sum ft =$	$7.5 \times 10 + 12 \times 16 + 16 \times$	24 + 21.5	×'35'+32.5	$\times '15'[=18]$	91]		M1	
	Maan	$\frac{1891}{188} = 18.91$						A 1	
	Mean =	$\frac{100}{100} = 18.91$						A1	
									(2)
(d)	Standard	deviation = $\sqrt{\frac{41033}{100}}$ –	$\left(\frac{1891}{100}\right)^{2}$	or $\sqrt{\frac{410}{}}$	$\frac{033-100\times}{99}$	18.91'2		M1	
		= 7.262		or 7.2	98 a	wrt 7.26 or	awrt	A1	
	7.3[0]							111	(2)
		15			15.25				(2)
	[LQ =] 1	$[LQ =]10 + \frac{15}{16}(14 - 10)[= 13.75]$ [LQ =]10 + $\frac{15.25}{16}(14 - 10)[= 13.8125]$							
	an 14	10							
(0)	or 14-	$-\frac{1}{16}(14-10)[=13.75] \qquad \text{or } 14-\frac{0.75}{16}(14-10)[=13.8125]$						M1	
(e)	or Q_1-1	$\frac{Q_1 - 10}{4 - 10} = \frac{25 - 10}{26 - 10} \left[= 13.75 \right] \qquad \text{or } \frac{Q_1 - 10}{14 - 10} = \frac{25.25 - 10}{26 - 10} \left[= 13.8125 \right]$					IVII		
	14-1	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$							
	or $\frac{Q_1-1}{14}$	$\frac{14}{10} = \frac{25 - 26}{26 - 10} [= 13.75]$		or $\frac{Q_1-14}{14}$	$\frac{4}{3} = \frac{25.25 - 1}{26}$	$\left[\frac{26}{2}\right] = 13.8$	125]		
		23-'13.75'		*	<u> 26-1</u> - '13.8125'			M1	
	=9.			-	vrt 9.19			A1	
									(3)
				otes				Tota	
(a)	B1	for 35 and 15 (If answer given in the table)					en mark the	answers	8
(b)	M1 for $10 + 16 + (2 \times 6)$ or $10 + 16 + \frac{24}{2}$ or $\frac{x - 26}{50 - 26} = \frac{16 - 14}{18 - 14}$								
	A1								
(c)	M1	Cao A correct method for finding $\sum ft$ May be implied by 1891 Allow one error							
(C)	A1	18.91 Allow 18.9							
(d)	M1								
(-/	A1 awrt 7.26 or awrt 7.3 if using $n - 1$								
for $10 + \frac{15}{16}(14 - 10)$ or $14 - \frac{1}{16}(14 - 10)$ or $\frac{Q_1 - 10}{14 - 10} = \frac{25 - 10}{26 - 10}$ or $\frac{Q_2}{14} = \frac{25 - 10}{26 - 10}$					$\frac{0}{2}$ or $\frac{Q_1 - 1}{2}$	$\frac{4}{1} = \frac{25 - 26}{1}$			
(e)	M1	M1 or $10 + \frac{16}{16}(14 - 10)$ or $14 - \frac{0.75}{16}(14 - 10)$ or $\frac{Q_1 - 10}{14 - 10} = \frac{25.25 - 10}{26 - 10}$ or $\frac{Q_1 - 14}{14 - 10} = \frac{25.25 - 10}{26 - 10}$				<u>-26</u>			
	M1		orovided LQ		14-10	20-10	14-10	26-1	IU
	A1	For 9.25 or awrt 9.19 if		` `					
	•	•							

Question	_	Scheme		Marks
2 (a)	5,50	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$\frac{\frac{5}{8} & \frac{3}{8}}{\frac{8}{13}} & \frac{5}{13} \\ \frac{\frac{7}{13}}{\frac{6}{13}} & \frac{6}{13}$	B1 B1 B1
(b)	$\frac{5}{9} \times \frac{4}{8} + \frac{4}{9}$			M1 A1 (2)
(c)	$\frac{5}{9} \times \frac{4}{8} \times \frac{1}{1}$	$\frac{8}{3} + \frac{4}{9} \times \frac{3}{8} \times \frac{7}{13} = \frac{61}{234}$ oe		M1 A1 (2)
(d)	$\frac{\frac{5}{9} \times \frac{4}{8} \times \frac{8}{13}}{\frac{61}{234}} = \frac{\frac{20}{117}}{\frac{61}{234}} = \frac{40}{61} \text{ oe}$			M1 A1ft A1
	Notes			
		Notes		(3) Total 10
(a)	B1	Notes for $\frac{5}{8} \& \frac{3}{8}$ in the correct place on the 2 nd branches Allow 0.625 & 0.375	or 62.5% & 3	Total 10 37.5%
(a)	B1 B1	for $\frac{5}{8}$ & $\frac{3}{8}$ in the correct place on the 2 nd branches Allow 0.625 & 0.375 for $\frac{8}{13}$ & $\frac{5}{13}$ in the correct place on the 3 rd branches Allow awrt 0.615 & 61.5% & awrt 38.5%	awrt 0.385 c	Total 10 37.5% or awrt
(a)		for $\frac{5}{8}$ & $\frac{3}{8}$ in the correct place on the 2 nd branches Allow 0.625 & 0.375 for $\frac{8}{13}$ & $\frac{5}{13}$ in the correct place on the 3 rd branches Allow awrt 0.615 & 61.5% & awrt 38.5% for $\frac{7}{13}$ & $\frac{6}{13}$ in both correct places on the 3 rd branches Allow awrt 0.538 53.8% or awrt 46.2%	awrt 0.385 c	Total 10 37.5% or awrt
(a) (b)	B1	for $\frac{5}{8}$ & $\frac{3}{8}$ in the correct place on the 2 nd branches Allow 0.625 & 0.375 for $\frac{8}{13}$ & $\frac{5}{13}$ in the correct place on the 3 rd branches Allow awrt 0.615 & 61.5% & awrt 38.5% for $\frac{7}{13}$ & $\frac{6}{13}$ in both correct places on the 3 rd branches Allow awrt 0.538	awrt 0.385 c	Total 10 37.5% or awrt
	B1 B1	for $\frac{5}{8}$ & $\frac{3}{8}$ in the correct place on the 2 nd branches Allow 0.625 & 0.375 for $\frac{8}{13}$ & $\frac{5}{13}$ in the correct place on the 3 rd branches Allow awrt 0.615 & 61.5% & awrt 38.5% for $\frac{7}{13}$ & $\frac{6}{13}$ in both correct places on the 3 rd branches Allow awrt 0.538 53.8% or awrt 46.2% for $\frac{5}{9} \times \frac{4}{8} + \frac{4}{9} \times \frac{5}{8}$ 'ft their tree diagram provided these are probabilities Allow $\frac{5}{9} \times \frac{4}{8} \times \frac{7}{13} + \frac{5}{9} \times \frac{4}{8} \times \frac{6}{13} + \frac{4}{9} \times \frac{5}{8} \times \frac{7}{13} + \frac{4}{9} \times \frac{5}{8} \times \frac{6}{13}$ ' $\frac{5}{9}$ oe Allow awrt 0.556 or awrt 55.6%	awrt 0.385 c	Total 10 37.5% or awrt
	B1 B1 M1	for $\frac{5}{8}$ & $\frac{3}{8}$ in the correct place on the 2 nd branches Allow 0.625 & 0.375 for $\frac{8}{13}$ & $\frac{5}{13}$ in the correct place on the 3 rd branches Allow awrt 0.615 & 61.5% & awrt 38.5% for $\frac{7}{13}$ & $\frac{6}{13}$ in both correct places on the 3 rd branches Allow awrt 0.538 53.8% or awrt 46.2% for $\frac{5}{9} \times \frac{4}{8} + \frac{4}{9} \times \frac{5}{8}$ 'ft their tree diagram provided these are probabilities Allow $\frac{5}{9} \times \frac{4}{8} \times \frac{7}{13} + \frac{5}{9} \times \frac{4}{8} \times \frac{7}{13} + \frac{4}{9} \times \frac{5}{8} \times \frac{7}{13} + \frac{4}{9} \times \frac{5}{8} \times \frac{7}{13} + \frac{4}{9} \times \frac{5}{8} \times \frac{6}{13}$ oe Allow awrt 0.556 or awrt 55.6% for $\frac{5}{9} \times \frac{4}{8} \times \frac{8}{13} + \frac{4}{9} \times \frac{3}{8} \times \frac{7}{13}$ ft their tree diagram provided these are provi	awrt 0.385 c	Total 10 37.5% or awrt
(b)	B1 B1 M1	for $\frac{5}{8}$ & $\frac{3}{8}$ in the correct place on the 2 nd branches Allow 0.625 & 0.375 for $\frac{8}{13}$ & $\frac{5}{13}$ in the correct place on the 3 rd branches Allow awrt 0.615 & 61.5% & awrt 38.5% for $\frac{7}{13}$ & $\frac{6}{13}$ in both correct places on the 3 rd branches Allow awrt 0.538 53.8% or awrt 46.2% for $\frac{5}{9} \times \frac{4}{8} + \frac{4}{9} \times \frac{5}{8}$ ft their tree diagram provided these are probabilities Allow $\frac{5}{9} \times \frac{4}{8} \times \frac{7}{13} + \frac{5}{9} \times \frac{4}{8} \times \frac{6}{13} + \frac{4}{9} \times \frac{5}{8} \times \frac{7}{13} + \frac{4}{9} \times \frac{5}{8} \times \frac{6}{13}$ oe Allow awrt 0.556 or awrt 55.6% for $\frac{5}{9} \times \frac{4}{8} \times \frac{8}{13} + \frac{4}{9} \times \frac{3}{8} \times \frac{7}{13}$ ft their tree diagram provided these are probabilities and $\frac{5}{9} \times \frac{4}{8} \times \frac{8}{13} + \frac{4}{9} \times \frac{3}{8} \times \frac{7}{13}$ ft their tree diagram provided these are probabilities and $\frac{5}{9} \times \frac{4}{8} \times \frac{8}{13} + \frac{4}{9} \times \frac{3}{8} \times \frac{7}{13}$ ft their tree diagram provided these are probabilities and $\frac{5}{9} \times \frac{4}{8} \times \frac{8}{13} + \frac{4}{9} \times \frac{3}{8} \times \frac{7}{13}$ ft their tree diagram provided these are probabilities and $\frac{5}{9} \times \frac{4}{8} \times \frac{8}{13} + \frac{4}{9} \times \frac{3}{8} \times \frac{7}{13}$ ft their tree diagram provided these are probabilities and $\frac{5}{9} \times \frac{4}{8} \times \frac{8}{13} + \frac{4}{9} \times \frac{3}{8} \times \frac{7}{13}$ ft their tree diagram provided these are probabilities and $\frac{5}{9} \times \frac{4}{8} \times \frac{8}{13} + \frac{4}{9} \times \frac{3}{8} \times \frac{7}{13}$ ft their tree diagram provided these are probabilities and $\frac{5}{9} \times \frac{4}{8} \times \frac{8}{13} + \frac{4}{9} \times \frac{3}{8} \times \frac{7}{13} + $	awrt 0.385 c	Total 10 37.5% or awrt
(b)	B1 B1 M1 A1 M1	for $\frac{5}{8}$ & $\frac{3}{8}$ in the correct place on the 2 nd branches Allow 0.625 & 0.375 for $\frac{8}{13}$ & $\frac{5}{13}$ in the correct place on the 3 rd branches Allow awrt 0.615 & 61.5% & awrt 38.5% for $\frac{7}{13}$ & $\frac{6}{13}$ in both correct places on the 3 rd branches Allow awrt 0.538 53.8% or awrt 46.2% for $\frac{5}{9} \times \frac{4}{8} + \frac{4}{9} \times \frac{5}{8}$, ft their tree diagram provided these are probabilities Allow $\frac{5}{9} \times \frac{4}{8} \times \frac{7}{13} + \frac{5}{9} \times \frac{4}{8} \times \frac{6}{13} + \frac{4}{9} \times \frac{5}{8} \times \frac{7}{13} + \frac{4}{9} \times \frac{5}{8} \times \frac{6}{13}$, $\frac{5}{9}$ oe Allow awrt 0.556 or awrt 55.6% for $\frac{5}{9} \times \frac{4}{8} \times \frac{8}{13} + \frac{4}{9} \times \frac{3}{8} \times \frac{7}{13}$ ft their tree diagram provided these are probability of Allow awrt 0.261 or awrt 26.1% for $\frac{a}{234}$ oe Allow awrt 0.261 or awrt 26.1% where numerator < denominator and 0 < part (c) < 1	awrt 0.385 c	Total 10 37.5% or awrt 2 or awrt
(b) (c)	B1 B1 M1 A1 A1	for $\frac{5}{8}$ & $\frac{3}{8}$ in the correct place on the 2 nd branches Allow 0.625 & 0.375 for $\frac{8}{13}$ & $\frac{5}{13}$ in the correct place on the 3 rd branches Allow awrt 0.615 & 61.5% & awrt 38.5% for $\frac{7}{13}$ & $\frac{6}{13}$ in both correct places on the 3 rd branches Allow awrt 0.538 53.8% or awrt 46.2% for $\frac{5}{9} \times \frac{4}{8} + \frac{4}{9} \times \frac{5}{8}$ 'f their tree diagram provided these are probabilities Allow $\frac{5}{9} \times \frac{4}{8} \times \frac{7}{13} + \frac{5}{9} \times \frac{4}{8} \times \frac{6}{13} + \frac{4}{9} \times \frac{5}{8} \times \frac{7}{13} + \frac{4}{9} \times \frac{5}{8} \times \frac{6}{13}$ $\frac{5}{9}$ oe Allow awrt 0.556 or awrt 55.6% for $\frac{5}{9} \times \frac{4}{8} \times \frac{8}{13} + \frac{4}{9} \times \frac{3}{8} \times \frac{7}{13}$ ft their tree diagram provided these are probability of Allow awrt 0.261 or awrt 26.1% for $\frac{61}{234}$ oe Allow awrt 0.261 or awrt 26.1%	awrt 0.385 c	Total 10 37.5% or awrt 2 or awrt

Question	Scheme			Marks
3 (a)	$E(X) = 2a + 3 \times 0.4 + 4(0.6 - a) = 3.6 - 2a$			
				(2)
(b)	0 < a < 0	0.6 oe		B1
	$2 \times 0.6 +$	$3 \times 0.4[=2.4]$ or $3.6 - 2 \times 0.6[=2.4]$	Alternative	
	and		0 > -2a > -1.2	M1
		$4 \times 0.6[=3.6]$ or $3.6 - 2 \times 0[=3.6]$	3.6 > 3.6 - 2a > 2.4	
	2.4 < E(<i>X</i>) < 3.6		A1
()	T7 (T7)	P(W ²) P(W) ²		(3)
(c)		$= \mathrm{E}(X^2) - \mathrm{E}(X)^2$		
	$E(X^2)$	=]4a+3.6.+9.6-16a[=13.2-12a]		M1 A1
	Var(X)	$= '(13.2-12a)'-('3.6-2a')^2$		M1
		2.4a - 0.32 = 0		A1
	'2.	$\frac{4'\pm\sqrt{'2.4'^2-4\times'-4'\times'-0.32'}}{2\times'-4'}$		M1
	<i>a</i> =	2×'-4'		IVII
	$a=\frac{1}{5}$			A1
	5	5		AI
		Notes		(6) Total 11
(a)	M1	for an attempt to find E(X) with 2 out of the 3 p	roducts correct	10tal 11
(u)	A1	for $2a+1.2+4(0.6-a)$ oe	ioddets correct	
(1)		This may be seen as two separate parts e.g. $a > 0$ and $a < 0.6$, Allow the use of \leq or \geq for $<$ or $>$		
(b)	B1	We allow this to be written in words e.g. a is be		
	M1	for a correct method for finding the lower and $0.4 < E(X) < 3.6$ or sight of 2.4 and 3.6	upper end of the range. May be impli	ed by
	A1	Allow e.g. 2.4,, 3.6–2 <i>a</i> ,, 3.6		
		NB $2.4 < E(X) < 3.6 \text{ or } 2.4, 3.6 - 2a, 3.6$	6 scores 3/3	
(c)	M1	An attempt at an expression for $E(X^2)$ with 2 $Var(X)$	terms correct. May be seen in an atte	empt at
	A1	a correct expression for $E(X^2)$ May be seen in simplified, allow $4a + 3.6 + 9.6 - 16a$ or better	an attempt at Var(X) Does not have	to be fully
	M1	use of $Var(X) = E(X^2) - E(X)^2$ ft their $E(X)$	(a) and their part (a)	
	A1	a correct 3TQ e.g. $25a^2 - 15a + 2 = 0$		
		correct method for solving their 3TQ e.g. (5a -	-2)(5a-1)=0	
	3.54	May be implied by $a = \frac{1}{5}$ and $a = \frac{2}{5}$		
	M1	If the 3TQ is incorrect then a correct substitution and c are both negative, allow the omission of r in the denominator) or a complete method using must be seen before their values of a	negatives in 4ac and allow a correct s	single value
	A1	$a = \frac{1}{5}$ oe and $a = \frac{2}{5}$ oe Allow any letter for a		

Question		Scheme	Marks
4 (i)(a)	n+a=-	$\frac{7}{25}$ oe $q + r = \frac{1}{5}$ oe $p + r = \frac{8}{25}$ oe	M1 M1
+ (1)(α)	$P \cdot q - f$	25 q r = 5 p r = 25 q r = 100	M1
	2p+2q	$+2r = \frac{7}{25} + \frac{1}{5} + \frac{8}{25} \left[= \frac{4}{5} \right] *$	A1* (4)
(i)(b)	eg $p+q$	+r+s=1	M1
	$n=\frac{1}{2}$	e $q = \frac{2}{25}$ oe $r = \frac{3}{25}$ oe $s = \frac{3}{5}$ oe	A1 A1
	5	$\frac{q-25}{25}$ $\frac{3-5}{5}$ $\frac{3-5}{5}$	A1 A1
			(5)
(ii)	$\frac{x}{x+5}$	$\frac{1}{x} = \frac{x^2 + 5(x+5)}{x(x+5)} \text{or} \frac{x}{x+5} + \frac{5}{x} = \frac{x+5-5}{x+5} + \frac{5}{x}$	M1
(11)	x+5 x	$x(x+5) \qquad x+5 x \qquad x+5 \qquad x$	1411
	$-x^2 + 5x$	x + 25 5 5	М1
	$={x^2+}$	$\frac{x+25}{-5x}$ oe or $=1-\frac{5}{x+5}+\frac{5}{x}$	M1
		$\frac{25}{+5x}$ or as $x^2 + 5x + 25 > x^2 + 5x$ P(C) + P(D) > 1 or As $x + 5 > x$ then	
	$-1+\frac{1}{x^2}$	${+5x} \text{ of as } x + 5x + 25 \ge x + 5x + 1 $	A1
	5 5	$\frac{5}{x} \Rightarrow -\frac{5}{x+5} + \frac{5}{x} > 0 \text{ So } P(C) + P(D) > 1$	AI
	x+5 x	$x \rightarrow x + 5 x \rightarrow x + 5 x$	
	$P(C \cup D)$	$P(C \cap D) > 0$	A1 cso
			(4)
	NID	Notes	Total 13
	NB	In (i) Allow the use of exact decimals throughout and mark (a) and (b) together	
(i)(a)	M1	for $p+q = \frac{7}{25}$ oe or $p+q = P(A)$	
	M1	for $q+r=\frac{1}{5}$ oe or $q+r=P(B)$	
	M1	for $p+r = \frac{8}{25}$ oe or $p+r = P[(A \cap B') \cup (A' \cap B)]$	
	A1*	we must see $2p + 2q + 2r = \frac{7}{25} + \frac{1}{5} + \frac{8}{25}$ and no errors	
		any correct equation involving at least two of p , q , r and s . May be implied by two	correct
(i)(b)	M1	values. Do not allow just $2p + 2q + 2r = \frac{4}{5}$ This mark may be awarded in part (a)	
	A1	for $\frac{1}{5}$ or 0.2 oe This mark may be awarded in part (a)	
	A1	for $\frac{2}{2}$ or 0.08 oe This mark may be awarded in part (a)	
		25	
	A1	for $\frac{3}{25}$ or 0.12 oe This mark may be awarded in part (a)	
	A1	for $\frac{3}{5}$ oe This mark may be awarded in part (a)	
	SC	for one correct value M0 A1 A0 A0 A0	
		For an attempt to add P(C) and P(D) e.g. $\frac{x^2}{x(x+5)} + \frac{5(x+5)}{x(x+5)}$ May be implied by	$x^2 + 5x + 25$
(ii)	M1	For all attempt to add $r(C)$ and $r(D)$ e.g. $\frac{1}{x(x+5)} + \frac{1}{x(x+5)}$ what we implied by -	$x^2 + 5x$
(11)	1411	$1 - \frac{5}{1 - \frac{5}{1$	
		x+5 x	
	M1	$1 - \frac{5}{x+5} + \frac{5}{x}$ For $\frac{x^2 + 5x + 25}{x^2 + 5x}$ oe or $1 - \frac{5}{x+5} + \frac{5}{x}$	
		$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	
	A1	for recognising that $P(C) + P(D)$ is > 1	
	A1 cso	a fully correct solution showing that C and D cannot be mutually exclusive	

Question		Scheme	Marks
5 (a)	P(L < 3.	$.86) = P\left(Z < \pm \frac{3.86 - 4.5}{0.4}\right)$	M1
	=P(Z<	(x-1.6) = 1 - 0.9452 or $1 - 0.945200 = 0.0548$ awrt 0.0548	M1 A1 (3)
(b)(i)		$Q_3 = 0.75 \text{ gives } \frac{Q_3 - 4.5}{0.4} = 0.67 \text{ or } P(L < Q_1) = 0.25 \text{ gives } \frac{Q_1 - 4.5}{0.4} = -0.67$	M1 B1
		768 awrt 4.77 or $Q_1 = 4.232$ awrt 4.23	A1
(ii)	$[Q_1 =]'4$.232' awrt 4.23 or $[Q_3 =]'4.768'$ awrt 4.77	B1 ft (4)
(c)	1.5('Q ₃ '	$-'Q_1')[=0.804]$ (0.81)	M1
	Lower li	mit = 3.428 (3.42 – 3.43) Upper $limit = 5.572$ (5.57 – 5.58)	A1 A1 (3)
	P('3.42	$' < L < '5.58'$) = $P\left(\frac{'3.42' - 4.5}{0.4} < Z < \frac{'5.58' - 4.5}{0.4}\right)$	M1 A1ft
(d)	(C-11-	= [P(-2.7 < Z < 2.7)] = 0.9930*	A1* (3)
(e)	P(5 < L	tor gives 0.99306) $< '5.58' = P \left(\frac{5-4.5}{0.4} < Z < \frac{'5.58'-4.5}{0.4} \right) = 0.1021$	M1 A1
		tor gives 0.10218) awrt 0.102 $ '3.42' < L < '5.58') = \frac{P(5 < L < '5.58')}{P('3.42' < L < '5.58')} \left[= \frac{'0.102'}{0.993} \right]$	M1
		= 0.1027 awrt 0.103	A1 (4)
(a)	M1	Notes for standardising with 3.86, 4.5 and 0.4	Total 17
<u>(u)</u>	M1	for $1 - p$ where 0.5	
		f., and 0.0540 (NID and 0.0540 and 2/2)	
	A1	for awrt 0.0548 (NB awrt 0.0548 scores 3/3)	
(b)(i)	A1 M1	for standardising with Q_3 or Q_1 (o.e.), 4.5 and 0.4 and setting equal to a z value, 0.65	5 < z < 0.7
(b)(i)		for standardising with Q_3 or Q_1 (o.e.), 4.5 and 0.4 and setting equal to a z value, 0.65 for use of 0.67,, $ z $, 0.675 This may be implied by a final answer of 4.769 or 4.2	- ' '
(b)(i)	M1	for standardising with Q_3 or Q_1 (o.e.), 4.5 and 0.4 and setting equal to a z value, 0.65	- ' '
(b)(i) (b)(ii)	M1 B1	for standardising with Q_3 or Q_1 (o.e.), 4.5 and 0.4 and setting equal to a z value, 0.65 for use of 0.67,, $ z $, 0.675 This may be implied by a final answer of 4.769 or 4.2 awrt 4.77 or awrt 4.23 for Q_1 correctly labelled NB it is possible to score M1B0A1 awrt 4.23 if Q_3 given in (i) or awrt 4.77 if Q_1 given in (i) ft their part (b)(i) You will need to check whether $Q_1 + Q_3 = 9$	2302
	M1 B1 A1	for standardising with Q_3 or Q_1 (o.e.), 4.5 and 0.4 and setting equal to a z value, 0.65 for use of 0.67,, $ z $, 0.675 This may be implied by a final answer of 4.769 or 4.2 awrt 4.77 or awrt 4.23 for Q_1 correctly labelled NB it is possible to score M1B0A1 awrt 4.23 if Q_3 given in (i) or awrt 4.77 if Q_1 given in (i) ft their part (b)(i)	2302
(b)(ii)	M1 B1 A1 B1ft M1 A1	for standardising with Q_3 or Q_1 (o.e.), 4.5 and 0.4 and setting equal to a z value, 0.65 for use of 0.67,, $ z $, 0.675 This may be implied by a final answer of 4.769 or 4.2 awrt 4.77 or awrt 4.23 for Q_1 correctly labelled NB it is possible to score M1B0A1 awrt 4.23 if Q_3 given in (i) or awrt 4.77 if Q_1 given in (i) ft their part (b)(i) You will need to check whether $Q_1 + Q_3 = 9$ use of $1.5(Q_3 - Q_1)$ ft their Q_3 and Q_1 If these are not correct then working must be shown for lower limit awrt 3.42 to 3.43	2302
(b)(ii) (c)	M1 B1 A1 B1ft M1 A1 A1	for standardising with Q_3 or Q_1 (o.e.), 4.5 and 0.4 and setting equal to a z value, 0.65 for use of 0.67,, $ z $, 0.675 This may be implied by a final answer of 4.769 or 4.2 awrt 4.77 or awrt 4.23 for Q_1 correctly labelled NB it is possible to score M1B0A1 awrt 4.23 if Q_3 given in (i) or awrt 4.77 if Q_1 given in (i) ft their part (b)(i) You will need to check whether $Q_1 + Q_3 = 9$ use of $1.5(Q_3 - Q_1)$ ft their Q_3 and Q_1 If these are not correct then working must be short lower limit awrt 3.42 to 3.43 for upper limit awrt 5.57 to 5.58	2302
(b)(ii)	M1 B1 A1 B1ft M1 A1	for standardising with Q_3 or Q_1 (o.e.), 4.5 and 0.4 and setting equal to a z value, 0.65 for use of 0.67,, $ z $, 0.675 This may be implied by a final answer of 4.769 or 4.2 awrt 4.77 or awrt 4.23 for Q_1 correctly labelled NB it is possible to score M1B0A1 awrt 4.23 if Q_3 given in (i) or awrt 4.77 if Q_1 given in (i) ft their part (b)(i) You will need to check whether $Q_1 + Q_3 = 9$ use of $1.5(Q_3 - Q_1)$ ft their Q_3 and Q_1 If these are not correct then working must be shown for a correct standardisation for either their 3.42 or their 5.58 May be implied by awrawrt 2.7 If lower/upper limits are incorrect then the standardisation must be shown	nown
(b)(ii) (c)	M1 B1 A1 B1ft M1 A1 A1	for standardising with Q_3 or Q_1 (o.e.), 4.5 and 0.4 and setting equal to a z value, 0.65 for use of 0.67,, $ z $, 0.675 This may be implied by a final answer of 4.769 or 4.2 awrt 4.77 or awrt 4.23 for Q_1 correctly labelled NB it is possible to score M1B0A1 awrt 4.23 if Q_3 given in (i) or awrt 4.77 if Q_1 given in (i) ft their part (b)(i) You will need to check whether $Q_1 + Q_3 = 9$ use of $1.5(Q_3 - Q_1)$ ft their Q_3 and Q_1 If these are not correct then working must be sh for lower limit awrt 3.42 to 3.43 for upper limit awrt 5.57 to 5.58 for a correct standardisation for either their 3.42 or their 5.58 May be implied by awrence of Q_1 and Q_2 are their 5.58 May be implied by awrence of Q_1 and Q_2 are their 5.58 May be implied by awrence of Q_1 and Q_2 are their 5.58 May be implied by awrence of Q_2 and Q_3 are their 5.58 May be implied by awrence of Q_1 and Q_2 are their 5.58 May be implied by awrence of Q_2 and Q_3 are their 5.58 May be implied by awrence of Q_2 and Q_3 are their 5.58 May be implied by awrence of Q_3 and Q_4 are their 5.58 May be implied by awrence of Q_3 are the formula of Q_3 and Q_4 are their 5.58 May be implied by awrence of Q_3 and Q_4 are the formula of Q_3 and Q_4 are the formula of Q_4 are the formula of Q_4 and Q_4 are the formula of Q_4 are the formula of Q_4 and Q_4 are the	2302 nown rt –2.7 or 7 and awrt
(b)(ii) (c)	M1 B1 A1 B1ft M1 A1 A1 M1	for standardising with Q_3 or Q_1 (o.e.), 4.5 and 0.4 and setting equal to a z value, 0.65 for use of 0.67,, $ z $, 0.675 This may be implied by a final answer of 4.769 or 4.2 awrt 4.77 or awrt 4.23 for Q_1 correctly labelled NB it is possible to score M1B0A1 awrt 4.23 if Q_3 given in (i) or awrt 4.77 if Q_1 given in (i) ft their part (b)(i) You will need to check whether $Q_1 + Q_3 = 9$ use of $1.5(Q_3 - Q_1)$ ft their Q_3 and Q_1 If these are not correct then working must be sh for lower limit awrt 3.42 to 3.43 for upper limit awrt 5.57 to 5.58 for a correct standardisation for either their 3.42 or their 5.58 May be implied by awr awrt 2.7 If lower/upper limits are incorrect then the standardisation must be shown for a correct standardisation for their 3.42 and their 5.58 May be implied by awrt -2. 2.7 If lower/upper limits are incorrect then the standardisation must be shown or clear use of symmetry e.g. $(0.9965-0.5)\times 2$ Do not allow use of negative limits answer is given so there must be a fully correct solution given with no errors Allow 0 better or $0.9965-0.0035$ oe or $1-0.0035-0.0035$ oe	2302 nown rt –2.7 or 7 and awrt
(b)(ii) (c)	M1 B1 A1 B1ft M1 A1 A1 A1 A1 M1 A1ft A1*	for standardising with Q_3 or Q_1 (o.e.), 4.5 and 0.4 and setting equal to a z value, 0.65 for use of 0.67,, $ z $, 0.675 This may be implied by a final answer of 4.769 or 4.2 awrt 4.77 or awrt 4.23 for Q_1 correctly labelled NB it is possible to score M1B0A1 awrt 4.23 if Q_3 given in (i) or awrt 4.77 if Q_1 given in (i) ft their part (b)(i) You will need to check whether $Q_1 + Q_3 = 9$ use of $1.5(Q_3 - Q_1)$ ft their Q_3 and Q_1 If these are not correct then working must be shorn limit awrt 3.42 to 3.43 for upper limit awrt 5.57 to 5.58 for a correct standardisation for either their 3.42 or their 5.58 May be implied by awr awrt 2.7 If lower/upper limits are incorrect then the standardisation must be shown for a correct standardisation for their 3.42 and their 5.58 May be implied by awrt -2.2.7 If lower/upper limits are incorrect then the standardisation must be shown or clear use of symmetry e.g. $(0.9965-0.5)\times 2$ Do not allow use of negative limits answer is given so there must be a fully correct solution given with no errors Allow 0 better or $0.9965-0.0035$ oe or $1-0.0035-0.0035$ oe for writing or using $P(5 < L < 5.58)$ Maybe implied by awrt 0.102	2302 nown rt –2.7 or 7 and awrt
(b)(ii) (c) (d)	M1 B1 A1 B1ft M1 A1 A1 A1 A1 A1 A1 A1ft	for standardising with Q_3 or Q_1 (o.e.), 4.5 and 0.4 and setting equal to a z value, 0.65 for use of 0.67,, $ z $, 0.675 This may be implied by a final answer of 4.769 or 4.2 awrt 4.77 or awrt 4.23 for Q_1 correctly labelled NB it is possible to score M1B0A1 awrt 4.23 if Q_3 given in (i) or awrt 4.77 if Q_1 given in (i) ft their part (b)(i) You will need to check whether $Q_1 + Q_3 = 9$ use of $1.5(Q_3 - Q_1)$ ft their Q_3 and Q_1 If these are not correct then working must be shown for a correct standardisation for either their 3.42 or their 5.58 May be implied by awr awrt 2.7 If lower/upper limits are incorrect then the standardisation must be shown for a correct standardisation for their 3.42 and their 5.58 May be implied by awrt -2. 2.7 If lower/upper limits are incorrect then the standardisation must be shown or clear use of symmetry e.g. $(0.9965 - 0.5) \times 2$ Do not allow use of negative limits answer is given so there must be a fully correct solution given with no errors Allow 0 better or $0.9965 - 0.0035$ oe or $1 - 0.0035 - 0.0035$ oe for writing or using $P(5 < L < '5.58')$ Maybe implied by awrt 0.102 awrt 0.102	2302 nown rt –2.7 or 7 and awrt s 0.9930 or
(b)(ii) (c) (d)	M1 B1 A1 B1ft M1 A1 A1 A1 A1 M1 A1ft A1*	for standardising with Q_3 or Q_1 (o.e.), 4.5 and 0.4 and setting equal to a z value, 0.65 for use of 0.67,, $ z $, 0.675 This may be implied by a final answer of 4.769 or 4.2 awrt 4.77 or awrt 4.23 for Q_1 correctly labelled NB it is possible to score M1B0A1 awrt 4.23 if Q_3 given in (i) or awrt 4.77 if Q_1 given in (i) ft their part (b)(i) You will need to check whether $Q_1 + Q_3 = 9$ use of $1.5(Q_3 - Q_1)$ ft their Q_3 and Q_1 If these are not correct then working must be shorn limit awrt 3.42 to 3.43 for upper limit awrt 5.57 to 5.58 for a correct standardisation for either their 3.42 or their 5.58 May be implied by awr awrt 2.7 If lower/upper limits are incorrect then the standardisation must be shown for a correct standardisation for their 3.42 and their 5.58 May be implied by awrt -2.2.7 If lower/upper limits are incorrect then the standardisation must be shown or clear use of symmetry e.g. $(0.9965-0.5)\times 2$ Do not allow use of negative limits answer is given so there must be a fully correct solution given with no errors Allow 0 better or $0.9965-0.0035$ oe or $1-0.0035-0.0035$ oe for writing or using $P(5 < L < 5.58)$ Maybe implied by awrt 0.102	2302 nown rt –2.7 or 7 and awrt s 0.9930 or

6 (a) An increase/change of 1°C will allow an extra 2.72 grams [of sugar] to dissolve (b) $151.2 + 2.72 \times 90 = 396$	Question		Scheme	Marks	
(c) The temperature/90[°C] is outside of the range; so (may be) unreliable B1; d1 (d) Use of $\bar{y} = 151.2 + 2.72\bar{x}$ So $\sum x = \frac{3119}{12} - 151.2 \over 2.72$ $\times 12 = 479.63235$ M1 A1 S _{xx} = 851093 $-\frac{3119^2}{12}$ [= 40412.9166] M1 S _{xx} = 24500 $-\frac{'479.63235^2}{12}$ [= 5329.4005] M1 $\frac{r}{\sqrt{5329.4005^2}} = \frac{14495.9693}{12}$ or $r = 2.72 \times \sqrt{\frac{'5329.4005}{'40412.9166}}$ M1 $r = \frac{'14495.9693'}{\sqrt{5329.4005^2}} = \frac{14495.9693}{12}$ or $r = 2.72 \times \sqrt{\frac{'5329.4005}{'40412.9166}}$ M1 (e) e.g. the points lie reasonably close to a straight line/positive correlation and the PMCC is close to 1 therefore supports a linear model Notes (a) B1 for a correct interpretation of the gradient in context including grams and degrees (b) M1 for substitution of 90 into the regression line A1 cao 396 on its own scores 2 out 2 (c) B1 for a correct interpretation line to find $\sum x$ or \bar{x} (may be implied by 3rd M1) A1 $\sum x = \text{awrt 480 or } \bar{x} = \text{awrt 40 (may be implied by 3rd M1)}$ M1 for a correct expression for S_{xx} fit their $\sum x$ or \bar{x} May be implied by awrt 14500 or use of $r = \frac{1}{12} \frac{\sqrt{5329.4005}}{\sqrt{5329.4005}}$ If these are not correct then they must be labelled before an expression for r is given for this mark to be awarded A1* Answer is given so a fully correct solution must be seen for the points lie reasonably close to a straight line/points or data are linear/positive correlation or the PMCC is close to 1 (Ignore any reference to strength) with a correct correct correct in the prediction of the points lie reasonably close to a straight line/points or data are linear/positive correct correct correct correct correct solution must be seen	_	An incre	ase/change of 1°C will allow an extra 2.72 grams [of sugar] to dissolve	B1	
(c) The temperature/90[°C] is outside of the range; so (may be) unreliable B1; d1 (d) Use of $\bar{y} = 151.2 + 2.72\bar{x}$ So $\sum x = \frac{3119}{12} - 151.2 \over 2.72$ $\times 12 = 479.63235$ M1 A1 S _{xx} = 851093 $-\frac{3119^2}{12}$ [= 40412.9166] M1 S _{xx} = 24500 $-\frac{'479.63235^2}{12}$ [= 5329.4005] M1 $\frac{r}{\sqrt{5329.4005^2}} = \frac{14495.9693}{12}$ or $r = 2.72 \times \sqrt{\frac{'5329.4005}{'40412.9166}}$ M1 $r = \frac{'14495.9693'}{\sqrt{5329.4005^2}} = \frac{14495.9693}{12}$ or $r = 2.72 \times \sqrt{\frac{'5329.4005}{'40412.9166}}$ M1 (e) e.g. the points lie reasonably close to a straight line/positive correlation and the PMCC is close to 1 therefore supports a linear model Notes (a) B1 for a correct interpretation of the gradient in context including grams and degrees (b) M1 for substitution of 90 into the regression line A1 cao 396 on its own scores 2 out 2 (c) B1 for a correct interpretation line to find $\sum x$ or \bar{x} (may be implied by 3rd M1) A1 $\sum x = \text{awrt 480 or } \bar{x} = \text{awrt 40 (may be implied by 3rd M1)}$ M1 for a correct expression for S_{xx} fit their $\sum x$ or \bar{x} May be implied by awrt 14500 or use of $r = \frac{1}{12} \frac{\sqrt{5329.4005}}{\sqrt{5329.4005}}$ If these are not correct then they must be labelled before an expression for r is given for this mark to be awarded A1* Answer is given so a fully correct solution must be seen for the points lie reasonably close to a straight line/points or data are linear/positive correlation or the PMCC is close to 1 (Ignore any reference to strength) with a correct correct correct in the prediction of the points lie reasonably close to a straight line/points or data are linear/positive correct correct correct correct correct solution must be seen				(1)	
(d) Use of $\overline{y} = 151.2 + 2.72\overline{x}$ So $\sum x = \frac{3119}{12} - 151.2$ $S_{xy} = 851093 - \frac{3119^2}{12} [= 40412.9166]$ M1 $S_{xx} = 24500 - \frac{'479.63235^2}{12} [= 5329.4005]$ M1 $S_{xy} = 2.72 \times '5329.4005' [= 14495.9693]$ M1 $r = \frac{'14495.9693'}{\sqrt{'5329.4005} \times '40412.9166}$ or $r = 2.72 \times \sqrt{\frac{'5329.4005}{'40412.9166'}}$ M1 $e.g. the points lie reasonably close to a straight line/positive correlation and the PMCC is close to 1 therefore supports a linear model (e) Rote $	(b)	151.2 + 2	$2.72 \times 90 = 396$	M1 A1	
(d) Use of $\overline{y} = 151.2 + 2.72\overline{x}$ So $\sum x = \frac{3119}{12} - 151.2$ $S_{xy} = 851093 - \frac{3119^2}{12} [= 40412.9166]$ M1 $S_{xx} = 24500 - \frac{'479.63235^2}{12} [= 5329.4005]$ M1 $S_{xy} = 2.72 \times '5329.4005' [= 14495.9693]$ M1 $r = \frac{'14495.9693'}{\sqrt{'5329.4005} \times '40412.9166}$ or $r = 2.72 \times \sqrt{\frac{'5329.4005}{'40412.9166'}}$ M1 $e.g. the points lie reasonably close to a straight line/positive correlation and the PMCC is close to 1 therefore supports a linear model (e) Rote $				(2)	
$S_{xx} = 851093 - \frac{3119^2}{12} [= 40412.9166] \qquad M1$ $S_{xx} = 24500 - \frac{'479.63235^2}{12} [= 5329.4005] \qquad M1$ $S_{xy} = 2.72 \times '5329.4005' [= 14495.9693] \qquad or \qquad r = 2.72 \times \sqrt{\frac{'5329.4005}{'40412.9166'}} \qquad M1$ $r = \frac{'14495.9693}{\sqrt{5329.4005} \times '40412.9166} \qquad or \qquad r = 2.72 \times \sqrt{\frac{'5329.4005}{'40412.9166'}} \qquad M1$ $= 0.988 * \qquad \qquad A1*$ (e) $e.g. the points lie reasonably close to a straight line/positive correlation and the PMCC is close to 1 therefore supports a linear model M1 \qquad \text{Notes} \qquad \text{Total} (a) B1 \qquad \text{for a correct interpretation of the gradient in context including grams and degrees} (b) M1 \qquad \text{for substitution of 90 into the regression line} (c) B1 \qquad \text{for a cornment that implies the temperature/90[°C] is outside of the range. Allow extrapolation in linked to 396. (Do not allow comments that imply that 396 is out of range or the use of "bit dB1 dependent on 1st B1 for a correct conclusion (d) M1 \qquad \text{for clear use of the regression line to find } \sum_{x} x \text{ or } \overline{x} \text{ (may be implied by } 3^{sd} \text{ M1}) M1 \qquad \text{for a correct expression for } S_{xy} \text{ May be implied by } 3^{sd} \text{ M1}) M1 \qquad \text{for a correct expression for } S_{xy} \text{ ft their } \sum_{x} x \text{ or } \overline{x} \text{ May be implied by awrt } 14500 \text{ or use of } 100000000000000000000000000000000000$	(c)	The temp	perature/90[°C] is outside of the range; so (may be) unreliable	B1; dB1	
$S_{xx} = 851093 - \frac{3119^2}{12} [= 40412.9166] \qquad M1$ $S_{xx} = 24500 - \frac{'479.63235^2}{12} [= 5329.4005] \qquad M1$ $S_{xy} = 2.72 \times '5329.4005' [= 14495.9693] \qquad or \qquad r = 2.72 \times \sqrt{\frac{'5329.4005}{'40412.9166'}} \qquad M1$ $r = \frac{'14495.9693}{\sqrt{5329.4005} \times '40412.9166} \qquad or \qquad r = 2.72 \times \sqrt{\frac{'5329.4005}{'40412.9166'}} \qquad M1$ $= 0.988 \times \qquad \qquad M1$ (e) e.g. the points lie reasonably close to a straight line/positive correlation and the PMCC is close to 1 therefore supports a linear model **Notes** **Notes** **Total** (a) **B1** **Notes** **Total** (a) **B1** **In a correct interpretation of the gradient in context including grams and degrees* (b) **M1** for a corrent that implies the temperature/90[°C] is outside of the range. Allow extrapolation of unked to 396. (Do not allow comments that imply that 396 is out of range or the use of "bit dependent on 1st B1 for a correct conclusion (d) **M1** for clear use of the regression line to find $\sum x$ or \overline{x} (may be implied by 3^{sd} M1) **A1** **\sum_{x} x = \text{awrt} 480 or $\overline{x} = \text{awrt} 40$ (may be implied by 3^{sd} M1) **\sum_{x} x = \text{awrt} 480 or $\overline{x} = \text{awrt} 40$ (may be implied by 3^{sd} M1) **\sum_{x} x = \text{awrt} 480 or $\overline{x} = \text{awrt} 40$ (may be implied by 3^{sd} M1) **\sum_{x} x = \text{awrt} 480 or $\overline{x} = \text{awrt} 40$ (may be implied by 3^{sd} M1) **\sum_{x} x = \text{awrt} 480 or $\overline{x} = \text{awrt} 40$ (may be implied by 3^{sd} M1) **\sum_{x} x = \text{awrt} 480 or $\overline{x} = \text{awrt} 40$ (may be implied by 3^{sd} M1) **\sum_{x} x = \text{awrt} 480 or $\overline{x} = \text{awrt} 40$ (may be implied by 3^{sd} M1) **\sum_{x} x = \text{awrt} 480 or $\overline{x} = \text{awrt} 40$ (may be implied by 3^{sd} M1) **\sum_{x} x = \text{awrt} 480 or $\overline{x} = \text{awrt} 40$ (may be implied by 3^{sd} M1) **\sum_{x} x = \text{awrt} 480 or $\overline{x} = \text{awrt} 40$ (may be implied by 3^{sd} M1) **\sum_{x} x = \text{awrt} 480 or $x = \text{awrt} 40$ (may be implied by 3^{sd} M1) **\sum_{x} x				(2)	
$S_{xx} = 24500 - \frac{'479.63235'^2}{12} [= 5329.4005]$ $S_{y} = 2.72 \times '5329.4005' [= 14495.9693]$ $r = \frac{'14495.9693'}{\sqrt{5329.4005} \times '40412.9166'}$ or $r = 2.72 \times \sqrt{\frac{'5329.4005}{'40412.9166}}$ M1 (e) e.g. the points lie reasonably close to a straight line/positive correlation and the PMCC is close to 1 therefore supports a linear model Notes Notes Total (a) B1 for a correct interpretation of the gradient in context including grams and degrees (b) M1 for substitution of 90 into the regression line A1 cao 396 on its own scores 2 out 2 (c) B1 for a comment that implies the temperature/90[°C] is outside of the range. Allow extrapolation on linked to 396. (Do not allow comments that imply that 396 is out of range or the use of "it dependent on 1" B1 for a correct conclusion (d) M1 for clear use of the regression line to find $\sum x$ or \overline{x} (may be implied by 3rd M1) A1 $\sum x = \text{awrt } 480 \text{ or } \overline{x} = \text{awrt } 40 \text{ (may be implied by } \text{ awrt } 40400$ M1 for a correct expression for S_{yy} May be implied by awrt 40400 M1 for a correct expression for S_{yy} May be implied by awrt 40400 M1 for a correct expression for S_{yy} May be implied by awrt 14500 or use of the gradient to find S_{xy} ft their S_{xy} Nay be implied by awrt 14500 or use of S_{xy} for the interpretation of S_{xy} ft their S_{xy} Nay be implied by awrt 14500 or use of S_{xy} ft their S_{xy} Nay be implied by awrt 14500 or use of S_{xy} ft their S_{xy} Nay be implied by awrt 14500 or use of S_{xy} ft their S_{xy} Nay be implied by awrt 14500 or use of S_{xy} ft their S_{xy} Nay so implied by awrt 14500 or use of S_{xy} ft their S_{xy} Nay so implied by awrt 14500 or use of S_{xy} ft their S_{xy} Nay so implied by S_{xy} or S_{xy} if these are not correct then they must be labelled before an expression for S_{xy} if these are not correct then they must be labelled before an expression for S_{xy} if these are not correct then they must be labelled before an ex	(d)	Use of \bar{y}	$\overline{y} = 151.2 + 2.72\overline{x}$ So $\sum x = \left(\frac{\frac{3119}{12} - 151.2}{2.72}\right) \times 12 = 479.63235$	M1 A1	
$S_{xy} = 2.72 \times '5329.4005' [= 14495.9693] \qquad \text{M1}$ $r = \frac{'14495.9693'}{\sqrt{'5329.4005} \times '40412.9166} \qquad \text{or} \qquad r = 2.72 \times \sqrt{'5329.4005'} \qquad \text{M1}$ $= 0.988 * \qquad \qquad \text{A1*}$ (e) $\frac{\text{e.g. the points lie reasonably close to a straight line/positive correlation and the PMCC is close to 1 therefore supports a linear model} \frac{\text{Notes}}{\text{Is close to 1 therefore supports a linear model}} \qquad \text{B1 B1 B1} \frac{\text{Notes}}{\text{Is close to 1 therefore supports a linear model}} \qquad \text{B2 B1 B1} (a) \frac{\text{B1}}{\text{In a correct interpretation of the gradient in context including grams and degrees}} \qquad \text{B3 B1 B1}} (b) \frac{\text{M1}}{\text{In a correct interpretation of 90 into the regression line}} \qquad \text{A1 cao 396 on its own scores 2 out 2}} \qquad \text{Correct interpretation of 90 into the regression line}} (c) \frac{\text{B1}}{\text{In a correct interpretation of 90 into the regression line}} \qquad \text{A1 cao 396 on its own scores 2 out 2}} \qquad \text{Correct interpretation of 11} \qquad \text{Correct conclusion}} \qquad \text{A1 cao 396 on its own scores 2 out 2}} \qquad \text{Correct data on 11} \qquad \text{A1 cao 396 on its own scores 2 out 2}} \qquad \text{Correct data on 11} \qquad \text{A1 cao 396 on its own scores 2 out 2}} \qquad \text{Correct data on 11} \qquad \text{A1 cao 396 on its own scores 2 out 2}} \qquad \text{A1 cao 396 on its own scores 2 out 2}} \qquad \text{A1 cao 396 on its own scores 2 out 2}} \qquad \text{A1 cao 396 on its own scores 2 out 2}} \qquad \text{A1 cao 396 on its own scores 2 out 2}} \qquad \text{A1 cao 396 on its own scores 2 out 2}} \qquad \text{A1 cao 396 on its own scores 2 out 2}} \qquad \text{A1 cao 396 on its own scores 2 out 2}} \qquad \text{A1 cao 396 on its own scores 2 out 2}} \qquad \text{A1 cao 396 on its own scores 2 out 2}} \qquad \text{A1 cao 396 on its own scores 2 out 2}} \qquad \text{A1 cao 396 on its own scores 2 out 2}} \qquad \text{A1 cao 396 on its own scores 2 out 2}} \qquad \text{A1 cao 396 on its own scores 2 out 2}} \qquad \text{A1 cao 396 on its own scores 2 out 2}} \qquad \text{A1 cao 396 on its own scores 2 out 2}} \qquad \text{A1 cao 396 on its own scores 2 out 2}} \qquad \text{A1 cao 396 on its own scores 2 out 2}} \qquad \text{A1 cao 396 on its own scores 2 out 2} \qquad \text{A1 cao 396 on its own scores 2}} \qquad A1 cao 396 on$		$S_{yy} = 85$	$1093 - \frac{3119^2}{12} [= 40412.9166]$	M1	
$r = \frac{14495.9693'}{\sqrt{5329.4005\times'40412.9166'}} \text{ or } r = 2.72 \times \sqrt{\frac{5329.4005'}{40412.9166'}} \text{ M1}$ $= 0.988 * \text{ A1*}$ (e) e.g. the points lie reasonably close to a straight line/positive correlation and the PMCC is close to 1 therefore supports a linear model		$S_{xx} = 24$	$500 - \frac{479.63235^{2}}{12} [= 5329.4005]$	M1	
(e) e.g. the points lie reasonably close to a straight line/positive correlation and the PMCC is close to 1 therefore supports a linear model Notes Notes Total (a) B1 for a correct interpretation of the gradient in context including grams and degrees (b) M1 for substitution of 90 into the regression line A1 cao 396 on its own scores 2 out 2 (c) B1 for a comment that implies the temperature/90[°C] is outside of the range. Allow extrapolation not linked to 396. (Do not allow comments that imply that 396 is out of range or the use of "it dependent on 1st B1 for a correct conclusion (d) M1 for clear use of the regression line to find $\sum x$ or \overline{x} (may be implied by 3rd M1) A1 $\sum x = \text{awrt } 480 \text{ or } \overline{x} = \text{awrt } 40 \text{ (may be implied by awrt } 40400$ M1 for a correct expression for S_{xy} May be implied by awrt 40400 M1 for a correct expression for S_{xy} fit their $\sum x$ or \overline{x} May be implied by awrt 14500 or use of for use of the gradient to find S_{xy} fit their S_{xy} May be implied by awrt 14500 or use of $r = b \sqrt{\frac{ S_{xy} }{ S_{yy} }}$ for a correct expression for r fit their S_{xy} , S_{xx} and S_{yy} or 2.72, S_{xx} and S_{yy} If these are not correct then they must be labelled before an expression for r is given for this mark to be awarded A1* Answer is given so a fully correct solution must be seen (e) B1 for either the points lie reasonably close to a straight line/points or data are linear/positive correlation or the PMCC is close to 1 (Ignore any reference to strength) with a correct correct correct of the points lie reasonably close to a straight line/points or data are linear/positive correlation and the PMCC is close to 1 (Ignore any reference to strength) with a correct		$S_{xy}=2.7$	72×'5329.4005'[=14495.9693]	M1	
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