Question Number	Scheme	Marks
1.(a)	$S_{tt} = 1828 - \frac{(136)^2}{12} = 286.6.....$ o.e. awrt **287**	M1A1 (2)
(b)	$r = \frac{S_{ht}}{\sqrt{S_{tt}S_{hh}}} = \frac{-236}{\sqrt{"286.6..."\times 297}}$ or $\frac{-236}{\sqrt{85140}}; = -0.8088...$ awrt **−0.809**	M1A1 (2)
(c)	Temperature decreases as height increases.	B1ft (1)
(d)	$b = \frac{S_{ht}}{S_{hh}} = \frac{-236}{297} (= -0.7946...)$	M1
	$a = \bar{t} - b\bar{h} = 11.3... + 0.7946 \times 9.33... = 18.7497...$	M1
	$t = 18.7 - 0.795h$	A1 (3)
(e)	$t = 18.7 - 0.795 \times 5 = 14.7$	M1 A1 (2)
(f)	Unreliable as the data is from France not South Africa	B1 (1)
		Total 11

Qu	Scheme	Marks
2(a)	$S_{tw} = 2304.53 - \frac{297.8 \times 114.8}{15}$ or $S_{ww} = 6089.12 - \frac{297.8^2}{15}$	M1
	$S_{tw} = 25.367...$ **awrt 25.4**	A1
	$S_{ww} = 176.797$ **awrt 177**	A1
		(3)
(b)	$r = \frac{"25.367"}{\sqrt{5.3173 \times "176.797..."}}$	M1
	$= 0.82735....$ **awrt 0.827 or 0.828**	A1
		(2)
(c)	$b = \frac{"25.367..."}{5.3173} [= 4.77065...]$	M1
	$a = \frac{297.8}{15} - \frac{"25.367"}{5.3173} \times \frac{114.8}{15} [= -16.658....]$	M1
	$b = 4.771$ or better **or** $a = -16.66$ or better seen **and** $w = -16.7 + 4.77t$*	A1*cso
		(3)
(d)	[On average,] for each **cm/1 cm** of tail **length/*t*** the **weight/*w* increases** by **4.77 g/grams**	B1
		(1)
(e)	$w = -16.7 + 4.77 \times 2 [= -7.16]$ or $4.77 \times 2 [= 9.54]$ or $[t =] \frac{16.7}{4.77} [= 3.5]$ or sd = awrt 0.6	M1
	$[w =] -7.16$ or $9.54 < 16.7$ or $2 < 3.5$ which is negative/weight cannot be negative or for sd extrapolation since a 2 cm tail is (approx 9 sd)/(more than 3 sd) from the mean	A1
		(2)
(f)	0.827	B1ft
		(1)
(g)	$2y + 10 = -16.7 + 4.77(x + 6)$ oe	B1ft
		(1)
	Notes	**Total 13**

Question	Scheme	
3 (a)	eg They represent / analyse / solve (real world problems)	B1
	They improve understanding / simplify (the real world)	
	Can be repeated/ adapted / refined	
	To show the relationship between variables/show trends	
		(1)
(b)	$[S_{ww} =]10036.45-\frac{339.25^2}{12}=445.57$ (to 2 decimal places)*	B1*
		(1)
(c)	$S_{td}=\frac{-91.55}{11.5}$ or $S_{td}=14.4-\frac{29.5\times9.1}{12}$ or $S_{dd}=\frac{445.57}{11.5^2}$ or $S_{dd}=75.9-\frac{29.5^2}{12}$	M1
	$S_{td}=-7.9608...$ awrt **−7.96** $S_{dd}=3.3691...$ awrt **3.37**	A1A1
		(3)
(d)	$[r=]\frac{-91.55}{\sqrt{445.57\times26.43}}$ or $[r=]\frac{"-7.9608..."}{\sqrt{"3.3691..."\times26.43}}$	M1
	$=-0.8436...$ awrt **− 0.844**	A1
		(2)
(e)	As the **temp**erature increases, **gas/consumption** decreases	B1ft
		(1)
(f)	$b=\frac{-91.55}{26.43}[=-3.4638...]$	M1
	$a=\frac{339.25}{12}-"-3.4638"\times\frac{9.1}{12}$ $[=30.897...]$ or $a=$awrt $28.3-"-3.4638"\times$awrt 0.76	M1
	$w=-3.46t+30.9$ *	A1*
		(3)
(g)	$11.5d=-3.46t+30.9$ oe eg $d=-0.301t+2.69$	B1
		(1)
(h)(i)	$2.0852...(m^3)$ awrt **2.09**	B1
(ii)	the gas consumption will **decrease** by **0.3 m³**	B1ft
		(2)

Question Number	Scheme	Marks
4 (a)	LQ = 28 or UQ = 48	B1
	'48'+1.5('48'−'28')[=78]	M1
	90 > 78 so, 90 is an outlier*	A1*
		(3)
(b)	$b=\frac{1735.6}{1667.6}[=1.04...]$	M1
	$a=38.2-'b'(42.2)[=-5.72....]$	M1
	$s=-5.72+1.04f$ *	A1*
		(3)
(c)	For every **extra mark** (oe) in **French/*f***, **Spanish/*s* goes up** (oe) by [on average] **1.04 marks**	B1
		(1)
(d) (i)	$s=-5.72+1.04\times55=51.48$ awrt 51.5	M1 A1
(ii)	$s=-5.72+1.04\times18=13$	A1
		(3)
(e)	• The first estimate is an interpolation/The second estimate is an extrapolation • 55 is within the range of data/18 is not within the range of data • 55 is closer to the mean/18 is further away from the mean	M1
	…..so 51.5 is the more reliable estimate	A1
		(2)
	Notes	**Total 12**

Question Number	Scheme	Marks
3. (a)	[It supports because:] r is close to –1 <u>or</u> there is strong correlation.	**B1** **(1)**
(b)	e.g. The dependent variable. The variable being studied.	**B1** **(1)**
(c)	$[b = \frac{S_{ch}}{S_{cc}} =] \frac{-3034.6}{303448} = -0.01[000...\text{hours/mg}]$	**M1 A1**
	So the data support the statement. (o.e.)	**dA1** **(3)**
(d)	$a = \bar{h} - b\bar{c} = \frac{126}{20} - "-0.01.." \times \frac{3660}{20} = 6.3 - "-0.01..." \times 183 = 8.13\ldots$ **awrt <u>8.1</u>**	**M1 A1ft** **A1** **(3)**
		[8 marks]

Question	Scheme	Marks
4 (a)	$S_{dg} = 141978.84 - \frac{1456.8 \times 713.2}{8}$ or $S_{gg} = 72675.98 - \frac{713.2^2}{8}$	M1
	$S_{dg} = 12105.12$	A1
	$S_{gg} = 9094.2$	A1
		(3)
(b)	$r = \frac{"12105.12"}{\sqrt{16769.78 \times "9094.2"}}$	M1
	$= 0.9802\ldots.$ awrt **<u>0.98</u>**	A1
		(2)
(c)	$b = \frac{"12105.12"}{16769.78} [= 0.7218...]$	M1
	$a = \frac{713.2}{8} - "0.7218..." \times \frac{1456.8}{8} [= -42.297....]$	M1
	$g = -42.3 + 0.722d$ *	A1*cso
		(3)
(d)	for each 1 [cm] increase in length/d the girth/g increases by "0.722…"	B1
		(1)
(e)(i)	138.2 awrt **<u>138</u>**	B1
(ii)	[unreliable] as get a negative girth	B1
		(2)
(f)	$0.722x = 17.3$	M1
	$x = 23.96...$ awrt **<u>24</u>**	A1
		(2)
	Notes	**Total 13**

Question Number	Scheme	Marks
6 (a)	$S_{tt} = 14837 - \frac{635^2}{30} \quad \left(= \frac{8377}{6} = 1396.1666...\right)$	M1
	$r = \frac{-1648.83}{\sqrt{2396.97 \times 1396.166...}} = -0.9013136...*$	A1*
		(2)
(b)	Possible **linear** relationship between t and w / points lie close to a (straight) line a negative gradient/slope / as w increases t decreases	B1 B1
		(2)
(c)	$b = \frac{S_{wt}}{S_{ww}} = \frac{-1648.83}{2396.97}$	M1
	$= -0.68788...$ awrt **–0.69**	A1
	$a = \frac{635}{30} - ('-0.68788...') \times \frac{839}{30} = 40.404...$	M1
	$t = 40.4 - 0.688w$	A1
		(4)
(d)	On average as **score increases by 1**, **time decreases by '0.688'** minutes	B1ft
		(1)
(e)(i)	(pmcc would) stay the same	B1
(ii)	(Magnitude of gradient would) decrease	B1
(iii)	(Intercept would) stay the same	B1
		(3)

Question Number	Scheme	Marks
5. (a)	$y = 6.066 + 0.136 \times 80$	M1
	$= 16.946$ (so annual rent is) **S 16 946**	A1
		(2)
(b)	$S_{yy} = 3434 - \frac{183^2}{10}$ or $S_{xx} = 84\,818 - \frac{900^2}{10}$	M1
	$S_{yy} =$ **85.1**	A1
	$S_{xx} =$ **3818**	A1
		(3)
(c)	Need S_{xy} so use b so $S_{xy} = b \times S_{xx} = 0.136 \times 3818$ or 519.248	M1; A1
	$[r =] \frac{0.136 \times "3818"}{\sqrt{"3818" \times "85.1"}}$	M1
	$= 0.9109448...$ awrt **0.911**	A1
		(4)
(d)	Since (new $x = 90$ and [original or] new $\bar{x} = 90$) the term $(x - \bar{x})$ will be 0	M1
	Therefore (the 11th shop makes no change) S_{xy} stays the same	A1
		(2)
(e)	S_{xx} will be the same so b will be the same	M1
	New $\bar{y} = \frac{183+15}{11} = 18$ (or a is reduced by 0.3)	M1
	Equation is $y = 5.766 + 0.136x$	A1
		(3)
(f)	$x = 300$ is outside the range $300 \gg 90$ [$300 \gg 90 + 3\sigma = 90 + 3 \times 18.63.. \approx 146$]	B1
	So not suitable (since involves extrapolation) (o.e.)	(1)
		[15]