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 $S_{td} = 14.4 - \frac{29.5 \times 9.1}{12}$ 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)	$[r =]\frac{-91.55}{\sqrt{445.57 \times 26.43}}$ or $[r =]\frac{"-7.9608..."}{\sqrt{"3.3691..." \times 26.43}}$	M1
	$= -0.8436\ldots$ awrt **– 0.844**	A1
		(2)
(e)	As the **temp**erature increases, **gas/consumption** decreases	B1ft
		(1)
(f)	$b = \frac{-91.55}{26.43}$ [$= -3.4638\ldots$]	M1
	$a = \frac{339.25}{12} - "-3.4638" \times \frac{9.1}{12}$ [$= 30.897\ldots$] 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)	$2.0852\ldots$ (m^3) awrt **2.09**	B1
(ii)	the gas consumption will **decrease** by **0.3 m^3**	B1ft
		(2)
		Total 14

(a)	B1 for one valid reason why models are used B0 for comments relating to **time**, **cost**, and **predictions** only. **"**Easy"/ "Easy to use" on its own is B0 Ignore extraneous non-contradictory comments once B1 has been scored.
(b)	B1* Correct numerical method to find S_{ww} shown with an answer awrt 445.57
(c)	M1 Method to find S_{dd} or S_{td} (implied by awrt −7.96 or awrt −7.97 or awrt 3.37 or awrt 3.38)
	A1 awrt −7.96 **or** awrt 3.37 condone awrt −7.97 **or** awrt 3.38 for this mark
	A1 awrt −7.96 **and** awrt 3.37
(d)	M1 for a correct method with $S_{ww} \neq 10036.45$
	A1 awrt –0.844 correct answer scores 2 out of 2 an answer of awrt –0.843 scores M1A0
(e)	B1ft for correct contextual interpretation with bold words o.e., ft "their (d)" Allow as **gas** increases, **temp(**erature) decreases o.e. B0 for "their (d)" outside the range [–1, 1] Interpreting numerically as a gradient is B0.
(f)	M1 for a correct numerical expression to find the value of b
	M1 for a correct method to find a allow "their b" or just b in the expression $w -$ awrt $28.3 = "-3.46..."(t -$ awrt $0.76)$
	A1* (dep on M1M1) for correct given equation. Allow $w =$ awrt $-3.46t +$ awrt 30.9 No fractions.
(g)	B1 Any correct equation seen (ISW) (allow fractions). allow $d = -0.3t + 2.69$, $d = \frac{-3.46t+30.9}{11.5}$
(h)(i)	B1 awrt 2.09
(ii)	B1ft for decrease awrt 0.3m^3 must include units ft their changed gradient B0 for decrease by –0.3m^3