

Correlation – Mark Scheme

June 2017 Mathematics Advanced Paper 1: Statistics and Mechanics 1

1.

Question Number	Scheme	Marks
1. (a)	$[S_{wy}] = 784 - \frac{119 \times 42}{6} =, \underline{-49}$	A1
	$[S_{wt}] = 2435 - \frac{119^2}{6} =, \underline{74.8\dot{3}}$ or $74\frac{5}{6}$ or $\frac{449}{6}$ (accept awrt <u>74.8</u>)	M1 A1
		(3)
(b)	$S_{xy} = 5 \times 10^7$ or <u>50 000 000</u> (o.e.)	B1
	$S_{xt} = \underline{-49\ 000}$	B1ft
		(2)
(c)	$r = \frac{"-49"}{\sqrt{50 \times "74.8\dot{3}"}} \text{ or } \frac{"-49\ 000"}{\sqrt{"5 \times 10^7" \times "74.8\dot{3}"}} =, -0.80105\dots = \text{awrt } \underline{-0.801}$	M1, A1
		(2)
(d)	r is close to -1 or $ r $ is close to 1 or " strong " (o.e.) [negative] correlation ... so " yes " or does support the belief	B1ft
		(1)
(e)	$b = \frac{"-49"}{"74.8\dot{3}} = [-0.6547\dots], a = \frac{42}{6} - b \times \frac{119}{6} = [19.9866\dots]$ or $a = 7 - b \times 19.8\dot{3}$ So <u>$w = 20.0 - 0.655t$</u>	M1, M1 A1
		(3)
(f)	<u>$s = 20\ 000 - 655t$</u> or <u>$c = 20\ 000$</u> and <u>$d = -655$</u>	B1ft B1ft
		(2)
(g)	Decrease in sales of [£] 655 (ignore any minus sign)	B1ft
		(1)
		[14]

Notes	
(a)	<p>M1 for a correct expression for S_{wt} or S_{tt} (May be implied by either correct answer)</p> <p>1st A1 for $[S_{wt}] = -49$</p> <p>2nd A1 for $[S_{tt}] = \text{awrt } 74.8$ SC If <u>both</u> values correct but clearly mislabelled award M1A0A1</p>
(b)	2 nd B1ft for multiplying their S_{wt} by 1000
(c)	<p>M1 for a correct expression using their values provided S_{tt} and S_{ss} both > 0</p> <p>A1 for awrt -0.801 (Correct ans. only M1A1, -0.80 with no working M1A0)</p>
(d)	<p>B1ft for a correct comment that uses their <u>value</u> of r as support, provided $0.5 \leq r \leq 1$</p> <p>For $r < 0.5$ comment must be “does <u>not</u> support”, because “weak” (o.e.) correlation.</p> <p>NB “points lie close to a straight line” is B0 unless supported by mention of their value of r</p>
(e)	<p>1st M1 for a correct expression for b or awrt -0.66 or -0.65 Ft their answers from (a)</p> <p>2nd M1 for a correct expression for a ft their value for b</p> <p>A1 for a correct equation in w and t only with $a = 20$ or awrt 20.0 and $b = \text{awrt } -0.655$ (No fractions)</p> <p style="text-align: center;">If their a and b are given to more than 3 sf, accept answers in (f) to 3sf or better.</p>
(f)	<p>1st B1 ft for correct c or “their 20.0” $\times 1000$ 2nd B1ft for correct d or their “-0.655” $\times 1000$</p> <p>Values can be in an s, t eq’n or $c =, d =$ (Their a and b needn’t be to 3 sf and ft their letter for t)</p>
(g)	B1ft for stating clearly <u>both</u> decrease (o.e.) <u>and</u> [£] 655. Ft their d and allow “increase” if $d > 0$