



Q	Answer	Marks
1	a) the strength of the linear relationship (linear correlation) between two variables b) $H_0: \rho = 0$, $H_1: \rho < 0$; critical value -0.4973; $-0.614 < -0.4973$ so reject H_0: there is evidence of negative correlation between screen time and sleep	4
2	$H_0: \rho = 0$, $H_1: \rho \neq 0$; critical values ± 0.4438; $-0.402 < 0.4438$ so do not reject H_0: insufficient evidence of correlation between part-time work and mock score	4
3	a) $a = 141$, $b = 1.22$ b) the number of bacteria is multiplied by 1.22 each hour (it grows by about 22% an hour)	4
4	a) $H_0: \rho = 0$, $H_1: \rho < 0$, where ρ is the population PMCC b) $0.0379 < 0.05$ so reject H_0: there is evidence of negative correlation between wind speed and temperature c) yes: $0.0379 > 0.01$, so at 1% she would not reject H_0 (insufficient evidence) d) correlation does not imply causation; the correlation is weak, and both may depend on another factor such as the weather system or the season	5
5	a) $r = 0.675$ (0.6747) b) $H_0: \rho = 0$, $H_1: \rho > 0$; critical value 0.5822; $0.6747 > 0.5822$ so reject H_0: evidence of positive correlation c) no: the two-tailed critical value is 0.6664 and $0.6747 > 0.6664$, so H_0 is still rejected	6
6	a) $H_0: \rho = 0$, $H_1: \rho < 0$; critical value -0.6120; $-0.962 < -0.6120$ so reject H_0: evidence of negative correlation between x and y b) $h = 229m^{(-0.24)}$ c) about 83 beats per minute (82.6)	7
7	a) $k = 66.1$, $c = 1.36$ b) the number of downloads is multiplied by about 1.36 each week (an increase of about 36% a week) c) week 11 d) week 11 is just outside the range of the data (weeks 1 to 10), so it is a small extrapolation; only reliable if the exponential growth continues, which may not happen	7
8	a) $H_0: \rho = 0$, $H_1: \rho < 0$; critical value -0.7155; $-0.931 < -0.7155$ so reject H_0: evidence of negative correlation b) altitude a: altitude can affect temperature, not the other way round c) for each extra metre of altitude, the mean July temperature falls by 0.0062°C (about 0.62°C per 100 m)	7

	d) 12.1 °C e) 1345 m is outside the range of the data (20 m to 950 m), so it is extrapolation	
9	a) $n = 17$ (critical value 0.4124 0.42) b) $H_0: \rho = 0$, $H_1: \rho \neq 0$; critical values ± 0.3961 ; $0.42 > 0.3961$ so reject H_0 : evidence of correlation c) with a large enough sample even a weak correlation is significant; $r = 0.42$ is only weak to moderate, and the test only shows that ρ is unlikely to be zero	6
10	a) (i) -0.964 (ii) -1.00 (-0.9998) b) r for t and $\log C$ is closer to -1, so $\log C$ is almost exactly linear in t , which is what $C = ab^t$ gives c) $y = 1.9076 - 0.0700t$ (gradient -0.07005) d) $a = 80.8$, $b = 0.851$ e) 4.30 minutes	8
11	a) $a = 20\,000$ (19 952.6), $b = 0.822$ b) the car loses about 17.8% of its value each year (its value is multiplied by 0.822 each year) c) 7.07 years d) e.g. the model predicts the value tends to 0, but an old car keeps some value (scrap value), or classic cars can gain value	7
12	a) $\log P = \log a + d \log b$, which is of the form $y = c + mx$ with $y = \log P$, $x = d$ b) $r = 0.9997$ (1.00); $H_0: \rho = 0$, $H_1: \rho > 0$; critical value 0.6215; $0.9997 > 0.6215$ so reject H_0 : evidence of positive correlation c) $\log P = 0.5981 + 0.1773d$; $a = 3.96$, $b = 1.50$ d) day 12; this is extrapolation beyond day 8, and with only 600 pupils the growth must slow as fewer pupils are left to catch it, so the prediction is unreliable (likely too early)	10

Full worked solutions, written out by hand, are on the solutions sheet for this topic.