1A Exponential Models

t	3	5	6	8	9	11
g	1.04	1.49	1.79	2.58	3.1	4.46

1. The table above shows some data collected on the temperature, in °C, of a colony of bacteria (t), and its growth rate (g).

   The data are coded using the changes of variable $x = t$ and $y = logg$. The regression line of y on x is found to be:

   $y = -0.2215 + 0.0792x$

a) Mika says that the constant -0.2215 in the regression line means that the colony is shrinking when the temperature is 0°C. Explain why Mika is wrong.

b) Given that the data can be modelled by an equation of the form $g = kb^t$, where k and b are constants, find the values of k and b.

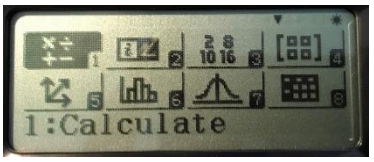
1B PMCC

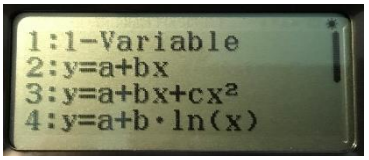
Day of month	1	2	3	4	5	6	7	8	9	10
w	4	4	8	7	12	12	3	4	7	10
g	13	12	19	23	33	37	10	n/a	n/a	23

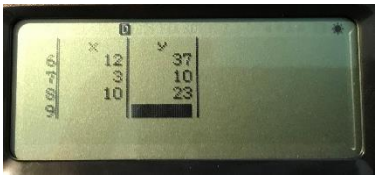
1. From the large data set, the daily mean windspeed, w knots, and the daily maximum gust, g knots, were recorded for the first 10 days in September in Hurn in 1987.

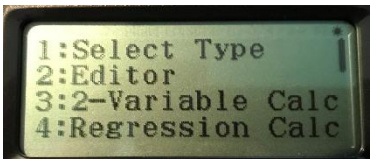
a) State the meaning of n/a in the table

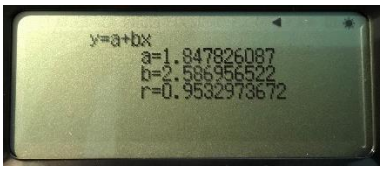
b) Calculate the product moment correlation coefficient for the remaining 8 days











c) With reference to your answer to part b), comment on the suitability of a linear regression model for this data

1C Hypothesis Testing for Correlation

1. A scientist takes 30 observations of the masses of two reactants in an experiment. She calculates a PMCC of $r = -0.45$.

   The scientist believes there is no correlation between the masses of the two reactants. Test, at the 10% level of significance, the scientist's claim, stating your hypotheses clearly.

Product Moment Coefficient					
Level					Sample size, n
0.10	0.05	0.025	0.01	0.005	
0.8000	0.9000	0.9500	0.9800	0.9900	4
0.6870	0.8054	0.8783	0.9343	0.9587	5
0.6084	0.7293	0.8114	0.8822	0.9172	6
0.5509	0.6694	0.7545	0.8329	0.8745	7
0.5067	0.6215	0.7067	0.7887	0.8343	8
0.4716	0.5822	0.6664	0.7498	0.7977	9
0.4428	0.5494	0.6319	0.7155	0.7646	10
0.4187	0.5214	0.6021	0.6851	0.7348	11
0.3981	0.4973	0.5760	0.6581	0.7079	12
0.3802	0.4762	0.5529	0.6339	0.6835	13
0.3646	0.4575	0.5324	0.6120	0.6614	14
0.3507	0.4409	0.5140	0.5923	0.6411	15
0.3383	0.4259	0.4973	0.5742	0.6226	16
0.3271	0.4124	0.4821	0.5577	0.6055	17
0.3170	0.4000	0.4683	0.5425	0.5897	18
0.3077	0.3887	0.4555	0.5285	0.5751	19
0.2992	0.3783	0.4438	0.5155	0.5614	20
0.2914	0.3687	0.4329	0.5034	0.5487	21
0.2841	0.3598	0.4227	0.4921	0.5368	22
0.2774	0.3515	0.4133	0.4815	0.5256	23
0.2711	0.3438	0.4044	0.4716	0.5151	24
0.2653	0.3365	0.3961	0.4622	0.5052	25
0.2598	0.3297	0.3882	0.4534	0.4958	26
0.2546	0.3233	0.3809	0.4451	0.4869	27
0.2497	0.3172	0.3739	0.4372	0.4785	28
0.2451	0.3115	0.3673	0.4297	0.4705	29
0.2407	0.3061	0.3610	0.4226	0.4629	30
0.2070	0.2638	0.3120	0.3665	0.4026	40
0.1843	0.2353	0.2787	0.3281	0.3610	50
0.1678	0.2144	0.2542	0.2997	0.3301	60
0.1550	0.1982	0.2352	0.2776	0.3060	70
0.1448	0.1852	0.2199	0.2597	0.2864	80
0.1364	0.1745	0.2072	0.2449	0.2702	90
0.1292	0.1654	0.1966	0.2324	0.2565	100

x	31	28	38	37	18	17	21	29
y	99	94	87	80	80	89	84	86

2. The table from the large data set shows the daily maximum gust, x kn, and the daily maximum relative humidity, y%, in Leeming for a sample of eight days in May 2015.

a) Find the PMCC for these data

b) Test, at the 10% level of significance, whether there is evidence of a positive correlation between daily maximum gust and daily maximum humidity. State your hypotheses clearly