

## Additional data sets for Spearman's Rank practice - ANSWERS

### 1. Total alkalinity and dissolved inorganic carbon

Sample date	Total alkalinity (umol/kg)	Rank	Dissolved inorganic carbon (umol/kg)	Rank	$d$	$d^2$
17/03/10	2137	8	2003	15	7	49
19/03/10	2114	19	2000	19	0	0
21/03/10	2134	9.5	2006	14	4.5	20.25
23/03/10	2129	11.5	2001	18.5	7	49
25/03/10	2123	14	2001	18.5	4.5	20.25
27/03/10	2117	17	2002	16.5	-0.5	0.25
29/03/10	2142	4.5	2008	11.5	7	49
31/03/10	2109	20	2002	16.5	-3.5	12.25
02/04/10	2115	18	2009	10	-8	64
04/04/10	2121	15.5	2007	13	-2.5	6.25
06/04/10	2121	15.5	2013	7	-8.5	72.25
08/04/10	2128	13	2008	11.5	-1.5	2.25
10/04/10	2129	11.5	2010	8.5	-3	9
12/04/10	2155	1	2010	8.5	7.5	56.25
14/04/10	2142	4.5	2023	5	1.5	2.25
16/04/10	2144	2	2018	6	4	16
18/04/10	2138	7	2029	1	-6	36
20/04/10	2134	9.5	2025	2.5	-7	49
22/04/10	2143	3	2024	4	1	1
24/04/10	2140	6	2025	2.5	-3.5	12.25

$\Sigma d^2$	526.5
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$$r = 1 - \frac{6 \Sigma d^2}{n^3 - n}$$

$$r = 1 - \frac{6 \times 526.5}{8000 - 20}$$

$$r = 1 - \frac{3159}{7800}$$

$$r = 1 - 0.396$$

$r = 0.60$
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## 2. Temperature and salinity

Sample date	Temperature (°C)	Rank	Salinity (parts per thousand ‰)	Rank	$d$	$d^2$
17/03/10	-1.644	7	29.94	19.5	12.5	156025
19/03/10	-1.644	7	29.94	19.5	12.5	156025
21/03/10	-1.644	7	30.04	15	8	64
23/03/10	-1.643	5	30.23	7.5	2.5	6.25
25/03/10	-1.641	2.5	30.46	1	-1.5	2.25
27/03/10	-1.640	1	29.98	17	16	256
29/03/10	-1.641	2.5	29.99	16	13.5	182.25
31/03/10	-1.642	4	29.97	18	14	196
02/04/10	-1.647	11	30.11	13	2	4
04/04/10	-1.646	10	30.08	14	4	16
06/04/10	-1.649	12.5	30.30	3	-9.5	90.25
08/04/10	-1.649	12.5	30.12	12	-0.5	0.25
10/04/10	-1.645	9	30.16	10.5	1.5	2.25
12/04/10	-1.651	15	30.16	10.5	-4.5	20.25
14/04/10	-1.652	17	30.23	7.5	-9.5	90.25
16/04/10	-1.652	17	30.19	9	-8	64
18/04/10	-1.652	17	30.26	5.5	-11.5	132.25
20/04/10	-1.654	19.5	30.26	5.5	-14	196
22/04/10	-1.650	14	30.34	2	-12	144
24/04/10	-1.654	19.5	30.28	4	-15.5	240.25

$\Sigma d^2$	2019
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$$r = 1 - \frac{6 \Sigma d^2}{n^3 - n}$$

$$r = 1 - \frac{6 \times 2019}{8000 - 20}$$

$$r = 1 - \frac{12114}{7800}$$

$$r = 1 - 1.518$$

$r = -0.52$
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