Looking at relationships:
Spearman's coefficient of rank correlation

An absolute minimum of **7 pairs of data** is needed for Spearman's coefficient of rank correlation. The Spearman coefficient r_s is used to determine the strength and significance of any correlation and is calculated as follows:

$$r_s = 1-\left[\frac{6\sum D^2}{n^3 - n}\right]$$

where: r_s = Spearman's coefficient of rank correlation
D = the difference between ranks for each data pair
n = the number of pairs of observations
and $\sum D^2$ = the sum of all the D values squared

Use the Spearman coefficient worksheet to lay out your data and calculate your r_s value

Null hypothesis: there is no correlation between ……...

Alternative hypothesis: there is a significant correlation between……...

Now fill in the table below. Values are ranked giving the highest value rank 1 and so on. Where there are 2 or 3 tied values they are given the average of the ranks they would have had if they had not been tied. Use the r_x check and r_y check columns to keep track of your ranking procedure.

r_x check	r_y check	obs. no.	values of x	ranks of x values	values of x	ranks of x values	difference D (r_x - r_y)	Difference Squared (D^2)
		1						
		2						
		3						
		4						
		5						
		6						
		7						
		8						
		9						
		10						
		11						
		12						
		13						
		14						
		15						
		16						
		17						
		18						
		19						
		20						
		21						
		22						
		23						
		24						
		25						
							If your rankings are correct this value should be zero →	
							sum of D^2 values, $\sum D^2$ →	

In our analysis the number of pairs, n, = ☐ and the sum of D^2 values, $\sum D^2$ = ☐

Calculating r_s

the number of pairs, n, = ☐ so n^3 = ☐ and $n^3 - n$ = ☐

and the sum of D^2 values, $\sum D^2$ = ☐ so $6\sum D^2$ = ☐

Now we can calculate the Spearman coefficient r_s :

$r_s = 1 - \left[\frac{6\sum D^2}{n^3 - n}\right]$ $= 1 - \left(\text{————}\right)$ = 1- ☐ so r_s = ☐

(don't worry if it is a negative value – this simply means that there is a negative correlation.

Now compare your calculated r_s value with the critical value for r_s given below. All values are for the 5% probability level. If your calculated value is **the same as or greater (positively or negatively) than the critical value** then there is a **significant relationship** (at the 5% probability level) between your two data sets and you cannot accept your null hypothesis. **Beware though!** A correlation does not necessarily imply cause and effect; both variables could be affected by another, unknown, variable.

If your calculated value is **less (positively or negatively) than the critical value** then there is **no significant relationship** (at the 5% probability level) between your two data sets and your null hypothesis is accepted.

Table of critical values of the Spearman coefficient r_s at the 5% probability level

Number of pairs of data (n)	Critical value of r_s
5	1.000
6	0.886
7	0.786
8	0.738
9	0.683
10	0.648
12	0.591
14	0.544
16	0.506
18	0.475
20	0.450
22	0.428
24	0.409
26	0.392
28	0.377
30	0.364

Calculated value of r_s = ☐ critical value of r_s = ☐

So we accept ☐ reject ☐ null hypothesis at the 5% probability level.

Notes: