

# Regression and Correlation

## 1 Spearman's rank

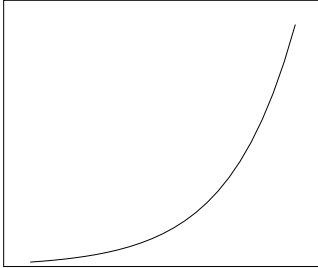
Spearman's rank shows whether two sets of data agree or disagree.

$r_s$  can take values from 1 to -1 (inclusive)

### 1.1 $r_s = 1$

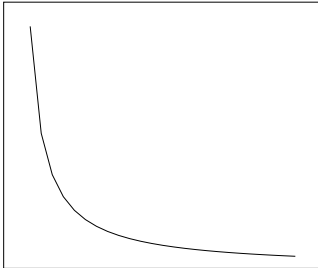
The total sets of data are in perfect rank order.

The gradient between each successive point is positive



### 1.2 $r_s = -1$

The gradient between each point is negative



### 1.3 Formula

$$r_s = 1 - \frac{6\sum d^2}{n(n^2 - 1)}$$

### 1.4 Example

Height of a sun-flower(cm)	Rank	Width of stem(mm)	Rank	d	$d^2$
183	4	21	4	0	0
134	3	14	1	2	4
234	6	24	5	1	1
256	7	32	7	0	0
190	5	29	6	1	1
89	1	18	2	1	1
112	2	20	3	1	1

$$\sum d^2 = 8$$

$$1 - \frac{6 \times 8}{7(7^2 - 1)} = \frac{6}{7}$$

## 2 Hypothesis Test For $r_s$

Step 1

State  $H_0$  and  $H_1$

$$H_0 : \rho_s = 0 \text{ (always)}$$

$$H_1 : \rho_s \neq 0 \text{ or}$$

$$H_1 : \rho_s > 0 \text{ or}$$

$$H_1 : \rho < 0$$

Step 2

State critical value from tables

Step 3

Calculate  $r_s$

Step 4

Compare  $r_s$  to the critical value. If in the critical region, testis significant, reject  $H_0$  in favour of  $H_1$

Step 5

Make conclusion in context of question

## 3 Tied ranks

If there are tied ranks and average of the positions they would take up