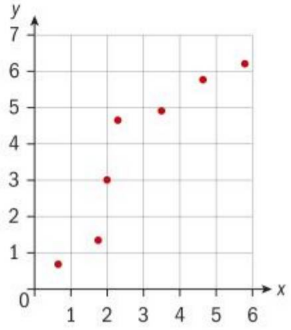
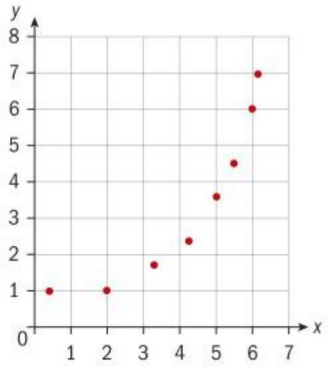
Exercise 8A

1 Write down the value of Spearman's rank correlation coefficient for each of the sets of data shown.

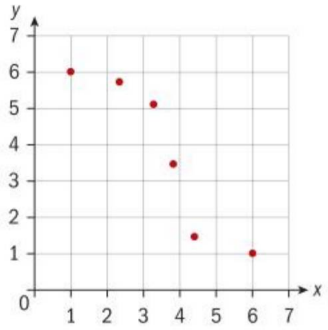
a



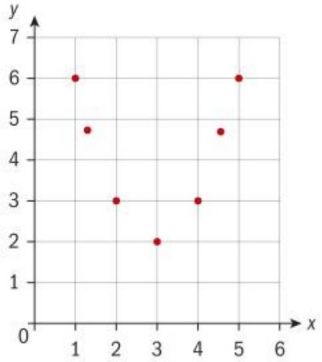
b



c



d



2 A group of students is asked to rank six snack foods by taste and value for money. The ranks are averaged and recorded in the following table.

Calculate Spearman's rank correlation coefficient for the data and comment on your results.

	Pop-corn	Crisps	Choco-late bar	Chews	Chocolate-chip cookie
Taste	2	4	1	5	3
Value	5	3	2	4	1

3 Find Spearman's rank correlation coefficient for the following data sets.

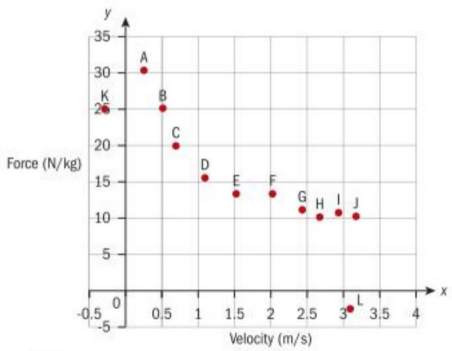
a

x	0	5	10	15	20	25	30
y	23	18	10	9	7	7	7

b

x	10	12	9	6	3	14	8
y	12	11	8	5	7	14	9

4 A sports scientist is testing the relationship between the speed of muscle movement and the force produced. In 10 tests the following data is collected.



Point

- A = (0.25, 30.4)
- B = (0.51, 25.1)
- C = (0.69, 20)
- D = (1.09, 15.6)
- E = (1.52, 13.4)
- F = (2.02, 13.4)
- G = (2.43, 11.2)
- H = (2.67, 10.2)
- I = (2.93, 10.8)
- J = (3.17, 10.3)
- K = (-0.29, 25.07)
- L = (3.09, -2.44)

a Explain why it might not be appropriate to use the PMCC in this case.

b Calculate Spearman's rank correlation coefficient (r_s) for this data.

c Interpret the value of r_s and comment on its validity.

5 A class took a mathematics test (marked out of 80) and an English test (marked out of 100), and the results are given in the following table.

Maths	15	25	37	45	60	72	74	78	78	79	79
English	44	47	42	49	52	44	54	59	69	78	89

a Calculate the PMCC for this data and comment on the result.

b Use graphing software to plot these points on a scatter diagram and comment on your result from **a**.

c Calculate Spearman's rank correlation coefficient for this data and comment on your result.

d State which is the more valid measure of correlation, and give a reason.

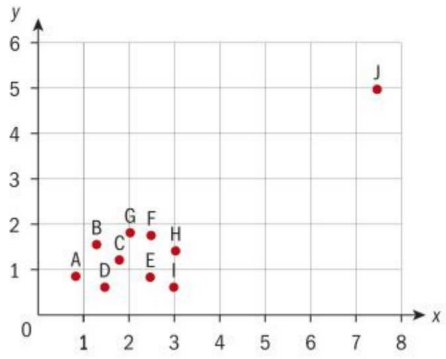
6 In a blind tasting, customers are asked to rank six different brands of coffee in terms of taste. These rankings and the costs of the different brands are given in the following table.

Brand	A	B	C	D	E	F
Taste rank	1	2	3	4	5	6
Cost	450	360	390	320	350	300

a Explain why you cannot use PMCC in this case.

b Find Spearman's rank correlation coefficient for this data and comment on your answer.

7 Consider the following data set:



Point

- A = (0.82, 0.86)
- B = (1.28, 1.56)
- C = (1.78, 1.22)
- D = (1.46, 0.62)
- E = (2.46, 0.84)
- F = (2.48, 1.76)
- G = (2.02, 1.82)
- H = (3.02, 1.42)
- I = (2.98, 0.62)
- J = (7.46, 4.98)

a For this data, calculate the PMCC:

i with the outlier J

ii without the outlier J.

b Calculate Spearman's rank correlation coefficient:

i with the outlier J

ii without the outlier J.

c Comment on the results.

The advantages of Spearman's rank correlation coefficient over the PMCC are:

- It can be used on data that is not linear.
- It can be used on data that has been ranked even if the original data is unknown or cannot be quantified.
- It is not greatly affected by outliers.

Developing inquiry skills

Can you use the PMCC or Spearman's rank correlation coefficient to compare the data in the opening scenario of this chapter, which looked at tree heights in different forest areas?

Why, or why not?

Developing your toolkit

Now do the Modelling and investigation activity on page 418.