Planner

Working with data (1)

- Determining whether two sets of data are correlated
- Drawing a line graph to see how data changes over time
- Understanding which average to use for data
- Representing data in a stem and leaf diagram

Keywords

You should know

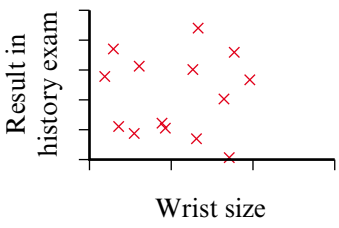
explanation 1a | explanation 1b | explanation 1c | explanation 1d | explanation 1e | online

1 **a** Which of these graphs shows positive correlation? Explain how you know.

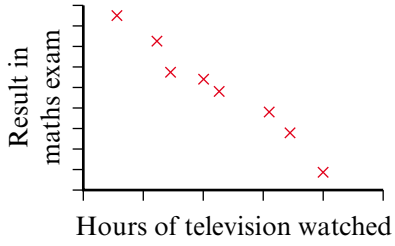
b Which of these graphs shows negative correlation? Explain how you know.

c Which of these graphs shows no correlation? Explain how you know.

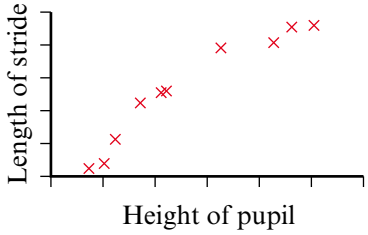
A



B



C



2 What type of correlation would you expect with these data sets?

a Height of a person and speed at which they can run.

b Age of a second-hand car and its value.

c Colour of eyes and distance walked to school.

d Height and weight of pupils in a school.

e Shoe size and the length of feet.

f Time taken to walk to school and the walking speed.

3 Here are the maths and art test scores for 12 pupils.

Maths	75	23	51	67	65	72	18	48	50	34	78	61
Art	27	72	43	31	36	22	65	45	61	75	29	30

a Plot this data as a scatter graph and draw a line of best fit.

b Describe the correlation between the maths and art test scores.

c Use your graph to find the likely maths score of a pupil who scores 50 in their art exam.

4 Ricky wants to buy a secondhand car.
He finds the following prices on the internet for the make and model that he likes.

Age (months)	42	36	36	24	24	18	18	12	12
Price (£)	10 000	10 300	10 400	11 400	11 300	11 700	11 800	12 000	12 200

a Plot this data as a scatter graph and draw a line of best fit.

b What does the scatter graph show about the relationship between the age of the car and its price?

c The local garage is selling a 36-month-old car for £11 800.
Plot this point on the scatter graph.
Is it likely to be the same make and model? Explain your answer.

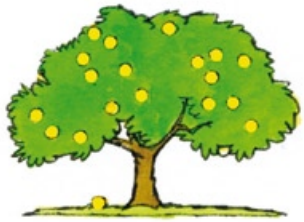
5 This table gives details of the age and the diameter (in years) of the trunk (in inches) of some grapefruit trees in an orchard.

Age	8	7	10	6	7	8	5	9	10	5	6	6
Diameter	6.5	5.7	7.1	5.5	6.2	6.2	4.2	6.6	7.0	4.6	5.0	5.2

a Plot this data as a scatter graph and draw a line of best fit.

b What does the scatter graph show about the relationship between the age of a grapefruit tree and the diameter of its trunk?

c A different tree is 6 years old and the diameter of its trunk is 7.5 inches.
Use the graph to explain why it is likely to be a different variety of tree.



d Another grapefruit tree in this orchard is $7\frac{1}{2}$ years old.
Estimate the diameter of its trunk.

6 If one shape is an enlargement of another, the two shapes are *similar* to each other. The table gives the width and length of some similar rectangles.

Width of rectangle (cm)	4	8	6	11	5	2	10	7
Length of rectangle (cm)	6	12	9	16.5	7.5	3	15	10.5

a Plot this data as a scatter graph.

b What does the scatter graph show about the relationship between the width and length of similar rectangles?

c Draw a line of best fit.

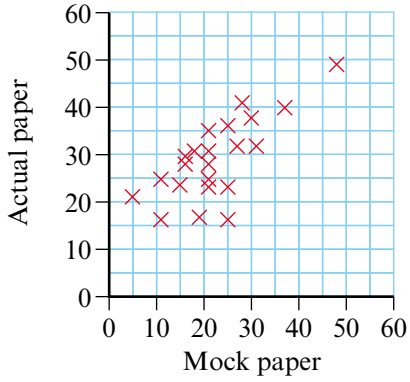
d Another rectangle has a width of 5 cm and a length of 10 cm.
Plot this point on the scatter graph.
Use the graph to determine whether this rectangle is similar to the others.

7 This scatter graph shows the class results in a mock examination and in the actual paper, five months later.

a Describe the correlation between the results in the two examinations.

b In which paper did most pupils do better? Explain your reasoning.

Mock and actual examination results



explanation 2

8 These are the monthly sales figures in thousands of pounds from a company.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
54	62	56	59	67	61	58	55	54	50	52	66

a Draw a line graph to display the data, plotting the months on the horizontal axis and the sales figures on the vertical axis.

b The company ran an advertising campaign from March to May.

Do you think the advertising campaign was successful? Explain your answer.

9 The table shows the actual population in the UK and in Italy from 1950 to 2000 and the forecasted population up to the year 2050.

a Plot the data as two line graphs on the same axes.

b What are the predicted populations in the UK and Italy in 2015?

c Calculate the difference between the populations of the two countries for each year shown in the table.

d In which year will there be the greatest difference in the populations of the two countries?

Year	Population (millions) UK	Population (millions) Italy
1950	50	47
1960	52	50
1970	56	54
1980	56	56
1990	57	57
2000	60	58
2010	61	58
2020	63	57
2030	64	55
2040	64	53
2050	64	50

10 These are the average monthly temperatures in degrees Celsius at London Heathrow and in Moscow. Plot them both as line graphs on the same axes.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heathrow	4	4	6	8	12	15	17	16	14	10	7	5
Moscow	−10	−9	−4	4	12	16	18	16	10	4	−2	−8

a What is the minimum temperature in Moscow?

b What is the range of temperatures in Moscow?

c In which month is there the greatest difference between the temperature at London Heathrow and the temperature in Moscow?

explanation 3a explanation 3b explanation 3c

11 Jordan wrote down the number of texts he received each hour one Saturday.

0 1 6 2 8 5 3 5 6 3 1 1 1 2 4

Find the range, mean, median and mode of the number of texts he received.

12 Hayley counted the number of emails she received each day over a two-week period.

9 10 12 9 8 11 6 0 7 12 10 8 12 6

Find the range, mean (to 1 d.p.), median and mode of the number of emails she received.

13 These are the results in an end-of-term test.

54 34 22 29 25 20 26 28 19 16 32 31 31 41 25

a Find the range, mean, median and mode of the marks.

b An extra mark was added and the mean changed to 28.5.

What was the new mark?

14 These are the average monthly temperatures in degrees Celsius in the Russian city of Vladivostok.

−14, −11, −3, 4, 9, 13, 18, 20, 16, 8, −2, −12

Find the range and mean (to 1 d.p.) of the monthly temperatures.

15 The mean of six numbers is 17. Five numbers are 34, 12, 22, 10 and 15.
What is the sixth number?

16 Five numbers have a mean, mode, median and range of 4.
What are the numbers?

17 Eight pupils each took five examinations in June.
For each pair, write down a set of five possible marks for each pupil.
Which pupil do you think did better?
Is there more than one possible answer?

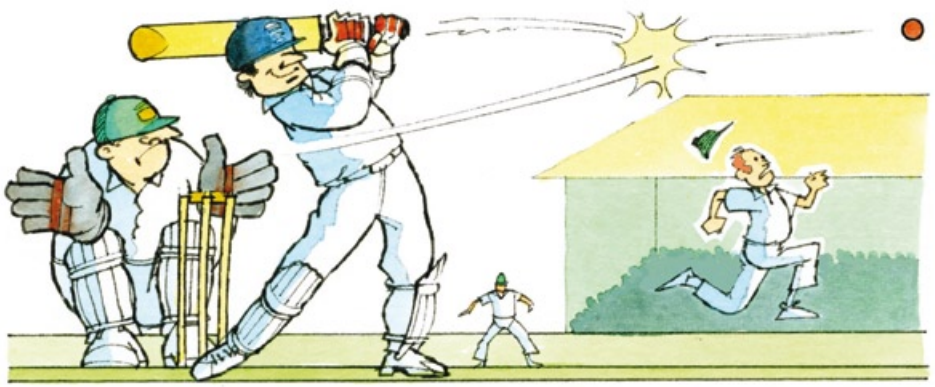
a Emily had a range of 80% and Taylor had a range of 20%.

b Ryan had a mean of 56% and Cally had a mean of 50%.

c Kofi had a median of 56% and Jessica had a median of 60%.

d Josh had a mode of 50% and Chelsey had a mode of 84%.

18 The mean score of a group of five cricketers was 34 runs.
When a sixth cricketer joined the group their mean score went down to 32.
Work out the score of the sixth cricketer.



19 Four pupils worked out that their mean score in a test was 67%.
When Anna joined the other four pupils, their mean score went up to 73%.
What was Anna's score in the test?

20 There are five players in each quiz team.
The mean number of points scored per team member in team A was 24.8.
The mean number of points scored per team member in team B was 18.6.
How many more points did team A score than team B?

21 Which of the three averages, mean, median or mode, would be used to find the following?

a Average age in years and months in a class.

b Average age in years in Uganda.

c Average shoe size in a class.

d Average number of children per woman in the UK.

e Favourite flavour of ice cream in the school.

f Average salary in a manufacturing company where the manager has a salary of £5 000 000 per year.

g Average weight of a baby at birth.

h Most common colour of car in the staff car park.

22 Max went to four different birthday parties last year. He worked out statistics for the ages of the people attending each party.
What age was each party to celebrate?
Explain how you know.

Part **a** has been completed for you.

a Range = 37 years, mean = 20.3 years, median = 15 years, mode = 15 years.

Most guests are aged 15 (mode = 15), half the guests are 15 or younger (median = 15) so it is a teenage party. The range of 37 years and mean of more than 20 show that some adults are also present.

b Range = 62 years, mean = 46.7 years, median = 49 years, mode = 50 years.

c Range = 40 years, mean = 12.2 years, median = 7 years, mode = 6 years.

d Range = 74 years, mean = 70.3 years, median = 79.5 years, mode = 80 years.

23 Cameron says that the average person has less than two legs. Penny disagrees and says that the average person has two legs. How did they calculate their answers? Which average is more appropriate to use?

24 Students with the top 50% of the marks in an exam pass; the others fail.
Which average should the exam board use to set the pass mark?
Explain your answer.

25 A local Scout group consists of 4 adult leaders and 15 scouts who are between the ages of 11 and 14.

a Write down possible ages for the members of the group.

b Calculate the mean, median, mode and range of the ages of the members.

c Which averages represent the age of the group most fairly?
Explain your answer.

26 In 2007, the median age in Uganda was 14.9 years and the median age in Japan was 43.5 years.

a Describe one difference between the populations of Uganda and Japan.

b Why do you think the median age is low in many African countries?

c The UK had a median age of 39.6 years in 2007. What problems do you think a high median age may cause the UK in the future?

explanation 4a explanation 4b online

27 Jade surveyed some of her friends to find out how many texts they each received in a week.
She used the results of her survey to draw a stem and leaf diagram.

0	9
1	3 7 8 9 9
2	0 1 4 4 5 8
3	3 4 4 4 4 7 8 9
4	2 5 7

Key
1|3 means 13 texts.

a How many friends did Jade survey?

b How many people received 19 texts?

c What is the modal number of texts?

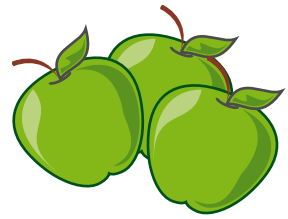
d Work out the range.

e Work out the median number of texts.

28 Roy found the weight of 25 apples. Their weights, correct to the nearest gram, are shown in this stem and leaf diagram.

17	3	4	6	7							
18	0	0	0	3	4	5	6	6	7	8	8
19	2	3	4	4	6	7	9				
20	0	1	2								

Key
17|3 means 173 grams.



a What is the modal weight of the apples?

b Find the range of the weights.

c Work out the median weight.

Roy finds and measures two more apples.
Their weights are 178 g and 201 g.

d If he adds these results into his stem and leaf diagram will the mode and median be affected? Give an explanation for your answers.

29 In a biology experiment Aaisha measured the length of 20 woodlice.
The measurements, correct to the nearest mm, are given below.

7	18	23	12	29	15	8	9	11	21
19	23	12	7	23	27	28	17	18	27

a Draw a stem and leaf diagram for these lengths.

b What is the modal length?

c Find the range of the lengths.

d Work out the median length.

30 Annie is collecting data for a science project. She measures the lengths of 30 leaves in centimetres, correct to the nearest millimetre. These are her results.

4.3	2.6	3.7	3.2	5.4	3.9	4.2	4.3	5.2	2.8
3.2	3.1	5.3	2.4	2.7	5.3	3.0	3.4	5.3	2.1
2.5	4.7	4.5	3.2	4.9	5.1	5.1	2.9	3.9	4.2

a Draw a stem and leaf diagram for these lengths.

b What is the modal length?

c Find the range of the lengths.

d Work out the median length.

31 Anil and Brandon recorded the number of texts they received each day for 21 days. This information is shown in the back-to-back stem and leaf diagram.

Anil									Brandon							
		8	5	4	3	3	2	0	7	8	9					
9	7	6	4	2	1	0	0	1	1	5	6	6	6	7	8	
		6	5	3	2	2	1	2	2	4	7	8	9	9		
							7	3	0	1	2	1	3			

Key
2|1 means 21 texts.

a Work out the range and median number of texts for each boy.

b Write a short paragraph comparing the numbers of texts that the boys received.

32 Ceri measured the heights of 20 boys and 20 girls correct to the nearest centimetre. Here are her results.

Girls

158	156	152	160	163	159	147	160	162	149
151	167	154	158	148	157	163	165	154	168

Boys

165	172	170	166	175	178	182	167	167	170
177	175	173	169	182	176	174	180	178	181

a Draw a back-to-back stem and leaf diagram to display the data.

b What does the shape of the diagram suggest?

c Find the range and median heights for the boys and for the girls.

d Write a short paragraph comparing the heights of the girls and the heights of the boys.