



Scatter diagrams and correlation

About 45 minutes Calculator allowed 36 marks

Date _____

A Do Now

The first question is what today's lesson needs. The others bring back earlier topics.

A1 Needed today [2 marks] **A2** Last lesson [2 marks]

Find the gradient of the line through $(-3, -1)$ and $(5, 6)$.

Answer

Some people were asked how many cars in their family. The answers 0, 1, 2, 3 have frequencies 5, 6, 7, 7 in that order. Work out the mean.

Answer

A3 From chapter 1 [2 marks] **A4** From chapter 3 [2 marks]

One light flashes every 6 seconds and another flashes every 13 seconds. They flash together at the start. How many more times do they flash together in the next 7 minutes?

Answer

A pie chart for 45 boys shows football with an angle of 216° . A pie chart for 90 girls shows football with an angle of 96° . How many more boys than girls chose football?

Answer

B Example, then your turn

Your teacher works through each example with you. Then try the one beside it.

EXAMPLE 1

Five readings: $(4, 11)$, $(8, 18)$, $(12, 26)$, $(16, 31)$, $(20, 39)$. Find the point the line of best fit passes through.

Hint The line goes through the mean point: the mean x with the mean y .

B1 Five readings: $(6, 22)$, $(9, 27)$, $(13, 31)$, $(18, 40)$, $(24, 50)$. Find the point the line of best fit passes through. [3 marks]

Answer (.....,)

EXAMPLE 2

A line of best fit is $y = 2.5x + 9$, from readings with x from 4 to 20. Estimate y at $x = 12$, and say whether $x = 40$ can be trusted.

Hint Put the value in. Then ask whether $x = 40$ is inside the readings.

B2 A line of best fit is $y = 1.8x + 6$, from readings with x from 5 to 25. Estimate y at $x = 18$, and say whether $x = 60$ can be trusted. [3 marks]

C Practice

C1 A line of best fit for test mark y against hours of revision x is $y = 7x + 22$. What does the 7 tell you? [1 mark]

C2 A line of best fit passes through (10, 24) and (40, 60). Find its gradient. [2 marks]

Answer

C3 A line of best fit is $y = 0.4x + 15$. Find x when $y = 31$. [2 marks]

C4 Hat sales and soup sales both rise together. Explain why one need not cause the other. [2 marks]

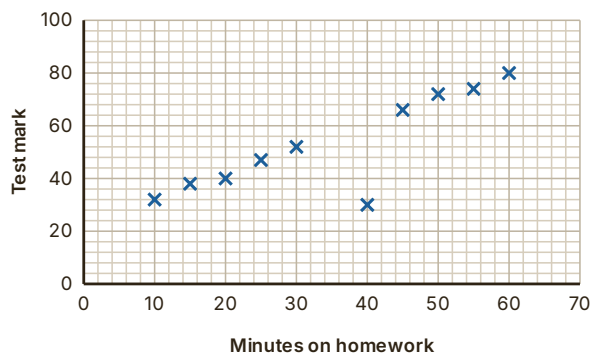
Answer

D Exam-style questions

D1 For children aged 5 to 11, the line of best fit for height h cm against age a years is $h = 6a + 80$. Ben says, "So a 40-year-old is 320 cm tall." [2 marks]

Explain why Ben's estimate cannot be trusted.

D2 Ten students recorded the minutes they spent on homework and the mark they scored in a test.



(a) Describe the correlation. [1 mark]

Answer

(b) One reading is an outlier. Write down its coordinates.

[1 mark]

Answer (.....,)

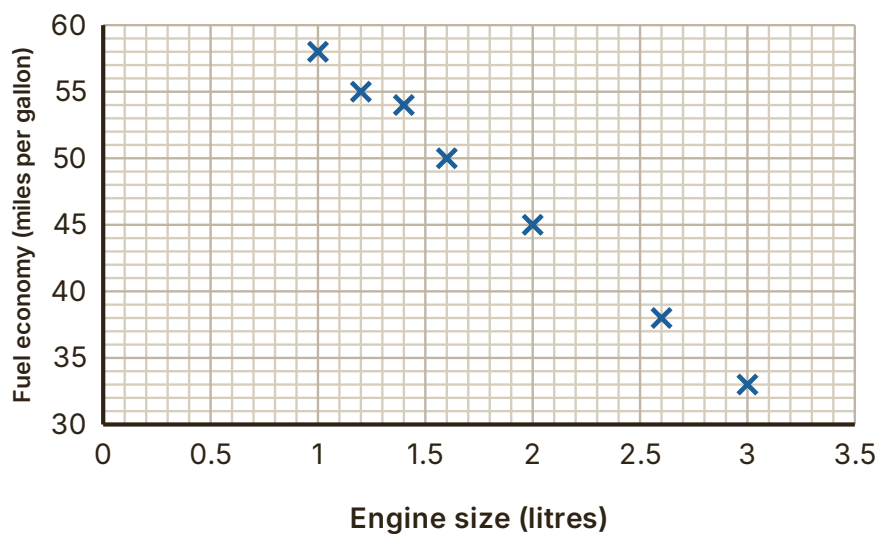
(c) A line of best fit passes through (10, 32) and (50, 70). Use it to estimate the mark of a student who spent 30 minutes on homework. You must show your working.

[3 marks]

Answer

Total for D2: 5 marks

D3 The scatter diagram shows the engine size and the fuel economy of seven cars. Three more cars have engine sizes of 1.8, 2.2 and 2.8 litres, with fuel economies of 47, 42 and 36 miles per gallon, in that order.



(a) On the scatter diagram, plot the three more cars.

[2 marks]

(b) Draw a line of best fit on the scatter diagram.

[1 mark]

(c) Use your line of best fit to estimate the fuel economy of a car with an engine size of 2.4 litres.

[1 mark]

Answer

(d) Describe the relationship between engine size and fuel economy.

[1 mark]

Total for D3: 5 marks

E Extension

No route is given. The hints are at the end of the sheet. Use one at a time.

- E1** Ten readings on a scatter diagram have mean point $(20, 45)$. One of them, $(38, 18)$, is an outlier and is taken out. Work out the mean point of the nine readings that are left.

[3 marks]

Answer (.....,)

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** The mean point tells you the total of the x -values and the total of the y -values.
- Hint 2** The ten x -values add to 200 and the ten y -values add to 450.
- Hint 3** Taking the outlier out leaves $200 - 38 = 162$ and $450 - 18 = 432$, over nine readings.

How did it go?

Colour one circle on each line: not yet, nearly, yes.

I can describe the correlation on a scatter diagram and spot an outlier.



I can find the mean point a line of best fit passes through.



I can read an estimate off a line of best fit and say when it is unreliable.

