Data Analysis 3.8

A Level

Consider the following data set:

$3.91, 4.29, 3.75, 4.28, 3.68, 4.13, 3.61, 4.19, 4.18, 4.01.$

Find the median, interquartile range, mean and standard deviation of the data set.

Part A The median

Find the median of the data set.

Part B The interquartile range

Find the interquartile range of the data set.

Part C The mean

Find the mean of the data set. Give your answer to 3 sf.

Part D The standard deviation

Find the standard deviation of the data set. Give your answer to 3 sf.

Created for isaacphysics.org by Julia Riley

Essential GCSE Maths 55.11

GCSE C C C A Level P P P

A technician is given a list of measurements in cm, correct to the nearest $0.1\,\mathrm{cm}$. He is told that the mean of the values is $3.3\,\mathrm{cm}$, but when he checks the calculation he finds a different value. Here is the list:

$$3.6, 3.4, 3.2, 2.9, 3.8, 3.4, 3.6, 3.2, 3.3, 3.6$$

Part A What is the mean of the values?

What is the mean of these values?

Part B What is the value of the missing numbers?

To find the source of the discrepancy, the technician checks the list he was given against the original data for the experiment, and finds two identical numbers are missing. What is the value of these numbers?

Gameboard:

STEM SMART Single Maths 6 - Data Analysis

Data Analysis 3.1

A Level

Nine measurements were made of the time taken by a pendulum to perform six swings. The mean of the values was $10.240\,\text{s}$ with a standard deviation of $0.073\,\text{s}$. A tenth measurement was included changing the mean to $10.253\,\text{s}$. Find (a) the value of the tenth measurement and (b) the new value of the standard deviation.

Part A The value of the tenth measurement

Find the value of the tenth measurement; give your answer to 3 decimal places.

Part B The new value of the standard deviation

Find the value of the new standard deviation; give your answer to 2 sf.

Created for isaacphysics.org by Julia Riley

Gameboard:

STEM SMART Single Maths 6 - Data Analysis

Essential GCSE Maths 56.5

GCSE P P P A Level P P P

x	Frequency
$0 \leqslant x < 5$	4
$5 \leqslant x < 10$	5
$10 \leqslant x < 20$	13
$20 \leqslant x < 30$	25
$30 \leqslant x < 35$	6

Part A Construct a histogram

Construct a histogram for this data.

Choose which of the following figures is correct.

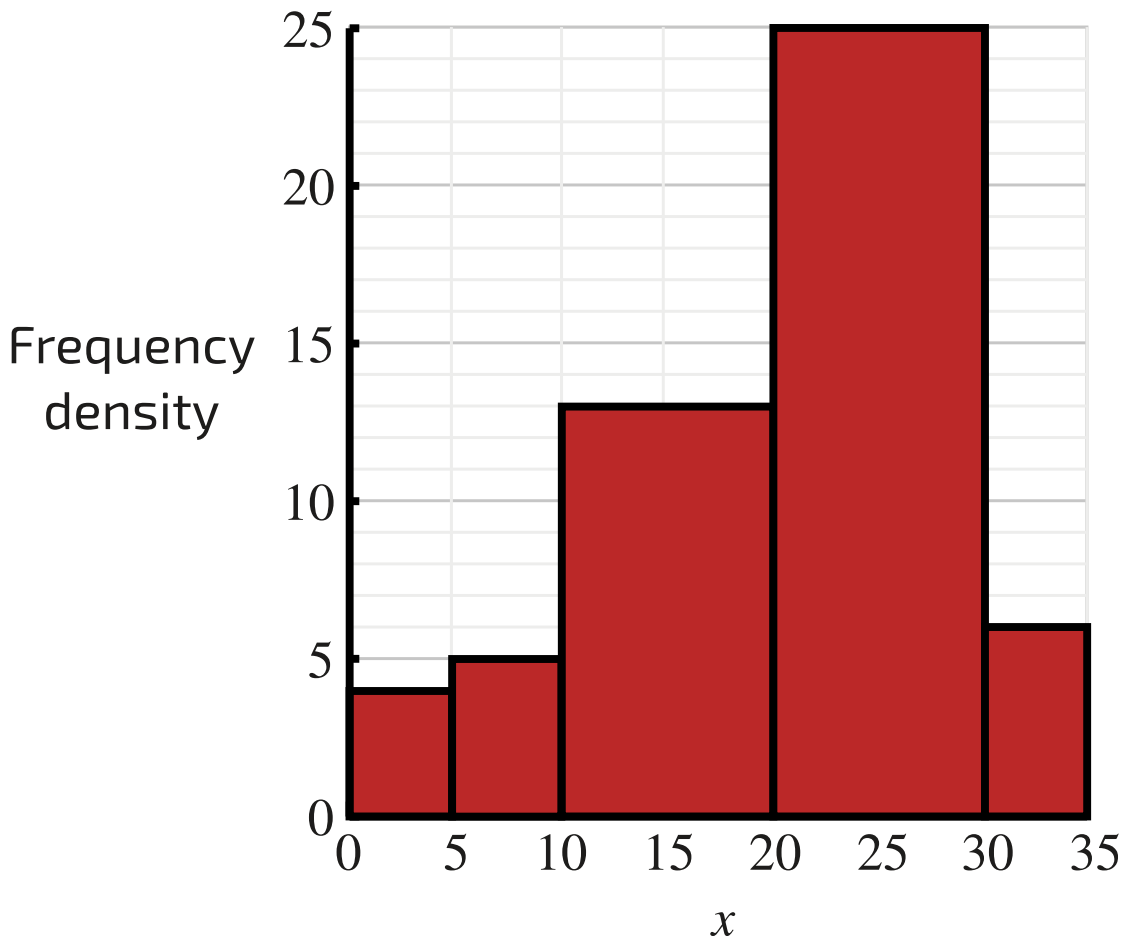

Figure 1: Option A.

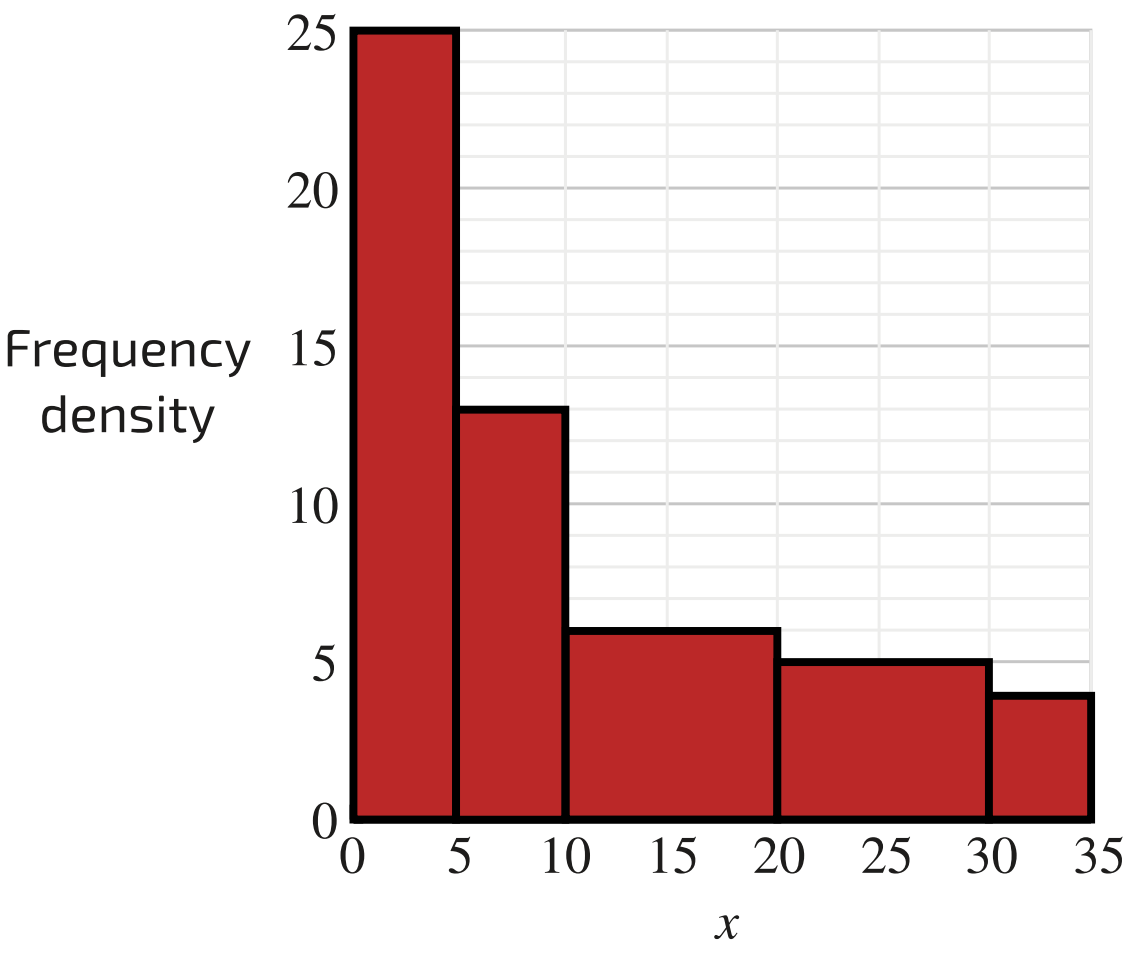

Figure 2: Option B.

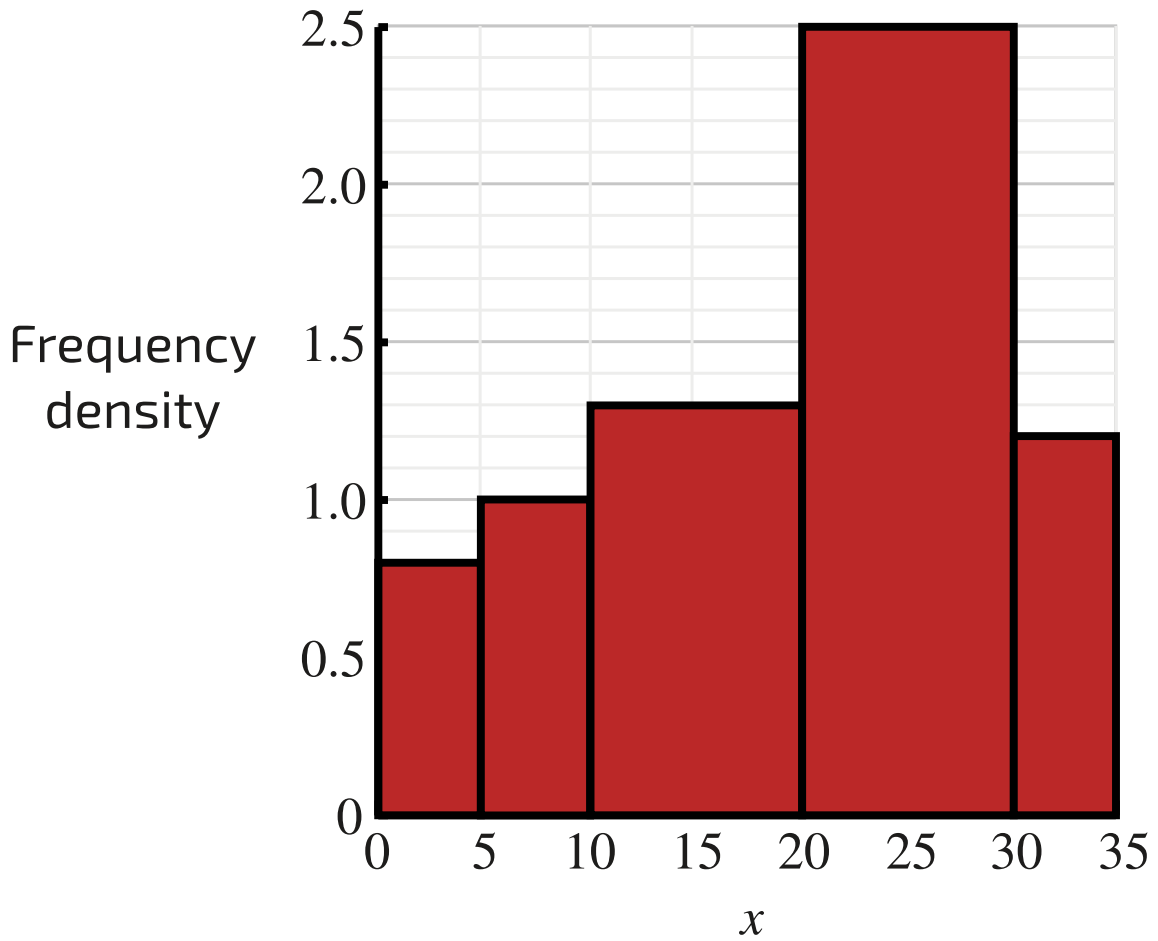

Figure 3: Option C.

- Option A
- Option B
- Option C

Part B What is the modal class?

What is the modal class?

- $0 \leqslant x < 5$
- $20 \leqslant x < 30$
- $5 \leqslant x < 10$
- $10 \leqslant x < 20$
- $30 \leqslant x < 35$

Part C Estimate the mean value of x

Estimate the mean value of x for this data to 3 s.f..

Part D Construct a cumulative frequency diagram

Construct a cumulative frequency diagram for this data.

Choose which of the following figures is correct.

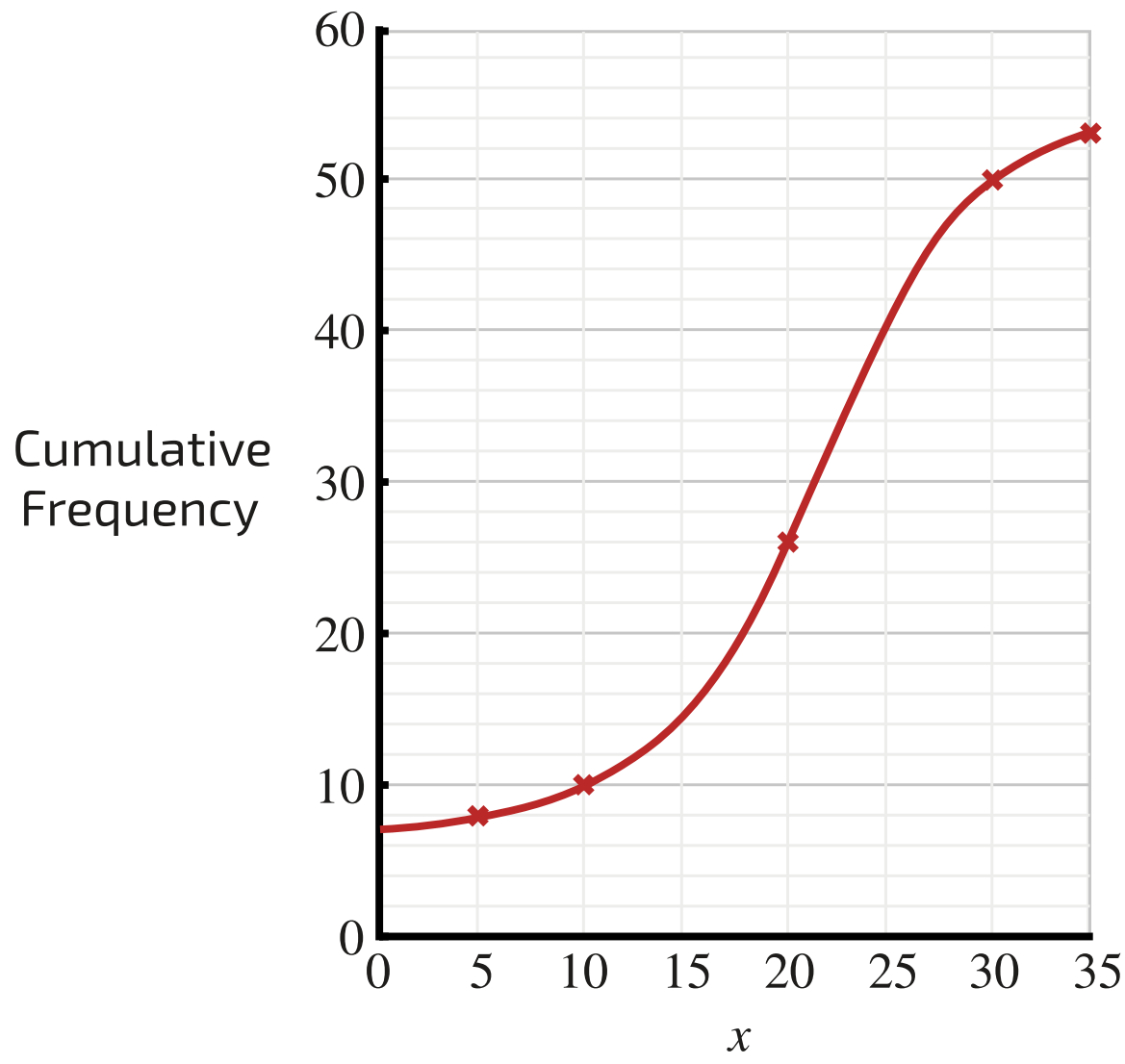

Figure 4: Option A.

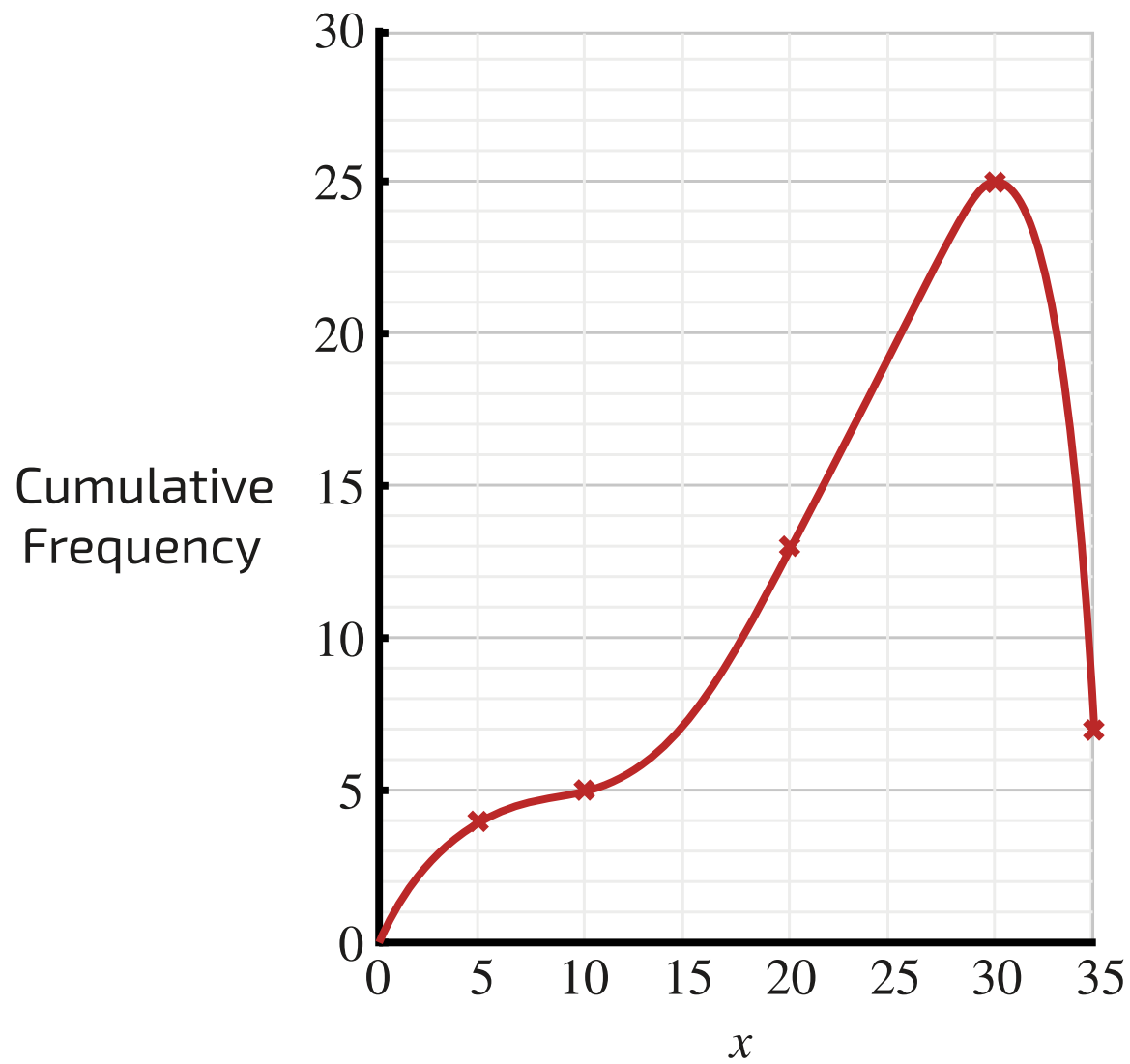

Figure 5: Option B.

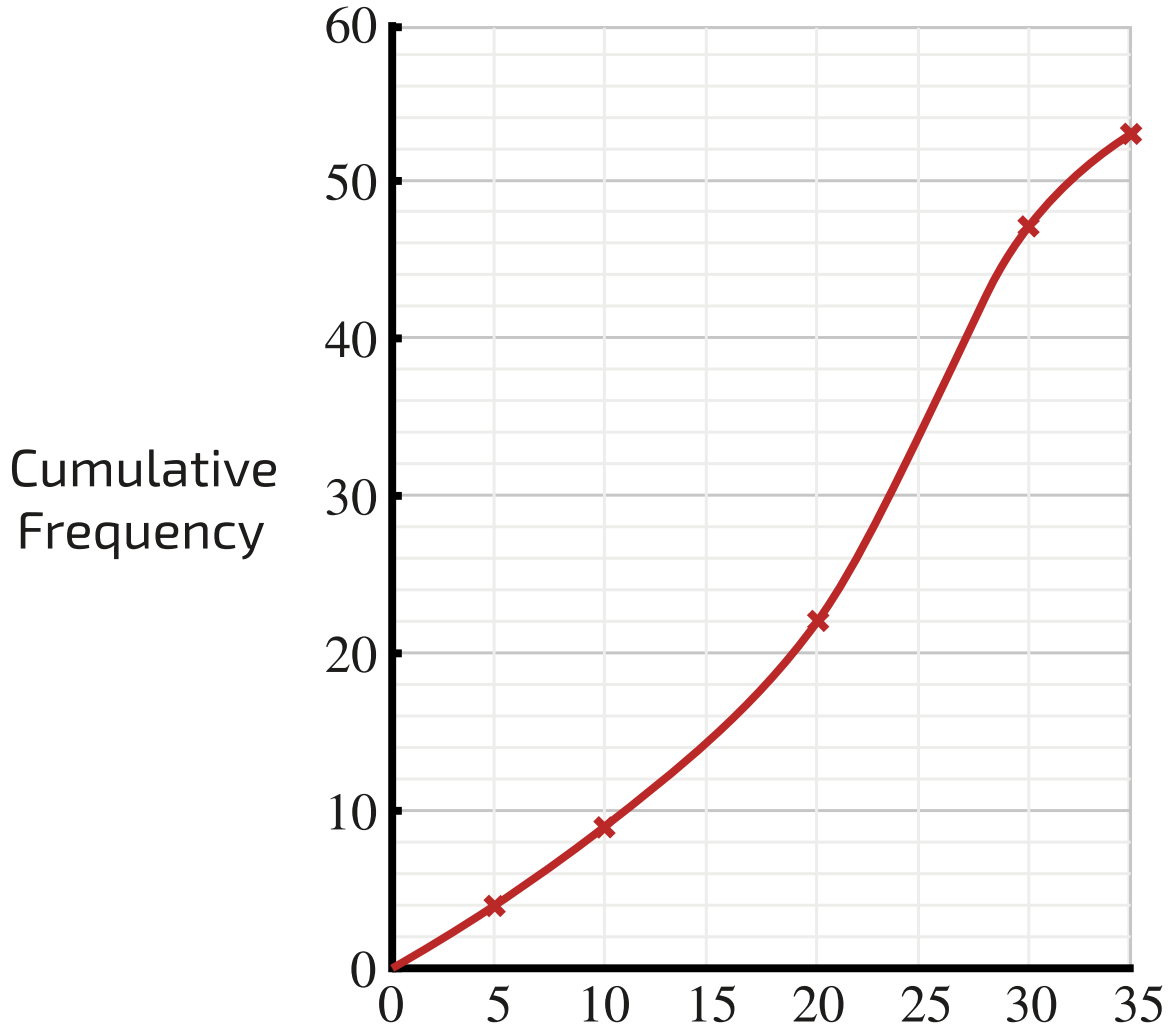

Figure 6: Option C.

- Option A
- Option B
- Option C

Gameboard:

STEM SMART Single Maths 6 - Data Analysis

Essential GCSE Maths 56.7

GCSE C C C A Level P P P

The histogram below summarises the total annual payments (including expenses) made to employees in a company.

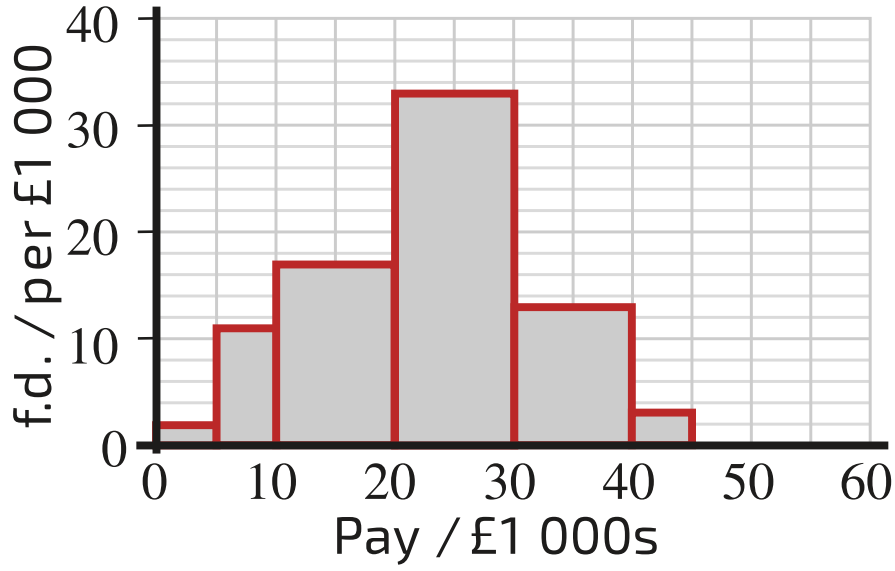

Figure 1: A histogram summarises the total annual payment made to employees.

Part A Make a frequency table

Let the variable for pay be p. Make a frequency table for the data in the histogram.

A partially complete frequency table is given below. Find the missing values A, B and C.

Pay in £1 000, p	Frequency
$0 \leq p < 5$	10
$5 \leq p < 10$	A
$10 \leq p < 20$	B
$20 \leq p < 30$	330
$30 \leq p < 40$	130
$40 \leq p < 45$	C

What is the value of A?

What is the value of B?

What is the value of C?

Part B What is the frequency density of the new class?

An extra class is added for $45 \leq p < 60$. This class has a frequency of 15. What is the frequency density of this class?

Part C Estimate the mean pay

Calculate an estimate of the mean amount payed out to an employee, including the extra class from part B. Give your answer in thousands of pounds to 3 s.f. (e.g. $£32,460$ would be entered as 32.5).

Gameboard:

STEM SMART Single Maths 6 - Data Analysis

Essential GCSE Maths 56.8

GCSE C C C A Level P P P

A company conducts plant growth trials of two varieties of chilli pepper, A and B. The graph shows cumulative frequency plots for the heights of both types of pepper after 13 weeks.

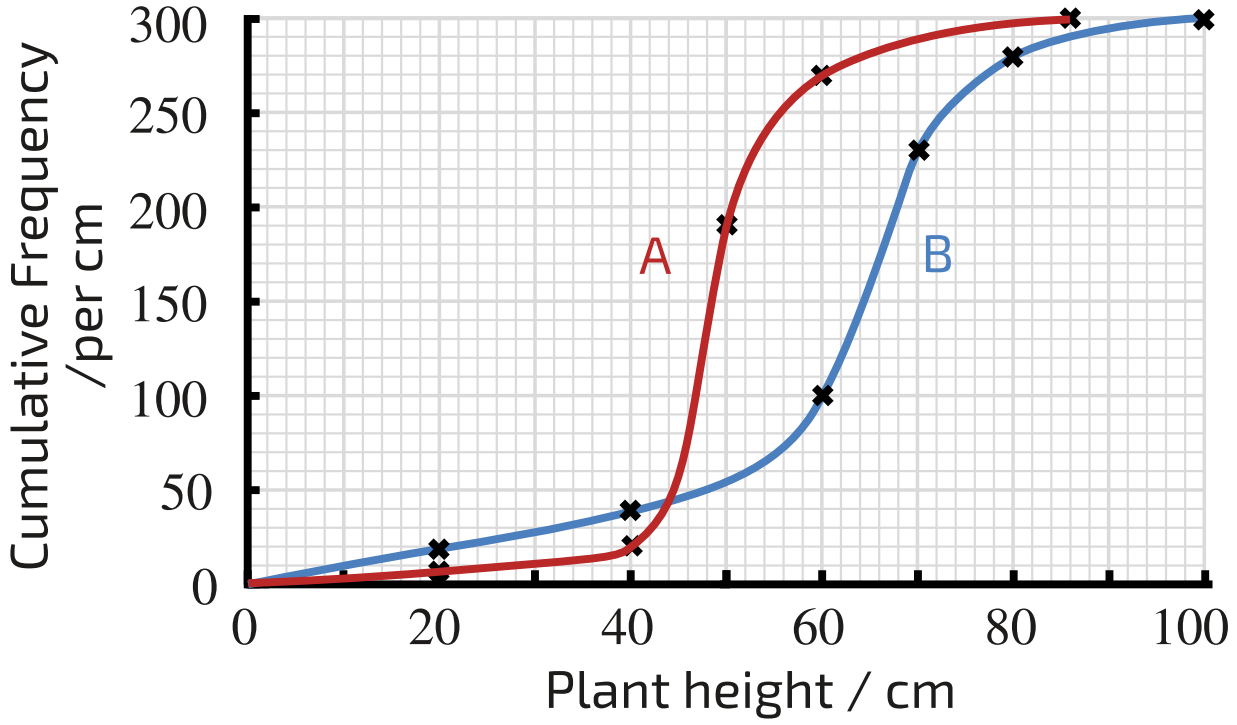

Figure 1: A cumulative frequency plot for the height of two types of chilli pepper.

Part A Create box plots

Create box plots for both varieties of pepper. Choose which of the following figures is correct.

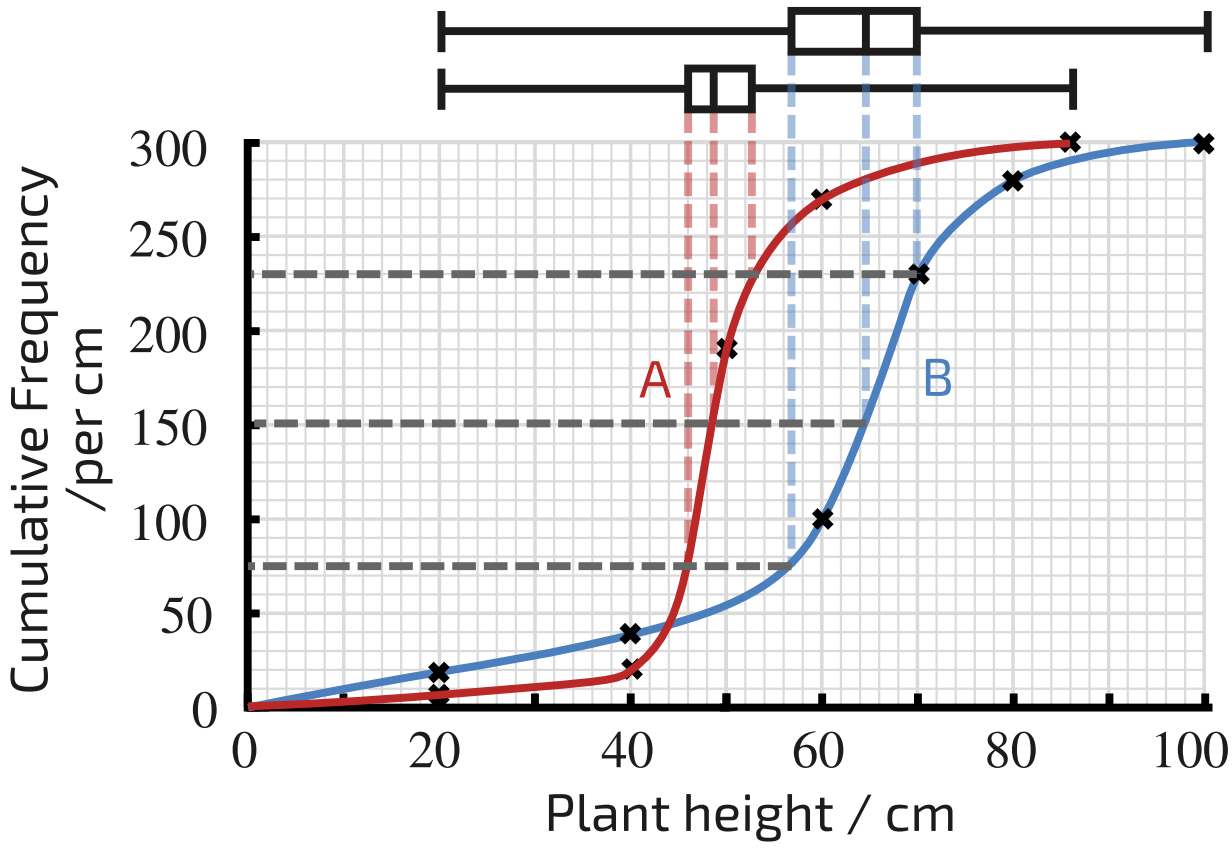

Figure 2: Option A.

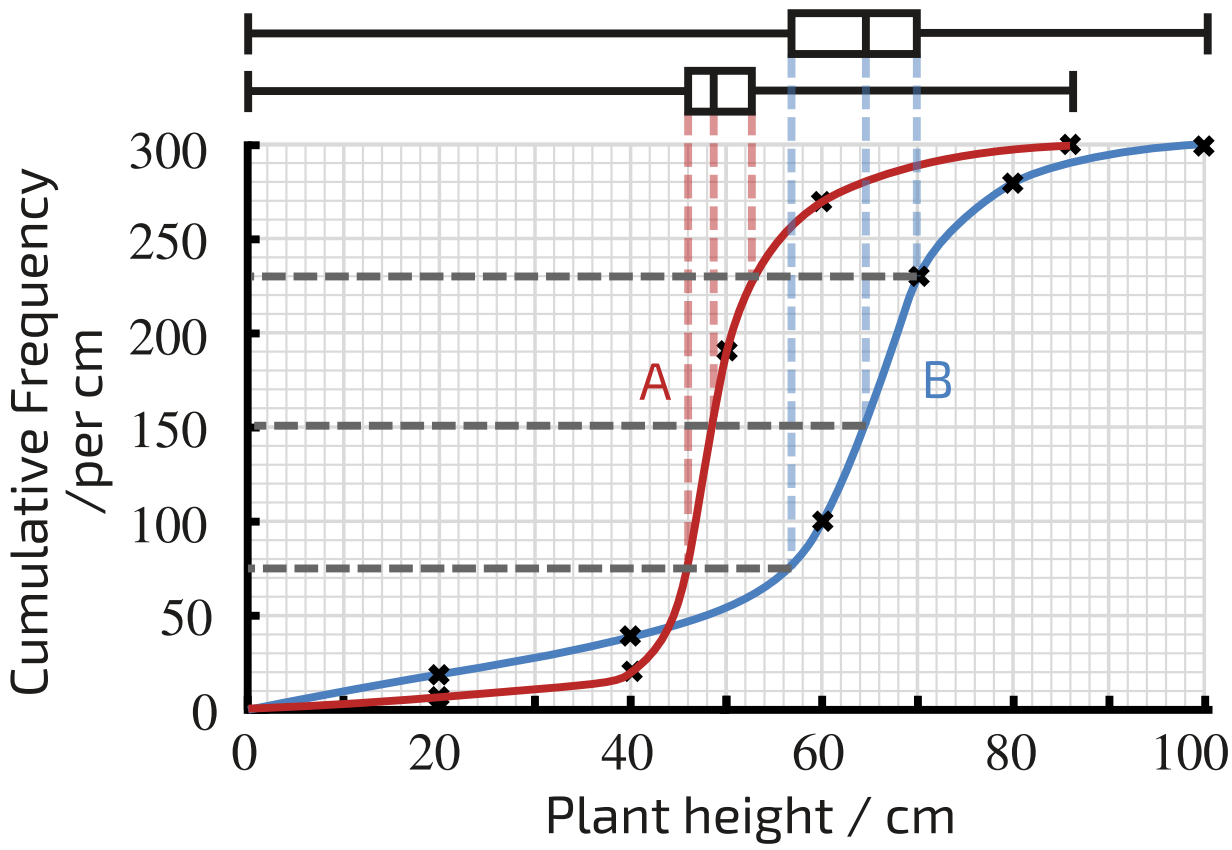

Figure 3: Option B.

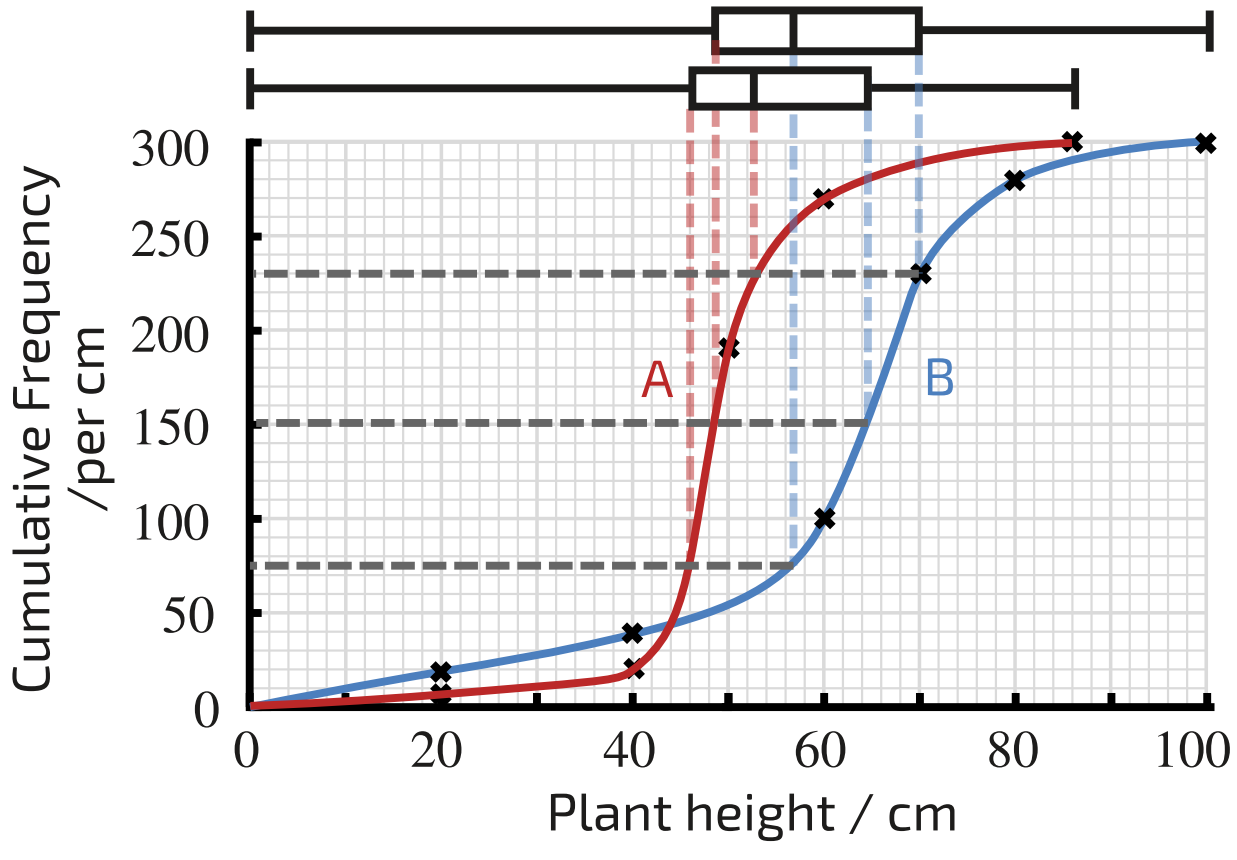

Figure 4: Option C.

- Option A
- Option B
- Option C

Part B Which variety produced fewer failures?

The company defines failures as plants which do not reach $40\,\mathrm{cm}$ in height. Which variety produced fewer failures?

- Type A
- Type B

Part C For which plant was the spread of plant heights greater?

For which plant was the spread of plant heights greater? Explain your answer.

- Type A
- Type B

Gameboard:

STEM SMART Single Maths 6 - Data Analysis

Essential GCSE Maths 57.4

GCSE C C C A Level P P P

Look at the following sketches and work out which equation describes the line of best fit.

Part A First line of best fit

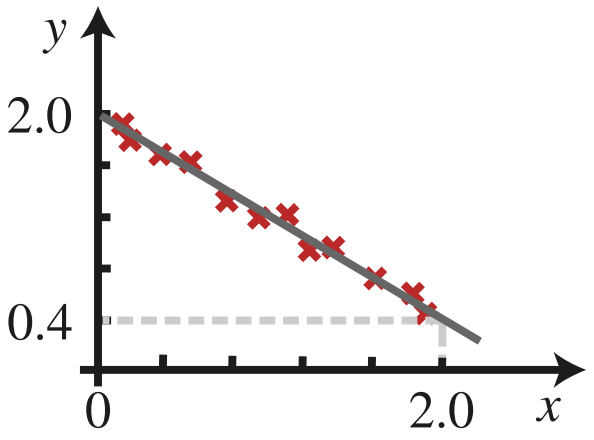

Figure 1: A graph of some data points and a line of best fit.

- $y = -1.8x + 4.0$
- $y = -0.8x + 2.0$
- $y = 0.8x - 2.0$

Part B Second line of best fit

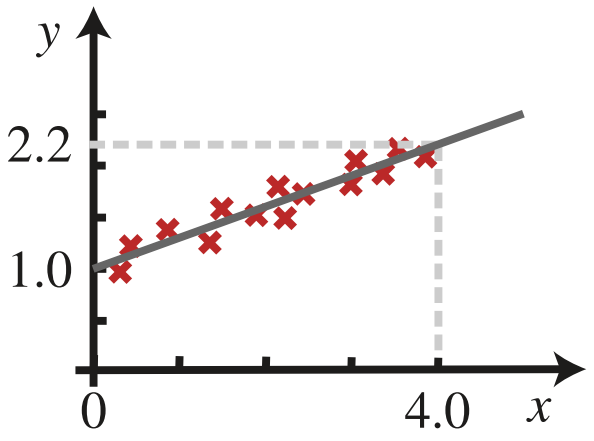

Figure 2: A graph of some data points and a line of best fit.

- $y = 0.4x - 1.5$
- $y = 0.4x + 1.5$
- $y = 0.3x + 1.0$

Part C Third line of best fit

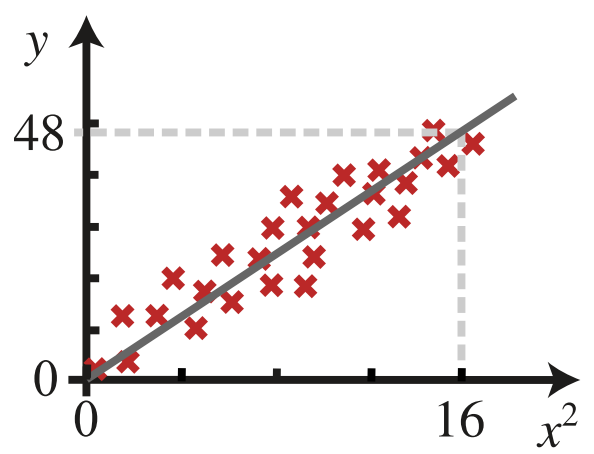

Figure 1: A graph of some data points and a line of best fit.

- $y = 3.0x^2$
- $y = 3.0x$
- $y = (3.0x)^2$

Gameboard:

STEM SMART Single Maths 6 - Data Analysis

Essential GCSE Maths 57.5

GCSE C C C A Level P P P

The nuclei of atoms contain protons and neutrons. In this question p is the number of protons and n is the number of neutrons.

Part A Graph of n against p: light nuclei

Plot a graph with p on the x-axis and n on the y-axis for the following selected light nuclei. Then choose which of the options below is the best.

Element	He	Be	C	N	F	Mg	Cl	Ca
p	2	4	6	7	9	12	17	20
n	2	5	6	7	10	12	18	20

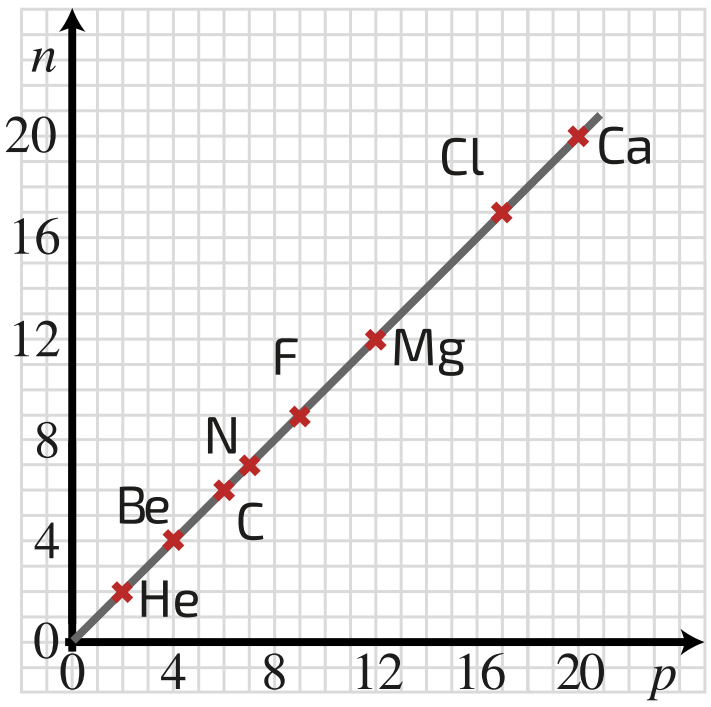

Figure 1: Option A.

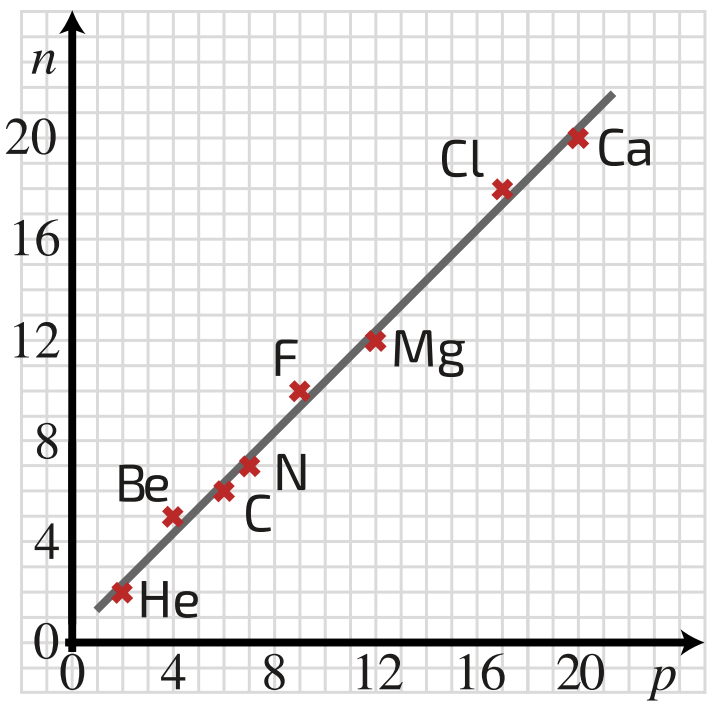

Figure 2: Option B.

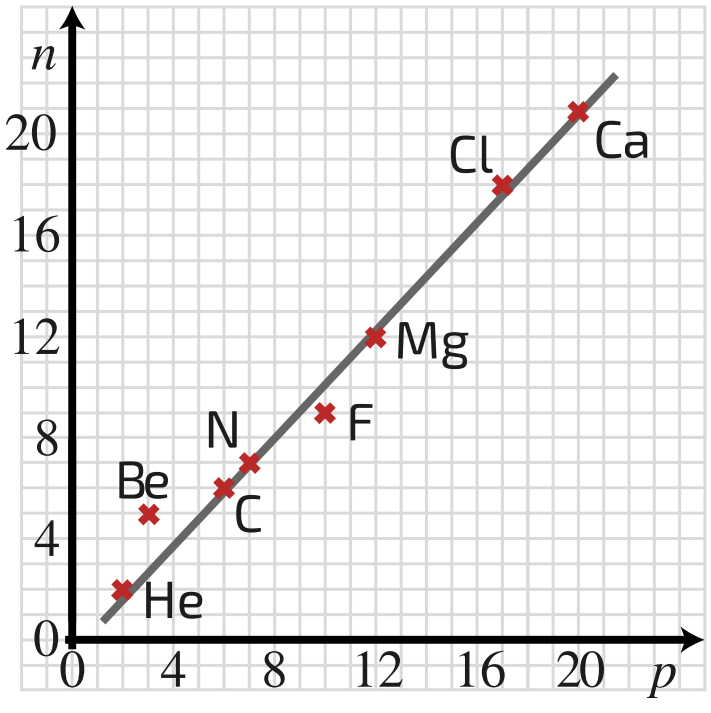

Figure 3: Option C.

- Option A
- Option B
- Option C

Part B Type of correlation: light nuclei

What sort of correlation do you see?

- Positive linear correlation
- Negative linear correlation
- Correlation that is not linear
- No correlation

Part C Conclusions from graph: light nuclei

What can you conclude from the graph about the value of the ratio $n : p$ for the nuclei given?

- The number of neutrons is generally smaller than the number of protons. $n < p$.
- The number of neutrons is roughly the same as the number of protons. For these light nuclei $n : p \approx 1 : 1$
- The number of neutrons is generally larger than the number of protons. $n > p$.
- There is no relation between the number of protons (p) and the number of neutrons (n).

Part D Graph of n against p: heavy nuclei

Plot a graph with p on the x-axis and n on the y-axis for the following selected heavier nuclei, and then choose which of the options below is the best.

Element	Pd	Cs	Pr	Tb	W	Pt	Au	Pb
p	46	55	59	65	74	78	79	82
$p+n$	106	133	141	159	184	195	197	207

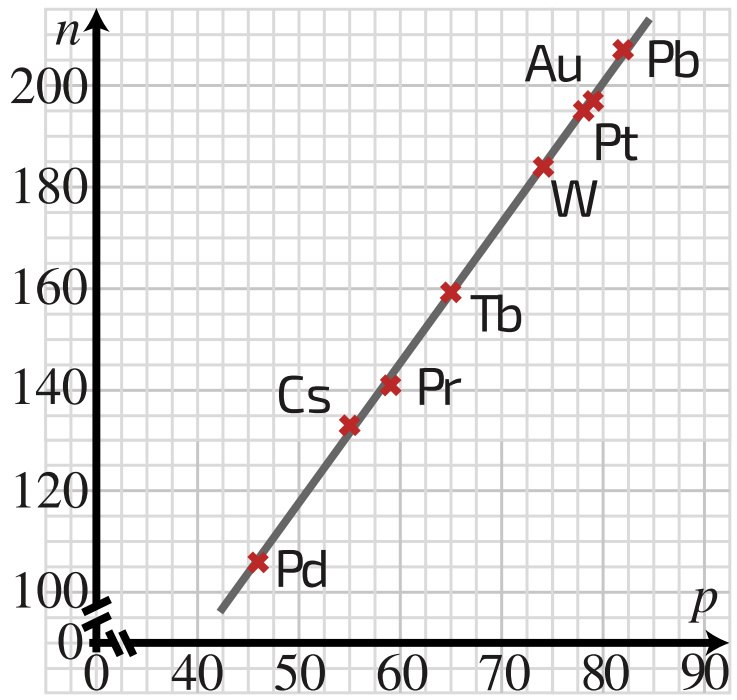

Figure 4: Option A.

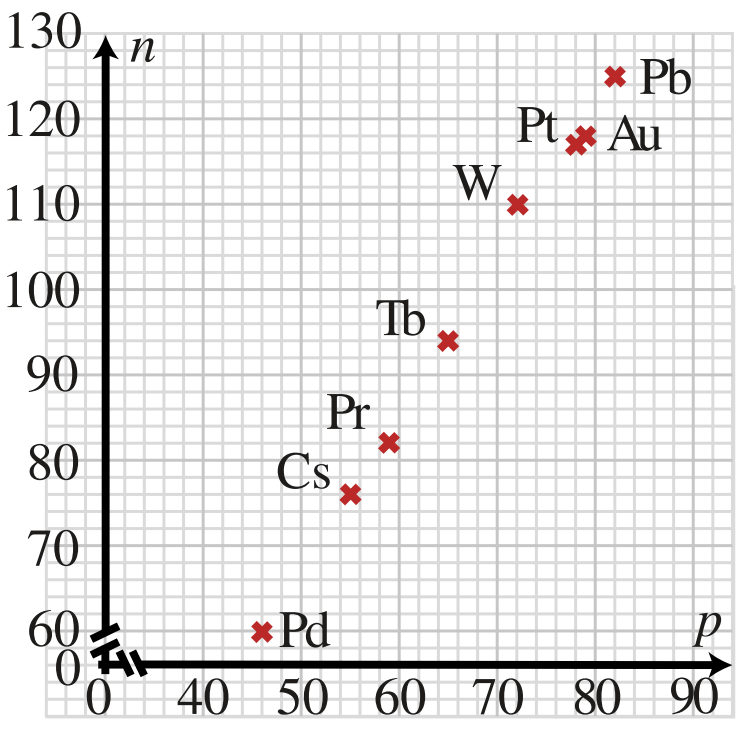

Figure 5: Option B.

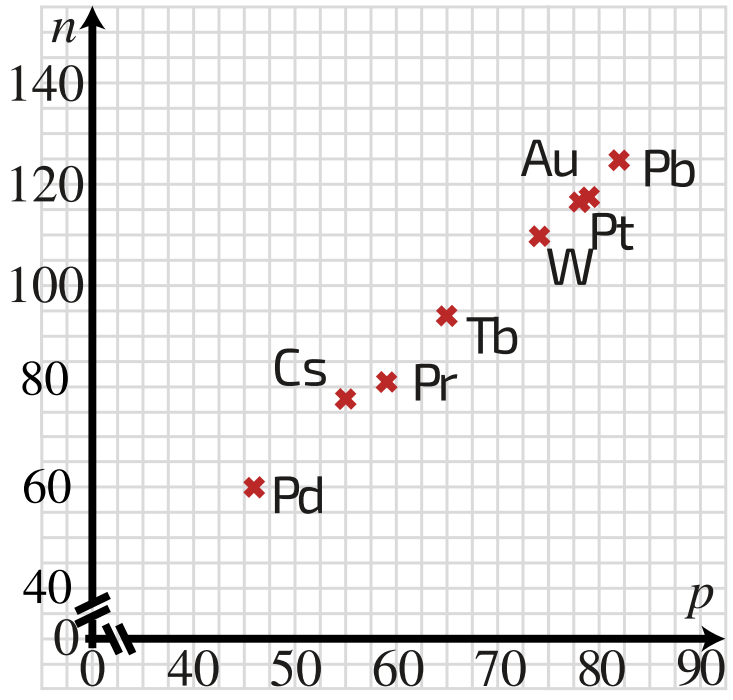

Figure 6: Option C.

- Option A
- Option B
- Option C

Part E Type of correlation: heavy nuclei

What sort of correlation do you see?

- Negative linear correlation
- Positive linear correlation
- No correlation
- Correlation that is not linear

Part F Line of best fit: heavy nuclei

Find the gradient.