



Essential GCSE Maths 55.9

The ages of the children in a small youth group are

4, 5, 6, 7, 7, 8, 8, 8, 9, 9, 10, 11, 11, 15.

Part A Construct a box plot for the data

Construct a box plot (box and whisker diagram) for this data.

Figure 1: Option A.

Figure 2: Option B.

Figure 3: Option C.

- ☐ Option A
 - ☐ Option B
 - ☐ Option C
-

Part B What is the range of the data?

What is the range of the data?

Part C What fraction of the children are older than 7?

What fraction of the children are older than 7?

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Jury Duty

GCSE A Level



You are serving on a jury in the Crown Court. The defendant has been accused of a serious crime, however the **only** evidence is that their DNA is a perfect match to the perpetrator's DNA found at the crime scene.

The expert in genetic analysis tells you that the chance of a false positive (i.e. an innocent person matching that DNA) is 1 in 3 000 000. The prosecution lawyer says in their summing up speech that this means that as the defendant matches the DNA, the chance that they are innocent is less than 0.000 04%, This means that there is a 99.999 96% chance that the person is guilty, and as this is *beyond reasonable doubt* you and your jury colleagues should decide that the person is guilty.

Back in the jury room, the other jurors know that you have mathematical knowledge and ask you for your view on the matter.

If you think it relevant, you may also assume that the crime was definitely committed by a British person, and that the population of Britain is 67 000 000.

Based on the information given, what is your best estimate of the probability that the defendant is guilty? Give your answer to two significant figures.



Essential GCSE Maths 56.7

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

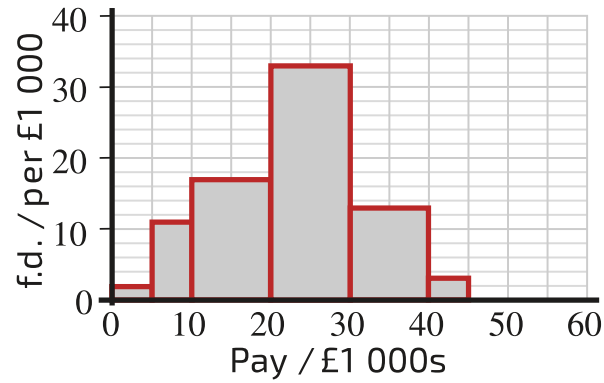


Figure 1: A histogram summarises the total annual payment made to employees.

Part A Make a frequency table

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

A partially complete frequency table is give 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 paid out to an employee, including the extra class from part B. Give your answer to 3 s.f..



Essential GCSE Maths 55.11

A technician is given a list of measurements in cm, correct to the nearest 0.1 cm. He is told that the mean of the values is 3.3 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?



Essential GCSE Maths 54.9

An ecologist uses capture and recapture sampling to estimate the total number of terrapins, T , in a large pond.

Part A What fraction of the total did she capture?

She captures 30 terrapins, marks their shells, then returns them to the pond. What fraction of the total did she capture?

The following symbols may be useful: T

Part B What fraction of this sample are marked?

The terrapins disperse. Four days later, she captures 40 terrapins. 5 have her mark. What fraction of this sample are marked?

Part C Estimate T

The answer to part B is an estimate of the fraction of terrapins in the pond that are marked. Equate answers to part A and part B to estimate T .

Essential GCSE Maths 56.8

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.

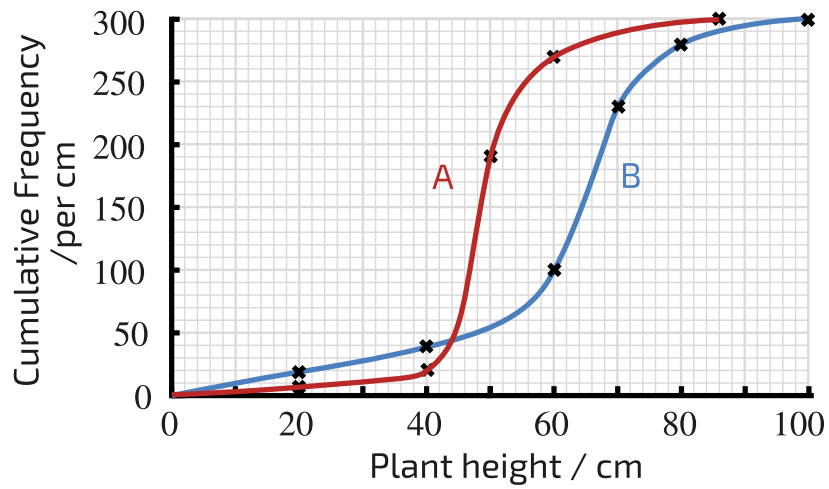


Figure 1: A cumulative frequency plot for the height of two types of chilli pepper.

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

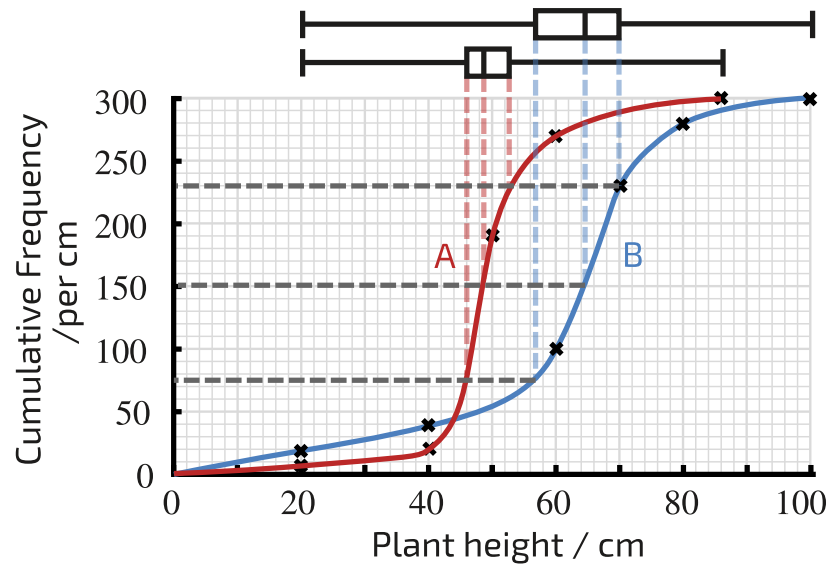


Figure 2: Option A.

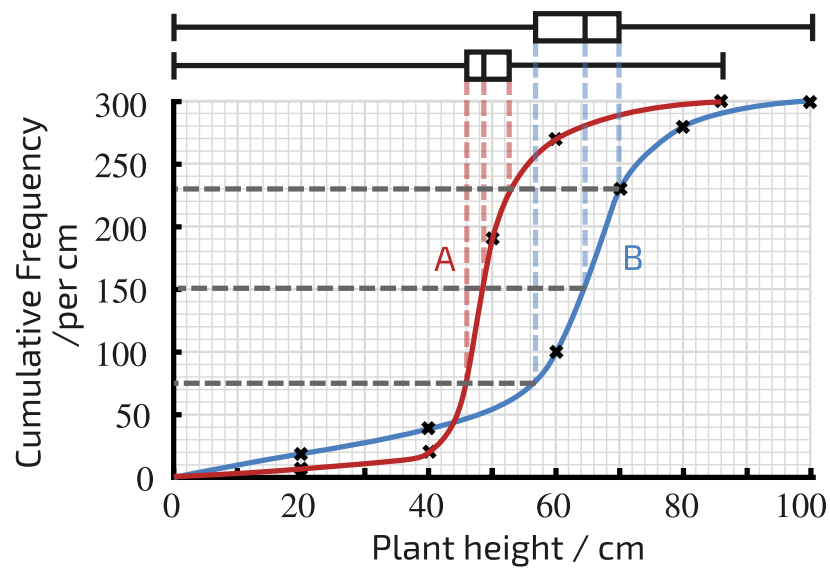
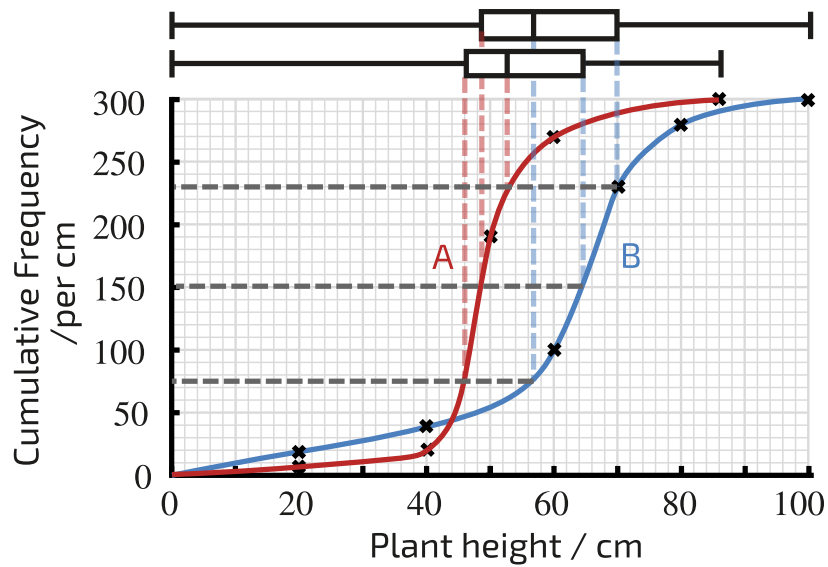


Figure 3: Option B.



Part B Which variety produced fewer failures?

Figure 4: Option C.

The company defines failures as plants which do not reach 40 cm in height. Which variety produced fewer failures?

- ☐ Option A
- ☐ Option B
Type A
- ☐ Option C
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



Essential GCSE Maths 57.5

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 Plot a graph of n against p

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 What sort of correlation do you see?

What sort of correlation do you see?

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

Part C What can you conclude from the graph?

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 larger than the number of protons. $n > p$.
 - ☐ There is no relation between the number of protons (p) and the number of neutrons (n).
 - ☐ 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 smaller than the number of protons. $n < p$.
-

Part D Plot a graph of n against p

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 What sort of correlation do you see?

What sort of correlation do you see?

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

Part F Draw a line of best fit

Find the gradient.

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Essential GCSE Maths 57.4

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

Part A Which equation describes the line of best fit?

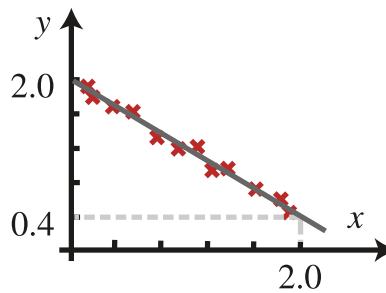


Figure 1: A graph of some data points and a line of best fit.

Which equation describes the line of best fit?

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

Part B Which equation describes the line of best fit?

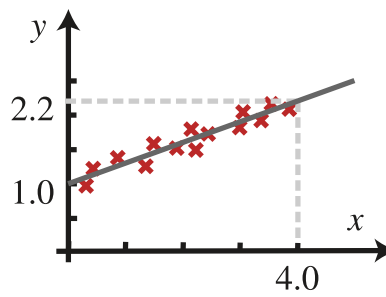


Figure 2: A graph of some data points and a line of best fit.

Which equation describes the line of best fit?

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

Part C Which equation describes the line of best fit?

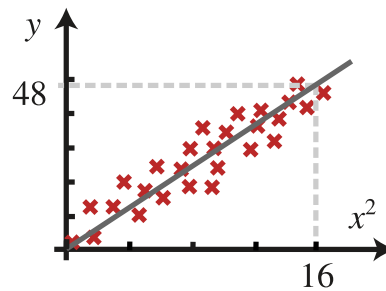


Figure 1: A graph of some data points and a line of best fit.

Which equation describes the line of best fit?

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



Essential GCSE Maths 57.3

Part A Draw a scatter plot

The table below shows how the price of a particular basket of shopping changes from year to year. Draw a scatter plot for this data.

Year	1	2	3	4	5	6	7
Cost £	27.00	27.63	27.97	28.38	28.20	29.41	29.75

Choose which of the following three graphs is correct.

Figure 1: Option A.

Figure 2: Option B.

Figure 3: Option C.

- ☐ Option A
 - ☐ Option B
 - ☐ Option C
-

Part B Draw a line of best fit

Draw a line of best fit, and find the gradient.

Choose which of the following three graphs is correct.

Figure 4: Option A

Figure 5: Option B

Figure 6: Option C

- ☐ Option A
 - ☐ Option B
 - ☐ Option C
-

Part C Predict the cost of the basket

Predict the cost of the basket in year 8. Give your answer in £.

Part D Is the prediction reliable?

Do you think this prediction is reliable? Explain your answer.

- ☐ Reliable
 - ☐ Unreliable
-



Essential GCSE Maths 55.7

During one particular cricket season, a bowler takes 1, 2, 3 or 4 wickets in each of his matches. Find the mean number of wickets he takes per match. Give your answer to 3 s.f..

Wickets	Frequency
1	5
2	6
3	8
4	2