GCSE Statistics: Grade 6

Worked solutions

GCSE Statistics practice

1 HISTOGRAMS WITH UNEQUAL CLASS WIDTHS

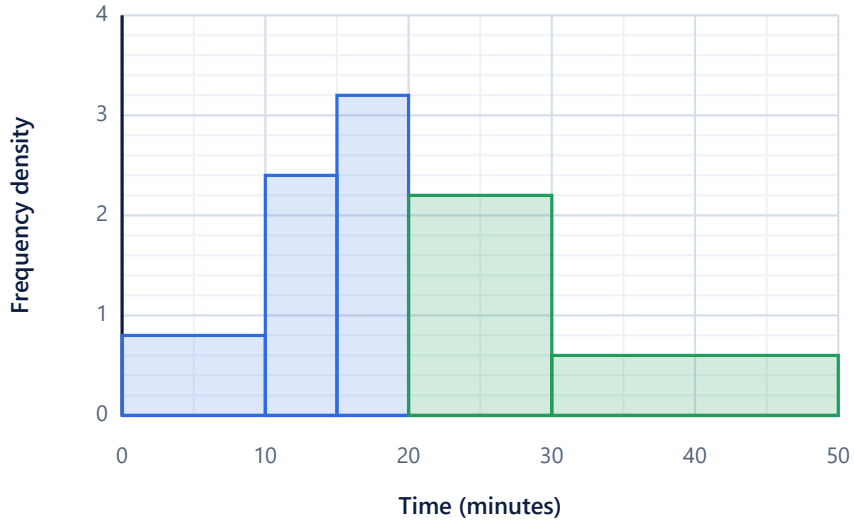
The incomplete table and histogram show the time, t minutes, that shoppers spent in a supermarket.

Time, t (min)	$0 < t \leq 10$	$10 < t \leq 15$	$15 < t \leq 20$	$20 < t \leq 30$	$30 < t \leq 50$
Frequency	8	12		22	12

a. Use the histogram to work out the missing frequency in the table. (1)

b. Complete the histogram. (2)

c. Work out an estimate for the number of shoppers who spent more than 25 minutes in the supermarket. (2)



(5 marks)

a)

Frequency = frequency density x class width

3.2 x 5 = 16

b)

Frequency density = frequency ÷ class width

22 ÷ 10 = 2.2

12 ÷ 20 = 0.6

c)

25 is halfway through the 20 to 30 class

22 ÷ 2 = 11

11 + 12 = 23

a) 16 b) bars of height 2.2 and 0.6 c) 23 shoppers

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2 **OUTLIERS**

A warehouse records the number of hours each employee worked in one week. The lower quartile is 32 hours and the upper quartile is 40 hours. The smallest value is 21 hours and the largest value is 55 hours.

An outlier is a value that is more than 1.5 × IQR below the lower quartile or more than 1.5 × IQR above the upper quartile.

a. Determine whether each of 21 hours and 55 hours is an outlier. You must show your working. (3)

b. The manager checks and finds that the value of 55 hours was recorded correctly. Should this value be removed from the data? Give a reason for your answer. (1)

(4 marks)

a)

$$\begin{aligned} \text{IQR} &= 40 - 32 \\ &= 8 \\ 1.5 \times 8 &= 12 \\ \text{Lower boundary} &= 32 - 12 \\ &= 20 \\ \text{Upper boundary} &= 40 + 12 \\ &= 52 \end{aligned}$$

$21 > 20$ so 21 hours is not an outlier

$55 > 52$ so 55 hours is an outlier

b)

No, it should not be removed.

It is a real value, not a mistake.

a) 21 is not an outlier, 55 is an outlier b) no, keep it

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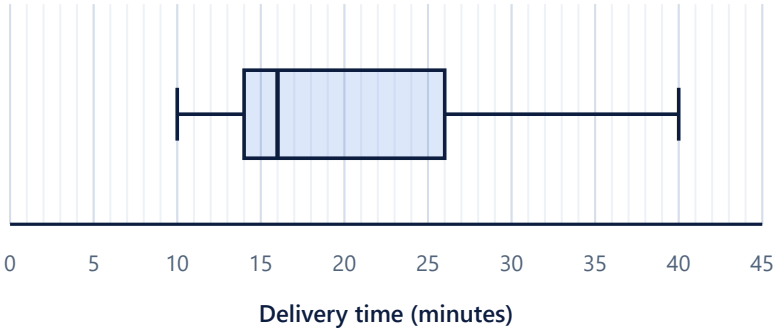
3 **SKEWNESS**

The box plot shows the delivery times, in minutes, for the orders from a takeaway on one evening.

a. Describe the skew of the distribution of delivery times. Give a reason for your answer. (2)

b. Interpret the skew in the context of the delivery times. (1)

c. The owner wants to give customers a typical delivery time. Explain why the median is a better average to use than the mean. (1)



(4 marks)

a)

Median − lower quartile = 16 − 14

= 2

Upper quartile − median = 26 − 16

= 10

The median is closer to the lower quartile.

So the skew is positive.

b)

Most deliveries took a short time,

but a few took much longer.

c)

The few very long times pull the mean up.

The median is not affected by them.

a) positive b) mostly short, a few long c) not affected

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4 **WEIGHTED MEAN**

The final mark for a college course is a weighted mean of three marks, each out of 100.

Component	Coursework	Written exam	Practical
Weighting	30%	50%	20%

a. Amira scores 70 for coursework, 58 in the written exam and 85 in the practical. Work out her final mark. (2)

b. Ben scores 60 for coursework and 80 in the practical. He needs a final mark of at least 65 to pass with distinction. Work out the lowest mark he can score in the written exam to pass with distinction. (2)

(4 marks)

a)

$0.3 \times 70 = 21$

$0.5 \times 58 = 29$

$0.2 \times 85 = 17$

$21 + 29 + 17 = 67$

b)

First find what Ben has so far

$0.3 \times 60 = 18$

$0.2 \times 80 = 16$

$18 + 16 = 34$

The exam must give the rest

$65 - 34 = 31$

$31 \div 0.5 = 62$

a) 67 b) 62

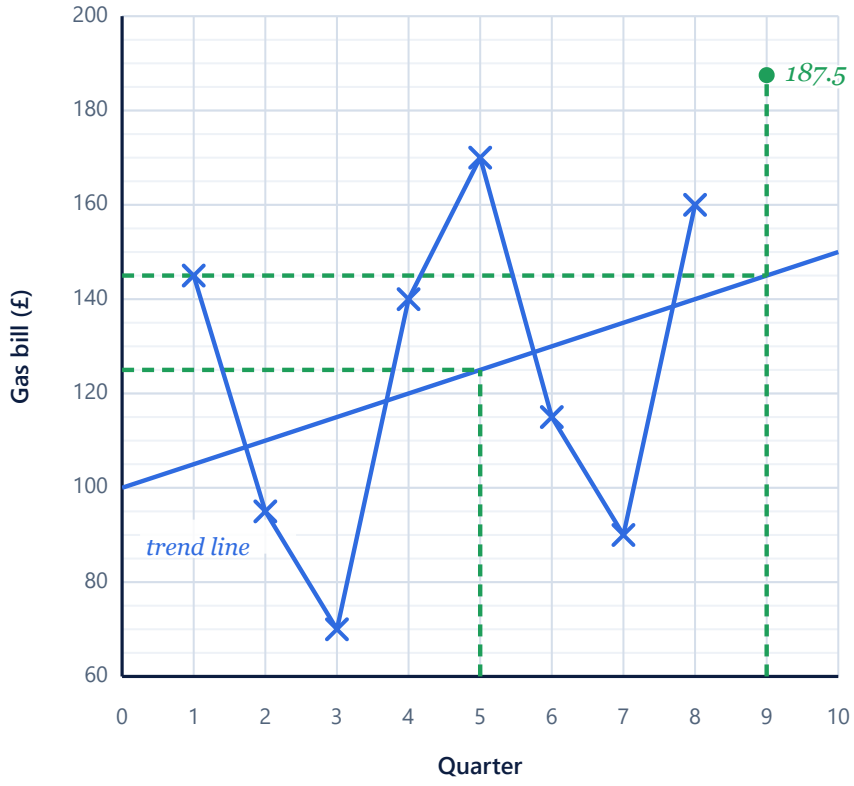
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5 SEASONAL VARIATION AND PREDICTIONS

The time series graph shows a household's gas bill, in pounds, for each quarter of 2024 and 2025. Quarter 1 is January to March 2024 and quarter 5 is January to March 2025. A trend line has been drawn on the graph.

a. The gas bill for quarter 5 was £170. Work out the seasonal variation for quarter 5. (2)

b. The seasonal variation for quarter 1 was +£40. Work out the mean seasonal variation for the January to March quarter, and use it to predict the gas bill for quarter 9 (January to March 2026). (3)



(5 marks)

a)

The trend line value at quarter 5 is 125

Seasonal variation = actual value - trend value

170 - 125 = 45

b)

The two seasonal variations are +40 and +45

Mean = (40 + 45) ÷ 2

= 42.5

The trend line value at quarter 9 is 145

Prediction = trend value + mean seasonal variation

145 + 42.5 = 187.5

a) +£45 b) mean +£42.50, prediction £187.50

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6 CHAIN BASE INDEX NUMBERS

The table shows the annual rent for a flat in three years.

Year	2023	2024	2025
Annual rent	£8000	£8400	£9240

a. Work out the chain base index numbers for the rent in 2024 and in 2025. (2)

b. Interpret your chain base index number for 2025. (1)

c. The chain base index number for the rent in 2026 is 95. Work out the annual rent in 2026. (1)

(4 marks)

a)

Chain base index = value ÷ value the year before × 100

$$2024 \text{ index} = \frac{8400}{8000} \times 100$$

$$= 105$$

$$2025 \text{ index} = \frac{9240}{8400} \times 100$$

$$= 110$$

b)

The rent went up by 10% from 2024 to 2025.

c)

$$\frac{95}{100} \times 9240 = 8778$$

a) 105 and 110 b) up 10% on the year before c) £8778

7 CONDITIONAL PROBABILITY

120 patients took part in a trial of a new hay fever drug. Each patient was given either the new drug or a placebo. The two-way table shows whether their symptoms improved.

	Improved	Did not improve	Total
New drug	49	21	70
Placebo	25	25	50
Total	74	46	120

a. One of the patients who took the new drug is chosen at random. Write down the probability that this patient's symptoms improved. (1)

b. One of the patients whose symptoms improved is chosen at random. Work out the probability that this patient took the new drug. (2)

c. Does the trial suggest that the new drug works? Use probabilities to support your answer. (2)

(5 marks)

a)

70 patients took the new drug and 49 improved

$$p = \frac{49}{70}$$

$$= \frac{7}{10}$$

b)

74 patients improved and 49 of them took the new drug

$$p = \frac{49}{74}$$

c)

Compare the two groups of patients

$$P(\text{improved given new drug}) = 0.7$$

$$P(\text{improved given placebo}) = \frac{25}{50}$$

$$= 0.5$$

$0.7 > 0.5$

Patients on the new drug were more likely to improve, so yes it suggests the drug works.

a) $\frac{7}{10}$ b) $\frac{49}{74}$ c) yes, $0.7 > 0.5$

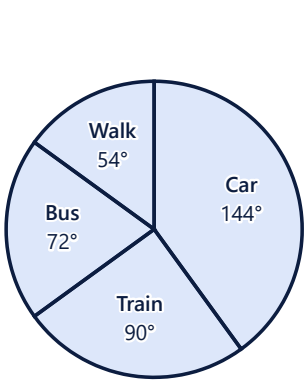
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8 COMPARATIVE PIE CHARTS

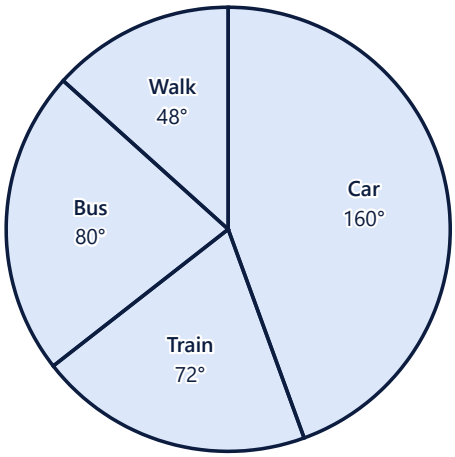
The comparative pie charts show how visitors travelled to a music festival in 2015 and in 2025. There were 200 visitors in 2015 and 450 visitors in 2025. The pie chart for 2015 has a radius of 3 cm.

a. Work out the radius of the pie chart for 2025. (2)

b. Tariq says, "The angle for Train is smaller in 2025, so fewer visitors travelled by train in 2025 than in 2015." Is Tariq correct? You must show your working. (2)



2015: 200 visitors



2025: 450 visitors

Diagram NOT accurately drawn

(4 marks)

a)

The areas are in the same ratio as the totals

$450 \div 200 = 2.25$

Square root for the radius scale factor

$\sqrt{2.25} = 1.5$

$3 \times 1.5 = 4.5$

b)

Find the train visitors in 2015, then in 2025

$\frac{90}{360} \times 200 = 50$

$\frac{72}{360} \times 450 = 90$

$90 > 50$ so more visitors used the train in 2025.

Tariq is not correct.

a) 4.5 cm b) no, 50 in 2015 and 90 in 2025

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