GCSE Statistics: Grade 4

Worked solutions

GCSE Statistics practice

1 RANDOM AND STRATIFIED SAMPLING

A leisure centre has 600 members. The table shows the number of members in each age group.

Age group	Under 18	18 to 39	40 to 59	60 and over
Number of members	180	240	120	60

The manager wants to survey a sample of 50 members, stratified by age group.

a. Work out the number of members aged 18 to 39 that should be in the sample. (2)

b. There should be 15 members aged under 18 in the sample. Describe how the manager could choose these 15 members using simple random sampling. (2)

c. Give one reason why a stratified sample is better here than a simple random sample of all 600 members. (1)

(5 marks)

a)

$$\frac{240}{600} \times 50 = 20$$

b)

Number the under 18 members from 1 to 180.

Use a random number generator

to pick 15 different numbers.

Survey the members with those numbers.

c)

Every age group is represented

in proportion to its size.

a) 20 b) number, then pick 15 at random c) fair to all ages

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2 ESTIMATED MEAN FROM A GROUPED FREQUENCY TABLE

The table shows the time, t minutes, that 40 employees took to travel to work one morning.

Time, t (minutes)	Frequency
$0 < t \leq 10$	6
$10 < t \leq 20$	11
$20 < t \leq 30$	14
$30 < t \leq 40$	7
$40 < t \leq 50$	2

a. Work out an estimate for the mean time. (3)

b. Explain why your answer to part (a) is only an estimate. (1)

(4 marks)

a)

Midpoint x frequency

$5 \times 6 = 30$

$15 \times 11 = 165$

$25 \times 14 = 350$

$35 \times 7 = 245$

$45 \times 2 = 90$

Add them up

$30 + 165 + 350 + 245 + 90 = 880$

Divide by the total frequency

$880 \div 40 = 22$

b)

The exact times are not known.

The midpoint of each class is used instead.

a) 22 minutes b) exact times not known, midpoints used

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3 FREQUENCY POLYGONS

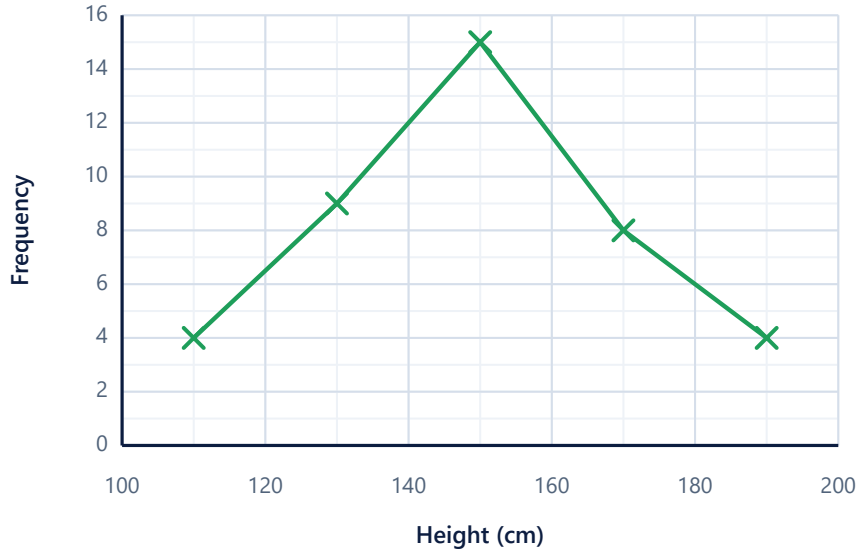
A gardener measures the height, h cm, of each of 40 sunflowers.

Height, h (cm)	Frequency
$100 < h \leq 120$	4
$120 < h \leq 140$	9
$140 < h \leq 160$	15
$160 < h \leq 180$	8
$180 < h \leq 200$	4

a. On the grid, draw a frequency polygon for this information. (2)

b. Write down the modal class. (1)

c. Work out the percentage of the sunflowers that are more than 160 cm tall. (1)



(4 marks)

a)

Plot each frequency at the midpoint of its class.

(110, 4) (130, 9) (150, 15) (170, 8) (190, 4)

Join the points with straight lines.

b)

Highest frequency is 15, so it is $140 < h \leq 160$

c)

$8 + 4 = 12$

$\frac{12}{40} \times 100 = 30\%$

a) polygon drawn b) $140 < h \leq 160$ c) 30%

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4 LINE OF BEST FIT, INTERPOLATION AND EXTRAPOLATION

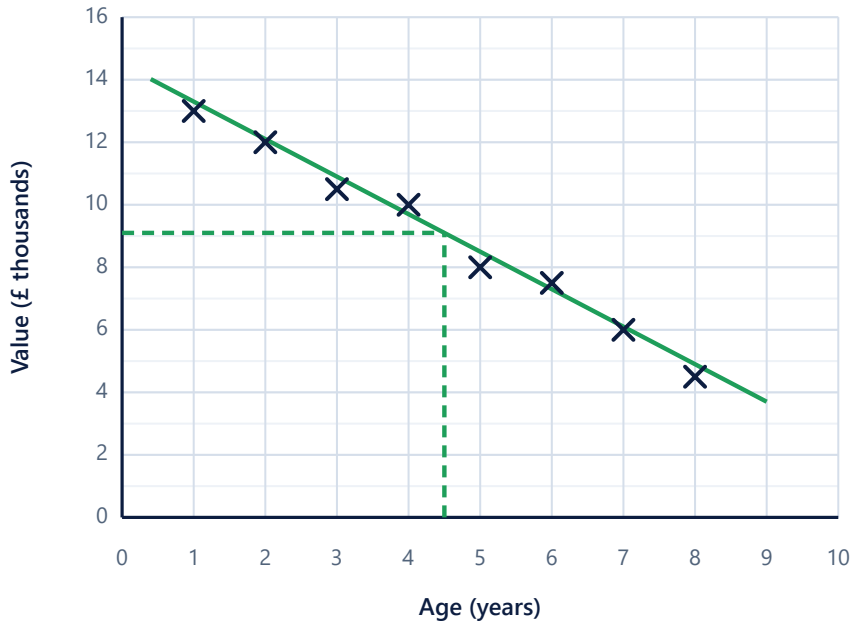
A garage sells used cars. The scatter diagram shows the age and the value of 8 cars of the same model.

a. Describe the correlation shown. (1)

b. Draw a line of best fit on the scatter diagram. (1)

c. Use your line to estimate the value of a car of this model that is 4.5 years old. (1)

d. Ravi uses the line of best fit to estimate the value of a car of this model that is 12 years old. Comment on the reliability of his estimate. (1)



(4 marks)

a)

Negative. As the age goes up, the value goes down.

b)

Draw a straight line through the middle of the points.

c)

Go up from 4.5 years to the line, then across.

About 9.1, so about £9100

d)

Not reliable. 12 years is outside the range of the data.

The trend may not continue (extrapolation).

a) negative b) line drawn c) about £9100 d) not reliable

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5 **TIME SERIES AND TREND LINES**

The table shows the number of visitors, in thousands, to a museum in each quarter of 2024 and 2025.

Year	2024	2024	2024	2024	2025	2025	2025	2025
Quarter	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Visitors (thousands)	12	18	26	14	16	22	30	18

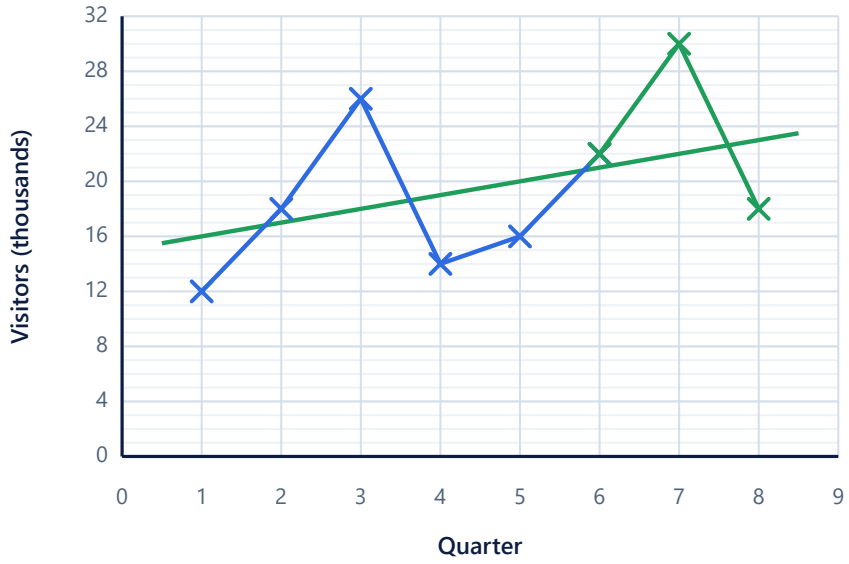
The first six values have been plotted on the time series graph. On the graph the quarters are numbered 1 to 8, so quarter 1 is Q1 of 2024 and quarter 5 is Q1 of 2025.

a. Complete the time series graph. (1)

b. Draw a trend line on the graph. (1)

c. Describe the trend in the number of visitors. (1)

d. Describe the seasonal variation in the number of visitors. (1)



(4 marks)

a)

Plot (7, 30) and (8, 18)

Join them to the graph with straight lines.

b)

Draw one straight line through the middle of the highs and the lows.

c)

Upward trend. Visitor numbers are increasing.

d)

Each year it is highest in Q3 and lowest in Q1.

a) 30, 18 plotted b) line drawn c) rising d) peak in Q3

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6 SAMPLE SPACE DIAGRAMS

At a school summer fair, each player spins two fair spinners. Spinner A is numbered 1, 2, 3, 4. Spinner B is numbered 1, 3, 5. The score is the sum of the two numbers.

Score	B = 1	B = 3	B = 5
A = 1	2	4	6
A = 2	3		
A = 3			
A = 4			

a. Complete the sample space diagram. (1)

b. Work out the probability that a player scores exactly 6. (1)

c. A player wins a prize with a score of 7 or more. 150 people play the game. Work out an estimate for the number of prizes won. (2)

(4 marks)

a)

Row A = 2 is 3, 5, 7

Row A = 3 is 4, 6, 8

Row A = 4 is 5, 7, 9

b)

There are 12 outcomes and 2 of them are 6

$$P(6) = \frac{2}{12}$$

$$= \frac{1}{6}$$

c)

7 or more is 7, 7, 8, 9 so 4 outcomes

$$P(\text{prize}) = \frac{4}{12}$$

$$= \frac{1}{3}$$

$$\frac{1}{3} \times 150 = 50$$

a) table completed b) $\frac{1}{6}$ c) 50 prizes

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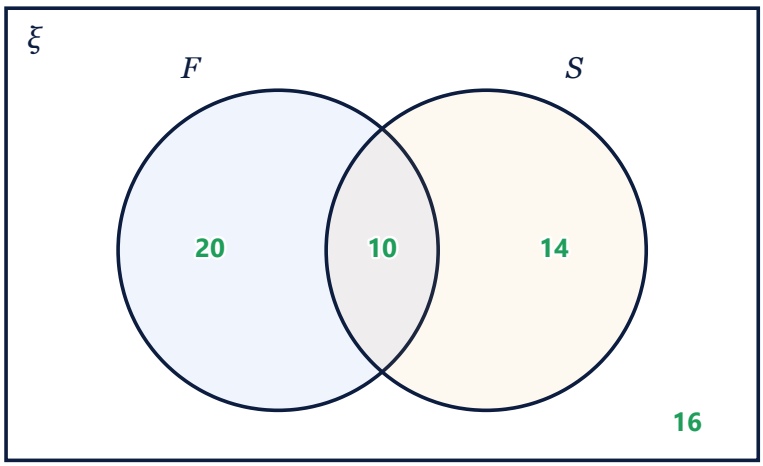
7 **VENN DIAGRAMS**

A youth club has 60 members. 30 of the members play football (F). 24 of the members swim (S). 10 of the members do both.

a. Complete the Venn diagram. (2)

b. One member is chosen at random. Work out the probability that this member swims but does not play football. (1)

c. Work out the probability that a member chosen at random plays football or swims or does both. (1)



(4 marks)

a)

Start with the overlap, which is 10

Football only is $30 - 10 = 20$

Swimming only is $24 - 10 = 14$

Neither is $60 - (20 + 10 + 14) = 16$

b)

$$P = \frac{14}{60} = \frac{7}{30}$$

c)

$20 + 10 + 14 = 44$ members are inside the circles

$$P = \frac{44}{60} = \frac{11}{15}$$

a) 20, 10, 14, 16 b) $\frac{7}{30}$ c) $\frac{11}{15}$

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8 **SIMPLE INDEX NUMBERS**

A monthly bus pass cost £60 in 2020 and £69 in 2023.

a. Using 2020 as the base year, work out the index number for the price of the bus pass in 2023. (2)

b. The index number for the price in 2025, using 2020 as the base year, is 124. Explain what this index number tells you about the price of the bus pass. (1)

c. Work out the price of the bus pass in 2025. (1)

(4 marks)

a)

Index number = price ÷ base year price × 100

$\frac{69}{60} \times 100 = 115$

b)

124 is 24 more than 100.

The price is 24% higher than in 2020.

c)

$\frac{124}{100} \times 60 = 74.4$

a) 115 b) 24% higher than in 2020 c) £74.40

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