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Comparing Data

Worked Solutions

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Full worked solutions for the free Comparing Data worksheet, GCSE and iGCSE Maths



Tap a section to jump straight to it

Full worked solutions for every question on the Comparing Data worksheet, in the same order and with the same question numbers.

How to mark your work. Tick each step you got right, not just the final answer. In the exam, method marks are given for correct working even when the final answer is wrong. If you lost marks, find the *first* line where your working is different from ours. That is the thing to fix.

In Section E: **M** = method mark, **P** = process mark, **A** = accuracy mark, **B** = independent mark, **C** = communication mark.

Question sheet

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A**Your turn answers**

Compare each line of your working with the solution. A good comparison mentions an average and a spread, in the context of the question.

FOUNDATION

A1 Team *Y* was faster on average (mean 21 against 24 minutes). Team *X* was more consistent (range 12 against 20).

A2 Means: $80 \div 5 = 16$ and $85 \div 5 = 17$. Ranges: 8 and 11. *S* is higher on average; *R* is more consistent.

A3 $\frac{25}{80} \times 1200 = 375$

HIGHER

A4 IQRs: $61 - 40 = 21$ and $58 - 45 = 13$. *C* has the higher median (52 against 50); *D* is more consistent.

A5 The mean ($130 \div 6 \approx 21.7$) is pulled up by the outlier 58. The median is better: 15 minutes

A6 Only Year 7 are asked, so the views of other years are missed. Improve it by taking a random sample from every year, for example in proportion to the year sizes.

A7 $\frac{50}{1000} = \frac{1}{20}$ of each group: 12, 18, 20

B**Fluency solutions**

One mark for each correct part. The notes in *italics* explain why each sequence was chosen.

FOUNDATION

B1 (a) **correct**: 45 is higher than 38 (b) **wrong**: *A*'s range is smaller (c) **wrong**: *A*'s median is higher
(d) **correct**: *A*'s range is smaller

Averages compare typical values; the range or IQR compares consistency.

B2 (a) 6 (b) 7 (c) *X*: 5, *Y*: 11 (d) *Y* is higher on average, but *X* is more consistent



B3 (a) **150** (b) **840** (c) **3500** (d) $\frac{12}{50} \times 800 = \mathbf{192}$

B4 (a) people at a bus stop are more likely to use the bus (b) five is far too small a sample
(c) neighbours may be affected differently from the rest of the town (d) some people can vote many times, so the results are not fair

B5 (a) **median**: the mansion is an outlier (b) **mode**: sizes are categories and we want the most common
(c) **mean**: it uses every mark and there are no outliers

B6 (a) $\frac{0+7+10+9+4}{20} = \mathbf{1.5}$ (b) $\frac{0+5+12+15+8}{20} = \mathbf{2}$ (c) $P: \mathbf{1}, Q: \mathbf{2}$ (d) Team Q scored more goals on average

HIGHER

B7 (a) **16** (b) **8** (c) **A** (22 against 21) (d) **B**: its IQR is smaller

B8 (a) median **8**, IQR $11 - 5 = \mathbf{6}$ (b) median **7**, IQR $10 - 6 = \mathbf{4}$ (c) **M** (d) **N**: smaller IQR

B9 (a) **12** and **28** (b) **10**, **15**, **25** (c) 12.3 and 17.7: **12** and **18** (d) $\frac{14}{40} = \frac{210}{N}$, so $N = \mathbf{600}$

B10 (a) **mean**: no outliers (b) **median**: 60 is an outlier (c) **median**: a few very high incomes pull the mean up (d) **mean**: heights are fairly evenly spread

C

Reasoning solutions

Your wording can be different. Check that your reason makes the same point.

FOUNDATION

C1 One top mark does not describe the whole class. Compare an average (such as the median) and a spread (such as the range).

C2 Six people is too small a sample, and they may not be typical of the town.

C3 A random sample gives everyone the same chance of being chosen, so it is less likely to be biased. For example, number the students 1 to 1000 and use a random number generator to pick 50 numbers.



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C4 Mean of $A = 85 \div 5 = 17$. Mean of $B = 70 \div 5 = 14$. $17 - 14 = 3$, as required

HIGHER

C5 The range uses only the two extreme values, so one outlier can make it large. The IQR uses the middle half of the data, so it is not affected by outliers. X 's smaller IQR suggests X is more consistent.

C6 Yes. The median is the middle value of each group, so it can be compared even when the groups have different sizes, although the larger group gives more reliable information.

C7 One class may not have the same views as other years, and the sample is small compared with the whole school.

C8 (a) $x = 12$: mean $= \frac{38}{5} = 7.6$, median $= 7$, and $7.6 > 7$

(b) The mean is $\frac{26+x}{5}$. Consider where x lies.

If $x \geq 7$, the median is 7: $\frac{26+x}{5} > 7$ gives $x > 9$, so $x \geq 10$

If $x \leq 6$, the median is 6: $\frac{26+x}{5} > 6$ gives $x > 4$, so $x = 5$ or 6

No whole number lies strictly between 6 and 7 $x = 5, x = 6, \text{ or } x \geq 10$

D**Problem solving solutions**

There is often more than one correct method. Any complete, correct method scores full marks.

FOUNDATION

D1 Both have a mean of 5.5 m. Amy's range is 0.9 m and Bea's is 0.4 m. Choose Bea: she is just as good on average and more consistent.

D2 (a) $A: 140 \div 4 = 35$ $B: 140 \div 4 = 35$

(b) $A: 50 - 20 = 30$ $B: 40 - 30 = 10$

(c) The shops have the same mean weekly sales, but shop B 's sales are much more consistent.

D3 $0.45 \times 36\,000 = 16\,200$ Assumption: the sample is representative of all the voters.



D4 Mean of $A = 40 \div 4 = 10$. The total of B must be 40: $30 + x = 40$ $x = 10$

HIGHER

D5 Group A has the slightly higher median (245 against 240 ms), so its reaction times were slower on average. Group B has the smaller IQR (25 against 50 ms) and range, so its times were more consistent.

D6 Total = 1200, so the sample is $\frac{50}{1200}$ of each group

$$72 \times \frac{50}{1200} = \boxed{3}, 336 \times \frac{50}{1200} = \boxed{14}, 792 \times \frac{50}{1200} = \boxed{33} \quad 3 + 14 + 33 = 50$$

D7 (a) $498 \times 2000 = \boxed{996\,000}$ g, about 996 kg
 (b) The sample is only 25 bags, so its mean may differ from the true mean just by chance.

D8 (a) $\frac{60}{600} = \frac{1}{10}$ of each year: 18, 24, 18
 (b) $\frac{12}{18} \times 180 = \boxed{120}$, $\frac{12}{24} \times 240 = \boxed{120}$, $\frac{7}{18} \times 180 = \boxed{70}$ $\frac{310}{600} \times 100 \approx 51.7\%$
 (c) Each year is sampled in proportion to its size, so every student in the sample stands for 10 students.
 Scaling each year up by 10 is the same as using the whole sample: $\frac{31}{60} \approx 51.7\%$

E

Exam practice solutions

Marks are shown on the right of each line.

FOUNDATION *Foundation and Higher crossover*

E1 The chess club is older on average (median 34 against 27) C1
 The drama club's ages are more consistent (range 22 against 40) C1
 Both statements in context C1

E2 (a) A : mean 40, range 10. B : mean 42, range 22 B1 B1
 (b) B has more cars on average, but A is more consistent C1

E3 (a) People inside a library use it more than most people C1
 20 people is a small sample C1
 (b) Take a larger random sample of people from the whole town C1



- E4** (a) $\frac{12}{50} \times 900$ M1
 $= 216$ A1
 (b) The sample is representative of the whole school C1

- E5** (a) The median: the value 1240 is an outlier that pulls the mean up C1 C1
 (b) $\frac{330 + 340}{2} = 335$, so £335 B1

HIGHER

- E6** Class *P* has the higher median (55 against 53), so did slightly better on average C1
 IQRs: *P*: $64 - 42 = 22$; *Q*: $58 - 50 = 8$ M1
 Class *Q*'s marks are much more consistent C1

- E7** *U*: median 9, IQR $12 - 5 = 7$ B1
V: median 9, IQR $11 - 7 = 4$ B1
 Same median, but *V* is more consistent C1

- E8** (a) *A*: mean $100 \div 7 \approx 14.3$, median 10. *B*: mean $83 \div 7 \approx 11.9$, median 12 B1 B1
 (b) The median: 41 is an outlier that makes group *A*'s mean too large C1
 Using the medians, group *A* was faster (10 against 12 minutes) C1

- E9** (a) Sample 2: it is larger C1
 (b) $\frac{8 + 15}{40 + 60} = \frac{23}{100}$ M1 A1
 (c) $\frac{23}{100} \times 2500$ M1
 $= 575$ A1

