# Comparing data

86 marks

Hints online, answers free with an account: mathswariz.uk/worksheets/a-level-statistics-comparing-data/

Date

## A Do Now

Quick questions to start. Some use earlier lessons; some set a slip that costs marks.

**A1** Needed today [3 marks]

For $6$ values, $\sum x = 84$ and $\sum x^2 = 1236$. Find the mean and the standard deviation.

Answer .....

**A2** Common slip [2 marks]

The masses of bags filled by machine A have standard deviation $3.2$ g, and by machine B $5.8$ g. Which machine is more consistent? Give a reason.

**A3** Needed today [2 marks]

Data are coded using $y = x - 20$. The coded data have mean $3.5$ and standard deviation $1.2$. Find the mean and the standard deviation of $x$.

Answer .....

**A4** Common slip [2 marks]

A data set has an outlier. Which measure of location and which measure of spread should you use to describe it? Give a reason.



© 2026 Mathswariz. All rights reserved. Free for personal and classroom use. Not to be sold or republished.

## PART 1 Comparing with the mean and standard deviation

EXAMPLE 1 · I DO

The masses of tomatoes grown by two gardeners, A and B, are summarised below. Compare the masses of the two gardeners' tomatoes.

| | Mean (g) | s.d. (g) |
|---|---|---|
| **A** | 82 | 6.1 |
| **B** | 75 | 11.4 |

**Hint** Use one measure of location and one of spread. Quote both values, say which is bigger, and say what that means for the tomatoes.

YOUR TURN · WE DO

**B1** The times, in minutes, that people in two towns take to travel to work are summarised below. Compare the travel times in the two towns. [4 marks]

| | Median (min) | IQR (min) |
|---|---|---|
| **Town P** | 34 | 12 |
| **Town Q** | 28 | 20 |


© 2026 Mathswariz. All rights reserved. Free for personal and classroom use. Not to be sold or republished.

**EXAMPLE 2 · I DO**

The daily maximum temperatures, $x\ ^\circ\mathrm{C}$, at two weather stations were recorded for $30$ days. At station A, $\sum x = 540$ and $\sum x^2 = 10\,020$. At station B, $\sum x = 465$ and $\sum x^2 = 7590$. Compare the temperatures at the two stations.

**Hint** Find the mean and the standard deviation for each station first.

**YOUR TURN · WE DO**

**B2** [5 marks]

Two machines fill bags with flour. For $20$ bags from machine X, $\sum x = 10\,040$ and $\sum x^2 = 5\,040\,160$, where $x$ is the mass in grams. For $20$ bags from machine Y, $\sum x = 9980$ and $\sum x^2 = 4\,980\,500$. Compare the masses of the bags filled by the two machines.


© 2026 Mathswariz. All rights reserved. Free for personal and classroom use. Not to be sold or republished.

**C1** The daily hours of sunshine in June at two towns have these summaries: Town A mean $7.2$ h, standard deviation $1.9$ h; Town B mean $6.1$ h, standard deviation $3.0$ h. A student writes: "$7.2 > 6.1$ and $1.9 < 3.0$." Explain why this gains little credit, and write a full comparison. [4 marks]

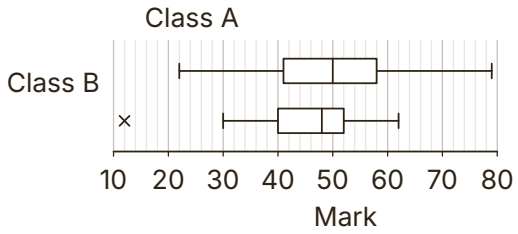
**C2** Machine A fills jars with mean $251.2$ g and standard deviation $1.4$ g. Machine B has mean $249.8$ g and standard deviation $2.6$ g. Leah says: "Machine B is more consistent because its standard deviation is bigger." Explain her mistake and compare the two machines. [4 marks]


© 2026 Mathswariz. All rights reserved. Free for personal and classroom use. Not to be sold or republished.

## PART 2 Box plots and outliers

**EXAMPLE 3 · I DO**

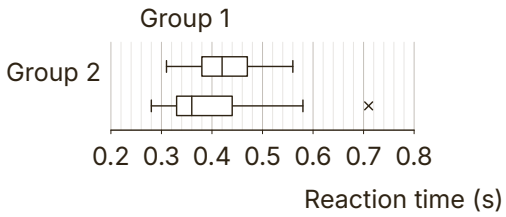
The box plots show the test marks of two classes. Compare the marks of the two classes.




**Hint** Read the median and the quartiles of each. Compare the medians, then the interquartile ranges.

**YOUR TURN · WE DO**

**B3** The box plots show the reaction times, in seconds, of two groups of drivers. Compare the reaction times of the two groups. [4 marks]





© 2026 Mathswariz. All rights reserved. Free for personal and classroom use. Not to be sold or republished.

**EXAMPLE 4 · I DO**

The prices, in thousands of pounds, of the houses sold in two streets last year are shown below. Street A: $180$, $195$, $200$, $210$, $215$, $220$, $950$. Street B: $205$, $215$, $225$, $230$, $240$, $250$, $260$. Choose suitable measures and compare the prices.

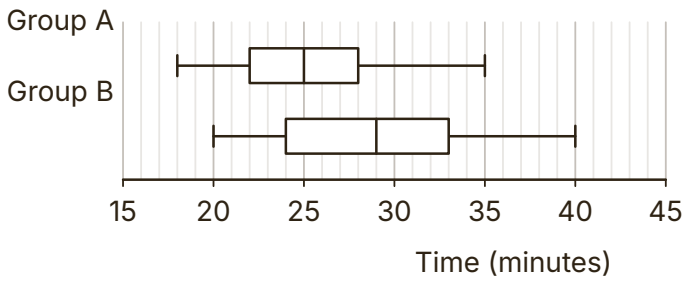
**Hint** Is there an outlier? If so, the mean and the range are not good measures. For $7$ values, $Q_1$ is the $2$nd, the median the $4$th and $Q_3$ the $6$th.

**YOUR TURN · WE DO**

**B4** The times, in seconds, of two groups of $8$ swimmers are shown. Group X: $12.1$, $12.4$, $12.5$, $12.8$, $13.0$, $13.2$, $13.4$, $19.6$. Group Y: $11.8$, $12.0$, $12.6$, $12.9$, $13.3$, $13.7$, $14.0$, $14.4$. The mean of X is $13.6$ s and of Y is $13.1$ s. Explain why the means give a misleading comparison, and compare the groups using the median and the interquartile range. [5 marks]


© 2026 Mathswariz. All rights reserved. Free for personal and classroom use. Not to be sold or republished.

**C3** The box plots show the times, in minutes, that two groups took to finish a puzzle. Nadia says: "Every person in group A was faster than every person in group B, because A's median is lower." Explain why she is wrong, and compare the two groups. [4 marks]





© 2026 Mathswariz. All rights reserved. Free for personal and classroom use. Not to be sold or republished.

**C4** The ages of the members of two walking groups are: P: $23$, $25$, $26$, $27$, $28$, $30$, $71$; Q: $24$, $29$, $31$, $33$, $35$, $36$, $40$. Tom compares them using the mean ($32.9$ and $32.6$) and the range ($48$ and $16$). Explain why these are poor choices, and compare the ages using better measures. [4 marks]


© 2026 Mathswariz. All rights reserved. Free for personal and classroom use. Not to be sold or republished.

## PART 3 Coded data and combined groups

**EXAMPLE 5 · I DO**

Group A has $10$ people with mean $12$ and standard deviation $2$. Group B has $15$ people with mean $17$ and standard deviation $3$. Find the mean and the standard deviation of all $25$ people together.

**Hint** Rebuild $\sum x$ and $\sum x^2$ for each group: $\sum x = n\bar{x}$ and $\sum x^2 = n(\sigma^2 + \bar{x}^2)$.

**YOUR TURN · WE DO**

**B5** In a class, $12$ boys have mean height $150$ cm and standard deviation $6$ cm, and $8$ girls have mean height $145$ cm and standard deviation $5$ cm. Find the mean and the standard deviation of the heights of the whole class. [4 marks]

Answer .....


© 2026 Mathswariz. All rights reserved. Free for personal and classroom use. Not to be sold or republished.

**C5** The lengths, $x$ mm, of bolts made by brand A are coded using $y = \dfrac{x - 100}{5}$. The coded data have mean $2.4$ and standard deviation $1.6$. Raj says the standard deviation of $x$ is $1.6 + 100 = 101.6$ mm. Brand B bolts have mean $110$ mm and standard deviation $11$ mm. Find the correct mean and standard deviation of $x$, and compare the two brands. [4 marks]


© 2026 Mathswariz. All rights reserved. Free for personal and classroom use. Not to be sold or republished.

**C6** The daily mean temperatures, $x$ degrees Fahrenheit, in town A on 30 days were coded using $y = \dfrac{x - 50}{2}$, giving $\sum y = 36$ and $\sum y^2 = 210$. In town B, on the same days, the mean was $12.4\ ^\circ\mathrm{C}$ and the standard deviation was $3.1\ ^\circ\mathrm{C}$. Given that $C = \frac{5}{9}(F - 32)$, compare the temperatures in the two towns. [7 marks]


© 2026 Mathswariz. All rights reserved. Free for personal and classroom use. Not to be sold or republished.

**D1** The numbers of hours, $x$, that students spent on homework in one week were recorded at two schools. School S: $n = 40$, $\sum x = 260$, $\sum x^2 = 1860$. School T: $n = 50$, $\sum x = 290$, $\sum x^2 = 2050$.

**(a)** Find the mean and the standard deviation for each school. [4 marks]

Answer .....

**(b)** Compare the time spent on homework at the two schools. [2 marks]



© 2026 Mathswariz. All rights reserved. Free for personal and classroom use. Not to be sold or republished.

**(c)** Find the mean and the standard deviation of all $90$ students together. [3 marks]

Answer .....

**(d)** One student at S did $13$ hours. An outlier is a value more than $2$ standard deviations from the mean. Is this student an outlier? Show your working. [2 marks]

Answer .....

**Total for D1: 11 marks**

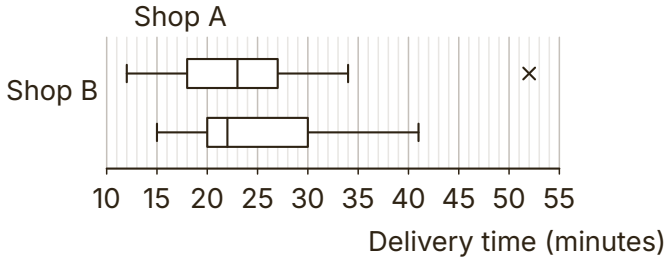

© 2026 Mathswariz. All rights reserved. Free for personal and classroom use. Not to be sold or republished.

**D2**

The box plots show the delivery times, in minutes, of two takeaway shops. Ollie says: "Shop A's delivery times are more variable, because its range is bigger."

Ollie is wrong.

**(a)** Explain why the range is not a good measure of spread here. [2 marks]




**(b)** Compare the delivery times of the two shops using the median and the interquartile range. [4 marks]


© 2026 Mathswariz. All rights reserved. Free for personal and classroom use. Not to be sold or republished.

**(c)** Shop A says that at least $75\%$ of its deliveries take less than $30$ minutes. Is this supported by the box plot? Give a reason. [2 marks]

**Total for D2: 8 marks**


© 2026 Mathswariz. All rights reserved. Free for personal and classroom use. Not to be sold or republished.

## E Extension

Stretch

No route is given. The hints are at the end of the sheet. Use one at a time.

**E1** Group A has $12$ people with mean score $15$ and standard deviation $2$. When group A and group B are combined, the $20$ people have mean $16$ and standard deviation $2.5$. Find the mean and the standard deviation of group B, and compare the scores of the two groups. [9 marks]

Answer .....



© 2026 Mathswariz. All rights reserved. Free for personal and classroom use. Not to be sold or republished.

## Extension hints

Cover these with paper. Uncover one at a time.

**E1**

**Hint 1** Group B has $20 - 12 = 8$ people. Its total is the combined total minus A's total.

**Hint 2** Rebuild $\sum x^2$ from a mean and a standard deviation: $\sum x^2 = n(\sigma^2 + \bar{x}^2)$. Do this for A and for all $20$.

**Hint 3** B's $\sum x^2$ is the combined $\sum x^2$ minus A's. Then use $\frac{\sum x^2}{n} - \bar{x}^2$ for B.

## How did it go?

Colour one circle on each line: not yet, nearly, yes.

| | |
|---|---|
| I can compare two data sets using one measure of location and one measure of spread, with the values and in context. | ○ ○ ○ |
| I can choose median and IQR when there are outliers, and mean and standard deviation otherwise. | ○ ○ ○ |
| I can compare data from box plots, summary statistics and coded data. | ○ ○ ○ |
| I can find a combined mean and standard deviation for two groups. | ○ ○ ○ |



© 2026 Mathswariz. All rights reserved. Free for personal and classroom use. Not to be sold or republished.