



Statistics

HKDSE Mathematics Compulsory Part

Hoksi Education

Version 2026.1.0 | 2026-08-27

4 Statistics

4.1 Measures of central tendency

For a data set $x_1, x_2, \dots, x_n$ the **mean** is

$$\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i.$$

The **median** is the middle value once the data are ordered, and the **mode** is the most frequently occurring value.

Which measure to use

The mean uses every value but is dragged towards outliers. The median is resistant to outliers, which is why income and house-price data are usually reported as medians.

4.2 Measures of dispersion

The **standard deviation** of a population is

$$\sigma = \sqrt{\frac{1}{n} \sum_{i=1}^n (x_i - \bar{x})^2}.$$

The **interquartile range** is $\text{IQR} = Q_3 - Q_1$. A value is commonly treated as an outlier if it lies below $Q_1 - 1.5 \text{ IQR}$ or above $Q_3 + 1.5 \text{ IQR}$.

Example 4.1 (Effect of a linear transformation). A data set has mean 50 and standard deviation 8. Each value is multiplied by 3 and then decreased by 10. Find the new mean and standard deviation.

Solution. If $y = 3x - 10$ then

$$\bar{y} = 3\bar{x} - 10 = 3(50) - 10 = 140,$$

$$\sigma_y = |3| \sigma_x = 3(8) = 24.$$

Adding a constant shifts the data but does not spread it out, so it leaves the standard deviation unchanged.

4.3 Standard scores

The **standard score** of a value x is

$$z = \frac{x - \bar{x}}{\sigma},$$

measuring how many standard deviations x lies from the mean. Standard scores allow results from different tests to be compared directly.

4.4 Exercises

1. Find the mean and median of 4, 7, 7, 9, 13, 20.
2. A student scores 72 on a test with mean 60 and standard deviation 8. Find the standard score.
3. Every value in a data set is increased by 5. State the effect on the mean, the median and the standard deviation.

Answers

1. Mean 10, median 8.
2. $z = 1.5$.
3. Mean and median both increase by 5; the standard deviation is unchanged.

Statistics

HKDSE Mathematics Compulsory Part

Developed and maintained by Hoksi Education Limited

The content is licensed under CC BY-NC-SA 4.0.

Licence terms: <https://creativecommons.org/licenses/by-nc-sa/4.0/>

Hong Kong government, aided, Direct Subsidy Scheme, and private primary and secondary schools may copy, adapt, and share this work through school-operated learning platforms for internal teaching, regardless of whether the school charges tuition. Attribution and ShareAlike still apply.

The Hoksi Education name, trademarks, and logo belong to Hoksi Education Limited and are excluded from the content licence. Complete, unmodified copies may retain the marks. Adapted copies must remove them unless prior written permission is obtained.

The marks may not be extracted, modified, or used separately, or used to imply endorsement, association, or sponsorship.



Online edition

<https://books.hoksi-edu.com/en/dse-math-compulsory/>



Report errors

<https://github.com/Hoksi-Education/textbooks/issues/new>