

# Proof: properties of sigma notation

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## Summary

An explanation as to why some of the properties of sigma notation are true.

Before reading this proof sheet, it is recommended that you read [Guide: Introduction to sigma notation](#) and [\[Guide: Proof by induction\]](#).

## Proof of properties of sigma notation

### Distributivity

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Hello

#### Proof of distributivity

You can see this is true by writing the entire sum out, like this:

$$\begin{aligned}\sum_{i=k}^n C a_i &= C a_k + C a_{k+1} + C a_{k+2} + \dots + C a_n \\ &= C(a_k + a_{k+1} + a_{k+2} + \dots + a_n) \\ &= C \sum_{i=k}^n a_i\end{aligned}$$

### Combining and decomposing sums

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Hello

#### Proof of combining and decomposing sums

Similar to the distributive property, you can show this is true by writing the entire sum out:

$$\begin{aligned}\sum_{i=k}^n a_i + \sum_{i=k}^n b_i &= (a_k + a_{k+1} + \dots + a_n) + (b_k + b_{k+1} + \dots + b_n) \\ &= (a_k + b_k) + (a_{k+1} + b_{k+1}) + \dots + (a_n + b_n) \\ &= \sum_{i=k}^n (a_i + b_i).\end{aligned}$$

In a similar way, you can show that  $\sum_{i=k}^n a_i - \sum_{i=k}^n b_i = \sum_{i=k}^n (a_i - b_i)$  is also true.

## Further reading

[Guide: Using the quadratic formula](#)

[Questions: Using the quadratic formula](#)

## Version history

v1.0: created in 04/24 by tdhc.