Mathematical Induction

Tutorial

Exercise 1

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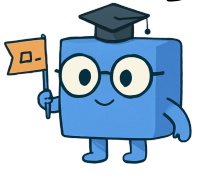
Final Exercise

Page 1 : Mathematical Induction Main Page

Hi, I am Dr. Cube. . . . .

. . . . . .

(Explaining mathematical induction)



Page 2.1 : Tutorial Introduction by Dr. Cube

> Tutorial

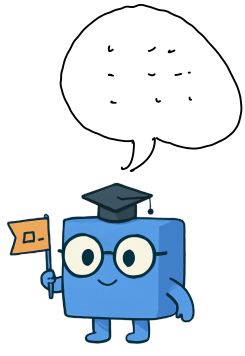
Q.E.D

We proof the statement by mathematical induction

Base Case:

$n = 1$

$$\sum_{k=1}^{1} k = 1 = \dots$$



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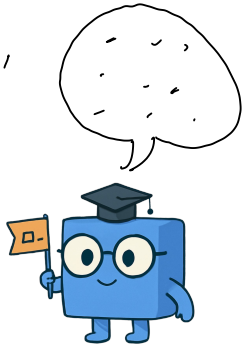
Page 2.2 : Base Case

Q.E.D

Induction hypothesis:

We assume the statement holds for $k = n$, now we show it holds also for $k = n+1$



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Page 2.3 : Induction Hypothesis

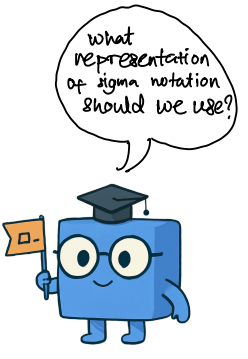
Induction step :

Q.E.D

$\sum_{k=1}^{n+1} k =$ [ ]

$\sum_{k=1}^{n} k + n+1$ option 1

$n+1+n+\ldots+1$ option 2



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Page 2.4 : Induction step

Induction Hypothesis : assume . . . . . ,

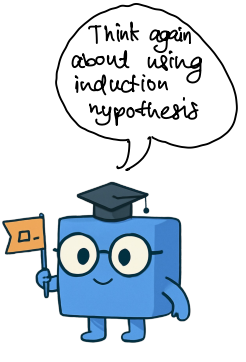
Induction step :

Q.E.D

$\sum_{k=1}^{n+1} k =$ [ ]

$\sum_{k=1}^{n} k + n+1$ option 1

$n+1+n+\ldots+1$ option 2



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Page 2.4a : Induction step Wrong Input

Induction Hypothesis : assume . . . . . ,

Q.E.D

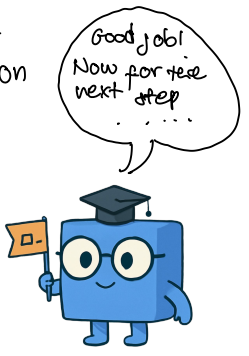
Induction step .

$$\sum_{k=1}^{n+1} k = \sum_{k=1}^{n} k + n+1 \quad | \text{ Definition of sigma notation}$$

$$= \square$$

$\frac{(n+1) \cdot n}{2} + n+1$ option 1

$\sum_{k=1}^{n-1} k + n + n+1$ option 2



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Page 2.4b: induction step right input

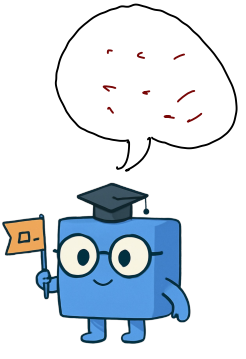
Induction step :

Q.E.D

$$\sum_{k=1}^{n+1} k = \ldots$$

$$= \ldots$$

$$= \frac{(n+1)(n+2)}{2}$$



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Page 2.3 : End of the proof

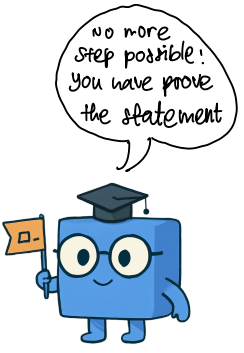
Induction step :

$$\sum_{k=1}^{n+1} k = \dots$$

$$= \dots$$

$$= \frac{(n+1)(n+2)}{2}$$

Q.E.D



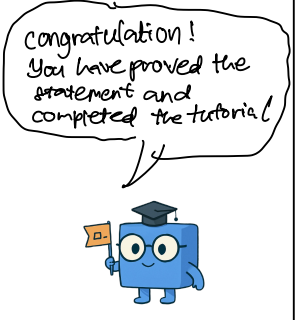
Page 2.2b: End of the proof but user chose to continue

Induction step :

$$\sum_{k=1}^{n+1} k = \dots$$

$$= \dots$$

$$= \frac{(n+1)(n+2)}{2} \quad \square$$



Page 2.3 : End of the proof right inputs

> Exercise 1

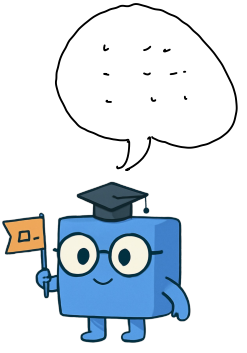
Q.E.D

We proof the statement by mathematical induction

Base Case:

$n = 1$

$$\sum_{k=1}^{1} k = 1 = \dots$$



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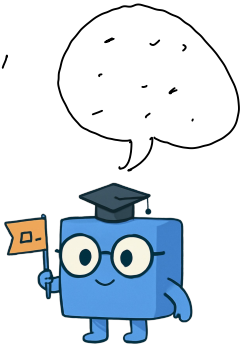
Page 3.1: Base Case

Q.E.D

Induction hypothesis:

We assume the statement holds for $k = n$,
now we show it holds also for $k = n+1$



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Page 3.2: Induction Hypothesis

Induction step :

Q.E.D

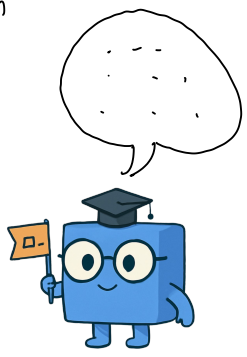
$$\sum_{k=1}^{n+1} k = \boxed{\sum_{k=1}^{n} k + n+1}$$

| Definition of sigma notation

[ ]

[Induction hypothesis] option 1

[Arithmatics] option 2



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Page 3.3 : Induction step with scaffolded option

Induction step :

Q.E.D

$$\sum_{k=1}^{n+1} k = \boxed{\sum_{k=1}^{n} k + n+1}$$

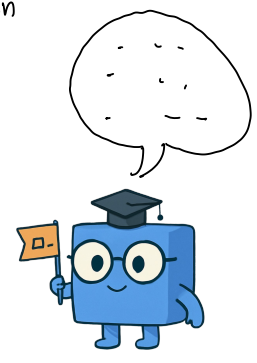
| Definition of sigma notation

| Induction hypothesis

[. . ..]

[Σ □/□ √ ..
. . . . .]

user input for math notation



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Page 3.4 : Induction step with user own input and correct option chosen