

# lean-architect-example

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# Chapter 1

## Natural numbers

**Definition 1** (Natural numbers).

### 1.1 Addition

Here we define addition of natural numbers.

**Definition 2.** Natural number addition.

**Theorem 3.** *For any natural number  $a$ ,  $0 + a = a$ , where  $+$  is Def. 2.*

*Proof.* The proof follows by induction. □

**Theorem 4.** *For any natural numbers  $a, b$ ,  $(a + 1) + b = (a + b) + 1$ .*

*Proof.* Proof by induction on  $b$ . □

**Theorem 5.** *For any natural numbers  $a, b$ ,  $a + b = b + a$ .*

*Proof.* The base case follows from 3.

The inductive case follows from 4. □

### 1.2 Multiplication

**Definition 6.** Natural number multiplication.

**Theorem 7.** *For any natural numbers  $a, b$ ,  $a * b = b * a$ .*

*Proof.* □

### 1.3 Fermat's Last Theorem

**Theorem 8** (Taylor–Wiles). *Fermat's last theorem.*

*Proof.* See [1, 2]. □

In the docstring, usual Markdown features and math mode are supported (by MD4Lean), with additional support for citations like [1] using [square brackets] and references to other nodes like 3 using inline `code`.

You can also directly input raw LaTeX, e.g. as follows:

# Bibliography

- [1] Andrew Wiles (1995) *Modular elliptic curves and Fermat's last theorem*, Annals of Mathematics, 141(3), 443–551.
- [2] Richard Taylor and Andrew Wiles (1995) *Ring-theoretic properties of certain Hecke algebras*, Annals of Mathematics, 141(3), 553–572.