

Proposition 4.16. [27Q] Addition is associative.

Proof. Consider

$$P(h) \doteq \forall n, m \in \mathbb{N}, (n + m) + h = n + (m + h) \quad ;$$

Obviously $P(0)$ is true, moreover $P(Sh)$ is proven (omitting " $\forall n, m \in \mathbb{N}$ ") like this

$$\begin{aligned} (n + m) + Sh &= S(n + m) + h = (Sn + m) + h \stackrel{P(n)}{=} \\ &= Sn + (m + h) = n + S(m + h) = n + (m + Sh) \quad \square \end{aligned}$$