

$$\begin{array}{c}
e^N \mathbb{1} \\
\downarrow ed \\
e^N \overbrace{\mathbb{F} \triangleleft \mathbb{1}}^N \\
e^N \mathbb{1} \xleftarrow{ed} e^N \mathbb{1} \\
\mathbb{F} \overbrace{ed} \dot{\mathfrak{h}} = e \overbrace{\mathbb{F} \rtimes \dot{\mathfrak{h}}} \\
\dot{\mathfrak{h}} \in e^N \mathbb{1} \\
e^N \mathbb{1} = e^N \overbrace{\mathbb{1} \triangleleft \mathbb{1}^0}^N \\
\dot{\mathfrak{h}}:1 \in e^N \mathbb{1} \rtimes \mathbb{1} \xrightarrow{\text{mod } \mathbb{1}} e^N \mathbb{1} \ni \dot{\mathfrak{h}}1
\end{array}$$

$$\begin{array}{c}
e^N \mathbb{1} \\
\downarrow ed \\
e^N \overbrace{\mathbb{F} \triangleleft \mathbb{1}}^N \\
\downarrow ed \\
e^N \overbrace{\mathbb{F} \triangleleft \mathbb{1}^2}^N \\
\qquad \qquad \qquad \nearrow \widehat{ed}^2
\end{array}$$

$$\Theta = e \overbrace{de \rtimes de} \in \overbrace{\mathbb{F} \triangleleft e^{N^2} \mathbb{1}_N e} = \overbrace{e^N \mathbb{1}_N e} \rtimes \overbrace{\mathbb{F} \triangleleft \mathbb{1}^2}$$

$$\overset{\text{H}}{\text{H}}\Theta = e \overbrace{\text{f} \times e \text{f} \times e} - \overbrace{\text{f} \times e \text{f} \times e} = e \overbrace{\text{f} \times e} \times \overbrace{\text{f} \times e}$$

$$e \text{f} \times e e = 0$$

$$\text{f} \times e = \text{f} \times e^2 = \overbrace{\text{f} \times e} e + e \overbrace{\text{f} \times e} \Rightarrow e \overbrace{\text{f} \times e} = e \overbrace{\text{f} \times e} e + e \overbrace{\text{f} \times e}$$

$$\overset{\text{H}}{\text{H}}\Theta = e \overbrace{\text{f} \times e} \times \overbrace{\text{f} \times e} \text{ mult}$$

$$\begin{aligned} \overset{\text{H}}{\text{H}}\Theta \dot{\text{h}} &= \overset{\text{e}}{\text{f}} \overbrace{\text{d}} \overset{\text{e}}{\text{f}} \overbrace{\text{d}} \dot{\text{h}} - \overset{\text{e}}{\text{f}} \overbrace{\text{d}} \overset{\text{e}}{\text{f}} \overbrace{\text{d}} \dot{\text{h}} - \overset{\text{e}}{\text{f}} \overbrace{\text{d}} \dot{\text{h}} = e \overbrace{\text{f} \times} \overbrace{e \text{f} \times \dot{\text{h}}} - e \overbrace{\text{f} \times} \overbrace{e \text{f} \times \dot{\text{h}}} - e \overbrace{\text{f} \times \text{f} \times \dot{\text{h}}} \\ &= e \overbrace{\text{f} \times e \text{f} \times \dot{\text{h}}} + e \overbrace{\text{f} \times \text{f} \times \dot{\text{h}}} - e \overbrace{\text{f} \times e \text{f} \times \dot{\text{h}}} - e \overbrace{\text{f} \times \text{f} \times \dot{\text{h}}} - e \overbrace{\text{f} \times \text{f} \times \dot{\text{h}}} \\ &= e \overbrace{\text{f} \times e} \overbrace{\text{f} \times e \dot{\text{h}} + e \text{f} \times \dot{\text{h}}} - e \overbrace{\text{f} \times e} \overbrace{\text{f} \times e \dot{\text{h}} + e \text{f} \times \dot{\text{h}}} \\ &\underset{0}{=} e \overbrace{\text{f} \times e} \overbrace{\text{f} \times e \dot{\text{h}}} - e \overbrace{\text{f} \times e \text{f} \times e \dot{\text{h}}} = e \overbrace{\text{f} \times e} \times \overbrace{\text{f} \times e} \dot{\text{h}} \end{aligned}$$

$$\text{f} \times \dot{\text{h}} = \text{f} \times e \dot{\text{h}} = \overbrace{\text{f} \times e} \dot{\text{h}} + e \overbrace{\text{f} \times \dot{\text{h}}}$$