**Definition** (Enriched category). Let  $\langle \mathbf{V}, \boldsymbol{\otimes}, \mathbf{1}, \text{as}, \text{lu}, \text{ru} \rangle$  be a monoidal category. A category  $\mathbf{C}$  *enriched* in  $\mathbf{V}$  is composed of:

- 1. The set of objects  $Ob_{\mathbf{C}}$ ;
- 2. For all  $X, Y \in Ob_{\mathbb{C}}$ , an object  $Hom_{\mathbb{C}}(X; Y)$ , called the *hom-object* from X to Y.
- 3. For all  $X, Y, Z \in Ob_{\mathbb{C}}$ , there exists a morphism  $\mathcal{C}_{X,Y,Z}$  in  $\mathbb{V}$ :

$$\S_{X,Y,Z}$$
:  $\operatorname{Hom}_{\mathbf{C}}(X;Y) \otimes \operatorname{Hom}_{\mathbf{C}}(Y;Z) \to \operatorname{Hom}_{\mathbf{C}}(X;Z)$ .

This is called *composition morphism*.

4. For each  $X \in \mathrm{Ob}_{\mathbb{C}}$ , a morphism  $\mathrm{Id}_X : \mathbb{1} \to \mathrm{Hom}_{\mathbb{C}}(X;X)$ , called *identity element*.

Furthermore, for any  $X, Y, Z, W \in Ob_{\mathbb{C}}$ , the following diagrams must commute.