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Introduction to Category Theory

A short first text for readers of matinf.lt

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1 Categories

Definition 1.1. A category **C** consists of:

- objects $A, B, C, \dots$;
- morphisms $f : A \rightarrow B$;
- identity morphisms $\text{id}_A : A \rightarrow A$;
- composition of morphisms.

These data satisfy associativity and identity laws.

Example 1.1. The category **Set** has sets as objects and functions as morphisms.

2 A first diagram

$$\begin{array}{ccc} A & \xrightarrow{f} & B \\ & \searrow g \circ f & \downarrow g \\ & & C \end{array}$$

Exercise 2.1. Describe the category whose objects are natural numbers and where there is a unique morphism $n \rightarrow m$ exactly when $n \leq m$.