Requirements for setting math arrows

Alan Jeffrey

1   Introduction

This document takes a brief look at the requirements for setting arrows in math mode. Arrows are used as mathords, as binary operators as binary relations, as delimiters, and as accents, for example:

$$(X = \vec{Y}) \Rightarrow (\rightarrow) : X^2 \rightarrow \vec{Y}$$

and:

$$\uparrow \begin{matrix} a \\ b \\ c \end{matrix} \downarrow$$

In addition, arrows are often extended, and such extensions may be arbitrarily long, for example:

$$D \xrightarrow{f \circ ()_\perp \circ (\rightarrow) \circ \triangle} D$$

Arrows may also be negated, for example:

$$P \nrightarrow P$$

In this document, we'll just consider arrows in math mode (rather than used in pictures such as commuting diagrams). The arrow accents will be left for the accents document.

2   A survey of arrows

The following arrows are used in mathematics, there are probably more:

$$\rightarrowtail \leftrightarrow \multimap \bullet\!\!-\!\!\bullet \multimap \circ\!\!-\!\!\circ \circ\!\!-\!\!\bullet \Rightarrow \Leftrightarrow \hookrightarrow \mapsto \rightarrow \leftrightarrow$$
$$\rightharpoonup \rightharpoondown \rightleftharpoons \twoheadrightarrow \rightrightarrows \rightarrowtail \twoheadrightarrow \rightleftarrows \rightsquigarrow \leftrightsquigarrow \looparrowright \Rrightarrow$$

Each of these is used mirrored around the vertical axis, extended, and negated. The following are used facing vertically:

$$\uparrow \updownarrow \Uparrow \Updownarrow \upharpoonleft \upharpoonright$$

Each of these is used mirrored around the horizontal axis, extended and negated. The following are used facing diagonally:

$$\uparrow \updownarrow \Uparrow \Updownarrow$$

Each of these is used facing north-east, south-east, south-west and north-west, with two-headed versions, extended and negated. There are rare uses of north-north-east, north-north-west, south-south-east and south-south-west.

There may be a demand for vertical and diagonal versions of '$\rightsquigarrow$' and '$\hookrightarrow$'. Indeed, it would be pleasant if all arrows were available in all eight directions, but this will probably not be practical, and is heading in the direction of the work on category theoretic diagrams.

◇ Alan Jeffrey
University of Sussex
`alanje@cogs.susx.ac.uk`