

# The mfabacus package

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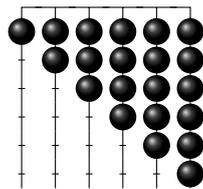
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## Abstract

A very simple  $\LaTeX$  package to produce abacus diagrams. This is not very polished, and will be an eternal work-in-progress, but may be useful – please let me know if you like it, and feel free to suggest more useful features you would like to see.

## 1 Introduction

Sometimes in algebraic combinatorics (especially the combinatorial representation theory of the symmetric group) we draw abacus diagrams, showing an abacus with vertical runners, with each runner having marked positions and beads at some of these positions.



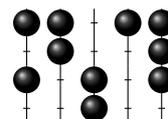
This package uses the `tikz` package to render these diagrams compactly with very efficient syntax, and with the beads looking nice and shiny. It's very limited: colour is not supported, nor can positions or runners be labelled.

`mfabacus` uses the `tikz` package, so you need to have this installed, but you don't need to know how to use it. To use `mfabacus`, put the file `mfabacus.sty` somewhere  $\LaTeX$  will find it and call it with `\usepackage{tikz,mfabacus}`.

## 2 Drawing an abacus diagram

The basic command to draw an abacus diagram is `\abacus()`. This can be used in math mode or text mode. Essentially you put the contents of the diagram inside the `()`, reading row-by-row from top to bottom, with `,` to start a new row. You enter `b` for a bead, and `n` for a marked position with no bead.

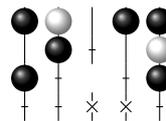
`\abacus(bbnbb,nbnnb,bnbnb,nbnn)`



There are a few more things you can do.

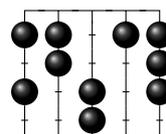
- `s` gives you an empty bit of runner with no marked position.
- `-` just leaves an empty space
- `x` puts a little  $\times$  on the runner
- `o` draws a white bead

`\abacus(bosbb, sbnso, bn_nb, nxxxn)`



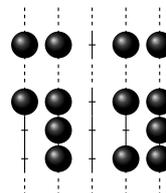
Usually the convention with these abacus diagrams is that runners extend infinitely far downwards, but there is variation in whether they extend infinitely far upwards or not. If you want your runners to be finite in the upward direction, then you can make a horizontal bar joining them together, using `l` and `r` for the left and right runners, and `m` for all the runners in between.

`\abacus(lmmmr, bbhbb, nbhbn, bnhbn, nnhbn)`



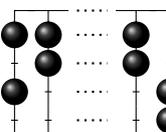
To indicate runners going off to infinity (or some undrawn rows in the diagram) you can do vertical dashes with `v`.

`\abacus(vvvvv, bbhbb, vvvvv, bbhbb, nbhbn, nbhbb, vvvvv)`



Finally, there are horizontal dots to indicate undrawn runners. Use `h` for these, but use `t` in the horizontal bar at the top of the abacus.

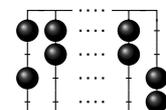
`\abacus(lmtmr, bbhbn, nbhbn, bnhbn, nnhbn)`



### 3 Re-scaling

If you want a diagram of a different size, use `\sabacus()`. For this, the first thing inside the `()` must be a number, followed by `,` and then your usual abacus input as described above. The diagram will then be scaled by that number. (Strangely, the standard size obtained with `\abacus()` is obtained by setting the number equal to 1.2.)

`\sabacus(1, lmtmr, bbhbn, nbhbn, bnhbn, nnhbn)`



`\sabacus(2, lmtmr, bbhbn, nbhbn, bnhbn, nnhbn)`

