

STEPS

ConTEXTXML

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MkIV

Description

This module is written in the process of defining a couple of styles for an educational math book. The macros provide you a way to visualize steps in for instance solving equations.

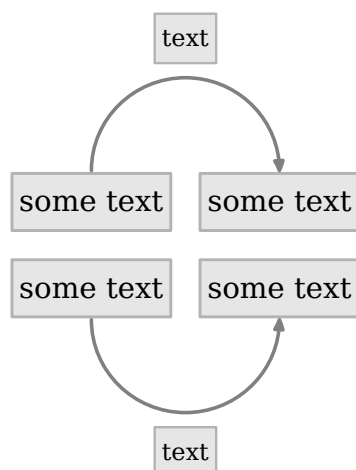
The horizontal visualization is called stepchart, while the vertical alternative carries the name steptable. The vertical alternative has a special case that permits alignment on a mid symbol (in most cases a relation).

The implementation uses a combination of $\text{T}_{\text{E}}\text{X}$ and METAPOST, and is set up in such a way that hyperlinks and alike will work okay.

Structure

The horizontal stepcharts have at most four rows: two rows of cells with each an associated row of texts. The plural elements `cells` and `texts` each have two subelements. The `texts` elements are put between `cells`.

```
<stepchart>
  <cells> <top> some text </top> <bot> some text </bot> </cells>
  <texts> <top> text </top> <bot> text </bot> </texts>
  <cells> <top> some text </top> <bot> some text </bot> </cells>
</stepchart>
```



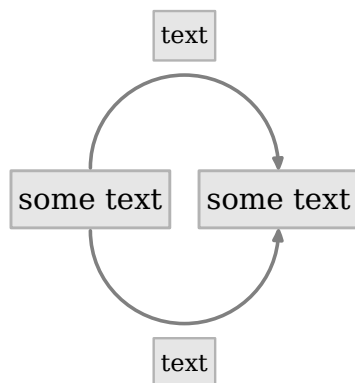
When a singular `cell` element is used in combination with the plural `texts`, we get one row of step cells with both top and bottom texts.

```
<stepchart>
  <cell> some text </cell>
```

```

<texts> <top> text </top> <bot> text </bot> </texts>
<cell> some text </cell>
</stepchart>

```

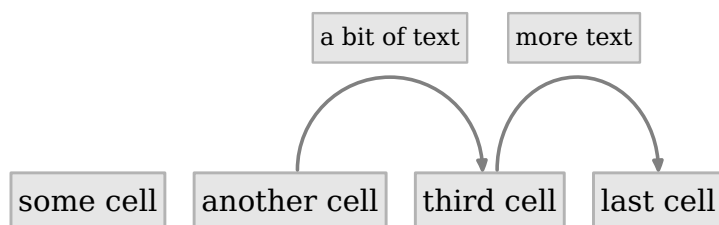


The third horizontal alternative only has singular elements, and as a result the texts are put above the step cells.

```

<stepchart>
  <cell> some cell </cell>
  <cell> another cell </cell> <text> a bit of text </text>
  <cell> third cell </cell> <text> more text </text>
  <cell> last cell </cell>
</stepchart>

```

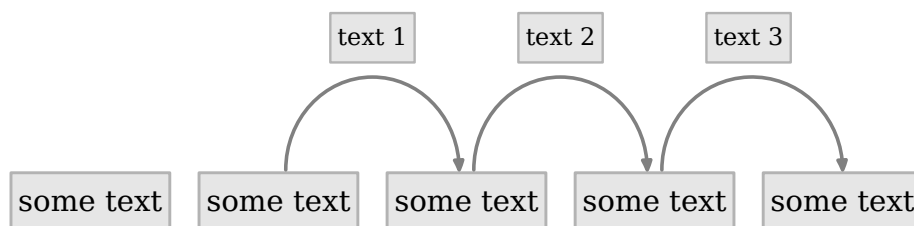


Normally, the lines go from cell to cell via a text. When you let the `cell` element follow by more than one `text` element (or their plural forms), all lines will start at the same point.

```

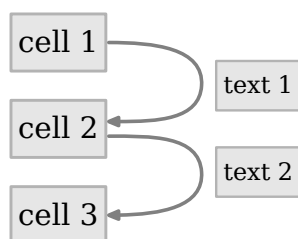
<stepchart>
  <cell> some text </cell>
  <cell> some text </cell> <text> text 1 </text> <text> text 2 </text>
  <cell> some text </cell>
  <cell> some text </cell> <text> text 3 </text>
  <cell> some text </cell>
</stepchart>

```



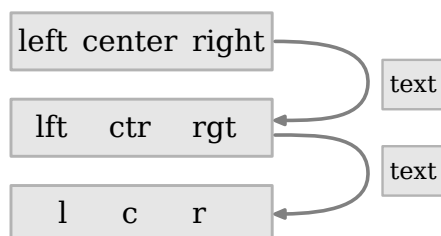
The vertical alternative (of course) looks different and permits pretty long explanations.

```
<steptable>
  <cell> cell 1 </cell>
  <text> text 1 </text>
  <cell> cell 2 </cell>
  <text> text 2 </text>
  <cell> cell 3 </cell>
</steptable>
```



When the plural element `cells` is used, three sub-elements are expected. These align around the mid element `c2`.

```
<stepalightable>
  <cells> <c1> left </c1> <c2> center </c2> <c3> right </c3> </cells>
  <text> text </text>
  <cells> <c1> lft </c1> <c2> ctr </c2> <c3> rgt </c3> </cells>
  <text> text </text>
  <cells> <c1> l </c1> <c2> c </c2> <c3> r </c3> </cells>
</stepalightable>
```



You can draw lines normally or dashes and with or without arrows in both directions. This is controlled by the `alternative` option of `\setupSTEPaligntable`. As an example we use this table:

```
\startSTEPaligntable
  \cells {$2c$} {$=$} {$2a+3b$}
  \text {with $a=5$}
  \cells {$2c$}{$=$} {$10+3b$}
  \text {and $b=6$}
  \cells {$2c$} {$=$} {$10+18$}
  \text {we get}
\stopSTEPaligntable
```

Next we show the (currently) 9 alternatives. The zero alternative draws no lines so there we can make the distance smaller.

```
\setupSTEPlines
[alternative=0,
width=.5em]
```

$$2c = 2a + 3b$$

$$2c = 10 + 3b$$

$$2c = 10 + 18$$

with $a = 5$

and $b = 6$

```
\setupSTEPlines
[alternative=1]
```

$$2c = 2a + 3b$$

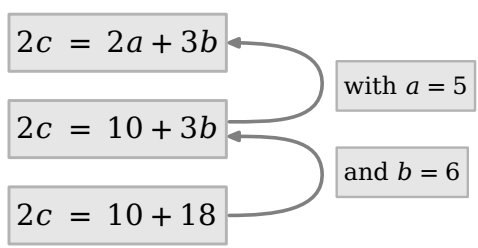
$$2c = 10 + 3b$$

$$2c = 10 + 18$$

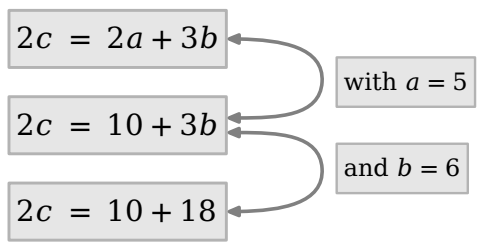
with $a = 5$

and $b = 6$

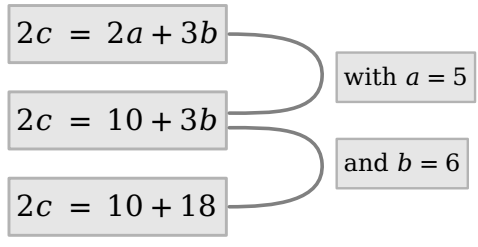
```
\setupSTEPlines
[alternative=2]
```



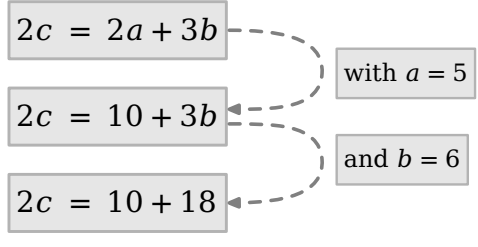
```
\setupSTEPlines
[alternative=3]
```



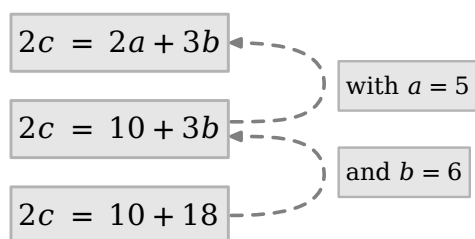
```
\setupSTEPlines
[alternative=4]
```



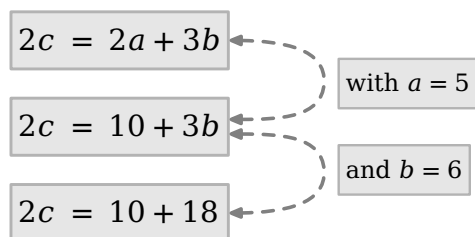
```
\setupSTEPlines
[alternative=5]
```



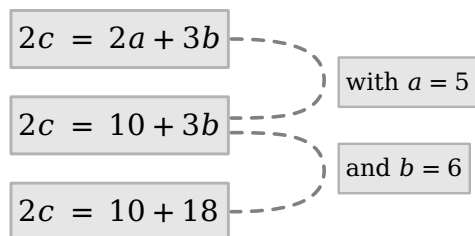
```
\setupSTEPlines
[alternative=6]
```



```
\setupSTEPlines
[alternative=7]
```



```
\setupSTEPlines
[alternative=8]
```



Usage

The step chart module is loaded with:

```
\usemodule[cell] % was step
```

but in the case of embedded math, you should also load the MATHML module:

```
\usemodule[cell,mathml]
```

XML example

Because we don't want to clutter the examples with MATHML we stick to a simple mapping:

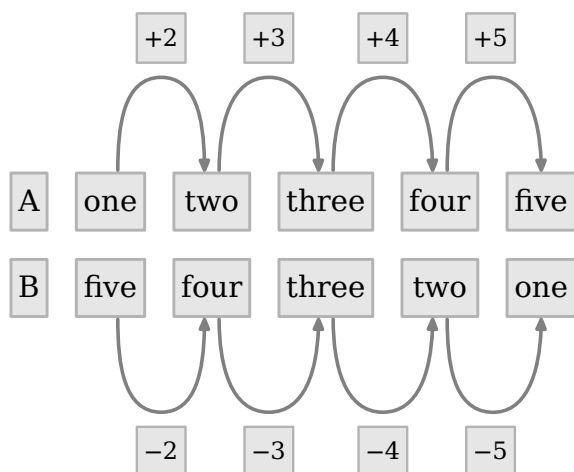
```
\startxmlsetups xml:math:simple
  \xmlsetsetup {#1} {m} {xml:math:simple:tex}
\stopxmlsetups
```

```
\startxmlsetups xml:math:simple:tex
  \mathematics{\xmlflush{#1}}
\stopxmlsetups
```

```
\xmlregistersetup{xml:math:simple}
```

So, in the next examples the `m` element contains \TeX math.

```
<stepchart>
  <cells> <top> A          </top> <bot> B          </bot> </cells>
  <cells> <top> one        </top> <bot> five       </bot> </cells>
  <texts> <top> <m> +2 </m> </top> <bot> <m> -2 </m> </bot> </texts>
  <cells> <top> two        </top> <bot> four       </bot> </cells>
  <texts> <top> <m> +3 </m> </top> <bot> <m> -3 </m> </bot> </texts>
  <cells> <top> three      </top> <bot> three      </bot> </cells>
  <texts> <top> <m> +4 </m> </top> <bot> <m> -4 </m> </bot> </texts>
  <cells> <top> four       </top> <bot> two        </bot> </cells>
  <texts> <top> <m> +5 </m> </top> <bot> <m> -5 </m> </bot> </texts>
  <cells> <top> five       </top> <bot> one        </bot> </cells>
</stepchart>
```



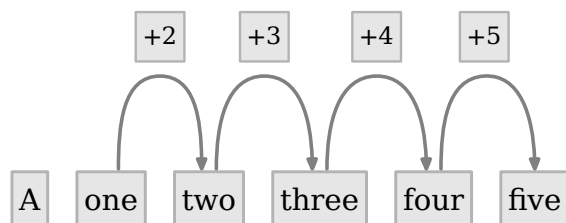
```
<stepchart>
  <cell> A          </cell>
  <cell> one        </cell> <text> <m> +2 </m> </text>
```



```

<cell> two </cell> <text> <m> +3 </m> </text>
<cell> three </cell> <text> <m> +4 </m> </text>
<cell> four </cell> <text> <m> +5 </m> </text>
<cell> five </cell>
</stepchart>

```



```

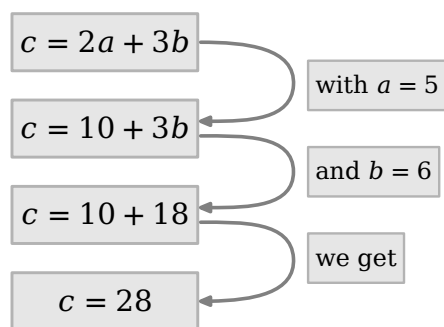
<steptable>
<cell>
  <math xmlns="mathml">
    <apply> <eq/> <ci> c </ci>
      <apply> <plus/>
        <apply> <times/> <cn> 2 </cn> <ci> a </ci> </apply>
        <apply> <times/> <cn> 3 </cn> <ci> b </ci> </apply>
      </apply>
    </math>
  </cell>
<text> with
  <math xmlns="mathml">
    <apply> <eq/> <ci> a </ci> <cn> 5 </cn> </apply>
  </math>
</text>
<cell>
  <math xmlns="mathml">
    <apply> <eq/> <ci> c </ci>
      <apply> <plus/> <cn> 10 </cn>
        <apply> <times/> <cn> 3 </cn> <ci> b </ci> </apply>
      </apply>
    </math>
  </cell>
<text> and
  <math xmlns="mathml">
    <apply> <eq/> <ci> b </ci> <cn> 6 </cn> </apply>
  </math>
</text>

```

```

<cell>
  <math xmlns="mathml">
    <apply> <eq/> <ci> c </ci>
      <apply> <plus/> <cn> 10 </cn> <cn> 18 </cn> </apply>
    </apply>
  </math>
</cell>
<text>
  we get
</text>
<cell>
  <math xmlns="mathml">
    <apply> <eq/> <ci> c </ci> <cn> 28 </cn> </apply>
  </math>
</cell>
</steptable>

```



```

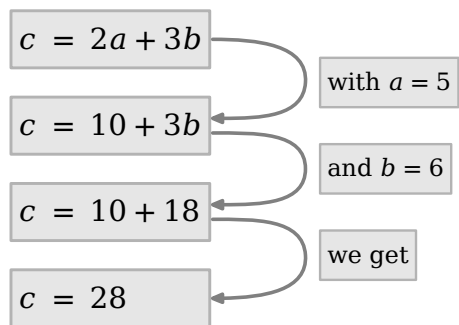
<steptable>
  <cells>
    <c1> <m>c</m> </c1> <c2> <m>=</m> </c2> <c3> <m>2a+3b</m> </c3>
  </cells>
  <text>
    with <m>a=5</m>
  </text>
  <cells>
    <c1> <m>c</m> </c1> <c2> <m>=</m> </c2> <c3> <m>10+3b</m> </c3>
  </cells>
  <text>
    and <m>b=6</m>
  </text>
  <cells>
    <c1> <m>c</m> </c1> <c2> <m>=</m> </c2> <c3> <m>10+18</m> </c3>
  </cells>

```

```

<text>
  we get
</text>
<cells>
  <c1> <m>c</m> </c1> <c2> <m>=</m> </c2> <c3> <m>28</m> </c3>
</cells>
</stepaligntable>

```

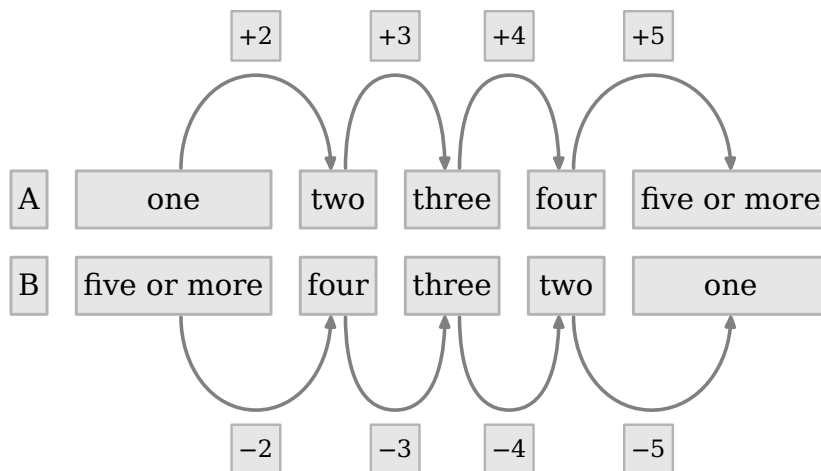


TeX example

```

\startSTEPchart
\cells {A}           {B}
\cells {one}         {five or more} \texts{+$2$}{$-2$}
\cells {two}         {four}         \texts{+$3$}{$-3$}
\cells {three}       {three}        \texts{+$4$}{$-4$}
\cells {four}        {two}          \texts{+$5$}{$-5$}
\cells {five or more} {one}
\stopSTEPchart

```



```

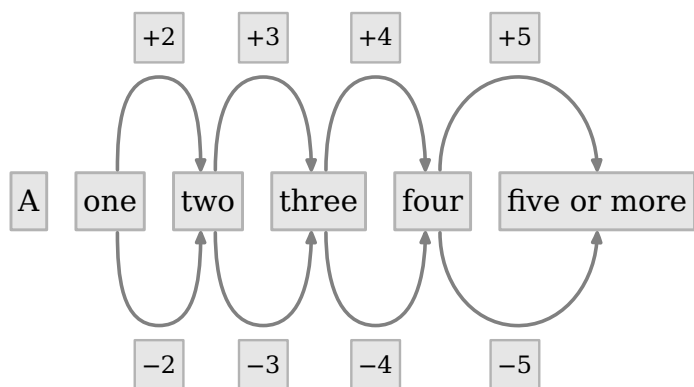
\startSTEPchart

```

```

\cell {A}
\cell {one}      \texts{+2$}{$-2$}
\cell {two}      \texts{+3$}{$-3$}
\cell {three}    \texts{+4$}{$-4$}
\cell {four}     \texts{+5$}{$-5$}
\cell {five or more}
\stopSTEPchart

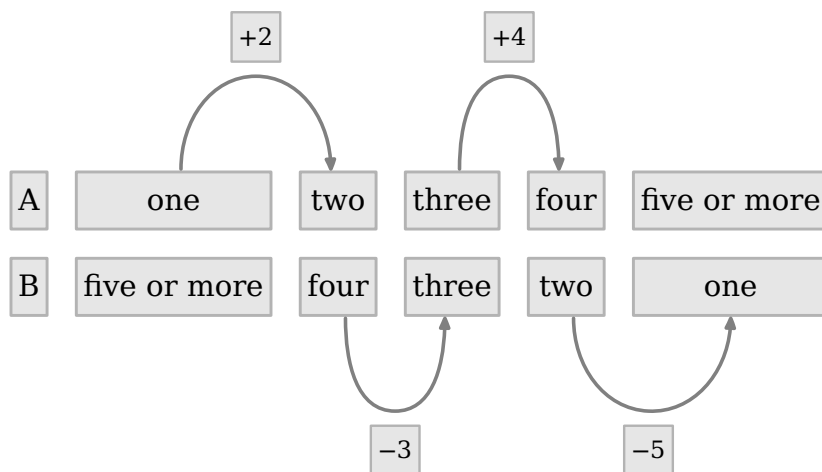
```



```

\startSTEPchart
\cells {A}      {B}
\cells {one}    {five or more} \texts{+2$}{}
\cells {two}    {four}         \texts{}{$-3$}
\cells {three}  {three}        \texts{+4$}{}
\cells {four}   {two}          \texts{}{$-5$}
\cells {five or more} {one}
\stopSTEPchart

```



```

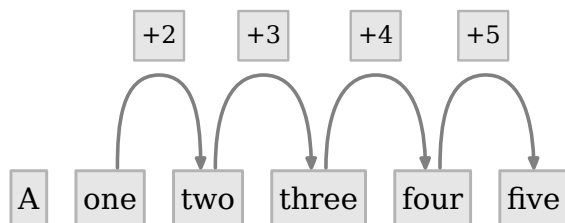
\startSTEPchart
\cell {A}
\cell {one}  \text{+2} \text{+3} \text{+4} \text{+5}

```

```

\cell {two}
\cell {three}
\cell {four}
\cell {five}
\stopSTEPchart

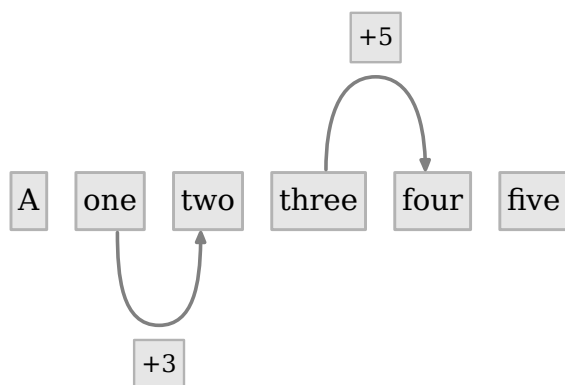
```



```

\startSTEPchart
\cell {A}
\cell {one} \texts{}{+2} \texts{}{+3}
\cell {two}
\cell {three} \texts{+4}{} \texts{+5}{}
\cell {four}
\cell {five}
\stopSTEPchart

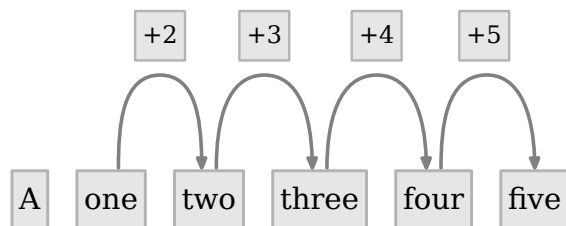
```



```

\startSTEPchart
\cell {A}
\cell {one} \text{+2}
\cell {two} \text{+3}
\cell {three} \text{+4}
\cell {four} \text{+5}
\cell {five}
\stopSTEPchart

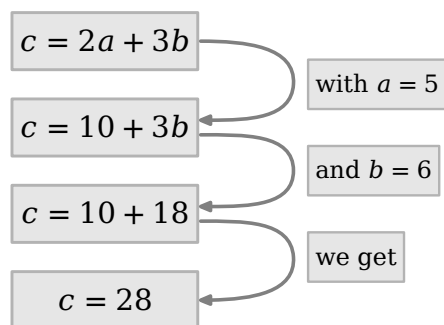
```



```

\startSTEPTable
\cell {$c=2a+3b$}
\text {with $a=5$}
\cell {$c=10+3b$}
\text {and $b=6$}
\cell {$c=10+18$}
\text {we get}
\cell {$c=28$}
\stopSTEPTable

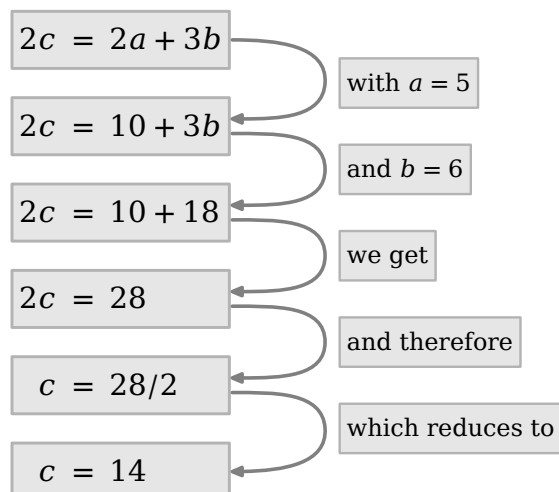
```



```

\startSTEPAligntable
\cells {$2c$} {$=$} {$2a+3b$}
\text {with $a=5$}
\cells {$2c$}{$=$} {$10+3b$}
\text {and $b=6$}
\cells {$2c$} {$=$} {$10+18$}
\text {we get}
\cells {$2c$} {$=$} {$28$}
\text {and therefore}
\cells {$c$} {$=$} {$28/2$}
\text {which reduces to}
\cells {$c$} {$=$} {$14$}
\stopSTEPAligntable

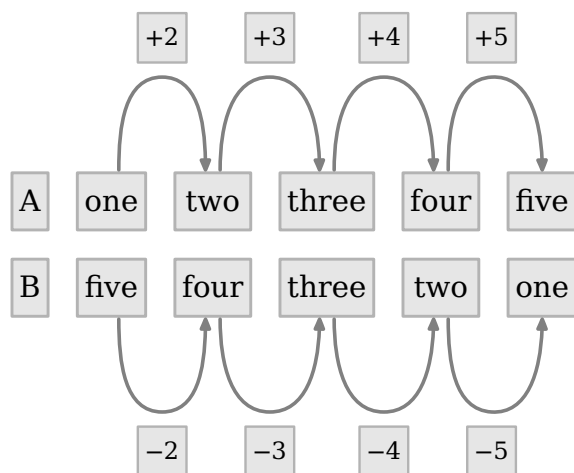
```



```

\startSTEPchart
  \cells {A}      {B}
  \cells {one}    {five} \texts{+$2$}{$-2$}
  \cells {two}    {four}  \texts{+$3$}{$-3$}
  \cells {three}  {three} \texts{+$4$}{$-4$}
  \cells {four}   {two}   \texts{+$5$}{$-5$}
  \cells {five}   {one}
\stopSTEPchart

```



Configuring

The charts and tables can have their own spacing set. Quite certainly the distances between cells will differ.

```
\setupSTEPcharts \setupSTEPtables
```

after hook for commands to execute after the table
 before hook for commands to execute before the table

Both charts and tables have common settings with respect to the cells, texts and lines.

`\setupSTEPcells` `\setupSTEPtexts`

<code>alternative</code>	the kind of shape to be drawn
<code>backgroundcolor</code>	the background color identified by name
<code>rulethickness</code>	the width of frame around cells
<code>framecolor</code>	the frame color identified by name
<code>offset</code>	the space between content and frame
<code>style</code>	a (preferable named) style
<code>color</code>	the color of the content

`\setupSTEPlines`

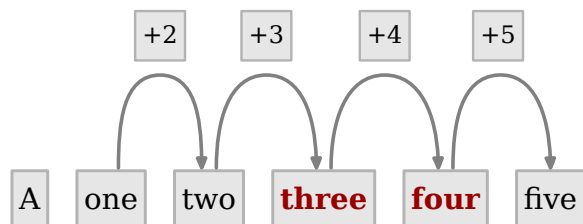
<code>alternative</code>	the kind of line to draw between cells
<code>distance</code>	the distance between lines and text
<code>offset</code>	the shift to the right of the start of the line
<code>height</code>	the height of the (curved) line
<code>rulethickness</code>	the width of the lines between cells
<code>color</code>	the line color identified by name

In $\text{T}_\text{E}\text{X}$, some of the settings, like `style` and `color` can be set between elements. In XML, the settings are passed as processing instructions.

```

\startSTEPchart
\cell {A}
\cell {one}  \text{+2}
\cell {two}  \text{+3}
\start
  \setupSTEPcells[color=darkred,style=bold]
  \cell {three} \text{+4}
  \cell {four}  \text{+5}
\stop
\cell {five}
\stopSTEPchart

```

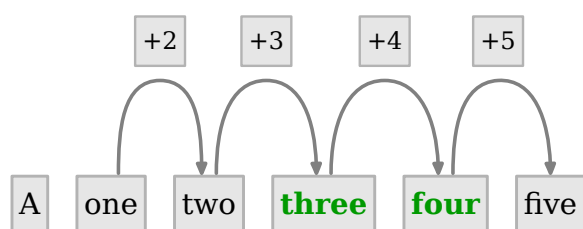



There are a couple of alternative shapes available. The most relevant ones are: **5 6 7 8 9 12 13 14 15 16 17 18 19 22 23 24 25 26 27 28 29**.

Although it is not too wise to set up the layout in the middle of a document, for graphics one can seldom get by some local fine-tuning. Here we encounter a rather fundamental difference between $\text{T}_\text{E}\text{X}$ and XML. In $\text{T}_\text{E}\text{X}$, you can easily change settings on a temporary basis by using groups. In XML on the other hand, settings are bound to a category. So, in $\text{T}_\text{E}\text{X}$ you can do this:

```
\setupSTEPcells
  [important]
  [color=darkgreen,
   style=bold]

\startSTEPchart
\cell {A}
\cell {one} \text{+2}
\cell {two} \text{+3}
\cell [important] {three} \text{+4}
\cell [important] {four} \text{+5}
\cell {five}
\stopSTEPchart
```



An XML example is:

```
\setupSTEPcells[demo-1][alternative=5]
\setupSTEPcells[demo-1][framecolor=darkred]
\setupSTEPtexts[demo-1][framecolor=darkgreen]
\setupSTEPlines[demo-1][alternative=4]
\setupSTEPtexts[demo-2][style=bold]
```

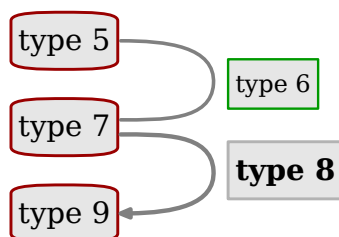
This will be applied to:

```

<steptable class="demo-1">
  <cell> type 5 </cell>
  <text> type 6 </text>
  <cell> type 7 </cell>
  <text class="demo-2"> type 8 </text>
  <cell> type 9 </cell>
</steptable>

```

so that we get:

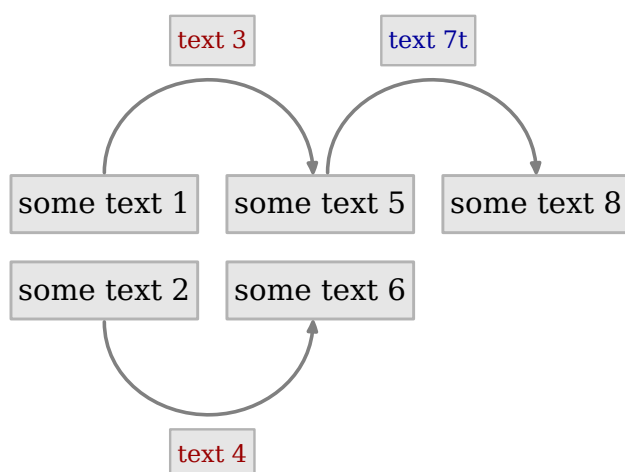


You can also use processing instructions:

```

<stepchart>
  <cells> <top> some text 1 </top> <bot> some text 2 </bot> </cells>
  <?context-stepchart-directive text color darkred ?>
  <texts> <top> text 3 </top> <bot> text 4 </bot> </texts>
  <cells> <top> some text 5 </top> <bot> some text 6 </bot> </cells>
  <?context-stepchart-directive text color darkblue ?>
  <texts> <top> text 7t </top> </texts>
  <cells> <top> some text 8 </top> </cells>
</stepchart>

```



```

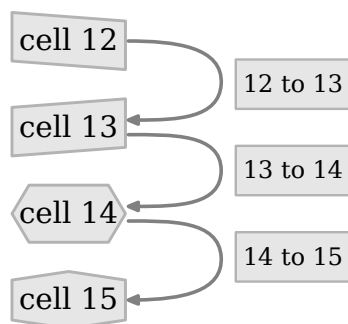
<steptable>
  <?context-stepchart-directive cell alternative 12 ?>

```

```

<cell> cell 12 </cell> <text> 12 to 13 </text>
<?context-stepchart-directive cell alternative 13 ?>
<cell> cell 13 </cell> <text> 13 to 14 </text>
<?context-stepchart-directive cell alternative 14 ?>
<cell> cell 14 </cell> <text> 14 to 15 </text>
<?context-stepchart-directive cell alternative 15 ?>
<cell> cell 15 </cell>
</steptable>

```



Some settings apply to the whole chart. In $\text{T}_{\text{E}}\text{X}$ this is easy since we can group the whole chart including settings but in XML this is somewhat problematic. We can however fall back on basic tex commands but it's probably better to use as category (class), like:

```
\setupSTEPtexts[demo-5][distance=3em]
```

So, the following works as expected:

```

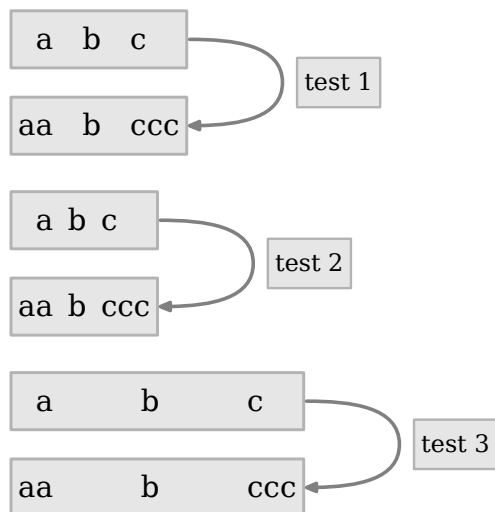
<document>
  <?context-tex-directive start ?>
  <?context-stepchart-directive text distance 1em ?>
  <stepalightable>
    <cells> <c1>a</c1> <c2>b</c2> <c3>c</c3> </cells>
    <text> test 1 </text>
    <cells> <c1>aa</c1> <c2>b</c2> <c3>ccc</c3> </cells>
  </stepalightable>
  <?context-tex-directive stop ?>
  <stepalightable>
    <cells> <c1>a</c1> <c2>b</c2> <c3>c</c3> </cells>
    <text> test 2 </text>
    <cells> <c1>aa</c1> <c2>b</c2> <c3>ccc</c3> </cells>
  </stepalightable>
  <stepalightable class="demo-5">
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```

```

<text> test 3 </text>
<cells> <c1>aa</c1> <c2>b</c2> <c3>ccc</c3> </cells>
</stepaligntable>
</document>

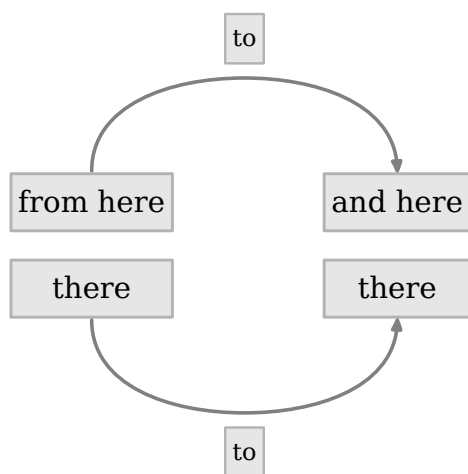
```



```

<document>
  <?context-tex-directive start ?>
  <?context-stepchart-directive cell dx 10ex ?>
  <stepchart>
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    <texts> <top> to </top> <bot> to </bot> </texts>
    <cells> <top> and here </top> <bot> there </bot> </cells>
  </stepchart>
  <?context-tex-directive stop ?>
</document>

```



```

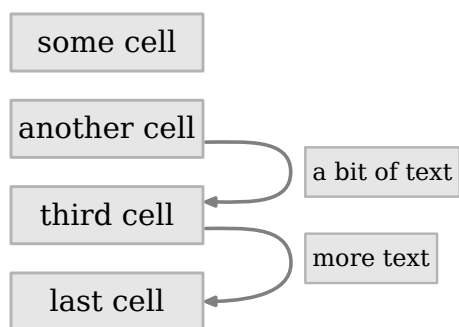
<document>

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<?context-stepchart-directive line offset 5pt ?>
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  <cell> another cell </cell> <text> a bit of text </text>
  <cell> third cell </cell> <text> more text </text>
  <cell> last cell </cell>
</steptable>
<?context-tex-directive stop ?>
</document>

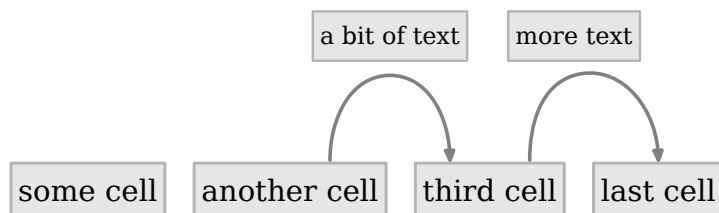
```



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<document>
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  <cell> third cell </cell> <text> more text </text>
  <cell> last cell </cell>
</stepchart>
<?context-tex-directive stop ?>
</document>

```



There is no additional documentation on this module.

Colofon

This manual is part of the CON_T_E_X_T distribution, and is authored and maintained by Hans Hagen. CON_T_E_X_T is developed at PRAGMA ADE, Hasselt, The Netherlands. This manual is produced on February 9, 2017.