The partitions package

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1 Introduction

A **(integer) patition** of a non-negative integer n is a way to write n as a sum of integers. Sums that only differ in the order of the summation are considered to be the same. A **part** is an individual summation. The number of different sums in a partition of n is the partition function, $\mathbf{p}(\mathbf{n})$. A partition π of n is indicated as $\pi \vdash \mathbf{n}$. A partion can be written as sums, a tuple, in a superscript notation or as a Young diagram (also called a Ferrers diagram).

5	(5)	5^1	
$4+1$	$(4,1)$	$1^1 4^1$	
$3+2$	$(3,2)$	$2^1 3^1$	
$3+1+1$	$(3,1,1)$	$1^2 3^1$	
$2+2+1$	$(2,2,1)$	$1^1 2^2$	
$2+1+1+1$	$(2,1,1,1)$	$1^3 2^1$	
$1+1+1+1+1$	$(1,1,1,1,1)$	1^5	

Table 1: The partition of 5 can be written as

2 Usage

```
\partition{3,1,1}
```

```
\begin{tikzpicture}[x=2mm,y=2mm]
\tikzpartition{7,5,3}
\node[dotpartblue] at (d11)  {};
\node[dotpartblue] at (d12)  {};
\node[dotpartblue] at (d13)  {};
\node[dotpartblue] at (d14)  {};
\node[dotpartblue] at (d15)  {};
\node[dotpartgreen] at (d21)  {};
\node[dotpartgreen] at (d22)  {};
\node[dotpartgreen] at (d23)  {};
\end{tikzpicture}
```

3 Implementation

3.1 partitions

```
\RequirePackage{tikz}
\usetikzlibrary{calc}
```

\tikzpartition

```
\newcommand{\tikzpartition}[1]{
\pgfkeys{tikz/dotpart/.style={
draw, fill, color=red!40, inner sep=0pt, minimum size=4pt, circle},
tikz/dotpartblue/.style={dotpart, color=blue!40},
tikz/dotpartgreen/.style={dotpart, color=green!60},
}
\def\maxi{0}
\foreach \i [count=\ii from 0] in {#1}{%{5,3,1}{
\xdef\part@count{\ii}%
\pgfmathparse{max(\maxi,\i)}%
\xdef\maxi{\pgfmathresult}%
\foreach \j in {1,...,\i}{%
\node[dotpart] (d\ii\j) at ($(1*\j,-1*\ii)$) {};
%\node[] (d\ii\j) at ($(1*\j,-1*\ii)$) {d\ii\j};
}
}
%\draw (0,-\part@count-1) rectangle (\maxi+1,1);
\clip (0,-\part@count-1) rectangle (\maxi+1,1); % margin of 1 unit
}
```

\partition

```
\newcommand{\partition}[1]{%
\foreach \i [count=\ii from 0] in {#1}{\xdef\part@count{\ii}}%\part@count
\raisebox{-\part@count mm}{%
\begin{tikzpicture}[x=2mm,y=2mm]%
```

```
\tikzpartition{#1}%
\end{tikzpicture}}%
}
```

3.2 partitions.ltxml

```
# -*- mode: Perltidy -*-
# LaTeXML bindings for partitions.sty
package LaTeXML::Package::pool; # to put new subs & variables in common pool
use LaTeXML::Package; # to load these definitions
use strict; # good style
use warnings;
#RequirePackage('tikz',options=> ['calc']);
RawTeX(<<'EoTeX');
\RequirePackage{tikz}
\usetikzlibrary{calc}
```

\tikzpartition

```
\newcommand{\tikzpartition}[1]{
\pgfkeys{tikz/dotpart/.style={
draw, fill, color=red!40, inner sep=0pt, minimum size=4pt, circle},
tikz/dotpartblue/.style={dotpart, color=blue!40},
tikz/dotpartgreen/.style={dotpart, color=green!60},
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\def\maxi{0}
\foreach \i [count=\ii from 0] in {#1}{%{5,3,1}{
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\xdef\maxi{\pgfmathresult}%
\foreach \j in {1,...,\i}{%
\node[dotpart] (d\ii\j) at ($(1*\j,-1*\ii)$) {};
%\node[] (d\ii\j) at ($(1*\j,-1*\ii)$) {d\ii\j};
}
}
%\draw (0,-\part@count-1) rectangle (\maxi+1,1);
\clip (0,-\part@count-1) rectangle (\maxi+1,1); % margin of 1 unit
}
```

\partition

```
\newcommand{\partition}[1]{%
\foreach \i [count=\ii from 0] in {#1}{\xdef\part@count{\ii}}%\part@count
\raisebox{-\part@count mm}{%
\begin{tikzpicture}[x=2mm,y=2mm]%
\tikzpartition{#1}%
\end{tikzpicture}}%
}

EoTeX
1;
```