The dimnum package

Miguel R. Clemente

miguel.clemente@dem.uc.pt

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Note: Prandtl number is redefined from the `amsmath` package.

1 Introduction

This package simplifies the calling of Dimensionless Numbers in math or text mode.

In Table 1 you can find all available Dimensionless Numbers.

2 Usage

A Dimensionless number is composed of four items:

- the command,
- the symbol,
- the name,
- its identifier.

You can call a Dimensionless Number in three distinct ways:

- by its symbol – using the command (i.e. `\Ar` – Ar).
- by its name (short version) – appending [s] to the command (i.e. `\Bi[s]` – Biot).
- by its name and identifier (long version) – appending [l] to the command (i.e. `\Kn[l]` – Knudsen number).

Symbol, short and long versions, all work in math or text mode without the need of further commands.

Besides the comprehensive list of included Dimensionless Numbers, this package also introduces a command to create new Dimensionless Numbers. Creating a Dimensionless Number is achieved by using

```
\newdimnum{\command}{symbol}{name}{identifier}
```

for example, to add the Morton number we write

```
\newdimnum{\Mo}{Mo}{Morton}{number}
```

The identifier can be left empty, such as in the case of Drag Coefficient

```
\newdimnum{Cd}{\ensuremath{C_d}}{Drag Coefficient}{}
```

in this example we also introduce an important command. When the Dimensionless Number symbol is always expressed in math mode – either by definition or the use of subscripts or superscripts – we add `\ensuremath{}` to encompass the symbol, ensuring a proper representation of the Dimensionless Number.

You can add your own Dimensionless Numbers to your projects. Requests and suggestions to increment Table 1 are accepted and encouraged.

Table 1: List of Dimensionless Numbers Available

Long Name	**Symbol**	**Command**
Abbe number	V	`\Ab`
Activity coefficient	γ	`\AC`
Albedo	α	`\Al`

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Long Name	**Symbol**	**Command**
Archimedes number	Ar	`\Ar`
Arrhenius number	α	`\Arr`
Atomic weight	M	`\AW`
Atwood number	A	`\At`
Bagnold number	Ba	`\Ba`
Basic reproduction number	R_0	`\Rz`
Bejan number	Be	`\Be`
Bingham number	Bm	`\Bm`
Biot number	Bi	`\Bi`
Blake number	Bl	`\Bl`
Blondeau number	B_k	`\Blo`
Bodenstein number	Bs	`\Bs`
Bond number	Bo	`\Bo`

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Long Name	**Symbol**	**Command**
Brinkman number	Br	`\Br`
Brownell-Katz number	N_{BK}	`\BK`
Capillary number	Ca	`\Ca`
Cauchy number	C	`\Cau`
Chandrasekhar number	Q	`\Ch`
Chilton-Colburn Heat J-factor	J_H	`\Jh`
Chilton-Colburn Mass J-factor	J_D	`\Jd`
Chilton-Colburn Momentum J-factor	J_M	`\Jm`
Coefficient of Determination	R^2	`\CoD`
Coefficient of Frication	C_f	`\CoF`
Coefficient of Kinetic Friction	μ_k	`\CoK`
Coefficient of Static Friction	μ_s	`\CoS`
Coefficient of Variation	$\frac{\sigma}{\mu}$	`\CoV`

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Long Name	**Symbol**	**Command**
Cohesion number	Coh	`\Coh`
Condensation number	Co	`\Co`
Courant-Friedrich-Levy number	C	`\CFL`
Dahmköhler number	Da	`\Dah`
Damping ratio	ζ	`\Dr`
Darcy friction factor	f_D	`\fD`
Darcy number	Da	`\Dar`
Dean number	De	`\De`
Deborah number	De	`\Deb`
Drag Coefficient	C_d	`\Cd`
Dukhin number	Du	`\Du`
Eckert number	Ec	`\Ec`
Ekman number	Ek	`\Ek`

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Table 1 – continued from the previous page

Long Name	**Symbol**	**Command**
Elasticity number	El	`\Ela`
Elenbass number	El	`\El`
Eötvös number	Eo	`\Eo`
Ericksen number	Er	`\Er`
Euler number	Eu	`\Eu`
Excess Temperature coefficient	Θ_r	`\ExT`
Fanning friction factor	f	`\fF`
Fine-structure constant	α	`\Fs`
Föppl-von Kármán number	γ	`\FvK`
Fourier number	Fo	`\Fo`
Fresnel number	F	`\Fre`
Froude number	Fr	`\Fr`
Görtier number	G	`\Go`

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Table 1 – continued from the previous page

Long Name	**Symbol**	**Command**
Galilei number	Ga	`\Ga`
Graetz number	Gz	`\Gz`
Grashof number	Gr	`\Gr`
Hagen number	Hg	`\Hg`
Hatta number	Ha	`\Ha`
Havnes parameter	P_H	`\Hav`
Helmholtz number	He	`\He`
Hodgson number	H	`\Ho`
Iribarren number	Ir	`\Ir`
Jakob number	Ja	`\Ja`
Karlovitz number	Ka	`\Ka`
Keulegan-Carpenter number	K_C	`\KC`
Knudsen number	Kn	`\Kn`

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Table 1 – continued from the previous page

Long Name	**Symbol**	**Command**
Kutateladze number	Ku	`\Ku`
Laplace number	La	`\La`
Lewis number	Le	`\Le`
Lift Coefficient	C_L	`\Cl`
Lockhart-Martinelli parameter	χ	`\LM`
Lundquist number	S	`\Lu`
Mach number	Ma	`\Ma`
Marangoni number	Mg	`\Mg`
Markstein number	$\mathcal{M}$	`\Mar`
Morton number	Mo	`\Mo`
Nusselt number	Nu	`\Nus`
Ohnesorge number	Oh	`\Oh`
Péclet number	Pe	`\Pe`

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Table 1 – continued from the previous page

Long Name	**Symbol**	**Command**
Peel number	N_P	`\Peel`
pH	pH	`\pH`
Pierce parameter	C	`\Pie`
Poisson's ratio	ν	`\Poi`
Power factor	pf	`\Pf`
Power number	N_p	`\Pn`
Prandtl number	Pr	`\Pr`
Pressure Coefficient	C_P	`\Cp`
Rayleigh number	Ra	`\Ra`
Refractive index	n	`\Rfi`
Reynolds number	Re	`\Rey`
Richardson number	Ri	`\Ri`
Rolling resistance coefficient	C_{rr}	`\Crr`

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Table 1 – continued from the previous page

Long Name	**Symbol**	**Command**
Roshko number	Ro	`\Ro`
Rossby number	Ro	`\Ros`
Rouse number	P	`\Rou`
Schmidt number	Sc	`\Sc`
Sherwood number	Sh	`\Sh`
Shield's parameter	τ_*	`\Shi`
Sommerfield number	S	`\So`
Stanton number	St	`\St`
Stefan number	Ste	`\Ste`
Stokes number	Stk	`\Stk`
Strouhal number	Sr	`\Sr`
Stuart number	N	`\Stu`
Svelteness	Sv	`\Sv`

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Table 1 – continued from the previous page

Long Name	**Symbol**	**Command**
Taylor number	Ta	`\Ta`
Ursell number	U	`\Ur`
Vadasz number	Va	`\Va`
Van 't Hoff factor	i	`\vtH`
Wagner number	Wa	`\Wa`
Wallis parameter	j^*	`\Wal`
Weaver flame speed number	Wea	`\Wea`
Weber number	We	`\We`
Weissenberg number	Wi	`\Wei`
Womersley number	α	`\Wo`
Zel'dovich number	β	`\Zd`

3 Implementation

```
\NeedsTeXFormat{LaTeX2e}
\ProvidesPackage{dimnum}
[2021/04/05 v1.0.1 Provides commands for Dimensionless numbers]
```

```
\RequirePackage{amsmath}
\RequirePackage{xifthen}
\let\Pr\relax
\newif\ifstartedinmathmode
```

\newdimnum

```
\newcommand{\newdimnum}[4]{%
\expandafter\newcommand\csname #1\endcsname[1][]{%
\ifthenelse{\equal{##1}{}}{%
\relax\ifmmode\startedinmathmodetrue\else\startedinmathmodefalse\fi%
\ifstartedinmathmode\operatorname{#2}\else#2\fi}{%
\ifthenelse{\equal{##1}{s}}{\text{#3}}{%
\ifthenelse{\equal{##1}{l}}{%
\ifthenelse{\equal{#4}{}}{\text{#3}}{\text{#3 #4}}}{%
\ifthenelse{\equal{#4}{}}{\text{#3}}{\text{#3 #4}}}%
            }%
        }%
    }%
}

\newdimnum{Ar}{Ar}{Archimedes}{number}
\newdimnum{At}{A}{Atwood}{number}
\newdimnum{Ba}{Ba}{Bagnold}{number}
\newdimnum{Be}{Be}{Bejan}{number}
\newdimnum{Bm}{Bm}{Bingham}{number}
\newdimnum{Bi}{Bi}{Biot}{number}
\newdimnum{Bl}{Bl}{Blake}{number}
\newdimnum{Bs}{Bs}{Bodenstein}{number}
\newdimnum{Bo}{Bo}{Bond}{number}
\newdimnum{Br}{Br}{Brinkman}{number}
\newdimnum{BK}{\ensuremath{N_{BK}}}{Brownell-Katz}{number}
\newdimnum{Ca}{Ca}{Capillary}{number}
\newdimnum{Cau}{C}{Cauchy}{number}
\newdimnum{Ch}{Q}{Chandrasekhar}{number}
\newdimnum{CoF}{\ensuremath{C_f}}{Coefficient of Frication}{}
\newdimnum{Co}{Co}{Condensation}{number}
\newdimnum{Dah}{Da}{Dahmköhler}{number}
\newdimnum{Dar}{Da}{Darcy}{number}
\newdimnum{De}{De}{Dean}{number}
\newdimnum{Deb}{De}{Deborah}{number}
\newdimnum{Cd}{\ensuremath{C_d}}{Drag Coefficient}{}
\newdimnum{Du}{Du}{Dukhin}{number}
\newdimnum{Ec}{Ec}{Eckert}{number}
\newdimnum{Ek}{Ek}{Ekman}{number}
\newdimnum{Ela}{El}{Elasticity}{number}
\newdimnum{El}{El}{Elenbass}{number}
\newdimnum{Eo}{Eo}{Eötvös}{number}
\newdimnum{Er}{Er}{Ericksen}{number}
\newdimnum{Eu}{Eu}{Euler}{number}
\newdimnum{Fo}{Fo}{Fourier}{number}
```

```
\newdimnum{Fr}{Fr}{Froude}{number}
\newdimnum{Ga}{Ga}{Galilei}{number}
\newdimnum{Go}{G}{Görtier}{number}
\newdimnum{Gz}{Gz}{Graetz}{number}
\newdimnum{Gr}{Gr}{Grashof}{number}
\newdimnum{Ha}{Ha}{Hatta}{number}
\newdimnum{Hg}{Hg}{Hagen}{number}
\newdimnum{Ho}{H}{Hodgson}{number}
\newdimnum{Ir}{Ir}{Iribarren}{number}
\newdimnum{Ja}{Ja}{Jakob}{number}
\newdimnum{Ka}{Ka}{Karlovitz}{number}
\newdimnum{KC}{\ensuremath{K_C}}{Keulegan-Carpenter}{number}
\newdimnum{Kn}{Kn}{Knudsen}{number}
\newdimnum{Ku}{Ku}{Kutateladze}{number}
\newdimnum{La}{La}{Laplace}{number}
\newdimnum{Le}{Le}{Lewis}{number}
\newdimnum{Ma}{Ma}{Mach}{number}
\newdimnum{Mg}{Mg}{Marangoni}{number}
\newdimnum{Mo}{Mo}{Morton}{number}
\newdimnum{Nus}{Nu}{Nusselt}{number}
\newdimnum{Oh}{Oh}{Ohnesorge}{number}
\newdimnum{Pe}{Pe}{Péclet}{number}
\newdimnum{pH}{pH}{pH}{}
\newdimnum{Po}{Po}{Poiseuille}{constant}
\newdimnum{Pr}{Pr}{Prandtl}{number}
\newdimnum{Ra}{Ra}{Rayleigh}{number}
\newdimnum{Rey}{Re}{Reynolds}{number}
\newdimnum{Ri}{Ri}{Richardson}{number}
\newdimnum{Ro}{Ro}{Roshko}{number}
\newdimnum{Ros}{Ro}{Rossby}{number}
\newdimnum{Rou}{P}{Rouse}{number}
\newdimnum{Sc}{Sc}{Schmidt}{number}
\newdimnum{Sh}{Sh}{Sherwood}{number}
\newdimnum{So}{S}{Sommerfield}{number}
\newdimnum{St}{St}{Stanton}{number}
\newdimnum{Ste}{Ste}{Stefan}{number}
\newdimnum{Stk}{Stk}{Stokes}{number}
\newdimnum{Sr}{Sr}{Strouhal}{number}
\newdimnum{Stu}{N}{Stuart}{number}
\newdimnum{Sv}{Sv}{Svelteness}{}
\newdimnum{Ta}{Ta}{Taylor}{number}
\newdimnum{Ur}{U}{Ursell}{number}
\newdimnum{Va}{Va}{Vadasz}{number}
\newdimnum{Wa}{Wa}{Wagner}{number}
\newdimnum{Wea}{Wea}{Weaver flame speed}{number}
\newdimnum{We}{We}{Weber}{number}
\newdimnum{Wei}{Wi}{Weissenberg}{number}
\newdimnum{Ab}{\ensuremath{V}}{Abbe}{number}
\newdimnum{AC}{\ensuremath{\gamma}}{Activity}{coefficient}
\newdimnum{Al}{\ensuremath{\alpha}}{Albedo}{}
```

```
\newdimnum{Arr}{\ensuremath{\alpha}}{Arrhenius}{number}
\newdimnum{AW}{\ensuremath{M}}{Atomic}{weight}
\newdimnum{Rz}{\ensuremath{R_0}}{Basic reproduction}{number}
\newdimnum{Blo}{\ensuremath{B_k}}{Blondeau}{number}
\newdimnum{Jm}{\ensuremath{J_M}}{Chilton-Colburn Momentum J-factor}{}
\newdimnum{Jh}{\ensuremath{J_H}}{Chilton-Colburn Heat J-factor}{}
\newdimnum{Jd}{\ensuremath{J_D}}{Chilton-Colburn Mass J-factor}{}
\newdimnum{CoD}{\ensuremath{R^2}}{Coefficient of Determination}{}
\newdimnum{CoK}{\ensuremath{\mu_k}}{Coefficient of Kinetic Friction}{}
\newdimnum{CoS}{\ensuremath{\mu_s}}{Coefficient of Static Friction}{}
\newdimnum{CoV}{\ensuremath{\frac{\sigma}{\mu}}}{Coefficient of Variation}{}
\newdimnum{Coh}{\ensuremath{{Coh}}}{Cohesion}{number}
\newdimnum{CFL}{\ensuremath{C}}{Courant-Friedrich-Levy}{number}
\newdimnum{Dr}{\ensuremath{\zeta}}{Damping}{ratio}
\newdimnum{fD}{\ensuremath{f_D}}{Darcy friction}{factor}
\newdimnum{ExT}{\ensuremath{\Theta_r}}{Excess Temperature}{coefficient}
\newdimnum{fF}{\ensuremath{f}}{Fanning friction}{factor}
\newdimnum{Fs}{\ensuremath{\alpha}}{Fine-structure constant}{}
\newdimnum{FvK}{\ensuremath{\gamma}}{Föppl-von Kármán}{number}
\newdimnum{Fre}{F}{Fresnel}{number}
\newdimnum{Hav}{\ensuremath{P_H}}{Havnes}{parameter}
\newdimnum{He}{He}{Helmholtz}{number}
\newdimnum{Cl}{\ensuremath{C_L}}{Lift Coefficient}{}
\newdimnum{LM}{\ensuremath{\chi}}{Lockhart-Martinelli}{parameter}
\newdimnum{Lu}{S}{Lundquist}{number}
\newdimnum{Mar}{\ensuremath{\mathcal{M}}}{Markstein}{number}
\newdimnum{Peel}{\ensuremath{N_P}}{Peel}{number}
\newdimnum{Pie}{\ensuremath{C}}{Pierce}{parameter}
\newdimnum{Poi}{\ensuremath{\nu}}{Poisson's}{ratio}
\newdimnum{Pf}{\ensuremath{{pf}}}{Power}{factor}
\newdimnum{Pn}{\ensuremath{N_p}}{Power}{number}
\newdimnum{Cp}{\ensuremath{C_P}}{Pressure Coefficient}{}
\newdimnum{Rfi}{\ensuremath{n}}{Refractive index}{}
\newdimnum{Crr}{\ensuremath{C_{rr}}}{Rolling resistance}{coefficient}
\newdimnum{Shi}{\ensuremath{\tau_*}}{Shield's}{parameter}
\newdimnum{vtH}{\ensuremath{i}}{Van 't Hoff}{factor}
\newdimnum{Wal}{\ensuremath{j^*}}{Wallis}{parameter}
\newdimnum{Wo}{\ensuremath{\alpha}}{Womersley}{number}
\newdimnum{Zd}{\ensuremath{\beta}}{Zel'dovich}{number}
\endinput
```