

# Basic Book Builder

A Pandoc Template for building books and articles



**Title:** Basic Book Builder

**Subtitle:** A Pandoc Template for building books and articles

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**Source:** <https://github.com/jehaverlack/basic-book-builder>

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## 1 Introduction

This is a basic book (or article) builder template based on a Pandoc build process in conjunction with a number of other tools to generate PDF, ODT, HTML, LaTex, Markdown, and Epub book output formats from Markdown source content , which can optionally be edited as an Obsidian vault.

This book builder template has been curated by John Haverlack.([“John Haverlack | ACEP” n.d.](#))

### 1.1 Conventions

A few callout box styles have been added to easily highlight content.

## Established Concept

Einstiens Relativistic Dynamics Equations

$$E^2 = (m_0 \cdot c^2)^2 + (p \cdot c)^2$$

## Proposed Concept

With the speed of light,  $c = 1$ :

$$E^2 = m_0^2 + p^2$$

## Speculative Concept

With the speed of light,  $c = 1$ :

$$E^2 = m_0^2 + p^2$$

## Caution Note

Beware of this section.

## Warning Note

Beware of this section.

## Alerts

Extreme Highlight

## 2 Getting Started

### 2.1 Installing Pre-Requisites

For Debian / ZorinOS and likely Ubuntu based systems.

#### TODO

It would be nice to roll a setup script to take care of this.

#### 2.1.1 Required

##### 2.1.1.1 Pandoc

- <https://pandoc.org/>
- [Download](#)

```
sudo apt install https://github.com/jgm/pandoc/releases/download/3.8.2.1/pandoc-3.8.2.1-1-amd64.deb
```

### 2.1.1.2 Code Editor

#### Code Editor

[VSCode](#) is recommended for privacy (telemetry/tracking) reasons - <https://vscode.com/>

But any text editor will work. ##### make

```
sudo apt install make
```

### 2.1.1.3 jq and yq

```
sudo apt install jq yq
```

### 2.1.1.4 texlive

```
sudo apt install texlive texlive-xetex texlive-latex-extra texlive-fonts-recommended texlive-fonts-extra
```

### 2.1.1.5 MathJax

- <https://www.mathjax.org/>

```
wget https://registry.npmjs.org/mathjax/-/mathjax-3.2.2.tgz
tar xzf mathjax-3.2.2.tgz
mv package/es5/* lib/mathjax
rm -rf package mathjax-3.2.2.tgz
```

#### TODO

This needs to be rolled into a setup script.

## 2.1.2 Optional

The following are not strictly required to use this book builder template.

### 2.1.2.1 Obsidian

#### Highly Recommended

Editing book chapter content in Obsidian is a very productive means for editing Markdown source content.

- <https://obsidian.md/>
- [Deb Package](#)

```
sudo apt install https://github.com/obsidianmd/obsidian-releases/releases/download/v1.9.14/obsidian_1.9.14_amd64.deb
```

### 2.1.2.2 Zotero

#### Highly Recommended

If you need to manage citations and references, Zotero integration is highly recommended.

- <https://www.zotero.org/>

```
sudo cp ./scripts/deps/zotero.list /etc/apt/sources.list.d/
```

```
sudo apt update
```

```
sudo apt install zotero
```

#### 2.1.2.2.1 Better BibTeX for Zotero

Install the Better BibTeX Plugin for Zotero - Zotero > Tool > Plugins

#### 2.1.2.2.2 Export citations.bib

- Zotero > File > Export Library > Format: Better BibTeX
- Keep Updated
- Save to: ~/Documents/Lib/zotero.bib
- Symlink your ~/Documents/Lib/Citations.bib to basic-book-builder/lib/zotero.bib

#### 2.1.2.2.3 Zotero Connector Browser Plugin

- <https://chromewebstore.google.com/detail/zotero-connector/ekhagklcjbdpajgpjgmbionohlpdbjgc>

Provides you the ability to auto add Web resources to your Zotero citation database.

#### 2.1.2.3 lmodern

```
sudo apt install lmodern
```

#### 2.1.2.4 epubcheck

```
sudo apt install epubcheck
```

#### 2.1.2.5 foliate An EPub Reader

- <https://johnfactotum.github.io/foliate/>

```
sudo apt install https://github.com/johnfactotum/foliate/releases/download/2.6.4/com.github.johnf-foliate_2.6.4_all.deb
```

#### 2.1.2.6 calibre An EPub Reader

- <https://calibre-ebook.com>

```
sudo apt install calibre
```

## 2.2 Editing the Configuration

# 3 Editing the Book

### 3.0.1 Configuration

There are a number of other config files for each format:

```
conf/
├── epub-metadata.xml
├── epub_template.html
├── epub.yaml
├── frontmatter_epub.md
├── frontmatter_epub.xhtml
├── frontmatter.html
├── frontmatter.tex
├── header.tex
├── html.yaml
├── latex.yaml
├── markdown.yaml
├── metadata.yaml
├── pandoc.yaml
├── pdf.yaml
├── style.css
└── style_epub.css
```

#### 3.0.1.1 Main Config Files

- metadata.yaml - Set Title, etc
- pandoc.yaml - Main Pandoc Config ##### Per format Configs
- pdf.yaml
- html.yaml
- latex.yaml
- epub.yaml

#### 3.0.2 FrontMatter Config

There are 2 Version of the FrontMatter for PDF, and HTML bases formats that set the Title, Author, Verizon, Copyright, etc...

- frontmatter.tex

- `frontmatter.html`
- `frontmatter_epub.*` - Work in Progress

There is probably a better way to do this.

### 3.1 Editing the Content

To edit the book open the `basic-book-builder` directory as an Obsidian Vault.

- Edit the Markdown content in the `chapters` directory.

#### 3.1.1 Citations

Note: the Zotero database needs configured to export automatically to `lib/citations.bib`

To insert a Zotero Citation - Ensure the Zotero App and DB are running on your system. - Alt + I (to insert citation) - Search for and select citation reference

### 3.2 Usage: Building the Book

#### 3.2.0.1 PDF

```
make pdf
```

#### 3.2.0.2 HTML

```
make html
```

#### 3.2.0.3 LaTex

```
make latex
```

#### 3.2.0.4 Markdown

```
make markdown
```

#### 3.2.0.5 EPub

Note: This ePUB configuration still needs tuning.

```
make epub
```

## 4 Example Content

In  $R\nu$  the [Planck Length](#) is the universal unit for measurement of distance, and is defined approximately to be:

$$L_P = \sqrt{\hbar} = 5.72928 \times 10^{-35} m = 1L$$

Where 1  $L$ , is 1 Planck Length of distance.

#### 4.0.1 SI Conversion Factors

The following conversion factors can be used to convert observable quantities of measure from the *SI* system of units to  $R\nu$  to  $\sim 6$  significant digits.

Conversion Factor	Symbol	Value
meters to Planck Length	$\chi_P$	$1.74542 \times 10^{34} \frac{L}{m}$
seconds to Planck Length	$\tau_p$	$5.23264 \times 10^{42} \frac{L}{s}$
mass to Planck Length	$G_P$	$1.62871 \times 10^8 \frac{L}{kg}$
energy to Planck Length	$E_P$	$1.81219 \times 10^9 \frac{L}{J}$
momentum to Planck Length	$P_P$	$5.43280 \times 10^{-1} \frac{L \cdot s}{kg \cdot m}$
temperature to Planck Length	$k_P$	$2.501998 \times 10^{-14} \frac{L}{K}$
charge to Planck Length	$C_P$	$1.89007 \times 10^{18} \frac{L}{C}$

#### 4.0.2 Physical Constants

Applying conversion factors from the table above, we can convert SI values to Reduced Natural Units. For example, performing this analysis on the speed of light yields a unit-less number with a value of 1:

$$c = 299792458 \frac{m}{s} = 299792458 \frac{m}{s} \cdot 1.74542 \times 10^{34} \frac{L}{m} \cdot \frac{1}{5.23264 \times 10^{42} \frac{L}{s}} = 1.00000$$

Quantity	Symbol	SI	$\nu$
Speed of Light	$c$	$299792458 \frac{m}{s}$	1
Reduced Gravitational Constant	$G_0$	$8.38659 \times 10^{-10} \frac{m^3}{kg \cdot s^2}$	1
Boltzmann's Constant	$k$	$k = 1.380649 \times 10^{-23} \frac{J}{K}$	1
Permittivity of Free Space	$\epsilon_o$	$8.854187817620 \times 10^{-12} \frac{C^2 s^2}{kg \cdot m^3}$	1
Permeability of Free Space	$\mu_o$	$\frac{1}{\epsilon_o \cdot c^2}$	1
Reduced Planck's Constant	$\hbar$	$1.054571726 \times 10^{-34} \frac{kg \cdot m^2}{s}$	$1L^2$
Mass of the Electron	$m_e$	$9.10938 \times 10^{-31} kg$	$1.48366 \times 10^{-22} L$
Charge of the Electron	$e^-$	$-1.60218 \times 10^{-19} C$	$-3.02822 \times 10^{-1} L$
Unit Cycle	$\Theta$	$2\pi = 6.28318\dots Radians$	$1\tau = 6.28318\dots Radians$

## 4.1 Fine Structure Constant

As a consistency check, we compute the *Fine Structure Constant* using Reduced Natural Units which is a unit less ratio that should be independent of our system of units.

$$\alpha = \frac{e^2}{4\pi\epsilon_0\hbar c} = \frac{e^2}{2\tau} = 0.00729735 \approx \frac{1}{137}$$

**4.1.0.1 Dimensional Analysis** The reader should be familiar with high school physics and chemistry [dimensional analysis](#).

- 1 meter ( $m$ ) = 100 centimeters ( $cm$ )
- 1 kilometer ( $km$ ) = 1000 meters ( $m$ )
- 1 mile = 5280 feet ( $ft$  or  $'$ )
- 1 foot ( $ft$  or  $'$ ) = 12 inches ( $in$  or  $"$ )
- 1 inch ( $"$ ) = 2.54 centimeters ( $cm$ )

How many kilometers are in 1 mile?  $1 \text{ mile} = 1 \text{ mile} \times \frac{5280 \text{ ft}}{\text{mile}} \times \frac{12 \text{ in}}{\text{ft}} \times \frac{2.54 \text{ cm}}{\text{in}} \times \frac{1 \text{ m}}{100 \text{ cm}} \times \frac{1 \text{ km}}{1000 \text{ m}} = \frac{5280 \times 12 \times 2.54}{100 \times 1000} \text{ km} = \frac{160934.40}{100000} \text{ km} = 1.6 \text{ km}$  Note that each unit in the denominator cancels with one if the numerator until we are left with only km.

## 4.2 Newton's Law of Gravity

The force of gravity ( $F_g$ ) between 2 masses,  $m_1$  and  $m_2$  separated by distance  $r$  is given by [Newton's Law of Gravity](#):

$$F_g = G \frac{m_1 m_2}{r^2}$$

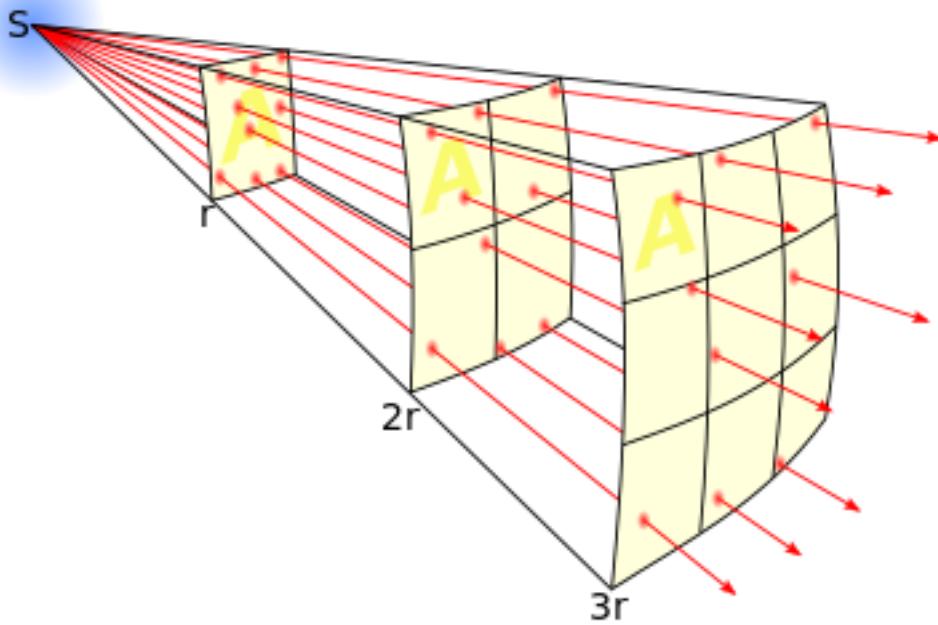
Where  $G$ , is the [Gravitational Constant](#).

$$G = 6.67430 \times 10^{-11} \text{ N} \frac{\text{m}^2}{\text{kg}^2}$$

The strength of gravitational force follow the inverse square law distributing gravitational flux over the surface area of a sphere ( $4\pi r^2$ ).

**4.2.0.1 Inverse Square Law** Any source of a signal strength ( $S_0$ ) that radiates isotropically in 3-dimensional space will distribute that signal strength ( $S_0$ ) over the surface area of a sphere ( $SA = 4\pi r^2$ ) of radius ( $r$ ). Such that the intensity ( $I$ ) at distance ( $r$ ) is:

$$I(r) = \frac{S_0}{4\pi r^2} = \frac{S_0}{2\tau r^2}$$



####  $R\nu$

Reduced Gravitational Constant In this version of Newton's Law of Gravity we introduce a new constant  $G_0$ , the reduced gravitational constant to accommodate for the factor of  $4\pi = 2\tau$  which is has been integrated in the SI version of the gravitational constant.

$$F_g = G \frac{m_1 m_2}{r^2} = G_0 \frac{m_1 m_2}{4\pi r^2} = G_0 \frac{m_1 m_2}{2\tau r^2}$$

Where:

$$G = \frac{G_0}{2\tau} = 6.67384 \times 10^{-11} \frac{N \cdot m^2}{kg^2}$$

Analyzing the units:

$$\frac{N \cdot m^2}{kg^2} = \left( \frac{(kg \cdot \frac{m}{s^2}) \cdot m^2}{kg^2} \right) = \frac{m^3}{s^2 kg}$$

Converting seconds to meters with the SI speed of light as a conversion factor:

$$\frac{m^3}{s^2 kg} \cdot \frac{1}{c^2} = \frac{m^3}{s^2 kg} \cdot \frac{s^2}{m^2} = \frac{m}{kg}$$

Thus where space and time are measured in units of meters, the reduced gravitational constant, is:

$$G_0 = \frac{2\tau G}{c^2} = \frac{2\tau \cdot 6.67384 \times 10^{-11}}{299792458^2} \frac{m}{kg} = 9.33135 \times 10^{-27} \frac{m}{kg}$$

Observation This implies that not only can space and time be measure in units of meters, but so can mass.

### 4.2.1 Relativistic Energy Momentum Relation

Einstiens **Relativistic Energy Momentum** relationship shows a Pythagorean relation between the total energy ( $E$ ), rest mass ( $m_0$ ) and momentum ( $p$ ) of a system.

$$E^2 = (m_0 \cdot c^2)^2 + (p \cdot c)^2$$

Where space and time are both measure in units of meters,  $c=1$ .

$$E^2 = (m_0)^2 + (p)^2$$

From this we can see that Energy, Momentum and Mass have equivalent units.

*While we do not really know what energy, mass and momentum are we know that they are fundamentally “made” out of the same stuff because they have the same units.*

**4.2.1.0.1 Objects of mass at rest** For an object at rest with no momentum ( $p = 0$ ) we see Einstein's famous equations:

$$E = m_0 \cdot c^2$$

Or, with  $c = 1$ , this is much simpler to understand. Energy = Mass

$$E = m_0$$

**4.2.1.0.2 Zero mass objects moving at the speed of light** And for objects with no mass, like photos, ( $m_0 = 0$ ):

$$E = pc$$

Or, with  $c = 1$ , this is much simpler to understand. Energy = Momentum

$$E = p$$

## 4.3 Planck's Constant

The **Reduced Planck constant**,  $\hbar$ , represents a conversion factor for relating the frequency,  $\omega$  (in  $2\pi$  radians per second), of a photon to the energy of that photon. This can easily be seen from the simple but profound relationship:

$$E = \hbar\omega$$

Where:

$$\hbar = 1.054571726 \times 10^{-34} J \cdot s$$

and

$$J \cdot s = kg \cdot \frac{m^2}{s}$$

$$\text{Reduced Planck's Constant } \hbar = \frac{\hbar}{2\pi} = \frac{\hbar}{\tau}$$

Simplifying our units by converting time and mass to units of meters:

$$\hbar = 1.054571726 \times 10^{-34} kg \cdot \frac{m^2}{s} \cdot \frac{G_0}{c} = 3.282462 \times 10^{-69} m^2$$

Which suggest that the Plank constant can be interpreted as an areas for which the square root of is suspiciously close to the Plank length:

$$\sqrt{\hbar} = \sqrt{3.282462 \times 10^{-69} m^2} = 5.72928 \times 10^{-35} m$$

**4.3.0.1 Planck Area** The [Planck Area](#) is the square of the [Planck Length](#).

$$l_P = \sqrt{\frac{\hbar G}{c^3}}$$

$$\text{and } l_P^2 = \frac{\hbar G}{c^3}$$

In  $R\nu$  units both  $c$  and  $G_o$  are 1.

$$l_P = \sqrt{\hbar}$$

and  $l_P^2 = \hbar$  ## Bekenstein's Bound After having recently read *Three Roads to Quantum Gravity* by Lee Smolin, I now suspect the meaning of this areas is related to the [Bekensteins Law](#) as applied to a surface areas surrounding a mass. Where the [thermodynamic entropy](#),  $S$ , is proportional to the the enclosed surface area,  $A$ .

$$S = \frac{1}{4} \cdot \frac{A}{G\hbar}$$

$$S = \frac{k c^3 A}{4 G \hbar}$$

$$S \leq \frac{2\pi k R E}{\hbar c} = \frac{\tau R k E}{\hbar c}$$

From our new values for  $G_0$  and  $\hbar$  we can likely rewrite this:

$$S = \frac{\pi \cdot A}{\hbar G_0}$$

With the limiting case being at the Plank scale.

$$S = \frac{\pi \cdot \sqrt{\hbar}}{\hbar G_0}$$

## 4.4 Planck Length

[https://en.wikipedia.org/wiki/Planck\\_length](https://en.wikipedia.org/wiki/Planck_length)

The concept of the Planck Length comes from exploring the limits of Quantum Mechanics and General Relativity. The limits of General Relativity can be seen a the event horizon of a black hole, described by the Schwarzschild Radius. And the limits of Quantum Mechanics can be found in the Compton Wavelength for a given quanta.

The [Schwarzschild Radius](#) is defined as the distance at which light cannot escape from the gravitational field of a mass ( $m$ ):

Classic Derivation.

$$r_S = \frac{2Gm}{c^2}$$

The reduced Compton Wavelength represents a lower limit on the wavelength for quanta that can interact with a quantum particle with mass (m):

$$\lambda_C = \frac{\hbar}{mc}$$

$$\bar{\lambda}_C = \frac{2\pi\hbar}{mc} = \frac{\tau\hbar}{mc}$$

And set the Schwarzschild Radius equal to the Compton Wavelength:  $r_S = \lambda_C$

$$\frac{2Gm}{c^2} = \frac{\hbar}{mc}$$

$$m^2 = \frac{hc}{2G}$$

$$m = \sqrt{\frac{hc}{2G}}$$

$$l_P = \frac{2G\sqrt{\frac{hc}{2G}}}{c^2} l_P = \frac{2G\sqrt{\frac{hc}{2G}}}{c^2} = \sqrt{\frac{2Gh}{c^2}}$$

With reduced Compton Wavelength  $r_S = \bar{\lambda}_C$

$$\frac{2Gm}{c^2} = \frac{\tau\hbar}{mc}$$

$$m^2 = \frac{\tau\hbar c}{2G}$$

$$m = \sqrt{\frac{\tau\hbar c}{2G}}$$

$$l_P = \frac{2G\sqrt{\frac{\tau\hbar c}{2G}}}{c^2}$$

$$l_P = \frac{2G\sqrt{\frac{\tau\hbar c}{2G}}}{c^2} = \sqrt{\frac{4\tau G \hbar}{c^3}}$$

If we reduce the units in these equation to those of mass and time measured in meters.

$$l_P = \sqrt{4\tau\hbar G_o}$$

and

$$\lambda_C = \frac{\hbar}{m}$$

$$m = R_s = \lambda_C = \frac{\hbar}{m}$$

This is known as the Planck Mass,  $M_P$ .  $M_P = m = \sqrt{\hbar}$

Solving the Compton Wavelength for distance we find the classic Plank Length:

$$\lambda_C = \frac{\hbar}{\sqrt{\hbar}} = \frac{\sqrt{\hbar}}{\sqrt{\hbar}} \cdot \frac{\hbar}{\sqrt{\hbar}} = \sqrt{\hbar} = L_P$$

Which is in precise agreement with the value we found in above. Thus the Plank Length is:

$$L_P = \sqrt{\hbar} = 5.72928 \times 10^{-35} m$$

When we measure distance, time, and mass in units of distance,  $c=1$ , and the Plank Time,  $T_P$ , is equal to Plank Length,  $L_P$ , which is equal to the Plank Mass,  $M_P$ :

$$L_P = T_P = M_P$$

Conversion Factor	Symbol	Value
meters to Planck Length	$\chi_P$	$1.74542 \times 10^{34} \frac{L}{m}$
seconds to Planck Length	$\tau_p$	$5.23264 \times 10^{42} \frac{L}{s}$
mass to Planck Length	$G_P$	$1.62871 \times 10^8 \frac{L}{kg}$
energy to Planck Length	$E_P$	$1.81219 \times 10^9 \frac{L}{J}$
momentum to Planck Length	$P_P$	$5.43280 \times 10^{-1} \frac{L \cdot s}{kg \cdot m}$
Length		
temperature to Planck Length	$k_P$	$2.501998 \times 10^{-14} \frac{L}{K}$
charge to Planck Length	$C_P$	$1.89007 \times 10^{18} \frac{L}{C}$

Applying conversion factors from the table above, we can convert SI values to Reduced Natural Units.  $c = \frac{1}{\sqrt{\epsilon_o \mu_o}}$

Quantity	Symbol	SI	$\nu$
Speed of Light	$c$	$299792458 \frac{m}{s}$	1
Gravitational Constant	$G_0$	$8.38659 \times 10^{-10} \frac{m^3}{kg \cdot s^2}$	1
Boltzmann's Constant	$k$	$k = 1.380649 \times 10^{-23} \frac{J}{K}$	1
Permittivity of Free Space	$\epsilon_o$	$8.854187817620 \times 10^{-12} \frac{C^2 s^2}{kg \cdot m^3}$	1
Permeability of Free Space	$\mu_o$	$\frac{1}{\epsilon_o \cdot c^2}$	1
Planck's Constant	$\hbar$	$1.054571726 \times 10^{-34} \frac{kg \cdot m^2}{s}$	$1L^2$
Mass of the Electron	$m_e$	$9.10938 \times 10^{-31} kg$	$1.48366 \times 10^{-22} L$
Charge of the Electron	$e^-$	$-1.60218 \times 10^{-19} C$	$-3.02822 \times 10^{-1} L$

## 4.5 Fine Structure Constant

[https://en.wikipedia.org/wiki/Fine-structure\\_constant](https://en.wikipedia.org/wiki/Fine-structure_constant) As a consistency check, we compute the *Fine Structure Constant* using Reduced Natural Units which is a unit less ratio that should be independent of our system of units.

$$\alpha = \frac{e^2}{4\pi\epsilon_0\hbar c} = \frac{e^2}{4\pi} = 0.00729735 \approx \frac{1}{137}$$

This check confirms that our system of Reduced Natural Units has internally consistent values for  $c$ ,  $\epsilon_0$ ,  $\hbar$  and  $e$ . And also  $G_o$  which was used to computer prior values is also consistent.

## 4.6 Sage Code

Unit Analysis computations have been performed with [Sage Math](#).

```
# Define constance
one = 1.n(digits=6)
pi = pi.n(digits=6)
tau = 2 * pi
t = tau

# Define the units
meters = var('m')
m = one*meters

seconds = var('s')
s = seconds

kilograms = var('kg')
kg = kilograms

newtons = kg * m / s^2
N = newtons

joules = N * m
J = joules

print("pi      =", pi)
print("tau     =", t)

# Speed of light in meters/second
speed_of_light = 299792458 * meters/seconds
sol = speed_of_light
c = sol
print("si c   =", c)

rnu_c = c / c
print("R\u03bd c  =", rnu_c)

# Gravitational Constant
gravitational_constant = 6.67384e-11 * N*(m^2/kg^2)
G = gravitational_constant
```

```

print("si G  =", G)

rnu_G = 4*pi*G/c^2
Go = rnu_G
print("R\u03bd Go =", Go)

# Planck's Constant
reduced_plancks_constant = 1.054571726e-34 * J*s
h_bar = reduced_plancks_constant
print("si \u210F  =", h_bar)

rnu_h_bar = h_bar * Go / c
print("R\u03bd "u"\u210F  =", rnu_h_bar)

# Planck Length
rnu_h_bar_str = str(rnu_h_bar)
numerical_part_str = rnu_h_bar_str.split('*')[0]
numerical_part_str = numerical_part_str.strip('()')
numerical_part = float(numerical_part_str)
rnu_sqrt_h_bar = numerical_part^(1/2)
# ^ Sage cannot process sqrt on units... Lame.
lP = rnu_sqrt_h_bar * m
print("R\u03bd \u2211\u210F =", lP)

```

#### 4.6.0.1 Output

```

pi      = 3.14159
tau    = 6.28319
si c   = 299792458*m/s
Rv c   = 1
si G   = (6.67384e-11)*m^3/(kg*s^2)
Rv Go  = (9.33135e-27)*m/kg
si \hbar = (1.05457e-34)*kg*m^2/s
Rv \hbar = (3.28246e-69)*m^2
Rv \sqrt{\hbar} = (5.72928e-35)*m
si lP  = (1.61620e-35)*sqrt(m^2)
Rv lP  = (2.77455e-47)*sqrt(m^3/kg)

```

## 5 Terminology

### Citations

“John Haverlack | ACEP.” n.d. <https://www.uaf.edu/acep/about/our-team/john-haverlack.php>. Accessed September 30, 2025.