PHYS 87

Exercises (February 7, 2018):

1. Exercise: try typesetting this

   It doe snot work with beamer

   > The first entry here

   > Then the second

   > etc

   - The first entry here
   - Then the second
   - etc

   Hint: Use `\textgreater` for ">" and `$\bullet$` for "•".

2. Make a tripple nested list.

3. How do you get this default:

   > First level

   ⋆ Second level

   • Third level

   Check that it works by typesetting the tripple ensted list of the pervious exercise.

   Hint: Symbols used: `\textgreater, $\star$, $\bullet$`.

4. Typeset this:

   First The first entry here

   Second Then the second

   Last Then the last

   with the descriptors "First" in red color, "Second" in blue and "Last" in black.
   Hint: `\usepackage{color}`

Solutions

Exercise 1: `\renewcommand{\labelitemi}{\textgreater}`

```
\begin{itemize}
\item The first entry here
\item Then the second
\item etc
\end{itemize}

\renewcommand{\labelitemi}{$\bullet$}

\begin{itemize}
\item The first entry here
\item Then the second
\item etc
\end{itemize}
```

Exercise 2: Here is an example of a tripple nested list:

```
\begin{itemize}
\item The first entry here
\begin{itemize}
\item The first sub-entry here
\item Then the second sub-entry
\begin{itemize}
\item The first sub-sub-entry here
\item Then the second sub-sub-entry
\end{itemize}
\item etc
\end{itemize}
\item Return to original list, etc
\end{itemize}
```

Exercise 3:

```
\renewcommand{\labelitemi}{\textgreater}
\renewcommand{\labelitemii}{$\star$}
\renewcommand{\labelitemiii}{$\bullet$}
```

Exercise 4: Per the hint place `\usepackage{color}` in the preamble. Then

```
\begin{description}
\item[\color{red}First] The first entry here
\item[\color{blue}Second] Then the second
\item[\color{black}Last] Then the last
\end{description}
```

Exercises (February 14, 2018):

1. Typeset

$$\begin{aligned} a &= b & c &= d & e &= f \\ g &= b & h &= d & k &= f \end{aligned}$$

2. Typeset

$$a^2 = b^2 + c^2$$

3. Typeset two of these: ♀, ♂, ♉, ⊟, ə

4. Typeset

$$F = G_N \frac{m_1 m_2}{r^2}$$

5. Typeset

$$n_{\pm}(E,T) = \frac{1}{e^{\frac{E}{k_B T}} \pm 1} = \frac{1}{e^{\hbar\omega/k_B T} \pm 1}$$

Note: This uses the greek letter `\omega` *and the symbol* `\hbar`.

6. Typeset

$$F_{\mu\nu} = [D_\mu, D_\nu] = \partial_\mu A_\nu - \partial_\nu A_\mu = \partial_{[\mu} A_{\nu]}$$

Note: This uses the greek letters `\mu` *and* `\nu`, *and the symbol* `\partial`.

7. Typeset these (the first is inline, the next two are separate displayed equations):

"Taylor expansion $e^x = \sum_{n=0}^{\infty} \frac{1}{n!} x^n$."

$$\int_0^1 \frac{df}{dx} dx = f(1) - f(0)$$

$$e^{\zeta(s)} = \prod_{n=1}^{\infty} e^{1/n^s}$$

(This uses the greek letter zeta).

Exercise 1:
```
\begin{align*}
a&=b & c&=d & e&=f \\
g&=b & h&=d & k&=f
\end{align*}
```
Note: the star in `align*` is used in order to omit equation numbering.

Exercise 2:
```
\item Typeset
\[
a^2=b^2+c^2
\]
\bigskip
```

Exercise 3: Use package *wasysym* for `\female, \male, \taurus`, *amssymb* for `$\boxminus$`, and *tipa* for `\textschwa`

Exercise 4:
```
\[
F = G_N\frac{m_1m_2}{r^2}
\]
\bigskip
```

Exercise 5:
```
\[
n_{\pm}(E,T)=\frac1{e^{\frac{E}{k_BT}}\pm1}
           =\frac1{e^{{\hbar\omega}/{k_BT}}\pm1}
\]
\bigskip
```

Exercise 6:
```
\[
F_{\mu\nu}  =  [D_\mu  ,   D_\nu]
   =\partial_\mu A_\nu-\partial_\nu A_\mu
 =\partial_{[\mu} A_{\nu]}
\]
```

Exercise 7:
```
‘‘Taylor expansion $e^x=\sum_{n=0}^\infty \frac1{n!}x^n$.’’
\[\int_{0}^1 \frac{df}{dx}dx= f(1)-f(0)\]
\[e^{\zeta(s)}=\prod_{n=1}^\infty e^{1/n^s}\]
```

Exercises (February 21, 2018):

1. Typeset this:
   "Taylor expansion $e^x = \sum_{n=0}^{\infty} \frac{1}{n!} x^n$."

   $$\int_0^1 \frac{df}{dx} dx = f(1) - f(0)$$

   $$e^{\zeta(s)} = \prod_{n=1}^{\infty} e^{1/n^s}$$

   (This uses the greek letter zeta).

2. Typeset these two expressions as separate *displayed equations*:

   $$2\left[3\frac{a}{z} + 2\left(\frac{a}{d} + 7\right)\right] \qquad\qquad x^2\left(\sum_n A_n + 3\left(b + \frac{1}{c}\right)\right)\Bigg]_0$$

3. Typeset this, using the `multline*` environment:

   $$2\left(1 + \frac{1}{2} + \frac{1}{2^2} + \frac{1}{2^3} + \frac{1}{2^4} + \frac{1}{2^5} + \frac{1}{2^6} + \frac{1}{2^7} + \frac{1}{2^8} + \frac{1}{2^9}\right.$$
   $$\left. + \frac{1}{2^{10}} + \frac{1}{2^{11}}\right) = \frac{4095}{1024}$$

4. Make the first entry of Exercise 2 look like this:

   $$2\left[3\frac{a}{z} + 2\left(\frac{a}{d} + 7\right)\right]$$

5. Typeset: The Pauli matrices are:

   $$\sigma^1 = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}, \quad \sigma^2 = \begin{pmatrix} 0 & -i \\ i & 0 \end{pmatrix} \quad \text{and} \quad \sigma^3 = \begin{pmatrix} 1 & \\ 0 & -1 \end{pmatrix}$$

   Note: The blank in the 2nd entry of the 1st row of σ^3 is a deliberate typo

Exercise 1:
```
‘‘Taylor expansion $e^x=\sum_{n=0}^\infty \frac1{n!}x^n$.’’
\[\int_{0}^1 \frac{df}{dx}dx= f(1)-f(0)\]
\[e^{\zeta(s)}=\prod_{n=1}^\infty e^{1/n^s}\]
```

Exercise 2:
```
\[ 2\left[3\frac{a}{z}+2\left(\frac{a}{d}+7\right)\right] \]
```
and
```
\[ \left.x^2\left(\sum_nA_n+3\left(b+\frac1c\right)\right)\right]_0 \]
```

Exercise 3:
```
\begin{multline*}
2\left(1+\frac12+\frac1{2^2}+\frac1{2^3}+\frac1{2^4}
       +\frac1{2^5}+\frac1{2^6}+\frac1{2^7}
               +\frac1{2^8}+\frac1{2^9}\right.\\
\left.+\frac1{2^{10}}+\frac1{2^{11}}\right)=\frac{4095}{1024}
\end{multline*}
```

Exercise 4:
```
\[ 2\Bigg[3\frac{a}{z}+
       2\bigg(\frac{a}{d}+7\bigg)\Bigg] \]
```

Exercise 5:
```
The Pauli matrices are:
\[\sigma^1=\begin{pmatrix}0&1\\1&0\end{pmatrix},\quad
\sigma^2=\begin{pmatrix}0&-i\\i&0\end{pmatrix}\quad\text{and}\quad
\sigma^3=\begin{pmatrix}1&\\0&-1\end{pmatrix}
\]
```

Exercises (February 28, 2018):

1. Typeset: The Pauli matrices are:

$$\sigma^1 = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}, \quad \sigma^2 = \begin{pmatrix} 0 & -i \\ i & 0 \end{pmatrix} \quad \text{and} \quad \sigma^3 = \begin{pmatrix} 1 & \\ 0 & -1 \end{pmatrix}$$

Note: The blank in the 2nd entry of the 1st row of σ^3 is a deliberate typo

2. Typset this:

$a \times b$	$c + d$
α	γ
3	1.1

3. Typeset this:

Jersey	First Name	Last Name
10	Cristiano	Ronaldo
11	Didier	Drogba

4. Modify the previous table to typeset this:

Jersey	First Name	Last Name
10	Cristiano	Ronaldo
10	Edson	Arantes do Nascimento (Pele)
11	Didier	Drogba

5. Typeset this:

Shape	Area	Perimeter
Disk of radius R	πR^2	$2\pi R$
Rectangle of sides L_1 and L_2	$L_1 L_2$	$2(L_1 + L_2)$
Square of side $L_1 = L_2$		
Right triangle, base b and height h	$\frac{1}{2}bh$	$b + h + \sqrt{b^2 + h^2}$

6. Optional exercise: Typeset this (note the alignment at equal sign)

a	$x^2 + y = 30$
b	$100 = \sin(\theta) + \cos\varphi$
c	$q \cup p = q \cap p$

Solutions

Exercise 1:
```
The Pauli matrices are:
\[\sigma^1=\begin{pmatrix}0&1\\1&0\end{pmatrix},\quad
\sigma^2=\begin{pmatrix}0&-i\\i&0\end{pmatrix}\quad\text{and}\quad
\sigma^3=\begin{pmatrix}1&\\0&-1\end{pmatrix}
\]
```

Exercise 2:
```
\[
\begin{array}{||r|l||}
a\times b& c+d\\
\alpha &\gamma\\
\hline
3&1.1
\end{array}
\]
```

Exercise 3:
```
\begin{center}
\begin{tabular}{c||l|l}
  Jersey & First Name & Last Name \\
\hline\hline
  10 & Cristiano & Ronaldo \\
\hline
  11 & Didier & Drogba
\end{tabular}
\end{center}
```

Exercise 4:
```
\begin{center}
\begin{tabular}{c||l|l}
  Jersey & First Name & Last Name \\
\hline\hline
  10 & Cristiano & Ronaldo \\
  \hline
10 & Edson & Arantes do Nascimento (Pele)\\
\hline
  11 & Didier & Drogba
\end{tabular}
\end{center}
```

Exercise 5:
```
\begin{center}
\begin{tabular}{|p{2in}|c|c|}
Shape&Area&Perimeter\\
\hline\hline
Disk of radius $R$ &$\pi R^2$ & $2\pi R$\\
\hline
Rectangle of sides $L_1$ and $L_2$ & $L_1L_2$&$2(L_1+L_2)$\\
\cline{1-1}
Square of side $L_1=L_2$ & & \\
\hline
Right triangle, base $b$ and height $h$ & $\frac12bh$&$b+h+\sqrt{b^2+h^2}$
\end{tabular}
\end{center}
```

Exercise 6: Solution:

```
\begin{center}
\begin{tabular}{|l|r@{~$=$~}l|}
\hline
a&$x^2+y$&30\\\hline
b&100&$\sin(\theta)+\cos\varphi$\\\hline
c&$q\cup p$&$q \cap p$\\\hline
\end{tabular}
\end{center}
```

Exercises (March 7, 2018):

1. Experiments:

   (a) Paste a lot of text into your document, enough for a couple of pages of typeset material, at least 6 good paragraphs.
   (*Hint*: Find one good paragraph, copy it into the buffer, and paste it many times into your document).

   Then insert your *Dream Team Table* between paragraphs 2 and 3. Include a caption with a `\label{dreamteam}` (you provide the text). Insert `\ref{dreamteam}` somewhere in the text before and again after where you inserted the table.

   Typeset once with each of positioning `b`, `t` and `h`.

   (b) Copy the table and caption and paste into the space between paragraphs 4 and 5. Typeset. Check console (warning on repeated labels).

   Change label of second table: `\label{dreamteam2}`. Insert a few `\ref{dreamteam2}` somewhere in the text before and again after where you inserted the table.

2. Resize and crop the triton image to get this:

3. *Experiment* with images just as you did with tables above, and with both tables and figures in the same document. Download additional figures from the web.

Solutions

Exercise 1: Make sure you leave a blank line between paragraphs!

Exercise 2:

```
\begin{center}
\includegraphics[width=3cm,trim= 7cm 6cm 8cm 1cm,clip]{gl-5-triton.png}+
\end{center}
```

Exercises (March 14, 2018):

1. Typeset this definition:

$$\int_0^\infty f(x)\,dx \equiv \lim_{t\to\infty} \int_0^t f(x)\,dx$$

2. Typeset this equation:

$$\sqrt[n]{x^{1/n}} = (\sqrt[n]{x})^{\frac{1}{n}} = x^{1/n^2}$$

3. Typeset:

$$|\vec{a}+\vec{b}|^2 = \vec{a}\cdot\vec{a} + 2\vec{a}\cdot\vec{b} + \vec{b}\cdot\vec{b}$$

Solutions

Exercise 1: `\[ \int_0^\infty f(x)\,dx\equiv \lim_{t\to\infty}\int_0^t f(x)\,dx \]`

Exercise 2: `\[ \sqrt[n]{x^{{1/n}}}=(\sqrt[n]{x})^{\frac{1}{n}}=x^{1/n^2}\]`

Exercise 3: `\[ |\vec a +\vec b|^2=\vec a \cdot \vec a+2\vec a \cdot \vec b+\vec b \cdot \vec b \]`