A Complete Example (→ B.1)

Every element shows up

Version 1.6.2

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If the subtitle is not sufficient, this <TitleComment> element can be used for a slightly longer text on the front page.

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Abstract

This document tries to use all elements that exist in GAPDoc. In addition, the final output not only contains the usual content, but also an appendix with the source text. There are also links from the usual content to the corresponding source text. This should enable new users to learn GAPDoc quickly.

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Acknowledgements

We thank Lehrstuhl D für Mathematik.

Colophon

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A Complete Example (→ B.1)

Text before chapter 1. (→ B.2)
Chapter 1

Sectioning Elements

Text before the section 1.1. (→ B.2)

1.1 Normal subsections

[→ B.3]

1.1.1 A subsection
This is text in the first subsection.

1.1.2 Another subsection
This is text in the second subsection. This subsection has a label, such that one can reference it.

1.2 ManSections

[→ B.4]

1.2.1 f

▷ f(x[, y])

Returns: an element in IsBlubb (1.2.8) or fail.
This function calculates something.

1.2.2 \{\}\[\<& (for nothing)

▷ \{\}\[\<& (c)

This method is for an operation with a tricky name.
1.2.3 MyOperation
▷ MyOperation(x) (operation)

The operation MyOperation operates on \( x \).

1.2.4 MyOperation (First)
▷ MyOperation(x) (method)

This method calculates something by the generic method.

1.2.5 MyOperation (for bla)
▷ MyOperation(x[, good_hint]) (method)

This is the super-fast method for the operation MyOperation (1.2.3) if the argument \( x \) is in the representation IsBla (1.2.7). It will become even faster if the optional argument \text{good\_hint} is given.

1.2.6 MyConstructor
▷ MyConstructor(filt, x) (constructor)

The constructor MyConstructor constructs from \( x \) an object in \( \text{filt} \).

1.2.7 IsBla
▷ IsBla(obj) (representation)

For objects in this representation there is a super-fast method (see MyOperation (1.2.5)) for the operation MyOperation (1.2.3).

1.2.8 IsBlubb
▷ IsBlubb(obj) (property)

A property.

1.2.9 NumberBlobbs
▷ NumberBlobbs(obj) (attribute)

An attribute. Number of blobbs.

1.2.10 AllBlibbs
▷ AllBlibbs (global variable)

This global variable holds a list of all blibbs.
1.2.11 BlibbsFamily

BlibbsFamily

Family of all blibbs.

1.2.12 InfoBlibbs

InfoBlibbs

This info class is used throughout the library of blibbs.
Chapter 2

Other Markup

2.1 Various types of text

In this section we present examples for all the various types of text that are possible in GAPDoc:

- This is emphasized.
- Keywords are typeset like this and that.
- Arguments of functions have an element. They look like this: \(x\) and \(y\).
- Code can be written with the Code element: if \(x = y\) then Print("Equal"); fi; or while true do Print("Hello"); od;.
- Filenames have their own element: /usr/local/ca/gap4r2 or pkg/xgap/doc.
- Buttons, menus, menu entries, and such things are also supported: OK or CANCEL.
- Packages are typeset like this: Small Groups Library
- Quoted text: "This is a text in quotes."

Paragraphs are separated by the empty Par or P element.

Alternatives for different output formats: This is \LaTeX output.

There are also three elements to typeset “verbatim-like” text. (→ B.6)

The first is a Listing:

```
Sieve := function(n)
  # Returns the primes less than n
  local l,p,i;
  l := [1..n]; Unbind(l[1]);
  p := 2;
  while p^2 <= n do
    if IsBound(l[p]) then
      i := 2 * p;
      while i <= n do Unbind(l[i]); i := i + p; od;
    fi;
    p := p + 1;
```
od;
    return Compacted(l);
end;

Here is a *Log* of a GAP session using this function:

```gap
Sieve(100);
[ 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61,
  67, 71, 73, 79, 83, 89, 97 ]
Length(last);
25
```

Here is a GAP *Example* session that is automatically tested:

```gap
s := Size(CharacterTable("M"));
808017424794512875886459904961710757005754368000000000
s < 10^53;
false
s < 10^54;
true
```

## 2.2 Formulae

[→ B.7]

There are three types of formulae. The first is the *normal math mode* of \LaTeX: $b_i \cdot b_j = \sum_{k=1}^{d} h_{ijk} b_k$. Then there are *displayed formulae*:

\[
\Rightarrow \left( \sum_{i=1}^{d} x_i b_i \right) \cdot \left( \sum_{j=1}^{d} y_j b_j \right) = \sum_{k=1}^{d} \left( \sum_{i,j} x_i y_j h_{ijk} \right) b_k
\]

If possible, use the `Alt` element to specify a better readable text version of such a formula as in the following example:

\[
\Rightarrow \left( \sum_{i=1}^{d} x_i b_i \right) \cdot \left( \sum_{j=1}^{d} y_j b_j \right) = \sum_{k=1}^{d} \left( \sum_{i,j} x_i y_j h_{ijk} \right) b_k
\]

For small formulae without “difficult” parts use the `M` element: $b_i, x^2, x^2 + 2x + 1 = (x + 1)^2$. Note that here whitespace matters for text (or HTML) output.

Here are two formulae containing less than characters which are special characters for XML: $a < b < c < d$ and $e < f$.

Using the `Mode` attribute of a `Display` element formulae like

\[
a \rightarrow a \mod m!
\]

can also be displayed nicely in text and HTML output.
2.3 Crossreferencing

In this section we demonstrate various references to parts of this document. Here is a reference to this section: 2.3. Here is a reference to chapter 1, to appendix A, and to subsection 1.1.1.

We distinguish among others references to functions (see $f$ (1.2.1)), to methods with tricky name (see $\backslash\{\backslash[\backslash]\backslash\{\&$ (1.2.2)), to operations (see MyOperation (1.2.3)), to methods (see MyOperation (1.2.4) or MyOperation (1.2.5)), to filters (see IsBla (1.2.7)), to properties (see IsBlubb (1.2.8)), to attributes (see NumberBlobbs (1.2.9)), to variables (AllBlibbs (1.2.10)), to families (see BlibbsFamily (1.2.11)), and to info classes (see InfoBlibbs (1.2.12)).

There are also references to labels: see 2.3, to other books: see (GAPDoc: What is a DTD?) or IsSubgroup (Reference: IsSubgroup) in the GAP reference manual.

References to sections come in two styles: 1 or ‘Sectioning Elements’.

Another type of cross referencing is bibliography. Here is a citation: [CR81, (5.22)] is an interesting lemma.

There are also URLs:

http://www.math.rwth-aachen.de/

Email addresses have a special element: Frank.Luebeck@Math.RWTH-Aachen.De

and Homepages another one: http://www-groups.mcs.st-and.ac.uk/~neunhoef/

And here is a link to the EDIM archives.

One can generate index entries as follows (look up the words “\LaTeX-UserGroup”, “RWTH”, “Aachen, Hauptbahnhof”, and “GAPDoc, for GAP programmers”).

2.4 Lists and Tables

There are

• lists
• enumerations, and
• tables

or:

1. lists
2. enumerations, and
3. tables

or with marks:

lists: not numbered

enumerations:
numbered

tables:
two-dimensional
Lists can also be nested:

1. (a) first item of inner enumeration
   (b) second item of inner enumeration

2. • first item of inner list
   • second item of inner list

Here is a table:

<table>
<thead>
<tr>
<th>Object</th>
<th>Price</th>
<th>available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoe</td>
<td>$1.00</td>
<td>there</td>
</tr>
<tr>
<td>Hat</td>
<td>$2.00</td>
<td>not there</td>
</tr>
</tbody>
</table>

**Table:** Prices

### 2.5 Entities and Special Characters

[→ B.10]

Here is a table of special characters, the first two are special for XML and must be typed in by entities in GAPDoc documents. The other characters are special for \LaTeX but in GAPDoc they can be typed directly.

<table>
<thead>
<tr>
<th>&amp;</th>
<th>&lt;</th>
<th>&gt;</th>
<th>#</th>
<th>$</th>
<th>%</th>
<th>~</th>
<th>\</th>
<th>{</th>
<th>}</th>
<th>_</th>
<th>^</th>
</tr>
</thead>
</table>

**Table:** Special characters in character data

And here are the predefined entities in GAPDoc:

| $\&$GAP; | GAP |
| $\&$GAPDoc; | GAPDoc |
| $\&$TeX; | \TeX |
| $\&$LaTeX; | \LaTeX |
| $\&$BibTeX; | Bib\TeX |
| $\&$MeatAxe; | MeatAxe |
| $\&$XGAP; | XGAP |
| $\&$copyright; | © |

**Table:** Predefined Entities in the GAPDoc system

And some more for mathematical symbols: $\mathbb{C}, \mathbb{Z}, \mathbb{N}, \mathbb{P}, \mathbb{Q}, \mathbb{H}, \mathbb{R}$. 
Appendix A

An Appendix

[→ B.11]
This is an appendix.
Appendix B

The Source

B.1 TitlePage (Source)

```xml
>TitlePage
  <Title>A Complete Example (&see; <Ref Sect="One"/>)</Title>
  <Subtitle>Every element shows up</Subtitle>
  <Version>Version 1.6.2</Version>
  <TitleComment>
    If the subtitle is not sufficient, this &lt;TitleComment&gt;
    element can be used for a slightly longer text on the front page.
  </TitleComment>
  <Author>Frank Lübeck
    <Email>Frank.Luebeck@Math.RWTH-Aachen.De</Email>
  </Author>
  <Author>Max Neunhöffer
    <Email>neunhoef at mcs.st-and.ac.uk</Email>
  </Author>
  <Date>September 2011</Date>
  <Address>
    Lehrstuhl D für Mathematik
    Templergraben
    64
    52062 Aachen
    (Germany)
  </Address>
  <Abstract>This document tries to use all elements that exist in &GAPDoc;.
    In addition, the final output not only contains the usual
    content, but also an appendix with the source text. There
    are also links from the usual content to the corresponding
    source text. This should enable new users to learn &GAPDoc;
    quickly.
  </Abstract>
  <Copyright>© 2000-2011 by Frank Lübeck and Max Neunhöffer</Copyright>
  <Acknowledgements>We thank Lehrstuhl D für Mathematik.
  </Acknowledgements>
  <Colophon>This is the Colophon page.
  </Colophon>
</TitlePage>
```
B.2 Before First Chapter (Source)

```xml
<TableOfContents/>

<Body>

Text before chapter <Ref Chap="First"/>.</n
<Chapter Label="First"><Heading>Sectioning Elements</Heading>

Text before the section <Ref Sect="FirstSect"/>.

</Chapter>
</Body>
```

B.3 First Chapter (Source)

[1]

```xml
<Section Label="FirstSect"><Heading>Normal subsections</Heading>

<Subsection Label="Asub"><Heading>A subsection</Heading>

This is text in the first subsection.

</Subsection>

<Subsection Label="Another"><Heading>Another subsection</Heading>

This is text in the second subsection. This subsection has a label, such that one can reference it.

</Subsection>

</Section>
```

B.4 ManSections (Source)

[1.2]

```xml
<Section><Heading>ManSections</Heading>

<ManSection>
<Func Name="f" Arg="x[,y]" Comm="calculates something"/>
<Returns>an element in <Ref Filt="IsBlubb" /> or <K>fail</K>.</Returns>
</Description>

This function calculates something.
</Description>
</ManSection>

<ManSection>
<Meth Name="\"\{\}\[\<\&amp;" Arg="c" Label="for nothing" Comm="tricky name"/>
```
This method is for an operation with a tricky name.

The operation operates on .

This method calculates something by the generic method.

This is the super-fast method for the operation if the argument is in the representation . It will become even faster if the optional argument is given.

The constructor constructs from an object in .

For objects in this representation there is a super-fast method (see ) for the operation.

For property, whether object is blubb.
A property.
</Description>
</ManSection>

<ManSection>
<Attr Name="NumberBlobbs" Arg="obj" Comm="number of blobbs"/>
<Description>
An attribute. Number of blobbs.
</Description>
</ManSection>

<ManSection>
<Var Name="AllBlibbs" Comm="list of all blibbs in the system"/>
<Description>
This global variable holds a list of all blibbs.
</Description>
</ManSection>

<ManSection>
<Fam Name="BlibbsFamily" Comm="family of blibbs"/>
<Description>
Family of all blibbs.
</Description>
</ManSection>

<ManSection>
<InfoClass Name="InfoBlibbs" Comm="InfoClass for the library of blibbs"/>
<Description>
This info class is used throughout the library of blibbs.
</Description>
</ManSection>

</Section>

B.5 Various Types of Text (Source)

In this section we present examples for all the various types of text that are possible in &GAPDoc;:
<List>
<Item>
<Emph>This</Emph> is <E>emphasized</E>.</Item>
<Item>
<E>Keywords</E> are typeset like <Keyword>this</Keyword> and <K>that</K>.
</Item>
</List>
Arguments of functions have an element. They look like this:
<Arg>x</Arg> and <A>y</A>.

Code can be written with the Code element:
<Code>if x = y then Print("Equal"); fi;</Code> or
<C>while true do Print("Hello"); od;</C>.

Filenames have their own element:
<File>/usr/local/ca/gap4r2</File> or <F>pkg/xgap/doc</F>.

Buttons, menus, menu entries, and such things are also supported: <B>OK</B> or <Button>Cancel</Button>.

Packages are typeset like this:
<Package>Small Groups Library</Package>

Quoted text: <Q>This is a text in quotes.</Q>

Paragraphs are separated by the empty <C>Par</C> or <C>P</C> element.

There are also three elements to typeset <Q>verbatim-like</Q> text.

The first is a <E>Listing</E>:

```gml
<![CDATA[Sieve := function(n)
    # Returns the primes less than n
    local l,p,i;
    l := [1..n]; Unbind(l[1]);
    p := 2;
    while p^2 <= n do
        if IsBound(l[p]) then
            i := 2 * p;
            while i <= n do Unbind(l[i]); i := i + p; od;
        fi;
        p := p + 1;
    fi;
    Unbind(l[n]);
]>
```

B.6 Verbatim-like text (Source)

There are also three elements to typeset <Q>verbatim-like</Q> text.

The first is a <E>Listing</E>:
Here is a Log of a GAP session using this function:

```
gap>& Sieve(100);
[ 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61,
  67, 71, 73, 79, 83, 89, 97 ]
gap>& Length(last);
25
```

Here is a GAP Example session that is automatically tested:

```
gap>& s := Size(CharacterTable("M"));
808017424794512875886459904961710757005754368000000000
gap>& s &lt; 10^53;
false
gap>& s &lt; 10^54;
true
```

B.7 Formulae (Source)

There are three types of formulae. The first is the normal math mode of LaTeX:

\[ b_i \cdot b_j = \sum_{k=1}^d h_{ijk} b_k \]

Then there are displayed formulae:

\[ \Longleftrightarrow \quad \left( \sum_{i=1}^d x_i b_i \right) \cdot \left( \sum_{j=1}^d y_j b_j \right) = \sum_{k=1}^d \left( \sum_{i,j} x_i y_j h_{ijk} \right) b_k \]

If possible, use the Alt element to specify a better readable text version of such a formula as in the following example:

\[ \Longleftrightarrow \quad \sum_{i=1}^d x_i b_i \right) \cdot \left( \sum_{j=1}^d y_j b_j \right) = \sum_{k=1}^d \left( \sum_{i,j} x_i y_j h_{ijk} \right) b_k \]
\[
\sum_{j=1}^d y_j b_j = \\
\sum_{k=1}^d \left( \sum_{i,j} x_i y_j h_{ijk} \right) b_k
\]

For small formulae without difficult parts use the \element{C} element: \element{M}{b_i}, \element{M}{x^2/M}, \element{M}{x^2 + 2x + 1 = (x + 1)^2/M}. Note that here whitespace matters for text (or HTML) output).

Here are two formulae containing less than characters which are special characters for XML: \element{M}{<![CDATA[a < b < c < d]]>}/ and \element{M}{e &lt; f}.

B.8 Crossreferencing (Source)

\[2.3\]

In this section we demonstrate various references to parts of this document. Here is a reference to this section: \element{Ref Sect="Cross"/}. Here is a reference to chapter \element{Ref Chap="First"/}, to appendix \element{Ref Appendix="Appendix"/}, and to subsection \element{Ref Subsect="Asub"/}.\element{P/}

We distinguish among others references

to functions (see \element{Ref Func="f"/}),
to methods with tricky name (see \element{Ref Meth="\{\}\\&lt;\&amp;" Label="for nothing"/}),
to operations (see \element{Ref Oper="MyOperation"/}),
to methods (see \element{Ref Meth="MyOperation Label="First"/} or \element{Ref Meth="MyOperation Label="for bla"/>),
to filters (see \element{Ref Filt="IsBla"/>),
to properties (see \element{Ref Prop="IsBlubb"/>),
to attributes (see \element{Ref Attr="NumberBlobbs"/>),
to variables (see \element{Ref Var="AllBlibbs"/>),
to families (see \element{Ref Fam="BlibbsFamily"/>),
and to info classes (see \element{Ref InfoClass="InfoBlibbs"/>).\element{P/}
There are also references to labels: see `<Ref Text="here" Label="there"/>`, to other books: see `<Ref Sect="syntaxXML" BookName="gapdoc"/>` or `<Ref Oper="IsSubgroup" BookName="ref"/>` in the GAP; reference manual.

References to sections come in two styles:
`<Ref Chap="First" Style="Number"/>` or `<Ref Chap="First" Style="Text"/>`.

Another type of cross referencing is bibliography. Here is a citation: `<Cite Key="CR1" Where="(5.22)"/>` is an interesting lemma.

There are also URLs:
`<URL>http://www.math.rwth-aachen.de/LDfM/</URL>`

Email addresses have a special element:
`<Email>Frank.Luebeck@Math.RWTH-Aachen.De</Email>`

and Homepages another one:
`<Homepage>http://www-groups.mcs.st-and.ac.uk/~neunhoef/</Homepage>`

One can generate index entries as follows (look up the words `<Q>&TeX;-UserGroup</Q>`, `<Q>RWTH</Q>`, and `<Q>Aachen, Hauptbahnhof</Q>`).
`<Index Key="TeX-Usergroup"><&TeX;-UserGroup/></Index>
[Index Key="RWTH"></Index>
[Index Key="Aachen"><Subkey>Hauptbahnhof</Subkey></Index>
[Index Key="GAPDoc"><Subkey>"for GAP programmers"&GAPDoc;</Subkey>for &GAP; programmers</Subkey></Index>`

### B.9 Lists and Tables (Source)

There are
`<List>
<Item>lists</Item>
<Item>enumerations, and</Item>
<Item>tables</Item>
</List>`

or:
A Complete Example (→ B.1)

<Enum>
  <Item>lists</Item>
  <Item>enumerations, and</Item>
  <Item>tables</Item>
</Enum>

or with marks:
<List>
  <Mark>lists:</Mark><Item> not numbered</Item>
  <Mark>enumerations:</Mark><Item> numbered</Item>
  <Mark>tables:</Mark><Item> two-dimensional</Item>
</List>

Lists can also be nested:
<Enum>
  <Item>
    <Enum>
      <Item>first item of inner enumeration</Item>
      <Item>second item of inner enumeration</Item>
    </Enum>
  </Item>
  <Item>
    <List>
      <Item>first item of inner list</Item>
      <Item>second item of inner list</Item>
    </List>
  </Item>
</Enum>

Here is a <E>table</E>:
<table align="|r|c|l|"><caption>Prices</caption>
  <tr><td>Object</td><td>Price</td><td>available</td></tr>
  <tr><td>Shoe</td><td>$1,00</td><td>there</td></tr>
  <tr><td>Hat</td><td>$2,00</td><td>not there</td></tr>
</table>
Here is a table of special characters, the first two are special for XML and must be typed in by entities in &GAPDoc; documents. The other characters are special for &LaTeX{} but in &GAPDoc{} they can be typed directly.

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|c|c|c|c|}
\hline
\textbf{Special characters in character data}  \\
\hline
\texttt{&amp;} & \texttt{&lt;} & \texttt{&gt;} & \texttt{#} & \texttt{$$} & \texttt{\%} & \texttt{\~} \\
\hline
\end{tabular}
\caption{Special characters in character data}
\end{table}

And here are the predefined entities in &GAPDoc{}:

\begin{table}[h]
\centering
\begin{tabular}{|l|l|}
\hline
\texttt{&amp;GAP;} & \texttt{&GAP;}  \\
\hline
\texttt{&amp;GAPDoc;} & \texttt{&GAPDoc;}  \\
\hline
\texttt{&amp;TeX;} & \texttt{&TeX;}  \\
\hline
\texttt{&amp;LaTeX;} & \texttt{&LaTeX;}  \\
\hline
\texttt{&amp;BibTeX;} & \texttt{&BibTeX;}  \\
\hline
\texttt{&amp;MeatAxe;} & \texttt{&MeatAxe;}  \\
\hline
\texttt{&amp;XGAP;} & \texttt{&XGAP;}  \\
\hline
\texttt{&amp;copyright;} & \texttt{&copyright;}  \\
\hline
\end{tabular}
\caption{Predefined Entities in the &GAPDoc{} system}
\end{table}
And some more for mathematical symbols: &CC;, &ZZ;, &NN;, &PP;, &QQ;, &HH;, &RR;.

B.11 Appendix (Source)

[A]

<Appendix><Heading>An Appendix</Heading>

This is an appendix.
</Appendix>
References

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IsBlubb, 6
MyConstructor, 6
MyOperation, 6
   First, 6
   for bla, 6
NumberBlobbs, 6
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\TeX-UserGroup, 10