# Exercise 1.4 Experiments with sorting

```
{a,b,c,d,e,f,g,h,i,j,k,l,m,n,o,p,q,r,s,t,u,v,w,x,y,z#}::Indices(position=independent).

\partial{#}::PartialDerivative.

expr := C^{f}
        w^{e}
        B^{d}
        v^{c}
        A^{b}
        u^{a}.                          # cdb (ex-0104.100,expr)

sort_product (expr)                     # cdb (ex-0104.101,expr)

expr := \Omega_{f}
        \gamma_{e}
        \Pi_{d}
        \beta_{c}
        \Gamma_{b}
        \alpha_{a}.                     # cdb (ex-0104.200,expr)

sort_product (expr)                     # cdb (ex-0104.201,expr)

expr := C^{f}
        w^{e}
        B^{d}
        v^{c}
        A^{b}
        u^{a}
        \Omega_{f}
        \gamma_{e}
        \Pi_{d}
        \beta_{c}
        \Gamma_{b}
        \alpha_{a}.                     # cdb (ex-0104.300,expr)

sort_product (expr)                     # cdb (ex-0104.301,expr)
```

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37
38  expr := \partial_{f}{C^{f}}
39          w^{l}
40          \partial_{d}{B^{d}}
41          v^{k}
42          \partial_{b}{A^{b}}
43          u^{j}
44          \Omega_{i}
45          \partial^{e}{ \gamma_{e}}
46          \Pi_{h}
47          \partial^{c}{\beta_{c}}
48          \Gamma_{g}
49          \partial^{a}{\alpha_{a}}.      # cdb (ex-0104.400,expr)
50
51  sort_product (expr)                    # cdb (ex-0104.401,expr)
52
53  expr := \partial{C}
54          w
55          \partial{B}
56          v
57          \partial{A}
58          u
59          \Omega
60          \partial{ \gamma}
61          \Pi
62          \partial{\beta}
63          \Gamma
64          \partial{\alpha}.              # cdb (ex-0104.500,expr)
65
66  sort_product (expr)                    # cdb (ex-0104.501,expr)
67
68  expr := A_{b}
69          A_{a}
70          A_{c d e}
71          A_{f g}.                       # cdb (ex-0104.600,expr)
72
73  sort_product (expr)                    # cdb (ex-0104.601,expr)
74
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75  expr :=  A_{a} A^{a}
76         + A^{a} A_{a}.                  # cdb (ex-0104.700,expr)
77
78  sort_product (expr)                    # cdb (ex-0104.701,expr)
```

$$\texttt{ex-0104.100} := C^{f} w^{e} B^{d} v^{c} A^{b} u^{a}$$

$$\texttt{ex-0104.101} := A^{b} B^{d} C^{f} u^{a} v^{c} w^{e}$$

$$\texttt{ex-0104.200} := \Omega_{f} \gamma_{e} \Pi_{d} \beta_{c} \Gamma_{b} \alpha_{a}$$

$$\texttt{ex-0104.201} := \Gamma_{b} \Omega_{f} \Pi_{d} \alpha_{a} \beta_{c} \gamma_{e}$$

$$\texttt{ex-0104.300} := C^{f} w^{e} B^{d} v^{c} A^{b} u^{a} \Omega_{f} \gamma_{e} \Pi_{d} \beta_{c} \Gamma_{b} \alpha_{a}$$

$$\texttt{ex-0104.301} := A^{b} B^{d} C^{f} \Gamma_{b} \Omega_{f} \Pi_{d} \alpha_{a} \beta_{c} \gamma_{e} u^{a} v^{c} w^{e}$$

$$\texttt{ex-0104.400} := \partial_{f} C^{f} w^{l} \partial_{d} B^{d} v^{k} \partial_{b} A^{b} u^{j} \Omega_{i} \partial^{e} \gamma_{e} \Pi_{h} \partial^{c} \beta_{c} \Gamma_{g} \partial^{a} \alpha_{a}$$

$$\texttt{ex-0104.401} := \Gamma_{g} \Omega_{i} \Pi_{h} \partial_{b} A^{b} \partial_{d} B^{d} \partial_{f} C^{f} \partial^{a} \alpha_{a} \partial^{c} \beta_{c} \partial^{e} \gamma_{e} u^{j} v^{k} w^{l}$$

$$\texttt{ex-0104.500} := \partial C w \partial B v \partial A u \Omega \partial \gamma \Pi \partial \beta \Gamma \partial \alpha$$

$$\texttt{ex-0104.501} := \Gamma \Omega \Pi \partial A \partial B \partial C \partial \alpha \partial \beta \partial \gamma u v w$$

$$\texttt{ex-0104.600} := A_{b} A_{a} A_{cde} A_{fg}$$

$$\texttt{ex-0104.601} := A_{a} A_{b} A_{fg} A_{cde}$$

$$\texttt{ex-0104.700} := A_{a} A^{a} + A^{a} A_{a}$$

$$\texttt{ex-0104.701} := A_{a} A^{a} + A^{a} A_{a}$$