Exercise 1.11 Cycling free indices – preferred solution

```
{a,b,c,d,e,f,u,v,w}::Indices.

expr := A_{a b c}.                                  # cdb (ex-0111.101,expr)

rule := T_{a b c} -> @(expr).
expr := T_{b c a}.                                  # cdb (ex-0111.102,expr)

substitute (expr, rule)                             # cdb (ex-0111.103,expr)
```

$$A_{abc} \tag{ex-0111.101}$$
$$T_{bca} \tag{ex-0111.102}$$
$$A_{bca} \tag{ex-0111.103}$$

Exercise 1.11 Cycling free indices – alternative solution

This alternative solution uses two rounds of Kroncker deltas. It does the job but is not as simple as the previous solution.

```
{a,b,c,d,e,f,u,v,w}::Indices.

\delta{#}::KroneckerDelta.

expr := A_{a b c}.                                          # cdb (ex-0111.201,expr)

expr := \delta^{a}_{u} \delta^{b}_{v} \delta^{c}_{w} @(expr).  # cdb (ex-0111.202,expr)

eliminate_kronecker (expr)                                  # cdb (ex-0111.203,expr)

expr := \delta^{u}_{b} \delta^{v}_{c} \delta^{w}_{a} @(expr).  # cdb (ex-0111.204,expr)

eliminate_kronecker (expr)                                  # cdb (ex-0111.205,expr)
```

$$A_{abc} \tag{ex-0111.201}$$
$$\delta^{a}{}_{u}\delta^{b}{}_{v}\delta^{c}{}_{w}A_{abc} \tag{ex-0111.202}$$
$$A_{uvw} \tag{ex-0111.203}$$
$$\delta^{u}{}_{b}\delta^{v}{}_{c}\delta^{w}{}_{a}A_{uvw} \tag{ex-0111.204}$$
$$A_{bca} \tag{ex-0111.205}$$