Aufgabe 1

The greatest common denominator:

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$\{\, m > 0 \wedge n > 0 \,\}[\ \mathbf{glocon}\, m, n; \mathbf{virvar}\, gcd \quad ;\ \mathbf{privar}\, i, j \quad ;\ i\ \mathbf{vir}\ int, j\ \mathbf{vir}\ int\ := m, n$
$;\ \mathbf{do}\ \ i \neq j\ \rightarrow\ \mathbf{if}\ \ i > j\ \rightarrow\ i\ := i - j \quad [\!]\ \ j > i\ \rightarrow\ j\ := j - i \quad \mathbf{fi}$
$\mathbf{od} \quad ;\ \mathrm{gcd}\ \ \mathbf{vir}\mathrm{int}\ \ := i \quad ]\ \ \{\, gcd = \mathbf{gcd}.(n, m) \,\}$
```

This is the outcome of p0:

```
$\mathit{out:}\ [\ \mathbf{glocon}\, n, q; \mathbf{virvar}\, d\{\, 0 \leq n < q \,\} \quad ;\ \mathbf{privar}\, u, v \quad ;\ d\ \mathbf{vir}\ int\ \mathbf{array}, u\ \mathbf{vir}\ int, v\ \mathbf{vir}\ int\ := (1), 10, n{*}10$
$;\ \mathbf{do}\ \ u\, \mathbf{div}\, 2 < v\ \ \wedge\ \ u \leq q\ \rightarrow\ d{:}hiext.\big((v + u\, \mathbf{div}\, 2 - 1)\, \mathbf{div}\, q\big) \quad ;\ u, v\ := 10{*}u, (v - d.high{*}q){*}10$
$\mathbf{od} \quad ;\ \mathbf{if}\ \ \mathrm{u}\ \mathbf{div} 2 < v\ \rightarrow\ d{:}hiext.\big((v + q\, \mathbf{div}\, 2)\, \mathbf{div}\, q\big)\ [\!]\ v \leq u\, \mathbf{div}\, 2\ \rightarrow\ skip\ \ \mathbf{fi}$
$]\ \ \{\, d$ contains the decimal digits of $n/q \,\}$
```

Analternative

```
$[\ \mathbf{glocon}\, m, n; \mathbf{virvar}\, gcd; \mathbf{privar}\, i, j\, ;\ i\ \mathbf{vir}\ int, j\ \mathbf{vir}\ int\ := m, n; \mathbf{do}\ \ i > j\ \rightarrow\ i\ := i - j\, [\!]\ \ i < j\ \rightarrow\ j\ := j - i$
$\mathbf{od}$
$;\ \mathrm{gcd}\ \ \mathbf{vir}\mathrm{int}\ \ := (i + j)\, \mathbf{div}\, 2 \quad ]$
```

Thisprogramcomputesthenexthigherpermutationofc.

```
$[\ \mathbf{glovar}\, c; \mathbf{privar}\, i, j \quad ;\ i\ \mathbf{vir}\ int\ := c.hib - 1;\ \mathbf{do}\ \ c.i \geq c.(i + 1)\ \rightarrow\ i\ := i - 1\ \ \mathbf{od}$
$;\ \ \mathrm{j}\ \mathbf{vir}\mathrm{int}\ \ := c.hib;\ \mathbf{do}\ \ c.j \leq c.i\ \rightarrow\ j\ := j - 1\ \ \mathbf{od}$
$;\ \ \mathrm{c{:}swap.(i,j)} \quad ;\ \ \mathrm{i}\ \ := i + 1; j\ := c.hib; \quad ;\ \mathbf{do}\ \ i < j\ \rightarrow\ c{:}swap.(i, j); i, j\ := i + 1, j - 1\ \ \mathbf{od}$
$]$
```

AndthisisthefamousDutchflagprogram:

```
$[\ \mathbf{glovar}\, buck; \mathbf{glocon}\, n; \mathbf{privar}\, r, w, b \quad ;\ r\ \ \mathbf{vir}\ \ int, w\ \ \mathbf{vir}\ \ int, b\ \ \mathbf{vir}\ \ int\ := 1, n, n$
$;\ \mathbf{do}\ \ w \geq r\ \ \rightarrow\ \ [\ \mathbf{glovar}\, buck, r, w, b; \mathbf{pricon}\, col \quad ;\ col\ \ \mathbf{vir}\ \ colour\ := buck.w$
$;\ \mathbf{if}\ \ col = red\ \rightarrow\ buck{:}swap.(r, w); r{:} = r + 1 \quad [\!]\ \ col = white\ \rightarrow\ w\ := w - 1$
$[\!]\ \ col = blue\ \rightarrow\ buck{:}swap.(w, b); w, b\ := w - 1, b - 1 \quad \mathbf{fi}$
$] \quad \mathbf{od} \quad ]$
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Aufgabe 2

2.*tex*