$\int$
$\pi ::=$
$|\int$
$\tau ::=$
$\pi|(\tau_1, \tau_2)|\tau$
$_1, v_2)|\{v_1, ..., v_k\}$
??
$_1, e_2) pair$
$|\{e_1, ..., e_k\}_{k\geq 1} primitivesequence$
$|\{\}\tau emptysequenceoftype\tau$
$_1 e_2 let - binding$
$|ebuilt - infunctioncall$
$|e_1 x e_0 generalcomprehension$
$|e_1 e_0 restrictedcomprehension$
$|f(e_1, ..., e_k) user - definedfunctioncall$
$d ::=$
$\times$
$function f(x_1 :$
$\tau_1, ..., x_k :$
$\tau_k) :$
$\tau =$
$euser - definedfunction$
e_1
$\times$
$using$
$\times$
$mkseq$
$\times$
seq
??
??
$\Gamma = [x_1 \| - > \tau_1, ..., x_i \| - > \tau_i]$

Σ
$\Sigma = [f_1 \| - > \tau_1 \times ... \times \tau_k \tau, ..., f_i \| - > \tau_1' \times ... \times \tau_m' \tau']$

$\vdash_\Sigma$
$e :$
τ
$\pi) \vdash_\Sigma a : \pi((x) = \tau) \vdash_\Sigma x : \tau$
$\vdash_\Sigma e_1 : \tau_1 \vdash_\Sigma e_2 : \tau_2 \vdash_\Sigma (e_1, e_2) : (\tau_1, \tau_2)$
$\vdash_\Sigma e_1 : \tau ... \vdash_\Sigma e_k : \tau \vdash_\Sigma \{e_1, ..., e_k\} : \{\tau\} \vdash_\Sigma \{\}\tau : \{\tau\}$
$\vdash_\Sigma e_1 : \tau_1 [x \| - > \tau_1] \vdash_\Sigma e_2 : \tau \vdash_\Sigma x e_1 e_2 : \tau$
$\vdash_\Sigma e_1 : \tau_1 ... \vdash_\Sigma e_k : \tau_k (\Sigma() = \tau_1 \times ... \times \tau_k \tau) \vdash_\Sigma e : \tau$
$\vdash_\Sigma e_0 : \{\tau_0\}[x \| - > \tau_0, \jmath x_i \| - > \tau_i] \vdash_\Sigma e_1 : \tau(\jmath(x_i) = \tau_i \in \{\pi, (\pi_1, \pi_2)\}) \vdash_\Sigma e_1 x e_0 : \tau$
$\vdash_\Sigma e_0 : [\jmath x_i \| - > \tau_i] \vdash_\Sigma e_1 : \tau(\jmath(x_i) = \tau_i) \vdash_\Sigma e_1 e_0 : \tau$
$\vdash_\Sigma e_1 : \tau_1 ... \vdash_\Sigma e_k : \tau_k (\Sigma(f) = \tau_1 \times ... \times \tau_k \tau) \vdash_\Sigma f(e_1, ..., e_k) : \tau$
τ
$\int$
$v_1 \tau_1 v_2 \tau_2 (v_1, v_2)(\tau_1, \tau_2) v_1 \tau ... v_k \tau v \{\tau\} Typingrulesofvalues$
e_1
$x_1, ..., x_j$
k
$k \geq$
0
k
??
ρ
$\rho = [x_1 \| - > v_1, ..., x_i \| - > v_i]$

$\Phi = [f \| - > (v_1, ..., v_k) v]$

$\rho \vdash_\Phi$
$ev \rho \vdash_\Phi aa(\rho(x) = v) \rho \vdash_\Phi xv \rho \vdash_\Phi e_1 v_1 \rho \vdash_\Phi e_2 v_2 \rho \vdash_\Phi (e_1, e_2)(v_1, v_2)$
$\rho \vdash_\Phi e_1 v_1 ... \rho \vdash_\Phi e_k v_k \rho \vdash_\Phi \{e_1, ..., e_k\}\{v_1, ..., v_k\} \rho \vdash_\Phi \{\}\tau\{\}$
$\rho \vdash_\Phi e_1 v_1 \rho [x \| - > v_1] \vdash_\Phi e_2 v \rho \vdash_\Phi e_1 x e_2 v$
$\rho \vdash_\Phi e_1 v_1 ... \rho \vdash_\Phi e_k v_k ((\Phi() = (v_1, ..., v_k) v) \rho \vdash_\Phi ev$
$\rho \vdash_\Phi$
$e_0 \{v_1, ..., v_k\}(\rho[x \| - > v_i] \vdash_\Phi e_1 v_i')_{i=1}^k \rho \vdash_\Phi e_1 x e_0 v'$
$\rho \vdash_\Phi e_0 \rho \vdash_\Phi e_1 e_0 \{\} \rho \vdash_\Phi e_0 \rho \vdash_\Phi e_1 v_1 \rho \vdash_\Phi e_1 x \{v_1\}$
$\rho \vdash_\Phi e_1 v_1 ... \rho \vdash_\Phi e_k v_k ((\Phi(f) = (v_1, ..., v_k) v) \rho \vdash_\Phi fev Semanticsof$
$boundsequence$
e_0
k
x
e_1
e_1
k
x
$guard$
e_0
e_1
e_1
??
$\times$
$mqseq$
$\times$
zip
$\times$
$scan$
$\times$
$reduce$
$+$
$\otimes$
??
$\oplus|\times$