```
root@7e1c3002b8e4:/work# cafeobj lecture10-compiler/submission/t.cafe
-- loading standard prelude
                                             -- CafeOBJ system Version 1.6.2(PigNose0.99) --
                                                                        built: 2024 Dec 26 Thu 0:09:00 GMT
                                                                                             prelude file: std.bin
                                                                              2025 Jan 16 Thu 13:14:52 GMT
                                                                                                         Type ? for help
                                                                                                                                ***
                                                                   -- Containing PigNose Extensions --
                                                                                                             built on SBCL
                                                                                                             2.0.1.debian
processing input : /work/lecture10-compiler/submission/t.cafe
-- defining module! BOOL-ERR
-- reading in file : bool
processing input : /usr/local/share/cafeobj-1.6/lib/bool.cafe
processing input : /usr/local/share/cafeobj-1.6/lib/base_bool.cafe
processing input : /usr/local/share/cafeobj-1.6/lib/truth.cafe
-- defining module! TRUTH
-- reading in file : truth
-- done reading in file: truth
-- defining module* BASE-BOOL
-- reading in file : eql
processing input : /usr/local/share/cafeobj-1.6/lib/eql.cafe
-- defining module! EQL
-- done reading in file: eql
processing input : /usr/local/share/cafeobj-1.6/lib/sys_bool.cafe
-- defining module! BOOL
 -- done reading in file: bool
-- defining module! NAT-ERR
-- reading in file : nat
processing input : /usr/local/share/cafeobj-1.6/lib/nat.cafe
-- defining module! NAT
-- reading in file : nznat
processing input : /usr/local/share/cafeobj-1.6/lib/nznat.cafe
-- defining module! NZNAT
-- done reading in file: nznat
-- done reading in file: nat
-- defining module! PAIR
-- defining module* TRIV-ERR
-- defining module! LIST
-- defining module* TRIV-ERR
[Warning]: Redefining module TRIV-ERR
-- defining module* VAR
-- defining module! INSTRUCT
-- defining view
-- defining module! ILIST
-- defining module! EXP
-- defining module! STM
-- defining module! ENTRYTRIV-ERR2INSTRUCT
-- defining view
-- defining module! ENV
-- defining module! INTERPRETTRIV-ERR2ENTRY
-- defining view
-- defining module! STACK
-- defining module! VM
-- defining module! COMPILE
-- opening module VM + COMPILETRIV-ERR2NAT-ERR
-- reduce in %VM + COMPILE : (genForExp(n(3))):IList
(push(3) | iln):IList
(0.00000 \text{ sec for parse}, 0.00000 \text{ sec for } 1 \text{ rewrites} + 1 \text{ matches})
-- reduce in %VM + COMPILE : (genForExp((n(3) + (n(4) * n(5))))):IList
(push(3) | (push(4) | (push(5) | (multiply | (add | iln))))):IList
(0.00000 \text{ sec for parse}, 0.00000 \text{ sec for } 15 \text{ rewrites} + 27 \text{ matches})
-- reduce in %VM + COMPILE : (generate((x := (n(3) + (n(4) * n(5))) ;))):IList
(push(3) | (push(4) | (push(5) | (multiply | (add | (store(x) | iln)))))):IList
(0.00000 \text{ sec for parse}, 0.0010 \text{ sec for } 22 \text{ rewrites} + 39 \text{ matches})
-- reduce in %VM + COMPILE : (generate((if (n(100) < n(10)) { (x := (x + n(100)) ;) } else { (x := (x - n(100)) ;)
n(21));)})):IList
   (\mathsf{push}(100) \mid (\mathsf{push}(10) \mid (\mathsf{lessThan} \mid (\mathsf{jump}0\mathsf{nCond}(2) \mid (\mathsf{jump}(6) \mid (\mathsf{load}(\mathsf{x}) \mid (\mathsf{push}(100) \mid (\mathsf{add} \mid (\mathsf{store}(\mathsf{x})))))
| (jump(5) | (load(x) | (push(21) | (minus | (store(x) | iln)))))))))))))))))))
(0.0000 sec for parse, 0.0000 sec for 91 rewrites + 155 matches)
-- reduce in %VM + COMPILE : (generate((if (n(100) > n(10)) { (x := (x + n(100)) ;) } else { (x := (x - n(100)) ;) }
n(21)) ;) }))):IList
(push(100) \mid (push(10) \mid (greaterThan \mid (jumpOnCond(2) \mid (jump(6) \mid (load(x) \mid (push(100) \mid (add \mid
(0.0010 sec for parse, 0.0000 sec for 91 rewrites + 156 matches)
-- reduce in %VM + COMPILE : (generate((if ((tmp * tmp) > x) { (z := (tmp - n(1)) ;) } else { (y := tmp
(load(tmp) \mid (load(tmp) \mid (multiply \mid (load(x) \mid (greaterThan \mid (jumpOnCond(2) \mid (jump(6) \mid (load(tmp) \mid
(push(1) | (minus | (store(z) | (jump(3) | (load(tmp) | (store(y) | iln)))))))))))))))))));IList
(0.0000 sec for parse, 0.0000 sec for 81 rewrites + 145 matches)
-- reduce in %VM + COMPILE : (generate((if (((z - y) % n(2)) === n(0)) { (tmp := (y + ((z - y) / n(2)))
;) } else { (tmp := ((y + ((z - y) / n(2))) + n(1)) ;) }))):IList
(load(z) \mid (load(y) \mid (minus \mid (push(2) \mid (mod \mid (push(0) \mid (equal \mid (jumpOnCond(2) \mid (jump(10) \mid
(load(y) \mid (load(z) \mid (load(y) \mid (minus \mid (push(2) \mid (divide \mid (add \mid (store(tmp) \mid (jump(11) \mid (load(y)
| (load(z) | (load(y) | (minus | (push(2) | (divide | (add | (push(1) | (add | (store(tmp) |
(0.0000) sec for parse, 0.0010 sec for 253 rewrites + 472 matches)
-- reduce in %VM + COMPILE : (generate((while ((y < n(10)) || (y === n(10))) { ((x := (x * y) ;) (y := (y
+ n(1));)):IList
(load(y) \mid (push(10) \mid (lessThan \mid (load(y) \mid (push(10) \mid (equal \mid (or \mid (jumpOnCond(2) \mid (jump(10) \mid
(load(x) \mid (load(y) \mid (multiply \mid (store(x) \mid (load(y) \mid (push(1) \mid (add \mid (store(y) \mid (bjump(17) \mid
iln)))))))))))))))))):IList
(0.0000) sec for parse, 0.0010 sec for 210 rewrites + 421 matches)
-- reduce in %VM + COMPILE : (generate((for y n(1) n(10) \{(x := (y * x);)\})):IList
(push(1) \mid (store(y) \mid (load(y) \mid (push(10) \mid (lessThan \mid (load(y) \mid (push(10) \mid (equal \mid (or \mid (ar \mid (bastore(y) \mid (bastore(y
(jumpOnCond(2) \mid (jump(10) \mid (load(y) \mid (load(x) \mid (multiply \mid (store(x) \mid (load(y) \mid (push(1) \mid (add \mid
(store(y) | (bjump(17) | iln))))))))))))))))))))))))))))))))
(0.0000 sec for parse, 0.0010 sec for 218 rewrites + 435 matches)
-- reduce in %VM + COMPILE : (generate(((x := (y * x); (y := (y + n(1)); ())):IList
(load(y) \mid (load(x) \mid (multiply \mid (store(x) \mid (load(y) \mid (push(1) \mid (add \mid (store(y) \mid iln)))))))))))
(0.0000 sec for parse, 0.0000 sec for 30 rewrites + 59 matches)
-- reduce in %VM + COMPILE : (generate((y := n(1) ;) (while ((y < n(10)) || (y === n(10))) { ((x := (y * n(1))) } { ((x := (y * n(1))) 
x); (y := (y + n(1));)):IList
(push(1) \mid (store(y) \mid (load(y) \mid (push(10) \mid (lessThan \mid (load(y) \mid (push(10) \mid (equal \mid (or \mid (article)))))))
(jumpOnCond(2) \mid (jump(10) \mid (load(y) \mid (load(x) \mid (multiply \mid (store(x) \mid (load(y) \mid (push(1) \mid (add \mid
(store(y) | (bjump(17) | iln))))))))))))))))))))))))))))))))
(0.0000 sec for parse, 0.0010 sec for 218 rewrites + 440 matches)
-- reduce in %VM + COMPILE : (generate(p0)):IList
(push(1) \mid (store(x) \mid (push(1) \mid (store(y) \mid (load(y) \mid (push(10) \mid (lessThan \mid (load(y) \mid (push(10) \mid (push(10
 (equal \mid (or \mid (jump0nCond(2) \mid (jump(10) \mid (load(y) \mid (load(x) \mid (multiply \mid (store(x) \mid (load(y) \mid (equal \mid (or \mid (jump0nCond(2) \mid (jump(10) \mid (load(y) \mid (load(x) \mid (load(x
(0.0000 sec for parse, 0.0020 sec for 227 rewrites + 453 matches)
-- reduce in %VM + COMPILE : (run(compile(p0))):Env&Err
((x, 3628800) | ((y, 11) | empEnv)):Env
(0.0000 sec for parse, 0.0540 sec for 6033 rewrites + 15729 matches)
-- reduce in %VM + COMPILE : (compile(p1)):IList
   (\mathsf{push}(1) \mid (\mathsf{store}(\mathsf{x}) \mid (\mathsf{push}(1) \mid (\mathsf{store}(\mathsf{y}) \mid (\mathsf{load}(\mathsf{y}) \mid (\mathsf{push}(10) \mid (\mathsf{lessThan} \mid (\mathsf{load}(\mathsf{y}) \mid (\mathsf{push}(10) \mid (\mathsf{push}(10
 (equal \mid (or \mid (jump0nCond(2) \mid (jump(10) \mid (load(x) \mid (load(y) \mid (multiply \mid (store(x) \mid (load(y) \mid (equal \mid (or \mid (jump0nCond(2) \mid (jump(10) \mid (load(x) \mid (load(y) \mid (equal (equal \mid (equal 
(0.0000) sec for parse, 0.0010 sec for 253 rewrites + 510 matches)
-- reduce in %VM + COMPILE : (run(compile(p1))):Env&Err
((x, 3628800) | ((y, 11) | empEnv)):Env
(0.0000 sec for parse, 0.0600 sec for 6035 rewrites + 15740 matches)
-- reduce in %VM + COMPILE : (compile(p2)):IList
(push(1) \mid (store(x) \mid (push(1) \mid (store(y) \mid (load(y) \mid (push(10) \mid (lessThan \mid (load(y) \mid (push(10) \mid (push(10
 (equal \mid (or \mid (jump0nCond(2) \mid (jump(10) \mid (load(y) \mid (load(x) \mid (multiply \mid (store(x) \mid (load(y) \mid (equal \mid (or \mid (jump0nCond(2) \mid (jump(10) \mid (load(y) \mid (load(x) \mid (multiply \mid (store(x) \mid (load(y) \mid (equal \mid (equal \mid (equal \mid (equal \mid (equal \mid (equal (equa
(0.0000 sec for parse, 0.0010 sec for 251 rewrites + 499 matches)
-- reduce in %VM + COMPILE : (run(compile(p2))):Env&Err
((x, 3628800) | ((y, 11) | empEnv)):Env
(0.0000 sec for parse, 0.0600 sec for 6033 rewrites + 15729 matches)
-- reduce in %VM + COMPILE : (compile(p3)):IList
(push(24) \mid (store(x) \mid (push(30) \mid (store(y) \mid (load(y) \mid (push(0) \mid (notEqual \mid (jumpOnCond(2) \mid
(jump(10) \mid (load(x) \mid (load(y) \mid (mod \mid (store(z) \mid (load(y) \mid (store(x) \mid (load(z) \mid (store(y) \mid (
(bjump(13) | (quit | iln)))))))))))))))))))):IList
(0.00000 \text{ sec for parse}, 0.0010 \text{ sec for } 217 \text{ rewrites} + 444 \text{ matches})
-- reduce in %VM + COMPILE : (run(compile(p3))):Env&Err
((x, 6) | ((y, 0) | ((z, 0) | empEnv))):Env
(0.0000 sec for parse, 0.0130 sec for 1581 rewrites + 4077 matches)
-- reduce in %VM + COMPILE : (compile(p4)):IList
   (push(200000000000000000) \mid (store(x) \mid (push(0) \mid (store(y) \mid (load(x) \mid (store(z) \mid (load(y) \mid (load(z) \mid 
   | (notEqual | (jumpOnCond(2) | (jump(44) | (load(z) | (load(y) | (minus | (push(2) | (mod | (push(0) |
  (equal \mid (jump0nCond(2) \mid (jump(10) \mid (load(y) \mid (load(z) \mid (load(y) \mid (minus \mid (push(2) \mid (divide \mid (add
  \mid (store(tmp) \mid (jump(11) \mid (load(y) \mid (load(z) \mid (load(y) \mid (minus \mid (push(2) \mid (divide \mid (add \mid
 (push(1) | (add | (store(tmp) | (load(tmp) | (load(tmp) | (multiply | (load(x) | (greaterThan |
(jumpOnCond(2) \mid (jump(6) \mid (load(tmp) \mid (push(1) \mid (minus \mid (store(z) \mid (jump(3) \mid (load(tmp) \mid
 (0.0000 sec for parse, 0.0150 sec for 1425 rewrites + 2634 matches)
-- reduce in %VM + COMPILE : (run(compile(p4))):Env&Err
```

((x , 20000000000000000) | ((y , 141421356) | ((z , 141421356) | ((tmp , 141421356) | empEnv)))):Env

(0.0000 sec for parse, 2.1040 sec for 123257 rewrites + 319387 matches)

Cafe0BJ>