```
##### EXERCISE 1 #####
       -- defining module! GLIST1
      -- 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
  22 -- defining module! EQL
   23 -- done reading in file: eql
       processing input : /usr/local/share/cafeobj-1.6/lib/sys_bool.cafe
   27 -- defining module! BOOL
   28 -- done reading in file: bool
  29 -- 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
  43 -- defining module! NATLIST1
  44 -- opening module NATLIST1
  45 -- reduce in %NATLIST1 : (nil):Nil
  47 (0.0000 sec for parse, 0.0000 sec for 0 rewrites + 0 matches)
  48 -- reduce in %NATLIST1 : (1 | nil):NnList
  49 (1 | nil):NnList
  50 (0.0000 sec for parse, 0.0000 sec for 0 rewrites + 0 matches)
  51 -- reduce in %NATLIST1 : ((1 | nil) @ (2 | nil)):List
  52 (1 | (2 | nil)):NnList
  53 (0.0000 sec for parse, 0.0000 sec for 2 rewrites + 3 matches)
  54 -- reduce in %NATLIST1 : ((1 | (2 | nil)) @ (3 | (4 | nil))):List
  55 (1 | (2 | (3 | (4 | nil))):NnList
  56 (0.0000 sec for parse, 0.0000 sec for 3 rewrites + 5 matches)
  57 -- defining module! NATLIST2
  58 -- defining module! NATLIST3
  59 -- defining module! NAT-ERR
  60 -- defining module* TRIV-ERR
 61 -- defining module! GLIST2
 62 -- defining module! NATLIST7
 63 -- opening module NATLIST7
  64 -- reduce in %NATLIST7 : (hd(nlnil)):ErrNat
 65 (errNat):ErrNat
  66 (0.0000 sec for parse, 0.0000 sec for 1 rewrites + 1 matches)
  67 -- reduce in %NATLIST7 : (hd(((4 | (3 | nlnil)) @ (2 | (1 | (0 | nlnil))))):Nat&Err
  68 (4):NzNat
  69 (0.0000 sec for parse, 0.0000 sec for 4 rewrites + 6 matches)
  70 -- reduce in %NATLIST7 : (tl(nlnil)):NatList
  71 (nlnil):NLNil
  72 (0.0000 sec for parse, 0.0000 sec for 1 rewrites + 1 matches)
  73 -- reduce in %NATLIST7 : (tl(((4 | (3 | nlnil)) @ (2 | (1 | (0 | nlnil))))):NatList
  74 (3 | (2 | (1 | (0 | nlnil))):NnNatList
  75 (0.0000 sec for parse, 0.0000 sec for 4 rewrites + 7 matches)
  76 -- defining module! GLIST-ERR
  77 -- defining module! NATLIST8
  78 -- opening module NATLIST8
  79 -- reduce in %NATLIST8 : (hd(nlnil)):ErrNat
 80 (errNat):ErrNat
  81 \quad (0.0000 \text{ sec for parse, } 0.0000 \text{ sec for } 1 \text{ rewrites } + 1 \text{ matches)}
  82 -- reduce in %NATLIST8 : (hd(((4 | (3 | nlnil)) @ (2 | (1 | (0 | nlnil))))):Nat&Err
  83 (4):NzNat
  84 (0.0000 sec for parse, 0.0000 sec for 4 rewrites + 6 matches)
  85 -- reduce in %NATLIST8 : (tl(nlnil)):ErrNatList
  86 (errNatList):ErrNatList
      (0.0000 sec for parse, 0.0000 sec for 1 rewrites + 1 matches)
  88 -- reduce in %NATLIST8 : (tl(((4 | (3 | nlnil)) @ (2 | (1 | (0 | nlnil))))):NatList&Err
 89 (3 | (2 | (1 | (0 | nlnil))):NatList
  90 (0.0000 sec for parse, 0.0000 sec for 4 rewrites + 6 matches)
  91 -- defining module! NATLISTLIST1
  92 -- opening module NATLISTLIST1
  93 -- reduce in %NATLISTLIST1 : (hd(nllnil)):ErrNatList
  94 (errNatList):ErrNatList
 95 (0.0000 sec for parse, 0.0000 sec for 1 rewrites + 1 matches)
  96 -- reduce in %NATLISTLIST1 : (hd(((4 | (3 | nlnil)) | ((2 | (1 | (0 | nlnil))) | nllnil)))):NatList&Err
  97 (4 | (3 | nlnil)):NatList
 98 (0.0000 sec for parse, 0.0000 sec for 1 rewrites + 1 matches)
  99 -- reduce in %NATLISTLIST1 : (tl(nllnil)):ErrNatListList
 100 (errNatListList):ErrNatListList
 101 (0.0000 sec for parse, 0.0000 sec for 1 rewrites + 1 matches)
 102 -- reduce in %NATLISTLIST1 : (tl(((4 | (3 | nlnil)) | ((2 | (1 | (0 | nlnil))) | nllnil)))):NatListList&Err
 103 ((2 | (1 | (0 | nlnil))) | nllnil):NatListList
 104 (0.0000 sec for parse, 0.0000 sec for 1 rewrites + 1 matches)
 105 -- defining module* TRIV-ERR-ORD
 106 -- defining module! GQSORT
 107 -- opening module GQSORT(E <= TRIV-ERR-ORD2NAT-ERR)</pre>
      -- reduce in %GQSORT(E <= TRIV-ERR-ORD2NAT-ERR) : (qsort((4 | (7 | (5 | (1 | (0 | (3 | (6 | (2 | nil)))))))))))):List
      (0 | (1 | (2 | (3 | (4 | (5 | (6 | (7 | nil)))))):List
       (0.0000 sec for parse, 0.0010 sec for 64 rewrites + 105 matches)
 111 -- defining module! STRING-ERR
 112 -- reading in file : string
       processing input : /usr/local/share/cafeobj-1.6/lib/string.cafe
 116 -- defining module! STRING
 117 -- reading in file : character
       processing input : /usr/local/share/cafeobj-1.6/lib/character.cafe
 121 -- defining module! CHARACTER
 122 -- done reading in file: character
 124 -- done reading in file: string
 126 -- opening module GQSORT(E <= TRIV-ERR-ORD2STRING-ERR)</pre>
 127 -- reduce in %GQSORT(E <= TRIV-ERR-ORD2STRING-ERR) : (qsort(("Lisp" | ("Python" | ("Python" | ("Prolog" | ("Fortran" | nil)))))))))))))))))))))))))))))
 128 ("C" | ("Cafe0BJ" | ("Fortran" | ("Java" | ("Lisp" | ("Pascal" | ("Prolog" | ("Python" | nil)))))))):List
       (0.0000 sec for parse, 0.0010 sec for 64 rewrites + 102 matches)
 130 -- defining module! GLIST-ERR-ORD
 131 -- defining module! NATLIST9
 132 -- opening module GQSORT(E <= TRIV-ERR-ORD2NATLIST9)</pre>
 (nlnil | ((0 | nlnil) | ((1 | (0 | nlnil)) | ((1 | (1 | nlnil)) | ((2 | nlnil)) | ((3 | (0 | (3 | (0 | (2 | nlnil))) | nil)))))))))))))))))))))))
       (0.0010 sec for parse, 0.0020 sec for 183 rewrites + 335 matches)
 136 -- defining module! STRLIST1
137 -- opening module GQSORT(E <= TRIV-ERR-ORD2STRLIST1)</pre>
 138 -- reduce in %GQSORT(E <= TRIV-ERR-ORD2STRLIST1) : (qsort(("Cafe0BJ" | ("C" | ("Cafe0BJ" | ("C" | ("Cafe0BJ" | ("C" | slnil)) | (("Java" | ("C" | slnil)) | (("Java" | ("C" | slnil)) | (("Fortran" | slnil)) | (("Fortran" | slnil)) | (("Fortran" | slnil)) | (("Fortran" | slnil)) | (("Java" | ("C" | slnil))) | (("C" | slnil))) | (("C" | slnil))) | (("C" | slnil))) | (("C" | slnil)) | (("C" | slnil)
 139 (slnil | (("C" | slnil) | (("Cafe0BJ" | ("C" | slnil)) | (("Vafe0BJ" | slnil)) | (("Vafe0BJ" | slnil)) | (("Fortran" | sln
 140 (0.0000 sec for parse, 0.0010 sec for 183 rewrites + 329 matches)
       ##### EXERCISE 2
       ##### EXERCISE 2: MERGE SORT NAT #####
 147 -- defining module! GLIST-ERR-ORD-MERGE-SORT
 148 -- opening module GLIST-ERR-ORD-MERGE-SORT(E <= TRIV-ERR-ORD2NAT-ERR)
149 -- reduce in %GLIST-ERR-ORD-MERGE-SORT(E <= TRIV-ERR-ORD2NAT-ERR) : (mergeSort((4 | (7 | (5 | (1 | (0 | (3 | (6 | (2 | nil))))))))))))))))))))))))))))))))
150 (0 | (1 | (2 | (3 | (4 | (5 | (6 | (7 | nil))))))):List
 151 (0.0000 sec for parse, 0.0020 sec for 246 rewrites + 558 matches)
153 (0 | (1 | (2 | (3 | (4 | (5 | (6 | (7 | (8 | (9 | nil))))))))):List
154 (0.0000 sec for parse, 0.0020 sec for 360 rewrites + 797 matches)
155 -- reduce in %GLIST-ERR-ORD-MERGE-SORT(E <= TRIV-ERR-ORD2NAT-ERR) : (mergeSort((4 | (2 | (7 | (5 | (1 | (0 | (3 | (6 | (2 | nil))))))))))))))))))))))))))
156 (0 | (1 | (2 | (2 | (3 | (4 | (5 | (6 | (7 | nil))))))):List
 157 (0.0000 sec for parse, 0.0010 sec for 293 rewrites + 667 matches)
158 -- reduce in %GLIST-ERR-ORD-MERGE-SORT(E <= TRIV-ERR-ORD2NAT-ERR) : (mergeSort((5 | (5 | (5 | (5 | nil)))))):List
159 (5 | (5 | (5 | (5 | nil)))):List
160 (0.0000 sec for parse, 0.0000 sec for 121 rewrites + 294 matches)
162 (0 | (1 | (2 | (3 | (4 | (5 | (6 | (7 | (8 | (9 | nil))))))))):List
 163 (0.0010 sec for parse, 0.0010 sec for 360 rewrites + 807 matches)
164 -- reduce in %GLIST-ERR-ORD-MERGE-SORT(E <= TRIV-ERR-ORD2NAT-ERR) : (mergeSort((1000000 | (200 | (500000 | (1 | (0 | (999999 | nil))))))))))))))))
165 (0 | (1 | (200 | (500000 | (999999 | (1000000 | nil)))))):List
166 (0.0000 sec for parse, 0.0010 sec for 164 rewrites + 370 matches)
167 -- reduce in %GLIST-ERR-ORD-MERGE-SORT(E <= TRIV-ERR-ORD2NAT-ERR) : (mergeSort((3 | (1 | (4 | (1 | (5 | (9 | nil)))))))))))))
168 (1 | (1 | (3 | (4 | (5 | (9 | nil))))):List
 169 (0.0000 sec for parse, 0.0010 sec for 172 rewrites + 385 matches)
170 -- reduce in %GLIST-ERR-ORD-MERGE-SORT(E <= TRIV-ERR-ORD2NAT-ERR) : (mergeSort((8 | (6 | (7 | (5 | (3 | (0 | (9 | (2 | nil)))))))))))))))))))))))))))))))
171 (0 | (2 | (3 | (5 | (6 | (7 | (8 | (9 | nil))))))):List
172 (0.0000 sec for parse, 0.0010 sec for 246 rewrites + 553 matches)
173 -- reduce in %GLIST-ERR-ORD-MERGE-SORT(E <= TRIV-ERR-ORD2NAT-ERR) : (mergeSort(nil)):List
 174 (nil):Nil
      (0.0000 sec for parse, 0.0000 sec for 1 rewrites + 1 match
       ##### EXERCISE 2: MERGE SORT STRING #####
 179 -- opening module GLIST-ERR-ORD-MERGE-SORT(E <= TRIV-ERR-ORD2STRING-ERR)</pre>
 180 -- reduce in %GLIST-ERR-ORD-MERGE-SORT(E <= TRIV-ERR-ORD2STRING-ERR) : (mergeSort(("CafeOBJ" | ("Python" | ("Lisp" | ("Prolog" | ("Pascal" | nil)))))))))))))))))))))))))))))))
181 ("C" | ("CafeOBJ" | ("Fortran" | ("Java" | ("Lisp" | ("Pascal" | ("Prolog" | ("Python" | nil)))))))):List
182 (0.0000 sec for parse, 0.0010 sec for 254 rewrites + 568 matches)
 183 -- reduce in %GLIST-ERR-ORD-MERGE-SORT(E <= TRIV-ERR-ORD2STRING-ERR) : (mergeSort(("Zebra" | ("Apple" | ("Banana" | ("Grape" | nil))))))):List
 184 ("Apple" | ("Banana" | ("Grape" | ("Orange" | ("Zebra" | nil))))):List
185 (0.0000 sec for parse, 0.0000 sec for 113 rewrites + 261 matches)
 186 -- reduce in %GLIST-ERR-ORD-MERGE-SORT(E <= TRIV-ERR-ORD2STRING-ERR) : (mergeSort(("a" | ("b" | ("c" | ("d" | ("e" | nil))))))):List
187 ("a" | ("b" | ("c" | ("d" | ("e" | nil)))):List
188 (0.0000 sec for parse, 0.0000 sec for 129 rewrites + 287 matches)
 189 -- reduce in %GLIST-ERR-ORD-MERGE-SORT(E <= TRIV-ERR-ORD2STRING-ERR) : (mergeSort(("e" | ("d" | ("c" | ("b" | ("a" | nil))))))):List
190 ("a" | ("b" | ("c" | ("d" | ("e" | nil)))):List
 191 (0.0000 sec for parse, 0.0000 sec for 129 rewrites + 283 matches)
 192 -- reduce in %GLIST-ERR-ORD-MERGE-SORT(E <= TRIV-ERR-ORD2STRING-ERR) : (mergeSort(("same" | ("same" | ("same" | nil)))):List
       ("same" | ("same" | nil))):List
 194 (0.0000 sec for parse, 0.0000 sec for 55 rewrites + 130 matches)
      -- reduce in %GLIST-ERR-ORD-MERGE-SORT(E <= TRIV-ERR-ORD2STRING-ERR) : (mergeSort(nil)):List
 196 (nil):Nil
       (0.0000 sec for parse, 0.0000 sec for 1 rewrites + 1 matches)
       ##### EXERCISE 2: MERGE SORT NATLIST #####
 201 -- opening module GLIST-ERR-ORD-MERGE-SORT(E <= TRIV-ERR-ORD2NATLIST9)</pre>
 (nlnil | ((0 | nlnil) | ((1 | (0 | nlnil)) | ((1 | (1 | nlnil)) | ((2 | nlnil)) | ((3 | (0 | (3 | (0 | (2 | nlnil))) | nil)))))))))))))))))))))))))
       (0.0010 sec for parse, 0.0030 sec for 512 rewrites + 1078 matches)
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209 -- reduce in %GLIST-ERR-ORD-MERGE-SORT(E <= TRIV-ERR-ORD2STRLIST1) : ("C" | ("CafeOBJ" | ("C" | slnil)) | (("CafeOBJ" | ("C" | slnil)) | (("CafeOBJ" | ("C" | slnil)) | (("CafeOBJ" | slnil)) | (("CafeOBJ" | slnil)) | (("CafeOBJ" | slnil)) | ("VafeOBJ" | slnil)) | ("VafeOB

(slnil | (("C" | slnil) | (("Cafe0BJ" | ("C" | slnil)) | (("Fortran" | slnil))

EXERCISE 2: MERGE SORT STRLIST

208 -- opening module GLIST-ERR-ORD-MERGE-SORT(E <= TRIV-ERR-ORD2STRLIST1)</pre>

(0.0000 sec for parse, 0.0030 sec for 512 rewrites + 1064 matches)