

CSC 416

Programming Challenge 6

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A program in LISP to search the state space to solve the Missionaries and Cannibals problem.

Determines whether a solution is possible, and displays step by step instruction on how to arrive
at the first goal found.

Listing of mc2.l:

```
; mc2.l - Missionaries and Cannibals II

; Program Description
;
; Missionaries and Cannibals problem solver.
;
; This program is a state space problem solver for the classic
; "Missionaries and Cannibals" problem. An explicit state
; space graph is grown in concert with breadth first search
; for a solution.
;
; Banks are represented as a 3-slot class consisting of
; missionaries, cannibals, and boat.
;
; States are represented as a 2-slot class consisting of
; left-bank and right-bank.
;
; Operators are represented as a 3-slot class consisting of a name,
; a precondition, and a description.
;
; Nodes are represented as a 4-slot class consisting of
; a state, a parent node, a move (state space operator), and a name.
;-----
; Modelling a bank

(defclass bank ()
  (
    (missionaries :accessor bank-missionaries :initarg :missionaries)
    (cannibals :accessor bank-cannibals :initarg :cannibals)
    (boat :accessor bank-boat :initarg :boat)
  )
)

(defmethod display ((b bank))
  (format t "Missionaries: ~A Cannibals: ~A Boat: ~A~%"
    (bank-missionaries b)
    (bank-cannibals b)
    (bank-boat b)
  )
  NIL
)

(defmethod equal-bank-p ((b1 bank) (b2 bank))
  (and
    (equal (bank-missionaries b1) (bank-missionaries b2))
    (equal (bank-cannibals b1) (bank-cannibals b2))
    (equal (bank-boat b1) (bank-boat b2))
  )
)

(defmethod left-bank-ok-p ((b bank))
  (and
    (equal (bank-missionaries b) NIL)
  )
)
```

```

    (equal (bank-cannibals b) NIL)
    (equal (bank-boat b) NIL)
  )
)

(defmethod right-bank-ok-p ((b bank))
  (and
    (equal (bank-missionaries b) '(m m m))
    (equal (bank-cannibals b) '(c c c))
    (equal (bank-boat b) 'b)
  )
)

(defmethod copy-bank ((b bank))
  (make-instance 'bank
    :missionaries (bank-missionaries b)
    :cannibals (bank-cannibals b)
    :boat (bank-boat b)
  )
)

(defmethod move-c ((source bank) (dest bank))
  (setf (bank-cannibals dest) (cons 'c (bank-cannibals dest)))
  (setf (bank-cannibals source) (remove 'c (bank-cannibals source) :count
1))
  (setf (bank-boat dest) (bank-boat source))
  (setf (bank-boat source) NIL)
  NIL
)

(defmethod move-cc ((source bank) (dest bank))
  (setf (bank-cannibals dest) (append '(c c) (bank-cannibals dest)))
  (setf (bank-cannibals source) (remove 'c (bank-cannibals source) :count
2))
  (setf (bank-boat dest) (bank-boat source))
  (setf (bank-boat source) NIL)
  NIL
)

(defmethod move-m ((source bank) (dest bank))
  (setf (bank-missionaries dest) (cons 'm (bank-missionaries dest)))
  (setf (bank-missionaries source) (remove 'm (bank-missionaries source)
:count 1))
  (setf (bank-boat dest) (bank-boat source))
  (setf (bank-boat source) NIL)
  NIL
)

(defmethod move-mm ((source bank) (dest bank))
  (setf (bank-missionaries dest) (append '(m m) (bank-missionaries dest)))
  (setf (bank-missionaries source) (remove 'm (bank-missionaries source)
:count 2))
  (setf (bank-boat dest) (bank-boat source))
  (setf (bank-boat source) NIL)
  NIL
)

```

```

)
(defmethod move-mc ((source bank) (dest bank))
  (setf (bank-cannibals dest) (cons 'c (bank-cannibals dest)))
  (setf (bank-cannibals source) (remove 'c (bank-cannibals source) :count
1))
  (setf (bank-missionaries dest) (cons 'm (bank-missionaries dest)))
  (setf (bank-missionaries source) (remove 'm (bank-missionaries source)
:count 1))
  (setf (bank-boat dest) (bank-boat source))
  (setf (bank-boat source) NIL)
  NIL
)

```

```

;-----
; Modelling a state

```

```

(defclass state ()
  (
    (left-bank :accessor state-left-bank :initarg :left-bank)
    (right-bank :accessor state-right-bank :initarg :right-bank)
  )
)

```

```

(defmethod display ((s state))
  (display (state-left-bank s))
  (display (state-right-bank s))
  NIL
)

```

```

(defmethod goalp ((s state))
  (and (left-bank-ok-p (state-left-bank s))
        (right-bank-ok-p (state-right-bank s))
  )
)

```

```

(defmethod copy-state ((s state) &aux c)
  (setf c (make-instance 'state
                        :left-bank (copy-bank (state-left-bank s))
                        :right-bank (copy-bank (state-right-bank s))
  )
  )
  c
)

```

```

;-----
; Modelling a node

```

```

(defclass node ()
  (
    (name :accessor node-name :initarg :name)
    (state :accessor node-state :initarg :state)
    (parent :accessor node-parent :initarg :parent)
    (operator :accessor node-operator :initarg :operator)
  )
)

```

```

)
)
(defmethod display ((n node))
  (princ (node-name n))
  (write-string " ")
  (if (not (rootp n))
      (let ()
        (princ (node-name (node-parent n)))
        (princ " ")
        (display (node-operator n))
      )
    )
  (terpri)
  (display (node-state n))
  NIL
)

(defmethod rootp ((n node))
  (eq (node-name n) 'root)
)

(defmethod goalp ((n node))
  (and (left-bank-ok-p (state-left-bank (node-state n)))
       (right-bank-ok-p (state-right-bank (node-state n))))
)

)

;-----
; Modelling an operator

(defclass operator ()
  (
    (name :accessor operator-name :initarg :name)
    (precondition :accessor operator-precondition :initarg :precondition)
    (description :accessor operator-description :initarg :description)
  )
)

(defmethod display ((o operator))
  (princ (operator-name o))
)

(defmethod describe-operators ()
  (mapcar #'describe-operator *operator-list*)
  (terpri)
  NIL
)

(defmethod describe-operator ((op operator))
  (format t "Operator name: ~A" (operator-name op)) (terpri)
  (format t "Precondition: ~A" (operator-precondition op)) (terpri)
  (format t "Description: ~A" (operator-description op)) (terpri)
  (terpri)
)

```

```

;-----
; Main method

(defmethod mc ()
  (establish-operators)
  (setup)
  (solve)
)

;-----
; The setup

(defmethod setup (&aux root lb rb ystate)
  ;; establish root node
  (setf lb (make-instance 'bank :missionaries '(m m m) :cannibals '(c c c)
:boat 'b))
  (setf rb (make-instance 'bank :missionaries '() :cannibals '() :boat
NIL))
  (setf ystate (make-instance 'state :left-bank lb :right-bank rb))
  (setf root (make-instance 'node :state ystate :name 'root))
  ;; initialize list of unexplored nodes
  (setf *unexplored* (list root))
  ;; initialize list of explored nodes
  (setf *explored* ())
  ; get ready to create good names
  (setf *ng* (make-instance 'name-generator :prefix "N"))
)

;-----
; breadth first search

(defmethod solve (&aux kids e-node)
  (if *tracing-search*
    (let ()
      (terpri)
      (write-line ">>> Solve")
      (terpri)
      (display-explored-nodes)
      (display-unexplored-nodes)
    )
  )
  (cond
    ((null *unexplored*)
      (write-line "There is no solution.")
      (return-from solve NIL)
    )
  )
  (setf e-node (pop *unexplored*))
  (if *tracing-search*
    (let ()
      (display-e-node e-node)
    )
  )
  (cond

```

```

      ((goalp (node-state e-node))
       (display-solution e-node)
      )
      ((exploredp e-node)
       (solve)
      )
      (t
       (push e-node *explored*)
       (setf kids (children-of e-node))
       (setf *unexplored* (append *unexplored* kids))
       (solve)
      )
    )
  )
  NIL
)

(defmethod display-e-node ((n node))
  (write-line "E-NODE ") (terpri)
  (display n)
  NIL
)

```

; Name generator class

```

(defclass name-generator ()
  (
    (prefix :accessor name-generator-prefix :initarg :prefix)
    (nr :accessor name-generator-nr :initform 0)
  )
)

(defmethod next ((ng name-generator))
  (setf (name-generator-nr ng) (+ 1 (name-generator-nr ng)))
  (concatenate 'string
    (name-generator-prefix ng)
    (write-to-string (name-generator-nr ng))
  )
)

```

; Checking to see if a node has already been explored

```

(defmethod exploredp ((n node))
  (member-state-p (node-state n) *explored*)
)

(defmethod member-state-p ((s state) (l list))
  (cond
    ((null l)
     NIL
    )
    ((equal-state-p s (node-state (first l)))
     t
    )
  )
)

```

```

    (t
      (member-state-p s (rest l))
    )
  )
)

(defmethod equal-state-p ((s1 state) (s2 state))
  (and
    (equal-bank-p (state-left-bank s1) (state-left-bank s2))
    (equal-bank-p (state-right-bank s1) (state-right-bank s2))
  )
)

;-----
; Checking to see if an operator is applicable in a particular state

(defmethod applicablep ((op operator) (s state))
  (cond
    ((eq (operator-name op) 'move-c-lr)
      (applicable-move-c-lr-p s)
    )
    ((eq (operator-name op) 'move-cc-lr)
      (applicable-move-cc-lr-p s)
    )
    ((eq (operator-name op) 'move-m-lr)
      (applicable-move-m-lr-p s)
    )
    ((eq (operator-name op) 'move-mm-lr)
      (applicable-move-mm-lr-p s)
    )
    ((eq (operator-name op) 'move-mc-lr)
      (applicable-move-mc-lr-p s)
    )
    ((eq (operator-name op) 'move-c-rl)
      (applicable-move-c-rl-p s)
    )
    ((eq (operator-name op) 'move-cc-rl)
      (applicable-move-cc-rl-p s)
    )
    ((eq (operator-name op) 'move-m-rl)
      (applicable-move-m-rl-p s)
    )
    ((eq (operator-name op) 'move-mm-rl)
      (applicable-move-mm-rl-p s)
    )
    ((eq (operator-name op) 'move-mc-rl)
      (applicable-move-mc-rl-p s)
    )
  )
)

(defmethod applicable-move-c-lr-p ((s state))
  (and
    (> (length (bank-cannibals (state-left-bank s))) 0)
    (eq 'b (bank-boat (state-left-bank s)))
  )
)

```



```

(or
  (<= (+ 1 (length (bank-cannibals (state-right-bank s))))
    (length (bank-missionaries (state-right-bank s)))
  )
  (= 0 (length (bank-missionaries (state-right-bank s))))
)
(or
  (<= (- (length (bank-cannibals (state-left-bank s))) 1)
    (length (bank-missionaries (state-left-bank s)))
  )
  (= 0 (length (bank-missionaries (state-left-bank s))))
)
)
)
)

(defmethod applicable-move-cc-lr-p ((s state))
  (and
    (> (length (bank-cannibals (state-left-bank s))) 1)
    (eq 'b (bank-boat (state-left-bank s)))
    (or
      (<= (+ 2 (length (bank-cannibals (state-right-bank s))))
        (length (bank-missionaries (state-right-bank s)))
      )
      (= 0 (length (bank-missionaries (state-right-bank s))))
    )
    (or
      (<= (- (length (bank-cannibals (state-left-bank s))) 2)
        (length (bank-missionaries (state-left-bank s)))
      )
      (= 0 (length (bank-missionaries (state-left-bank s))))
    )
  )
)

(defmethod applicable-move-m-lr-p ((s state))
  (and
    (> (length (bank-missionaries (state-left-bank s))) 0)
    (eq 'b (bank-boat (state-left-bank s)))
    (or
      (<= (length (bank-cannibals (state-right-bank s)))
        (+ 1 (length (bank-missionaries (state-right-bank s))))
      )
      ;(= 0 (length (bank-missionaries (state-right-bank s))))
    )
    (or
      (<= (length (bank-cannibals (state-left-bank s)))
        (- (length (bank-missionaries (state-left-bank s))) 1)
      )
      (= 0 (- (length (bank-missionaries (state-left-bank s))) 1))
    )
  )
)

(defmethod applicable-move-mm-lr-p ((s state))
  (and

```

```

(> (length (bank-missionaries (state-left-bank s))) 1)
(eq 'b (bank-boat (state-left-bank s)))
(or
  (<= (length (bank-cannibals (state-right-bank s)))
        (+ 2 (length (bank-missionaries (state-right-bank s))))
  )
  ;(= 0 (length (bank-missionaries (state-right-bank s))))
)
(or
  (<= (length (bank-cannibals (state-left-bank s)))
        (- (length (bank-missionaries (state-left-bank s))) 2)
  )
  (= 0 (- (length (bank-missionaries (state-left-bank s))) 2))
)
)
)

```

```

(defmethod applicable-move-mc-lr-p ((s state))
  (and
    (> (length (bank-missionaries (state-left-bank s))) 0)
    (> (length (bank-cannibals (state-left-bank s))) 0)
    (eq 'b (bank-boat (state-left-bank s)))
    (or
      (<= (+ 1 (length (bank-cannibals (state-right-bank s))))
            (+ 1 (length (bank-missionaries (state-right-bank s))))
      )
      ;(= 0 (length (bank-cannibals (state-right-bank s))))
    )
    (or
      (<= (- (length (bank-cannibals (state-left-bank s))) 1)
            (- (length (bank-missionaries (state-left-bank s))) 1)
      )
      (= 0 (- (length (bank-missionaries (state-left-bank s))) 1))
    )
  )
)

```

```

(defmethod applicable-move-c-rl-p ((s state))
  (and
    (> (length (bank-cannibals (state-right-bank s))) 0)
    (eq 'b (bank-boat (state-right-bank s)))
    (or
      (<= (- (length (bank-cannibals (state-right-bank s))) 1)
            (length (bank-missionaries (state-right-bank s)))
      )
      (= 0 (length (bank-missionaries (state-right-bank s))))
    )
    (or
      (<= (+ 1 (length (bank-cannibals (state-left-bank s))))
            (length (bank-missionaries (state-left-bank s)))
      )
      (= 0 (length (bank-missionaries (state-left-bank s))))
    )
  )
)

```

```

(defmethod applicable-move-cc-rl-p ((s state))
  (and
    (and
      (> (length (bank-cannibals (state-right-bank s))) 1)
      (eq 'b (bank-boat (state-right-bank s)))
      (or
        (<= (- (length (bank-cannibals (state-right-bank s))) 2)
            (length (bank-missionaries (state-right-bank s)))
        )
        (= 0 (length (bank-missionaries (state-right-bank s))))
      )
    )
    (or
      (<= (+ 2 (length (bank-cannibals (state-left-bank s))))
          (length (bank-missionaries (state-left-bank s))))
      (= 0 (length (bank-missionaries (state-left-bank s))))
    )
  )
)

(defmethod applicable-move-m-rl-p ((s state))
  (and
    (and
      (> (length (bank-missionaries (state-right-bank s))) 0)
      (eq 'b (bank-boat (state-right-bank s)))
      (or
        (<= (length (bank-cannibals (state-right-bank s)))
            (- (length (bank-missionaries (state-right-bank s))) 1)
        )
        (= 0 (- (length (bank-missionaries (state-right-bank s))) 1))
      )
    )
    (or
      (<= (length (bank-cannibals (state-left-bank s)))
          (+ 1 (length (bank-missionaries (state-left-bank s))))
      )
      ;(= 0 (length (bank-missionaries (state-left-bank s))))
    )
  )
)

(defmethod applicable-move-mm-rl-p ((s state))
  (and
    (and
      (> (length (bank-missionaries (state-right-bank s))) 1)
      (eq 'b (bank-boat (state-right-bank s)))
      (or
        (<= (length (bank-cannibals (state-right-bank s)))
            (- (length (bank-missionaries (state-right-bank s))) 2)
        )
        (= 0 (- (length (bank-missionaries (state-right-bank s))) 2))
      )
    )
    (or
      (<= (length (bank-cannibals (state-left-bank s)))
          (+ 2 (length (bank-missionaries (state-left-bank s))))
      )
      ;(= 0 (length (bank-missionaries (state-left-bank s))))
    )
  )
)

```

```

)
)
)
(defmethod applicable-move-mc-rl-p ((s state))
  (and
    (> (length (bank-missionaries (state-right-bank s))) 0)
    (> (length (bank-cannibals (state-right-bank s))) 0)
    (eq 'b (bank-boat (state-right-bank s)))
    (or
      (<= (- (length (bank-cannibals (state-right-bank s))) 1)
          (- (length (bank-missionaries (state-right-bank s))) 1))
      (= 0 (- (length (bank-missionaries (state-right-bank s))) 1))
    )
    (or
      (<= (+ 1 (length (bank-cannibals (state-left-bank s))))
          (+ 1 (length (bank-missionaries (state-left-bank s))))
      )
      (= 0 (length (bank-missionaries (state-left-bank s))))
    )
  )
)
)
;-----
; establish operators

(defmethod establish-operators()
  (setf *move-c-lr*
    (make-instance 'operator
      :name 'move-c-lr
      :precondition "The left bank contains the boat and at least one
cannibal."
      :description "Move one cannibal from the left bank to the right with
the boat."
    )
  )
  (setf *move-cc-lr*
    (make-instance 'operator
      :name 'move-cc-lr
      :precondition "The left bank contains the boat and at least two
cannibals."
      :description "Move two cannibals from the left bank to the right with
the boat."
    )
  )
  (setf *move-m-lr*
    (make-instance 'operator
      :name 'move-m-lr
      :precondition "The left bank contains the boat and at least one
missionary."
      :description "Move one missionary from the left bank to the right
with the boat."
    )
  )
)
)

```

```

    (setf *move-mm-lr*
      (make-instance 'operator
        :name 'move-mm-lr
        :precondition "The left bank contains the boat and at least two
missionaries."
        :description "Move two missionaries from the left bank to the right
with the boat."
      )
    )
    (setf *move-mc-lr*
      (make-instance 'operator
        :name 'move-mc-lr
        :precondition "The left bank contains the boat and at least one
missionary and one cannibal."
        :description "Move one missionary and one cannibal from the left bank
to the right with the boat."
      )
    )
    (setf *move-c-rl*
      (make-instance 'operator
        :name 'move-c-rl
        :precondition "The right bank contains the boat and at least one
cannibal."
        :description "Move one cannibal from the right bank to the left with
the boat."
      )
    )
    (setf *move-cc-rl*
      (make-instance 'operator
        :name 'move-cc-rl
        :precondition "The right bank contains the boat and at least two
cannibals."
        :description "Move two cannibals from the right bank to the left with
the boat."
      )
    )
    (setf *move-m-rl*
      (make-instance 'operator
        :name 'move-m-rl
        :precondition "The right bank contains the boat and at least one
missionary."
        :description "Move one missionary from the right bank to the left
with the boat."
      )
    )
    (setf *move-mm-rl*
      (make-instance 'operator
        :name 'move-mm-rl
        :precondition "The right bank contains the boat and at least two
missionaries."
        :description "Move two missionaries from the right bank to the left
with the boat."
      )
    )
    (setf *move-mc-rl*

```

```

      (make-instance 'operator
        :name 'move-mc-rl
        :precondition "The right bank contains the boat and at least one
missionary and one cannibal."
        :description "Move one missionary and one cannibal from the right
bank to the left with the boat."
      )
    )
    (setf *operator-list*
      (list *move-c-lr* *move-cc-lr* *move-m-lr* *move-mm-lr* *move-mc-lr*
        *move-c-rl* *move-cc-rl* *move-m-rl* *move-mm-rl* *move-mc-rl*
      )
    )
  )
  NIL
)

```

```

;-----
; construct and display the solution

```

```

(defmethod display-solution ((n node))
  (cond
    ((rootp n)
      (terpri)
    )
    (t
      (display-solution (node-parent n))
      (princ (operator-description (node-operator n)))
      (terpri)
    )
  )
  NIL
)

```

```

;-----
; other display methods

```

```

(defmethod display-explored-nodes ()
  (prin1 'EXPLORED) (terpri) (terpri)
  (mapcar #'display *explored*)
  (terpri)
  NIL
)

(defmethod display-unexplored-nodes ()
  (prin1 'UNEXPLORED) (terpri) (terpri)
  (mapcar #'display *unexplored*)
  (terpri)
  NIL
)

```

```

;-----
; children generator

```

```

(defmethod children-of ((e-node node) &aux kids)
  (if (applicablep *move-c-lr* (node-state e-node))

```

```

    (push (child-of e-node *move-c-lr*) kids)
  )
  (if (applicablep *move-cc-lr* (node-state e-node))
    (push (child-of e-node *move-cc-lr*) kids)
  )
  (if (applicablep *move-m-lr* (node-state e-node))
    (push (child-of e-node *move-m-lr*) kids)
  )
  (if (applicablep *move-mm-lr* (node-state e-node))
    (push (child-of e-node *move-mm-lr*) kids)
  )
  (if (applicablep *move-mc-lr* (node-state e-node))
    (push (child-of e-node *move-mc-lr*) kids)
  )
  (if (applicablep *move-c-rl* (node-state e-node))
    (push (child-of e-node *move-c-rl*) kids)
  )
  (if (applicablep *move-cc-rl* (node-state e-node))
    (push (child-of e-node *move-cc-rl*) kids)
  )
  (if (applicablep *move-m-rl* (node-state e-node))
    (push (child-of e-node *move-m-rl*) kids)
  )
  (if (applicablep *move-mm-rl* (node-state e-node))
    (push (child-of e-node *move-mm-rl*) kids)
  )
  (if (applicablep *move-mc-rl* (node-state e-node))
    (push (child-of e-node *move-mc-rl*) kids)
  )
  )
  kids
)

(defmethod child-of ((n node) (o operator) &aux new-node c)
  (setf new-node (make-instance 'node))
  (setf (node-parent new-node) n)
  (setf (node-operator new-node) o)
  (setf (node-name new-node) (next *ng*))
  (setf c (copy-state (node-state n)))
  (apply-operator o c)
  (setf (node-state new-node) c)
  new-node
)

(defmethod apply-operator ((o operator) (c state) &aux lb rb)
  (setf lb (state-left-bank c))
  (setf rb (state-right-bank c))
  (cond
    ((eq (operator-name o) 'move-c-lr)
     (move-c lb rb)
    )
    ((eq (operator-name o) 'move-cc-lr)
     (move-cc lb rb)
    )
    ((eq (operator-name o) 'move-m-lr)
     (move-m lb rb)
    )
  )
)

```

```
)
((eq (operator-name o) 'move-mm-lr)
 (move-mm lb rb)
)
((eq (operator-name o) 'move-mc-lr)
 (move-mc lb rb)
)
((eq (operator-name o) 'move-c-rl)
 (move-c rb lb)
)
((eq (operator-name o) 'move-cc-rl)
 (move-cc rb lb)
)
((eq (operator-name o) 'move-m-rl)
 (move-m rb lb)
)
((eq (operator-name o) 'move-mm-rl)
 (move-mm rb lb)
)
((eq (operator-name o) 'move-mc-rl)
 (move-mc rb lb)
)
)
)
(setf (state-left-bank c) lb)
(setf (state-right-bank c) rb)
NIL
)
```

```
;-----
; set trace flag

(setf *tracing-search* t)
```


Listing of mc2-session.text:

```
$ clisp
```

```
<...snip...>
```

```
[1]> (load "mc2.l")  
;; Loading file mc2.l ...  
;; Loaded file mc2.l  
T  
[2]> (mc)
```

```
>>> Solve
```

```
EXPLORED
```

```
UNEXPLORED
```

```
ROOT
```

```
Missionaries: (M M M) Cannibals: (C C C) Boat: B  
Missionaries: NIL Cannibals: NIL Boat: NIL
```

```
E-NODE
```

```
ROOT
```

```
Missionaries: (M M M) Cannibals: (C C C) Boat: B  
Missionaries: NIL Cannibals: NIL Boat: NIL
```

```
>>> Solve
```

```
EXPLORED
```

```
ROOT
```

```
Missionaries: (M M M) Cannibals: (C C C) Boat: B  
Missionaries: NIL Cannibals: NIL Boat: NIL
```

```
UNEXPLORED
```

```
N3 ROOT MOVE-MC-LR
```

```
Missionaries: (M M) Cannibals: (C C) Boat: NIL  
Missionaries: (M) Cannibals: (C) Boat: B
```

```
N2 ROOT MOVE-CC-LR
```

```
Missionaries: (M M M) Cannibals: (C) Boat: NIL  
Missionaries: NIL Cannibals: (C C) Boat: B
```

```
N1 ROOT MOVE-C-LR
```

```
Missionaries: (M M M) Cannibals: (C C) Boat: NIL  
Missionaries: NIL Cannibals: (C) Boat: B
```

```
E-NODE
```

```
N3 ROOT MOVE-MC-LR
```

```
Missionaries: (M M) Cannibals: (C C) Boat: NIL  
Missionaries: (M) Cannibals: (C) Boat: B
```

>>> Solve

EXPLORED

N3 ROOT MOVE-MC-LR

Missionaries: (M M) Cannibals: (C C) Boat: NIL

Missionaries: (M) Cannibals: (C) Boat: B

ROOT

Missionaries: (M M M) Cannibals: (C C C) Boat: B

Missionaries: NIL Cannibals: NIL Boat: NIL

UNEXPLORED

N2 ROOT MOVE-CC-LR

Missionaries: (M M M) Cannibals: (C) Boat: NIL

Missionaries: NIL Cannibals: (C C) Boat: B

N1 ROOT MOVE-C-LR

Missionaries: (M M M) Cannibals: (C C) Boat: NIL

Missionaries: NIL Cannibals: (C) Boat: B

N5 N3 MOVE-MC-RL

Missionaries: (M M M) Cannibals: (C C C) Boat: B

Missionaries: NIL Cannibals: NIL Boat: NIL

N4 N3 MOVE-M-RL

Missionaries: (M M M) Cannibals: (C C) Boat: B

Missionaries: NIL Cannibals: (C) Boat: NIL

E-NODE

N2 ROOT MOVE-CC-LR

Missionaries: (M M M) Cannibals: (C) Boat: NIL

Missionaries: NIL Cannibals: (C C) Boat: B

>>> Solve

EXPLORED

N2 ROOT MOVE-CC-LR

Missionaries: (M M M) Cannibals: (C) Boat: NIL

Missionaries: NIL Cannibals: (C C) Boat: B

N3 ROOT MOVE-MC-LR

Missionaries: (M M) Cannibals: (C C) Boat: NIL

Missionaries: (M) Cannibals: (C) Boat: B

ROOT

Missionaries: (M M M) Cannibals: (C C C) Boat: B

Missionaries: NIL Cannibals: NIL Boat: NIL

UNEXPLORED

N1 ROOT MOVE-C-LR

Missionaries: (M M M) Cannibals: (C C) Boat: NIL

Missionaries: NIL Cannibals: (C) Boat: B

N5 N3 MOVE-MC-RL

Missionaries: (M M M) Cannibals: (C C C) Boat: B

Missionaries: NIL Cannibals: NIL Boat: NIL

N4 N3 MOVE-M-RL
Missionaries: (M M M) Cannibals: (C C) Boat: B
Missionaries: NIL Cannibals: (C) Boat: NIL
N7 N2 MOVE-CC-RL
Missionaries: (M M M) Cannibals: (C C C) Boat: B
Missionaries: NIL Cannibals: NIL Boat: NIL
N6 N2 MOVE-C-RL
Missionaries: (M M M) Cannibals: (C C) Boat: B
Missionaries: NIL Cannibals: (C) Boat: NIL

E-NODE

N1 ROOT MOVE-C-LR
Missionaries: (M M M) Cannibals: (C C) Boat: NIL
Missionaries: NIL Cannibals: (C) Boat: B

>>> Solve

EXPLORED

N1 ROOT MOVE-C-LR
Missionaries: (M M M) Cannibals: (C C) Boat: NIL
Missionaries: NIL Cannibals: (C) Boat: B
N2 ROOT MOVE-CC-LR
Missionaries: (M M M) Cannibals: (C) Boat: NIL
Missionaries: NIL Cannibals: (C C) Boat: B
N3 ROOT MOVE-MC-LR
Missionaries: (M M) Cannibals: (C C) Boat: NIL
Missionaries: (M) Cannibals: (C) Boat: B
ROOT
Missionaries: (M M M) Cannibals: (C C C) Boat: B
Missionaries: NIL Cannibals: NIL Boat: NIL

UNEXPLORED

N5 N3 MOVE-MC-RL
Missionaries: (M M M) Cannibals: (C C C) Boat: B
Missionaries: NIL Cannibals: NIL Boat: NIL
N4 N3 MOVE-M-RL
Missionaries: (M M M) Cannibals: (C C) Boat: B
Missionaries: NIL Cannibals: (C) Boat: NIL
N7 N2 MOVE-CC-RL
Missionaries: (M M M) Cannibals: (C C C) Boat: B
Missionaries: NIL Cannibals: NIL Boat: NIL
N6 N2 MOVE-C-RL
Missionaries: (M M M) Cannibals: (C C) Boat: B
Missionaries: NIL Cannibals: (C) Boat: NIL
N8 N1 MOVE-C-RL
Missionaries: (M M M) Cannibals: (C C C) Boat: B
Missionaries: NIL Cannibals: NIL Boat: NIL

E-NODE

N5 N3 MOVE-MC-RL
Missionaries: (M M M) Cannibals: (C C C) Boat: B

Missionaries: NIL Cannibals: NIL Boat: NIL

>>> Solve

EXPLORED

N1 ROOT MOVE-C-LR

Missionaries: (M M M) Cannibals: (C C) Boat: NIL

Missionaries: NIL Cannibals: (C) Boat: B

N2 ROOT MOVE-CC-LR

Missionaries: (M M M) Cannibals: (C) Boat: NIL

Missionaries: NIL Cannibals: (C C) Boat: B

N3 ROOT MOVE-MC-LR

Missionaries: (M M) Cannibals: (C C) Boat: NIL

Missionaries: (M) Cannibals: (C) Boat: B

ROOT

Missionaries: (M M M) Cannibals: (C C C) Boat: B

Missionaries: NIL Cannibals: NIL Boat: NIL

UNEXPLORED

N4 N3 MOVE-M-RL

Missionaries: (M M M) Cannibals: (C C) Boat: B

Missionaries: NIL Cannibals: (C) Boat: NIL

N7 N2 MOVE-CC-RL

Missionaries: (M M M) Cannibals: (C C C) Boat: B

Missionaries: NIL Cannibals: NIL Boat: NIL

N6 N2 MOVE-C-RL

Missionaries: (M M M) Cannibals: (C C) Boat: B

Missionaries: NIL Cannibals: (C) Boat: NIL

N8 N1 MOVE-C-RL

Missionaries: (M M M) Cannibals: (C C C) Boat: B

Missionaries: NIL Cannibals: NIL Boat: NIL

E-NODE

N4 N3 MOVE-M-RL

Missionaries: (M M M) Cannibals: (C C) Boat: B

Missionaries: NIL Cannibals: (C) Boat: NIL

>>> Solve

EXPLORED

N4 N3 MOVE-M-RL

Missionaries: (M M M) Cannibals: (C C) Boat: B

Missionaries: NIL Cannibals: (C) Boat: NIL

N1 ROOT MOVE-C-LR

Missionaries: (M M M) Cannibals: (C C) Boat: NIL

Missionaries: NIL Cannibals: (C) Boat: B

N2 ROOT MOVE-CC-LR

Missionaries: (M M M) Cannibals: (C) Boat: NIL

Missionaries: NIL Cannibals: (C C) Boat: B

N3 ROOT MOVE-MC-LR

Missionaries: (M M) Cannibals: (C C) Boat: NIL

Missionaries: (M) Cannibals: (C) Boat: B
ROOT
Missionaries: (M M M) Cannibals: (C C C) Boat: B
Missionaries: NIL Cannibals: NIL Boat: NIL

UNEXPLORED

N7 N2 MOVE-CC-RL
Missionaries: (M M M) Cannibals: (C C C) Boat: B
Missionaries: NIL Cannibals: NIL Boat: NIL
N6 N2 MOVE-C-RL
Missionaries: (M M M) Cannibals: (C C) Boat: B
Missionaries: NIL Cannibals: (C) Boat: NIL
N8 N1 MOVE-C-RL
Missionaries: (M M M) Cannibals: (C C C) Boat: B
Missionaries: NIL Cannibals: NIL Boat: NIL
N11 N4 MOVE-M-LR
Missionaries: (M M) Cannibals: (C C) Boat: NIL
Missionaries: (M) Cannibals: (C) Boat: B
N10 N4 MOVE-CC-LR
Missionaries: (M M M) Cannibals: NIL Boat: NIL
Missionaries: NIL Cannibals: (C C C) Boat: B
N9 N4 MOVE-C-LR
Missionaries: (M M M) Cannibals: (C) Boat: NIL
Missionaries: NIL Cannibals: (C C) Boat: B

E-NODE

N7 N2 MOVE-CC-RL
Missionaries: (M M M) Cannibals: (C C C) Boat: B
Missionaries: NIL Cannibals: NIL Boat: NIL

>>> Solve

EXPLORED

N4 N3 MOVE-M-RL
Missionaries: (M M M) Cannibals: (C C) Boat: B
Missionaries: NIL Cannibals: (C) Boat: NIL
N1 ROOT MOVE-C-LR
Missionaries: (M M M) Cannibals: (C C) Boat: NIL
Missionaries: NIL Cannibals: (C) Boat: B
N2 ROOT MOVE-CC-LR
Missionaries: (M M M) Cannibals: (C) Boat: NIL
Missionaries: NIL Cannibals: (C C) Boat: B
N3 ROOT MOVE-MC-LR
Missionaries: (M M) Cannibals: (C C) Boat: NIL
Missionaries: (M) Cannibals: (C) Boat: B
ROOT
Missionaries: (M M M) Cannibals: (C C C) Boat: B
Missionaries: NIL Cannibals: NIL Boat: NIL

UNEXPLORED

N6 N2 MOVE-C-RL

Missionaries: (M M M) Cannibals: (C C) Boat: B
Missionaries: NIL Cannibals: (C) Boat: NIL
N8 N1 MOVE-C-RL
Missionaries: (M M M) Cannibals: (C C C) Boat: B
Missionaries: NIL Cannibals: NIL Boat: NIL
N11 N4 MOVE-M-LR
Missionaries: (M M) Cannibals: (C C) Boat: NIL
Missionaries: (M) Cannibals: (C) Boat: B
N10 N4 MOVE-CC-LR
Missionaries: (M M M) Cannibals: NIL Boat: NIL
Missionaries: NIL Cannibals: (C C C) Boat: B
N9 N4 MOVE-C-LR
Missionaries: (M M M) Cannibals: (C) Boat: NIL
Missionaries: NIL Cannibals: (C C) Boat: B

E-NODE

N6 N2 MOVE-C-RL
Missionaries: (M M M) Cannibals: (C C) Boat: B
Missionaries: NIL Cannibals: (C) Boat: NIL

>>> Solve

EXPLORED

N4 N3 MOVE-M-RL
Missionaries: (M M M) Cannibals: (C C) Boat: B
Missionaries: NIL Cannibals: (C) Boat: NIL
N1 ROOT MOVE-C-LR
Missionaries: (M M M) Cannibals: (C C) Boat: NIL
Missionaries: NIL Cannibals: (C) Boat: B
N2 ROOT MOVE-CC-LR
Missionaries: (M M M) Cannibals: (C) Boat: NIL
Missionaries: NIL Cannibals: (C C) Boat: B
N3 ROOT MOVE-MC-LR
Missionaries: (M M) Cannibals: (C C) Boat: NIL
Missionaries: (M) Cannibals: (C) Boat: B
ROOT
Missionaries: (M M M) Cannibals: (C C C) Boat: B
Missionaries: NIL Cannibals: NIL Boat: NIL

UNEXPLORED

N8 N1 MOVE-C-RL
Missionaries: (M M M) Cannibals: (C C C) Boat: B
Missionaries: NIL Cannibals: NIL Boat: NIL
N11 N4 MOVE-M-LR
Missionaries: (M M) Cannibals: (C C) Boat: NIL
Missionaries: (M) Cannibals: (C) Boat: B
N10 N4 MOVE-CC-LR
Missionaries: (M M M) Cannibals: NIL Boat: NIL
Missionaries: NIL Cannibals: (C C C) Boat: B
N9 N4 MOVE-C-LR
Missionaries: (M M M) Cannibals: (C) Boat: NIL
Missionaries: NIL Cannibals: (C C) Boat: B

E-NODE

N8 N1 MOVE-C-RL

Missionaries: (M M M) Cannibals: (C C C) Boat: B

Missionaries: NIL Cannibals: NIL Boat: NIL

>>> Solve

EXPLORED

N4 N3 MOVE-M-RL

Missionaries: (M M M) Cannibals: (C C) Boat: B

Missionaries: NIL Cannibals: (C) Boat: NIL

N1 ROOT MOVE-C-LR

Missionaries: (M M M) Cannibals: (C C) Boat: NIL

Missionaries: NIL Cannibals: (C) Boat: B

N2 ROOT MOVE-CC-LR

Missionaries: (M M M) Cannibals: (C) Boat: NIL

Missionaries: NIL Cannibals: (C C) Boat: B

N3 ROOT MOVE-MC-LR

Missionaries: (M M) Cannibals: (C C) Boat: NIL

Missionaries: (M) Cannibals: (C) Boat: B

ROOT

Missionaries: (M M M) Cannibals: (C C C) Boat: B

Missionaries: NIL Cannibals: NIL Boat: NIL

UNEXPLORED

N11 N4 MOVE-M-LR

Missionaries: (M M) Cannibals: (C C) Boat: NIL

Missionaries: (M) Cannibals: (C) Boat: B

N10 N4 MOVE-CC-LR

Missionaries: (M M M) Cannibals: NIL Boat: NIL

Missionaries: NIL Cannibals: (C C C) Boat: B

N9 N4 MOVE-C-LR

Missionaries: (M M M) Cannibals: (C) Boat: NIL

Missionaries: NIL Cannibals: (C C) Boat: B

E-NODE

N11 N4 MOVE-M-LR

Missionaries: (M M) Cannibals: (C C) Boat: NIL

Missionaries: (M) Cannibals: (C) Boat: B

>>> Solve

EXPLORED

N4 N3 MOVE-M-RL

Missionaries: (M M M) Cannibals: (C C) Boat: B

Missionaries: NIL Cannibals: (C) Boat: NIL

N1 ROOT MOVE-C-LR

Missionaries: (M M M) Cannibals: (C C) Boat: NIL

Missionaries: NIL Cannibals: (C) Boat: B

N2 ROOT MOVE-CC-LR
Missionaries: (M M M) Cannibals: (C) Boat: NIL
Missionaries: NIL Cannibals: (C C) Boat: B
N3 ROOT MOVE-MC-LR
Missionaries: (M M) Cannibals: (C C) Boat: NIL
Missionaries: (M) Cannibals: (C) Boat: B
ROOT
Missionaries: (M M M) Cannibals: (C C C) Boat: B
Missionaries: NIL Cannibals: NIL Boat: NIL

UNEXPLORED

N10 N4 MOVE-CC-LR
Missionaries: (M M M) Cannibals: NIL Boat: NIL
Missionaries: NIL Cannibals: (C C C) Boat: B
N9 N4 MOVE-C-LR
Missionaries: (M M M) Cannibals: (C) Boat: NIL
Missionaries: NIL Cannibals: (C C) Boat: B

E-NODE

N10 N4 MOVE-CC-LR
Missionaries: (M M M) Cannibals: NIL Boat: NIL
Missionaries: NIL Cannibals: (C C C) Boat: B

>>> Solve

EXPLORED

N10 N4 MOVE-CC-LR
Missionaries: (M M M) Cannibals: NIL Boat: NIL
Missionaries: NIL Cannibals: (C C C) Boat: B
N4 N3 MOVE-M-RL
Missionaries: (M M M) Cannibals: (C C) Boat: B
Missionaries: NIL Cannibals: (C) Boat: NIL
N1 ROOT MOVE-C-LR
Missionaries: (M M M) Cannibals: (C C) Boat: NIL
Missionaries: NIL Cannibals: (C) Boat: B
N2 ROOT MOVE-CC-LR
Missionaries: (M M M) Cannibals: (C) Boat: NIL
Missionaries: NIL Cannibals: (C C) Boat: B
N3 ROOT MOVE-MC-LR
Missionaries: (M M) Cannibals: (C C) Boat: NIL
Missionaries: (M) Cannibals: (C) Boat: B
ROOT
Missionaries: (M M M) Cannibals: (C C C) Boat: B
Missionaries: NIL Cannibals: NIL Boat: NIL

UNEXPLORED

N9 N4 MOVE-C-LR
Missionaries: (M M M) Cannibals: (C) Boat: NIL
Missionaries: NIL Cannibals: (C C) Boat: B
N13 N10 MOVE-CC-RL
Missionaries: (M M M) Cannibals: (C C) Boat: B

Missionaries: NIL Cannibals: (C) Boat: NIL
N12 N10 MOVE-C-RL
Missionaries: (M M M) Cannibals: (C) Boat: B
Missionaries: NIL Cannibals: (C C) Boat: NIL

E-NODE

N9 N4 MOVE-C-LR
Missionaries: (M M M) Cannibals: (C) Boat: NIL
Missionaries: NIL Cannibals: (C C) Boat: B

>>> Solve

EXPLORED

N10 N4 MOVE-CC-LR
Missionaries: (M M M) Cannibals: NIL Boat: NIL
Missionaries: NIL Cannibals: (C C C) Boat: B
N4 N3 MOVE-M-RL
Missionaries: (M M M) Cannibals: (C C) Boat: B
Missionaries: NIL Cannibals: (C) Boat: NIL
N1 ROOT MOVE-C-LR
Missionaries: (M M M) Cannibals: (C C) Boat: NIL
Missionaries: NIL Cannibals: (C) Boat: B
N2 ROOT MOVE-CC-LR
Missionaries: (M M M) Cannibals: (C) Boat: NIL
Missionaries: NIL Cannibals: (C C) Boat: B
N3 ROOT MOVE-MC-LR
Missionaries: (M M) Cannibals: (C C) Boat: NIL
Missionaries: (M) Cannibals: (C) Boat: B
ROOT
Missionaries: (M M M) Cannibals: (C C C) Boat: B
Missionaries: NIL Cannibals: NIL Boat: NIL

UNEXPLORED

N13 N10 MOVE-CC-RL
Missionaries: (M M M) Cannibals: (C C) Boat: B
Missionaries: NIL Cannibals: (C) Boat: NIL
N12 N10 MOVE-C-RL
Missionaries: (M M M) Cannibals: (C) Boat: B
Missionaries: NIL Cannibals: (C C) Boat: NIL

E-NODE

N13 N10 MOVE-CC-RL
Missionaries: (M M M) Cannibals: (C C) Boat: B
Missionaries: NIL Cannibals: (C) Boat: NIL

>>> Solve

EXPLORED

N10 N4 MOVE-CC-LR
Missionaries: (M M M) Cannibals: NIL Boat: NIL

Missionaries: NIL Cannibals: (C C C) Boat: B
N4 N3 MOVE-M-RL
Missionaries: (M M M) Cannibals: (C C) Boat: B
Missionaries: NIL Cannibals: (C) Boat: NIL
N1 ROOT MOVE-C-LR
Missionaries: (M M M) Cannibals: (C C) Boat: NIL
Missionaries: NIL Cannibals: (C) Boat: B
N2 ROOT MOVE-CC-LR
Missionaries: (M M M) Cannibals: (C) Boat: NIL
Missionaries: NIL Cannibals: (C C) Boat: B
N3 ROOT MOVE-MC-LR
Missionaries: (M M) Cannibals: (C C) Boat: NIL
Missionaries: (M) Cannibals: (C) Boat: B
ROOT
Missionaries: (M M M) Cannibals: (C C C) Boat: B
Missionaries: NIL Cannibals: NIL Boat: NIL

UNEXPLORED

N12 N10 MOVE-C-RL
Missionaries: (M M M) Cannibals: (C) Boat: B
Missionaries: NIL Cannibals: (C C) Boat: NIL

E-NODE

N12 N10 MOVE-C-RL
Missionaries: (M M M) Cannibals: (C) Boat: B
Missionaries: NIL Cannibals: (C C) Boat: NIL

>>> Solve

EXPLORED

N12 N10 MOVE-C-RL
Missionaries: (M M M) Cannibals: (C) Boat: B
Missionaries: NIL Cannibals: (C C) Boat: NIL
N10 N4 MOVE-CC-LR
Missionaries: (M M M) Cannibals: NIL Boat: NIL
Missionaries: NIL Cannibals: (C C C) Boat: B
N4 N3 MOVE-M-RL
Missionaries: (M M M) Cannibals: (C C) Boat: B
Missionaries: NIL Cannibals: (C) Boat: NIL
N1 ROOT MOVE-C-LR
Missionaries: (M M M) Cannibals: (C C) Boat: NIL
Missionaries: NIL Cannibals: (C) Boat: B
N2 ROOT MOVE-CC-LR
Missionaries: (M M M) Cannibals: (C) Boat: NIL
Missionaries: NIL Cannibals: (C C) Boat: B
N3 ROOT MOVE-MC-LR
Missionaries: (M M) Cannibals: (C C) Boat: NIL
Missionaries: (M) Cannibals: (C) Boat: B
ROOT
Missionaries: (M M M) Cannibals: (C C C) Boat: B
Missionaries: NIL Cannibals: NIL Boat: NIL

UNEXPLORED

N15 N12 MOVE-MM-LR

Missionaries: (M) Cannibals: (C) Boat: NIL

Missionaries: (M M) Cannibals: (C C) Boat: B

N14 N12 MOVE-C-LR

Missionaries: (M M M) Cannibals: NIL Boat: NIL

Missionaries: NIL Cannibals: (C C C) Boat: B

E-NODE

N15 N12 MOVE-MM-LR

Missionaries: (M) Cannibals: (C) Boat: NIL

Missionaries: (M M) Cannibals: (C C) Boat: B

>>> Solve

EXPLORED

N15 N12 MOVE-MM-LR

Missionaries: (M) Cannibals: (C) Boat: NIL

Missionaries: (M M) Cannibals: (C C) Boat: B

N12 N10 MOVE-C-RL

Missionaries: (M M M) Cannibals: (C) Boat: B

Missionaries: NIL Cannibals: (C C) Boat: NIL

N10 N4 MOVE-CC-LR

Missionaries: (M M M) Cannibals: NIL Boat: NIL

Missionaries: NIL Cannibals: (C C C) Boat: B

N4 N3 MOVE-M-RL

Missionaries: (M M M) Cannibals: (C C) Boat: B

Missionaries: NIL Cannibals: (C) Boat: NIL

N1 ROOT MOVE-C-LR

Missionaries: (M M M) Cannibals: (C C) Boat: NIL

Missionaries: NIL Cannibals: (C) Boat: B

N2 ROOT MOVE-CC-LR

Missionaries: (M M M) Cannibals: (C) Boat: NIL

Missionaries: NIL Cannibals: (C C) Boat: B

N3 ROOT MOVE-MC-LR

Missionaries: (M M) Cannibals: (C C) Boat: NIL

Missionaries: (M) Cannibals: (C) Boat: B

ROOT

Missionaries: (M M M) Cannibals: (C C C) Boat: B

Missionaries: NIL Cannibals: NIL Boat: NIL

UNEXPLORED

N14 N12 MOVE-C-LR

Missionaries: (M M M) Cannibals: NIL Boat: NIL

Missionaries: NIL Cannibals: (C C C) Boat: B

N17 N15 MOVE-MC-RL

Missionaries: (M M) Cannibals: (C C) Boat: B

Missionaries: (M) Cannibals: (C) Boat: NIL

N16 N15 MOVE-MM-RL

Missionaries: (M M M) Cannibals: (C) Boat: B

Missionaries: NIL Cannibals: (C C) Boat: NIL

E-NODE

N14 N12 MOVE-C-LR

Missionaries: (M M M) Cannibals: NIL Boat: NIL

Missionaries: NIL Cannibals: (C C C) Boat: B

>>> Solve

EXPLORED

N15 N12 MOVE-MM-LR

Missionaries: (M) Cannibals: (C) Boat: NIL

Missionaries: (M M) Cannibals: (C C) Boat: B

N12 N10 MOVE-C-RL

Missionaries: (M M M) Cannibals: (C) Boat: B

Missionaries: NIL Cannibals: (C C) Boat: NIL

N10 N4 MOVE-CC-LR

Missionaries: (M M M) Cannibals: NIL Boat: NIL

Missionaries: NIL Cannibals: (C C C) Boat: B

N4 N3 MOVE-M-RL

Missionaries: (M M M) Cannibals: (C C) Boat: B

Missionaries: NIL Cannibals: (C) Boat: NIL

N1 ROOT MOVE-C-LR

Missionaries: (M M M) Cannibals: (C C) Boat: NIL

Missionaries: NIL Cannibals: (C) Boat: B

N2 ROOT MOVE-CC-LR

Missionaries: (M M M) Cannibals: (C) Boat: NIL

Missionaries: NIL Cannibals: (C C) Boat: B

N3 ROOT MOVE-MC-LR

Missionaries: (M M) Cannibals: (C C) Boat: NIL

Missionaries: (M) Cannibals: (C) Boat: B

ROOT

Missionaries: (M M M) Cannibals: (C C C) Boat: B

Missionaries: NIL Cannibals: NIL Boat: NIL

UNEXPLORED

N17 N15 MOVE-MC-RL

Missionaries: (M M) Cannibals: (C C) Boat: B

Missionaries: (M) Cannibals: (C) Boat: NIL

N16 N15 MOVE-MM-RL

Missionaries: (M M M) Cannibals: (C) Boat: B

Missionaries: NIL Cannibals: (C C) Boat: NIL

E-NODE

N17 N15 MOVE-MC-RL

Missionaries: (M M) Cannibals: (C C) Boat: B

Missionaries: (M) Cannibals: (C) Boat: NIL

>>> Solve

EXPLORED

N17 N15 MOVE-MC-RL
Missionaries: (M M) Cannibals: (C C) Boat: B
Missionaries: (M) Cannibals: (C) Boat: NIL
N15 N12 MOVE-MM-LR
Missionaries: (M) Cannibals: (C) Boat: NIL
Missionaries: (M M) Cannibals: (C C) Boat: B
N12 N10 MOVE-C-RL
Missionaries: (M M M) Cannibals: (C) Boat: B
Missionaries: NIL Cannibals: (C C) Boat: NIL
N10 N4 MOVE-CC-LR
Missionaries: (M M M) Cannibals: NIL Boat: NIL
Missionaries: NIL Cannibals: (C C C) Boat: B
N4 N3 MOVE-M-RL
Missionaries: (M M M) Cannibals: (C C) Boat: B
Missionaries: NIL Cannibals: (C) Boat: NIL
N1 ROOT MOVE-C-LR
Missionaries: (M M M) Cannibals: (C C) Boat: NIL
Missionaries: NIL Cannibals: (C) Boat: B
N2 ROOT MOVE-CC-LR
Missionaries: (M M M) Cannibals: (C) Boat: NIL
Missionaries: NIL Cannibals: (C C) Boat: B
N3 ROOT MOVE-MC-LR
Missionaries: (M M) Cannibals: (C C) Boat: NIL
Missionaries: (M) Cannibals: (C) Boat: B
ROOT
Missionaries: (M M M) Cannibals: (C C C) Boat: B
Missionaries: NIL Cannibals: NIL Boat: NIL

UNEXPLORED

N16 N15 MOVE-MM-RL
Missionaries: (M M M) Cannibals: (C) Boat: B
Missionaries: NIL Cannibals: (C C) Boat: NIL
N19 N17 MOVE-MC-LR
Missionaries: (M) Cannibals: (C) Boat: NIL
Missionaries: (M M) Cannibals: (C C) Boat: B
N18 N17 MOVE-MM-LR
Missionaries: NIL Cannibals: (C C) Boat: NIL
Missionaries: (M M M) Cannibals: (C) Boat: B

E-NODE

N16 N15 MOVE-MM-RL
Missionaries: (M M M) Cannibals: (C) Boat: B
Missionaries: NIL Cannibals: (C C) Boat: NIL

>>> Solve

EXPLORED

N17 N15 MOVE-MC-RL
Missionaries: (M M) Cannibals: (C C) Boat: B
Missionaries: (M) Cannibals: (C) Boat: NIL
N15 N12 MOVE-MM-LR
Missionaries: (M) Cannibals: (C) Boat: NIL

Missionaries: (M M) Cannibals: (C C) Boat: B
N12 N10 MOVE-C-RL
Missionaries: (M M M) Cannibals: (C) Boat: B
Missionaries: NIL Cannibals: (C C) Boat: NIL
N10 N4 MOVE-CC-LR
Missionaries: (M M M) Cannibals: NIL Boat: NIL
Missionaries: NIL Cannibals: (C C C) Boat: B
N4 N3 MOVE-M-RL
Missionaries: (M M M) Cannibals: (C C) Boat: B
Missionaries: NIL Cannibals: (C) Boat: NIL
N1 ROOT MOVE-C-LR
Missionaries: (M M M) Cannibals: (C C) Boat: NIL
Missionaries: NIL Cannibals: (C) Boat: B
N2 ROOT MOVE-CC-LR
Missionaries: (M M M) Cannibals: (C) Boat: NIL
Missionaries: NIL Cannibals: (C C) Boat: B
N3 ROOT MOVE-MC-LR
Missionaries: (M M) Cannibals: (C C) Boat: NIL
Missionaries: (M) Cannibals: (C) Boat: B
ROOT
Missionaries: (M M M) Cannibals: (C C C) Boat: B
Missionaries: NIL Cannibals: NIL Boat: NIL

UNEXPLORED

N19 N17 MOVE-MC-LR
Missionaries: (M) Cannibals: (C) Boat: NIL
Missionaries: (M M) Cannibals: (C C) Boat: B
N18 N17 MOVE-MM-LR
Missionaries: NIL Cannibals: (C C) Boat: NIL
Missionaries: (M M M) Cannibals: (C) Boat: B

E-NODE

N19 N17 MOVE-MC-LR
Missionaries: (M) Cannibals: (C) Boat: NIL
Missionaries: (M M) Cannibals: (C C) Boat: B

>>> Solve

EXPLORED

N17 N15 MOVE-MC-RL
Missionaries: (M M) Cannibals: (C C) Boat: B
Missionaries: (M) Cannibals: (C) Boat: NIL
N15 N12 MOVE-MM-LR
Missionaries: (M) Cannibals: (C) Boat: NIL
Missionaries: (M M) Cannibals: (C C) Boat: B
N12 N10 MOVE-C-RL
Missionaries: (M M M) Cannibals: (C) Boat: B
Missionaries: NIL Cannibals: (C C) Boat: NIL
N10 N4 MOVE-CC-LR
Missionaries: (M M M) Cannibals: NIL Boat: NIL
Missionaries: NIL Cannibals: (C C C) Boat: B
N4 N3 MOVE-M-RL

Missionaries: (M M M) Cannibals: (C C) Boat: B
Missionaries: NIL Cannibals: (C) Boat: NIL
N1 ROOT MOVE-C-LR
Missionaries: (M M M) Cannibals: (C C) Boat: NIL
Missionaries: NIL Cannibals: (C) Boat: B
N2 ROOT MOVE-CC-LR
Missionaries: (M M M) Cannibals: (C) Boat: NIL
Missionaries: NIL Cannibals: (C C) Boat: B
N3 ROOT MOVE-MC-LR
Missionaries: (M M) Cannibals: (C C) Boat: NIL
Missionaries: (M) Cannibals: (C) Boat: B
ROOT
Missionaries: (M M M) Cannibals: (C C C) Boat: B
Missionaries: NIL Cannibals: NIL Boat: NIL

UNEXPLORED

N18 N17 MOVE-MM-LR
Missionaries: NIL Cannibals: (C C) Boat: NIL
Missionaries: (M M M) Cannibals: (C) Boat: B

E-NODE

N18 N17 MOVE-MM-LR
Missionaries: NIL Cannibals: (C C) Boat: NIL
Missionaries: (M M M) Cannibals: (C) Boat: B

>>> Solve

EXPLORED

N18 N17 MOVE-MM-LR
Missionaries: NIL Cannibals: (C C) Boat: NIL
Missionaries: (M M M) Cannibals: (C) Boat: B
N17 N15 MOVE-MC-RL
Missionaries: (M M) Cannibals: (C C) Boat: B
Missionaries: (M) Cannibals: (C) Boat: NIL
N15 N12 MOVE-MM-LR
Missionaries: (M) Cannibals: (C) Boat: NIL
Missionaries: (M M) Cannibals: (C C) Boat: B
N12 N10 MOVE-C-RL
Missionaries: (M M M) Cannibals: (C) Boat: B
Missionaries: NIL Cannibals: (C C) Boat: NIL
N10 N4 MOVE-CC-LR
Missionaries: (M M M) Cannibals: NIL Boat: NIL
Missionaries: NIL Cannibals: (C C C) Boat: B
N4 N3 MOVE-M-RL
Missionaries: (M M M) Cannibals: (C C) Boat: B
Missionaries: NIL Cannibals: (C) Boat: NIL
N1 ROOT MOVE-C-LR
Missionaries: (M M M) Cannibals: (C C) Boat: NIL
Missionaries: NIL Cannibals: (C) Boat: B
N2 ROOT MOVE-CC-LR
Missionaries: (M M M) Cannibals: (C) Boat: NIL
Missionaries: NIL Cannibals: (C C) Boat: B

N3 ROOT MOVE-MC-LR
Missionaries: (M M) Cannibals: (C C) Boat: NIL
Missionaries: (M) Cannibals: (C) Boat: B
ROOT
Missionaries: (M M M) Cannibals: (C C C) Boat: B
Missionaries: NIL Cannibals: NIL Boat: NIL

UNEXPLORED

N21 N18 MOVE-MM-RL
Missionaries: (M M) Cannibals: (C C) Boat: B
Missionaries: (M) Cannibals: (C) Boat: NIL
N20 N18 MOVE-C-RL
Missionaries: NIL Cannibals: (C C C) Boat: B
Missionaries: (M M M) Cannibals: NIL Boat: NIL

E-NODE

N21 N18 MOVE-MM-RL
Missionaries: (M M) Cannibals: (C C) Boat: B
Missionaries: (M) Cannibals: (C) Boat: NIL

>>> Solve

EXPLORED

N18 N17 MOVE-MM-LR
Missionaries: NIL Cannibals: (C C) Boat: NIL
Missionaries: (M M M) Cannibals: (C) Boat: B
N17 N15 MOVE-MC-RL
Missionaries: (M M) Cannibals: (C C) Boat: B
Missionaries: (M) Cannibals: (C) Boat: NIL
N15 N12 MOVE-MM-LR
Missionaries: (M) Cannibals: (C) Boat: NIL
Missionaries: (M M) Cannibals: (C C) Boat: B
N12 N10 MOVE-C-RL
Missionaries: (M M M) Cannibals: (C) Boat: B
Missionaries: NIL Cannibals: (C C) Boat: NIL
N10 N4 MOVE-CC-LR
Missionaries: (M M M) Cannibals: NIL Boat: NIL
Missionaries: NIL Cannibals: (C C C) Boat: B
N4 N3 MOVE-M-RL
Missionaries: (M M M) Cannibals: (C C) Boat: B
Missionaries: NIL Cannibals: (C) Boat: NIL
N1 ROOT MOVE-C-LR
Missionaries: (M M M) Cannibals: (C C) Boat: NIL
Missionaries: NIL Cannibals: (C) Boat: B
N2 ROOT MOVE-CC-LR
Missionaries: (M M M) Cannibals: (C) Boat: NIL
Missionaries: NIL Cannibals: (C C) Boat: B
N3 ROOT MOVE-MC-LR
Missionaries: (M M) Cannibals: (C C) Boat: NIL
Missionaries: (M) Cannibals: (C) Boat: B
ROOT
Missionaries: (M M M) Cannibals: (C C C) Boat: B

Missionaries: NIL Cannibals: NIL Boat: NIL

UNEXPLORED

N20 N18 MOVE-C-RL

Missionaries: NIL Cannibals: (C C C) Boat: B

Missionaries: (M M M) Cannibals: NIL Boat: NIL

E-NODE

N20 N18 MOVE-C-RL

Missionaries: NIL Cannibals: (C C C) Boat: B

Missionaries: (M M M) Cannibals: NIL Boat: NIL

>>> Solve

EXPLORED

N20 N18 MOVE-C-RL

Missionaries: NIL Cannibals: (C C C) Boat: B

Missionaries: (M M M) Cannibals: NIL Boat: NIL

N18 N17 MOVE-MM-LR

Missionaries: NIL Cannibals: (C C) Boat: NIL

Missionaries: (M M M) Cannibals: (C) Boat: B

N17 N15 MOVE-MC-RL

Missionaries: (M M) Cannibals: (C C) Boat: B

Missionaries: (M) Cannibals: (C) Boat: NIL

N15 N12 MOVE-MM-LR

Missionaries: (M) Cannibals: (C) Boat: NIL

Missionaries: (M M) Cannibals: (C C) Boat: B

N12 N10 MOVE-C-RL

Missionaries: (M M M) Cannibals: (C) Boat: B

Missionaries: NIL Cannibals: (C C) Boat: NIL

N10 N4 MOVE-CC-LR

Missionaries: (M M M) Cannibals: NIL Boat: NIL

Missionaries: NIL Cannibals: (C C C) Boat: B

N4 N3 MOVE-M-RL

Missionaries: (M M M) Cannibals: (C C) Boat: B

Missionaries: NIL Cannibals: (C) Boat: NIL

N1 ROOT MOVE-C-LR

Missionaries: (M M M) Cannibals: (C C) Boat: NIL

Missionaries: NIL Cannibals: (C) Boat: B

N2 ROOT MOVE-CC-LR

Missionaries: (M M M) Cannibals: (C) Boat: NIL

Missionaries: NIL Cannibals: (C C) Boat: B

N3 ROOT MOVE-MC-LR

Missionaries: (M M) Cannibals: (C C) Boat: NIL

Missionaries: (M) Cannibals: (C) Boat: B

ROOT

Missionaries: (M M M) Cannibals: (C C C) Boat: B

Missionaries: NIL Cannibals: NIL Boat: NIL

UNEXPLORED

N23 N20 MOVE-CC-LR

Missionaries: NIL Cannibals: (C) Boat: NIL
Missionaries: (M M M) Cannibals: (C C) Boat: B
N22 N20 MOVE-C-LR
Missionaries: NIL Cannibals: (C C) Boat: NIL
Missionaries: (M M M) Cannibals: (C) Boat: B

E-NODE

N23 N20 MOVE-CC-LR
Missionaries: NIL Cannibals: (C) Boat: NIL
Missionaries: (M M M) Cannibals: (C C) Boat: B

>>> Solve

EXPLORED

N23 N20 MOVE-CC-LR
Missionaries: NIL Cannibals: (C) Boat: NIL
Missionaries: (M M M) Cannibals: (C C) Boat: B
N20 N18 MOVE-C-RL
Missionaries: NIL Cannibals: (C C C) Boat: B
Missionaries: (M M M) Cannibals: NIL Boat: NIL
N18 N17 MOVE-MM-LR
Missionaries: NIL Cannibals: (C C) Boat: NIL
Missionaries: (M M M) Cannibals: (C) Boat: B
N17 N15 MOVE-MC-RL
Missionaries: (M M) Cannibals: (C C) Boat: B
Missionaries: (M) Cannibals: (C) Boat: NIL
N15 N12 MOVE-MM-LR
Missionaries: (M) Cannibals: (C) Boat: NIL
Missionaries: (M M) Cannibals: (C C) Boat: B
N12 N10 MOVE-C-RL
Missionaries: (M M M) Cannibals: (C) Boat: B
Missionaries: NIL Cannibals: (C C) Boat: NIL
N10 N4 MOVE-CC-LR
Missionaries: (M M M) Cannibals: NIL Boat: NIL
Missionaries: NIL Cannibals: (C C C) Boat: B
N4 N3 MOVE-M-RL
Missionaries: (M M M) Cannibals: (C C) Boat: B
Missionaries: NIL Cannibals: (C) Boat: NIL
N1 ROOT MOVE-C-LR
Missionaries: (M M M) Cannibals: (C C) Boat: NIL
Missionaries: NIL Cannibals: (C) Boat: B
N2 ROOT MOVE-CC-LR
Missionaries: (M M M) Cannibals: (C) Boat: NIL
Missionaries: NIL Cannibals: (C C) Boat: B
N3 ROOT MOVE-MC-LR
Missionaries: (M M) Cannibals: (C C) Boat: NIL
Missionaries: (M) Cannibals: (C) Boat: B
ROOT
Missionaries: (M M M) Cannibals: (C C C) Boat: B
Missionaries: NIL Cannibals: NIL Boat: NIL

UNEXPLORED

N22 N20 MOVE-C-LR
Missionaries: NIL Cannibals: (C C) Boat: NIL
Missionaries: (M M M) Cannibals: (C) Boat: B
N26 N23 MOVE-M-RL
Missionaries: (M) Cannibals: (C) Boat: B
Missionaries: (M M) Cannibals: (C C) Boat: NIL
N25 N23 MOVE-CC-RL
Missionaries: NIL Cannibals: (C C C) Boat: B
Missionaries: (M M M) Cannibals: NIL Boat: NIL
N24 N23 MOVE-C-RL
Missionaries: NIL Cannibals: (C C) Boat: B
Missionaries: (M M M) Cannibals: (C) Boat: NIL

E-NODE

N22 N20 MOVE-C-LR
Missionaries: NIL Cannibals: (C C) Boat: NIL
Missionaries: (M M M) Cannibals: (C) Boat: B

>>> Solve

EXPLORED

N23 N20 MOVE-CC-LR
Missionaries: NIL Cannibals: (C) Boat: NIL
Missionaries: (M M M) Cannibals: (C C) Boat: B
N20 N18 MOVE-C-RL
Missionaries: NIL Cannibals: (C C C) Boat: B
Missionaries: (M M M) Cannibals: NIL Boat: NIL
N18 N17 MOVE-MM-LR
Missionaries: NIL Cannibals: (C C) Boat: NIL
Missionaries: (M M M) Cannibals: (C) Boat: B
N17 N15 MOVE-MC-RL
Missionaries: (M M) Cannibals: (C C) Boat: B
Missionaries: (M) Cannibals: (C) Boat: NIL
N15 N12 MOVE-MM-LR
Missionaries: (M) Cannibals: (C) Boat: NIL
Missionaries: (M M) Cannibals: (C C) Boat: B
N12 N10 MOVE-C-RL
Missionaries: (M M M) Cannibals: (C) Boat: B
Missionaries: NIL Cannibals: (C C) Boat: NIL
N10 N4 MOVE-CC-LR
Missionaries: (M M M) Cannibals: NIL Boat: NIL
Missionaries: NIL Cannibals: (C C C) Boat: B
N4 N3 MOVE-M-RL
Missionaries: (M M M) Cannibals: (C C) Boat: B
Missionaries: NIL Cannibals: (C) Boat: NIL
N1 ROOT MOVE-C-LR
Missionaries: (M M M) Cannibals: (C C) Boat: NIL
Missionaries: NIL Cannibals: (C) Boat: B
N2 ROOT MOVE-CC-LR
Missionaries: (M M M) Cannibals: (C) Boat: NIL
Missionaries: NIL Cannibals: (C C) Boat: B
N3 ROOT MOVE-MC-LR
Missionaries: (M M) Cannibals: (C C) Boat: NIL

Missionaries: (M) Cannibals: (C) Boat: B
ROOT
Missionaries: (M M M) Cannibals: (C C C) Boat: B
Missionaries: NIL Cannibals: NIL Boat: NIL

UNEXPLORED

N26 N23 MOVE-M-RL
Missionaries: (M) Cannibals: (C) Boat: B
Missionaries: (M M) Cannibals: (C C) Boat: NIL
N25 N23 MOVE-CC-RL
Missionaries: NIL Cannibals: (C C C) Boat: B
Missionaries: (M M M) Cannibals: NIL Boat: NIL
N24 N23 MOVE-C-RL
Missionaries: NIL Cannibals: (C C) Boat: B
Missionaries: (M M M) Cannibals: (C) Boat: NIL

E-NODE

N26 N23 MOVE-M-RL
Missionaries: (M) Cannibals: (C) Boat: B
Missionaries: (M M) Cannibals: (C C) Boat: NIL

>>> Solve

EXPLORED

N26 N23 MOVE-M-RL
Missionaries: (M) Cannibals: (C) Boat: B
Missionaries: (M M) Cannibals: (C C) Boat: NIL
N23 N20 MOVE-CC-LR
Missionaries: NIL Cannibals: (C) Boat: NIL
Missionaries: (M M M) Cannibals: (C C) Boat: B
N20 N18 MOVE-C-RL
Missionaries: NIL Cannibals: (C C C) Boat: B
Missionaries: (M M M) Cannibals: NIL Boat: NIL
N18 N17 MOVE-MM-LR
Missionaries: NIL Cannibals: (C C) Boat: NIL
Missionaries: (M M M) Cannibals: (C) Boat: B
N17 N15 MOVE-MC-RL
Missionaries: (M M) Cannibals: (C C) Boat: B
Missionaries: (M) Cannibals: (C) Boat: NIL
N15 N12 MOVE-MM-LR
Missionaries: (M) Cannibals: (C) Boat: NIL
Missionaries: (M M) Cannibals: (C C) Boat: B
N12 N10 MOVE-C-RL
Missionaries: (M M M) Cannibals: (C) Boat: B
Missionaries: NIL Cannibals: (C C) Boat: NIL
N10 N4 MOVE-CC-LR
Missionaries: (M M M) Cannibals: NIL Boat: NIL
Missionaries: NIL Cannibals: (C C C) Boat: B
N4 N3 MOVE-M-RL
Missionaries: (M M M) Cannibals: (C C) Boat: B
Missionaries: NIL Cannibals: (C) Boat: NIL
N1 ROOT MOVE-C-LR

Missionaries: (M M M) Cannibals: (C C) Boat: NIL
Missionaries: NIL Cannibals: (C) Boat: B
N2 ROOT MOVE-CC-LR
Missionaries: (M M M) Cannibals: (C) Boat: NIL
Missionaries: NIL Cannibals: (C C) Boat: B
N3 ROOT MOVE-MC-LR
Missionaries: (M M) Cannibals: (C C) Boat: NIL
Missionaries: (M) Cannibals: (C) Boat: B
ROOT
Missionaries: (M M M) Cannibals: (C C C) Boat: B
Missionaries: NIL Cannibals: NIL Boat: NIL

UNEXPLORED

N25 N23 MOVE-CC-RL
Missionaries: NIL Cannibals: (C C C) Boat: B
Missionaries: (M M M) Cannibals: NIL Boat: NIL
N24 N23 MOVE-C-RL
Missionaries: NIL Cannibals: (C C) Boat: B
Missionaries: (M M M) Cannibals: (C) Boat: NIL
N28 N26 MOVE-MC-LR
Missionaries: NIL Cannibals: NIL Boat: NIL
Missionaries: (M M M) Cannibals: (C C C) Boat: B
N27 N26 MOVE-M-LR
Missionaries: NIL Cannibals: (C) Boat: NIL
Missionaries: (M M M) Cannibals: (C C) Boat: B

E-NODE

N25 N23 MOVE-CC-RL
Missionaries: NIL Cannibals: (C C C) Boat: B
Missionaries: (M M M) Cannibals: NIL Boat: NIL

>>> Solve

EXPLORED

N26 N23 MOVE-M-RL
Missionaries: (M) Cannibals: (C) Boat: B
Missionaries: (M M) Cannibals: (C C) Boat: NIL
N23 N20 MOVE-CC-LR
Missionaries: NIL Cannibals: (C) Boat: NIL
Missionaries: (M M M) Cannibals: (C C) Boat: B
N20 N18 MOVE-C-RL
Missionaries: NIL Cannibals: (C C C) Boat: B
Missionaries: (M M M) Cannibals: NIL Boat: NIL
N18 N17 MOVE-MM-LR
Missionaries: NIL Cannibals: (C C) Boat: NIL
Missionaries: (M M M) Cannibals: (C) Boat: B
N17 N15 MOVE-MC-RL
Missionaries: (M M) Cannibals: (C C) Boat: B
Missionaries: (M) Cannibals: (C) Boat: NIL
N15 N12 MOVE-MM-LR
Missionaries: (M) Cannibals: (C) Boat: NIL
Missionaries: (M M) Cannibals: (C C) Boat: B

N12 N10 MOVE-C-RL
Missionaries: (M M M) Cannibals: (C) Boat: B
Missionaries: NIL Cannibals: (C C) Boat: NIL
N10 N4 MOVE-CC-LR
Missionaries: (M M M) Cannibals: NIL Boat: NIL
Missionaries: NIL Cannibals: (C C C) Boat: B
N4 N3 MOVE-M-RL
Missionaries: (M M M) Cannibals: (C C) Boat: B
Missionaries: NIL Cannibals: (C) Boat: NIL
N1 ROOT MOVE-C-LR
Missionaries: (M M M) Cannibals: (C C) Boat: NIL
Missionaries: NIL Cannibals: (C) Boat: B
N2 ROOT MOVE-CC-LR
Missionaries: (M M M) Cannibals: (C) Boat: NIL
Missionaries: NIL Cannibals: (C C) Boat: B
N3 ROOT MOVE-MC-LR
Missionaries: (M M) Cannibals: (C C) Boat: NIL
Missionaries: (M) Cannibals: (C) Boat: B
ROOT
Missionaries: (M M M) Cannibals: (C C C) Boat: B
Missionaries: NIL Cannibals: NIL Boat: NIL

UNEXPLORED

N24 N23 MOVE-C-RL
Missionaries: NIL Cannibals: (C C) Boat: B
Missionaries: (M M M) Cannibals: (C) Boat: NIL
N28 N26 MOVE-MC-LR
Missionaries: NIL Cannibals: NIL Boat: NIL
Missionaries: (M M M) Cannibals: (C C C) Boat: B
N27 N26 MOVE-M-LR
Missionaries: NIL Cannibals: (C) Boat: NIL
Missionaries: (M M M) Cannibals: (C C) Boat: B

E-NODE

N24 N23 MOVE-C-RL
Missionaries: NIL Cannibals: (C C) Boat: B
Missionaries: (M M M) Cannibals: (C) Boat: NIL

>>> Solve

EXPLORED

N24 N23 MOVE-C-RL
Missionaries: NIL Cannibals: (C C) Boat: B
Missionaries: (M M M) Cannibals: (C) Boat: NIL
N26 N23 MOVE-M-RL
Missionaries: (M) Cannibals: (C) Boat: B
Missionaries: (M M) Cannibals: (C C) Boat: NIL
N23 N20 MOVE-CC-LR
Missionaries: NIL Cannibals: (C) Boat: NIL
Missionaries: (M M M) Cannibals: (C C) Boat: B
N20 N18 MOVE-C-RL
Missionaries: NIL Cannibals: (C C C) Boat: B

Missionaries: (M M M) Cannibals: NIL Boat: NIL
 N18 N17 MOVE-MM-LR
 Missionaries: NIL Cannibals: (C C) Boat: NIL
 Missionaries: (M M M) Cannibals: (C) Boat: B
 N17 N15 MOVE-MC-RL
 Missionaries: (M M) Cannibals: (C C) Boat: B
 Missionaries: (M) Cannibals: (C) Boat: NIL
 N15 N12 MOVE-MM-LR
 Missionaries: (M) Cannibals: (C) Boat: NIL
 Missionaries: (M M) Cannibals: (C C) Boat: B
 N12 N10 MOVE-C-RL
 Missionaries: (M M M) Cannibals: (C) Boat: B
 Missionaries: NIL Cannibals: (C C) Boat: NIL
 N10 N4 MOVE-CC-LR
 Missionaries: (M M M) Cannibals: NIL Boat: NIL
 Missionaries: NIL Cannibals: (C C C) Boat: B
 N4 N3 MOVE-M-RL
 Missionaries: (M M M) Cannibals: (C C) Boat: B
 Missionaries: NIL Cannibals: (C) Boat: NIL
 N1 ROOT MOVE-C-LR
 Missionaries: (M M M) Cannibals: (C C) Boat: NIL
 Missionaries: NIL Cannibals: (C) Boat: B
 N2 ROOT MOVE-CC-LR
 Missionaries: (M M M) Cannibals: (C) Boat: NIL
 Missionaries: NIL Cannibals: (C C) Boat: B
 N3 ROOT MOVE-MC-LR
 Missionaries: (M M) Cannibals: (C C) Boat: NIL
 Missionaries: (M) Cannibals: (C) Boat: B
 ROOT
 Missionaries: (M M M) Cannibals: (C C C) Boat: B
 Missionaries: NIL Cannibals: NIL Boat: NIL

UNEXPLORED

N28 N26 MOVE-MC-LR
 Missionaries: NIL Cannibals: NIL Boat: NIL
 Missionaries: (M M M) Cannibals: (C C C) Boat: B
 N27 N26 MOVE-M-LR
 Missionaries: NIL Cannibals: (C) Boat: NIL
 Missionaries: (M M M) Cannibals: (C C) Boat: B
 N30 N24 MOVE-CC-LR
 Missionaries: NIL Cannibals: NIL Boat: NIL
 Missionaries: (M M M) Cannibals: (C C C) Boat: B
 N29 N24 MOVE-C-LR
 Missionaries: NIL Cannibals: (C) Boat: NIL
 Missionaries: (M M M) Cannibals: (C C) Boat: B

E-NODE

N28 N26 MOVE-MC-LR
 Missionaries: NIL Cannibals: NIL Boat: NIL
 Missionaries: (M M M) Cannibals: (C C C) Boat: B

Move one missionary and one cannibal from the left bank to the right with the boat.

Move one missionary from the right bank to the left with the boat.
Move two cannibals from the left bank to the right with the boat.
Move one cannibal from the right bank to the left with the boat.
Move two missionaries from the left bank to the right with the boat.
Move one missionary and one cannibal from the right bank to the left with the boat.
Move two missionaries from the left bank to the right with the boat.
Move one cannibal from the right bank to the left with the boat.
Move two cannibals from the left bank to the right with the boat.
Move one missionary from the right bank to the left with the boat.
Move one missionary and one cannibal from the left bank to the right with the boat.
NIL
[3]> (bye)
Bye.

