```
0000:             |           ;; Program that reads a positive integer n and
0000:             |           ;; solves the problem of the Hanoi towers for n disks:
0000:             |           ;;
0000:             |           ;;      void rhanoi(int n, int src, int dst)
0000:             |           ;;      {
0000:             |           ;;          int other;
0000:             |           ;;
0000:             |           ;;          if (n > 1) {
0000:             |           ;;              other = 6 - src - dst;
0000:             |           ;;              rhanoi(n - 1, src, other);
0000:             |           ;;              rhanoi(1, src, dst);
0000:             |           ;;              rhanoi(n - 1, other, dst);
0000:             |           ;;          }
0000:             |           ;;          else { /* print line "src -> dst" */
0000:             |           ;;              putmsg(src, dst);
0000:             |           ;;          }
0000:             |           ;;
0000:             |           ;;      int main()
0000:             |           ;;      {
0000:             |           ;;          int ndisks;
0000:             |           ;;
0000:             |           ;;          ndisks = read_integer();
0000:             |           ;;          rhanoi(n, 1, 2);
0000:             |           ;;
0000:             |           ;;          return 0;
0000:             |           ;;      }
0000:             |
0000:             |   READ    equ     0             ; syscall code for read integer
0000:             |   WRITE   equ     1             ; syscall code for write integer
0000:             |   EXIT    equ     2             ; syscall code for program exit
0000:             |   WRTSTR  equ     4             ; syscall code for write string
0000:             |
0000:             |           org     100H
0100:             |
0100: C0 A7 01    |           jmp     main          ; jump to main function
0103:             |
0103:             |
0103:             |   ;;;     data area -------------------------------------------
0103:             |
0103: 00 00       |   ndisks: dw      ?
0105:             |
0105: 45 6E 74    |   prompt: ds      "Enter n: "
0108: 65 72 20
010B: 6E 3A 20
010E: 00
010F: 53 6F 6C    |   sol:    ds      "Solution:\n"
0112: 75 74 69
0115: 6F 6E 3A
0118: 0A 00
011A:             |
011A:             |
011A:             |   msg:
011A: 3F          |   from:   du      "?"
011B: 20 2D 3E    |           du      " -> "
011E: 20
011F: 3F 20 0A    |   to:     ds      "? \n"
0122: 00
0123:             |
0123:             |
0123:             |
0123:             |
0123:             |
0123:             |
0123:             |
0123:             |
0123:             |
0123:             |
0123:             |   ;;;     void putmsg(int src, int dst); ----------------------
0123:             |
0123:             |   putmsg:
0123: 06          |           push    bp
0124: 40 3E       |           mov     bp, sp
0126:             |
0126:             |     ; stack frame:
0126:             |     ;     saved_bp     <--- bp
0126:             |     ;     return_addr       bp + 2
0126:             |     ;     src               bp + 4
0126:             |     ;     dst               bp + 6
0126:             |
0126:             |     src   equ     4
0126:             |     dst   equ     6
0126:             |
0126: 90 30 00    |           mov     r0, 30H         ; ASCII code for char '0'
0129:             |
0129: A9 04 00    |           mov     r1, [bp + src]  ; from
012C: 40 41       |           add     r1, r0
012E: A1 1A 01    |           movb    [from], r1
0131:             |
0131: A9 06 00    |           mov     r1, [bp + dst]  ; to
0134: 40 41       |           add     r1, r0
0136: A1 1F 01    |           movb    [to], r1
0139:             |
0139: 90 04 00    |           mov     r0, WRTSTR      ; show message "from -> to\n"
013C: 91 1A 01    |           mov     r1, msg
013F: 3E          |           syscall
0140:             |
0140:             |          ;mov     sp, bp
0140: 0E          |           pop     bp
0141: 3D          |           ret
0142:             |
0142:             |
0142:             |
```

```
0142:             |   ;;;     void rhanoi(int n, int src, int dst); ----------------
0142:             |
0142:             |   rhanoi:
0142: 06          |           push    bp
0143: 40 3E       |           mov     bp, sp
0145:             |
0145: 90 02 00    |           mov     r0, 2           ; alloc stack space (2 bytes)
0148: 40 C7       |           sub     sp, r0          ; for local variable "other"
014A:             |
014A:             |     ; stack frame:
014A:             |     ;     other             bp - 2
014A:             |     ;     saved_bp     <--- bp
014A:             |     ;     return_addr       bp + 2
014A:             |     ;     n                 bp + 4
014A:             |     ;     src               bp + 6
014A:             |     ;     dst               bp + 8
014A:             |
014A:             |     other equ     -2
014A:             |     n     equ     4
014A:             |     src   equ     6
014A:             |     dst   equ     8
014A:             |
014A: 91 01 00    |           mov     r1, 1
014D: A8 04 00    |           mov     r0, [bp + n]    ; n
0150: 41 48       |           cmp     r0, r1
0152: CE 98 01    |           jle     l1
0155:             |
0155: 93 06 00    |           mov     r3, 6
0158: A9 06 00    |           mov     r1, [bp + src]  ; src
015B: 40 CB       |           sub     r3, r1
015D: AA 08 00    |           mov     r2, [bp + dst]  ; dst
0160: 40 D3       |           sub     r3, r2
0162: B3 FE FF    |           mov     [bp + other], r3; other = 6 - src - dst;
0165:             |
0165:             |          ;mov     r3, [bp + other]; other
0165: 03          |           push    r3
0166:             |          ;mov     r1, [bp + src]  ; src
0166: 01          |           push    r1
0167:             |          ;mov     r0, [bp + n]
0167: 18          |           dec     r0              ; n - 1
0168: 00          |           push    r0
0169: CF 42 01    |           call    rhanoi          ; rhanoi(n - 1, src, other);
016C: 90 06 00    |           mov     r0, 6
016F: 40 47       |           add     sp, r0          ; remove three args from stack
0171:             |
0171: A8 08 00    |           mov     r0, [bp + dst]  ; src
0174: 00          |           push    r0
0175: A8 06 00    |           mov     r0, [bp + src]  ; dst
0178: 00          |           push    r0
0179: 90 01 00    |           mov     r0, 1           ; 1
017C: 00          |           push    r0
017D: CF 42 01    |           call    rhanoi          ; rhanoi(1, src, dst);
0180: 90 06 00    |           mov     r0, 6
0183: 40 47       |           add     sp, r0          ; remove three args from stack
0185:             |
0185: A8 08 00    |           mov     r0, [bp + dst]  ; dst
0188: 00          |           push    r0
0189: A8 FE FF    |           mov     r0, [bp + other] ;other
018C: 00          |           push    r0
018D: A8 04 00    |           mov     r0, [bp + n]
0190: 18          |           dec     r0              ; n - 1
0191: 00          |           push    r0
0192: CF 42 01    |           call    rhanoi          ; rhanoi(n - 1, other, dst);
0195:             |          ;mov     r0, 6
0195:             |          ;add     sp, r0          ; remove three args from stack
0195: C0 A3 01    |           jmp     l2
0198:             |
0198:             |   l1:
0198: A8 08 00    |           mov     r0, [bp + dst]  ; dst
019B: 00          |           push    r0
019C: A8 06 00    |           mov     r0, [bp + src]  ; src
019F: 00          |           push    r0
01A0: CF 23 01    |           call    putmsg          ; putmsg(src, dst);
01A3:             |          ;mov     r0, 4
01A3:             |          ;add     sp, r0          ; remove two args from stack
01A3:             |
01A3:             |   l2:
01A3: 40 37       |           mov     sp, bp
01A5: 0E          |           pop     bp
01A6: 3D          |           ret
01A7:             |
01A7:             |
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01A7:             |
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01A7:             |
01A7:             |
01A7:             |
01A7:             |   ;;;     main function ---------------------------------------
01A7:             |
01A7:             |   main:
01A7: 90 04 00    |           mov     r0, WRTSTR
01AA: 91 05 01    |           mov     r1, prompt
01AD: 3E          |           syscall
01AE:             |
01AE: 90 00 00    |           mov     r0, READ        ; read ndisks
01B1: 3E          |           syscall                 ;
01B2: 89 03 01    |           mov     [ndisks], r1
01B5:             |
01B5: 90 04 00    |           mov     r0, WRTSTR
01B8: 91 0F 01    |           mov     r1, sol
01BB: 3E          |           syscall
01BC:             |
01BC: 90 02 00    |           mov     r0, 2           ; rhanoi(ndisks, 1, 2);
01BF: 00          |           push    r0
01C0: 90 01 00    |           mov     r0, 1
01C3: 00          |           push    r0
01C4: 80 03 01    |           mov     r0, [ndisks]
01C7: 00          |           push    r0
01C8: CF 42 01    |           call    rhanoi
01CB: 90 06 00    |           mov     r0, 6
01CE: 40 47       |           add     sp, r0
01D0:             |
01D0: 90 02 00    |           mov     r0, EXIT        ; execution ends here
01D3: 3E          |           syscall
```