

TOWERS OF HANOI - PROLOG

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◆ GENERAL IDEA:

- THE BOUNDARY CONDITION OCCURS WHEN THERE ARE NO DISCS ON THE SOURCE POLE.
- MOVE $N-1$ DISCS FROM THE SOURCE POLE TO THE SPARE POLE, USING THE DESTINATION AS A SPARE. (RECURSIVE MOVE!)
- MOVE A SINGLE DISC FROM THE SOURCE POLE TO THE DESTINATION POLE.
- FINALLY, MOVE $N-1$ DISCS FROM THE SPARE TO THE DESTINATION, USING THE SOURCE AS THE SPARE.

◆ BOUNDARY CONDITION:

MOVE(0, _, _, _) :- !.

► BOUNDARY CONDITION OCCURS WHEN THERE ARE NO DISCS ON THE SOURCE POLE.

◆ RECURSIVE CASE:

MOVE(N, A, B, C) :-

M IS N-1,

MOVE(M, A, C, B), INFORM(A, B), MOVE(M, C, B, A).

INFORM(X, Y) :-

WRITE([MOVE, A, DISC, FROM, THE, X, POLE, TO, THE, Y, POLE]),

NL.

► The Predicate 'move' has four arguments:

- **The first argument (N):** number of discs to be moved.
- **The other three arguments** are atoms that name the poles for moving the discs, which are

left/A: the source

centre/B: destination

right/C: spare

► The predicate '**inform**' uses write to print out the names of the poles that are involved in moving a disc.

◆ CODE:

HANOI(N) :- MOVE(N, LEFT, CENTRE, RIGHT).

MOVE(0, _, _, _) :- !.

MOVE(N, A, B, C) :-

 M IS N-1,

 MOVE(M, A, C, B), INFORM(A, B), MOVE(M, C, B, A).

INFORM(X, Y) :-

 WRITE([MOVE,A,DISC,FROM,THE,X,POLE,TO,THE,Y,POLE]),

 NL.

hanoi(N): means to print out the sequence of moves when N discs are on the source pole.

◆ CODE (CONT.):

Program

```
1 hanoi(N) :- move(N, left, centre, right).
2
3 move(0, _, _, _) :- !.
4 move(N, A, B, C) :-
5     M is N-1,
6     move(M, A, C, B), inform(A, B), move(M, C, B, A).
7
8 inform(X, Y) :-
9     write([move,a,disc,from,the,X,pole,to,the,Y,pole]),
10    nl.
```

hanoi(3).

[move, a, disc, from, the, left, pole, to, the, centre, pole]

[move, a, disc, from, the, left, pole, to, the, right, pole]

[move, a, disc, from, the, centre, pole, to, the, right, pole]

[move, a, disc, from, the, left, pole, to, the, centre, pole]

[move, a, disc, from, the, right, pole, to, the, left, pole]

[move, a, disc, from, the, right, pole, to, the, centre, pole]

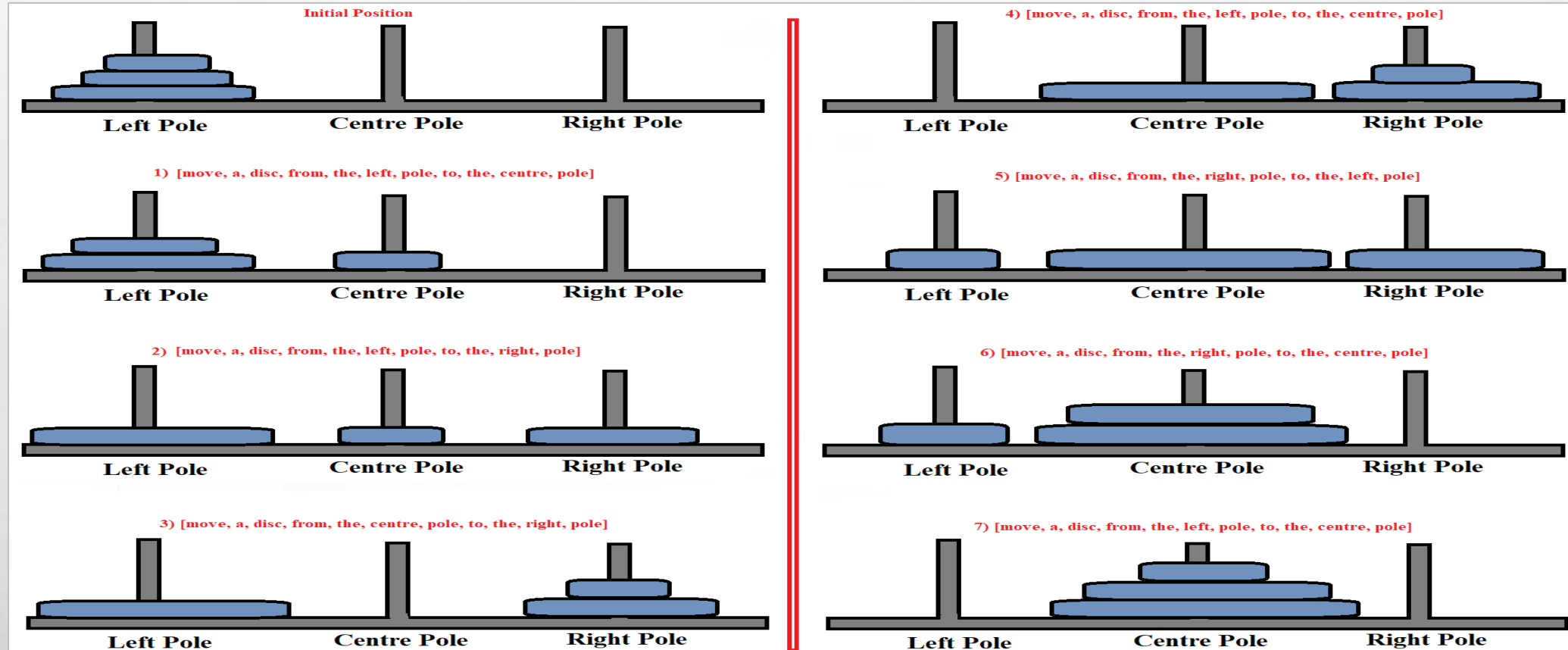
[move, a, disc, from, the, left, pole, to, the, centre, pole]

true

?- hanoi(3).

Examples▲ History▲ Solutions▲ ☐ table results Run!

◆ LIVE SIMULATION:



Credits: Mohamed Gamal

<https://mathsisfun.com/games/towerofhanoi.html>

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