Definition:

The distance of X, denoted Dist(X), is the number of pieces between X and X-1 going counter-clockwise around the loop. For example, Dist(2) is the number of pieces between 2 and 1.

Example:

Given the following configurations:
4, 5, 10, 2, 19, 20, 23, 15, 18, 1, ….

Where reading left to right is considered counter-clockwise around the loop.
Then Dist(2) = 5;

Note: When the game is solved Dist(Y) = 0 for all pieces Y.

Definition:

Let R denoted the permutation that moves each piece counter-clockwise one piece. S will denote a spin move. In cycle notation:

R = (1, 2, 3, 4, 5, …, 19, 20)
S = (1, 4)(2, 3)

Reachable States

Let X = [SRSR^(-1)SRSR^(3)]
Y = X^5
Z = YR^(-1)

In cycle notation Z = (1, 2), that is it interchanges 1 and 2 while fixing every other piece.

By placing any piece in the left most positions of the spinner and applying Z we interchange that piece with the piece directly to its right. Thus every configuration is reachable from the initial configuration by applying this method.

Algorithm

<u>Placing pieces 1-16:</u>

Let X = 2, i.e. begin by placing piece 2;

- While X is not piece 16 do:
  - While Dist(X) is greater than 3
    - Apply R until an application of S permutes X.
      NOTE: This will place X in the right-most position of the spinner
    - Apply S

        - Apply R^(-3)
        - Determine Dist(X)
    - Now Dist(X) is less than or equal to 3
    - Place X in the left most position of the spinner
    - If Dist(X) = 3
        - Apply R^(-3)S
    - Else, if Dist(X) = 2
        - Apply R^(-1)SR^(-1)S
    - Else, if Dist(X) = 1
        - Apply R^(-1)SRSR^(-1)S
    - X = X + 1 (we now look at the next piece and repeat these steps)

<u>Placing pieces 17-20:</u>

Recall the procedures X = [SRSR^(-1)SRSR^(3)]
Y = X^5

Let X = 17, that is X is piece 17

- While the puzzle is not solved
    - While Dist(X) > 0
        - Place the piece directly to the left of X in the left most position of the spinner.
        - Apply Y
    - X = X + 1 (we now consider the next piece)