Problem Set 10 Table #1

Six perfect shuffles return a 21-card deck back to its original state. So, there are six "transformations" that we can perform on this deck of cards:

- Perfect shuffle the deck 0 times (identity transformation)
- Perfect shuffle the deck 1 time
- Perfect shuffle the deck 2 times
- Perfect shuffle the deck 3 times
- Perfect shuffle the deck 4 times
- Perfect shuffle the deck 5 times

A symmetry is a transformation that leaves something appearing identical. In this case, it's a transformation that leaves a card in its original position.

Here are the positions of all 21 cards after each transformation.

Card Number	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0 shuffles	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1 shuffle	0	2	4	6	8	10	12	14	16	18	20	1	3	5	7	9	11	13	15	17	19
2 shuffles	0	4	8	12	16	20	3	7	11	15	19	2	6	10	14	18	1	5	9	13	17
3 shuffles	0	8	16	3	11	19	6	14	1	9	17	4	12	20	7	15	2	10	18	5	13
4 shuffles	0	16	11	6	1	17	12	7	2	18	13	8	3	19	14	9	4	20	15	10	5
5 shuffles	0	11	1	12	2	13	3	14	4	15	5	16	6	17	7	18	8	19	9	20	10
Row 1 Size of orbit of this card	1	6																			
Row 2 # of symmetries of this card (incl. identity)			1																		
Row 3 Multiplicative inverse (reciprocal) of the # in row 1																					