COSC241 Assignment Report

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The count values (number of transformations needed for a pile to be transformed back to its original state for a given row length and specification) resulting from the row being picked up with specifications beginning with either “L” or “R” are almost always the same regardless of the size of the card pile or the row length.

When specification LT is used, the count returned is always one, but when the specifications RT, LB and RB are used, the count returned is almost always two. LT always returns a count of one because the values in the pile are picked up and then put back down in the exact same order. The other three specifications generally return a count of two because when they are picked up, the values that were in the initial row they were in remain the same, but they will be in the reverse order if the specification begins with R, and/or the top and bottom row will have switched, and the second-top row and second-bottom row will have switched and so on (depending on the number of rows in the pile) if the specification ends with a B. So, when the same transformation is repeated, the same reversal or switch of the rows happens, bringing the pile back to the original. For a card pile containing the numbers 1 – 6 in rows of length 3:

1	2	3
4	5	6

When RB, for example, is called the numbers will be picked up in order: 6, 5, 4, 3, 2, 1. So when the card pile is laid back down it will look like this:

6	5	4
3	2	1

The rows have reversed direction due to the R specification ([1, 2, 3] to [3, 2, 1]) and the rows have swapped positions due to the B specification (the [1, 2, 3] row is now on the bottom, and it is reversed). When picked up a second time, the card pile will go through the same transformation back to the original.

The only times RT, LB and RB may result in a count other than two, is when either the row length is one, the number of rows is one, or both are one. The count will be one for RT when the row length is one, one for LB when the number of rows is one, and one for RB when both the row length and number of rows is one.

The maximum count value for any specification and pile size of 20 or less is 18. This occurs for the following pile sizes, row lengths and specifications:

Pile Size	Row Length	Specification(s)
18	2	TR
18	3	TR
18	6	BL
18	9	BL
20	2	TL, BR
20	4	BR
20	5	BR
20	10	TL, BR

Any pile with a prime number n of cards (e.g. 5, 7, 11, 13 etc.) only has two accessible piles: [1, 2, 3, … n-2, n-1, n] and [n, n-1, n-2, … 3, 2, 1]. This is because there can only ever be one row or n rows, so piles can only ever be picked up in the order they are in or in reverse.

Any pile that is accessible by using specifications beginning with T or B can be reversed by transforming with spec RB. Any rows can be reversed using RT and rows can be switched by using LB.