

Performance Indicator: (MR)

Use patterns and relationships to analyze mathematical situations

Title: Turncoat

Grade Level: 7 – 8

Purpose (enabler): Practice ordering numbers and using basic operations; investigate numerical relationships; make and discern patterns; develop and apply a variety of strategies to solve a problem; generalize solutions and strategies; understand and apply various reasoning processes; and construct and solve puzzles.

Grouping of Students: Groups of 1-2 students

Materials: Game board and game pieces

Process: The goal is to transfer a set of playing pieces to the opposite side of the board. A set of game pieces is placed on each side of the board, leaving the center hole open. Move or jump one piece at a time until the pieces are on the opposite side. If you cannot make a move before having completed the transfer, return the pieces to the original setup and start again. The pieces may only be moved as follows:

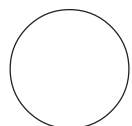
- one hole forward onto a vacant space.
- jumped forward over another piece onto a vacant space.

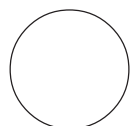
Note: Moving or jumping backward is not allowed.

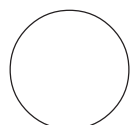
Assessment: Record the moves used to successfully complete the puzzles.

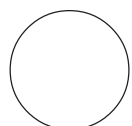
Turncoat

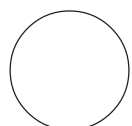
Estimate
of moves

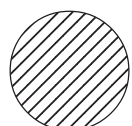
 5A

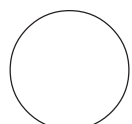
 4A

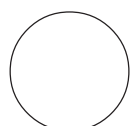
 3A

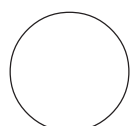
 2A

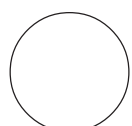
 1A

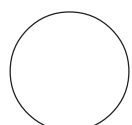
 C

 1B

 2B

 3B

 4B

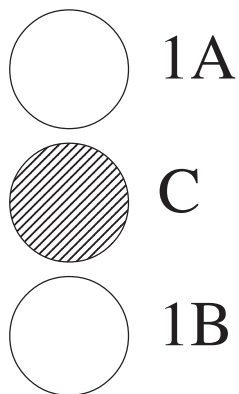
 5B

Move #	From	To
1	_____	_____
2	_____	_____
3	_____	_____
4	_____	_____
5	_____	_____
6	_____	_____
7	_____	_____
8	_____	_____
9	_____	_____
10	_____	_____
11	_____	_____
12	_____	_____
13	_____	_____
14	_____	_____
15	_____	_____
16	_____	_____
17	_____	_____
18	_____	_____
19	_____	_____
20	_____	_____
21	_____	_____
22	_____	_____
23	_____	_____
24	_____	_____
25	_____	_____
26	_____	_____
27	_____	_____
28	_____	_____
29	_____	_____
30	_____	_____
31	_____	_____
32	_____	_____
33	_____	_____
34	_____	_____
35	_____	_____

Turncoat

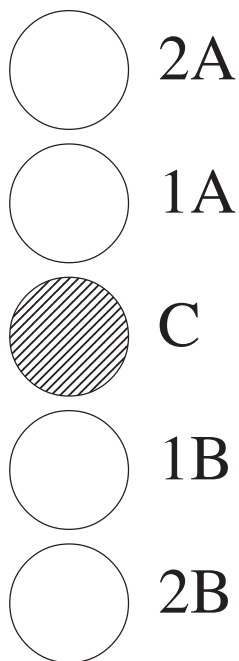
Estimate
of moves

Practice
Problem 1



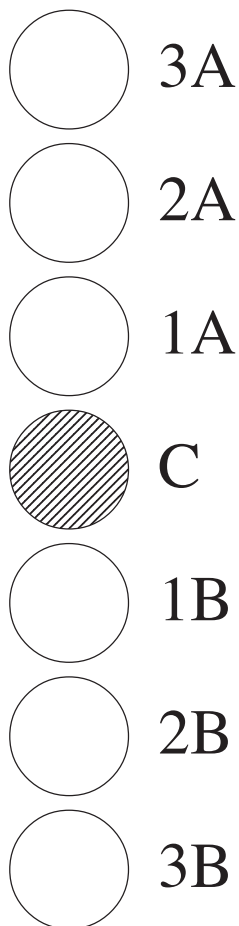
Estimate
of moves

Practice
Problem 2



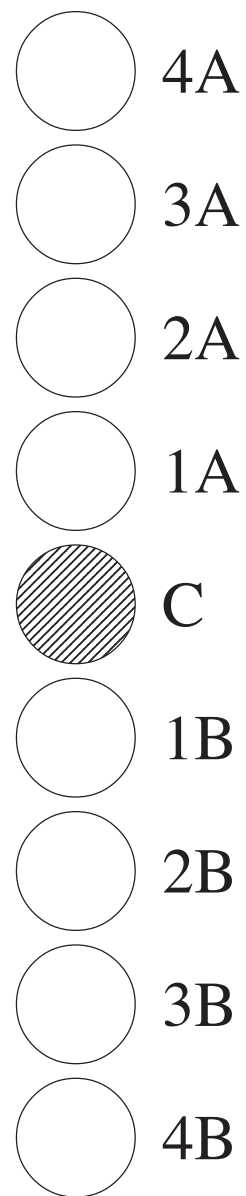
Estimate
of moves

Practice
Problem 3



Estimate
of moves

Practice
Problem 4



Turncoat

Practice Problem # _____

Move #	From	To
1	_____	_____
2	_____	_____
3	_____	_____
4	_____	_____
5	_____	_____
6	_____	_____
7	_____	_____
8	_____	_____
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11	_____	_____
12	_____	_____
13	_____	_____
14	_____	_____
15	_____	_____
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17	_____	_____
18	_____	_____
19	_____	_____
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23	_____	_____
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25	_____	_____
26	_____	_____
27	_____	_____
28	_____	_____
29	_____	_____
30	_____	_____
31	_____	_____
32	_____	_____
33	_____	_____
34	_____	_____
35	_____	_____

Practice Problem # _____

Move #	From	To
1	_____	_____
2	_____	_____
3	_____	_____
4	_____	_____
5	_____	_____
6	_____	_____
7	_____	_____
8	_____	_____
9	_____	_____
10	_____	_____
11	_____	_____
12	_____	_____
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27	_____	_____
28	_____	_____
29	_____	_____
30	_____	_____
31	_____	_____
32	_____	_____
33	_____	_____
34	_____	_____
35	_____	_____

Practice Problem # _____

Move #	From	To
1	_____	_____
2	_____	_____
3	_____	_____
4	_____	_____
5	_____	_____
6	_____	_____
7	_____	_____
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9	_____	_____
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32	_____	_____
33	_____	_____
34	_____	_____
35	_____	_____

Practice Problem # _____

Move #	From	To
1	_____	_____
2	_____	_____
3	_____	_____
4	_____	_____
5	_____	_____
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23	_____	_____
24	_____	_____
25	_____	_____
26	_____	_____
27	_____	_____
28	_____	_____
29	_____	_____
30	_____	_____
31	_____	_____
32	_____	_____
33	_____	_____
34	_____	_____
35	_____	_____

Turncoat

Practice Problem # 1

Move #	From	To
1	1A	C
2	1B	1A
3	C	1B
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
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32		
33		
34		
35		

Practice Problem # 2

Move #	From	To
1	1A	C
2	1B	1A
3	2B	1B
4	C	2B
5	2A	C
6	1A	2A
7	1B	1A
8	C	1B
9		
10		
11		
12		
13		
14		
15		
16		
17		
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33		
34		
35		

Practice Problem # 3

Move #	From	To
1	1A	C
2	1B	1A
3	2B	1B
4	C	2B
5	2A	C
6	3A	2A
7	1A	3A
8	1B	1A
9	3B	1B
10	2B	3B
11	C	2B
12	2A	C
13	1A	2A
14	1B	1A
15	C	1B
16		
17		
18		
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34		
35		

Turncoat

Practice Problem # 4

Problem # 5

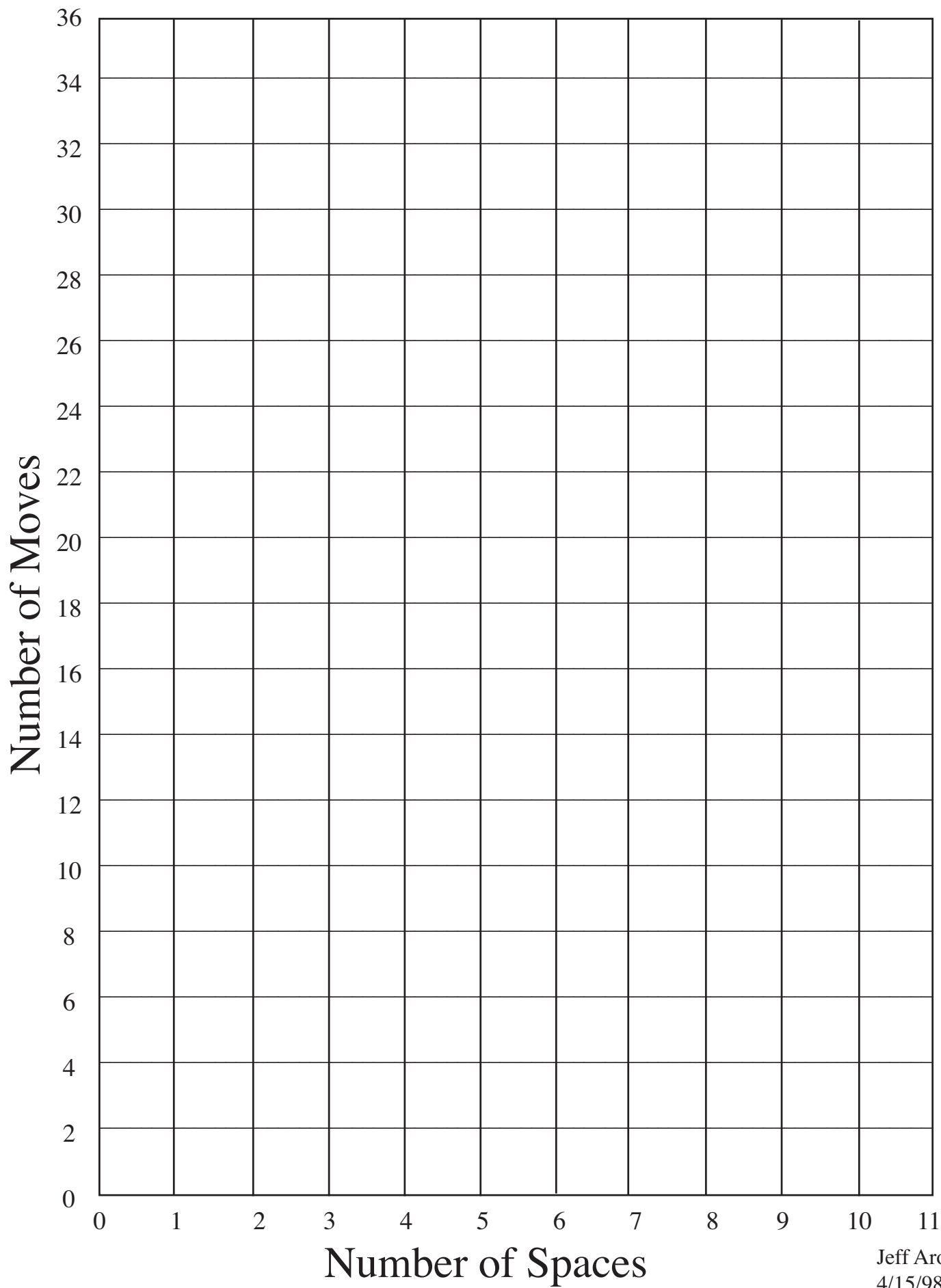
Practice Problem # _____

Move #	From	To
1	1A	C
2	1B	1A
3	2B	1B
4	C	2B
5	2A	C
6	3A	2A
7	1A	3A
8	1B	1A
9	3B	1B
10	4B	3B
11	2B	4B
12	C	2B
13	2A	C
14	4A	2A
15	3A	4A
16	1A	3A
17	1B	1A
18	3B	1B
19	2B	3B
20	C	2B
21	2A	C
22	1A	2A
23	1B	1A
24	C	1B
25		
26		
27		
28		
29		
30		
31		
32		
33		
34		
35		

Move #	From	To
1	1A	C
2	1B	1A
3	2B	1B
4	C	2B
5	2A	C
6	3A	2A
7	1A	3A
8	1B	1A
9	3B	1B
10	4B	3B
11	2B	4B
12	C	2B
13	2A	C
14	4A	2A
15	5A	4A
16	3A	5A
17	1A	3A
18	1B	1A
19	3B	1B
20	1B	3B
21	4B	1B
22	2B	4B
23	C	2B
24	2A	C
25	4A	2A
26	3A	4A
27	1A	3A
28	1B	1A
29	3B	1B
30	2B	3B
31	C	2B
32	2A	C
33	1A	2A
34	1B	1A
35	C	1B

Move #	From	To
1		
2		
3		
4		
5		
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Turncoat



Turncoat

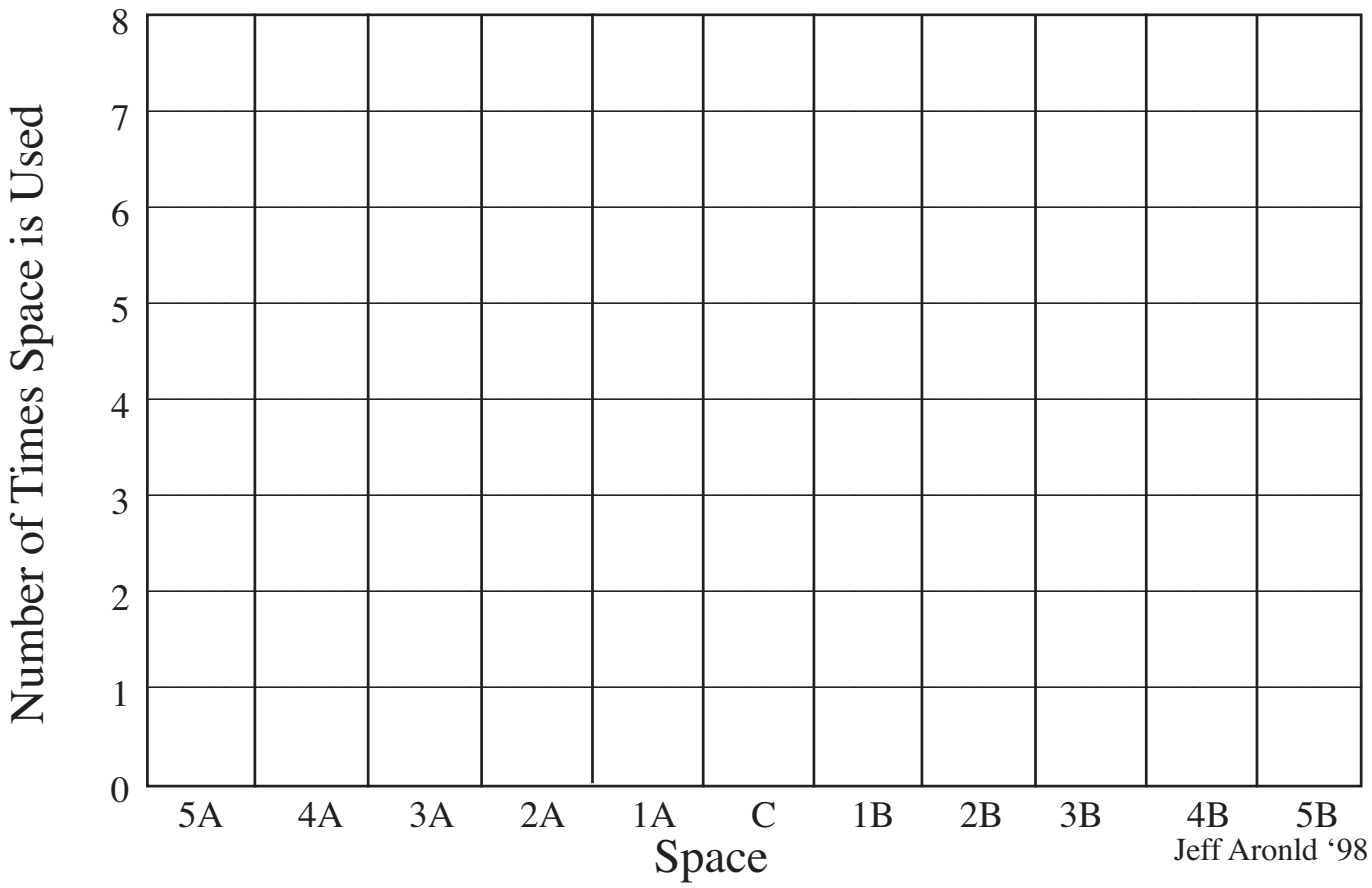
Data Table

5A					
4A					
3A					
2A					
1A					
C					
1B					
2B					
3B					
4B					
5B					
	1	2	3	4	5

Color Key

- Problem 1
- Problem 2
- Problem 3
- Problem 4
- Problem 5

Frequency: Bar Graph



Difference Table

Game # (X)	# of Spaces	# of Moves (Y)	Difference	Difference
---------------	-------------	----------------------	------------	------------

1	3	3		
			5	
2	5	8		2
			7	
3	7	15		2
			9	
4	9	24		2
			11	
5	11	35		

$$Y = Ax^2 + Bx + C$$

Equation 1

$$3 = A(1)^2 + B(1) + C$$

$$3 = 1A + 1B + C$$

$$C = -1A - 1B + 3$$

Equation 2

$$8 = A(2)^2 + B(2) + C$$

$$8 = 4A + 2B + C$$

Equation 3

$$15 = A(3)^2 + B(3) + C$$

$$15 = 9A + 3B + C$$

Combining Equations 1 & 2

$$8 = 4A + 2B - 1A - 1B + 3$$

$$5 = 3A + 1B$$

$$B = -3A + 5$$

Combining Equations 1 & 3

$$15 = 9A + 3B - 1A - 1B + 3$$

$$12 = 8A + 2B$$

$$12 = 8A + 2(-3A + 5)$$

$$12 = 8A - 6A + 10$$

$$2 = 2A$$

$$A = 1$$

$$B = -3A + 5$$

$$B = -3(1) + 5$$

$$B = 2$$

$$C = -1A - 1B + 3$$

$$C = (-1)A - 1B + 3$$

$$C = -1 - 1(2) + 3$$

$$C = -1 - 2 + 3$$

$$C = -3 + 3$$

$$C = 0$$

$$Y = x^2 + 2x$$

Where:

Y = the # of spaces on one side of the board

X = the number of moves required