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Quiz for Doron Zeilberge's Lecture at Math Leagues Camp, TCNJ, July 23, 2018, 1:30-2:20pm

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1. China played Soccer against Japan, and the score was

China: 5; Japan: 4

How many possible game histories are there?

$$\binom{9}{4} = \frac{9 \cdot 8 \cdot 7 \cdot 6}{4 \cdot 3 \cdot 2 \cdot 1} = \frac{9 \cdot 2 \cdot 7}{1} = 126$$

126 histories.

2. Out of these game-histories, how many were boring? How many exciting ones?

$$\frac{1}{2N+1} \binom{2N+1}{N} = \frac{1}{9} \binom{9}{4} = \frac{1}{9} \cdot 126 = 14$$

BORING GAMES: ~~14~~¹⁴; EXCITING GAMES: ~~112~~¹¹²

3. What 'bad' walk in the Manhattan lattice from (1, 0) to (5, 4) corresponds to the following walk from (0, 1) to (5, 4)?

(0, 1) → (0, 2) → (1, 2) → (2, 2) → (3, 2) → (3, 3) → (4, 3) → ~~(5, 3)~~ → (5, 3) → (5, 4)

"BAD": (1, 0) → (2, 0) → (2, 1) → (2, 2) → (3, 2) → (3, 3) → (4, 3) → (5, 3) → (5, 4)

4. What is the unique cyclic shift in the following game history between team A and team B, where team A scored 7 goals and team B scored 6 goals, that is boring.

1 2 1 0 7 0 1 0 1 0 1 2 1
A A B B B A B A B A A A B
1 2 3 2 3 4 3 2 1 2 1 2 1
A A A B A A B B B A B A B

5. IN THIS CIRCULAR TRACK, THERE IS ENOUGH PETROL AS INDICATED.

WHERE TO START WITHOUT GOING OUT OF PETROL?

Start at 10.

