Exercise 1.5.8

we require a bijective $\phi : F \to G$

where F is FIFTEEN and G is TIC-TAC-TOE

FIFTEEN:

set of numbers: $N = [1, 2, \dots, 9]$

set of player 1 choosings: $P1 = [\dots]$

set of player 2 choosings: $P2 = [\dots]$

choose operation: $Ch(u, n)$

$\swarrow$ $\searrow \in N$

$P1 \vee P2$

- removes n from N
- appends n to P1

win operation: $W(u)$

$\swarrow$

$P1 \vee P2$

- if $\sum_{i=0}^{n} (P1)_i = 15$ player wins

TIC-TAC-TOE

2-d space of numbers: $B = \begin{bmatrix} 6 & 7 & 2 \\ 1 & 5 & 9 \\ 8 & 3 & 4 \end{bmatrix}$

set of player 1 choosings: $P1 = [\dots]$

set of player 2 choosings: $P2 = [\dots]$

I am convinced that the games are isomorphic