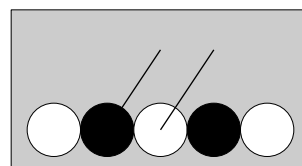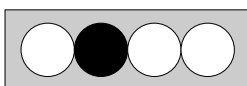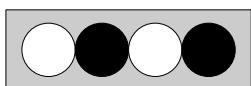# cmput 497/670 2024 homework 3

1. Recall $\uparrow = \{0|*\}$.   Let $g = \uparrow *$.   (a) Prove $g = \{*, \uparrow \,|\, 0, \uparrow\}$.   (b) Prove $g = \{*, 0 | 0\}$.

   Recall $\Uparrow = \uparrow + \uparrow$.   (c) Prove $\Uparrow = \{\uparrow \,|\, \uparrow *\}$.   (d) Prove $\Uparrow = \{0 | \uparrow *\}$.

2. Let $\mathcal{O} = \{\ \phi,\ 0,\ 1,\ -1,\ *,\ \{0, *\}\ \}$. For each S in $\mathcal{O}$ and each T in $\mathcal{O}$, give the canonical form of $g = \{S | T\}$. Show your work (answers on the next page).
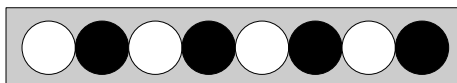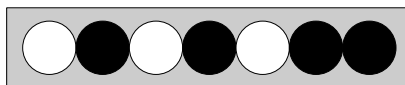
3. Prove the canonical forms of clobber games ox4, oxoo, ox5 are respectively
   $\pm\{*, \uparrow\}$, $\uparrow * = \{0, * | 0\}$, $\{\uparrow \,|\, *\}$ (For ox5, diagram shows the two canonical moves).

4. According to CGSuite, ox12 $=$ ox4$*$. Recall: the canonical form of ox4$*$ is $\pm\{0, \uparrow *\}$. Assume Left plays a clobber game that has ox12 as a subgame (connected component). On ox12, what are the only moves that Left needs to consider? Explain.
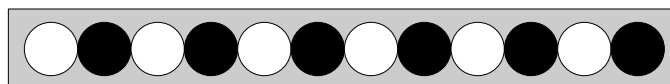
5. The canonical form of xx7 below is $\{\Uparrow \,|\, \downarrow *, \pm\{0, \uparrow *\}\}$. (a) Prove $\downarrow * <$ ox8. (b) Prove the canonical form of ox8 is $\pm\{\ $o5, ox4 $\uparrow\}$.

1. answers

	ϕ	0	-1	1	$*$	$\{0, *\}$
ϕ	0	?	?	?	?	?
0	1	$*$	?	?	?	?
1	2	$\{1 \mid 0\}$	± 1	?	?	?
-1	0	$-\frac{1}{2}$	$-1*$	0	?	?
$*$	0	$\downarrow$	$\{*| - 1\}$	0	0	?
$\{0, *\}$	1	$\uparrow *$	$\{0, *| - 1\}$	$\frac{1}{2}$	$\uparrow$	$*2$