1 Game Theory 3 - Goat game

1.1 Goat game description

You have n farmers; you have 36 goats. Every farmer can bring between 0 and 36 goats inclusive, $[0, 36]$. The number of goats that you can bring, is a strategy.

We assume that $D = \sqrt{(}36 - G)$, where D is the number of dollars you get, and G is the number of goats that you bring.

We represent the outcome, the number of goats each person brings as:
$(g_1, g_2, ...g_n)$.

Let's presuppose that there is a NE outcome:
$NE(g_1^\star, g_2^\star, ...g_n^\star)$,
where:
$g_i^\star = \underset{g_i}{\text{argmax}}[g_i\sqrt{(}36 - g_i - G_i^\star)]$

Now, we want to know what will maximize the above equation for $g_i^\star$. To know the optimal value, we TAKE THE DERIVATIVE and SET IT EQUAL TO ZERO:
$0 = \frac{\delta}{\delta g} g_i\sqrt{(}36 - g_i - G_{-i}^\star)$
$g_i^\star = \frac{2}{3}(36 - G_{-i}^\star) = 24 - \frac{2}{3}G_{-i}^\star$
therefore, we set: $g^\star = g_1^\star = g_2^\star = ... = g_n^\star$
$g^\star = 24 - \frac{2}{3}(n-1)g^\star$
$= \frac{72}{2n+1}$
Therefore you end up with
$36 - \frac{36}{2n+1}$

1.1.1 example

If you just want to maximiaze the **original equations**:

Left to their own , devices, this is what will happen if there are $n = 24$ goat herders $\rightarrow$ then you end up with 1.26 cents per farmer

But, the NE, if there are $n = 24$ goat herders $\rightarrow$ then you end up with 3.46 cents per farmer.

Note: the OPTIMAL answer is NOT the same as the NE. This is called the **tragedy of the commons**.

2 Tragedy of the Commons

2.1 Intro

In no situation, would anyone do the "right thing", where the right thing would be to maximize utility for everyone , because its not the same as the optimal for one particular person. Its like a **Prisoner's Dilemma**.

2.2 Review: prisoner dilemma

Player A is rows, player B is columms

	B	
A	$-1,-1$	$-9,0$
	$0,-9$	$-6,-6$

If player A has to choose, he will choose the SECOND row, via **maximin** (-6 is bigger than -9).

2.3 ???

"Obamacare is the ultimate result of a tragedy of the commons".

2.4 PD – read book/notes for more info!!

always cooperate: $\frac{-1}{1-\gamma}$
always defect: $0 + (\frac{-6}{1-\gamma})\gamma$

so, which is better, always defect or always cooperate?if always cooperate is better, than what is the matehmatiacl equation that has to be true?

$\frac{-1}{1-\gamma} > \frac{-6\gamma}{1-\gamma} \Rightarrow \frac{-1}{-6} < \gamma \Rightarrow \gamma > \frac{1}{6}$