

REPRESENTING A PROBLEM: ERIC THE SHEEP

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Abstract

In this paper I looked through a shearing problem, *Eric the Sheep*. I expressed my thinking style while I was drawing models and diagrams, putting my findings into a table, and generalizing them as a rule. At the end I not only solved the problem but also learned about my own thinking/representing style as a student-teacher.

Key Words: shearing problem, Eric the sheep, thinking/representing styles.

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Introduction

The purpose of this article was to explain my thinking style in a shearing problem which is named as *Eric the Sheep*. The problem includes two connected parts. The first one is such that: *It's a hot summer day, and Eric the Sheep is at the end of a line of sheep waiting to be shorn. There are 50 sheep in front of him. Being an impatient sort of sheep, though, every time the shearer takes a sheep from the front of the line to be shorn, Eric sneaks up two places in line. How many sheep will get shorn before Eric?* The second part of the question asks for: *What if Eric gets more and more impatient. Explore how your rule changes if Eric sneaks past 3 sheep at a time. How about 4 sheep at a time? 10 sheep at a time?* I explained the way of my understanding about the pattern and conducting the process of it in this paper.

Shearing Problem and Eric the Sheep

For the main part of the problem, I first tried to answer at which rank Eric would be shorn. I drew a model for a smaller number than 50 and chose ten as a first try. I drew ten sheep in front of Eric and moved Eric to two ranks up for each sheep taken to be shorn. By the way I noted my findings in a table as *number of sheep in front of Eric* and *Eric's rank*. However I could not realize any pattern in this way. Then I looked for another way: Instead looking for Eric's rank, I could note the number of sheep who went to be shorn before Eric. So, I could reach Eric's rank by utilizing from this number, I thought. When I added a new column to the table for the new idea, I realized the pattern easily. Before explaining the pattern, here is a draft of my drawing for the case *12 sheep in front of Eric*:

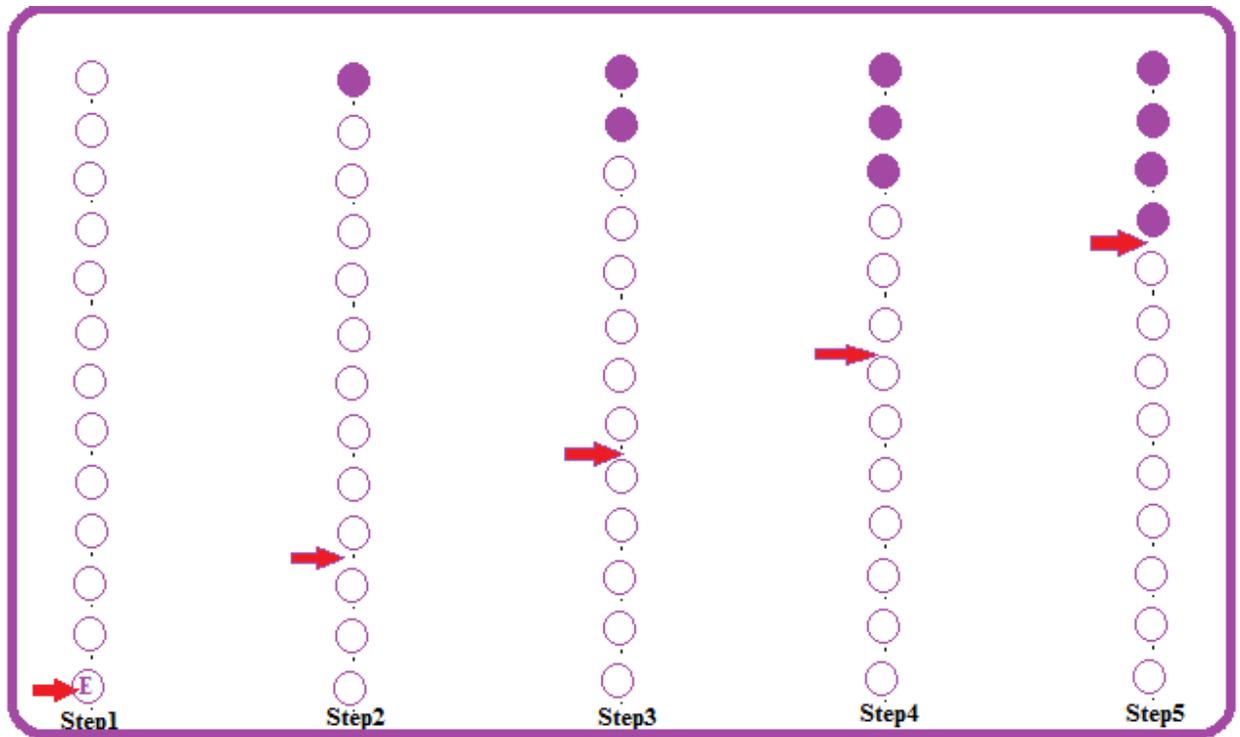


Figure 1. A model of my drawing about Eric's motion.

As it is seen in the figure, initially there are 12 sheep in front of Eric. The red arrows indicate Eric's position and the purple circles show the sheep gone to be shorn for each step. It could be seen that Eric sneaks past two sheep at a time and for the fifth step it could be seen that when the number of shorn sheep is four, Eric is already in the front of the line. Hence, he is the fifth one to be shorn.

The answer could be found out when it is extended for the case 50 sheep in front of Eric. But what if there were hundreds of sheep? So I looked for a pattern. By beginning from the case that there is just one sheep in front of Eric to be shorn, I extended it into a general rule. The table I got was like that:

Table 1.

Eric sneaks past two sheep at a time

Number of sheep in front of Eric	Sheep shorn before Eric	Eric's time to be shorn
1	1	2
2	1	2
3	1	2
4	2	3
5	2	3
6	2	3
7	3	4
8	3	4
9	3	4
10	4	5
11	4	5
12	4	5
13	5	6
...

Rule: For $n \geq 1$ and n is a positive integer;

As the number of sheep in front of Eric is $3n$, $3n-1$, or $3n-2$ then the number of sheep shorn before Eric is equal to n . Hence, for Eric's rank to be shorn will be $n+1$.

Here, it should be useful to explain what it means to be the number of sheep in front of Eric is $3n$, $3n-1$, or $3n-2$. To put it more clearly, for the given number, we could understand whether it is the multiple of three, one less than multiple of three or two less than multiple of three by just dividing it by three. If the remainder is zero, it means the given number is multiple

of three and represented by $3n$ for this rule. Similarly, if the remainder is one, it will be represented by $3n-1$; and lastly if the remainder is 2, it will be represented by $3n-2$.

If one needs to think in reverse, I mean for example, what if we know about the number of shorn sheep before Eric and not the whole number of sheep. Could it be found? Sure, but there would be three options for it. This time the person will accept the given number as n . After multiplying the number by three, he/she will get $3n$ as stated in the rule. So, the whole number of sheep could be $3n$, $3n-1$, or $3n-2$.

By utilizing from the same approach and following the same steps, I got the rules of the second part of the problem: *What if Eric gets more and more impatient...* For the case that Eric sneaks past three/four/ten sheep at a time, the rule statements will be such those:

For the case that Eric sneaks past three sheep at a time:

For $n \geq 1$ and n is a positive integer;

As the number of sheep in front of Eric is $4n$, $4n-1$, $4n-2$ or $4n-3$ then the number of sheep shorn before Eric is equal to n . Hence, for Eric's rank to be shorn will be $n+1$.

For the case that Eric sneaks past four sheep at a time:

For $n \geq 1$ and n is a positive integer;

As the number of sheep in front of Eric is $5n$, $5n-1$, $5n-2$, $5n-3$, or $5n-4$ then the number of sheep shorn before Eric is equal to n . Hence, for Eric's rank to be shorn will be $n+1$.

For the case that Eric sneaks past ten sheep at a time:

For $n \geq 1$ and n is a positive integer;

As the number of sheep in front of Eric is $11n$, $11n-1$, $11n-2$, ... or $11n-10$ then the number of sheep shorn before Eric is equal to n . Hence, for Eric's rank to be shorn will be $n+1$.

As a consequence of all these rules, it occurred one more pattern. If Eric sneaks past s sheep at a time, the coefficient of *the number of sheep in front of Eric* becomes $s+1$.

Additionally, when it is looked through, it is seen that the options for the *number of sheep in front of Eric* begin with $(s+1)*n$ and by decreasing one by one, end with $(s+1)*n - s$.

Conclusion

The purpose of this article was to represent my approach in a shearing problem. I drew my drafts while I was thinking on the problem and put my findings in a table to be able to see the pattern (if any) easily. After discovering the pattern, I thought to extend it into a rule. All the steps of this process made me learn about my own thinking style and gave the idea of my future teaching profession since most probably I will use the same thinking style during my classes.

"A Bilkent student does not lie, cheat, or steal or tolerate those who do. On my honor, as a Bilkent student, I have neither given nor received unauthorized aid on this academic work."

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