Project 1 : HUNGER IS NO GAME

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The Irish famine

William Trench , a County Cork land agent wrote:

"The leaves of the potatoes on many fields I passed were quite withered, and a strange stench, such as I had never smelt before, but which became a well-known feature in "the blight" for years after, filled the atmosphere adjoining each field of potatoes. The crop of all crops, on which they depended for food, had suddenly melted away"

This plant disease was one of the causes of the Great Famine. It actually destroyed most of potato crops therefore, Irish people didn't have much left to eat.

At the beginning of the Great Famine in 1845, there were 8.5 million inhabitants. Once the famine was over, fifty five years later, there were 6 million inhabitants. However, death isn't the main reason population decreased. Indeed, a lot of Irish people succeeded in escaping the famine by leaving the country.

1. Explain what the "blight" is. What are the consequences ?

2.
   a. Calculate the rate of evolution of the population between 1845 and 1900. Interpret the result.

   b. Considering that 700 000 people died during the Great Famine, find out how many people left the country. Then, find the percentage. (Note that we talk about disappeared people).

3. The Blight appeared in the 1845 in the West and South of Ireland. It first came from Europe and then the disease spread through Ireland. On day one, the blight touched 1 farm in ireland. Four days later, sixteen farms were touched by the disease. And it continued to spread that way to all the Irish farms days after days.

   a. Since the sequence (u_n) can be modelled as a geometric sequence, find the common ratio.

   b. Let's suppose that there were around 250 000 farms in Ireland at that time, in how many days did the disease spread to the entire country ? You can create an algorithm to help you.

   c. Express now (u_n) in function of n.

Bonus question : Decrypt the following equation (hint : M = 13) : (13 ; $(2 \times \frac{1}{2})$; 18 ; 3^2; 1 ;$\sqrt{64}$) - (3 ; 18^0; 18 ;$\sqrt{25}$; 5^2) = the name of an american singer with irish roots.

Correction of the maths problem :

1. The blight is the name of the disease that destroyed all the potatoes crops in Ireland and cause a gigantic famine.

2.

a. $rate = \dfrac{value\ of\ 1900 - value\ of\ 1845}{value\ of\ 1845} \times 100$

$rate = \dfrac{6,000,000 - 8,500,000}{8,500,000} \times 100 \approx -29.4$

The rate of evolution of the population between 1845 and 1900 is -29.4%. It means the population decreased of almost 30%.

b. $Population\ in\ 1845 - population\ in\ 1900 = people\ that\ disappeared$

$8,500,000 - 6,000,000 = 1,500,000$

$1,500,000 - 700,000 = 800,000$

So there were 800 000 people that left the country.

People that left the country	800,000	x
People that disappeared	1,500,000	100

$$x = \dfrac{800,000 \times 100}{1,500,000} \approx 53\%$$

53% of the people that disappeared left the country.

3.

a. We know that $u_1 = 1$ and $u_5 = 16$. Since the sequence (u_n) can be modelled as a geometric sequence, we are looking for the common ratio q. There are 4 terms between u_1 and u_5. So, we can solve the equation $q^4 = 16$ and the solution is $q = \sqrt[4]{16} = 2$. Therefore the common ratio of the sequences is 2.

b. The purpose is to find when the variable U is going to exceed 250,000 to find the rank N. Here is an example of an algorithm :

CASIO language :
```
1 → N
1 → U
While U ≤ 250,000
N + 1 → N
2*U → U
WhileEnd
N⊿
```

FORMAL language :
N takes the value 1
U takes the value 1
While U is inferior to 250,000
Then N takes the value N+1
U takes the value 2xU
While End
Print N

The answer is N = 18.

c. The sequence (u_n) is geometric so we can express it as : for all natural numbers, $u_n = 2^n$.