PUZZLING CARTOON

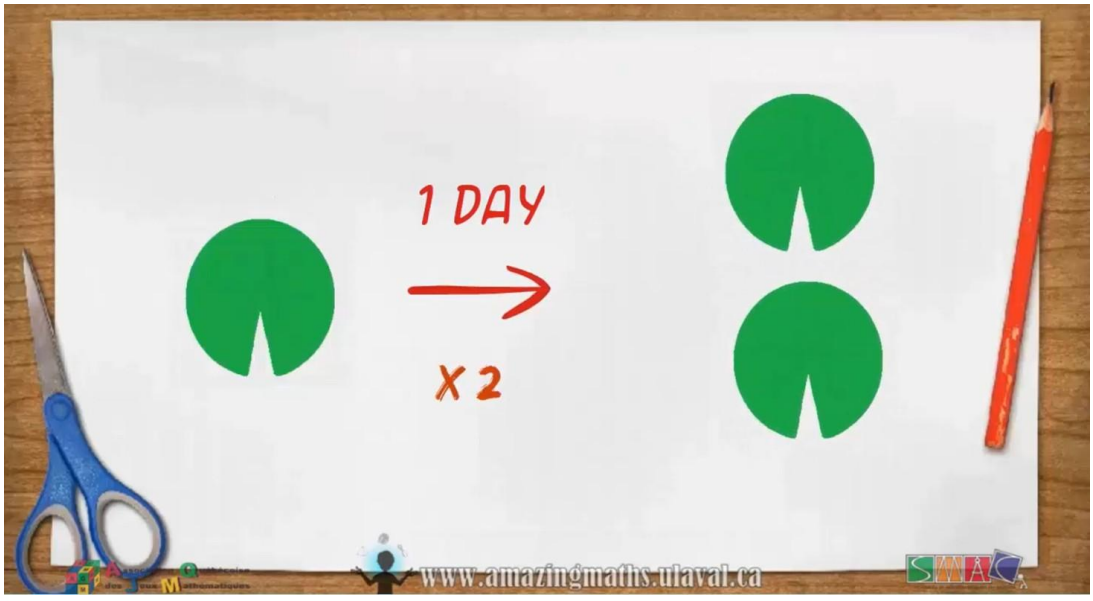
- WATER LILIES -

Puzzle statement

My father owns a cottage in the woods. Near his cottage, there is a pond. Every summer, the pond gets completely covered in water lilies. I have noticed that the number of water lilies in the lake doubles every day.

This summer, on June 1st, there was only one water lily. Thirty days later, the pond was entirely covered. Next summer, I will place two water lilies in the pond on the 1st of June.

How many days will it take for the pond to be completely covered again?



PUZZLE SOLUTION

The answer:

The pond will be covered in 29 days.

First solution :

<u>During the first summer:</u>

Since the number of water lilies doubles each day and the pond is full on the 30th day, we deduce that the pond was half full on the 29th day. Indeed, from day 29 to day 30, the number of water lilies doubled. We could create a table like this:

Day	1	2	3	4	...	29	30
Number of water lilies	$1 = (2^0)$	$2 = (2^1)$	$4 = (2^2)$	$8 = (2^3)$	...	2^{28} (The pond is half full)	2^{29} (The pond is full)

<u>During the second summer:</u>

The number of water lilies still doubles each day, but this time, there are already 2 lilies on day 1. It's as if we're starting at day 2 of last summer. If we made a table for this situation, it could look like the previous table, except the number of lilies would be shifted one column to the left.

Day	1	2	3	4	...	28	29
Number of water lilies	$2 = (2^1)$	$4 = (2^2)$	$8 = (2^3)$	$16 = (2^4)$	...	2^{28} (The pond is half full)	2^{29} (The pond is full)

We conclude that the pond will be covered in 29 days.

Second solution (if applicable, specify if it is more advanced):

Since the number of water lilies doubles every day and the pond is fully covered in 30 days, we deduce that after 29 days, the descendants of a single lily cover half of the pond's surface. Thus, if we have two lilies, each will take 29 days to cover half of the pond, and together, they will have covered the entire pond.