



SEMAINE DES MATHS

Materials:

- Video of the puzzle
- Pen and paper

PUZZLE

- THE KING'S CAKE -

The Puzzle

To play a game called *The King's Cake*, Sylvain and his friends prepare a cake and place four beans inside it; whomever gets a bean is named king.

After eating his piece, Sylvain's grandfather says that there were no beans in the piece that he ate.

The rest of the cake is shared among the remaining four people.



Sylvain would like for each of the four remaining people to be named king. So, for that to happen, there must be a bean in each cake portion.

To make sure that the 4 people get a bean, cut the rest of the cake in **four equal parts** and make sure that there is **a bean in each share**.

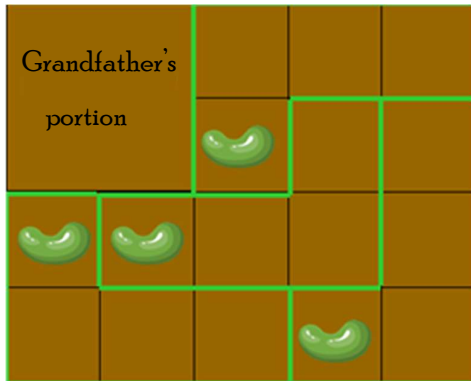
The **shares must be of identical shapes**, regardless of the direction in which they are placed.



PUZZLE SOLUTION



The answer:



The solution:

Of course, this puzzle may be solved by trial and error. However, there is a logical way to think about this problem and find its solution.

Steps:

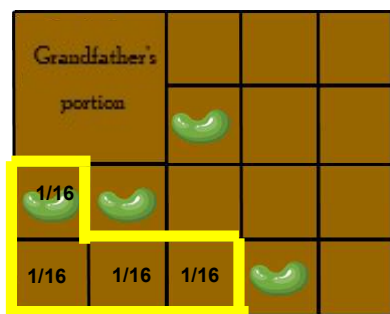
- 1) Calculate the total number of pieces.

Excluding the grandfather's pieces, there are 16 pieces of cake. Since we must share the cake into 4 equal parts, and that every piece of cake must be used, we know that each share will consist of 4 pieces of cake or $\frac{4}{16}$ pieces of cake.

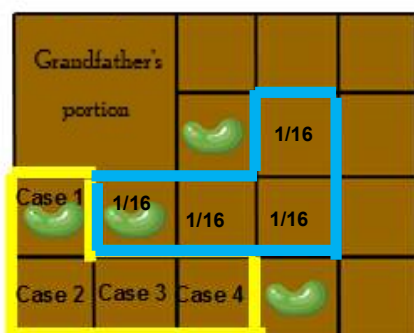
$$(16 \div 4 = 4) \text{ or } \left(\frac{1}{16} + \frac{1}{16} + \frac{1}{16} + \frac{1}{16} = \frac{4}{16}\right).$$

- 2) Surely, the 2 beans that are next to one another must be separated. The only shape that allows us to separate these beans into two separate shares of $\frac{4}{16}$ pieces of cake is by cutting the cake in the following "L" shape:

We now have one share ($\frac{4}{16}$ or $\frac{1}{4}$) of cake with a bean.



For the adjacent bean, there is only one possible solution for the second share to also be cut in an "L" shape:





PUZZLE SOLUTION



The solution (continued):

- 3) For the remaining 2 beans, there is only one way to create two equal shares of the same “L” shape as the previous shares:



Thus, for each of the remaining 4 people to get a bean, the same amount of cake, and for each share to be shaped the same way, the cake must be cut into four quarters (or four pieces of $\frac{4}{16}$) in the “L” shape shown above.