PUZZLING CARTOON

-A SHOE-FUL FAMILY-

AMAZINGMATHS

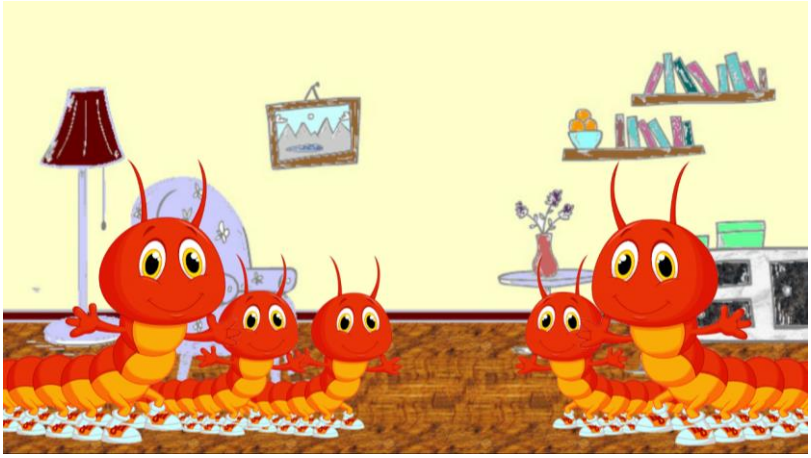
Materials:

- Video of the puzzle
- Sheets of paper
- Pencils

The puzzle

A very special family is composed of 5 centipedes : two parents and their three children. When returning from school, everyone must remove their shoes.

The centipede parents remove 2 shoes every 2 seconds. The children centipede, meanwhile, can remove 1 shoe every 2 seconds.



Each centipede has 1000 legs. In addition, when one centipede, parent or child, as removed all their shoes, they may go help those who have not finished, while maintaining the same pace.

How long, at a minimum, will it take for the centipede family to remove all their shoes?

PUZZLE SOLUTION

The answer:

It will take a minimum of 1429 seconds for the family to take all their shoes off.

First solution

At the beginning, everyone takes their own shoes off. Since the adults take 2 shoes off every 2 seconds, they take 1 off every second. So, since they have 1000 shoes, they will take them off in **1000** seconds.

After these 1000 seconds, the children took 500 shoes off, because they take 1 shoe off every two seconds, and 1000/2 = 500. Then, each child still has 500 shoes to take off.

Now, since each parent can help one child, these two children will take 3 shoes off every two seconds, or 1,5 shoes per second, with their parents' help. So, it will take them 500/1,5 = **333,33** seconds to take off the remaining shoes.

After these 333,33 seconds, the last centipede child will have taken off 333,33/2 = 166,66 shoes. So, he will still have 333,33 to take off.

The two parents and the two other children being done taking their shoes off, they can help the last child. Since the children take 1 shoe off every 2 seconds and the parents take 2 shoes off every 2 seconds, the 5 of them together, the centipedes take 7 shoes off every 2 seconds, or 3,5 shoes off every second. So, it will take them 333,33 / 3,5 = **95,23** seconds to take off the remaining shoes.

In total, it will have taken them 1000 + 333,33 + 95,23 = 1428,56 seconds. So, **1429** seconds minimum.

Second solution

We can also consider the total number of shoes. Indeed, since all the centipedes are always taking shoes off, theirs or others, the shoes will then be taken off at a pace of 2 + 2 + 1 + 1 + 1 = 7 per two seconds. Or 3,5 shoes per second.

Therefore, since the family has 5000 shoes to take off in total, it will take 5000/3,5 = 1428,56 seconds to take all the shoes off. So, **1429** seconds minimum.