

The Deca Tree



The deca tree
has 10 trunks.

On each trunk
there are 10
branches.

On each branch
there are
10 twigs.

On each twig
there are
10 leaves.



One day a woodcutter came
along and cut down one
trunk from the tree.

Then he cut off one
branch from another
trunk of the tree.

He then cut off one
twig from another branch.

Finally he pulled one leaf
from another twig.

**How many leaves were left
on the tree?**

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Seven Flipped



You have seven hexagonal-shaped mats,
each with one side red and one side blue.



Starting red side up, these mats all have to
be turned over - but you can only turn over
exactly three at a time.

What is the smallest number of moves you
can do this in?

Try with other numbers of mats. Do you
notice any patterns in your findings?
Can you explain why these patterns occur?

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Three Way Mix Up



Jack has three blue tiles, three yellow
tiles and three green tiles.

He put them together in a square so that
no two tiles of the same colour were
beside each other.

Can you find another way to do it?

Can you find ALL the ways to do it?



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The Deca Tree

Age 7 to 11 ★

This problem was very well answered. We had many very well explained solutions but Kirsty's solution was particularly clear:

There are 10 leaves per twig
There are 10 twigs per branch
 $10 \text{ leaves} \times 10 \text{ twigs} = 100 \text{ leaves per branch}$
There are 10 branches per trunk
 $100 \text{ leaves} \times 10 \text{ branches} = 1000 \text{ leaves per trunk}$
There are 10 trunks per tree
 $1000 \text{ leaves} \times 10 \text{ trunks} = 10\,000 \text{ leaves on the tree}$

Cut off one trunk: $10\,000 - 1000 = 9000 \text{ leaves left}$
Cut off one branch: $9000 - 100 = 8900 \text{ leaves left}$
Cut off one twig: $8900 - 10 = 8890 \text{ leaves left}$
Pull off one leaf: $8890 - 1 = 8889 \text{ leaves left}$

There are 8889 leaves left on the tree.

<https://nrich.maths.org/2006/solution>

SEVEN FLIPPED

Age 7-11 ***

6= 2 moves
7= 3 moves
8= 4 moves
9= 3 moves
10= 4 moves
11= 5 moves
12= 4 moves
13= 5 moves
14= 6 moves
15= 5 moves
16= 6 moves
17= 7 moves
18= 6 moves
19= 7 moves
20= 8 moves

Kahlia and Amy identified a pattern:

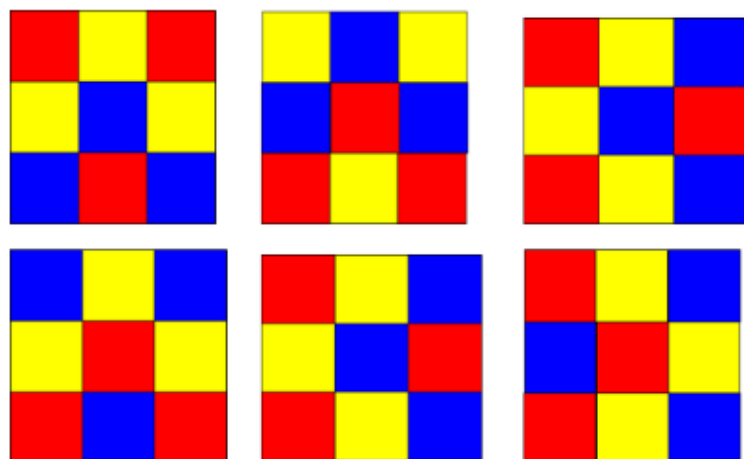
If there is a number of tiles 1 more than a multiple of 3 you add 1 to the answer of the multiple below it eg: 18 tiles = 6 turns; 21 tiles = 7 turns
17 tiles = 7 turns; 20 tiles = 8 turns

<https://nrich.maths.org/4871/solution>

Three Way Mix Up

Age 5 to 11 ★★

We received several different arrangements of tiles - thank you to those who sent in your suggestions. You had to remember that you didn't necessarily need one tile of each colour in every row and column - it was just that tiles of the same colour weren't allowed to touch. Not many of you looked for more than one other arrangement but Kesavan from Latymer All Saints C of E Primary sent in these solutions:



<https://nrich.maths.org/177/solution>