Halving chains

Children investigate which numbers from 1 to 20 (Y1) or 50 (Y2) will give the longest halving chain (each 'link' must be a whole number).

Skills practised:

- Halving even numbers up to 20 (Y1) or 50 (Y2)
- Recognising even numbers

***Conjecture**: The biggest number will give the longest halving chain. (This is false but the children may enjoy proving it to be wrong!)*

What to do:

Children work in pairs.
Each Year 1 pair needs 20 cubes.

1. Ask children to write 12. Halve it (using cubes to help if necessary). Write the answer, 6. They then halve 6 and write the answer, 3.
   Can we halve 3 without cutting a cube in half?
   Children try if they are not sure. *So we've made a halving chain starting at 12:*

$$12 \rightarrow 6 \rightarrow 3$$

2. Year 1: Challenge children to find which number up to 20 produces the longest halving chain. (Each number in the chain must be a whole number.) Which number do they think it might be?
   Year 2: Challenge children to find which number up to 50 produces the longest halving chain. (Each number in the chain must be a whole number.) Which number do they think it might be?

Year 1: Did 20 produce the longest chain? Why not?
Year 2: Did 50 produce the longest chain? Why not?
What do children notice about the numbers in the longest chain?

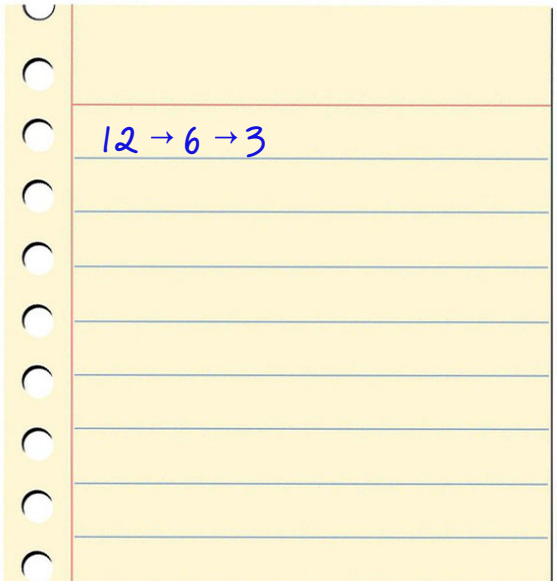
CHALLENGE: Could children use doubling to produce an even longer halving chain?

Aim:
– To make and test predictions

Minimum number of calculations expected
15

Halving chains

1. Write 12. Halve it (using cubes to help if necessary). Write the answer 6.
Then halve 6 and write the answer, 3.
Can you halve 3 without cutting a cube in half? Try if you are not sure.
We've made a halving chain starting at 12.



2. **Year 1**: Find which number up to 20 produces the longest halving chain.
(Each number in the chain must be a whole number.)
Which number do you think it might be?

Year 2: Find which number up to 50 produces the longest halving chain.
(Each number in the chain must be a whole number.) Which number do you think it might be?

Year 1: Did 20 produce the longest chain? Why not?
Year 2: Did 50 produce the longest chain? Why not?
What do you notice about the numbers in the longest chain?

Challenge

Could you use doubling to produce an even longer halving chain?