



Merry Christmas  
 (instructions inside)

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1	3	9	27	81	243	729	2187	6561				

Instructions

1. Solve the puzzles below.
2. Convert the answers to base 3.
3. Write the answers in the boxes on the front cover.
4. Colour squares containing a 1 green. Colour squares containing a 2 red. Leave squares containing a 0 unshaded.

Puzzles

1. The square number larger than 1 whose square root is equal to the sum of its digits.
2. The smallest square number whose factors add up to a different square number.
3. The largest number that cannot be written in the form  $23n+17m$ , where  $n$  and  $m$  are positive integers.
4. Write down a three-digit number whose digits are decreasing. Write down the reverse of this number and find the difference. Add this difference to its reverse. What is the result?
5. The number of numbers between 0 and 10,000,000 that do not contain the digits 0, 1, 2, 3, 4, 5 or 6.
6. The lowest common multiple of 57 and 249.
7. The sum of all the odd numbers between 0 and 66.
8. One less than four times the 40th triangle number.
9. The number of factors of the number  $2^{756} \times 3^{12}$ .
10. In a book with 13,204 pages, what do the page numbers of the middle two pages add up to?
11. The number of off-diagonal elements in a  $27 \times 27$  matrix.
12. The largest number,  $k$ , such that  $27k/(27+k)$  is an integer.

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