

Team _____
QUESTION 1

Four positive integers a, b, c, d are such that

$$abcd + abc + abd + \textcolor{red}{acd} + bcd + ab + ac + ad + bc + bd + cd + a + b + c + d = 2029$$

What is the value of $a+b+c+d$?

Answer:

Team _____
QUESTION 2

The seven members of the Swiss federal council have decided to take part in the team Maths challenge and want to form 4 teams in which all members must take part (each team can be made up of 1,2,3 or 4 members).

In how many different ways can they form the teams (the order of the teams or of the members within the teams does not matter, but each member must be in exactly one of the teams) ?

Answer:

Team _____
QUESTION 3

Nine congruent spheres are packed inside a unit cube, in such a way that the centre of one sphere has its centre in the centre of the cube, each of the other spheres is tangent to the centre sphere and to three faces of the cube. What is the radius of each sphere ?

Answer:

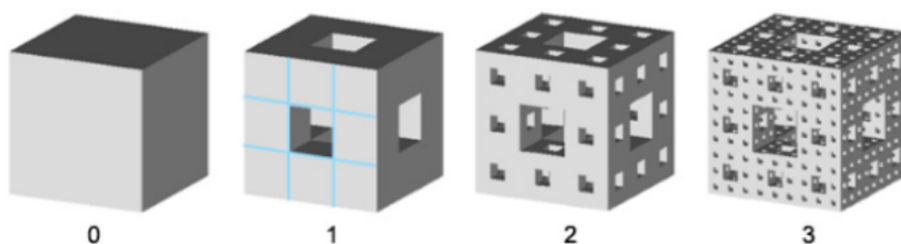
Find two 5 digits numbers whose product is

$$4^{10} + 6^{10} + 9^{10}$$

Answer:

A Sierpinski or Menger sponge is a fractal made from a cube and dividing each face into a 3x3 grid (like a Rubik's cube) then removing the centre square and everything behind it. this is the first stage of the fractal.

The second stage is repeating the same process for each of the squares left, and so on for the third stage.



Calculate the total surface area (to the nearest integer) of a Stage three fractal started from a cube with side 9 cm.

Answer

There is a disease which affects 1% of the population.

The test for the disease has a 90% accuracy, meaning it detects the illness 90 times out of 100.

The test also finds 10% false positives. A false positive is a test result which indicates a person has the disease when the person actually does not have it.

If all the population is tested, and a person has been detected by the test as having the disease,

what is the probability expressed as a percentage that the person has the disease (correct to 1 d.p.) ?

Answer

Find the value of the following

$$3 + 33 + 333 + \dots + \underbrace{33\dots3}_{100 \text{ digits}}?$$

Answer:

But then answer with the sum of the digits of the value found.

**Given two positive integers. Their sum plus their difference plus their product plus their quotient equals 243.
What are the integers both greater than 2 ?**

Answer:

Let four integers $0 < a, b, c, d < 10$, not necessarily all different.
Consider the 4-digit number N that has digits $abcd$.
Find a, b, c, d such that

$$N = a^b c^d$$

Answer:

A mad king wants to make a champagne fountain for his daughter's wedding. At the top of the glass fountain he must have 2 glasses (1×2) for the bride and groom, the next supporting layer must have 6 glasses (2×3), then 12 (3×4), then 20 (4×5), and so on until the lowest level which has 2022×2023 glasses. How many glasses would he need in total ?

Answer:

Seven examiners are responsible for keeping the Maths Challenge answers in a safe. The safe is kept locked with several padlocks. **How many different padlocks should be used** and **how many keys should be given to each commissioner** in total if any group of 4 commissioners is to be able to open the safe, but no group of 3?

Answer:

The number N has 2023 digits, all nines.

A computer calculates $N^3 = (\underbrace{99999 \dots 999}_{2023})^3$.

Answer:

How many digits 9 does N^3 have?