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1) Who were the 2 geniuses who proved the impossibility of a formula for solving a quintic?

Paolo Ruffini and Niels Henrik Abel

2) Find a way go place 31 domino pieces and cover completely an 8x8 square, where 2 opposite corners have been removed

It is not possible. A chess board has 32 black squares, and 32 white squares. Each domino will cover 1 black and 1 white square. Removing opposite corners will remove either 2 white or 2 black squares. Thus, there will only be 32 of one color, and 30 of the other, which does not allow for dominoes to fit

3) At what ages did the above geniuses die?

Ruffini - 56 years old

Abel - 26 years old

4) What university did the most in classifying so-called groups? What math dept. has the most number of Faculty members (dead or alive) with groups named after them?

1. Perform the following permutation-product

a b

$$\begin{pmatrix}1&2&3&4&5&6&7\\4&5&7&6&1&2&3\end{pmatrix}\begin{pmatrix}1&2&3&4&5&6&7\\3&1&2&6&7&4&5\end{pmatrix}$$

$$\begin{pmatrix}1&2&3&4&5&6&7\\6&7&5&4&3&1&2\end{pmatrix}$$

2. Let

$$\pi=\begin{pmatrix}1&2&3&4\\4&1&2&3\end{pmatrix}$$

find $\pi, \pi^2, \ldots$ until you get the identity permutation.

$$\begin{pmatrix}1&2&3&4\end{pmatrix} \quad \pi^4 = \begin{pmatrix}1&2&3&4\end{pmatrix}$$

$\pi^2 = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 3 & 4 & 1 & 2 \end{pmatrix}$ $\pi^4 = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 1 & 2 & 3 & 4 \end{pmatrix}$

3. Express the permutation

$$\alpha = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 3 & 1 & 2 & 5 & 4 \end{pmatrix},$$

as a product of disjoint cycles. What is the smallest i such that π^i is the identity permutation?

$\alpha = (1,3,2)(4,5)$

4. Find π^{-1} if

$$\pi = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 3 & 1 & 2 & 5 & 4 \end{pmatrix}$$

$\alpha^{-1} = (231)(54)$

$\pi^{-1} = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 2 & 3 & 1 & 5 & 4 \end{pmatrix}$