tomachello

tomachello3@gmail.com

introduction to the tomachello project

goal: creating a comprehensive mathematics book, pedagogically suited for gifted youth.
motivation: to write the book I needed growing up.
list of guidelines:
1. the reader has the job of discovering the math, while my job is to choose the exercises, guide the discussion, simplify and clarify the ideas and technique, and most importantly challenge the reader and make them love math.
2. in presenting an argument I must focus on the key idea, taking all details for granted - mathematical exposition should not be confusing to follow.
3. if a reader feels I did not follow one of the above guidelines they should let me know.

words

problem #bvo

if two words commute, they must both be powers of a third word.

$$\{(w_1, w_2) \in \text{WORDS}^2 \textbf{ s.t. } w_1 w_2 = w_2 w_1\} = \{(w^\alpha, w^\beta) \textbf{ s.t. } w \in \text{WORDS},\ \alpha, \beta \in \mathbb{Z}_{\geq 0}\}$$

problem #att

the set of all periods of a given word is closed under gcd.

$$\alpha, \beta \in \text{PERIODS}(\textit{word}) \implies \texttt{gcd}(\alpha, \beta) \in \text{PERIODS}(\textit{word})$$

problem #fll

suppose you found two equal consecutive sub words of some *word* of length $\texttt{minimal period}(\textit{word}) - 1$. then they differ in placement by a period of *word*.

algorithms

problem #upl

generate random permutation using random number generator

problem #ocj

longest common sub sequence of two words

problem #uhv

finding largest $j - i$ where $i < j$ and $a_i > a_j$ in a long sequence

more problems

problem #see

alice tells bob n, as well as the elements of a sphere $S = S(x)$ in the hamming cube Q_n. how should bob find x?