

MATH 391

Putnam Seminar

Fall 2015

Cognitive Control:

What am I doing? Why am I doing it? How will it help me?

Problem-solve away from frustration. Don't give up.

Heuristics: Search for a pattern. Draw a figure. Choose effective notation. Work backward. Use pigeonhole. Consider Modular Arithmetic. n is for Induction.

New Problems:

1. How many zeroes does $1,000,000!$ (one million factorial) end in?
2. Show that the product of n successive integers is always divisible by $n!$.
3. Let $f(x)$ be a polynomial of degree n such that

$$f(k) = \frac{k}{k+1}$$

for each $k = 0, 1, 2, \dots, n$. What is the value of $f(n+1)$?

4. Decide whether or not a cube can be decomposed into a finite number of smaller cubes, all of different sizes.