

**STUDENTS' PERCEPTIONS FOR AN IMPACT OF  
MATH AND LOGIC ENRICHMENT PROGRAM.**

Aleksandra Fedorov  
Ryan Marchenko  
Ethan Soifer  
Dr. Victoria Kofman

# MATH ENRICHMENT SCHOOL



- Mental math
- Organizing Information
- Communication Skills
- Logic
- Creative Thinking
- Popularity
- New Opportunities

Why do I need more math knowledge, when I already know enough from school?

# MENTAL MATH STRATEGIES VS ALGORITHMS

Left (Standard Algorithm):

$$\begin{array}{r} \cancel{0} \\ \cancel{0} \\ \cancel{0} \\ 37 \\ \times 9,999 \\ \hline 693 \\ + 6930 \\ + 69300 \\ + 693000 \\ \hline 769,923 \end{array}$$

Right (Mental Strategy):

$$\begin{array}{r} \cancel{0} \\ \cancel{0} \\ \cancel{0} \\ 37 \\ \times 9,999 \\ \hline 333 \\ + 3330 \\ + 33300 \\ + 333000 \\ \hline 369,963 \end{array} \quad ?$$

$$9,999 \times 37 = (10,000 - 1) \times 37 = 370,000 - 37 = 369,963$$

$$\begin{array}{r} 6,1515 \\ - 999 \\ \hline 6,666 \end{array} \quad ?$$

$$7,665 - 999 = 7,665 + 1 - 1,000 = 6,666$$

# NUMBER SENSE

$$\frac{1}{2} \div \frac{1}{6} = \frac{1}{2} \times \frac{6}{1} = \frac{6}{2} = 3 ?$$

$$\frac{1}{2} \div \frac{1}{6} = 3$$

$$\begin{array}{r} 0.0015 \\ \times 200 \\ \hline 00 \\ 000 \\ 3000 \\ \hline 0.3000 \end{array} ?$$

$$\begin{aligned} 0.0015 \times 200 &= 0.0015 \times 2 \times 100 = \\ &= 0.003 \times 100 = 0.3 \end{aligned}$$

I am fast, thanks to mental math!

# ORGANIZING INFORMATION IS IMPORTANT

- Was really sloppy - became *a bit* neater.
  - Organizing is a post-brainstorming technique-putting information in a logical order.
- Brainstorming is not enough!





# BRAINSTORMING VS ORGANIZING

Two drivers were coming to a *Lake On The Moon* city. The first driver drove 3 hours and 40 minutes with the speed of 60 miles per hour. The second driver drove 2 hours and 8 minutes with the speed of 120 km per hour. Which driver lives closer to *Lake on The Moon*? How much closer?

~~driver a~~ driver a = 60 mph  
 driver b = 120 km/h  
 driver a time = 3 hour 40 min  
 $= 3\frac{2}{3}$  hour  
 driver b time = 2 hour 8 min  
 $= 2\frac{2}{15}$  hour  
 driver a distance = 60 mph  $\cdot 3\frac{2}{3}$  hour = 220 mi  
 driver b distance = 120 km/h  $\cdot 2\frac{2}{15}$  hour = 256 km = 160 mi  
 Answer: The first driver  
 by 60 miles  
 driver a 220  
 driver b 160  

$$\begin{array}{r} 220 \\ - 160 \\ \hline 60 \end{array}$$

$V_1 = 60 \frac{\text{mi}}{\text{hr}}$   
 $V_2 = 120 \frac{\text{km}}{\text{hr}}$   
 $t_1 = 3 \text{ hrs} + 40 \text{ min}$   
 $t_2 = 2 \text{ hrs} + 8 \text{ min}$   
 $d_1 = ?$   
 $d_2 = ?$   
 $d_1 \neq d_2$   
 $|d_1 - d_2| = ?$

$t_1 = 3 \text{ hrs} + 40 \text{ min} = 3 \text{ hrs} + \frac{2}{3} \text{ hr}$   
 $= 3\frac{2}{3} \text{ hrs}$   
 $t_2 = 2 \text{ hrs} + 8 \text{ min} = 2 \text{ hrs} + \frac{2}{15} \text{ hrs}$   
 $= 2\frac{2}{15} \text{ hrs}$   
 $d_1 = 60 \frac{\text{mi}}{\text{hr}} \cdot 3\frac{2}{3} \text{ hrs} = 220 \text{ mi}$   
 $d_2 = 120 \frac{\text{km}}{\text{hr}} \cdot 2\frac{2}{15} \text{ hrs} = 256 \text{ km} = 160 \text{ mi}$

Answer:  $d_1 = 220 \text{ mi}$ ,  $d_2 = 160 \text{ mi}$ ,  $d_1 > d_2$ ,  $|d_1 - d_2| = 60$   
 the second driver lives closer so the first driver lives farther by 60 mi.  
 (lives farther)

# COMMUNICATING PROBLEM TO MYSELF

The ancient hero Abakkor decided to kill the dragon that was eating farm animals and frightening people. When a dragon eats, each head eats 3 sheep per week, so it's difficult for farmers to survive when a dragon is close by. Fortunately, the dragon that lives in Abakkor's village only had one head. What Abakkor and the villagers did not know is that every time one head is cut off, three new heads grow to replace it.

Abakkor the hero was sent by his village to fight the dragon. He went to the mountains and began his fight. He fought, and fought, and fought, and finally cut off the dragon's head and went home. The next day the dragon had 3 heads.

Again Abakkor went to the mountains and fought, and fought, and cut off all of the dragon's heads. He fought the dragon for an entire week. On the seventh day, the dragon had so many heads that they weighed more than his entire body, and the dragon fell over and died. Abakkor the hero became famous in all parts of the country. People from all over came to see the dragon and count its heads. How many heads did the dragon have when it died? How many heads did Abakkor cut off?



# DATA EXTRACTION, CHUNKING, AND SHORTCUTTING

## PREP

D grows 3 heads for 1 head cut.

A cuts 1 head the first day.

The next day there are 3 heads.

A cut off the heads for 7 days.

D died having too many heads.

How many heads did D have when it died?

How many heads were cut off?



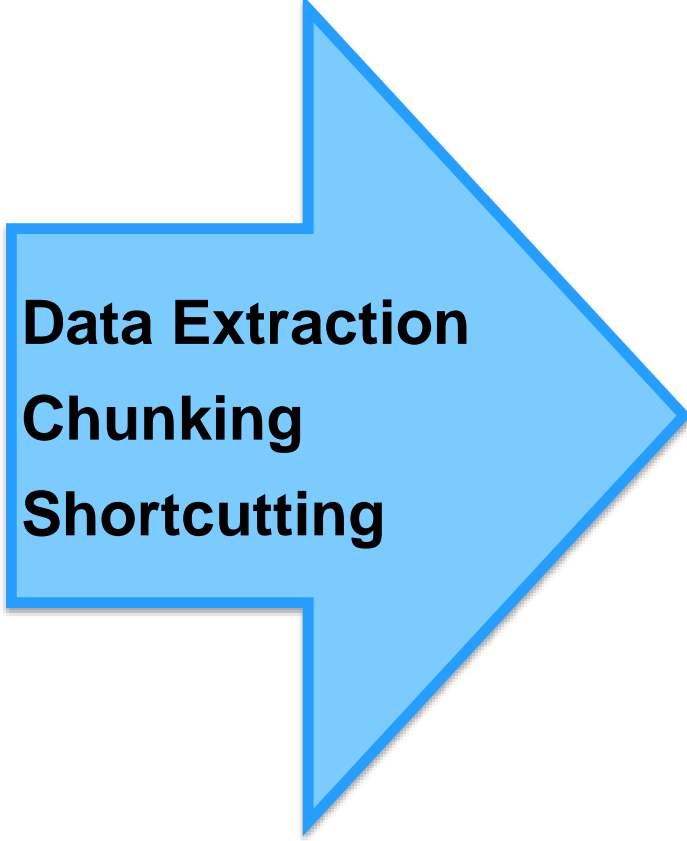
# WHY PREP?

The ancient hero Abakkor decided to kill the dragon that was eating farm animals and frightening people. When a dragon eats, each head eats 3 sheep per week, so it's difficult for farmers to survive when a dragon is close by. Fortunately, the dragon that lives in Abakkor's village only had one head. What Abakkor and the villagers did not know is that every time one head is cut off, three new heads grow to replace it.

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**Data Extraction**  
**Chunking**  
**Shortcutting**

Grows 3 new heads for 1 head cut off.  
A cuts 1 heads the first day.  
The next day there are 3 heads  
A cut off the heads for 7 days  
D died having too many heads  
How many heads did D have when it died?  
How many heads were cut off?

# LOGIC: BULLS AND COWS

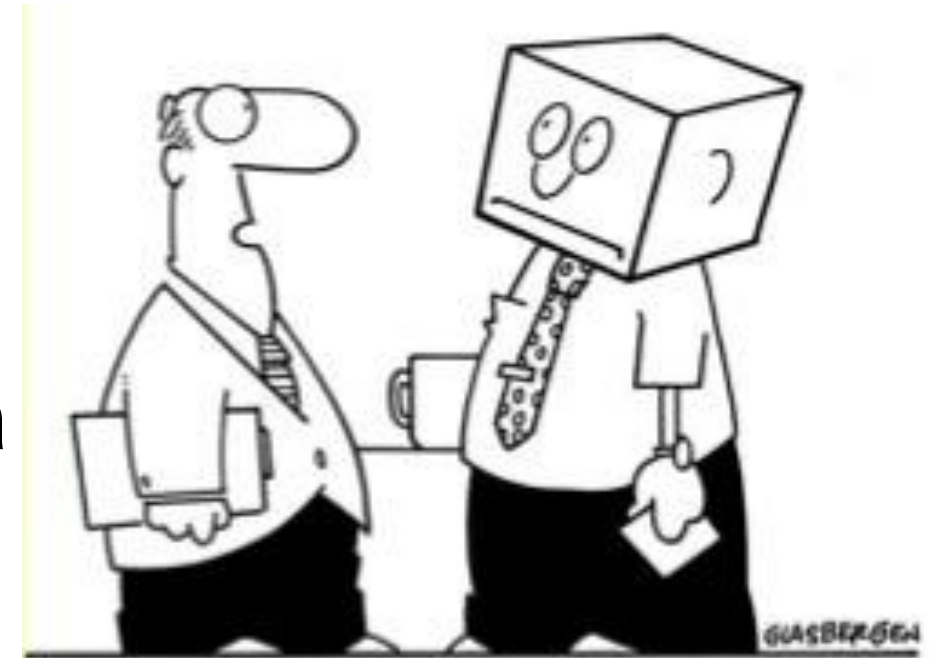
## Rules:

- Two players choose 4-digit numbers without zeros or repeated digits, keeping these numbers secret from each other.
- The players take turns guessing their opponent's 4-digit number.
- After each guess, the opponent tells the guessing player the number of bulls and cows.
  - Bulls — means the number of correctly guessed digits.
  - Cows — means the number of digits on the correct place.
- The player who finds the 4-digit number with the least attempts wins.

	Bulls	Cows
1375	0	0
4268	1	1
0298	2	1
0692	1	3
0296	2	2
0269	1	3
9620	1	3
6290	4	

# CREATIVE THINKING

- It's called "Thinking Outside the Box" or "Lateral Thinking"
- Solving problems through an indirect and creative approach instead of using a traditional step by step logic
- Creative models make it easier to solve the problem than traditional logic.



"Thinking outside of the box is difficult for some people. Keep trying."

# CREATIVE THINKING

Five Integers. There are five integer numbers. The first number is 7 more than the second, which is 998 more than the fifth. The fifth number has 4 digits. The fourth number has two digits less and is 99 times the first number. It is known that the third number is additive inverse of the square root of 4,096. Find the first number.

$$\begin{aligned} N_1 &= N_4 \div 99 \\ N_2 &= N_1 - 7 \\ N_3 &= -\sqrt{4096} \\ N_4 &= \overline{ab} \\ N_5 &= \overline{abcd}, N_2 - 998 \\ N_1 &= ? \end{aligned}$$

Step 1  $N_1$  is Integer  
 $N_1 = \dots N_4 \div 99, N_1 = N_2 + 7, N_1 = ?$

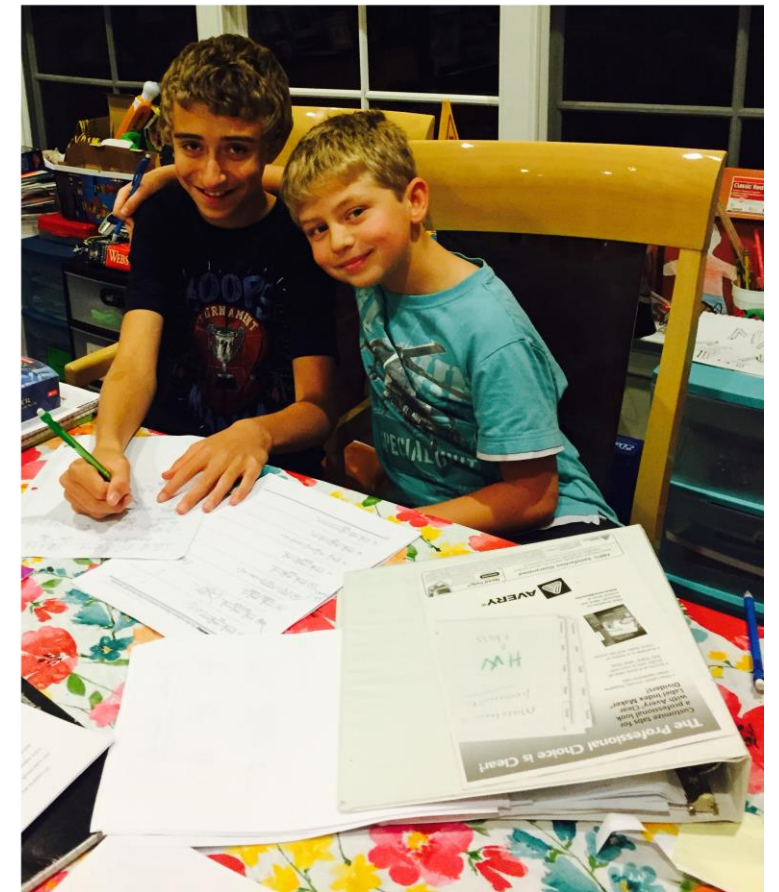
Step 2A  $N_4 = \overline{ab}$

Step 2B  $N_2 = N_5 + 998$

$$N_1 = N_4 \div 99 = 99 \div 99 = 1$$

# BECOMING POPULAR WITH MATH

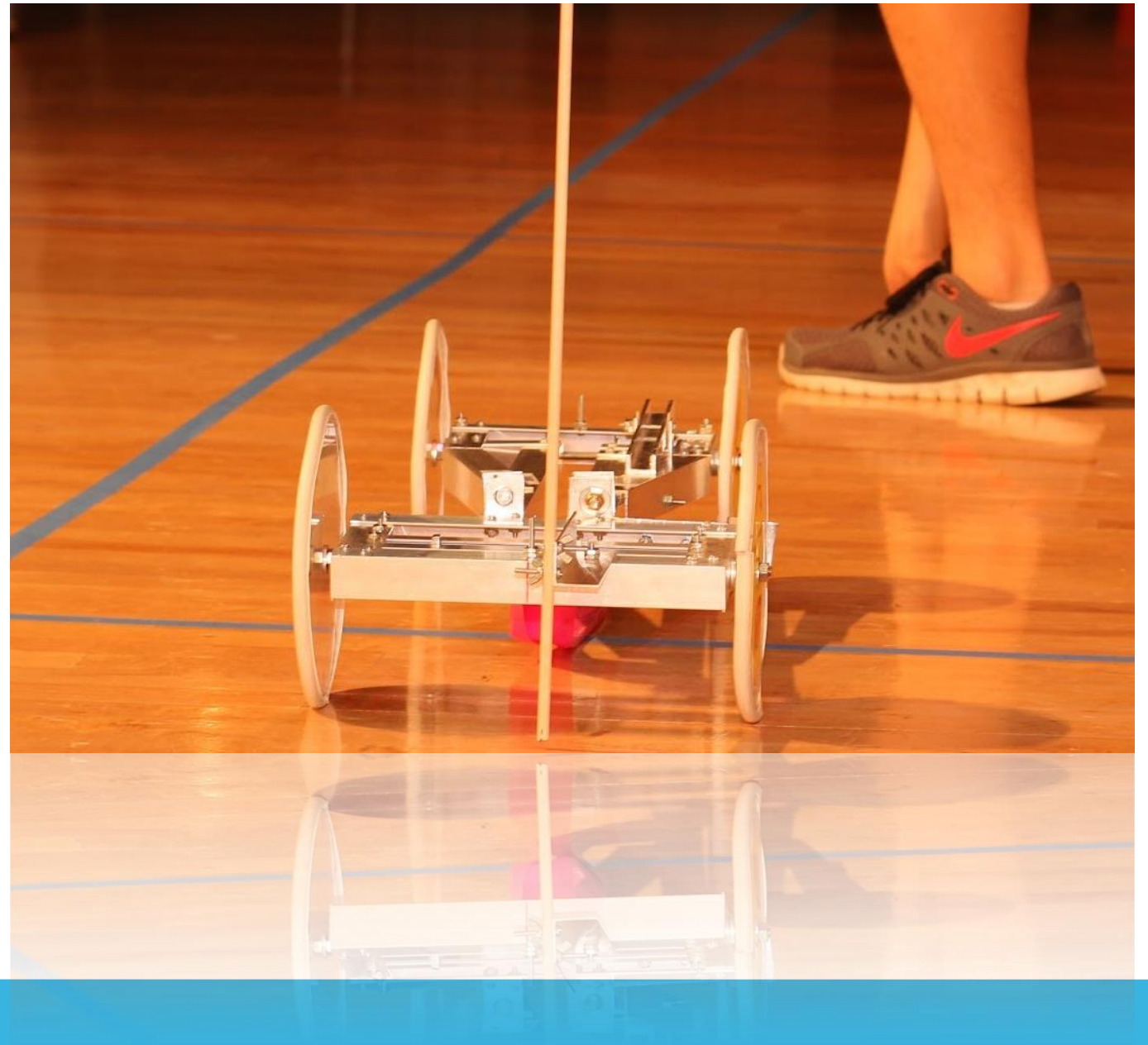
- Helping others = making new friends.
- Tutoring
  - Tutoring club
  - In class
  - After school
- Why math makes us popular?
- Widespread view:
  - smartness is innate!





# NEW OPPORTUNITIES

- Science Olympiad
- Math Club
- Scholastic Bowl



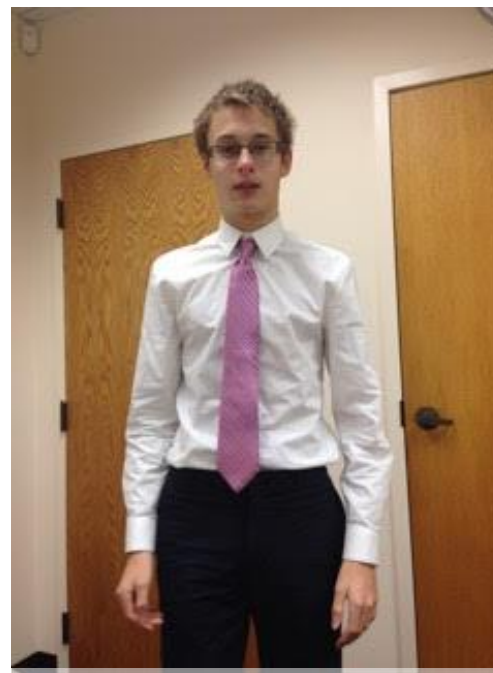
# FUTURE PROFESSION

- Logic and Creative Thinking
- Preparation to higher Level Math
- General Problem Solving

- Organizing
- Communication
- Estimation



Neurosurgeon



Financial  
Analyst



Lawyer

# THANKS

Contact info:

Victoria Kofman

Phone: 1 (847) 323-1435

Email: [drkofman@gmail.com](mailto:drkofman@gmail.com)

Aleksandra Fedorov

Email: [aleksandramath@gmail.com](mailto:aleksandramath@gmail.com)

Ryan Marchenko

Email: [ryanmarchenko2001@gmail.com](mailto:ryanmarchenko2001@gmail.com)

Ethan Soifer

Email: [ethan.soifer@gmail.com](mailto:ethan.soifer@gmail.com)

