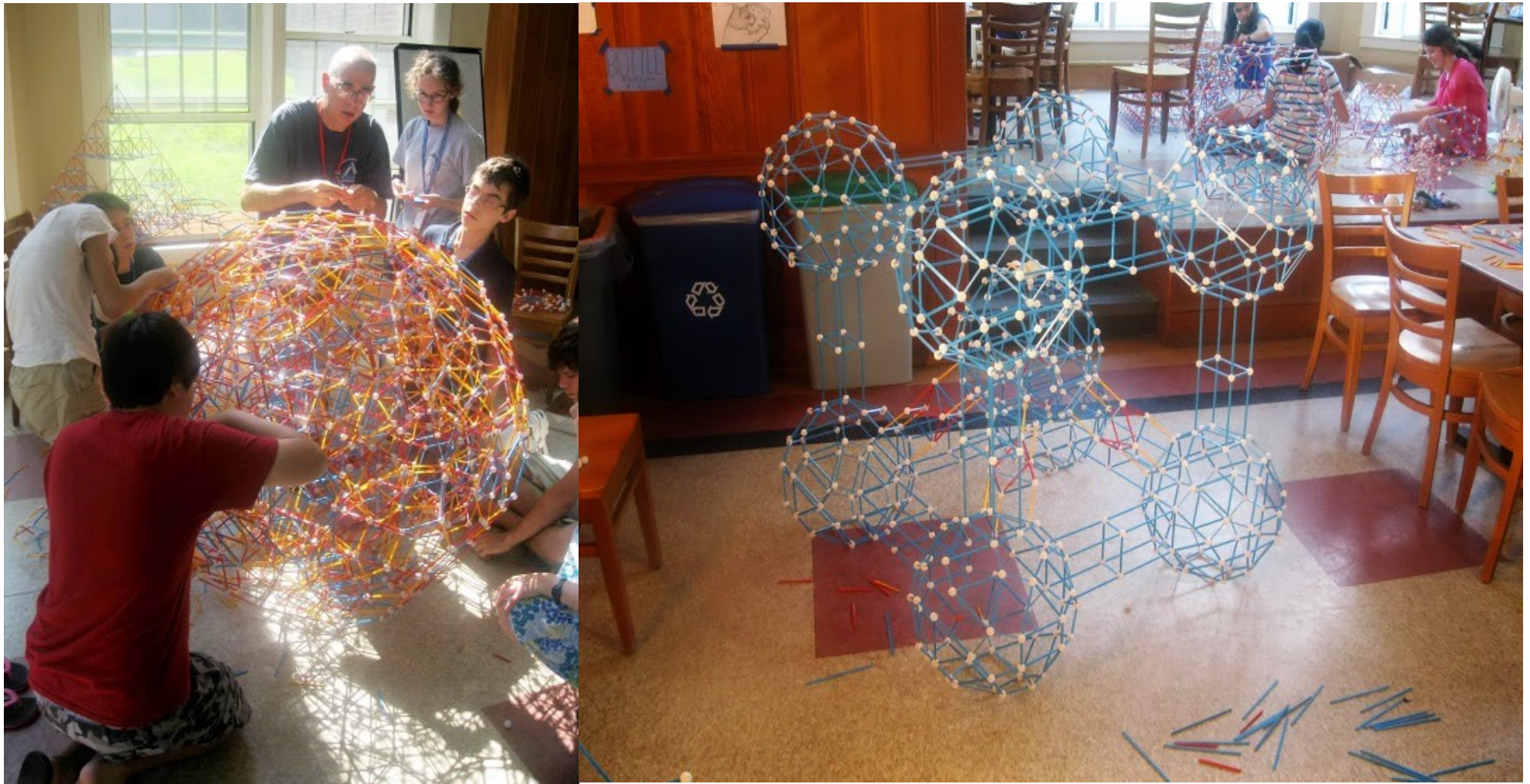


Marcin Kotowski

Mathcamp – czyli jak to robią w USA



WWW 9, Flashtalki

Co to jest?

- amerykański obóz matematyczny dla wybitnie zdolnej młodzieży (z USA/Kanady, ale nie tylko!)
- w wakacje, trwa 5 tygodni (!)
- ok. 120 uczestników
- ogólny klimat bardzo podobny do WWW/Funduszu, tylko...
 - dłuższe, więcej wszystkiego
 - tylko matematyka

Ostra jazda z koksem

Mathcamp 2013 Four-Week Schedule

Time	Week 1	Week 2	Week 3	Week 4
9:10am	Partially Ordered Sets 🍴🍴🍴 (Kevin)	Hydrogen Atom 🍴🍴🍴 (<i>David Jordan</i>)	Quantum Computation 🍴🍴🍴 (Matt)	[HW] Origami 🍴🍴🍴 (Zach)
	Combinatorial Games 🍴 (Alfonso)	Surfaces (week 1 of 2) 🍴 (Susan)	Multilinear Algebra 🍴🍴🍴 (Asi & Waffle)	Curvature of Polyhedra 🍴 (Nic)
	Group Theory 🍴🍴🍴 (Mark)	Probability (week 2 of 2) 🍴 (Aaron)	Surfaces (week 2 of 2) 🍴 (Susan)	Approximation 🍴-🍴🍴 (Paddy)
	[HW] PS: Polynomials 🍴🍴🍴🍴 (Pesto)	Models of Computation 🍴 (Pesto)		Auction Theory 🍴🍴🍴 (<i>Glenn Ellison</i>)
	Cryptography 🍴→🍴 (Matt)	Ring Theory 🍴🍴🍴 (Mark)		Rep Theory (week 2 of 2) 🍴🍴🍴🍴 (Mark)
10:10am	Euler 🍴🍴 (<i>Jon Tannenhaus</i>)	Matrix Groups 🍴🍴🍴 (Asi)	Graph Minors 🍴🍴🍴 (Alex & Marisa)	Fractal Geometry 🍴🍴 (<i>Julian Gilbey</i>)
	[HW] Number Theory 🍴🍴 (Ruthi)	Proof Writing 🍴-🍴 (Mira)	Harmonic Analysis 🍴🍴🍴 (Ari & Dave)	<i>John Conway</i> 🍴-🍴🍴🍴
	Inside Convexity 🍴🍴🍴 (Alex)	Symmetric Functions and Schubert Calculus (week 1 of 2) 🍴🍴🍴 (Nic & Kevin)	Representation Theory (week 1 of 2) 🍴🍴 (Mark)	Billiards 🍴🍴🍴🍴 (<i>Craig Sutton</i>)
	Continuum Hypothesis 🍴🍴🍴🍴 (Susan)	Epsilon the Enemy 🍴🍴 (Ruthi)		Geometry (TBA) 🍴🍴🍴 (<i>Moon Duchin</i>)
	Linear Algebra 🍴🍴 (Nic)	Set Theory 🍴🍴🍴 (Waffle)		
11:10am	[HW] Abstraction 🍴 (Mira)	Reverse Mathematics 🍴🍴 (Steve & Matt)	Polynomial Method 🍴🍴🍴🍴 (Pesto)	Category Theory 🍴🍴🍴🍴 (Waffle)
	4.99 Color Theorem 🍴🍴 (Noah)	Chip Firing and Sandpiles 🍴-🍴🍴🍴 (<i>Sam Payne & Dave Jensen</i>)	Continued Fractions 🍴🍴 (Dave)	TBA (Mark)
	Hindman's Theorem 🍴🍴🍴🍴 (Steve)	Using Linear Alg. 🍴🍴🍴 (<i>Po-Shen Loh</i>)	Symmetric Functions and Schubert Calculus (week 2 of 2) 🍴🍴🍴 (Nic & Kevin)	Elections: Influence and Stability 🍴🍴 (Tim!)
	Probability (week 1 of 2) 🍴→🍴 (Aaron)	Bruhat Orderings 🍴🍴🍴 (<i>Ben Elias</i>)		Sym. Group Reps. 🍴🍴🍴 (Kevin & Alex)
	Multipart Communication 🍴🍴🍴 (Tim!)	Topology of Surfaces 🍴🍴🍴 (<i>Scott Taylor</i>)		
1:10pm	Intro to Graph Theory 🍴 (Marisa)	Functions of a Complex Variable (week 1 of 2) 🍴🍴🍴 (Mark)	Functions of a Complex Variable (week 2 of 2) 🍴🍴🍴 (Mark)	Flows 🍴-🍴🍴🍴 (Pesto)
	[HW] Category of Sets 🍴🍴🍴 (Waffle)	[HW] Probabilistic Method 🍴🍴 (Tim!)	Voting Theory 🍴 (Alfonso)	Littlewood-Offord Problem 🍴🍴 (Susan)
	Spacetime 🍴🍴🍴 (<i>Jim Gates</i>)	Cut That Out! 🍴🍴 (Zach)	[HW] Travelling Salesman Problem 🍴-🍴🍴🍴 (<i>Gwen Spencer</i>)	Hyperreals 🍴🍴🍴 (<i>Don Lauckman</i>)
	Geometry is Awesome 🍴🍴 (Zach & Asi)	Finding the Perfect Match 🍴🍴 (Alex)		[HW] Flag Varieties 🍴🍴🍴🍴 (Asi)
	Multivariable Calculus 🍴🍴🍴 (Mark)			
Superclasses				
9:10am-11am, 3:10pm-4pm			Machine Learning 🍴🍴 (Tim! & Mira)	Algebraic Number Theory 🍴🍴🍴🍴 (Ruthi)
			Communication Complexity 🍴🍴🍴 (<i>Marcin Kotowski</i>)	Metric Spaces 🍴🍴 (Alfonso & Nina)
			Mathematical Sculpture 🍴 (<i>George Hart</i> & Zach)	
11:10am-12pm, 1:10pm-3pm			Combinatorics of Partitions 🍴🍴 (<i>Michał Kotowski</i>)	Rewrite Systems 🍴 (Aaron)
			Commutative Algebra 🍴🍴🍴 (Ruthi)	PRIMES is in P 🍴🍴🍴 (Mira & Matt)
			Markov Algorithms 🍴 (Aaron)	

Key: [HW]—Homework Required

Przykładowe zajęcia

- analiza harmoniczna, teoria reprezentacji, teoria funkcji symetrycznych
- uczenie maszynowe, przepisywanie termów
- topologia powierzchni, hipoteza continuum
- złożoność komunikacyjna, kombinatoryka podziałów :)
- + masa innych rzeczy







ic complexity

n)

are both $\Theta(\sqrt{n})$
 $\frac{D(f)}{\sqrt{\text{rank}(M_f)}}$

Open problem:

is it true that for every f

$$D(f) = O((\log \text{rank}(M_f))^c)$$

for some $c \geq 1$?

$$D(f) \leq \text{rank}(M_f)$$

$$D(f) \leq \sqrt{\text{rank}(M_f)}$$

Log

$f: \{0,1\}^n \rightarrow \{0,1\}$

M_f

M_i

$\text{rank}(M_f)$
of U

$\exists v_1, \dots, v_k$
linearly
if $\forall v_i$

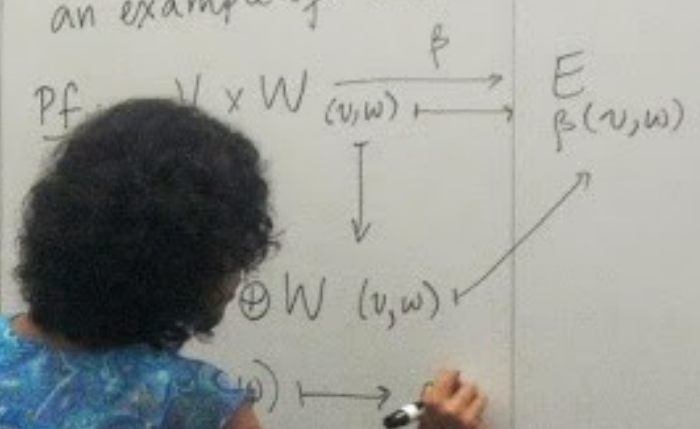
$\alpha_1 v_1 + \dots + \alpha_k v_k$

V, W
such that

"dominates"
E)

Defn: Given two vector spaces V, W , a sum on V, W is a new v-space D , together with a function $\alpha: V \times W \rightarrow D$ st. $\alpha(v_1 + v_2, w_1 + w_2) = \alpha(v_1, w_1) + \alpha(v_2, w_2)$ and $\alpha(cv, cw) = c \cdot \alpha(v, w)$

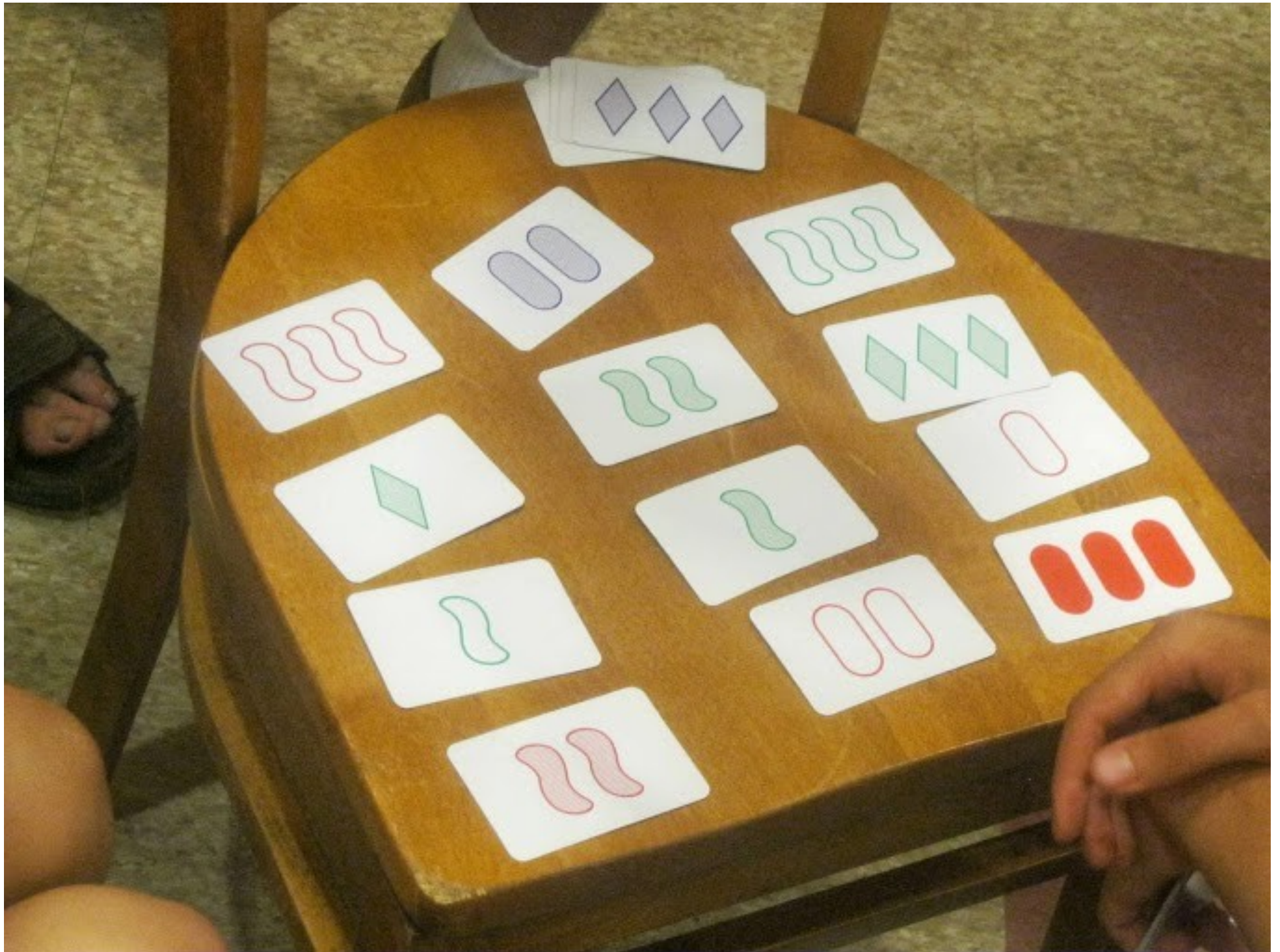
Prop: The direct sum $V \oplus W$ is an example of a universal sum.

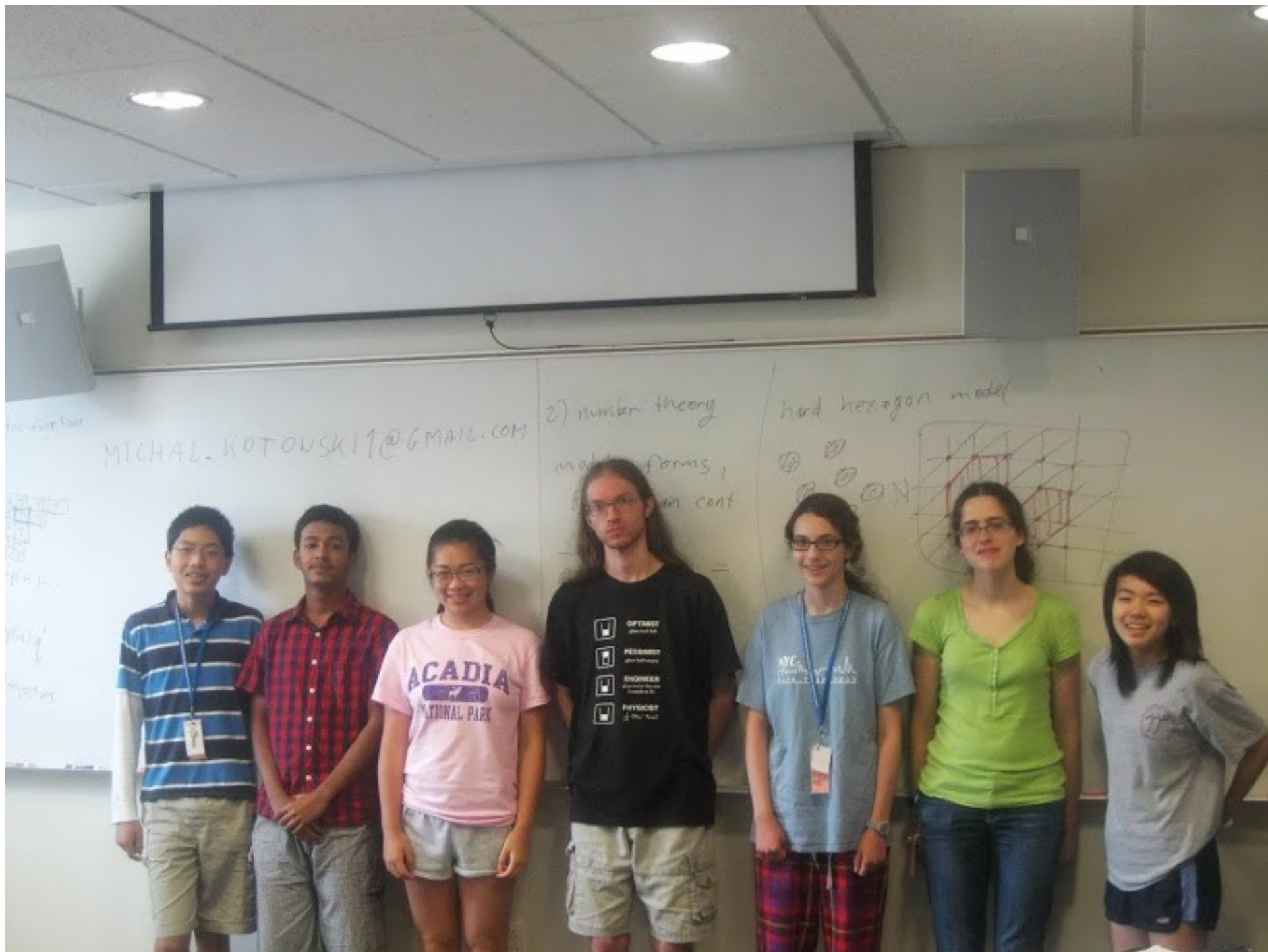


V, W
(universal) α



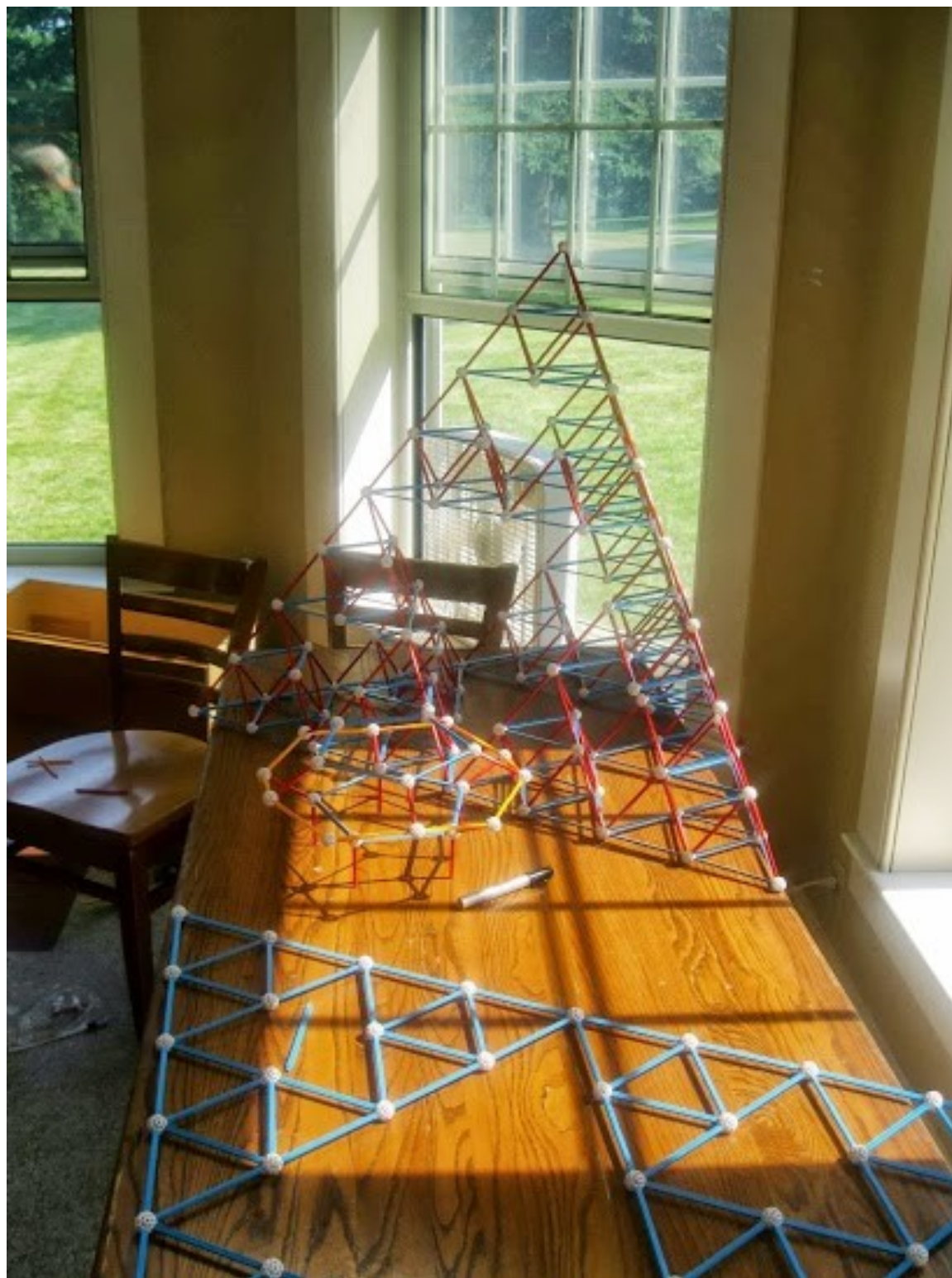
















Aplikujcie tam!

- Mathcamp przyjmuje uczniów z zagranicy!
- jak kogoś przyjmą, dają “full financial support”
(koszt pobytu + podróż)
- warto