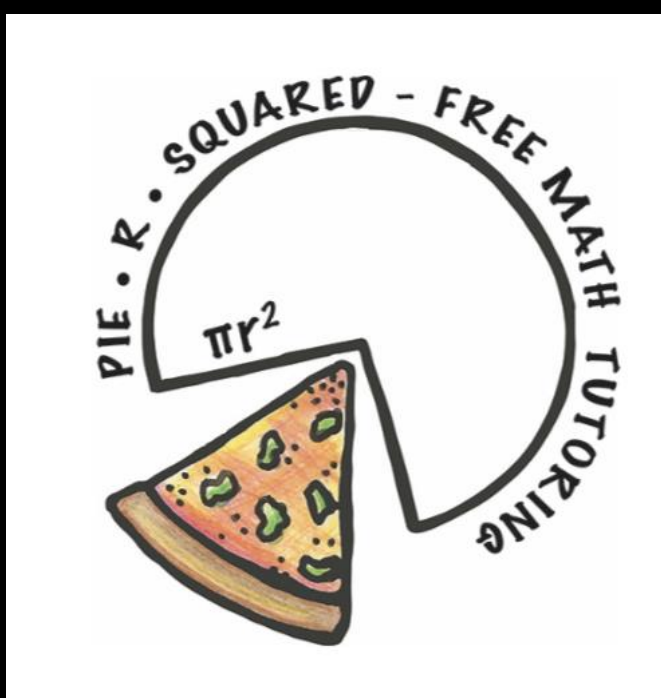


# The Northeast Noyce Regional Conference - Boston 2024

---



Sharing Teacher Knowledge: Voices from the Field about the Future of STEM Education



# PieRSquared and the Evolution of Free Community-Based Math Tutoring

[www.piersquared.org](http://www.piersquared.org)



# Themes to Cover

- Evolution of tutoring
- Community as key
- Partnership with schools
- Support for teachers
- Work with all the pieces – students, parents, teachers, tutors, resources
- Food and respect as welcome
- Stay with students through college
- 10 years in – where are we now?
- An offer to help you “try this at home”

# Evolution of PieRSquared

---

- 24 years of tutoring in Boston middle and high schools
- Middle school as ideal age to start
- High school proficiency exams
- Completed M.S. in Education in Teaching STEM at Wheelock (now BU)
- Partnered with Haley House to open PieRSquared in October 2015.





# Create Community

- Students
- Parents
- Schools
- Teachers
- Tutors and other volunteers
- Other non-profits
- Social workers
- Local businesses



**HALEY  
HOUSE**

Our home: A  
booth in a  
pizza shop in  
Roxbury, MA

---



# Start young...

---

- Students in 7<sup>th</sup> grade and higher can attend on their own
- Students in 6<sup>th</sup> grade and below need adult to bring them and stay
- All are welcome, including public, private, charter, parochial and home school students







# Peer groups

- Students often want to work in groups
- Add a tutor to listen to either their questions, or their conclusions



# Teachers

- Always welcome
- Bring their class.
- Make clear that teacher(s) and tutor(s) are in contact for HW, test schedules, goals.
- Get priority lists of students
- Get invited to parent/teacher nights

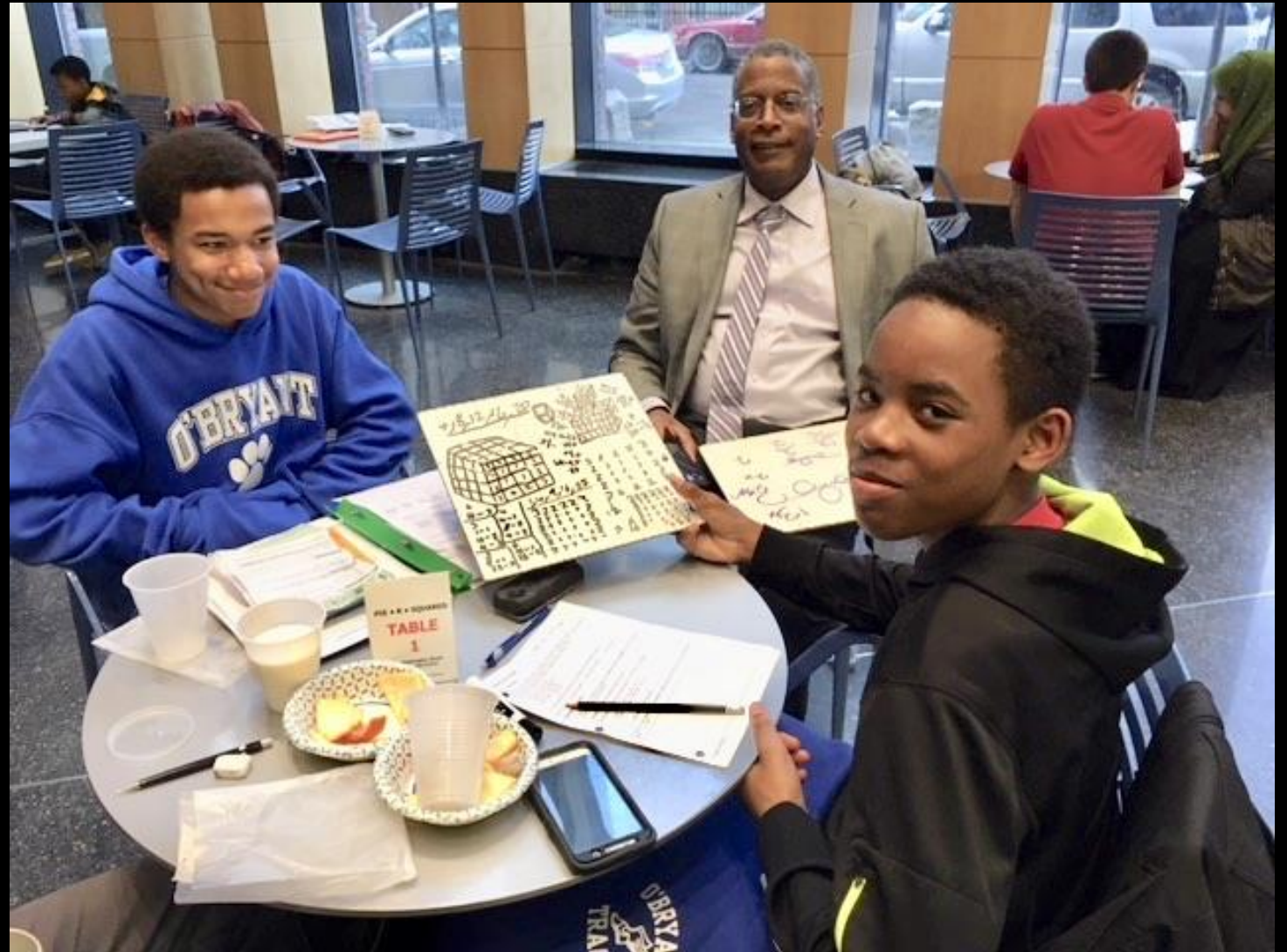




# Active learning

---

- The pen must be in the students' hands
- Tutor can write as well
- If only tutor writes, less effective
- Both students and tutors have markers and boards



# Tutor corps

---

- Qualified
- Committed to students
- Experienced in tutoring
- All volunteers
- Sample photo of our “Tuesday” crew





# More Tutors

Local universities

Boston College Pulse  
Program

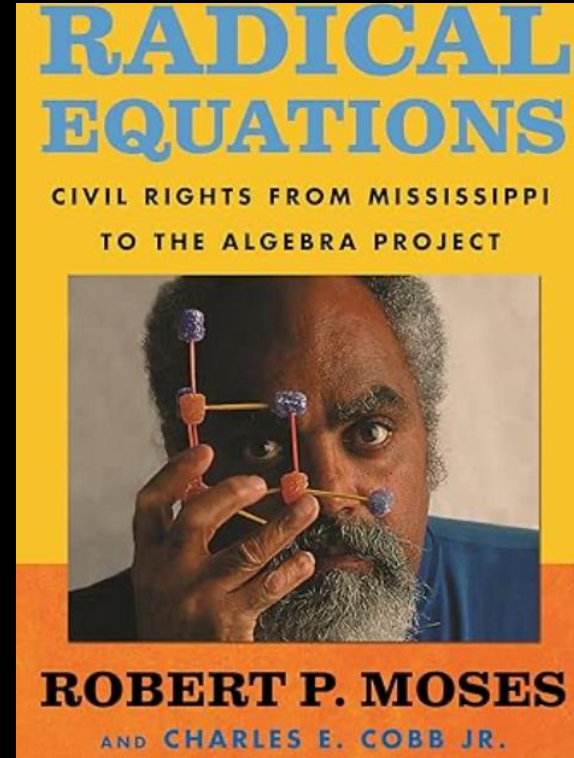
Northeastern

Math Clubs



# Tutors and the volunteer model

---





# Continuity of tutors

---

- These students have known their tutor for 5 years.
- The average visit is about one hour. Of that, 45 minutes is math, after a snack and a chance to unwind.
- In 10 years, we have registered over 2,000 students from over 75 schools.







# Expand

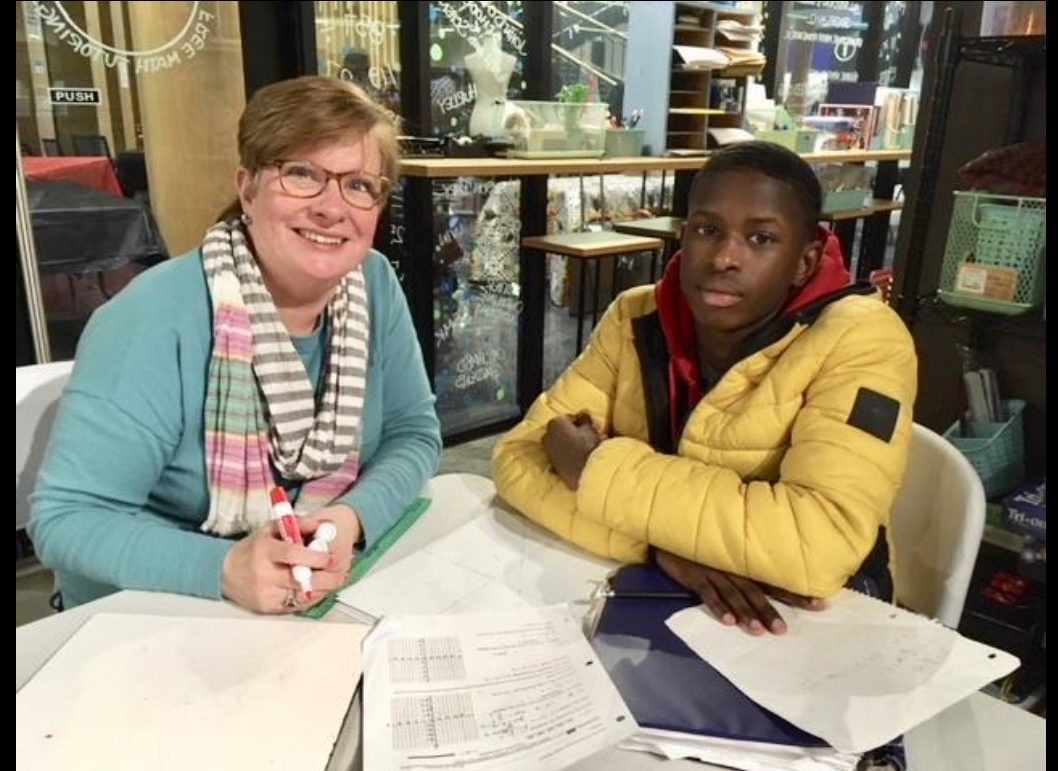
---

- We outgrew the booth
- We took over the lobby
- Community (BPS admin) enjoyed seeing students working hard



# Resilience and Perseverance

- Stories of resilience
- A first “A” in math or an ELL student
- This is why we tutor





# Social Workers

---

- Bring us students
- Weekly visits
- Tutoring
- Broaden community of support



# Families

- Always ask for siblings
- Build relationships with parents
- Invite parents to drop in





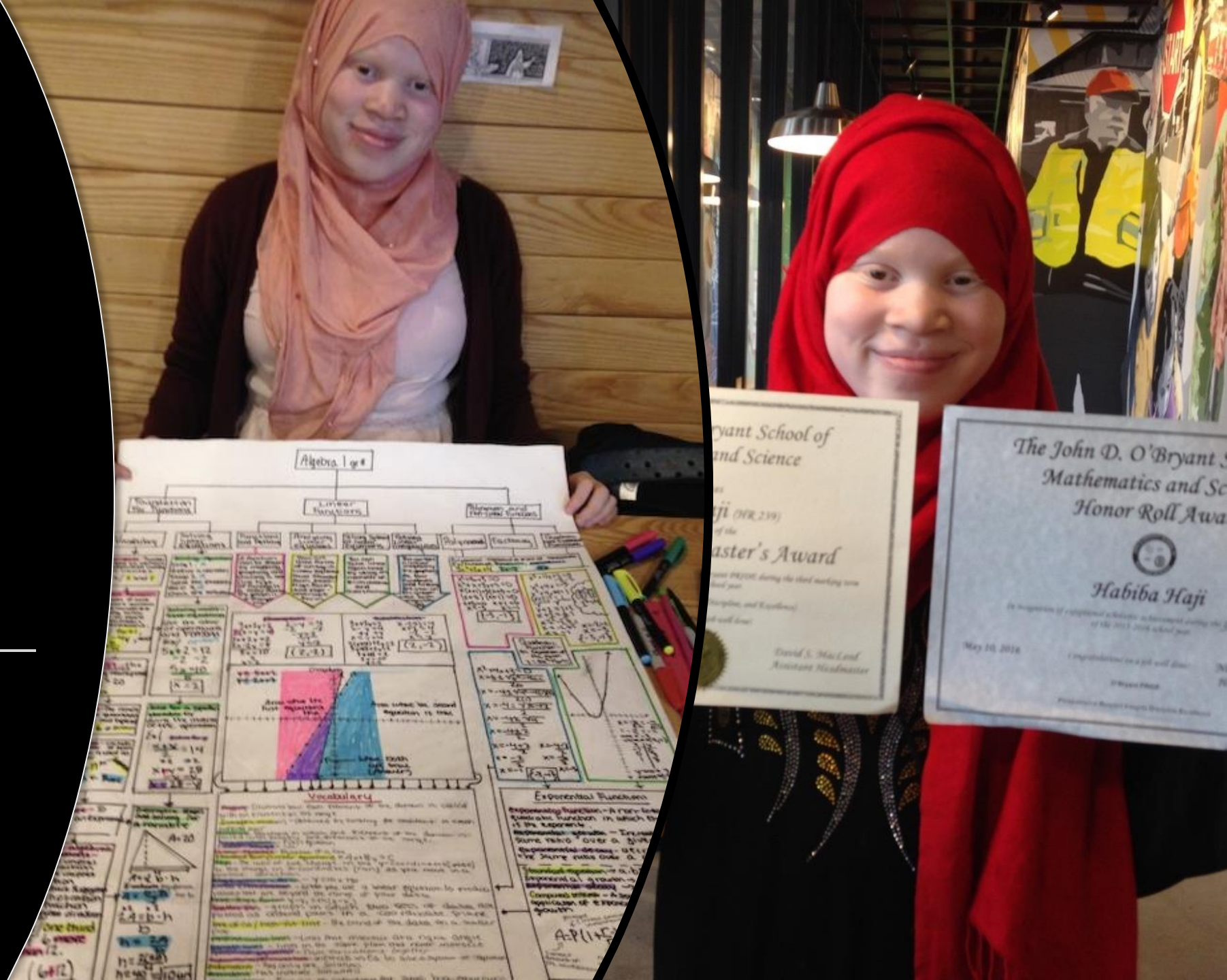
# Volunteers





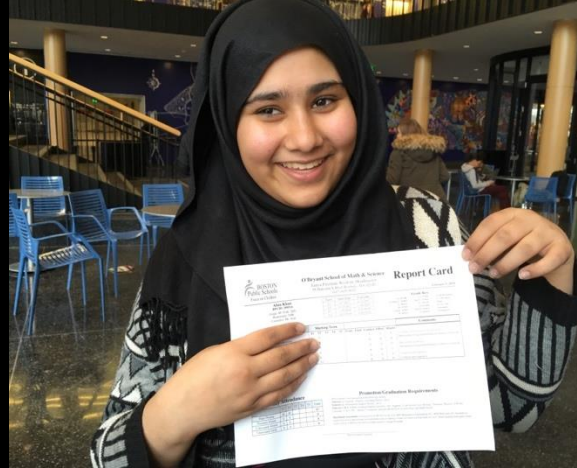
# Celebrate Everything

Encouragement at every turn





# New traditions and habits





# Community of scholars

---

Celebrate everything

- Birthdays
- Report cards
- Ice cream social at year-end
- Pi Day





# A sendoff...

---

- High school graduation lunch, June 2021





# Tutors and Volunteers Summer Clambake





# College Prep

---

- SAT Prep
- Regular weekly sessions
- Wrote study guide of key concepts
- Provide College Board book
- Work with schools to coordinate with their in-school exam dates.
- Summer options too.



# AP Calc Full Day Workshop

- Assemble tutors, teachers, students during school break for full day
- Invite one of the AP Calc exam writers to address students
- Practice sessions, reviews, and lots of food





# Summer Fun - Discovery Math: algorithms and sorting

**After a lesson in what algorithms  
are and how they work**



**Students built a sorting process and tested their  
algorithm...it worked!**



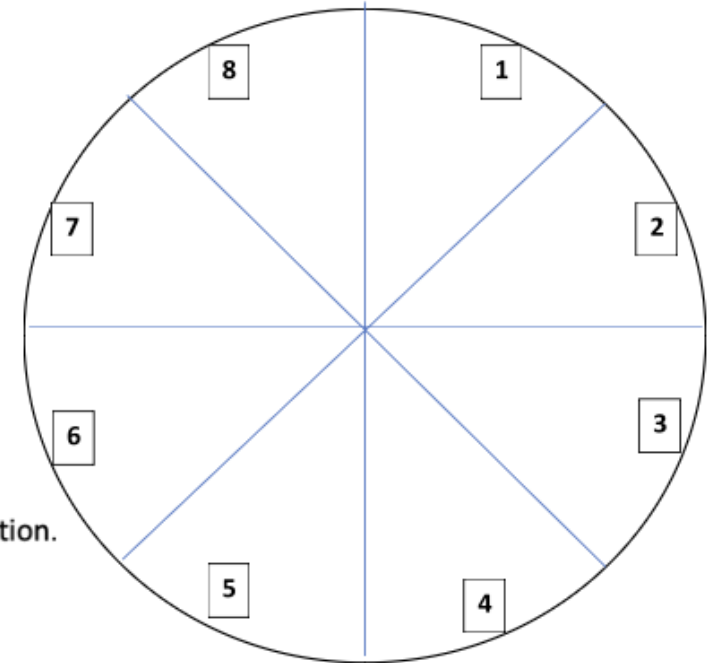
# Discovery Math: Try the color wheel problem

---

A simple task of working within constraints. Try to take  $\leq 25$  minutes!!!

## THE COLOR WHEEL

The names of eight colors - *blue, brown, green, maroon, orange, red, white* and *yellow* - must be placed in sections of the wheel. Use the five clues to correctly fill in each section.

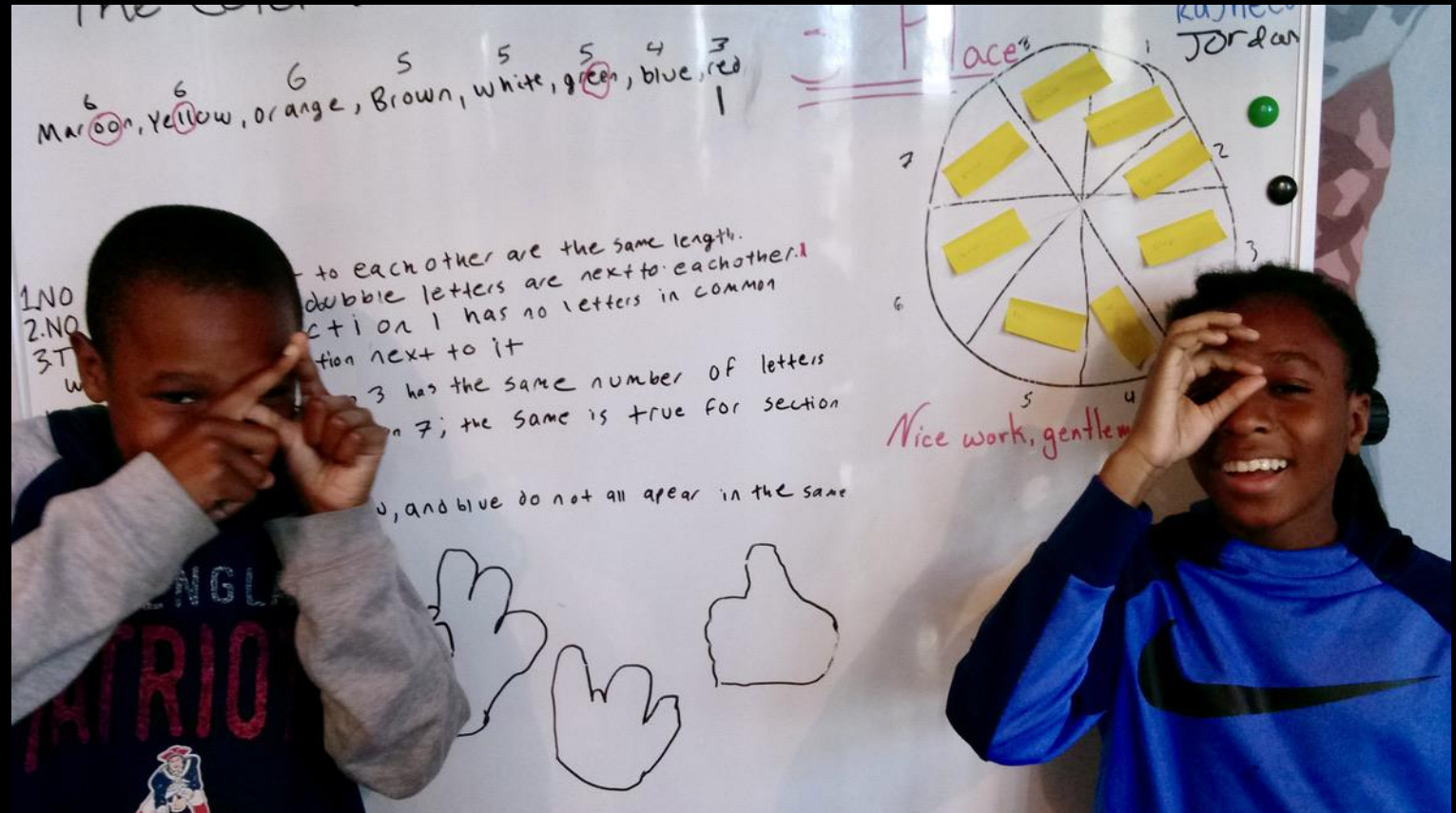


1. No two words next to each other are the same length.
2. No two words with double letters are next to each other.
3. The word in Section 1 has no letters in common with the words in either section next to it.
4. The word in Section 3 has the same number of letters as the word in Section 7; the same is true for Sections 4 and 8.
5. The words, *red*, *yellow*, and *blue* do not all appear in the same half of the wheel.



# Discovery Math: The Color Wheel Problem

---



# Summer programs during COVID



Here's an example of the kind of math puzzles you might see at PieRSquared:



Lismary starts doodling in her notebook. First, she draws a hexagon, which has 6 sides. Then she draws two hexagons next to each other, and she counts 11 sides. Then she draws three hexagons next to each other, and she counts 16 sides. If she keeps going, how many sides will there be when she draws 50 hexagons next to each other?





## Adjust as needed

- Dudley Dough closed after 2 years
- We refused to leave
- Moved to the lobby
- Hired same caterer
- Kept tutoring
- Returned to pizza shop space to carry on...



# Gather support

- Apply for grants
- Media
- Visits from Mayor, State and local reps
- Superintendent letter, etc



PieRSquared at Dudley Dough  
2302 Washington Street  
Roxbury, MA 02119

To Whom It May Concern:

I am writing to offer support for PieRSquared, the after-school math tutoring program that operates in conjunction with Dudley Dough in the Bolling Building in Roxbury. PieRSquared offers math tutoring for K-12 students in BPS schools, including district schools and the exam schools, as well as in charter, parochial and alternative schools.

All PieRSquared tutors are volunteers, and supervise math lessons from pre-algebra to advanced calculus and statistics. The tutors come from Boston's undergraduate and graduate math programs at local colleges and universities, as well as retired and working mathematicians, scientists and engineers.

We at BPS see these students and their tutors working hard each afternoon in the lobby of the BPS central office in the Bolling Building, which adjoins Dudley Dough. We know that local math teachers both support and participate in the program as tutors.

PieRSquared sees math confidence and competence as an element of social justice, and has set goals to increase the number of students who complete algebra by 8<sup>th</sup> grade and calculus by 12<sup>th</sup> grade. They know that achieving these goals opens up college and career choices for medicine, science, math and other STEM-related futures.

We support the efforts of this unique model, and encourage the greater Boston community to assist PieRSquared as they grow this quality math tutoring program for all Boston students.

Sincerely,



# And then came COVID...

---

- We immediately shifted online via Zoom
- Spring 2020 was hectic but distributed Wacom tablets to our regulars
- Tablet used by Sal Khan
- We can again see students' writing
- COVID brought us new tutors



# Tutoring online

---

- Quality tutoring
- 1 hour sessions with same tutor
- Scheduled vs drop-in
- Not for every student (esp. younger)
- We embed tutors in schools as needed
- It allowed us to follow alums to college
- New tutors can shadow/train experienced ones until ready







# Student alum

---

- Kimi Nguyen
- Alum of John D. O'Bryant High School of Mathematics and Science
- Graduated Northeastern University with B.S. in Mathematics
- Now in Masters Program in Applied Mathematics

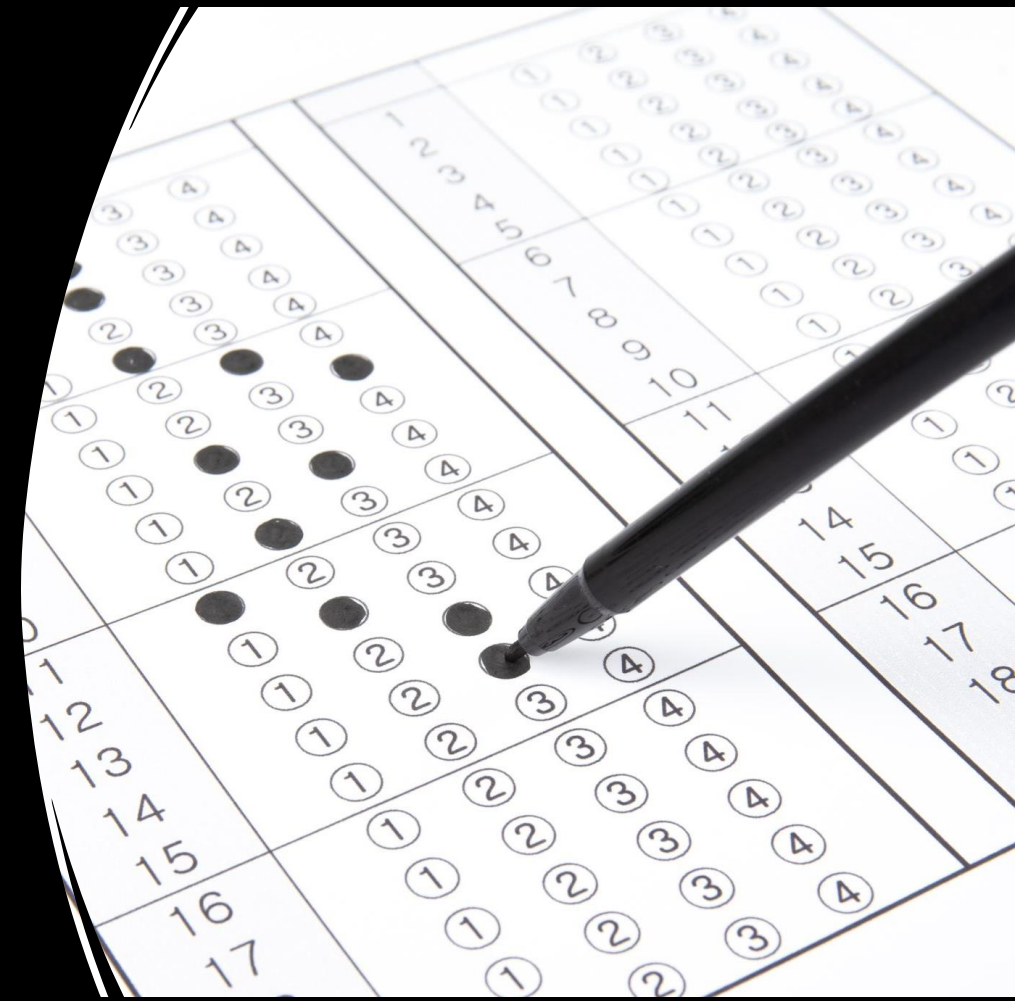




# Logistics

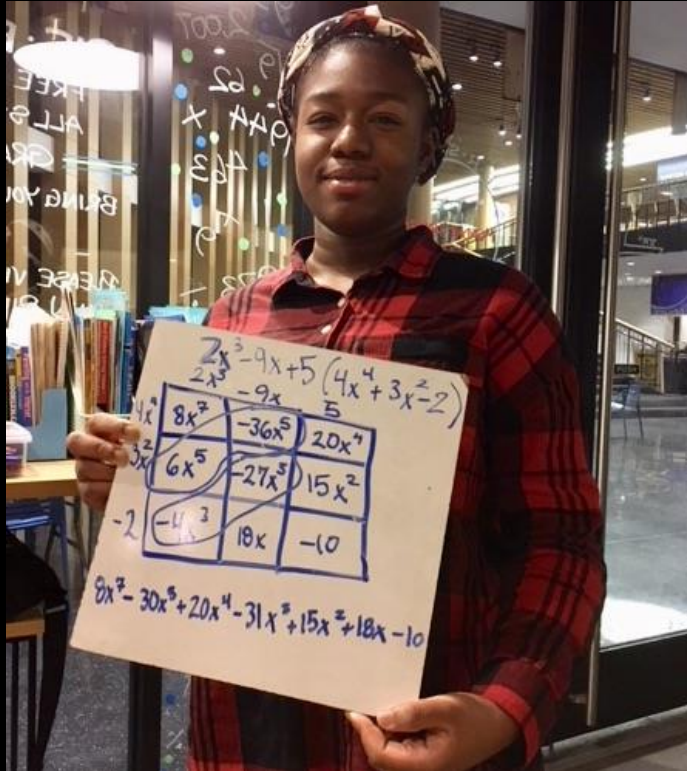
---

- Forms (CORI, Student Code of Conduct)
- Assessment tools for math proficiency
- Recruitment and training of tutors
- Scheduling and pairing of tutors with students
- Website and online tutoring
- Leveraging the many online math tools
- Food and more food (provision, serving, etc.)
- 501© 3? And donor management
- The grants game



# Keep budget simple

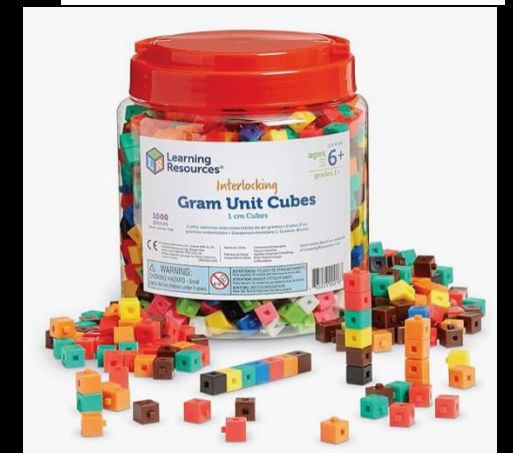
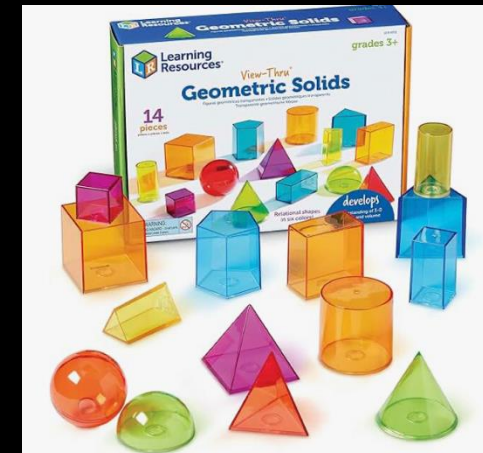
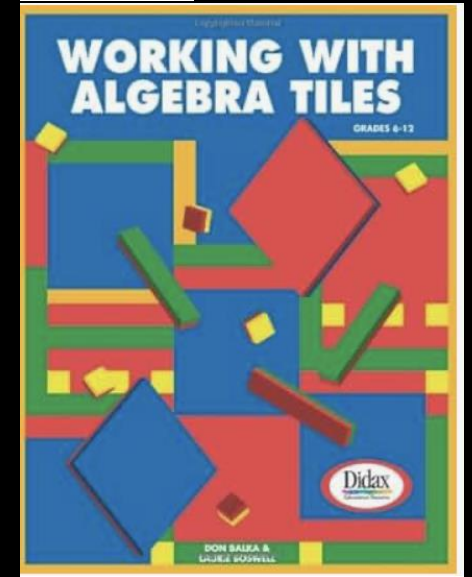
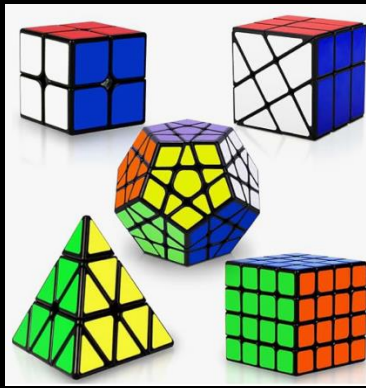
- Food was biggest cost (\$5/day/student)
- Supplies are modest (white boards, used textbooks, markers, manipulatives, etc. )
- 1 paid staff (food server)
- Value of volunteer math tutors was 10X our budget (\$500,000 vs. \$50,000). Grantors like to see this.





# Hands on

- Stock manipulatives for learning
- Encourage creativity hour after their HW
- Board games and card games (ask a volunteer to get these for you)
- Make it a place where they want to linger.
- Chess club



# Forms, forms, forms...

Tutor CORIs


Student  
registrations

Code of conduct

Math  
assessments

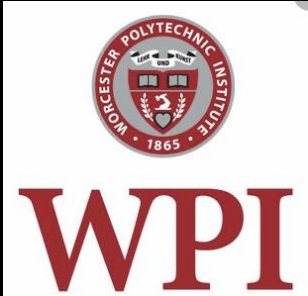
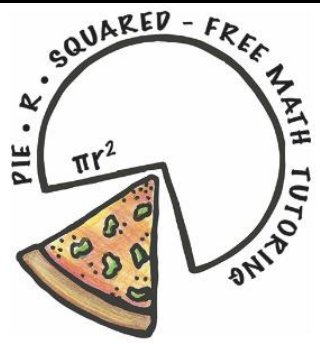
SAT materials

Teacher  
correspondence,  
etc.

 BOSTON COF P		2019-2020
<div>Pie R Squared Free Math Tutoring 2300 Washington Street, Dudley Square, Roxbury, MA 02119 <a href="http://www.piersquared.org">www.piersquared.org</a></div>		
<small>Pursuant to Massachusetts General Laws, Chapter 7 review my Criminal Offender Record Information (CO has been certified by the Criminal History Systems Board data). Additionally, I authorize Boston Public Schools to determine if I pose an unreasonable risk to the children.</small>		
<div><div>School/Dept/Name of Requestor: Your Email or Phone:</div><div><input type="checkbox"/> Employee <input type="checkbox"/> Non-Employee Position Title:</div><div>Last Name:</div><div>Current Address:</div></div>		<div>Students and Tutors: Name: _____ Current Grade: _____ Current School: _____ Teacher's Name: _____ Email: _____ Phone: (Yours if you have one) _____ Phone: (Parent) _____ Would you like to receive math tutoring: _____ Yes _____ No In what subjects would you like tutoring: (Check all that apply) <div>Algebra 1: _____ Algebra 2: _____ Geometry: _____ Pre-Calc: _____ Calculus: _____ AP Calculus: _____ Other: _____ SAT Prep: _____</div><div>Would you like to be a peer math tutor? _____ Yes _____ No What math subject would you like to tutor?</div></div>



# Colleges and Universities Attended by PieRSquared Alums With Scholarships as of November 2024







- College and beyond
- A privilege to share the journeys



# Questions?

- If you're interested in the mechanics of how you might consider a community-based free STEM tutoring, please reach out
- [314piersquared@gmail.com](mailto:314piersquared@gmail.com)
- Happy to host a group Zoom to review any details, share ideas, etc.
- Thank you for your time!