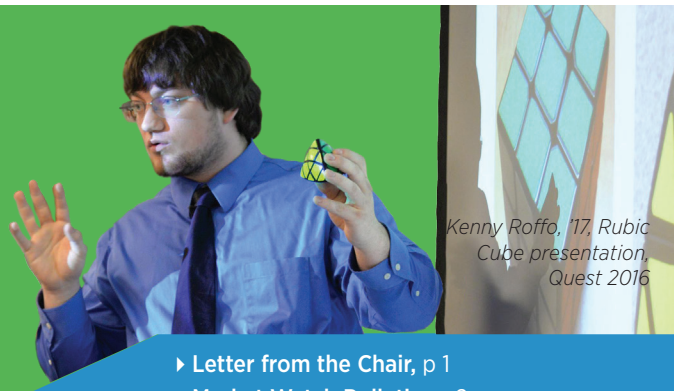
SUNY OSWEGO MATHEMATICS DEPARTMENT

Snygglet



Kenny Roffo, '17, Rubic Cube presentation, Quest 2016

VOLUME 4 • ISSUE 1 • FALL 2017

Letter From the Chair

Over a year has passed since our last issue. While things have settled somewhat in our new home, much remains in flux. Not enough office space! Not enough classroom space! (Every classroom on campus is in use on MWF up to 2 p.m.) And (y)our Math Department is changing in many ways — some more substantive than others. There are new students — as always a pleasure — and many new faculty: this fall we are welcoming four new full-time people.

I'd like to welcome John Myers, who joins us on a tenure track line. John completed his undergraduate work at the South Dakota School of Mines and Technology. His career path then diverged from Steve Reyner's: John went on to do his PhD at the University of Nebraska. John stood out in a very talented field of candidates, and we are fortunate to have him with us. Like Sarah Hanusch last year, John applied for and was chosen to participate in *Project NExT*, "a professional development program for new or recent PhDs in the mathematical sciences…address[ing] all aspects of an academic career" (search "MAA Project NExT" to learn more). John's credentials are impressive on a number of levels. He specializes in ring theory, but has the sort of "Generalist" background that makes this department run smoothly. John's initial course assignment will involve Engineering Math (MAT 249) and Calc 2 (MAT 220).

In April, we had commitments from two people (a spousal pair) to fill two other tenure-track positions. Late in May, circumstances and minds changed. The hiring "season" for these appointments in Math ramps up in January and pretty much shuts down by the end of April. Consequently, we were forced to search this summer for temporary "replacements." In addition, I'm happy (sad?) to report that Kate Spector and Casey Towne have "left" us (Kate to replace Winfield Ihlow — who retired — in the Office of Learning Services, and Casey to assume the role of Coordinator of the Math Learning Success Center (a large portion of this job is devoted to overseeing tutoring.) On the plus side, Kate and Casey will continue to teach some of our sections.

To cover for all this loss, three talented and personable one-year appointments are joining us: Rasika Churchill (South Florida), Thomas Kern (Cornell), and Daniel Kraus (Buffalo). We hope to help each of them find a pathway to future permanent employment, whether here or elsewhere.

So, we are already on the hook for two new tenure-track faculty; additionally Mark Elmer and Terry Tiballi have announced their retirements effective May 2018. This year, then, we hope to hire no fewer than four mathematicians to join our continuing faculty. This entails an *enormous* amount of work — mostly leveled on the department's Steering Committee, which, by default, I manage. (Among the Committee members, and somewhat unfairly, only I get release time from the classroom to perform this job. I had started writing this note to include some detail about our hiring process — it would really be stunning to anyone familiar with hiring in business and industry — but have deferred mostly due to the imposing length of such a description.)

Slowly but surely changes are coming to our instructional activities. In the upper division, MAT 332 Cryptology was revived last year by Elizabeth Wilcox. Mark Baker and I have some work to do in finalizing the Department's first offering in Big Data / Data Science / Analytics: a course designed to support the School of Business's nascent minor in Business Analytics. With four relatively new tenure track faculty in place, four on the way, and more retirements looming, this should be a time for great changes in Math at SUNY Oswego.

Numbers in the Math majors remain steady; we are hopeful that an uptick in Math Ed concentrates is nearing. Our support of STEM majors continues to grow. As always, we have varied and interesting students in the Math major — and working with them justifies all the effort we make in recruiting and retaining the highest quality faculty.

(I can't help myself!) For the Fall 2017 semester, over one-third of all student-credit hours of our instruction is devoted to Statistics. Relative to similar institutions we are uniquely strong in Stats. With three tenure-track PhDs in Stats on the faculty, and a number of others with either (or both) advanced formal training and interests in stats, we are uniquely poised to expand our programs devoted to training future statisticians.

Last spring Amy Lalonde ('12) visited campus and spoke to students about her graduate work at the University of Rochester and job prospects (not bad, it turns out. She accepted a position with a well-known, publicly traded pharmaceutical company). We welcome such a visit from all our alumni — your experiences vary in ways that our current students will benefit hearing about. Please do not hesitate to contact me and make arrangements for a visit. I look forward to hearing from you.

Chair, Mathematics — Scott Preston

Market Watch Bulletin, Jan 26, 2017

by Jillian Berman

Parents and math teachers, regularly asked by their school-aged charges whether math matters in real life, may now have an answer.

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In a study published by the National Bureau of Economic Research this week, Harvard Kennedy School Policy Professor Joshua Goodman took a look at what happened to students whose high schools were required in the 1980s to increase the minimum level of coursework required to graduate. What he found is that black students were more likely to increase the number of math courses they took as a result of the change in standards and that translated into higher earnings down the line.

Put simply: About 15 years after they graduated, African-American high school graduates who went to school when these changes took effect saw their average earnings increase about 10% for every extra year of math coursework. The findings may add fuel to the steady drum of education experts, policy makers and others calling for an increased focus on science and math education. "Our efforts to increase access to high-quality science and math education likely do matter for people's life outcomes," Goodman said.

Meet New Faculty: Sarah Hanusch

Dr. Sarah Hanusch, joined mathematics faculty in 2016

Sarah Hanusch joined the department in August 2016. Sarah is a Mathematics Education specialist, having earned her PhD in 2015 at Texas State University.

Sarah has returned home, in a manner of speaking, as she was born in Lagrangeville, New York, where she still has relatives, then moving twice as a young child. Her family settled in Round Rock, Texas. (Yup, she and her husband Chris both love barbecue!). In high school her AP Calculus teacher was a big influence, so she enrolled as a math major at St. Edwards University, in Austin, Texas. Discrete Mathematics was her first college math course. Her second was Linear Algebra, and, still a freshman, she was encouraged by the math club to attend a local Mathematical Association of America meeting at which several seniors were making presentations. Sarah learned that "math research was a real thing," and attended that conference all four years, soon making presentations of her own. Her original plan to become a high school teacher changed very early, as a sophomore, to instead attend graduate school in mathematics.

Sarah earned her MA in mathematics, with a concentrate in secondary education, from the University of Texas in 2008, then taught high school for one year. She next taught at Austin Community College, and continued doing so while pursuing her PhD at Texas State. This Spring 2017 semester she is enjoying teaching our MAT 215, Introduction to Discrete Mathematics, which introduces students to writing proofs (what could be more fun?!).

Dr. Hanusch's research focuses on how to effectively teach reasoning and proof writing, especially at the undergraduate level. Currently she is working on projects about the written and oral feedback that professor's leave for students on their written proofs. The goal of this project is to determine which types of comments are the most useful to students for improving their proof writing.

The department is very happy to welcome Sarah Hanusch!

Student Activity 2016

The Math Department has had the good fortune in recent years of being home to several outgoing students who have conducted great research and engaged in fascinating projects through independent studies, capstone projects, and summer programs. Here on campus Erika Wilson '15, Kenny Roffo, Mia Tomassetti, and Jesse Anderson '16 participated in QUEST 2015 and 2016 with talks titled "Harnessing the difficulties of statistical genetics," "The Invention of a [Rubic] Cube," "Coloring patterns and challenging Baloglou's Conjecture," and "Analysis of Growth Protein Amino Acid Chains for Mass Variation in Mammals." These talks arose from projects that developed with faculty members from the Math Department, the Computer Science Department, and the Biological Sciences Department. For QUEST 2016, the MAT 347: Analysis A class presented posters giving biographical sketches of mathematicians who contributed to the development of calculus, analysis, and measure theory.

Over the past several summers, increasing numbers of math students have worked on projects with faculty (both within and outside of the Math Department) through faculty-student challenge grants and Presidential Scholarship grants, as well additional venues. We've also had students work as TAs for summer programs that work with talented high school students and had students intern at businesses across upstate New York. Participation in these programs has given our students the chance to explore careers in industry and academia, and has also propelled some students to the national stage. In August 2015, Julia Martin '16 gave a presentation on rabies epidemiology and white nose syndrome epidemiology in bats at the national Mathematical Association of America (MAA) MathFest conference in Washington, DC — a conference attended by several thousand mathematicians to celebrate the centennial of the MAA. In 2016, Joanna McKinney Dec. '16 participated at a summer research experience for undergraduates (REU) at Marshall University in West Virginia — Joanna is one of the first students in our department to participate in an REU and as a consequence of the REU, Joanna presented a poster about her project at the national mathematics conference, the 2017

Student Activity 2016

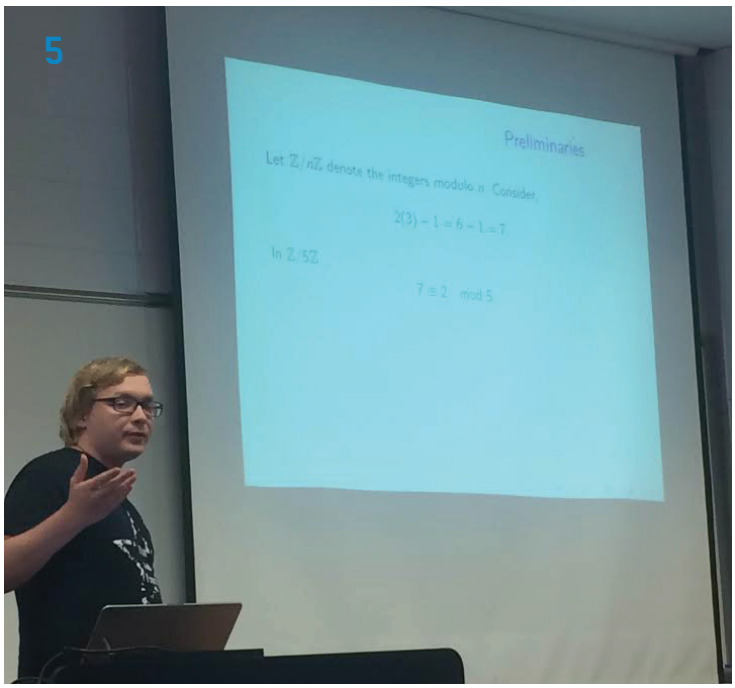
Joint Mathematics Meetings of the MAA and the American Mathematical Society in Atlanta, Georgia. (Check out a photo of Joanna and her smart-looking poster on the department's Facebook page, @OswegoMathDept!)

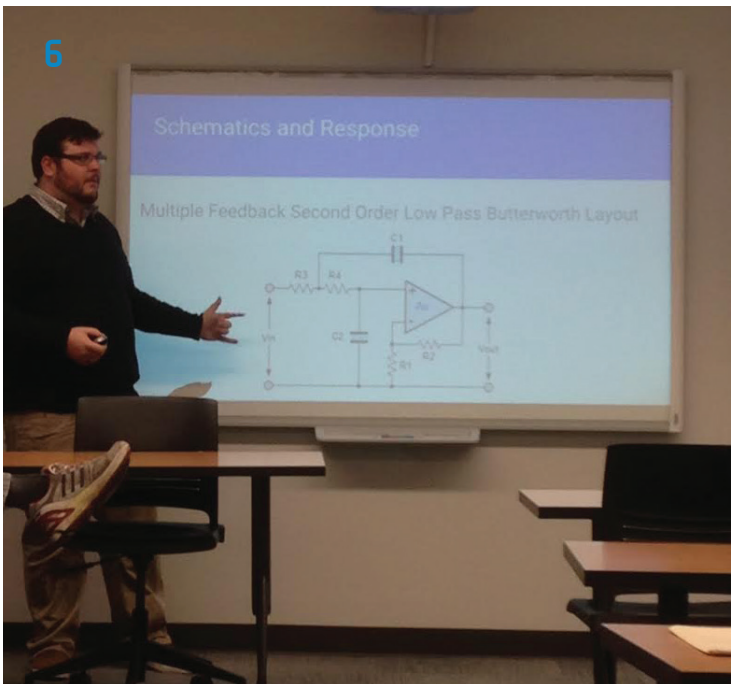
Also as a consequence of summer work on campus, the Math Department has had a strong showing at the Summer Scholars Symposium each fall. Students who conducted research on campus present posters to the university community that describe their results. There have been several math students participating in the symposium, and this gives students, like Justin D'Antonio '16, Kenny Roffo '17, and Max Robertson '17, who are double majoring, a chance to catch their math profs up on what's happening in physics, computer science, and engineering.

Not surprisingly, the SUNY Oswego student presence at local conferences such as the MAA Seaway Section conference series has been ramping up in parallel with the participation of students in research projects. SUNY Oswego student attendance started with 3 students attending in spring 2014 and increased to more than 20 students in the fall of 2016. Along with attendance at the past four MAA Seaway Section conferences, we've had a total of TEN student presentations! The topics have ranged over statistics and epidemiology, group theory, symmetries and tessellations, linear algebra, graph theory and abstract algebra, and combinatorics. Some students, such as Julia Martin '16 and Kenneth Roffo '17, have given multiple presentations; other students, such as Mia Tomassetti, Jon Backus, and Kyler Anderson, are just getting started — imagine what these enterprising, creative young people have yet to share with us as they embark on projects and activities over the coming summers!

SUNY Oswego hosted the Spring 2017 meeting of the Seaway Section of the Mathematical Association of America. Included in the program was a contest and presentation on various versions of Rubic's Cube, by senior Kenny Roffo.

Student Activity 2016





1. Amy LaLonde '12 University of Rochester PhD Biostatistics 2017, Science Today presentation in March 2017

2. Kenny Roffo '17, Rubic Cube presentation, Quest 2016

3. Band 2017 Students Harry Karandaras and Kenny Roffo, '17, with faculty left-to-right Terry Tiballi, Greg Schneider, Christopher Mosbo, James Early, as Department Picnic Band, May 2017

4. Oswego students and faculty MAA Seaway Section, Fall 2016, Rochester, NY

5. Jon Backus '18 MAA presentation 2016

6. Max Robertson '17 Capstone presentation, May 2017

7. Faculty Gary Bolduc and Terry Tiballi as Santa impersonators, December 2016

New Snyglett Problems

1. A casino invents a new game that works like this: The casino draws random numbers between 0 and 1, from a uniform distribution (all values between 0 and 1 are equally "likely"). It adds them together until their sum is greater than 1, at which time it stops drawing new numbers. You get a payout of $100 each time a new number is drawn.

For example, suppose the casino draws 0.4 and then 0.7. Since the sum is greater than 1, it will stop after these two draws, and you receive $200. If instead it draws 0.2, 0.3, 0.3, and then 0.6, it will stop after the fourth draw and you will receive $400.

How much would you pay to play this game (repeatedly)? Should you play for a $250 entrance fee? Specifically: what is the expected value of your winnings?

[The elegant, pencil-and-paper solution is preferred over a brutal, cold, silicon ones. Try to keep your computers holstered for this one.]

Submitted by Scott Preston*

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2. In 101 Snygg there were 100 seats. (Despite appeals made to Buildings and Grounds, no one ever labeled them. But…) Let's suppose the seats are numbered 1, 2,..., 100. A nasty stats professor insists on a seating chart for his 100 enrolled students. Students line up at the entrance in random order. However, the first person to enter is preoccupied with Facebook and a Twitter feed, and just sits in a random seat, without even looking at the seat assignment. Each subsequent student sits in his or her own assigned seat if it's empty, but sits in a random open seat if the assigned seat is occupied. What is the probability that you, the last = 100th* student to enter, find your seat unoccupied?

Submitted by Scott Preston*

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3. Find the value of
$(\cos 1^\circ)^2 + (\cos 2^\circ)^2 + (\cos 3^\circ)^2 + \ldots + (\cos 90^\circ)^2$ [It is rational.]

From the journal Crux

Math Grad's Co-op

Stephanie Becht '17
Worked at a co-op placement

Stephanie Becht, who graduated in May 2017 with the Applied Mathematics BS, worked in a co-op placement in Spring 2017. She is from East Amherst, NY.

Stephanie worked for the FitzGibbons Insurance Agency, in Oswego. Her position was called Risk Management Analyst; a major responsibility was implementing an organic growth program. Where needed, she learned to work in the company's management software packages, and had a chance to use some of her statistics background.

Co-ops are full time work, for pay, for which there is no college credit. In Stephanie's case, she contacted Sheila Cooley, the college's coordinator for co-op programs, in search of a co-op position; the Fitzgibbons Agency had contacted Sheila Cooley, hoping for a co-op employee. And so the match was made. Stephanie was encouraged to seek out a co-op position by Professor A. Nanthakumar, her instructor in several statistics classes.

The position worked out very well. Stephanie was welcomed into the company, treated as a regular employee. She enjoyed her work, and learned a lot. And has a job offer. Completing her graduation requirements in seven semesters enabled her to work her eighth semester and still graduate with her class. She strongly recommends the program to other students as a great way to step into full time employment after graduation.

* Not original author of the problem.

2016 Snygglet Problem Solutions

Problem 1. Three given segments may or may not serve as sides of a triangle, depending on their lengths. Suppose a stick is broken in two places selected at random. What is the probability that the resulting three pieces form a triangle if

a. After the first break, the longer piece is broken at a randomly selected spot?

OR

b. The two breaks are independently selected?

ANSWER: Let's say the initial stick has length 2. The three pieces will form a triangle exactly when the longest is less than 1.

In **question a.**, the longer piece after the first break has length 1 + x, where 0 < x < 1.

When this longer piece is broken, then for any x the probability that the pieces form a triangle is $\frac{1-x}{1+x}$.

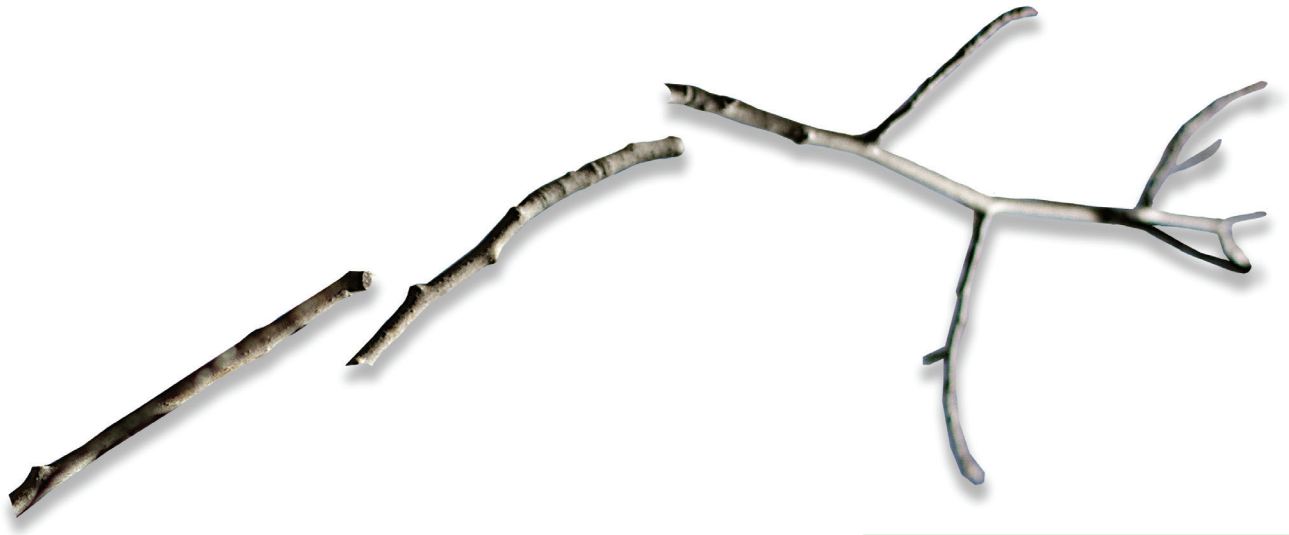
Since x is equally likely to be from any part of interval (0, 1), then the answer is $\int_0^1 \frac{1-x}{1+x}\,dx = -1+2\ln 2 \approx .386$.

For **question b.**, when the two breaks are independently selected, consider two cases.

Case 1. Both breaks are in the same half of the stick, which occurs with probability ½. In this case no triangle is possible.

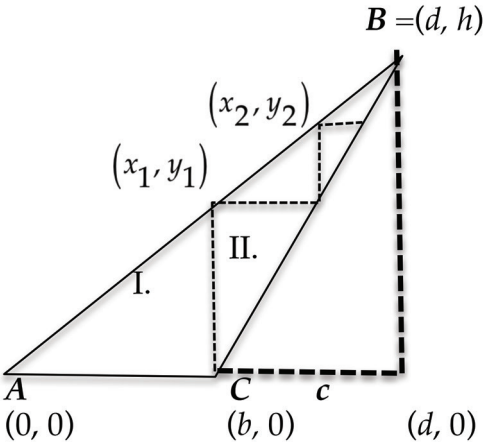
Case 2. One break is at x where 0 ≤ x ≤ 1 and the other break is between 1 and 2.

Here, when the left break is at x, we have no triangle when the right break is from 1 + x to 2,
for which the probability is 1 – x.
So in **Case 2**, the probability of no triangle is $\int_0^1 1-x\,dx = .5$.
So for **question b.**, the probability of obtaining a triangle is only .25.



Problem 2. A right triangle **with legs a and b** is half the rectangle with **sides a and b**, so its area is **ab/2**. For other triangles, if we limit ourselves to adding areas of right triangles, we can quickly find the area of a triangle when an altitude stays inside a triangle.

But can you derive the area formula when an altitude is outside the triangle, by adding right triangles?



ANSWER: You will need to add an infinite series of right triangle areas.

We have placed vertex A at the origin and C on the positive **x-axis**.

Show that, by adding areas of the infinite number of right triangles that form ΔABC, we arrive at the correct area.

Solution: For notation, let d – b = c. Because we will be adding areas of similar triangles, we will let k be the ratio of consecutive corresponding sides, and, therefore, k^2 is the ratio of consecutive areas:

$$k = \frac{x_2 - x_1}{x_1 - x_0} = \frac{x_2 - x_1}{b}.$$

Now: $\frac{x_2 - x_1}{b} = \frac{h - y_1}{y_1} = \frac{c}{d} = k.$

When Area I is the area of the right triangle with base AC, then the sum of areas of all the similar triangles is $\left(Area\, I\right)(1 + k^2 + k^4 + k^6 + \cdots) = \frac{by_1}{2}\frac{1}{1-k^2}.$

Likewise, when Area II. is the area of the right triangle with base $x_2 - x_1$ and height y_1, then the sum of areas of all the similar triangles is

$$\left(Area\ II\right)(1 + k^2 + k^4 + k^6 + \cdots) = \frac{(x_2 - x_1)y_1}{2}\frac{1}{1-k^2} = \frac{kby_1}{2}\frac{1}{1-k^2}.$$

We add to get the area of ΔABC,

$$\frac{by_1}{2}\frac{1}{1-k^2} + \frac{kby_1}{2}\frac{1}{1-k^2} = \frac{by_1}{2}\frac{1+k}{1-k^2} = \frac{b}{2}\frac{bh}{d}\frac{1}{1-k} = \frac{b}{2}\frac{bh}{d}\frac{d}{d-c} = \frac{bh}{2}.$$

Submitted by Mark Elmer

2016 Snygglet Problem Solutions

Problem 3. The Car Parking Problem. I presented this problem to students in September 2014. At least one student, Chaskin Saroff, correctly solved it.

A parking lot consists of 16 spaces in a line. After 12 cars have, at random, occupied 12 places, Maxine arrives with a wide vehicle that requires two consecutive spaces. What is the probability that she will find the two consecutive spaces to park her vehicle?

ANSWER: Imagine the problem is counting arrangements of wood blocks, where 8 are identical plain blocks and 4 are pairs of such blocks glued together, where each glued pair has a plain one on the left and a black one on the right. Black = empty parking space. The probability of no double space is the number of (1) arrangements of these twelve blocks + (2) (for the case where an empty parking space is on the far left) arrangements of 9 single blocks and 3 double blocks, all divided by 16 choose 4. (1) + (2) = C(12, 4) + C(12, 3) = C(13, 4). ANS C(13, 4)/C(16, 4) = 715/1820 = .393 is the probability there is no double space available. 1 - 715/1820 is the probability that a double space is available. [Chaskin Saroff had a different method of solution.]

Submitted by Chris Baltus*

The Snygglet is affectionately named after the former home of the Math Department, Snygg Hall. Donald Snygg (1904-1967) was professor and chair of the Department of Psychology from 1937-1967. Named University Professor by SUNY Trustees, October 1, 1966. He was an author and authority in the field of phenomenalogical psychology. Snygg Hall opened in 1968. Snygg Hall was razed (2013-2014) to make way for our new home, the Richard S. Shineman Center for Science Engineering and Innovation.

www.oswego.edu/library/who-were-our-buildings

Math Graduates: 2016–2017

May 2016

Jesse Anderson, Liverpool, NY, Applied Mathematics BS
Amanda Leigh Austin, Massapequa Park, NY, Mathematics BA
Laura Anne Critelli, Clay, NY, Adolescence Education Math MSED 7-12 (Prof)
Justin D'Antonio, Oswego, NY, Applied Mathematics BS
Kelsey L Dillon, Deer Park, NY, Applied Mathematics BS
Amy E Hannahan, Camillus, NY, Applied Mathematics BS
Julia Lynne Heck, Livonia, NY, Childhood Education 1-6 Math BS
Jiyeon Kim, Liverpool, NY, Childhood Education 1-6 Math BS
Julia Martin, La Fayette, NY, Applied Mathematics BS
Tyler Pelle, Sparta, NJ, Applied Mathematics BS
Devon M Rich, Hamburg, NY, Adolescence Education 7-12 Math BS
Rachael Ruggaber, Liverpool, NY, Childhood Education 1-6 Math BS
Allastar Smith, Barrytown, NY, Applied Mathematics BS
Lynn A Szczygiel, Baldwinsville, NY, Childhood Education 1-6 Math BS
John P Trawinski, Clifton Park, NY, Applied Math Economics BS
Samantha Wald, East Amherst, NY, Adolescence Education 7-12 Math BS, Mathematics BA
Emily A Walser, Baldwinsville, NY, Childhood Education 1-6 Math BS

August 2016

Suzanne King, Oswego, NY, Applied Mathematics BS
Ashley M Roles, Cato, NY, Adolescence Education Math MST 7-12
Christopher R Tylock, Penfield, NY, Mathematics BA

December 2016

Cassidy Farr, Chemung, NY, Childhood Education 1-6 Math BS
Joanna L McKinney, Angola, NY, Adolescence Education 7-12 Math BS, Mathematics BA

May 2017

Stephanie Becht, Amherst, NY, Applied Mathematics BS
Valerie Boscia, Cold Spring, NY, Applied Math Economics BS, Mathematics BA
Abigail Boyce, Lockport, NY, Applied Statistics Minor
Cayman Burke, Phoenix, NY, Adolescence Education 7-12 Math BS
Vincent Dibiase, Oswego, NY, Applied Mathematics BS
Marissa Diedrick, Hopewell Junction, NY, Childhood Ed 1-6 Math BS
Ryan Fitzpatrick, Dix Hills, NY, Applied Statistics Minor
Dylan Gates, Binghamton, NY, Applied Mathematics BS
Haralambos Kandaras, Elmira, NY, Adolescence Education 7-12 Math BS
Joanna McIntyre, Pearl River, NY, Mathematics BA
Ryan Murphy, Duanesburg, NY, Mathematics BA
Haley Parker, Perry, NY, Adolescence Education 7-12 Math BS, Mathematics BA
Emily Popple, Eden, NY, Adolescence Education 7-12 Math BS
Kristian Reynolds, Cortland, NY, Applied Mathematics BS
Max Robertson, Pittsford, NY, Applied Mathematics BS
Kevin Spath, Rochester, NY, Applied Statistics Minor
Matthew Tebaldi, Ballston Spa, NY, Applied Mathematics BS
Matthew Trudeau, Rochester, NY, Applied Mathematics BS
Alex Wapniewski, Williamsville, NY, Applied Statistics Minor

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* Not original author of the problem.