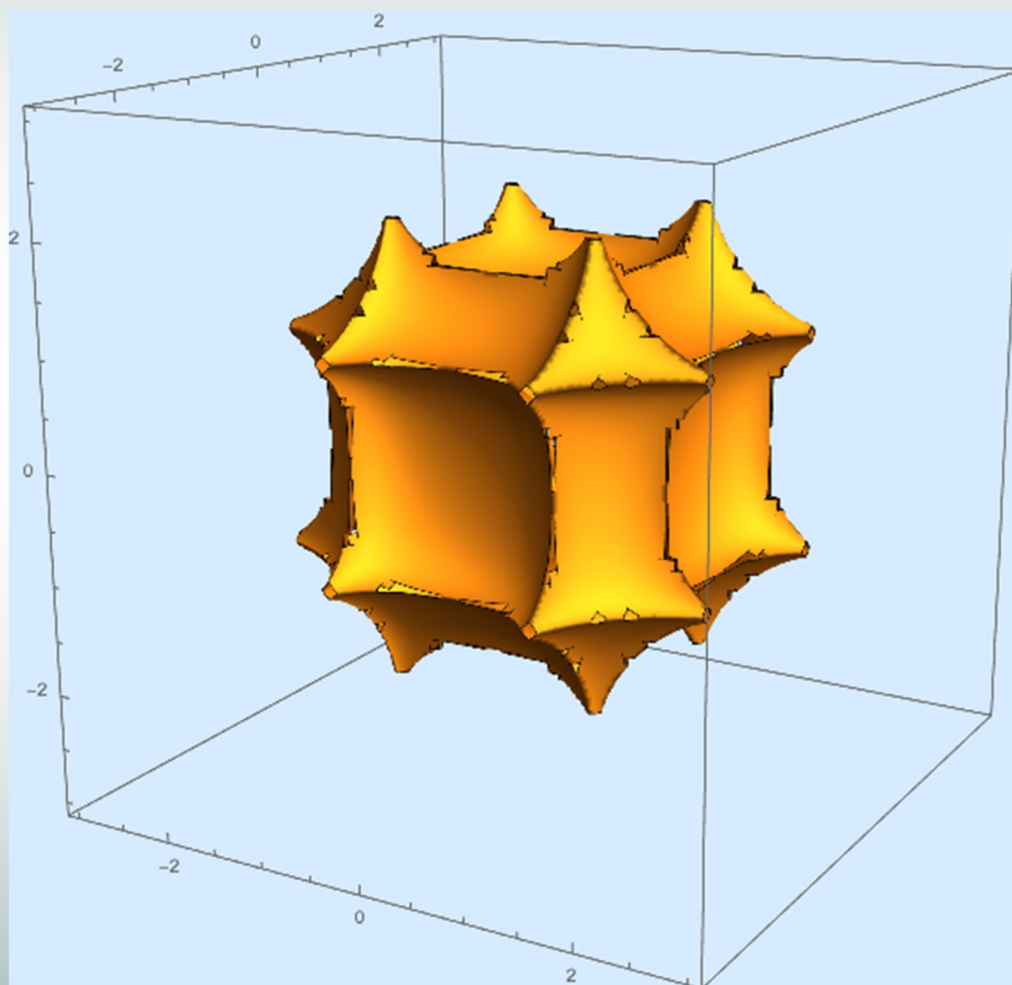


Las MATRICES

Valdosta State University



$$d((x_1, y_1, z_1), (x_2, y_2, z_2)) = \sqrt{|x_1 - x_2|} + \sqrt{|y_1 - y_2|} + \sqrt{|z_1 - z_2|}$$

A WORD FROM OUR CHAIR

Greetings to all of our friends and alumni of the Department of Mathematics at Valdosta State University. When I look back on 2016 and 2017, I see years of change, accomplishment, and commitment to our core values as a department.



We celebrate the recent promotion of Dr. Benjamin Wescoatt to Associate Professor as well as his earning tenure. Dr. Ashok Kumar retired at the end of Spring 2017 after 31

years of service, and we thank him for his commitment over the years. We also heartily thank Dr. Greg Harrell for his five years of leadership in the role of Department Head, having recently returned to regular faculty.

Our students have done some amazing things! They've gone to conferences, presented original research, worked on publishing papers, won awards, and served the department in a myriad of ways.

We're very proud of Margarita Bustos-Gonzalez, who graduated summa cum laude with a BA in Mathematics in 2017, having earned both the Outstanding Student in Mathematics and the Outstanding Student in the College of Arts and Sciences awards. We've also had numerous student contributions to the VSU Annual Undergraduate Research Symposium. Notably, Jessica Wellington and Christine Zeigler presented their paper on "Conics and Generalizations Through Metrics," which they also presented at the Mathematics Association of America (MAA) Southeast Regional Conference this past Spring. Christine was also the recipient of the 2018 Outstanding Student in Mathematics Award, while Skylar Rae Giddens received the Gerald Petrella Award for Outstanding Student in Mathematics Education. You can read more about Margarita, Jessica, Christine, Skylar, and others in the newsletter.

Our outreach programs continue to touch the lives of young people throughout Valdosta and Lowndes County. With Science Saturday, Camp Invention, Sonia Kovalevsky (SK) Day, the Middle School and High School Mathematics Tournaments, and other events, the VSU Mathematics Department provides many ways for young people to get engaged with math, sparking an interest that may persist for a lifetime!

During the past two years, our faculty have conducted quality research, producing academic papers, books, and texts, presenting at national and international conferences, mentoring students in undergraduate research, and collaborating with other researchers across the campus and even across the world.

We hope that the 2018-2019 academic year brings with it new vitality within the newly formed College of Science and Mathematics. We welcome the chance to focus our energies in the STEM disciplines and continue to strengthen our role as regional leader in the areas of math and science.

If you would like to partner with us as we continue to provide quality instruction, research, and outreach opportunities, please consider donating. You can find information about giving at www.valdosta.edu/administration/advancement. Don't forget to follow us on Facebook (**VSU Mathematics Department**) and Twitter (**@VSU_MATH**), and email us any questions at math@valdosta.edu.

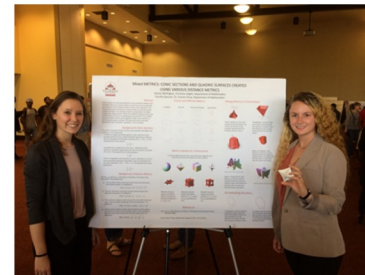
Here's to the Future!

Dr. Shaun V. Ault, Associate Professor and Interim Department Head

Department of Mathematics

The 24th VSU Annual Undergraduate Research Symposium

VSU hosted the **24th Symposium on Undergraduate Research**, April 10th – 12th, in the Student Union ballroom and theatre. Seniors **Jessica Wellington** and **Christine Zeigler** presented and discussed a paper entitled “Conics and Generalizations Through Metrics” with research sponsored by **Dr. Charles Kicey**. **James E. Henderson** also gave a talk entitled “How Technology Influences Our Approach to Mathematics”, sponsored by **Dr. Kicey** and **Dr. Iwan Elstak**. **Carson Anderson** created and presented a 3-minute video entitled “The Harmonic Series and the Desert Crossing Problem”, now available on YouTube.com. Sponsored by **Dr. Elstak**, students **Qua’Shaiila Jackson**, **Laura Ramirez**, and **Mag-nolia Mendoza** gave a poster presentation entitled “On the Amazing Properties of Cyclic Quadrilaterals.” And finally, **Joanne Wardell** offered a poster presentation entitled “Toward an Understanding of Skewed Top Corridors”, with research sponsored by **Dr. Shaun Ault**.



SCIENCE SATURDAY

In March, VSU presented **Science Saturday**, directed and organized by **Drs. Iwan Elstak, Arsalan Wares, Chunlei Liu, and Paul Mihail**. Live-action robots, an ancient Chinese game and 3-D printing were a few of the activities at Valdosta State University’s final installment of Science Saturday. Chemistry, biology, math, computer science, and geology are the five departments that receive the opportunity to lead Science Saturday throughout the year, organizers said. Hosted by the College of Arts and Sciences, the Department of Mathematics and the Department of Computer Science were featured during the educational event. Returning guest **Kevin Olheiser**, and his daughter, 14-year-old **Ashlyn Olheiser**, were some of the participants at the event Saturday in Nevins Hall. “She gets involved and tries to figure things out when she’s here; even the last one, she got into it,” he said. “Almost every station, (she) at least learned about it and showed some kind of interest in it whereas she probably wouldn’t (have) learned anything (by) not going.” Ashlyn Olheiser said she attended Science Saturday in February for the Department of Biology, and she said she enjoyed herself. **Renee Byrd** actively participated as she and her daughters, 6-year-old **Ansley Byrd** and 11-year-old **Aden Byrd**, learned how to write computer programs through computer games. **Renee Byrd** said she began attending



Science Saturdays eight years ago with Aden. Both of her daughters are home-schooled. “I just wanted them to be able to access any educational opportunities in the area,” she said. “They love it. That’s why we keep coming back each year.” **Dr. Arsalan Wares**, professor of mathematics education, said “the world runs on mathematics,” and he wants to utilize the event to help kids conquer their “math-phobia.” “We try to work around it; we try to counterbalance that by showing children how fun math is, how wonderful, how accessible math can be if you understand it,” Wares said. **Dr. Krishnendu Roy**, department head of computer science, said it’s important for children to learn about computer science because there are lots of jobs in the field. “Computer science is now one of the key science areas,” he said. “(It’s) basically part of all sciences in the sense that if you’re going to advance with any of the STEM disciplines now, you’re probably using computer programming in some way.” Science Saturday is supported by VSU’s STEM (Science, Technology, Engineering and Mathematics) Initiative and is part of an ongoing effort to inspire the next generation to want to learn more about these areas,” according to university officials. The event was held for children of all ages and also included origami folding and relating music to mathematics.

OUR EXPERIENCE IN...

“Everything is Possible if you Work for It”

BY MARGARITA BUSTOS-GONZALES



Dean of Arts and Sciences Dr. Connie Richards and Senior Margarita Bustos-Gonzales

Hello everyone, I, Margarita, am a Senior graduating summa cum laude with a Bachelor’s of Arts in Mathematics on May 6, 2017. I was requested by Dr. Velez to write a little bit about myself. So, I shall start with my parent’s backgrounds.

So, I am the oldest sibling with parents that were migrant workers. My mother had been a migrant worker her entire life. My mother lost her mother at the age of two; so, her older sisters helped their dad take care of the younger siblings which included my mother. Well, my mother did not like school, so she decided to not attend school. Since her family were migrant workers, she never was in trouble for not attending school which resulted in her not knowing how to read or write; however, that has never stopped her from providing for her family. My father was born in Mexico; he only went to school up until the sixth grade. When he was in his mid-twenties, he came to the United States. My father did not know English when he came here. Now, he understands it but does not speak English. However, that has never stopped my father for providing all the necessary things that my siblings and I needed.

During the weekends that I had no school, I would go to work with my parents. At that point, they were baling pine straw. When I was older, my parents made me work with them. I used to be so aggravated that they made me work. I remember once that I was angry with my mother that I confronted her and said that I did not deserve to work in the pine straw. My mother told me that If I did not want to work here the rest of my life, then I needed to keep going to school. That moment and continually going to work in the fields is the driving force that keeps me going. Throughout my years, I have worked in various labor jobs. I also clipped onions, graded onions, picked blueberries, worked at an olive orchard, and many other demanding jobs. Those experiences have driven me to keep going and achieve the goals I have set up for myself.

I plan to keep going to school after this. I would love to receive my Doctorate degree in Pure Mathematics one day. During the summer, I will be going to Ohio State for SAMMS, which stands for Sampling Advanced Mathematics for Minority Students. I am quite excited for what the future has in store for me.

I am telling you all of this for the simple fact that no matter what kind of childhood you had or what kind of family upbringing you come from, you can achieve your dreams just like I have done. It will not be easy that is for sure. However, the faculty of VSU will help you through this as they have helped me. You just have to have the drive and motivation to work for the things you wish to have.

“Everything is possible if you work for it.”

Sincerely,

Margarita Bustos Gonzalez

NEW

BA Mathematics-Secondary Education Track - The VSU Mathematics Department has recently added a new track that includes secondary education for those interested in teaching grades 7 through 12. This program provides students with a major in mathematics within the framework of a broad-based general education as well as prepares students for certification in secondary mathematics. Students must be admitted to the Teacher Education Program in the College of Education and Human Services prior to enrolling in the professional education courses and meet the Student Teaching requirements of the College of Education and Human Services.

ATTENTION FACULTY, STAFF, AND STUDENTS:
Please send articles of experiences that you want to share with us to:
math@valdosta.edu

Departmental NEWS

Dr. Ashok Kumar retired from the Mathematics Department after more than thirty years of service to VSU. While receiving his Ph.D. from Bowling Green State University in Bowling Green, OH, Dr. Kumar's research interests were in algebra and other areas of pure mathematics. "Most of my time at VSU was spent teaching full-time, but I did serve as head of the department for a period of eight years. It was a pleasure to serve the university as an administrator. I worked closely with several deans and learned quite a bit about the university and its workings. I have really enjoyed working for Valdosta State University. I have been fortunate to find an exceptional group of people in the department to work with. My colleagues have been kind and very helpful. I can't thank them enough for making my stay at Valdosta a very rewarding experience.... I have taught at many institutions. I found students at VSU to be very respectful to faculty. You are not going to find a more polite group of people than students at Valdosta State University. I am really going to miss my students."

Dr. Gregory Harrell stepped down as the head of the VSU Mathematics Department during Summer 2017 after five very successful years of holding the position. While acting Department Head, Dr. Harrell was instrumental in securing grant money to fund the Mathematics Tutoring Lab and championed the Secondary Education Track. Dr. Ault, the current Interim Department Head and whose research interests are algebraic topology and computational mathematics, received his Ph.D. in Mathematics from The Ohio State University 2008.

Ms. Megan Stator stepped down as our department administrative secretary during Summer 2017 after five years of service. Ms. Mary Marshall took over Megan's duties in July 2017.

Christine E. Zeigler of Hahira, Georgia, is the recipient of the Spring 2018 President's Award for Academic Excellence for the College of Arts and Sciences as well as the Outstanding Student in Mathematics Award at Valdosta State University. The President's Award for Academic Excellence is presented to the graduating student with the highest grade point average in each of VSU's five colleges — College of Arts and Sciences, College of the Arts, College of Nursing and Health Sciences, Harley Langdale Jr. College of Business Administration, and James L. and Dorothy H. Dewar College of Education and Human Services. The Outstanding Student in Mathematics Award is presented for a distinguished grade point average, focus on research, and extracurricular activities. Zeigler served as the official banner carrier for the College of Arts and Sciences during the undergraduate commencement ceremony on Saturday, May 5, and graduated summa cum laude with a Bachelor of Arts in mathematics.

Skylar Rae Giddens received the 2017-2018 Gerald Petrella Award for outstanding student in mathematics education. The award is given to a senior student and is based on a combination of GPA and extracurricular activities throughout the student's enrollment at VSU. Skylar says, "I was not always good at math. Through many of my elementary and middle school years, I struggled. But, I had a family that supported me and teachers who believed in me. Now I know, that even as hard as it was then, I was learning what it is like to be frustrated yet continue to work, struggle through, and not give up. I know I will be able to better relate the wonder of math to my students because of my struggles. I will be able to better understand what they may be going through and work with them, share my story as needed, and help them not to give up. Math is such an important part of learning and of life, yet we have so many students who view it as some foreign entity, as an enemy. We need to focus on ensuring students grasp math at a young age so they can develop a warm relationship with math and can see it in many aspects of life. I can't wait to help make that happen for my students."

Valdosta State University hosted its **23rd Annual Sonya Kovalevsky High School Math Day (SK Day)** for female students on Thursday, April, 19, 2018. Organized by **Drs. Denise Reid** and **Sandra Trowell**, the primary goal of SK Day is to attract high-school aged girls to the field of Mathematics and other STEM related majors. Named in honor of Sonya Kovalevsky, the first woman to earn her Ph. D. in Mathematics, SK Day is a hands-on STEM event with workshops, speakers, and a contest. 109 students and teachers from 17 high schools attended this year's event. Sponsors included the VSU Department of Mathematics, VSU Office of Admissions, Walmart, Publix Supermarket, VSU Office of Sponsored Programs and Research, Knewton Learning, VSU Bookstore, and VSU Graduate School. The welcome for the event was given by **Dr. Connie Richards**, Dean of the College of Arts and Sciences, and by **Dr. Shaun Ault**, Department Head for the Department of Mathematics. There were four workshops during the event: "Tessellations, Escher, and Kaleidocycle" led by Dr. Reid; a workshop focusing on perceptions of individuals working in STEM fields led by Dr. Trowell; "Graph Theory, Networking, and Games...OH MY!!", led by **Ms. Janice Lowe**; and "A Box Full of Mathematics" led by **Dr. Arsalan Wares**. Career speaker, **Mrs. Alex Cook**, discussed her job as a software engineer at Azalea Health; and **Ryan Hogan**, Director of Admissions, spoke about educational opportunities at VSU.

The VSU Mathematics Department hosted the **November 2017 High School and March 2018 Middle School Math Tournaments**, directed by **Dr. Andreas Lazari**. Area schools were invited to register one team consisting of four students. Teams had both individual and team competition during the event. Dr. Shaun Ault was the presenter during the Award Ceremony. **Drs. Arsalan Wares** and **José A. Vélez** were honored during the April 2018 **Dr. Philip Gunter Annual Faculty Honor Author Reception**, where their recent publications were recognized. **Seniors Carson Anderson**, **Jessica Wellington** and **Christine Zeigler**, along with Professors Dr. Kacey, Elstak, and Wescoatt, represented VSU at the **South-eastern MAA Conference** hosted by **Clemson University** during March 23 through 25, 2018. The stu-

dents, **Carson, Jessica, and Christine**, as a team, participated in "Math Jeopardy". Jessica and Christine also presented their joint work "Mixed Metrics: Conic Sections and Quadric Surfaces Using Various Metrics" at the undergraduate poster session. Although their poster did not win "best", it certainly seemed to be among the most popular. In a surprise, recent VSU Alumni **Callie Ragan**, who now lives and works in South Carolina, made an appearance to add to the VSU representation. The students and faculty seemed to enjoy not only the conference, but their time getting to know each other better, between the shared car rides and hotel rooms. The Mathematics Department hosted the first annual Math Majors Social on **Enneadecagon Day (03.29.18)**. 24 students attended, including Math Majors and Minors, as well as instructors. Students were encouraged to bring friends and participate in various organized math games. Pizza, desserts, and door prizes ensured a good time.

Congratulations to **Dr. Peggy Moch** on being presented the **Service Award from Kappa Delta Pi**, International Honor Society in Education! Moch was selected as President-Elect in Spring of 2014 and became the International President of KDP in July 2016. Receiving the award for her service as the International President for 2016-2018, she will continue to serve for an additional two years, from 2018 through 2020, as Past President. Moch received the award in October 2017 at the KDP Convocation in Pittsburg. KDP is a prestigious organization over 100 years old. Members include John Dewey, Albert Einstein, Eleanor Roosevelt, and George Washington Carver, as well as contemporary members of note: Nel Noddings, Linda Darling-Hammond, Marilyn Cochran-Smith, Carl Grant, and Gloria Ladsen-Billings. Moch is also the Alpha Beta Kappa Chapter Counselor, helping to establish the charter in 2004, and serves as the student advisor at VSU. ABK is the only chapter in the 100+ year history with the distinction of having the chapter charter displayed in the A&S Dean's Office.

Valdosta State University partnered with the National Inventors Hall of Fame to present **Camp Invention 2017**: Launch June 12-16. Creative and innovative dreamers in the elementary grades were invited to attend this fun, educational event. Hosted by VSU's Department of Mathematics and Department of Computer Science, Camp Invention is the only nationally recognized nonprofit elementary enrichment program inspired by the brightest thinkers around — the National Inventors Hall of Fame inductees. All activities are designed to be fun, hands-on, challenging, and age-appropriate, with a focus on encouraging problem-solving, teamwork, innovation, and entrepreneurship. Workshops included Duct Tape Billionaire, which allowed attendees to explore patents, launch a business, and present products to mock investors; Have a Blast, which focused on principles of engineering to create and build a castle, build an air cannon, and explore aerodynamics to blast water rockets from plastic bottles; Operation Keep Out, an activity allowing campers to create the ultimate spy gadget alarm box to keep treasures safe; and Mission Space Makers, and experience geared toward locating and preparing a new planet for habitation. **Camp Invention 2018** welcomed future innovators to camp on June 11-15 and spent the week rotating through a series of activities designed to encourage creative thinking, teambuilding skills, and a passion for innovation. This year's activities featured Robotic Pet Vet, a workshop in which attendees used tools, circuitry, biology, and physiology to build and personalize a take-home robotic dog; My Mini Mansion which allowed campers to dream up and design their own futuristic smart home complete with cutting-edge technology; and finally, armed with the future Opitbot, a small self-driving robot, children also discovered aerial, aquatic, and land transportation technology. This was VSU's sixth year presenting Camp Invention to the Valdosta-Lowndes County Community and appropriate for campers from kindergarten through sixth grade.

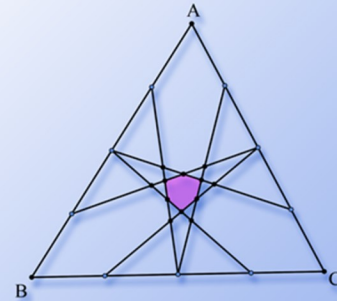
Upcoming/Recurring EVENTS

- ◆ **The VSU High School Math Tournament— November 2018**
- ◆ **Pi My Epsilon Math Contest—April 2019**
- ◆ **Mathematical Association of America AMC 10/12 Contest— February 2019**
- ◆ **Math Major Social— March 2019**
- ◆ **Science Saturday— January 2019**
- ◆ **Sonia Kovalesky Day— April 2019**
- ◆ **The VSU Middle School Math Tournament— April 2019**
- ◆ **Camp Invention— June 2019**

THE MATH PROBLEM CORNER

By Professor Arsalan Wares

Polygon ABC is an arbitrary triangle. Three points divide each side of $\triangle ABC$ into four equal parts. These nine points on the three sides of $\triangle ABC$ are connected to one another by six line segments as shown. These six line segments divide $\triangle ABC$ into nineteen non-overlapping polygons. If the area of the shaded hexagon in the middle is 1, find the area of $\triangle ABC$.



A Solution Sketch:
Answer: 40

Let $P_1, Q_1,$ and R_1 be the three points on side BC .
Let $P_2, Q_2,$ and R_2 be the three points on side AC .
Let $P_3, Q_3,$ and R_3 be the three points on side AB .
Moreover, $H_1 = Q_2R_3 \cap Q_3P_2, H_2 = Q_1R_2 \cap Q_3P_2, H_3 = Q_1R_2 \cap Q_2P_1, H_4 = Q_3R_1 \cap Q_2P_1,$
 $H_5 = Q_3R_1 \cap Q_1P_3, H_6 = Q_2R_3 \cap Q_1P_3, J_1 = Q_1P_3 \cap Q_3P_2, J_2 = Q_1R_2 \cap Q_2R_3,$
 $J_3 = Q_2P_1 \cap Q_3P_2, J_4 = Q_3R_1 \cap Q_1R_2, J_5 = Q_2P_1 \cap Q_1P_3,$ and $J_6 = Q_3R_1 \cap Q_2R_3.$
Suppose the area of $\triangle ABC$ is 80.
Since the ratio of the areas of triangles with the same height is same as the ratio of their respective bases, we can establish the following:

The area of $\triangle R_2H_2P_2$ = the area of $\triangle R_3H_6P_3$ = 10.
The area of $\triangle R_3Q_3H_1$ = the area of $\triangle P_1Q_1H_3$ = 6.
Now we will find the area of $\triangle R_3Q_3J_6$.
Let the area of $\triangle R_3Q_3J_6$ be x .
Then the area of $\triangle R_3J_6R_1$ must be $15 - x$,
the area of $\triangle J_6Q_3Q_2$ must be $10 - x$, and
the area of $\triangle Q_2J_6R_1$ must be $25 - (15 - x) = 10 + x$.
Now we can say the following:

$$\frac{x}{10 - x} = \frac{15 - x}{10 + x}$$

$$\Rightarrow 10x = 150 - 25x$$

$$\Rightarrow 35x = 150$$

$$\Rightarrow x = \frac{30}{7}$$

Therefore, the area of $\triangle R_3Q_3J_6 = \frac{30}{7}$. In a similar manner, we can show the area of $\triangle P_3Q_3J_1 = \frac{30}{7}$

We can now also show the following:

the area of quadrilateral $Q_3J_1H_6J_6$ is $10 - \frac{30}{7} - \frac{30}{7} = \frac{10}{7}$ and

the area of $\triangle J_6H_5H_6$ is $6 - \frac{30}{7} - \frac{10}{7} = \frac{2}{7}$.

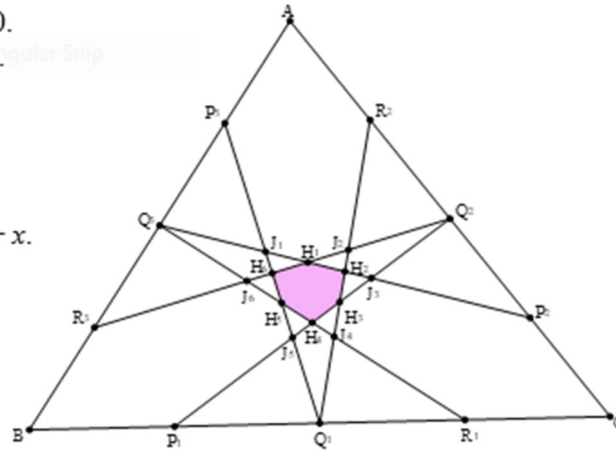
Therefore, the area of the shaded hexagon

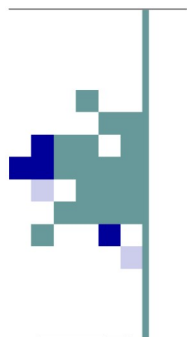
= the area of $\triangle ABC$ - the area of $\triangle AQ_3P_2$ - the area of quadrilateral $CQ_1H_2P_2$ - the area of $\triangle P_1Q_1H_3$ - the area of quadrilateral $BQ_3H_4P_1$ - the area of quadrilateral $Q_3J_1H_6J_6$ - the area of $\triangle J_6H_5H_6$ - the area of $\triangle J_1H_1H_6$

$$= 80 - 30 - 20 - 6 - 20 - \frac{10}{7} - \frac{2}{7} - \frac{2}{7}$$

$$= 4 - \frac{14}{7} = 2.$$

Since the area of the shaded hexagon is 1, the area of $\triangle ABC$ must be 40.





Outstanding Alumni

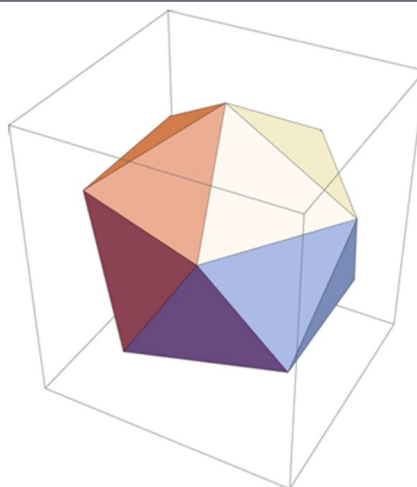
2017-2018

Dr. Malachi Schram was recently honored by the College of Arts and Sciences as the Outstanding Alumnus from the VSU Mathematics Department. Dr. Schram graduated from VSU in June 1999 with a B.A. in Mathematics and a B.S. in Physics, obtained his Master's Degree in Physics from the University of Tennessee, and his Ph.D in Elementary Particle Physics from Carlton University. He conducted postdoctoral research at McGill University; was employed as a research scientist at Bubble Technology Industry, Inc., and is currently a Staff Scientist at Pacific Northwest National Laboratory where he leads the PNNL research effort for the Belle II international collaboration, rare signal discoveries, and particle classification and detector performance using deep neural networks.



MATHEMATICA TIP...

Print polyhedral solids in a 3D-printer by creating STL files.



```
PolyhedronData["Icosahedron"]
```

```
Expot["Icosahedron.stl", PolyhedronData["Icosahedron"]]
```

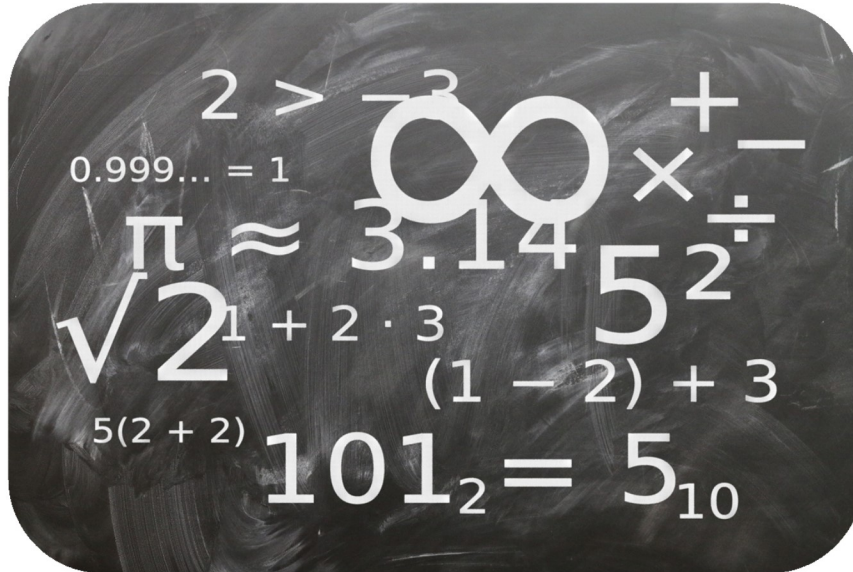
ATTENTION ALUMNI:

Please send your professional and personal news to math@valdosta.edu for inclusion in the alumni section of the newsletter.



Department of Mathematics

Valdosta State University
1500 N. Patterson St.
Valdosta, GA 31698-0040



A SPECIAL THANKS TO OUR DONORS!

The Elizabeth Joy Lohmar Scholarship Fund for Mathematics

A-N-D Lock and Key, Inc.
Dr. Patricia K. Bezona
Dr. David W. Boyd
Dr. Mary Kay Corbitt
Col. Ebenezer Folsom, NSDAR
Mr. Randy Johnson
Mr. and Mrs. Peter Lohmar
Phi Mu
Traveler's CyberGrants, Inc.
Mr. Gerald V. Werhan

SK High School Math Day

Ms. Janice F. Lowe
VSU Alumni Association, Inc.
Wal-Mart Foundation
Dr. David W. Boyd

VSU Math Department

Dr. Arsalan Wares
Dr. Gregory K. Harrell
Dr. David D. Boyd
Dr. Mary Kay Corbitt

Mrs. Maya Goel Scholarship

Dr. Sudhir Goel

Web site URL – <https://www.valdosta.edu/math/>

Twitter URL – [VSU Mathematics@VSU_Math](https://twitter.com/VSU_Math)

Facebook URL - <https://www.facebook.com/ValdostaStateBlazerNation/>

Email Address – math@valdosta.edu

229.333.5778 phone