Joshua Harrington
Associate Professor of Mathematics
Chair of Mathematics Department

Contact Information

Department of Mathematics
Cedar Crest College
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Research Interests

Elementary number theory. The theory of irreducible polynomials. Covering systems of the integers.

Education

University of South Carolina, Columbia, South Carolina, USA

Ph.D., Mathematics, December 2013

- Advisor: Michael A. Filaseta
- Dissertation Title: Selected Research in Covering Systems of the Integers and the Factorization of Polynomials

Shippensburg University, Shippensburg, Pennsylvania, USA

B.S., magna cum laude, Mathematics, May 2009

Academic Positions Held

Cedar Crest College, Allentown, Pennsylvania, USA

Chair of the Mathematics Department **May 2015 to Present**

Faculty Secretary **Spring 2016**

Assistant Professor **August 2014 to May 2019**

Associate Professor **May 2019 to present**

- College Mathematics, Mathematics for Health Care Professionals, Probability and Statistics, Pre-Calculus, Calculus I, Calculus II, Calculus III, Discrete Mathematics, Number Theory, Linear Algebra, Abstract Algebra, Mathematical Modeling, Real Analysis

Shippensburg University, Shippensburg, Pennsylvania, USA

Instructor of Mathematics **June 2013 to July 2014**

- Calculus I, Calculus II, College Algebra

University of South Carolina, Columbia, South Carolina USA

Graduate Student/Instructor of Record **August 2009 to May 2013**

- Basic College Mathematics, Intensive Basic College Mathematics, Business Calculus, Calculus I, Calculus II.

Published Papers

Harrington, Joshua; Jones, Lenny; "On the iteration of a function related to Euler's ϕ-function." *Integers 10* (2010).

Harrington, Joshua; "On the Factorization of the Trinomials $x^n + cx^{n-1} + d$." *Int. J. Number Theory 08* (2012), 1513–1518.

Brown, Kenneth A.; Dunn, Scott M.; Harrington, Joshua; "Arithmetic progressions in the polygonal numbers." *Integers 12* (2012).

Filaseta, Michael; Harrington, Joshua; "A polynomial investigation inspired by work of Schinzel and Sierpiński." *Acta Arith. 155* (2012), 149–161.

Finch, Carrie; Harrington, Joshua; Jones, Lenny; "Nonlinear Sierpiński and Riesel Numbers." *J. Number Theory 133* (2013), 534–544.

Harrington, Joshua; Jones, Lenny; "A class of irreducible polynomials", *Colloq. Math. 132* (2013), 113–119.

Harrington, Joshua; Jones, Lenny; White, Daniel; "The Reducibility of constant-perturbed products of cyclotomic polynomials", *Int. J. number Theory 10*, (2013), 13–29.

Harrington, Joshua; Vincent, Andrew; White, Daniel; "The factorization of $f(x)x^n + g(x)$ when deg $f \leq 2$." *J. Theor. Nombres Bordeaus 25*, no. 3 (2013), 565–578.

Harrington, Joshua; Jones, Lenny; Lamarche, Alicia; "Representing integers as the sum of two squares in $\mathbb{Z}_n$", *J. Integer Seq. 17* (2014), no. 7, article 14.7.4.

Cooper, Joshua; Filaseta, Michael; Harrington, Joshua; White, Daniel; "Coloring of Pythagorean triples within colorings of the positive integers", *J. Comb. Number Theory* (2014), Volume 6, Issue 1.

Harrington, Joshua; Jones, Lenny; Lamarche, Alicia; "Characterizing finite groups using the sum of the orders of the elements", *Int. J. Comb.*, 2014, Art. ID 826141, 11pp.

Harrington, Joshua; Jones, Lenny; "Extending a theorem of Pillai to quadratic sequences", *Integers 15A* (2015).

Harrington, Joshua; "Two Questions Concerning Covering Systems", accepted for publication in International Journal of Number Theory, *Int. J. Number Theory 11*, no. 6 (2015), 1739–1750.

Gross, Samuel; Harrington, Joshua; "Special numbers in $\mathbb{Z}_n$," *J. Integer Seq. 18* (2015), no 11, article 15.11.3.

Harrington, Joshua; Jones, Lenny; "A problem of Diophantus Modulo a prime," *Irish Math. Soc.* no. 77 (2016), 45–49.

Harrington, Joshua; Jones, Lenny; "Extending some results of Finch and Jones," *J. Comb. Number Theory 8* (2016), no.2, 131–144.

Hammer, James; Harrington, Joshua; Jones, Lenny; "On the congruence $x^x \equiv x \pmod{n}$," *Integers 16* (2016).

Harrington, Joshua; Jones, Lenny; Phillips, Tristan; "New primitive covering numbers and their properties," *J. Number Theory 172* (2017), 160–177.

Brazelton, Thomas; Harrington, Joshua; Kannan, Siddarth; Litman, Matthew; "On consecutive primitive nth roots of unity modulo q," *J. Number Theory 174* (2017), 495–504.

Harrington, Joshua; Jones, Lenny; "The irreducibility of power compositional polynomials and their Galois groups", *Math. Scand. 120* (2017), no. 2, 181–194.

Gross, Samuel; Harrington, Joshua; Minott, Laurel; "Sums of polynomial residues," *Irish Math. Soc. Bull. no. 79* (2017), 31–37.

Harrington, Joshua; Jones, Lenny; "Differences between elements of the same order in a finite field," *J. Number Theory 180* (2017), 443–459.

Harrington, Joshua; Jones, Lenny; "An equation involving arithmetic functions and Riesel numbers," *Integers 18* (2018).

Harrington, Joshua; Jones, Lenny; "A new condition equivalent to the Ankeny-Artin-Chowla conjecture," *J. Number Theory 192* (2018), 240–250.

Harrington, Joshua; Jones, Lenny; "A modification of a problem of Diophantus," *Math. Slovaca 68* (2018), no. 6, 1343–1352.

Hammer, James; Harrington, Joshua; Marotta, Kristina; "Odd coverings of subsets of the integers," *J. Comb. Number Theory* (2018), Volume 10, Issue 2.

Cha, Byungchul; Claman, Adam; Harrington, Joshua; Liu, Ziyu; Maldonado, Barbara; Miller, Alexander; Palma, Ann; Wong, Tony W. H.; Yi, Hongkwon; "An investigation on partitions with equal products," *Int. J. number Theory 15*, (2019), no. 8, 1731–1744.

Harrington, Joshua; Wong, Tony W. H.; "On super totient numbers and super totient labelings of graphs," *Discrete Math. 343* (2020), no. 2, 111670, 11pp.

Hammer, James; Harrington, Joshua; "Graph polynomials for a class of DI-pathological Graphs," *AKCE Int. J. Graphs. Comb. 17* (2020), no. 1, 206–212.

Harrington, Joshua; Jones, Lenny; "Monogenic binomial compositions," *Taiwanese J. Math. 24* (2020), no 5., 1073–1090.

Harrington, Joshua; Karhadkar, Kedar; Kohutka, Madeline; Stevens, Tessa; Wong, W. H. Tony; "Two dependent probabilistic chip-collecting games," *Discrete Appl. Math. 288* (2021), 20–34.

Baren, Theresa; Cory, Michael; Friedberg, Mia; Gardner, Peter; Hammer, James; Harrington, Joshua; McGinnis, Daniel; Waechter, Riley; Wong, Tony W. H.; "On the Domination Number of permutation Graphs and an Application to Strong Fixed Points," *Discrete Appl. Math. 288* (2021), 20–34.

Armbruster, Ashley; Barger, Grace; Bykova, Sofya; Dvorachek, Tyler; Eckard, Emily; Harrington, Joshua; Sun, Yewen; Wong, Tony W. H.; "On binomial coefficients associated with Sierpiński and Riesel numbers," *INTEGERS 21* (2021).

Accepted Papers

Harrington, Joshua; Jones, Lenny; "Some new polynomial discriminants," accepted Fall 2020.

Duncan, Breille; Harrington, Joshua; Vincent, Andrew; "Exceptional Totient Numbers," accepted Summer 2021.

Submitted Papers

Harrington, Joshua; Jones, Lenny; "Monogenic cyclotomic compositions," submitted Spring 2019.

Finch, Carrie; Groth, R.; Harrington, Joshua; "Consecutive Sierpiński numbers," submitted Spring 2019.

Harrington, Joshua; Henninger-Voss, Eugene; Karhadkar, Kedar; Robinson, Emily; Wong, W. H. Tony; "Sum index and difference index of graphs," submitted Fall 2019.

Finch-Smith, Carrie; Harrington, Joshua; Wong, W. H. Tony; "Sums of distinct cubic polynomial residues," submitted Spring 2020.

Harrington, Joshua; Roman, Melea; Wong, Tony W. H.; "On k-fold super totient numbers," submitted Summer 2020.

Harrington, Joshua; Sun, Yewen; Wong, Tony W. H.; "Covering systems with odd moduli," submitted Spring 2021.

Byer, Cameron; Dvorachek, Tyler; Eckard, Emily; Harrington, Joshua; Wise, Lindsey; Wong, Tony W. H.; "On the properties of Fibotomic polynomials," submitted Spring 2021.

Scholarly Services

- Referee for Monatshefte für Mathematik
- Referee for Ars Combinatoria
- Referee for The American Mathematical Monthly
- Referee for International Journal of Number Theory
- Referee for Journal of Number Theory
- Referee for INTEGERS: Electronic Journal of Combinatorial Number Theory
- Referee for Acta Arithmetica
- Article Reviewer for American Mathematical Society's MathSciNet
- REU contributor and mentor at Muhlenburg college (NSF site grant DMS-1560019)
- Co-PI, organizer, and mentor for REU at Moravian College (NSF site grant DMS 1852378)

Selected Talks

Bloomsburg University

- "Investigating the Factorization of Monic Trinomials," Seminar Series, June 2012.

Canadian Number Theory Association (CNTA)

- "On the Factorization of the Trinomials $x^n + cx^{n-1} + d$," CNTA XII, June 2012.

Clemson University

- Invited speaker, "Covering Systems and Some Applications," Number Theory Seminar, Fall 2012.

INTEGERS 2013: The Erdos Centennial Conference

- Invited speaker, "A Polynomial Investigation Inspired By Work of Schinzel and Sierpiński," October 2013.

Joint Mathematics Meetings

- "On the Iteration of a Function Related to Euler's ϕ-Function," January 2009.

- Invited speaker, "A Polynomial Investigation Inspired by Work of Schinzel and Sierpiński," January 2013.
- "The Reducibility of Constant-Perturbed Products of Cyclotomic Polynomials," January 2014.
- "Special Numbers in $\mathbb{Z}_n$," January 2016.
- "Sums of Polynomial Residues Mod n," January 2017.
- "Odd Coverings of Subsets of the Integers," January 2019.

Kutztown University

- Invited Speaker, "Fields containing consecutive elements of order n," Department Seminar, Spring 2017.

Mid-Atlantic Seminar On Numbers (MASON)

- "Odd Coverings of Subsets of the Integers," MASON I, Spring 2018.
- "Classifying Super-totient Numbers", MASON IV, Spring 2020.

Palmetto Number Theory Series (PANTS)

- "On the Iteration of a Function Related to Euler's ϕ-Function," PANTS VIII, December 2008.
- "On a Polynomial Variation of Sierpiński Numbers," PANTS XVI, September 2011.
- "Factorization of $f(x)x^n + g(x)$ when deg $f \leq 2$," PANTS XVIII, September 2012.
- "The Reducibility of Constant-Perturbed Products of Cyclotomic Polynomials," PANTS XX, September 2013.
- "Two Questions Concerning Covering Systems," PANTS XXII, December 2014.
- "Odd Coverings of Subsets of the Integers," PANTS XXXIII, December 2019.

Shippensburg University

- "The Fibonacci Sequence Under Modular Arithmetic," Annual Undergraduate Math Conference, Fall 2007.
- "On the Iteration of a Function Related to Euler's ϕ-Function," Department Seminar, Fall 2008.
- Invited Speaker, "On the Factorization of the Trinomials $x^n+cx^{n-1}+d$," Department Seminar, Spring 2012.
- Invited Speaker, "Covering Systems and Some Applications," Department Seminar, Spring 2013.
- Invited Speaker, "Fields containing consecutive elements of order n," Department Seminar, Fall 2016.
- Invited Speaker, "Applying a Concept of Pillai to Graph Theory," Department Seminar, Fall 2018.

SouthEast Regional Meeting On Numbers (SERMON)

- "On the Factorization of the Trinomials $x^n + cx^{n-1} + d$," April, 2012.

University of South Carolina

- "On a Polynomial Variation of Sierpiński Numbers," Number Theory Seminar, Fall 2011.
- "On the Factorization of the Trinomials $x^n + cx^{n-1} + d$," Number Theory Seminar, Spring 2012.
- "Covering Systems and Some Applications," SIAM Student Seminar, Fall 2012.
- "The Factorization of $f(x)x^n + g(x)$ when deg $f < 3$," Number Theory Seminar, Fall 2012.

Washington and Lee University

- Invited speaker, "On the factorization of the trinomials $x^n+cx^{n-1}+d$," Colloquium, Fall 2012.

Conferences

Attendee, Mathematical Association of America Sectional Meeting (virtual), November 2017.

Organizer/attendee, Series on Exploring Combinatorics and Number Theory (SECANT) III, Cedar Crest College (virtual), January 2021.

Attendee, Mid-Atlantic Series on Numbers (MASON) IV, Gettysburg College, March 2020.

Attendee, Palmetto Number Theory Series (PANTS) XXXIII, Clemson University, December 2019.

Organizer/attendee, Series on Exploring Combinatorics and Number Theory (SECANT) II, Cedar Crest College, October 2019.

Attendee, Mathematical Association of America Sectional Meeting, King's College, March 2019.

Attendee, Mid-Atlantic Series On Numbers (MASON) III, James Madison University, February 2019.

Participant, 2019 Joint Mathematics Meetings, Baltimore MD, January 2019.

Attendee, Palmetto Number Theory Series (PANTS) XXXI, University of South Carolina, December 2018.

Attendee, Mathematical Association of America Sectional Meeting, West Chester University, November 2018.

Organizer/attendee, Series on Exploring Combinatorics and Number Theory (SECANT) I, Cedar Crest College, November 2018.

Participant, Mid-Atlantic Series On Numbers (MASON) II, Towson University, April 2018.

Attendee, Mathematical Association of America Sectional Meeting, Shippensburg University, November 2017.

Participant, 2017 Joint Mathematics Meetings, Atlanta GA, January 2017.

Attendee, Palmetto Number Theory Series (PANTS) XXVII, University of South Carolina, December 2016.

Attendee, Mid-Atlantic Series On Numbers (MASON) 2016, Towson University, October 2016.

Attendee, Southeast Regional Meeting On Number (SERMON) 2016, James Madison University, April 2016.

Participant, 2016 Joint Mathematics Meetings, Seattle WA, January 2016.

Participant, Palmetto Number Theory Series (PANTS) XXIII, University of South Carolina, December 2014.

Attendee, DIMACS Conference on Challenges of Identifying Integer Sequences, Rutgers University, October 2014.

Participant, 2014 Joint Mathematics Meetings, Baltimore MD, January 2014.

Invited participant, INTEGERS 2013, University of West Georgia, October 2013.

Attendee, Maine-Quebec Number Theory Conference, University of Maine, October 2013.

Participant, Palmetto Number Theory Series (PANTS) XX, Davidson College, September 2013.

Attendee, Southeast Regional Meeting On Number (SERMON) 2013, High Point university, April 2013.

Invited participant, 2013 Joint Mathematics Meetings, San Diego, January 2013.

Attendee, Palmetto Number Theory Series (PANTS) XIX, University of South Carolina, December 2012.

Participant, Palmetto Number Theory Series (PANTS) XVIII, Wake Forest University, September 2012.

Participant, Canadian Number Theory Association (CNTA) XII, University of Lethbridge, June 2012.

Participant, Southeast Regional Meeting On Numbers (SERMON) 2012, Western Carolina University, April 2012.

Attendee, Palmetto Number Theory Series (PANTS) XVII , Clemson University , December 2011.

Participant, Palmetto Number Theory Series (PANTS) XVI , Emory University, September 2011.

Attendee, Southeast Regional Meeting On Numbers (SERMON) 2011, Armstrong Atlantic State University, April 2011.

Attendee, Palmetto Number Theory Series (PANTS) XV, Clemson University, February 2011.

Participant, 2009 Joint Mathematics Meetings, Washington DC, January 2009.

Participant, Palmetto Number Theory Series (PANTS) VIII, University of South Carolina, December 2008.