The following abstracts were received too late to appear in the printed Student Program.

ADDITIONS to MAA Session #11 – Thursday, August 4, 2011 – Thoroughbred 2

4:40-4:55

Yelling in Circles

Sarah Warkentin, Harvey Mudd College

In this presentation, we will examine the mathematics in the game "Look Up and Scream!" We extend the definition of a "win" to the formation of a k-cycle for a fixed k. We will show that the number of yells is still approximately Poisson distributed (with parameter $1/k$), and give a bound on the error of the approximation. Then we will discuss the joint distribution of k-cycles for all k up to a fixed b.

5:00-5:15

Using Greek Ladders to Approximate Roots of Monic Polynomials

Casey Horgan, United States Air Force Academy

Greek ladders are an ancient method of approximation based on a recursion. They are traditionally used to find nth root of a real number x. We will discuss how to expand the notion of Greek ladders to finding roots of polynomials of the form $x^2 + cx + d$.

5:20-5:35

Approximating Trigonometric Functions with Sums of Binomial Coefficients

Austin Buscher, United States Air Force Academy

Using a relationship derived from DeMoivre's Theorem, we can create infinite sums of binomial coefficients equal to common trigonometric functions. These approximations can be truncated and manipulated to produce approximations of trigonometric functions with speed and accuracy comparable to commonly used methods such as Taylor Series approximations. In this talk we will derive these approximations, and show how to optimize their accuracy.

ADDITION to MAA Session #12 – Thursday, August 4, 2011 – Thoroughbred 3

4:40-4:55

Independence polynomials of regular caterpillars

Greg Ferrin, Western Carolina University, and Michaela Stone, Alfred University

We offer a basic background of independence polynomials and their importance in graph theory. Specifically, we look at the independence polynomials of regular caterpillars (vertebrated graphs). We will introduce a new closed-form of the standard recursive formula for the independence polynomials of regular caterpillar of any finite size. We will then apply our formula to identify modes of the independence polynomials for certain regular caterpillars.

ADDITION to MAA Session #13 – Thursday, August 4, 2011 – Thoroughbred 5

4:40-4:55

Divisibility for Trinomial Coefficients

Duncan Wright, University of Northern Iowa

Expanding on the work of binomial coefficients in Pascal's triangle, we study the divisibility of trinomial and even m-nomial coefficients. Many of the divisibility properties of binomial coefficients have analogs for trinomial coefficients, including the classical theorems of Lucas and Kummer. We present these generalizations and work towards a general criterion for divisibility.

ADDITION to MAA Session #15 – Friday, August 5, 2011 – Thoroughbred 2

10:30-10:45

Permutation Patterns

Taylor Allison, North Carolina State University,
Katie Hawley, Harvey Mudd College, and Jennifer Herdan, Winona State University

Patterns within permutations are an active area of study. We explore two problems related to permutation patterns: first, we consider avoidance of 3-patterns in ordered partitions of the set $[n]$. The known result for permutations corresponds to partitions into n parts, with avoidance of a pattern growing at a rate of 4^n. For 3-part partitions, we have a preliminary result of $n2^n$, and are also considering arrangements of $[n]$ into $n/2$ partitions of two elements. Our second question involves covering all $n!$ n-permutation patterns with $n+1$-permutations. We have achieved a pigeonhole based lower bound for any complete covering, an Azuma-style bound for emergence of a covering, and a Spencer-style bound for threshold.

ADDITION to MAA Session #16 – Friday, August 5, 2011 – Thoroughbred 3

10:30-10:45

Ramsey Numbers and Saturation for a Class of Trees

Spencer Brooks, Amherst College, and Tony Nguyen, Spring Hill College

Let G be a graph with edge set $E(G)$. The *Ramsey number* of G, or $r(G, G)$, is the minimum n, such that a two-coloring of the edges of the complete graph on n vertices must contain a monochromatic copy of G. G is saturated if for any $e \notin E(G)$, then $r(G+e, G+e) > r(G, G)$. A tristar consists of the path on three vertices with at least one edge incident to each of the these three vertices. We establish the exact Ramsey number for certain tristars, present our results concerning their saturation, and provide some conjectures about the unknown Ramsey numbers for a class of trees.

ADDITION to MAA Session #20 – Friday, August 5, 2011 – Thoroughbred 3

3:40-3:55

Universal Cycles for Unordered Combinatorial Objects

Andre Kuney, Oberlin College, and Melinda Lanius, Wellesley College

Consider all possible length-k words taken from a size-n alphabet. It is classical that we can create a string such that the set of all length-k consecutive substrings of this string consists of each of our words exactly once; this string is called a universal cycle. In 1992, Chung, Diaconis, and Graham introduced the concept of a universal cycle for other combinatorial structures. Since then, universal cycles have been found for ordered objects like permutations, partitions, and labelled graphs; however, progress on unordered objects like k-subsets of an n-set and graph isomorphism classes has been slow. Here, we consider a particular class of unordered structures, and discuss ways to create universal cycles for these objects.

SUBSTITUTION to MAA Session #21 – Friday, August 5, 2011 – Thoroughbred 5

3:20-3:35

Hitting Set Size for Random Set Systems

Jessie Deering, East Tennessee State University,
Lucia Petito, University of Rochester, and William Jamieson, East Tennessee State University

Let Λ be a random set system of $[n] = \{1, 2, ...n\}$, where $\Lambda = \{A_j | A_j \in P([n])$, and A_j selected with probability p. A set $H \subseteq [n]$ is a hitting set of Λ if $|H \bigcap A_j| \geq 1$ for all $A_j \in \Lambda$. We explore the cardinality of H with respect to p and n using probabilistic methods.