Benjamin Armbruster [8], Sr., University of Arizona, barmbrus@email.arizona.edu
Title: Optimization in Radiation Therapy
Abstract: The goal of radiation therapy is to destroy the tumor with no side-effects. The recently developed technique of intensity modulated radiation therapy (IMRT) uses spatially nonuniform intensities. While this allows more flexibility and better treatments, it also increases the search space and hence requires optimization. I will present an overview of various optimization formulations including least squares and linear programming formulations.

Aaron Arvey [11], So., and **David Nichols**, So., Claremont McKenna College, aarvey06@mckenna.edu
Title: Asympotically Periodic Solutions of Linear ODE's
Abstract: We consider first order linear differential equations with coefficients $a(t)$ and $b(t)$ that are continuous and periodic. We prove that when the ratio between the periods of $a(t)$ and $b(t)$ is rational then the differential equation has exactly one periodic solution and every other solution converges to it as t goes to infinity. We also study the case when the ratio between the periods of $a(t)$ and $b(t)$ is irrational.

Roger A. Bailey [20], Sr., Northern Arizona University, rab33@dana.ucc.nau.edu
Title: Basic Usage of Polynomials in Binary Coding Theory
Abstract: When working with "codewords" from binary codes, it's extremely useful to view each word as a polynomial in $\mathbb{Z}_2$. When approached this way, codes and codewords can be easily studied using methods from linear algebra. This presentation demonstrates a few of these techniques for dealing with polynomials in coding theory. These methods can used for finding linear codes when given codewords, finding generating polynomials for a given code, and several other common problems. In addition, basic ideas of binary codes such as dimension, length, etc. will be briefly discussed to familiarize those who have no coding background.

Melissa Banister [18], Sr., Harvey Mudd College, mbanister@hmc.edu
Title: Separating Sets for Finite Groups
Abstract: We are concerned with methods of analyzing a vector of data in order to isolate prevalent trends or other information when the vector is an element of a module over a group ring. Such a module has a canonical decomposition into invariant subspaces. If we project a vector onto these invariant subspaces, we can extract information about the vector. We examine methods of computing these projections efficiently. Furthermore, sometimes we must decompose a vector more finely than into invariant components. Computing a Fast Fourier Transform on a group can yield important information. We examine methods for accomplishing this as well. For the symmetric group, the Jucys-Murphy elements accomplish this. The methods we seek will be useful for image processing, voting theory, and spectral analysis.

Ivan Barrientos [3], Sr., University of Arizona, theremix@email.arizona.edu
Title: Semi-Parametric Mass Estimates for the Milky Way and Andromeda Halos
Abstract: In this paper, we try to improve upon the mass estimates that Wilkinson and Evans undertook in their study of the Milky Way and the Andromeda (M31) halos by using semi-parametric methods of statistical analysis, which inherently use less assumptions about the data than does Bayesian analysis. Wilkinson and Evans had mass estimates of the Milky Way and Andromeda that were respectively $12.3^{+18}_{-6} \times 10^{11} M_0$ and $1.9^{+3.6}_{-1.7} \times 10^{12} M_0$, where M_0 denotes solar mass units. Our main result is that our Milky Way mass estimate is $4.74 \times 10^{11} M_0$ and our Andromeda mass estimate is $3.30 \times 10^{11} M_0$. We used the same data sets as Wilkinson and Evans.

Christopher Belford [24], Sr., Northern Arizona University, cab5@dana.ucc.nau.edu
Title: Relationships of the Dedekind Zeta Function and the Root Quantum Number
Abstract: The Dedekind Zeta Function of a field determines many of the field's invariants such as the degree, discriminant and the unit rank. The root quantum number is a newly found field invariant. Prior to this research it was unknown whether the Dedekind Zeta Function of a field determines the field's root quantum number. Investigation of the root quantum number and Dedekind Zeta Function of fields was accomplished via a lengthy translation from field theory into finite group theory and Galois theory. Background research included the study of Galois theory, arithmetic equivalence, and Gassmann triples. Through a search of subgroups of symmetric groups, a number of examples of Galois groups surfaced in which the fields fixed by the Galois groups had identical zeta functions but different root quantum numbers. Thus the root quantum number of a field is not determined by the field's Dedekind Zeta Function. An investigation of these Galois groups followed, looking for possible patterns.

Christopher Blakely [9], Sr., Arizona State University, chris.blakely@asu.edu
Title: Image Processing on the Sphere with Applications in Seismic Imaging
Abstract: Image processing principally concerns itself with data storage reduction, edge detection and data reconstruction of 2-D or even N-D signals. Despite the vast literature of image processing methods in cartesian coordinates, these techniques do not necessarily apply to the 2-sphere for reasons of basis functions and the different geometric structure. Because seismic imaging tools during the past couple decades have strongly advanced, constructing methods for the post-processing of data defined on the

sphere has become more pertinent. For this presentation we will consider fast techniques easily implementable for pinpointing jump discontinuities of discrete data defined on the sphere and then from there, how to smoothly reconstruct the data to eliminate the contamination of the original data from noise like Gibbs oscillations. Finally, an application to actual seismic image data will be seen.

Alicia Blueyes [28], Sr., New Mexico State University, ablueyes@yahoo.com
Title: Applications of Linear Algebra
Abstract: We use eigenvalues and diagonalization to derive the n^{th} term of the Fibonacci sequence.

Andrea Bruder [22], Sr., Department of Mathematics, Munich University of Technology, mathmax@gmx.de
Title: Fundamental Properties of Jacobi Polynomials
Abstract: Orthogonal Polynomials play a fundamental role all over the sciences. In numerical analysis for instance, the role of Tschebycheff polynomials or of Legendre polynomials is crucial to the construction of useful integration algorithms. Again in quantum mechanics, the Legendre polynomials serve to the understanding of a particle's spin, the Laguerre polynomials give insight into the behavior of the hydrogen atom and the Hermite polynomials characterize the energetic properties of a swinging simple molecule. These polynomials originate from a special functions' hierarchy, the so-called Askey-Wilson scheme. An important class within this scheme is given by the Jacobi polynomials.
Basic properties of the Jacobi polynomials are presented throughout the talk.

Tyler Byers [2], Sr., University of Arizona, tbyers@email.arizona.edu
Title: Helping Managers Understand Your Statistics
Abstract: It is no secret that many managers in industry and government-type jobs have very little (if any) understanding about the statistics that govern their projects. This is often a frustration for mathematics students who do understand these concepts. The speaker will address some of the issues he has come up against in various internships he has had during his undergraduate career. Most notable will be the internship he held with the federal government. He will address the problems with the understanding of statistics that managers had, and how he had to work around this to convince them of the actual truth that the statistics showed. The important topic addressed will be how we as mathematics students can help our managers in our future jobs have a better understanding of some statistical processes.

Reynaldo Castro [13], Gr., kingnaldo67@hotmail.com
Title: A Deterministic Approach to the Spread of Rumors
Abstract: Ideas and messages spread in ways that resemble the transmission dynamics of viruses. We begin with the same framework as Daley Kendall, which classifies individuals as susceptibles, "spreaders", and "stiflers", and models rumor spreading as an epidemic. We look at the spread of a rumor, an aspect not considered in the Daley Kendall model. Finally, the dynamics of rumor spreading in chat rooms that are accessible to a large number of groups are explored under the assumption of simple, local (neighborhood) dynamics. Characterization of the dynamics is carried out determine the most effective ways to stop or accelerate the spread of rumors are also discussed.

Will Chang [5], Sr., Harvey Mudd College, wchang@math.hmc.edu
Title: Image Processing with Wreath Products
Abstract: Processing digital images efficiently involves many compression schemes such as JPEG, PNG, and GIF. Represention theory allows a generalization of Fourier Transforms, which can be utilized in image compression. In this talk, I present a novel technique to decompose images using wreath product generalizations of the discrete Fourier transform (DFT).

Federico Chialvo [40], Jr., University of Arizona, federico@email.arizona.edu
Title: A Connected Sum Operation, Maximally Connected Planar Graphs and Coloring
Abstract: Any planar graph can be found as a subgraph of some simple planar graph, say G, with the same number of vertices but with the maximum number of edges. In such a maximally connected planar graph every face is a triangle. These graphs with the maximum number of edges we call Maximally Connected Planar Graphs (MCPG's). In our research we have chosen to look specifically at the set of all MCPG's and attempt to prove that they are 4-colorable. Consequently proving that any subgraph of these graphs is 4-colorable since removing edges cannot increase the number of colors required. The main strategy is the definition of independent graphs and an operation similar to connected sums. The connected sum operation we use is defined in general as the assignment of the vertices of a triangle, T, in one MCPG (G) to the vertices of a triangle, T', in another MCPG (G'). When G is connect summed to G' all vertices of $G-T_1$ are placed inside the triangle T_1' and the vertices of T are identified to T'.

Ariel Cintron-Arias [25] ,Gr., Cornell University, ariel@cam.cornell.edu
Title: Mathematical and Theoretical Biology Institute

Abstract: The MTBI program is an 8-week summer research program that takes place at Los Alamos National Labs. Approximately half of the program involves attending lectures, and the last half is geared towards group research. Students must complete a group research project and produce a written report, formal oral presentation, and poster.

Edward Clifford [4], Sr., Harvey Mudd College, eclifford@hmc.edu
Title: Representation Theory and Voting Paradoxes
Abstract: In many candidate democratic races, the question is: What's the fairest way of counting votes? Two of the oldest suggestions for tallying votes come from 1785, and are still the most widely used schemes today. I investigate the underlying mathematical properties of these systems from a representation theoretical standpoint. Specifically, I focus on mathematical underpinnings of voting paradoxes.

Andrew Crites [27], Sr., University of Arizona, acrites@email.arizona.edu
Title: Budapest Semesters in Mathematics
Abstract: Last semester I traveled to Budapest, Hungary for a study abroad program in mathematics. I would like to share some information about the program, which would be of interest to anyone who might want to studay abroad. This talk will include information about how to apply, what the courses are like, and what to expect.

Ajit Divakaruni [37], Jr., University of Arizona, ajitd@email.arizona.edu
Title: Mathematical Model of Glucose and Oxygen Metabolism in Tumor Cells
Abstract: The aim of our ongoing project is to create a model of tumor metabolism in order to better understand and ultimately reduce tumor hypoxia. Low levels of oxygen in tumors cause enhanced resistance to irradiation and some types of chemotherapy. There exist two main metabolic pathways in the cell: aerobic and anaerobic pathways which together generate the necessary ATP to meet cell energy requirements. Many tumors exhibit the so-called Crabtree effect, in which cells shift a greater burden of energy production to the anaerobic pathway relative to the aerobic pathway. Our goal is to develop a mathematical model to predict the decrease in oxygen consumption with increased glucose concentration. This decrease in oxygen consumption has been shown to effectively increase oxygen concentration and thus provides a possible method for alleviating tumor hypoxia.

Shawn Elledge [38], Sr., Arizona State University, sme13@asu.edu
Title: From Graph Pebbling to Number Theory to Groups
Abstract: Graph pebbling is a game played by moving pebbles about the vertices of a simple graph G, where the player may move pebbles between two adjacent vertices at a specified cost of pebbles. Starting from a given configuration of pebbles, the goal is to move at least one pebble to a given target vertex. Given enough pebbles this goal is achievable for every configuration and target; the pebbling number of G is the smallest such number of pebbles. It is known that every set of n integers has a subset whose sum is divisible by n. Erdős and Lemke conjectured an upper bound on how small such a sum could be guaranteed, and in 1988 Chung used graph pebbling to prove it. Kleitman and Lemke then conjectured for every group Γ; that every multi-set of $\Gamma$of its members has a subset whose sum is the identity. Chung's result shows that this is true for cyclic Γ. Our research aims to use graph pebbling to prove this conjecture (and a generalization) for simple Γ.

Arlene Evangelista [39], Sr., Arizona State University, arlene_me@yahoo.com
Title: Effects of Education,Vaccination and Treatment on HIV Transmission in Homosexuals with Genetic Heterogeneity
Abstract: Genetic studies report the existence of a mutant allele 32 of CCR5 chemokine receptor gene at high allele frequencies (~10%) in Caucasian populations. The presence of this allele is believed to provide partial or full resistance to HIV. In this study, we look at the impact of education, temporarily effective vaccines and therapies on the dynamics of HIV in homosexually active populations. In our model, it is assumed that some individuals possess one or two mutant alleles (like 32 of CCR5) that prevent the successful invasion or replication of HIV. Our model therefore differentiates by genetic and epidemiological status and naturally ignores the reproduction process. Furthermore, HIV infected individuals are classified as rapid, normal or slow progressors. In this complex setting, the basic reproductive number is derived in various situations. The separate or combined effects of therapies, education, vaccines, and genetic resistance are analyzed. Our results support the conclusions of Hsu Schmitz that some integrated intervention strategies are far superior to those based on a single approach. However, treatment programs may have effects which counteract each other, as may genetic resistance.

David Gaebler [7], Sr., Harvey Mudd College, dgaebler@hmc.edu
Title: Toeplitz Operators on Locally Compact Abelian Groups
Abstract: Given a function (more generally, a measure) on a locally compact Abelian group, one can define the Toeplitz operators as certain integral transforms of functions on the dual group, where the kernel is the Fourier transform of the original function or measure. In the case of the unit circle, this corresponds to forming a matrix out of the Fourier coefficients in a particular way. We will study the asymptotic eigenvalue distributions of these Toeplitz operators.

Charu Gaur [31], Gr., Arizona State University, charu.gaur@asu.edu
Title: A Professional Degree in Computational BioSciences

Abstract: As a current student in ASU's interdisciplinary M.S. program in CBS, I will present various aspects of the program, including what are the various resources, areas of study, research opportunities, and job prospects.

Matthew Green [32], Jr., University of Arizona, mhgreen@email.arizona.edu
Title: Primality Testing, Psuedoprimes and Carmichael Numbers
Abstract: The ability to obtain and use very large prime numbers has been crucial to the effectiveness of public key encryption algorithms (most notably RSA). To determine whether or not a large number is prime involves a substantial amount of computation. The amount of computation needed can be greatly reduced by using probablistic algorithms that diagnose primality with an acceptable error. When a number is suspected of being prime, but not known to be so, is called a psuedoprime. We can accumulate a set of psuedoprimes by checking that a given positive integer agrees with Fermat's little theorem. Among this set of psuedoprimes are a few numbers which always agree with Fermat's little theorem but are not truly prime. These numbers are called Carmichael numbers and they have various interesting porperties. My project addresses basic ideas about psuedoprimes and Carmichael numbers. I also explain a complicated paper written by Carl Pomerance on the distribution of Carmichael numbers.

Jaime Hernandez [6], Gr., University of Texas at El Paso, jaimeh@utep.edu
Title: An Inexact Newton Trust Region Interior-Point Algorithm for Large-Scale Nonlinear Programs
Abstract: We present an algorithm based on a trust region interior-point method for nonlinear programming introduced by Argaez, Velazquez, and Villalobos. We discuss a path-following strategy, and present some numerical experimentation on a set of test problems.

Theresa Johnston [12], Sr., Northern Arizona University, tmj4@dana.ucc.nau.edu
Title: Understanding Minkowski's First Theorem: Have You Found the g-Points?
Abstract: The Geometry of Numbers is a field of study with applications to many other areas of mathematics. Originating from a work by Hermann Minkowski in 1896, this field of mathematics recasts difficult problems into geometric settings in order to find answers that were previously elusive. In his work, Minkowski was able to find an application of convex bodies to number theory using an n-dimensional lattice and a convex body in $\mathbb{R}^n$. Minkowski's First Theorem states: A convex body in $\mathbb{R}^n$, having a center at the origin and having a volume larger than 2*n* must contain at least one g-point (integer coordinate point) different from the origin. Armed with a lemma regarding the existence of at least two g-points in any bounded, open set with volume greater than 1, the proof of Minkowski's First Theorem is simple and beautiful. The goal of this project is to expose other undergraduate students to this fundamental result from the Geometry of Numbers.

Andrey Kislyuk [10], Sr., UC Berkeley, kislyuk@uclink.berkeley.edu
Title: Shape Matching in Databases
Abstract: A survey of boundary-based shape matching algorithms and methodology suitable for time-efficient object classification applications working with image databases. Boundary polygonal approximation, compact representation, transformations, and difference measures are discussed. An approach of generating a boundary support (transformation of the Cartesian origin and boundary tangent angle) is examined for purposes of matching and user examination. A proof-of-concept application is presented and benchmarked. Further research topics are outlined.

Cristian Madar [41], Sr., University of Arizona, cmadar@email.arizona.edu
Title: The Role of Biostatistics in Analyzing cAMP Overshoot
Abstract: Chronic use of drugs such as morphine leads to tolerance and dependence at the cellular level that cause our bodies to become addicted. When use of the drug is discontinued, cells experience a "cAMP overshoot" where cAMP molecules are overproduced upon stimulation of the cell. Biostatistics are applied to analyze the statistical significance and magnitude of this cAMP overshoot.

Steven Martinez [21], Jr., University of Arizona dionicio@email.arizona.edu
Title: Doing the Math on Do the Math So We Can Do Some Mathematics
Abstract: Do the Math is an experimental Mathematics television show put on by the Center of Mathematics Teacher Recruitment and Retention of University of Arizona. The show was concieved after concern brought about from the low Arizona's Instrument to Measure Standards (AIMS) test scores by Arizona high school students. Do the Math is intended to to be a resource for the community by sparking interest in Mathematics and honing Mathematics skills. This presentation will explain the show's format, how the show has fared thus far, and struggles the show has encountered.

Christopher McMurdie [14], So., University of Arizona, mcmurdie@email.arizona.edu
Title: Penrose Tilings and Periodicity
Abstract: This paper explores some of the fundamental ideas of Penrose tilings. Specifically, this will include a discussion of constituent prototiles, composition rules for creating a tiling, the aperiodic nature of penrose tilings, and some of the interesting relationships between the ratio of prototiles, the Fibonacci sequence and the golden ratio. The space of all Penrose tilings provides one of the simplest examples of a non-commutative geometry, which is one of the reasons to study Penrose Tilings.

Retsina Meyer [33], Sr., University of Arizona, retsina@email.arizona.edu
Title: Mental Mapping Inertia: Bob and the 7 Morphs
Abstract: The hippocampus is a critical brain structure necessary for the processing of memories. Studied extensively, this region has been found to be particularly important for learning spatial relationships in the world, or for associating events with places. Neurons of the hippocampal CA1 and CA3 subfields fire in patterns coordinated with the animal's location suggesting that this structure may form the basis of what psychologists call a "cognitive map". Known as place cells, these cells encode the animal's location by integrating sensory information from the environment and information about self-motion through the environment. The region of the environment where the cell is most active is known as the cell's place field and the distribution of place fields from all cells active in a given environment is referred to as a place field "map". To what degree changes in the environment will result in changes in place field maps is not fully understood. Associational memory network theory predicts no change relationship between the morphing of the box and changes of the animal's place fields. These results may provide insight into the mechanisms of the neural encoding of environmental inputs and further support network theories. Supported by MH046823.

Michael Munroe [26], So., Mesa Community College, engr_student@cox.net
Title: A Non-Recursive Formula for the n^{th} Term in the Fibonacci Sequence.
Abstract: The Fibonacci sequence and the golden ratio appear throughout science from biology to number theory. This is a presentation of the derivation of a non-recursive formula for the n^{th} term of the Fibonacci sequence. Although it is a simple sequence and recursive formula the presentation of the non-recursive formula requires calculus. I will be using Power Series and Basic Algebra to derive the non-recursive formula. It should be fun for anyone who likes Algebra, Calculus or the Fibonacci sequence.

Benjamin Munyan [36], Fr., Arizona State University, Benjamin.Munyan@asu.edu
Title: Determining Fractional Pebbling Numbers for Various Graphs
Abstract: Graph pebbling is an area of discrete mathematics that analyzes the movement of objects ("pebbles") along the edges of a graph having edge costs, or tolls. Here the cost is half of the pebbles being moved. The pebbling number $\pi(G)$ of a graph G is the minimum number of pebbles t so that, from every initial configuration of t pebbles on the vertices of G, one can move at least one pebble to any specified target. The k-pebbling number $\pi_k(G)$ is defined similarly, except that k pebbles must reach the target. In this research we define the fractional pebbling number $\hat{\pi}(G) = \liminf_k \pi_k(G)/k$ and determine its value for cliques, trees and cycles. Moreover we conjecture that its value on G is completely determined by the diameter of G.

David Murillo [35], Sr., Arizona State University, dlm35@mathpost.asu.edu
Title: Change in Host Behavior and its Impact on the Co-Evolution of Dengue
Abstract: The joint evolutionary dynamics of dengue strains are poorly understood despite its high prevalence around the world. Two dengue strains are put in competition in a population where behavioral changes can affect the probability of infection. The destabilizing dynamic effect of even "minor" behavioral changes is discussed and their role in dengue control is explained.

Jessica Nelson [16], Sr., Harvey Mudd College, jnelson@hmc.edu
Title: On the Erdős Problem of Empty Convex Hexagons
Abstract: Paul Erdős's Empty Hexagon Problem asks if there exists a positive integer $H(6)$ such that for all sets of $n \geq H(6)$ points in general position on the plane (that is, no three points are on a line) at least one subset of six of the points form the vertices of an empty convex hexagon. The question of the existence and value of $H(6)$ is open although values for $H(3)$, $H(4)$, and $H(5)$ have been found and it is known that $H(k)$ does not exist for $k \geq 7$. I was attracted to this problem in combinatorial geometry for its apparent simplicity of statement and subtle complexity. This presentation is an overview of the history of the of the problem as well as some new promising directions the speaker is currently exploring.

Amy Ring [1], Sr., Northern Arizona University, aar22@dana.ucc.nau.edu
Title: Evolution of the Galaxy Merger Rate
Abstract: We used Hubble Space Telescope images to find collisional ring galaxies at redshifts between .1 and 1. Using these results we varied the galaxy merger rate with redshift and compared the number of observed and expected collisional rings. We found a significantly large number of such collisions, which implies there was a higher merger rate in the past.

Michelle Roehler [19], Sr., University of Arizona, mroehler@email.arizona.edu
Title: Middle School Students' Intuitive Techniques for Solving Algebraic Word Problems
Abstract: How do students approach word problems? Are students intuitively drawn to algebraic methods, or do their approaches differ from these commonly emphasized techniques? In many classrooms, students are taught to tackle word problems with specific algorithms for each problem type, and they often develop a reliance on cookie-cutter equations without fully comprehending the underlying problem and the algebra used to solve it. Since many students do not understand the concepts behind these methods, it is important to explore a student's inherent approaches to problem solving and algebra. In this study, I explored middle school students' methods for solving word problems and their utilization of algebra for problem solving. This

study provided insights into middle school students' grasp of variables and their ability to develop equations with or without previous formal algebraic experience. It also suggested which techniques were more intuitive to the sample of students.

Wiebke Schneider [29], So., Department of Mathematics, Munich University of Technology, LibelleFly@aol.com
Title: Development of the AbiTUMath Program
Abstract: The AbiTUMath program was created to interest gifted high school students to study mathematics or physics at the Technical University of Munich and to foster a creative environment between talented high school and university students. Moreover, the intention of the program is to promote an interdisciplinary learning process between motivated students of mathematics and physics at the university level. A report on the program and several facts are given in the talk.

Lisa Tait [17], Sr., Arizona State University, Lisa.Tait@asu.edu
Title: Defining In College Geometry
Abstract: What is an angle? As college students endeavor to answer this question they are forced to organize their thoughts as to what constitutes this seemingly simple concept. As they attempt to define, incongruencies arise between their working and written definitions. Through small group discussions, whole class discussions and the guidance of the instructor these problems are addressed.

Griselle Torres-Garcia [23], Sr., Arizona State University, griselle@mathpost.asu.edu
Title: The Effects of Student-Teacher Ratio on Student and Faculty Performance in High School Scenarios
Abstract: We develop a model that incorporates the impact of student-teacher ratio on the performance dynamics of both teachers and students. The model assumes that the members of both populations may be found in three dynamic states: positive, discouraged and reluctant. The role of complex nonlinear interactions between students and teachers, as well as the role of recruitment and intervention, are studied via analytic and numerical studies. Using center manifold theory we find conditions for the existence of a backward bifurcation that support endemic stationary states below the critical threshold value $R_0 < 1$, when normally only a positive environment would be supported. Our simulations show that in order to maintain a positive environment for students and teachers, R_0 must be reduced significantly. Since R_0 is a function of student-teacher ratio this can be achieved by decreasing class size.

Josh Whitney [34], Sr., Arizona State University uhawhitney@yahoo.com
Title: Subgraph Summability Number
Abstract: Subgraph summability number is a vertex labeling problem on simple, undirected graphs and is defined as follows. A vertex labeling L on a graph G is said to be an N-labeling if, for every integer $1 \le i \le N$, there exists a connected induced subgraph H of G with $\sum_{x \in v(H)} L(x) = i$. The largest N for which G has an N-labeling is called the subgraph summability number and is written $\sigma(G)$. Results will be presented on the subgraph summability number of several graph classes, including a graph composed of two cliques sharing one vertex, a complete graph on n vertices with an extra vertex of degree m, and a corona graph.

Brock Wilcox [30], Sr., Northern Arizona University, rbw3@dana.ucc.nau.edu
Title: Pick a Number...
Abstract: Demonstration and variations of a math trick involving unique representations of integers.

Jonathan Winkler [15], Sr., Arizona State University jonwinkler@aol.com
Title: Mathematics vs. Cancer: New Ideas = New Weapons
Abstract: Humanity is fighting a deadly battle against a disease that kills thousands of people all over the world every year. The need for new "weapons"(ideas) in this difficult war is great, and Mathematics is one of the disciplines answering the call. This talk will be a review of some of the ways Mathematicians are using their expertise to help in this noble fight, and will include, if time permits, topics such as biological stoichiometry and siRNA treatment modeling.

M. Ian Wyckoff [42], Jr., Arizona State University, wyckoff@yahoo.com
Title: Winning Strategies for Particular Cases of Builder-Painter Game
Abstract: In this presentation an introduction to general Ramsey theory and its applications to the "Builder-Painter" game will be given, as well as a winning strategy for builder in a particular form of this game. The particular case has 3-colorable graphs as the class of all available graphs, a triangle as the desired graph to be produced, and the winning strategy applies for all vertex sets larger than some fixed constant C. Besides this particular example, winning strategies for other forms of the Builder-Painter game may be given if time is available.