

2005:

Summer Institute I (June 13, 2005 to July 15, 2005): Seventeen undergraduate students (all Freshman) were selected from CSUN and community colleges in the area, to participate in a five-week summer institute. The main objective of this institute is to give the students the opportunity to learn mathematics through discovery in groups and as individuals. The students were exposed to various issues ranging from mathematical modeling, solving problems with MATLAB package software, and reporting their results in papers using LaTeX. Each student received a stipend after completing this institute. The institute was organized through a daily program from Monday through Friday from 9:00am to 3:30pm as follows: Two hours lecture given by Professor Jacek Polewczak, followed by a one hour recitation session conducted a graduate student Adrianna Gillman. Then, during the afternoon, from 1:00pm to 3:30pm, the students were active in the computing laboratory to perform their numerical investigation. Various topics were studied such as numerical method for solving nonlinear equations, numerical methods for differential equations, and discrete dynamical systems with applications.

Summer Bridge Institute (June 13, 2005 to July 15, 2005): Seventeen undergraduate students (all Sophomores) from CSUN and local community colleges were selected to participate in a five week program. Of these fourteen participated in the entire program. Among the participants were three Hispanic students and one African American student. Each student received a stipend after completing this institute. The main objective of this Institute was to prepare students for success in abstract upper-division mathematics courses. Students studied set theory, elementary topology and the foundations of analysis. The program met daily from 9:30am to 12:00pm and from 1:00pm to 3:30pm, students attended lectures and recitation sections held by Robert Reiner with the support of graduate assistants. Special emphasis was given on the development of concise mathematical language, the writing and reading of proofs. Students also learned the use of LaTeX. Students gave oral presentations and prepared written assignments. Direct instruction and discovery methods were used. Two of the community college participants transferred to CSUN as mathematics majors the following year.

Summer High School Institute (August 8, 2005 to August 26, 2005): 23 11th grade students from local High Schools were selected to participate in this summer program. The selection of those participants was made based on academic records and results of an entrance exam. Professor Bernardo Abrego introduced these students to concepts of elementary number theory and combinatorics. He was supported by two graduate students, Margo Carr and Christopher Dyer. The students received a stipend for their participation. The group met daily from 8:30 am to 3:30 pm with a typical daily schedule was as follows:

8:30 am. Lecture and discussion of a mathematical topic (e.g.: Modular arithmetic)

10:00 am. Break

10:30am. Group

work on activities based on daily math topic discussed earlier

12 pm. Lunch

1:00 pm. Afternoon discussion or morning work. (e.g.: Which day of the week?)

1:30 pm. Group Work, Computer Lab (Mathematica and The geometer's sketchpad).

The program concluded on August 26 with presentation of Diplomas for successful completion of the program. 18 of the participants continued in Fall 2005 and Spring 2006.

Fall Semester 2005:

PUMP Undergraduate Seminar: We organized a weekly seminar for eight undergraduate students, all at the junior and senior levels. Each student was assigned a topic and he/she had the responsibility to present concepts, proofs, and answer questions at the black board in a limited time (twenty minutes for each part) to the entire audience. The main objective of this one hour and thirty minutes weekly seminar was to complement courses, expand students' mathematical horizons, and teach them how to find key points and central ideas. The preparation and the presentation of each student were supervised by four faculty from our Department. At the end of this seminar, the students had to take an assessment test. This was organized on Friday, December 16, 2005 from 9:00 am to 5:00 pm. Each student had to pick up (randomly) a topic. Then, he/she had four hours to prepare his/her presentation in the university library. Once the time was expired, he/she had to come to room JR214 or JR212 (there were two parallel sessions) to (a) present the prepared work in twenty minutes, (b) prove the presented results in twenty minutes, and (c) answer the questions of the jury during twenty minutes. Each of the eight students received a stipend at the end of this seminar.

PUMP High School Program: The program consisted on a weekly meeting from 3:30 pm to 5:30 pm every Tuesday from September 06 , 2005 through December 17, 2005. There 18 participants in the Fall 2005 program. Topics discussed included vectors in R^3 , the stereographic projection, matrices and eigenvalues, Fibonacci numbers, and Markov chains. The program was supervised by PI Helena Noronha with the assistance of graduate student Christopher Dyer.

2006:

Spring Semester 2006:

PUMP Undergraduate Seminar: We organized a weekly seminar for ten undergraduate students, all at the junior and senior levels. Each student had the responsibility to present a topic from the book "Fourier analysis on finite groups and applications, Audrey Terras , (1999)". At the end of this seminar, the students had to take an assessment test. This test was organized on Friday, May 27, 2006 from 9:00 am to 5:00 pm. Each student had to come at a specific time to pick up (randomly) a topic. Then, he/she had four hours to prepare his/her presentation in the university library. Once the time was expired, he/she had to come to room JR214 or JR212 (there were two parallel sessions) to (a) present the

prepared work in twenty minutes, (b) prove the presented results in twenty minutes, and (c) answer the questions of the jury during twenty minutes. Each of the ten students received a stipend at the end of this seminar.

PUMP High School Program: The program of Fall 2005 continued. Students worked on projects in Public Key Cryptography and Discrete Dynamics under the supervision of Prof. Bernardo Abrego and Christopher Dyer. The groups presented their findings in a Symposium in May 2006.

PUMP Research Project: One advanced undergraduate student participated in a research project under the supervision of Co-PI Werner Horn. The student Madjiguene Ndiaye investigated re-arrangements of conditionally convergent series.

End of 2005/06 activities

Start of 2006/07 Activities

Summer 2006:

Summer Institute I (June 19 -- July 22, 2006): Fifteen undergraduate students (all Freshman) were selected from CSUN, to participate in a five-week summer institute. The main objective of this institute is to give the students the opportunity to learn mathematics through discovery in groups and as individuals. The students were exposed to various issues ranging from mathematical modeling, solving problems with MATLAB package software, and reporting their results in papers using Latex. Each student received a stipend after completing this institute. The institute was organized through a daily program from Monday through Friday from 9:00am to 3:30pm as follows: Two-hours lecture given by Professor Jacek Polewczak, followed by a one hour recitation session conducted a graduate student Adrianna Gillman. Then, during the afternoon, from 1:00pm to 3:30pm, the students were active in the computing laboratory to perform their numerical investigation. Various topics were studied such as numerical method for solving nonlinear equations, numerical methods for differential equations, and discrete dynamical systems with applications.

Summer Bridge Institute (June 19-July 15, 2006): Seventeen undergraduate students (Sophomores and Juniors) from CSUN and local community colleges were selected to participate in a four week program. All participated in the entire program. Among the participants were six Hispanic students and one African American student. Each student received a stipend after completing this institute. The main objective of this Institute was to prepare students for success in abstract upper-division mathematics courses. Students studied set theory, elementary topology, and advanced linear algebra. The program met daily from 9:30am to 12:00pm and from 1:00pm to 3:30pm, students attended lectures and recitation sections held by Professor Jerry Rosen with the support of a graduate assistant (Kahroline DiPassero). Special emphasis was given on the

development of concise mathematical language, the writing and reading of proofs. Students also learned the use of LaTeX. Students gave oral presentations and prepared written assignments. Direct instruction and discovery methods were used.

Summer High School Institute I (June 5-June 23, 2006): 26 11th grade students from local High Schools were selected to participate in this summer program. The selection of those participants was made based on academic records and results of an entrance exam. Co-PI Alberto Candel introduced these students to concepts in Graph Theory, Linear programming, Markov chains, Geometry, and Mathematics of DNA. The students received a stipend for their participation. The group met daily from 8:30 am to 3:30 pm with a typical daily schedule was as follows:

8:30 am. Lecture and discussion of a mathematical topic (e.g.: Modular arithmetic)

10:00 am. Break

10:30am. Group work on activities based on daily math topic discussed earlier

12 pm. Lunch

1:00 pm. Afternoon discussion or morning work. (e.g.: Which day of the week?)

1:30 pm. Group Work, Computer Lab (Mathematica).

The program concluded on June 23 with presentation of Diplomas for successful completion of the program. Most of the participants continued in Fall 2006 and Spring 2007.

Summer High School Institute II (August 14-September 1, 2006): 27 11th grade students from local High Schools were selected to participate in this summer program. The selection of those participants was made based on academic records and results of an entrance exam. Professor Bernardo Abrego introduced these students to concepts of elementary number theory and combinatorics. He was supported by two graduate students, Margo Carr and Christopher Dyer. The students received a stipend for their participation. The group met daily from 8:30 am to 3:30 pm with a typical daily schedule was as follows:

8:30 am. Lecture and discussion of a mathematical topic (e.g.: Modular arithmetic)

10:00 am. Break

10:30am. Group

work on activities based on daily math topic discussed earlier

12 pm. Lunch

1:00 pm. Afternoon discussion or morning work. (e.g.: Which day of the week?)

1:30 pm. Group Work, Computer Lab (Mathematica and The geometer's sketchpad).

The program concluded on September 1 with presentation of Diplomas for successful completion of the program. Most of the participants continued in Fall 2006 and Spring 2007.

Fall Semester 2006:

PUMP Fellows: Four mathematics undergraduate students at CSUN were selected to be PUMP Fellows in this semester. All of these students were seniors, who have participated

in various PUMP activities before. Among the Fellows were three Hispanic students and two women. They received a stipend for the semester and participated in the other activities for the semester. The support was renewable for the following semester provided that the students make satisfactory progress toward their degree.

PUMP Undergraduate Seminar: 10 undergraduate students participated in a seminar on Linear Lie Groups, organized by PI Noronha. Among the participants were 3 women and 5 Hispanic students. The seminar used topics from “Foundations of Differentiable Manifolds and Lie Groups” by Frank Warner.

PUMP Undergraduate Research Project: (Fall 2006-Spring 2007) Nine undergraduate students (all at the junior and senior levels) were offered to conduct a research project during the 2006-2007 academic year. Seven faculty accepted to be advisers of these students (one faculty advised three students). Examples of research topics included Projection of 3-Dimensional Objects to R^2 , The Rat Maze, Estimating the pinching constant of a manifold with assumed p -form curvatures, The Automatic Classification of Biomedical Particles in Urine Sample, and Dressing Actions. An REU Mini-Symposium was organized on Friday, April 27, 2007 where these nine students gave an oral and poster presentation of their work. The posters are currently displayed in the Department of Mathematics. All students prepared written papers on their findings which will be published on the PUMP website. Each student received a stipend.

PUMP High School Program: 42 of the participants of the two Summer High School Institutes met weekly at CSUN under the supervision of Co-PI Alberto Candel. The meetings were on Tuesdays from 4 to 6pm.

Intersession (January 16- January 26, 2007): There were 52 participants split in two institutes, depending on their mathematical background.

Institute I was run by A. Alekseenko and attended by lower division mathematics students. It covered Euclidean and Analytic Geometry and an introduction to the Geometry of curves and surfaces.

Institute II was run by co-PIs Noronha and Djellouli:

Topology: Fundamental Groups: Examples of simply connected spaces and the Fundamental group of the circle.

Applied Math: Power series methods for ordinary differential equations.

2007:

Spring Semester 2007:

PUMP Fellows: Three of the four Fellows were retained. All three graduated in May 2007 and will start a graduate program in mathematics in Fall 2007.

PUMP Undergraduate Seminar: 46 undergraduate students participated in two seminars.

Seminar 1 was organized by PI Noronha and was attended by students in lower division courses. It covered Arc Length, Metric Spaces, Mobius Transformations, and Spherical and Hyperbolic Geometry via the two Poincaré Models.

Seminar 2 was organized by Prof. Terry Fuller was attended by students in upper division courses. It covered the topology of surfaces, introduction to algebraic topology and non-orientable surfaces.

GRE Preparation: Co-PI Werner Horn offered a workshop to prepare students to take the GRE subject test in Mathematics. 8 undergraduate students participated in this weekly workshop. The workshop was open to all undergraduate students.

PUMP High School Program: The program of Fall 2006 continued under the direction of Prof. Bernardo Abrego and Boian Djonov (graduate Assistant). Students worked in groups on eight different projects:

1. Tiling the Plane: Determining all possible ways of tiling the plane with regular polygons and also with two kinds of regular polygons in such a way that the tessellation is transitive in vertices.
2. Security Cameras: Finding the least number of security cameras needed to guard a polygon (art gallery) with n sides. Also determine where those cameras should be placed.
3. Counting Squares: Determine the number of squares with vertices in the $n \times n$ square lattice.
4. Magic Squares: Construct Magic squares of any order. (All rows, columns and main diagonals have the same sum).
5. Areas of Lattice Polygons: Find a way of calculating the area of a polygon on the square grid by counting interior and boundary lattice points (Pick's Theorem).
6. Coloring Triangles: Show that any 3-coloring of a triangulation with the boundary conditions that each side of the large triangle uses only two colors, and the vertices of the main triangle have the three colors; satisfies that a small triangle always has three colors (Sperner's lemma in the plane).
7. One-Way Streets: Calculate the efficiency of classical one-way street assignments in square grid cities. Do the same by imposing conditions like no left turns allowed.
8. Volumes of Diophantine boxes: Find the number of boxes with integer sides and a given volume V .