Rutgers Young Scholars Program in Discrete Mathematics

Sample Schedule and Courses

This is a sample schedule, based on previous years'programs. It is presented here as an example of the kinds of activities you can expect to participate in if you attend the program. This summer's schedule may not necessarily be the same.

Schedule

7:30 - 8:30	Breakfast (except Monday)
8:30 - 11:00	Morning Instructional Session
11:00 - 12:00	Homework Session
12:45 - 1:15	Recreation
1:15 - 3:45	Afternoon Instructional Session
3:45 - 4:45	Homework Session (ends at 4pm on Friday)
4:45 - 5:45	Variety Sessions (except Friday)
6:00 - 6:45	Dinner
6:45 - 8:00	Scheduled Open Recreation
8:00 - 10:00	Residential Programming
10:00 - 11:00	Free Time

This is the typical schedule for most days – except Fridays, when the program ends at 4:00. The schedule is modified for certain activities that may require more time, or for special activities.

Each instructional session (except Monday) begins with a homework review session at which you will be presenting your solutions to homework assigned the previous day, and it concludes with a homework session based on material introduced in the instructional session.

Each week there is a five-session morning course and a five-session afternoon course, each taught by a college professor. Following is a sample sequence of the eight courses; some may be replaced by other courses

Week 1	AM:	General Mathematics Background
	PM:	Introduction to Vertex-Edge Graphs
Week 2	AM:	Combinatorics
	PM:	Graphs: Algorithms & Applications
Week 3	AM:	Number Theory
	PM:	Probability
Week 4	AM:	Coding and Cryptography
	PM:	Problem Solving

During the instructional sessions, you will be working in a group of 4-5 students together with a teaching assistant, who is a Rutgers undergraduate student with a focus on

mathematics or computer science. During the instructional session, there will be several repetitions of the following cycle: the instructor will present some material, you will discuss the material with your group and do some problems, and the material will be discussed by everyone. At the conclusion of the homework session, the teaching assistants will announce who will present each of the homework problems the next day. There won't be homework sessions in the evening, but you will need to prepare your homework presentation, and you may be given additional optional challenging problems on which you can work.

Variety Sessions

The final program of the afternoon will be the variety session, held on Monday-Thursday from 4:45 to 5:45. It is called the "variety session" because we schedule a variety of activities during this period. The variety sessions might include presentations on "The Netflix Competition," "Game Theory," "The Online Encyclopedia of Integer Sequences," "Auctions," "Mathematical Forensics," etc., presented by college professors or industrial mathematicians from Google, concerts, mathematical challenges, tours of Rutgers campuses, discussion of mathematical careers, etc.

Scheduled Open Recreation

On most evenings after dinner there will be a 1½-hour open recreation period, so that those of you who wish can go swimming, work out, play basketball, racquetball, or volleyball, explore Rutgers computers labs, work on the YSP "monthbook" or T-shirt, etc. The Open Recreation period is under the supervision of the three residence life counselors, so that each evening there will be up to three choices of activities.

Residential Evening Program

During the residential evening program (generally from 8pm to 10pm), you will be involved in fun activities conducted by the residence life counselors. Some of these activities might include a participant talent show, roommate games, international food exchange night, work on committees, and much more. Between 10pm and 11pm each evening, you have free time, during which some of you might continue to work on homework, but others may want to relax or watch movies. During this time, participants will be expected to remain inside the residence hall.

Content of courses

Assuming that the eight courses will be the courses listed above in the indicated sequence … following are how some instructors have described their courses:

In the first week, the morning course will focus on strengthening your general mathematics background; topics include mathematical induction, basic logic and types of proof, the use of mathematical abstraction in practical problems, and basic counting arguments. The afternoon course will focus on basic concepts of graph theory, including directed graphs, Euler tours, and Hamilton cycles.

In the second week, the morning course on combinatorics will focus on techniques for systematic listing and counting – for example, how many different pizzas can you make using three of eight available toppings? The afternoon course, building on the graph theory course in the first week, will focus on applications of graphs to a variety of situations, such as finding the shortest route for delivering a number of packages, and on the algorithms that are used to solve such problems.

In the third week, the morning course will focus will focus on number theory – for example, what are the first three numbers that are 1 more than a multiple of 3, 2 more than a multiple of 5, and 3 more than a multiple of 7? The afternoon course will focus on probability, building on the combinatorics course of the second week.

In the fourth week, the morning course will focus on coding theory and cryptography, important applications of the number theory course in the second week. The afternoon course on problem solving discusses general problem-solving techniques, but focuses, in particular, on problems involving puzzles and games, and revisits the problems that accompanied the Application Kit, and other such problems. The week concludes with a Tour D'Euler, a problem-solving competition for teams of participants.