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What's News—

Business and Finance

THE U.S. ECONOMY GREW ...t a 2.5% annual rate last ...own sharply from the ...s 5.6% increase, as ...k on spending ...ed. Con- ...highest ...ost-

World-Wide

■ **DIPLOMACY INCHED ahead, with no end to Mideast fighting in sight.** Bush and Blair backed a cease-fire resolution likely to pass the U.N. next week, but it won't demand an immediate end to hostilities and the president said disarmament of Hezbollah and its eviction from south Lebanon should be part of a deal. That means guns may not go silent until advance elements of a peacekeeping force are ...loyed, which will take some time. ...wants the U.N. to begin work ...forming one, but Israeli ...world body is running ...cused it of bomb- ...urpose. Rice ...Hezbollah ...t into ...4)

Dear Mom and Dad: Please Send Cookies And a New Calculator

Math Camps Spread for Kids Who Can't Get Enough; Alice's Moment of Glory

By JOHN HECHINGER

SANTA CRUZ, Calif.—A breeze swept through a redwood grove. Surfers rode the Pacific waves. It was a perfect summer day in Northern California, but 10-year-old Ryan Yoo was oblivious to the world outside a windowless lecture hall.

Ryan was exploring the outer reaches of infinity, represented by the Greek letter omega. "Is there any number bigger than omega to the omega to the omega?"

Ryan Yoo

Ryan asked his renowned professor, Princeton University mathematician John Conway.

"Yes!" Prof. Conway replied and turned to the blackboard to scribble a cascade of omegas that expressed the bewildering numbers beyond infinity.

A college math student might grapple with this topic in an advanced elective. Ryan was stretching his elementary-school mind at MathPath, perhaps the nation's toughest summer camp for numerical prodigies.

Math camps are multiplying in part because families are seeking an edge in competitive college admissions and worry about the quality of U.S. math instruction. Last summer, parents paid $280 million to send 120,000 children to academic summer camps, with math among the most popular subjects, according to Eduventures, a Boston research firm, which estimates enrollment is climbing 10% a year. Sylvan Learning Centers, the big tutoring company, says participation in summer math programs, including day camp, jumped 23% last year—twice the rate of other subjects.

The American Mathematical Society counts two dozen "challenging summer math programs"—twice as many as seven years ago. Most focus on high-school students. MathPath caters only to middle-school kids, age 10 to 14. It is also smaller—and more selective—than some better known programs.

About 80,000 kids in second through eighth grade, for example, take part in the annual "talent search" run by Johns Hopkins University's Center for Talented Youth. Through the search, about 70% qualify for summer camps across the country and some 10,000 enroll in a given year.

By contrast, almost 400 applicants took the eight-question MathPath quiz this year vying for a chance to learn at the feet of leading mathematical luminaries from top American colleges. Only 71 won admission.

The test, which explores number theory, probability and the vertices of a regular tetrahedron, requires applicants get at least four of the eight questions right and include detailed proofs. Many stu-

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Tony *and* **Danny Batou** *in Shelby Township, Mich., with a picture of their cousin Sandy Gbou, kidnapped in Baghdad in May.*

With Profits Flusi

Math Camps Spread Across Country for Today's Calculating Kids

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dents spent weeks completing it.

A sample question: "What is the largest integer that divides p^4-1 for all primes p>3? Justify your answer." (The solution: 48)

Michael Sipser, head of the mathematics department at the Massachusetts Institute of Technology, says the exam "would be challenging to most MIT undergraduates."

This year, MathPath campers are taking classes at the University of California at Santa Cruz, where students live in wood-shingled dorms overlooking the ocean and share winding paths with small herds of deer. The four-week program, ending today, costs $4,500.

On a recent weekday, Ryan Yoo wore a surfing T-shirt and looked tiny compared with some of the lanky 14-year-old boys in their sleeveless basketball jerseys and Harvard sweatshirts.

Jordan Hirsh

Ryan, who says he hasn't been homesick despite his first long separation from his parents, is studying Einstein's theory of relativity and wants to be a physicist. He has also read King Lear, written acrostic poetry and plays golf and cello. MathPath "is much more challenging than I thought," says Ryan, who lives in Los Angeles. "I'm learning to expand my horizons."

Many parents of MathPath students, including Ryan's, are highly-educated immigrants from China, South Korea and other countries who don't share native U.S. notions of carefree summer days.

"Ryan has found something he's really good at," says Gia Yoo, Ryan's mother, a chemist who was born in Korea. "I'm helping him shine. I don't think that many American parents drive kids that hard."

Ermek Nurkhaidarov, a mathematics professor who grew up in Kazakhstan, enrolled his 12-year-old son in the program because it evoked memories of a teenage Soviet math camp he enjoyed in Siberia. "I wanted to give my son every advantage," he says.

George Thomas, an Indian-born mathematician, founded the camp in 2001. He earned his Ph.D. in Canada, and taught at a liberal arts college in South Carolina before he says he found his calling one summer teaching high-school students in Vancouver. He decided that these precocious kids often asked better questions than college students. So he started the still-running Canada/USA Mathcamp for high-school students, before launching MathPath to concentrate on "profoundly gifted" middle-schoolers. He recruits professors from the University of California system, the University of Wisconsin, Swarthmore and Princeton.

The opening lecture begins at 9 a.m. sharp. Talks and breakout sessions on such advanced subjects as number theory and combinatorics—or counting and manipulating sets of numbers or other elements—run until 5 p.m., with breaks for lunch and dinner. One night, a movie on statistics was scheduled to begin at exactly 6:24, so the 26-minute-long film would end in time for what MathPath calls "relatively silent sustained mathematics"—or about an hour of homework. Students get time off for ping pong, soccer and other sports, as well as visits to

Probability Puzzler

A question from this year's MathPath qualifying quiz:

Q. Alice and Bob alternate tossing a fair coin, Alice going first. The first one of them to toss a "head" immediately after the other tosses a "tail" is the winner. Find the probability that:

(a) Alice wins on her first toss (we're checking that you read carefully).

(b) Bob wins on his first toss.

(c) Alice wins on her third toss.

(d) Bob wins on his fifth toss.

(e) Alice wins.

Answers

(a) 0 (b) 1/4 (c) 1/8 (d) 9/1024 (e) 4/9

Source: MathPath

the beach, hikes, bike rides and field trips to an aquarium and San Francisco.

But Jordan Hirsh, 14, can't get enough math. Spending his second year at the camp, he dreams of solving the famed Riemann Hypothesis, a 19th century problem that has long frustrated the field's brightest minds. An institute in Cambridge, Mass., has offered $1 million to anyone who can crack it. "I love math," says Jordan, who lives in Silver Spring, Md. "I feel like I belong here."

After nearly three hours of morning classes, Jordan turned to a working lunch. The middle-schooler snagged a seat in the cafeteria next to the gray-bearded Prof. Conway, 68.

Prof. Conway pored over Jordan's notebooks, which contain what the teen believes is a wholly original exploration of the algebraic expression of decimals. The professor is best known for discovering "surreal numbers," or the infinitely large or infinitesimally small numbers that lurk in the interstices between and beyond ordinary numbers.

Gently, Prof. Conway broke the news: Jordan's work, while advanced, isn't new. Jordan cast his eyes downward and could barely bring himself to nibble on a cookie.

Other moments are more triumphant. At 5 p.m., at the close of formal classes, Alice Xie, 14, was called before 70 students in the lecture hall to answer a thorny problem: "What is base b when 554 in base b is the square of 24 in base b?"

One of 15 girls in the program, Alice is a child of Chinese immigrants who lives in New York City and attends competitive Hunter College High School. In the silent lecture hall, Alice's chalk clicked across the blackboard like tap shoes on a Broadway stage. Row upon row of equations boiled down to the answer: 12. The class applauded.

Later that evening, the sun started to set over the Pacific and dusk bathed the hillside campus in a faint red glow. Other kids were done with their hour of homework and were goofing off in the common room. "Be quiet!" Alice ordered, her shoulders hunched over another problem in her notebook.

"I could go outside and play soccer instead of finishing my homework, but I'd be wasting my time," she said. "I came here to do math."

WSJ.com **Online Today:** *WSJ.com subscribers can try their skill at the 2006 MathPath qualifying quiz, at* **WSJ.com/OnlineToday**.