PuzzleCorner

Well, I survived another vacation! Each August, we go for two weeks to Sandy Island in Lake Winnipesaukee, a family camp run by the Boston YMCA. My main goal is to avoid embarrassing myself in either of the Sunday camper/staff softball games (i.e., not striking out or making too many errors). This is getting more important each year as my Little League sons are waiting to pounce. Well I did all right the first week and had to drive my wife, Alice, to the airport on the second Sunday so was relieved—until I returned from the airport to find that my 12-year-old (one year shy of the minimum age for participation) was "famous." He was somehow playing third in the game and a bad hop hit him just below the eye. Fortunately, he just had a bad swelling and, even more fortunately, it was almost gone when we arrived home six days later.

Problems

N/D 1. Larry Kells writes that while kibitzing a high-stakes game, he saw declarer bid and make 7 no-trump redoubled and vulnerable. In the aftermath, the defenders, a married couple, were arguing heatedly:

Wife: How many times do I have to tell you to stop making those risky speculative doubles? You've cost us thousands of dollars that way!

Husband: But I had 26 points. I thought I could beat 7 no-trump.

Wife: You see perfectly well that we had no defense. Next time don't double 7NT in that position unless you have all 4 suits completely stopped!

Assuming they were both telling the truth, reconstruct the deal.

N/D 2. Nob Yoshigahara wants you to solve the following criptarithmetic problem.

SEND PROBLEMS, SOLUTIONS, AND COMMENTS TO: ALLAN GOTTLIEB
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N/D 3. Martin Kalinski, a former Baker House colleague, asks a common question about palindromes. Kalinski reminds us that a palindrome is a positive integer that reads the same right to left as left to right. For example, 121 and 1331 are palindromes. Take a non-palindrome like 57 and add to its reverse: 57 + 75 = 132. Keep going and get 132 + 231 = 363, which is a palindrome. Will this procedure always yield a palindrome? Note that it is easy to find numbers that do not yield a palindrome after two applications of "adding the number to its reverse." The question: is are there any numbers that never yield a palindrome?

Speed Department

Larry Kells wonders if you know an English word with a quadruple letter?

Solutions

Jul 1. Jorgen Harmse is greedy. He wants South to make a bid of 1NT redoubled with 6 overtricks (for the highest possible declare score) against best defense after a reasonable auction. Your editor is not a Bridge guru but when I become omnipotent you will get more points for bidding and making 7NT redoubled than for bidding 1NT redoubled and making 7.

The following solution is from Robert Holt: North-South are playing weak no trumps, so South (assume South deals with both vulnerable) opens 1 no trump. A popular way of dealing with weak no trumps is to double with the top of the no trump range. Say East-West have agreed to double with 13+ high card points, so West doubles. Now N-S play Brozel runous, so North passes. If East-West remain silent, this forces South to redouble, and then North either passes with a strong hand or bids his long suit with a one-suited hand. (Two-suiters by North are shown with two-level bids or an immediate redouble.) East has nowhere to go, so East passes. South redoubles, and West, who thinks his or her kings are well placed and has a natural diamond lead against no trump, also passes. Now North decides that his hand is strong enough to sit for the redouble, and passes. East knows that E-W have half the high card points and doesn't have a decent suit to run to, East passes as well. Now South makes all 13 tricks by finessing as deeply as possible whenever clubs and spades are played.

	North ♠ A Q T 6 5 4 ♥ A 6 5 ♦ 7 6 ♣ 5 4	
West ♠ K J ♥ K 9 8 7 ♦ K Q J T ♣ 8 7 6		East ♠ 9 8 7 ♥ Q J T ♦ 5 4 3 2 ♣ K J 9
	South ♠ 3 2 ♥ 4 3 2 ♦ A 9 8 ♣ A Q T 3 2	

Jul 2. Nob Yoshigahara wants you to find three positive integers. 1) The smallest integer having the property that the first 10 digits of its square root are unique. 2) The smallest integer whose square consists of 10 digits all unique. 3) The smallest integer having the property that the first 10 digits of its reciprocal are unique.

I agree with the proposer's solutions, namely 1362, 32043, and 38. Robert Holt obtained the same solutions but adds that if leading zeros are not permitted for #3, the answer is 648. Holt also notes correctly that I should have said "distinct" rather than "unique."

Jul 3. Timothy Maloney is not at all afraid of sunburns.

Just before a business trip to Manila (14 degrees N latitude) around the end of April, I calculated that the sun should be directly overhead around noon, and indeed it was. For a spherical earth in a circular orbit around the sun with the earth's axis tilted at 23 degrees with respect to its orbital plane, find an exact trigonometric expression to give the latitude at which the sun is directly overhead (around noon) as a function of time of year.

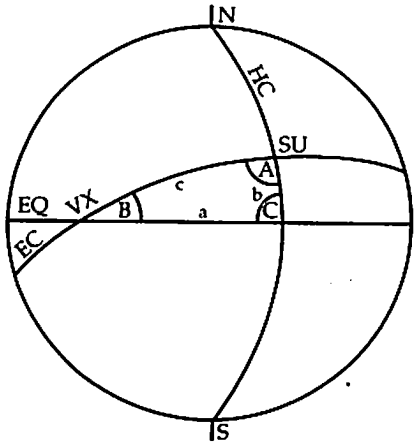
James Abbott sent us the following fine carefully drawn solution (see page MIT 40):

It can be shown by geometry that if a point on the earth's surface has the sun directly overhead, the latitude of the point is equal to the sun's declination. This quantity varies throughout the year and, for the real Earth, is tabulated in various almanacs. Our job then becomes one of deriving an expression for this same quantity for the fictitious earth described in the problem.

Continued on Page MIT 40

Puzzle

Continued from Page MIT 62



The above figure represents an imaginary sphere with the Earth at its center and having projected upon it the earth's equator EQ, the poles N, S, the Sun SU, and the ecliptic EC.

The vernal equinox VX marks the transition of the Sun from south to north along the ecliptic and is a convenient reference point for locating the Sun at any time of year. The calendar date of the vernal equinox varies from year to year and must be obtained from an almanac or similar source for the year desired.

The great circle HC (hour circle) passes through the images of the Sun and the poles. Together with EQ and EC this circle forms a spherical triangle with sides a, b, and c and corresponding angles A, B, and C. For a circular orbit we may assume that the orbital speed is uniform and therefore the length of side c is directly proportional to the time elapsed since the sun's transit of VX.

It can be shown that angle B is equal to the tilt of the earth's axis. Angle C is by definition a right angle. Side b is the measure of the Sun's declination, which is the quantity to be determined.

According to the law of sines for a spherical triangle,

sin b/sin B = sin c/sin C

Since angle C is by definition a right angle, the expression reduces to:

sin b = sin B * sin c.

To determine side c, we subtract the time of VX (taken from an almanac for the given year) from the desired time of year and multiply the result by the rate of change of side c per unit time.

Let T = time of year†
TVX = time of equinox transit†
Y = length of a full year†
P = angular units in a full circle (e.g., degrees)

Then c = (T-TVX)*P/Y

Since B is given as 23 degrees,
b = arcsin (sin 23 deg. * sin ((T-TVX)*P/Y)

Example:

Let T = noon GMT, April 30,1994
This converts to 119.50 days from 0:00 GMT 1/1/94.

From the *World Almanac*:
TVX = 20:28 GMT, March 20, 1994
This converts to 78.853 days from 0:00 GMT 1/1/94.

Letting angles be expressed in degrees,
P = 360
Y = 365.25 days
B = 23

Solving for b by the formula
b = arcsin (0.3907 * sin((119.50 - 78.853)*360/365.25))
= 14 deg. 34 min.

Again from the *World Almanac* (for the real earth):
Sun's declination for time T = 14 deg. 38 min.

†consistent units

Other Responders

Responses have also been received from F. Carbin, D. Detlefs, S. Feldman, M. Fountain, W. Hartford, R. Hess, M. Lindenberg, R. Moeser, K. Rosato, J. Spalding, A. Taylor, and D. Wachsman.

Proposer's Solution to Speed Problem

Glowworm, 4 u's in a row!

which he describes as "a research firm dedicated to progress in automated fabrication technologies and applications." His company produced the first of the so-called PC clones. He received a PhD in physics at the University of Texas at Austin in 1991. He has published extensively and has also been a keynote speaker at conferences around the world. . . . Another entrepreneur, Bengt Mutén, has founded Mutén and Associates, which "provides strategic consulting to the railroad industry, evaluating and predicting the effects of major changes such as mergers, acquisitions, divestitures, and facilities restructuring, as well as providing the software tools for these projects." Bengt spent 14 years with DNS Associates developing transportation analysis models, eventually becoming VP in charge of their consulting practice. Bengt has an MS from the University of California/Berkeley School of Engineering.

Robert Hone is the co-author of a book called *Making Movies with Your PC*. He also was producer, director, and writer of two hour-long installments of the international PBS-BBC documentary *The Machine that Changed the World*. . . David Band is an astrophysicist at UC/SD studying gamma ray bursts. His wife, Debbie, is an artist and they have two sons, ages 10 and 7 . . . John Kowalik and his wife, Michele, are the proud parents of Grant, born in October 1993. Older brother Ross is 5 years old and "is looking forward to teaching his brother everything about Power Rangers." John still manages institutional bond portfolios for Prudential Fixed Income Advisors in Short Hills, N.J.

Andrew Weiner and his wife, Brenda, have a new daughter, Roberta Alyssa, who was born last December. Since October 1992, Andrew has been a professor of EE at Purdue, working to establish a research program in ultrafast optics and high-speed optical communications. Last fall, he canoed the Tippecanoe River in northern Indiana with Jeff Dugal. . . . Shahriar Negahdaripour has received tenure in the department of Electrical Computer Engineering at the University of Miami. . . . Peter Bunin has become the VP and general manager of Outokumpu Copper Kenosha in Kenosha, Wisc.

Some classmates were mentioned recently in the MIT Alumn/aei Association newsletter. Stephanie Littell is the president of the MIT Club of Northern California. Back at the 'Tute, Reggie Van Lee organized a panel entitled "Succeeding at MIT and Afterwards" as part of a Black Student/Alumni/ae Day in March. Meanwhile, David C. Lee set up a fax-on-demand service and a voice bulletin board to enable CAMIT members to find out about that group's activities. (For those of you who are rusty on your acronyms, CAMIT is Chinese Alumni/ae of MIT).

Some news about your Faithful Secretary. Back in 1770, Samuel Johnson referred to a second marriage as "the triumph of hope over experience." I am apparently among the hopeful, and was recently engaged to be married! More news about the event itself in future columns. Until then, keep those cards and letters coming.—Sharon Lowenheim, secretary, 98-30 67 Avenue, Apt. 6E, Forest Hills, NY 11374

80 15th Reunion

Just a few notes this month: Sai B. Long has been quiet for a few years but wrote to let us know what he's been up to. Sai has been crunching away at Exxon for eight years; the last six in Houston (where it is HOT!). He and his wife, Wendy, have two beautiful girls, Deanna (6) and Tiffany (3). "The girls keep Daddy straight and busy!" according to Sai. . . . Charles Wilson writes he is "surviving the bad press of *Tech Review* and other publications and Congressional budgets to move the F-22 Advanced Tactical Fighter closer to operational status." Testing starts in two years and Charles can't wait. "This plane will assure superiority over the hundreds of new planes being sold by our 'allies' around the world every year."

Through a news release we get news of James Scutti. James has joined Massachusetts