ALLAN J. GOTTLIEB, '67

Dances with Words

I have some very sad news to pass along. A friend of our long-time correspondent Robert High found my name in his files and phoned me to report that he was killed on 8 January while white-water rafting in Chile. Apparently High was quite an adventurist and the expedition was considered daring. I shall miss him.

On a more pleasant note Harold Boas read our January speed problem in which one cancels the 6s to show that 64/16 = 1/4 and remarks that his father, the well-known mathematician R.P. Boas, wrote a paper on this subject that appeared in the 1979 MAA volume entitled *Mathematical Plums*, edited by Ross Honsberger.

Problems

M/J 1. We start with a Bridge Problem that Tom Harriman calls "Superwiener."

North
♠ 10 9 8 7 6
♥
♦ A K
♣ A 10 9 8 7 6

West	East
♠	♠ 5 4 3 2
♥ 9 8 7 6 5 4	♥ K Q J 10
♦ 6 5 4 3 2	♦
♣ 3 2	♣ K Q J 5 4

South
♠ A K Q J
♥ A 3 2
♦ Q J 10 9 8 7
♣

M/J2. Richard Kluger asks the "surname problem." A hypothetical planet contains n males with n distinct surnames married to n females. In this and all future generations, all females marry, assume their husbands' surnames, and bear 2 children who mature, marry, etc. A child has a 50% chance of being female. How many distinct surnames exist after k generations? Couples with identical surnames, including siblings, can marry but transgenerational marriages are not possible.

M/J 3. John Prussing needs help in stalking a drug runner.

A Coast Guard skipper named Pedro is stalking a drug runner named Biff. Both boats are at rest separated by a distance a. A fog rolls in and Biff flees in a *constant* but unknown direction at a speed b. Pedro knows the values of a and b and the fact that his boat is twice as fast as Biff's.

a) Determine a simple pursuit strategy which will guarantee that Pedro will intercept Biff in a finite time.

b) Determine the minimum and maximum possible intercept times (the intercept time will vary depending on the direction Biff flees).

Speed Department

Here's one Winslow Hartford found in a British newspaper. Five Wrens were standing in the crowded mess on HMS *Seaworthy* during an evening's get-together and dance. The ladies' "excuse-me" was about to come up, causing some discussion among the five. Brenda rather liked the petty officer with the ginger hair, Norma fancied the able-seaman with the green eyes, Linda wanted a helicopter pilot, Enid had her eye on a six-foot marine, while Rachel was secretly determined on the Captain himself. Next day, the five women gathered for critical discussion. "That's odd," said Rachel, when the names of their dancing partners became known. "If each of us adds a different letter of Wrens to her own name, and rearranges the letters if necessary, she gets her man's name." What were their partners' names?

Solutions

JAN 1. Edward Wallner sent us the following problem from "the gamesman" column in *IEEE Potentials*, where it was credited to Cindy Furst. Ms. Furst claims that every electrical engineer should be able to fill in the four blanks:

10, 11, 12, 13, 15, 16, 18, 20, 22, 24,
27, 30, 33, 36, 39, 43, 47, 51, 56, 62,
__, __, __, __, 100.

Violet Devoe notes that the numbers are the standard values of capacitors and resistors and the missing entries are 68, 75, 82, 91. I guess she should know since, in addition to being the mother of two MIT grads, Ms. Devoe is the president of Presidio Components, a USA manufacturer of capacitors.

JAN 2. Temple Patton has a plot of land in the form of a right triangle with all sides an integral number of feet. If the short side is 30 feet, what is the area? What if the short side is 31 feet?

Tom Eggers writes that there are three triangles with short side 30, having areas of 1200, 2160, and 6720. There is only a single such triangle with a side of 31, and its area is 14880.

The general solution for right triangles with integer sides is to solve $x^2+y^2 = z^2$ in integers. All the solutions for that equation are found by choosing integer values for u and v in

$$x=2uv;\ y=u^2-v^2;\ \text{and } z=u^2+v^2.$$

Also, if a side of 1,2,3,5,6,15, or 30 can be found with some values of u and v, then the resulting side (and its triangle) can be scaled up to provide a solution.

First look for solutions of $y=u^2-v^2 = \{1,2,3,5,6,15,\text{or } 30\}$. A little straightforward work will show that: $\{u=2,\ v=1\}$ results in a 3,4,5 right triangle which scales to 30,40,50; $\{u=3,\ v=2\}$ results in a 5,12,13 triangle which scales to 30,72,78; $\{u=8,\ v=7\}$ results in a 15,112,113 triangle which scales to 30,224,226; and $\{u=4,\ v=1\}$ results in a 8,15,17 right triangle but 30 is not the short side after scaling.

Next, look for solutions of $x = 2uv = \{1,2,3,5,6,15,\text{ or } 30\}$. A little more straightforward work finds: $\{u=1,\ v=3\}$ results in a 6,8,10 triangle which scales to 30,40,50, a duplicate; and $\{u=1,\ v=15\}$ results in the triangle 30,224,226 without any scaling, another duplicate.

So there are three right triangles with a short side of 30: 30,40,50 has an area of 600; 30,72,78 has an area of 1080; and 30,224,226 has an area of 3360. We'll hope Temple Patton owns the last plot.

There is only one solution for a side of 31: The triangle 31,480,481 has an area of 7440. If one of the legs is a prime, then there is only a single solution: $2uv$=prime has no (useful) integer solutions, and u^2-v^2 =prime has only one solution, u=(prime+1)/2 and v=(prime-1)/2.

Better Late Than Never

A/S 1. As noted by several readers, Black can escape with 5 ... K-B6. Eugene Sard remarks that an extra White pawn on Q2 solves this.

Other Responders

Responses have also been received from J. Abbott, M. Astelfi, F. Carbin, E. Cummings, S. Feldman, M. Fountain, R. Hedrick, R. Hess, T. Lewis, M. Lindenberg, T. Maloney, E. Margulies, N. Markovitz, F. Model, A. Ornstein, D. Patter, A. Peralta-Maninat, K. Rosato, C. Rozier, J. Rudy, S. Shapiro, T. Shepard, A. Silva, A. Silva, L. Steffens, H. Ungar, J. Uretsky, and M. Weinstock.

Proposer's Solution to Speed Problem

Brenda + R gives Petty Officer BERNARD
Norma + N gives Able Seaman NORMAN
Linda + E gives Helicopter Pilot DANIEL
Enid + W gives Marine EDWIN
Rachel + S gives Captain CHARLES.

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