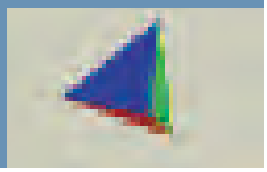


Brain Ticklers

RESULTS FROM SUMMER

Perfect

*Bohdan, Timothy E.	IN	Γ	'85
*Couillard, J. Gregory	IL	A	'89
*Gerken, Gary M.	CA	H	'11
*Kimsey, David B.	AL	A	'71
*Norris, Thomas G.	OK	A	'56
*Strong, Michael D.	PA	A	'84
*Thaller, David B.	MA	B	'93

Other

Aron, Gert	IA	B	'58
Bernacki, Stephen E.	MA	A	'70
Brule, John D.	MI	B	'49
Ciaravino, Vito A.	MI	Γ	'01
DeSelms, Bradley C.	MO	A	'82
*Ehrgott, Jr., M. Charles	FL	E	'92
Gulian, Frank J.	DE	A	'83
Gulian, William F.	Member's son		
Handley, Vernon K.	GA	A	'86
Jones, Donlan F.	CA	Z	'52
Lalinsky, Mark A.	MI	Γ	'77
Marks, Lawrence B.	NY	I	'81
Hertz, Caryn M.	NY	I	'81
Marks, Benjamin	Member's son		
McCormick, Raynard	Non-member		
Pendleton III, Winston	MI	Γ	'62
Pinkerton, Audrey Smith	TX	A	'90
Pinkerton, Kate	Member's daughter		
*Quintana, Juan S.	OH	Θ	'62
Rentz, Peter E.	IN	A	'55
*Richards, John R.	NJ	B	'76
Riedesel, Jeremy M.	OH	B	'96
Routh, Andre G.	FL	B	'89
*Schmidt, V. Hugo	WA	B	'51
Siskind, Kenneth S.	RI	A	'86
Siskind, Brian A.	Member's son		
*Spong, Robert N.	UT	A	'58
*Stribling, Jeffrey R.	CA	A	'92
Summerfield, Steven L.	MO	Γ	'85
*Voellinger, Edward J.	Non-member		

* Denotes correct bonus solution

We acknowledge perfect entries with correct Bonus solutions for the Spring 2014 Ticklers from **John R. Richards,** *NJ B '76*, **Jeffrey R. Stribling**, *CA A '92*, and a joint entry from **Frank J. Gulian,** *DE A '83*, and his son William. Due to a computer glitch, their entries were omitted from the listing in the Fall *Bent*.

SUMMER REVIEW

Problem 3 (What's in a Name?) was the hardest problem, with only about 25% of the entries providing a correct answer. Those that incorrectly answered this question found it difficult to find the probability that the prize is split between exactly two contestants.

Problem 2 (jewels) also stumped more than half the entrants, with many unable to find the distribution that minimized the number of three-of-a-kinds.

The Bonus (integer game), which the judges thought would be very difficult, produced a surprising number of correct answers. Special mention goes to **Thomas G. Norris,** *OK A '56*, who not only found the two opening moves provided by the judges, but every other possible winning opening move, all with less straightforward strategies.

FALL SOLUTIONS

Readers' entries for the fall problems will be acknowledged in the Spring *Bent*. Meanwhile, here are the answers:

1 PIERRE + ELLIOTT = TRUDEAU decodes as 246116 + 6884577 = 7130693. For ease of reference, we will consider the cryptic as consisting of seven columns. From col. 1, we see that T = E + 1, and from col. 7, U = E + T = 2E + 1 (units digit). Also, A = R + T (+ carry, units digit), and O = E – R (- carry, + 10 if O is negative). Thus, if we pick values for E and R, then six of the ten letters are determined. It is relatively easy to set up a spreadsheet to list the values of A, E, O, R, T, and U for various choices for E and R. Since E ≠ 0 or 9, and R ≠ E, T, or U, there are only 8 x 7 = 56 possibilities. When we discard all cases where there are duplicate values, 21 possibilities remain. Now, from col. 2, P + L + carry = R (units digit), and from col. 3, I + L + carry = U (units digit); subtracting, we have P – I = R – U. Next, for the 21 possibilities, list the four values that have not been used. Calculate the value of Δ = R – U, and see if any two of the four unused values have a difference of Δ. If so, assign these values to P and I. This leaves only L and D to consider, and we can quickly determine whether they fit or not. Using this approach, we find that the answer given above is unique.

2 Gerald is 51 years old, Harold is 40, Ian is 30, John is 36, and Karl is 45. From the problem statement, we have: J = 9H/10 = 12I/10, so I = 3H/4; K = I + 3(K – H), which simplifies to K = 3H/2 – I/2 = 9H/8; and G – K = J – I, or G = J + K – I = 9H/10 + 9H/8 – 3H/4 = 51H/40. Summarizing, G = 51H/40, I = 3H/4, J = 9H/10, and K = 9H/8. To make all these ages integers, H must be 40 or 80, but H = 80 makes G = 102, which is not allowed, so H must be 40, and the other ages are as above.

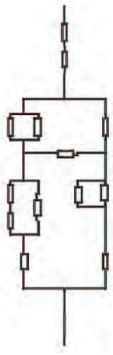
3 The order of the kings, first to most recent, is Eiche, Carolus, Fruhling, Adolf, Dachs, Gunther, and Bohnen. There are several ways to attack this problem. One approach is to assume Statements 1, 2, 4, and 5 are false. Then we have: (1) FxD; (2) GxxA; (4) CxxxG; and (5) ExxxxxB, where the x's indicate unidentified kings. By observation, we see that (1) fits neatly into (4), and then (4) fits into (5). This aligns six of the kings and leaves one blank which we fill with A, the remaining king. That gives us an order of ECFADGB. Comparing this order with the original seven statements, we find that only Statements 2 and 7 are true, as required.

4 The federal marshal releases the 2nd, 3rd, and 5th speakers. Since the first speaker will say he's an officer, whether or not he is an officer, the second speaker's statement is true. The fifth speaker's statement is also true, as he is just repeating what speaker 1 said and adding the fact (already stated) that speaker 1 will say that he is an officer whether or not he is. Now, considering speakers 3 and 4, it is clear that one is telling the truth and one is a liar. If speaker 3 is a liar, then there would not be three officers, but this would contradict the fact that speakers 2, 4, and 5 tell the truth. Therefore, speaker 3 tells the truth, and speaker 4 lies and so does speaker 1. Now everything balances (there are three officers, speakers 2, 3, and 5; and 2

prisoners, speakers 1 and 4). The otherwise logical case where everyone, except speaker 3, tells the truth (so that there would be four officers and one prisoner) is ruled out by the problem's reference to prisoners (plural).

5 The towns are located at 14-A, 3-C, 16-D, 2-E, 10-F, 13-H, 15-I, and 18-J. Since each sign lists the distances to two towns and each town is listed on two signs, the towns and signposts form two loops, one starting and ending with B and other with G. These loops are: G-7-S-1-A-6-K-5-C-3-O-4-I-3-R-4-J-3-T-6-G and B-1-P-6-H-7-Q-2-E-4-L-2-F-3-M-7-D-6-N-6-B. One approach is to make copies of the given map and, since the first step to P is obvious, identify all possible B loops. One can abandon a tentative route if 12 – 14 and 16 – 17 are both blocked, as one of those paths is needed for S – A in the G loop. There are about 36 possible B loops. Then all but one can be eliminated when starting at G and tracing possible G loops. The unique result is given above.

Bonus A resistance of π ohms, accurate to seven significant digits, can be achieved with 13 1-ohm resistors, as shown in the accompanying figure: To solve this problem, it helps to start with an inkling of the form of the answer. It is well known that 355/113 approximates π to seven significant digits, so if we can find a network with a resistance of 355/113 ohms, we will have a solution. Assume that the solution consists of a resistance in series (R_A) with a pair of resistances in parallel (R_B and R_C). Assume the resistances are rational fractions whose denominators are factors of 30. Based on the formulas for calculating resistances in series and parallel, $R_T = R_A + R_B R_C/(R_B + R_C) = A/30 + (B/30)(C/30)/(B/30 + C/30) = 355/113$. Since B + C should equal 113, pick values of B from 1 to 56 and corresponding values for C from 112 to 57, and use a spreadsheet to calculate the corresponding values of A, looking for an integer. Only one set of answers has an integral A, namely A = 66, B = 56, C = 57, which gives $R_A = 66/30 = 11/5 = 2 + 1/5$, $R_B = 56/30 = 28/15 = 5/3 + 1/5$, and $R_C = 57/30 = 19/10 = 3/2 + 2/5$. At this point, we have two 1-ohm resistors in series, and resistances of 5/3 and 3/2 ohms in parallel, connected through the three arms of a "wye" circuit of 1/5, 1/5, and 2/5 ohms. However, this is inefficient, requiring 29 1-ohm resistors. Applying the formula for converting a wye to a delta circuit yields a delta with resistances of 1, 1, and ½ ohms, as shown above. This replaces 20 resistances with four which reduces the total to 13 1-ohm resistors required for a network with a resistance of π ohms. This is the smallest number of resistors that the Judges are aware of.



Double Bonus BZ is parallel to AK. Since the problem was presented in the context of a general right triangle, all we need to do is prove the proposition for any right triangle, and it should hold for all right triangles. Therefore, let ΔABC be an isosceles right triangle. Then, from symmetry, it is clear that BZ extended is perpendicular to AC, but AK is a side of the square erected on AC. Therefore, AK is also perpendicular to AC, so BZ and AK must be parallel to each other.

NEW WINTER PROBLEMS

1 Based on the following information, find the values of A, B, C, and D, which are unique positive integers, all less than five.

If A is 1, then B is not 3.
If B is not 1, then D is 4.
If B is 1, then C is 4.
If C is 3, then D is not 2.
If C is not 2, then D is 2.
If D is 3, then A is not 4.

—*Brain Workout IQ Challenges* by Terry Stickels and J. J. Mendoza Fernandez

2 A point in the interior of a square is exactly 2, 3, and 4 cm from successive corners of the square. What is the length of a side of the square, expressed in exact terms?

—adapted from *The Canterbury Puzzles* by H.E. Dudeney

3 A hexomino is a polygon consisting of six unit squares joined edge to edge along the full length of their sides. There are 35 different hexominos. How many of these can be folded into a unit cube without making any slits?

—*More BrainMatics Logic Puzzles* by Ivan Moscovich

4 The game of 5-Spot consists of a deck of cards with five capital letters on each card. Between any two cards, there is one, and only one, matching letter. If each letter occurs the same number of times in the deck, what is the maximum number of cards in the deck? What is one such deck? Assume the letters are consecutive, i.e., A, B, C, ….. , and present your answer as a sentence of five-letter "words" with one word for each card in the deck. Within each word, the letters should be in alphabetical order, and then the words should also be in alphabetical order.

—**Fred J. Tydeman,** *CA Δ '73*

5 Consider a ten-digit integer that uses each of the digits 0 through 9 exactly once and has the proCperty that the sum of adjacent digits is a prime. The smallest such number is 1203476589. In total, how many numbers have this property? One is not a prime number. No leading zeroes are allowed. You could use your brain cells instead of a computer, but it would be tedious.

—adapted from *Math-E-Magic* by R. Blum, A. Hart-Davis, B. Longe, and D. Niederman

Bonus In the game of five card stud poker with one-eyed jacks (the jacks of spades and hearts) wild, what is the probability of getting exactly one pair? Also, what is the probability of getting a bust hand, i.e., a hand

(Continued on page 41)

Executive Council Meetings

(Continued from page 35)

J.P. Blackford and Vice President N. Pih to countersign checks on the Society's main and operating accounts.

Plans for the 2015 June Meeting of Association Officials were reviewed. Members of the Executive Council Elect planned to solicit feedback from the District Directors and Engineering Futures Facilitators to identify a purpose and goals for future June Meetings.

The Council approved policies regarding the purchase of gift cards using points earned from Tau Beta Pi credit cards, the initiation of petitioners at Convention, and the use and distribution of items bearing the insignia of the Association.

Final plans for the 2014 Convention were reviewed. The agenda for the Thursday meeting of Association Officials was approved. A proposal to award the 2014 J.D. Froula Outstanding Membership Award to Pennsylvania Delta was accepted.

N.T. Bussett, *CA Ξ '09*, was appointed to replace S.L. Forkner and C.S. Jenkins, *MS B '14*, was appointed to replace D.A. Williams as members of the Governance Document Restructuring Committee. R.M. Hickling, *CA E '80*, was appointed as a new member of the committee.

The Executive Council met by teleconference on October 15, 2014.

The Council's first action was the election of its and the Association's officers for the 2014-18 term: J.P. Blackford, President; N. Pih, Vice President; and G.J. Morales, Secretary of the Council.

The Council requested that Executive Director Gomulinski review and prepare updated policies in the areas of social media, official travel and reimbursement, and corporate partnerships.

Mr. Gomulinski presented an overview of the Association's finances to the Council. Vice President Pih reviewed the history of some of the large unrestricted bequests that the Association has received in the past several years. The Council agreed that the Association's overall finances are in good order, but we need to work to grow annual giving and to minimize extraneous spending that does not further the mission of the Association.

A proposal to establish an image enhancement and marketing fund was approved. A gift from M.E. Rudin, *NY K '83*, was allocated to the fund.

A proposal from Bulletin Media to serve as an advertising agency for non-recruitment advertising for *The Bent* and *The Bulletin* was approved.

The Executive Council met by teleconference on November 20, 2014.

The Council appointed Yvan A. Boucher, *MI Γ '08;* Kirstie T. Caesar, *NY T '11;* William P. Cleveland, *MS A '10*; Andrew K. Lloyd, *FL Γ '12*; and Timothy J.F. Luchini, *SD A '11*, as Engineering Futures Facilitators-In-Training for terms effective January to December 2015. Margaret M. Darrow, Ph.D., *AK A '02*; Charles W. Caldwell, Ph.D., *CA A '64*; and Solange C. Dao, P.E., *FL A '95*, were appointed to the Fellowship Board for terms ending July 2015, July 2016, and July 2018 respectively. Scott. E. Fable, *CA T '96*, and Brenda A. Kramer, *KS Γ '95*, were reappointed to the District Program Planning Committee for terms ending June 2015. Russell L. Werneth, *MD B '64*, and Rebecca A. Lewis, *FL A '04*, were appointed to the District Program Planning Committee to terms ending June 2015 and June 2017 respectively.

Councillor Morales updated the Council on a social media initiative by District Director Jason Rogan. Mr. Rogan indicated he had received all of the necessary materials to prepare a prototype issue of a new e-magazine and planned to have it ready for review by the Council in December.

Vice President Pih led a discussion on the development of an Executive Advisory Board. The Council agreed to discuss the board at its December meeting.

President Blackford discussed the Governance Document Restructuring Committee and a plan to carry out its work over the next two years.

The Council reviewed feedback for improvements to future Conventions. Possible speakers for the 2015 and 2016 Conventions were discussed as well as changes to increase the number of corporate recruiters.

Brain Ticklers

(Continued from page 37)

with not even a pair? Assume that a wild card is always used to maximize the value of a hand. The two one-eyed jacks are in hearts and spades.

—Howard G. McIlvried III, *PA Γ '53*

Computer Bonus Some pairs of "mirror image" integers have mirror image squares. For example, consider 12 and 21 and their squares, 144 and 441. How many non-palindromic four-digit mirror image pairs have mirror image squares?

—Technology Review

Send your answers to any or all of the Winter Brain Ticklers to **Curt Gomulinski, Tau Beta Pi, P. O. Box 2697, Knoxville, TN 37901-2697** or email to *BrainTicklers@tbp.org* as plain text only. The cutoff date for entries to the Winter column is the appearance of the Spring *Bent* in early April. The method of solution is not necessary. We welcome any interesting problems that might be suitable for the column. The Computer Bonus is not graded. Curt will forward your entries to the judges who are **H. G. McIlvried III,** *PA Γ '53;* **F. J. Tydeman,** *CA Δ '73;* **J. C. Rasbold,** *OH A '83;* and the columnist for this issue, **D. A. Dechman,** *TX A '57*