A Silver Jubilee

Leonard Nissim names the three states S (the success state), 1, and 2. Since pushing a button (R or G) always leads to a change of state, there are 26 or 64 such boxes satisfying this condition only. The additional condition is that from states 1 and 2 there is some sequence (of R's and G's) that leads to state S. This eliminates four of the boxes, leaving 60 which satisfy both conditions.

If we are in the S state to begin with, the bell is ringing already. For the purposes of analyzing the sequences leading to S (at least one) from the other states, we can collect the 60 boxes into 15 equivalence classes: We ignore what happens when R or G is pushed from state S, and only track of the results of pushing R or G from the other two states.

The following are the results of looking at all 15 equivalence classes:

(1) No sequence of length 3 will guarantee to ring the bell. (i.e., for each sequence of length 3, there is a box and an initial state which that sequence does not ring the bell.)

(2) The following sequences of length 4 each guarantee to ring the bell at least once: RRRG, BRRR, GGRR, and GRRG.

(3) Starting from states 1 or 2, if we push R or G randomly, the expected number of pushes needed to reach S is 31/15 or 2 1/15. Of course, a non-successful sequence of any length is possible for some boxes, but even the worst boxes have an expected number of pushes equal to 7/2 or 3 1/2.

(4) Starting from states 1 or 2, if we use any one of the length 4 sequences given above, then the expected number of pushes needed to reach S is only 26/15 or 1 11/15.

The equivalent question for the three non-success states is indeed very much longer, by a factor of about 100. We begin with 32 or 6,331 black boxes (before eliminating those for which S cannot be reached from some starting states).

MfJ 2. John Rule has a right triangle with integer sides without any common factor. When each digit is replaced by a code letter, the sides are SSSTTV, PTWTS, and RRRQQ. Break the code.

The following solution is from Ken Kiel, who writes: The hypotenuse < 99,999 < sqrt(2), therefore S = 1. The hypotenuse must be between 110,234 and 119,876. Using these limits, the possible combinations of P and R can be easily limited to the following nine:

<table>
<thead>
<tr>
<th>P</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>9</td>
<td>7</td>
</tr>
</tbody>
</table>

At this point a simple minded program (I ran it on a pocket programmable calculator) can quickly try the 9,000 combinations for P, Q, R, T, and W which result, even allowing multiple letters to take the same value. A flowogram for the program may be obtained from the editors. The only combination that worked was:

<table>
<thead>
<tr>
<th>P</th>
<th>R</th>
<th>T</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>8</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td>S</td>
<td>1</td>
<td>U</td>
</tr>
</tbody>
</table>

The sides are: 75,651 88,660 116,549.

Continued on Page MIT 54
Deceased

The following deaths have been reported to the Alumni/ae Association since the Review last went to press:

Thomas Ewing Hannah, '17; November 1, 1988; Russellford, N.J.
Uchachi Nabeshima, '19; April 25, 1974; Tokyo, Japan.
Gerald Taetsfield, '20; May 19, 1991; Philadelphia, Pa.
Kenneth B. White, '20; March 27, 1991; Magny-en-Vexin, France.
Mrs. Laighton Evans, '21; June, 1970; Woodbury, N.J.
David Henry Harris, '22; April 24, 1991; Falmouth, Mass.
William Albert Waldschmidt, '22; December 28, 1990; Midland, Tex.
Ephraim Fletcher Ingalls, '23; January 5, 1990; Del Mar, Calif.
Francis La Verne Smith, '23; May 4, 1991; Seal Beach, Calif.
George Donald Fife, '24; April 15, 1991; Eastham, Mass.
Lewis Frothingham Clark, '26; March 8, 1991; Los Angeles, Calif.
Julius Friedman, '27; May 25, 1991; Lynbrook, N.Y.
Lorey Glick Miller, '27; January 30, 1991; Rockbridge, Ohio.
Edgar R. Rousseau, '27; September 11, 1978; Rockford, Ill.
Earl Hathaway Abbe, '29; May 19, 1991; Newbury, N.H.
Edwin Sheldon Worden, '31; May 15, 1991; Mount Oora, Fla.
Jacob Millman, '32; May 22, 1991; Sarasota, Fla.
Lawrence Wilder Whitaker, '32; May 5, 1991; Stockbridge, Mass.
John W. Gaylord, '33; March 24, 1991; San Rafael, Calif.
Lawrence Chappell Kingsland, '33; April 18, 1991; Watseville, Calif.
Charles B. Stuart, '34; April 30, 1991; Tucson, Ariz.
Phillip B. Walker, Jr., '34; April 25, 1991; Sutton, Mass.
John H. Best, '35; April 17, 1991; Urbana, Ill.
Oscar Fantaine Wiedeman, '35; March 24, 1991; New Orleans, La.
Herman Brittman, '37; June 11, 1991; Salem, Mass.
Robert Treat, Jr., '38; February 11, 1991; Mesa, Ariz.
Ell M. Dannenberg, '39; April 22, 1991; Longboat Key, Fla.
Otto F.A. Arnold, '40; March 26, 1991; South Dartmouth, Mass.
Russell Thorne Werby, '40; February 13, 1991; Brookline, Mass.
Kenneth Andrew Roe, '41; June 3, 1991; Palm Beach, Fla.
Frances B. Bushay, '42; January 8, 1991; Delray Beach, Fla.
Leon W. Freeman, '42; March 15, 1991; Newton Highlands, Mass.
Trent Summer Russell, '42; March 20, 1991; Castleton, N.Y.

Theodore Harrison White, '42; April 28, 1991; Ardmore, Pa.
James Holt Jr., '43; October 22, 1990; Littleton, Colo.
Guy L. Ottinger, '43; April 28, 1991; Sunnyvale, Calif.
Alfred J. Ehrat, '44; March 13, 1991; York, Pa.
Frederick Maxwell Griffith, '44; September 7, 1989; Charleston, S.C.
William George Martin, Jr., '45; May 15, 1991; Williamsburg, Va.
Robert Kent Schumacher, '45; May 18, 1991; Winnetka, Ill.
Melvin Wilbert friedman, '46; May 14, 1991; Newton Center, Mass.
Arthur Lins, '46; April 3, 1991; Vero Beach, Fla.
Robert Madison Anderson, '47; November 9, 1990; Oberlin, Ohio.
Edward Theodore Clapp, '47; March 24, 1991; Columbus, Md.
Doghan H. Erokan, '47; July 13, 1988; Danville, Calif.
David Henry Frisch, '47; May 23, 1991; Cambridge, Mass.
Donald Hayward Strider, '47; February 22, 1991; Syracuse, N.Y.
James Merritt Brownlow, '48; April 11, 1991; Norwich, Vt.
Francis Xavier Crowley, '48; April 30, 1991; Wellesley, Mass.
Charlotte Meeker Davison, '48; January 1, 1991; Oxnard Hill, Md.
Cecil E. Hall, '48; March 5, 1991; Jasper, Ark.
Joseph T. Murphy, '48; April 14, 1991; Wellesley, Mass.
Aiden Pugh Taber, '48; November 12, 1990; Pensacola, Fla.
John F. Elliott, '49; April 15, 1991; Winchester, Mass.
Francis Valentine McCorry, '49; June 17, 1989; Flint, Mich.
Cyril J. Brown, '51; March 20, 1991; Lexington, Mass.
Bernard Cohen, '51; March 24, 1991; Stamford, Conn.
Robert J. Pascoe, '52; April 20, 1989; South Glastonbury, Conn.
John J. Cahill, '53; March 29, 1991; Severna Park, Md.
William G. Moffett, '53; December 21, 1990; Albuquerque, N.M.
James R. Wyne, '53; December 20, 1990; Miami, Fla.
Charles E. Loud, '54; August 13, 1990; Watertown, Conn.
Adolph J. Hansen, '56; March 19, 1991; Hastings-on-Hudson, N.Y.
Willard L. Irwin, '57; 1987; Augusta, Ga.
Howard S. Schumacher, '57; March 2, 1991; Rochester, N.Y.
Clayne M. Yeates, '58; April 18, 1991; Montrose, Calif.
Gilbert Tukuyu Chin, '59; May 6, 1991; Murray Hill, N.J.
Herman Erkk, '59; January, 1982; Burlington, Ontario, Canada.
Eugene A. Walles, '60; April 19, 1991; Fremont, Calif.
Thomas Burrell Cheek, '64; April 26, 1991; Lexington, Mass.
John R. Freeman, '64; September 26, 1990; Albuquerque, N.M.
Ian Christopher Smith, '77; June 3, 1990; Diego Martin, Trinidad.
Gainer J. Lindsey, '79; November 1, 1990; Arlington, Tex.
Burton S. Goldberg, '81; November 25, 1990; Somers, N.Y.
Victor G. DeNatale, '82; March 25, 1991; Somerville, Mass.
Edward B. Hontz, Jr., '92; June 4, 1991; Fairfax, Va.

He wants you to arrange them into a 4x4 square so that four vertical, four horizontal, and two diagonal lines each contain all kinds of arrows. The solution to this "ALHAM-BRA" problem is not unique.

Nancy Barrows reports that her son Andy gave her an MIT MOM T-shirt for Christmas and, in order to earn a right to wear it, she sent us the solution drawn below. Jim McNamara, who found (essentially) the same solution, reports that the best method of attack was to first arrange the arrows correctly without the box outlines and then draw in the boxes. Frederick Furland reports having the privilege of meeting Nob. in his studio in Japan and obtaining several of his puzzles. One was ALHAMBRA, to which Furland found the Barsos solution as well as a variant in which each diagonal contains four arrows all pointing in the same direction.

Better Late Than Never

Jan 2. Apparently Winslow Hartford’s declaration of solvability was just what Fred Tydeman needed for inspiration to produce the following solution. I should add that he was ably assisted by his 365SX, which worked 49 hours to help find the solution.

17433
1422868652]24804689210316
1422868652
10576182690
9956080564
6161021263
5619474608
4695466551
4268605956
4268605956
0

Other Responders

Responses have also been received from S. Feldman, G. Rice, M. FOUNTAIN, R. Hedrick, A. Silva, E. Davidson, R. Bart, H. Zarembo, R. Kinsley, Jr., J. Donkey, W. Hartford, A. Mullin, W. Cluett, R. Hedrick, S. Berkenblit, and J. Landau.

Proposer’s Solution to Speed Problem

Let $S = (D+1)/2$ and $L = S^2 + 1$. Now $L^2 - S^2 = 2S + 1 = D$. 