It has been a year since I specified the size of the backlogs for the various kinds of problems that are printed. Currently, I have a large queue of regular problems and speed problems. Bridge and other game-related problems, however, are in short supply.

You may recall that last issue I waxed ineloquent about the spectacular autumn we had in the Northeast, thanks in part to the lack of any significant storm. Well, there is a local committee forming to convince me never to do that again. Very soon after the column was written we had a snowstorm of over eight inches that closed NYU, the New York City public schools, and much else. Today we are just finishing with the "Blizzard of 2017"—a foot of snow where I live and even more a little north and west. March certainly came in like a lion, and now I must bow out like a lamb.

Problems

M/J 1. Larry Kells must have trouble setting contracts even when he has good hands. Kells wonders: what is the most (high-card) points a partnership can have and still be unable to beat 7 no-trump with best play on both sides? How about 6 no-trump, 3 no-trump, and 1 no-trump?

M/J 2. David Dewan proposed the following cryptarithmetic problem as a follow-up to his J/F speed problem.

Assign a distinct digit to each letter in the following formula and produce a valid numerical equation.

$$HA^{PPY} = NEW + YEAR$$

M/J 3. A two-part problem from Ermanno Signorelli:

Consider an equilateral triangle whose sides are three units in length (see Fig. 1). Mark off points on all three sides that are one unit apart. Construct line segments parallel to the base between the points on the other two sides. Create points one unit apart along these lines parallel to the base. (There will now be 10 points on the plan of this triangle.) Construct line segments from all the points to every other point. Find all the equilateral triangles that result whose sides are not an integer multiple of the unit length. What is the length of their sides? Hint: there are only two such triangles.

Now consider an equilateral triangle whose sides are four units in length (see Fig. 2). Again mark off points one unit apart on all three sides and on the internal lines. (There will be 15 points on the plan of this triangle.) Construct line segments between each pair of points. Find all the equilateral triangles that result whose sides are not an integer multiple of the unit length. What is the length of their sides and how many are there?

Figure 1

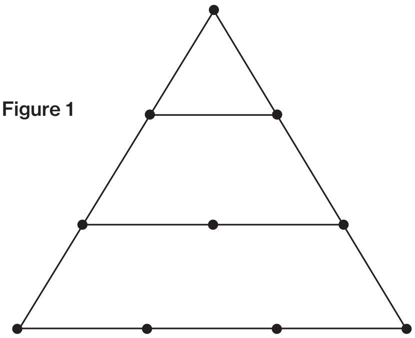
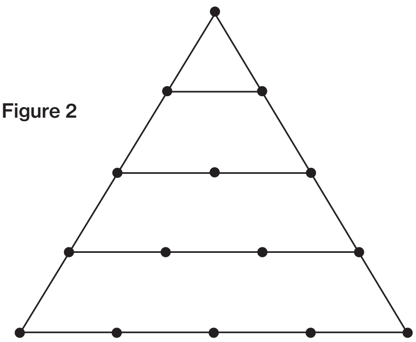


Figure 2

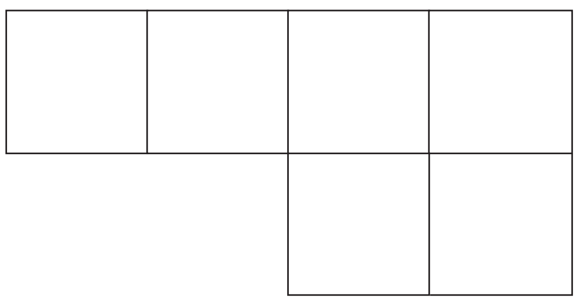


Speed Department

A geometry quickie from Sorab Vatcha. A right triangle ABC with the right angle at A has a perpendicular AD. Relate the lengths of AD, BD, and CD.

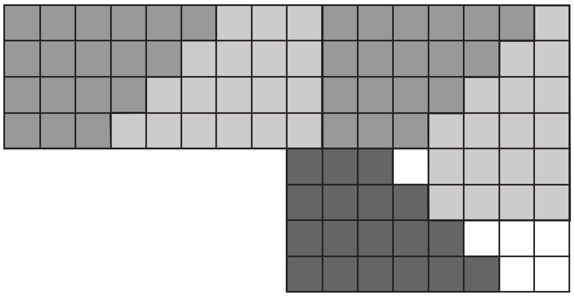
Solutions

J/F 1. Richard Hess and Robert Wainwright ask you to design a connected tile so that five tiles cover at least 93 percent of the area of the hexomino below. The tiles must be identical in size and shape but may be turned over so that some of them are mirror images of the others. They must not overlap each other or the border of the hexomino.

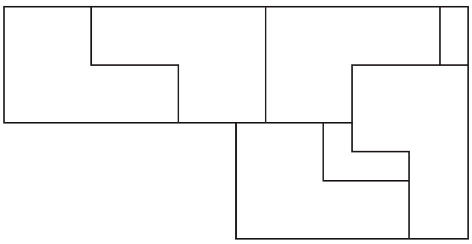


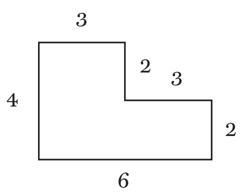
Ken Rosato tells us to treat each square of the hexomino as a 4-by-4 grid of 16 smaller squares: "If the new tile contains 18 of these smaller squares, five of them would cover $5 \times 18 = 90$ smaller squares or 90/96 = 93. 75 percent of the original hexomino."

Ken then suggests a stairstep design for the tile. Guy Steele has the same tile and supplies the lovely gray-scale diagram below. (He also sent a yet more lovely five-color version that I know enough not to even ask the editors to print. Instead, it is on the Puzzle Corner website.)

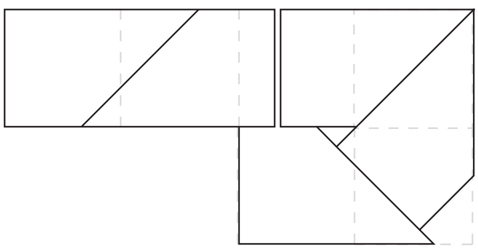


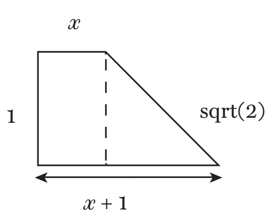
Joseph Feil gets the same coverage with a slightly less jagged tile.





Marc Strauss uses the following tile having a 45° angle and one side parameterized by x. For suitable values of x, five of these tiles cover over 96 percent of the hexomino.





J/F 2. Richard Bronowitz offers this radar detection problem. Assume that a radar has a detection threshold requiring at least nine successful pulse returns of out 10 successive pulses. Furthermore, once an object is detected, it remains detected—i.e., there are no lost contacts. The probability that a pulse is successfully detected is p, and pulse results are independent. What is the probability of detection given N total pulses?

Burgess Rhodes sent a lengthy, detailed analysis that I have placed on the website.

The following solution is from Richard Lipes. Let p denote the probability of detection of a single pulse, let $Q = 1 - p$ be the probability of a miss of a single pulse, and let $P(N)$ denote the probability of nine successful detections in 10 successive pulses in N overall pulses.

If $N < 9$, $P(N) = 0$. $P(9) = p^9$.

$P(10) = p^9 + 9Qp^9 = (10 - 9p)\,p^9$

If $N > 9$ then

$P(N) = p^9 + (1 + Q^2 \ldots Q^{N-10}) \times 9 \times Q \times p^9$

$= p^9 + (1 - Q^{N-9}) / (1 - Q) \times 9Qp^9$

So overall

If $N < 9$, $P(N) = 0$.

If $N > 8$, $P(N) = (9 - 8p - 9(1 - p)^{N-8} \times p^8$

Better Late Than Never

2016 J/A 1. Robert Wake sent in an alternate solution with an interesting twist: all the "helpmate" behavior is limited to trick 1. His response is on the Puzzle Corner website.

S/O 1. John Hatfield notes that step 16 should be (5,1) – (3,1).

Other Responders

Responses have also been received from R. Bumby, P. Cassady, G. Coss, P. Davis, E. Friedman, W. Lemnios, Z. Levine, R. Morgen, S. Shapiro, and R. Wake.

Proposer's Solution to Speed Problem

$AD^2 = BD \times CD$

Send problems, solutions, and comments to Allan Gottlieb, New York University, 715 Broadway, Room 712, New York, NY 10003, or to gottlieb@nyu.edu. For other solutions and back issues, visit the Puzzle Corner website at cs.nyu.edu/~gottlieb/tr.