Puzzle Corner

By Allan J. Gottlieb, '67

I am afraid that I must begin with an apology. Before this column appears in print it must go back and forth between *Tech Engineering News,* Technology Review, two different printers, and me. Somewhere in the shuffle for last month's installment a minor calamity occurred—everything, and I mean everything, got lost. All the letters I was saving for old times' sake are gone but not forgotten. Also, several submitted problems and solutions are currently somewhere in never-never land. Of course, I would be grateful for any resubmittals, and if anyone sees a gray envelope labeled "Puzzle Column" please send it to me, Allan Gottlieb, Box 4380, 362 Memorial Drive, Cambridge, Massachusetts 02139.

Problems

♦63—The following letter was sent to Technology Review:

Gentlemen:
    Here is a problem for the student who runs the puzzle-section of the Technology Review. I don't happen to have a copy of the Review at hand, so cannot recall his name, but I do enjoy this section of the publication. The problem appeared on a recent Graduate Record Examination, so there must be a quick and easy solution:

What is the remainder when 5^{100} is divided by 101?

I have worked the problem out by repeated iterations—first breaking up 5^{100} into $5^4 \times 5^{96}$, dividing 5^4 by 101 and discarding the 6; etc., etc., etc. The remainder turns out to be 1. What I am interested in is the method the GRE must have expected, since my method takes much too long for their examination.
                    Sincerely,
                    (Mrs.) Nancy O. Klock, '37

Thank you, Nancy. By the way, Je m'appelle Allan Gottlieb.

64—The following problem was submitted by H. Kelsea Moore, '32:

Dear Mr. Gottlieb:
    The following problem is an old chestnut, at least 50 years old, though I have never seen it in print anywhere.
    A courier is in the rear rank of a column one mile long. He leaves his position to deliver a message to his commanding officer in the front rank, and then returns to his original position, arriving there precisely at the same moment that the column has moved ahead one mile. How far did the courier walk? (It must be assumed that the courier walked at a constant rate of speed, and the column at a constant though different rate of speed.)

Here is a rate problem where time and rate of speed are unknown.

Very truly yours,
H. Kelsea Moore, '32

65—Peter L. Eirich, '69, wants to see 24 dots arranged to form 24 line segments of four dots each.

66 and 67—Chess problems seem to be the most popular so here are two more:

Dear Mr. Gottlieb:

One of M.I.T.'s alumni has just passed along to me his copy of the January issue of the Technology Review in which, on page 11, I have read your solution to problem 2. By a strange coincidence I have been skimming through my latest chess book (about #2,800!) by Horowitz and Rothenberg, *The Personality of Chess,* and on pages 200-1 and 224-5 I find reference to similar problems.

The first proposes: "Rearrange the eight pieces so that a maximum number of squares, including those on which the pieces are situated, is guarded" (otherwise, apparently, innumerable solutions).

(66) The second proposes: "same as above, except that you are allowed to place the two bishops on squares of the same color."

(67) And finally, a third proposal your readers may want to try: "Arrange the eight pieces so that a minimum number of squares is guarded. (The count must necessarily include absence or presence of guard of the squares on which the pieces themselves are situated.)"

This leads me to suspect there may be other references which, if I should uncover them, will be forwarded to you.

Very truly yours,
Robert Sinnott
Norwell, Mass.

Speed Department

68—How many solutions are there to the subtraction problem below:

$$\begin{array}{r} \text{WASGEORGE} \\ \underline{\text{PHILLIES}} \\ \hline \text{AHACK} \end{array}$$

69—Assume s consecutive hours are wasted each day by eating and sleeping, etc. The remaining are divided into working (at d dollars per hour), commuting, and listening to hi-fi. The pleasure obtained by listening to hi-fi is $10 \cdot \log_{10}(m)$ pleasure units per hour where m is the number of dollars invested in the hi-fi. The annoyance of working an h hour stretch is $ah^{3/2}$ (i.e., the pleasure is $-ah^{3/2}$ pleasure units). It takes c hours to commute from home where the hi-fi is located to work. Assume you will live another y years and have no hi-fi at present. How should you divide your time in order to maximize the total pleasure of your life?

Solutions

Due to the above mentioned mix-up, I shall defer giving solutions for February problems until June.