FUN WITH FUNDAMENTALS

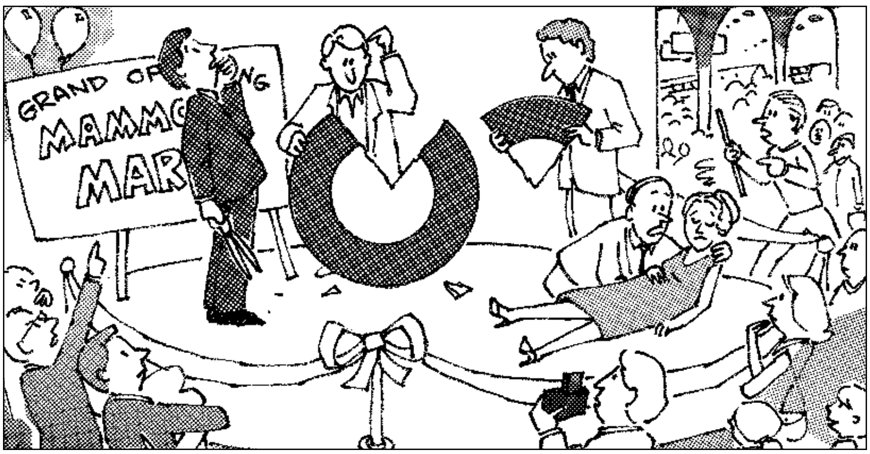
Snap judgment

Problem 170 — Spare the rod and you can end up spoiling the whole show, as this month's problem by E.A. Engebretson of St. Paul, Minn., demonstrates.

It was a quarter to 8:00 a.m. on the grand opening day of the new Mammoth Mart shopping complex. Store manager Eustace Snipp was adjusting his bow tie preparatory to having his picture taken cutting the red ribbon in front of the store.

Suddenly, a resounding crash echoed through the aisles of the new Mammoth Mart shopping complex. The letter "o" in the glass sign proclaiming the store name had fallen, and a pie-shaped wedge with a circular arc of 45 deg and 10 in. had broken off the top of the letter.

With a volley of 'Oh, dear's and 'Oh my's Snipp raced to the scene. The workmen were just raising the fallen letter when Snipp got an idea.



"We'll just bend this rod over the top and fit the broken glass back in. From a distance no one will be able to tell."

The rod is a thin strip of steel, $^1\!/_{32}$-in. and long enough so it can be clamped at each end and span the 10-in. circular gap. Its modulus of elasticity is 30×10^6. The rod has to be used later, and so it has to be kept in elastic bending. Thus, the bending stress is limited to 49,000 psi. What is the maximum angle of circular arc that can be maintained by the rod? Will Snipp's grand opening go off with a bang? Assume the rod is in pure bending, and the weight of the refitted broken glass is negligible.

Send your answer to:

Fun With Fundamentals
POWER TRANSMISSION DESIGN
1100 Superior Ave.
Cleveland, OH 44114-2543

Technical consultant, Jack Couillard, Menasha, Wis.

Solution to last month's problem 169 — You're right on the money if you answered **\$9,567** for SEND, **\$1,085** for MORE, and **\$10,652** for MONEY. Here's the final balance:

We know that $M = 1$, because 0 is excluded and $MO,NEY \leqslant 19{,}998$ ($9{,}999 \times 2$)

Thus,

$$\begin{array}{r} S,END \\ +\ 1,ORE \\ \hline 1O,NEY \end{array}$$

Then, since $S + 1$ + a possible carry-over of 1 from column $E + O = N$ has to equal 10 (11 is not possible because 1 is already used, and 12 or more is not reachable.)

$O = 0$. S has to equal 8 or 9. If $S = 8$, then we would need $E + O$ + a carry-over to be $\geqslant 12$, which, again, is not possible.

Therefore, $S = 9$, and:

$$\begin{array}{r} 9,END \\ +\ 1,0RE \\ \hline 10,NEY \end{array}$$

The largest number that can be carried over from any column is 1. Therefore we can deduce that $E + 1 = N$. We are then left with the following unknowns:

$$\begin{array}{r} END \\ +\ RE \\ \hline NEY \end{array}$$

From this, we can set up the following algebraic equation:

$$100E + 10(N + R) + D + E$$
$$= 100N + 10E + Y$$

Substitute $E + 1$ for N:

$$100E + 10(E + 1 + R) + D + E$$
$$= 100(E + 1) + 10E + Y$$
$$10R + D + E = 90 + Y$$

Therefore, $R = 8$. 9 is already used, and so it is not possible for $R \leqslant 7$ to satisfy $10R + D + E = 90 + Y$, since $70 + D + E \geqslant 90$ implies $D + E \geqslant 20$, which is not possible.

$$\begin{array}{r} 9,END \\ +\ 1,0\,8\,E \\ \hline 10,NEY \end{array}$$

Again, we can set up an algebraic equation. Plugging $R = 8$ into our last equation:

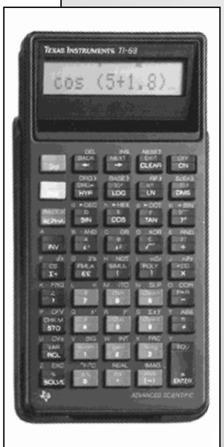
$$80 + D + E = 90 + Y$$

or,

$$D + E = 10 + Y$$

Now since 8 and 9 are already used, the

Contest winner — Congratulations to Brent McDorman of Seaford, Del., who won our January contest by having his name drawn from the 143 contestants who answered correctly out of a total of 187 for that month. A TI-68 calculator is in the mail to him.



The TI-68 Advanced Scientific Calculator by Texas Instruments can solve five simultaneous equations with real and complex coefficients and has 40 number functions that can be used in both the rectangular and polar coordinate systems. Other functions include formula programming, integration, and polynomial root finding. The calculator also features a last-equation replay function that lets you double-check your work.

To enter the contest, send your answer on a postcard or letter to POWER TRANSMISSION DESIGN, 1100 Superior Ave., Cleveland, OH 44114-2543.

You can also receive a TI-68 and credit in the magazine if you send in an *original* problem with solution, and we publish it.

highest remaining numbers are 6 and 7.

$$\therefore D + E \leq 13$$

$$\therefore Y = 2 \text{ or } 3$$

If $Y = 3$, then $D + E = 13$. Therefore, with the numbers 3, 4, 5, 6, and 7 remaining, $D = 6$ or 7; and $E = 6$ or 7.

But $E + 1 = N$, so $E \neq 6$ or 7.

Y, then, has to be 2.

$$\begin{array}{r} 9{,}END \\ +\ \underline{1{,}08E} \\ 10{,}NE2 \end{array}$$

$D + E = 12$. By elimination: $E = 5$; $D = 7$; and $N = 6$.

The solution is then:

$$\begin{array}{r} 9{,}567 \\ +\ \underline{1{,}085} \\ 10{,}652 \end{array}$$

The customers were certainly sending more money!