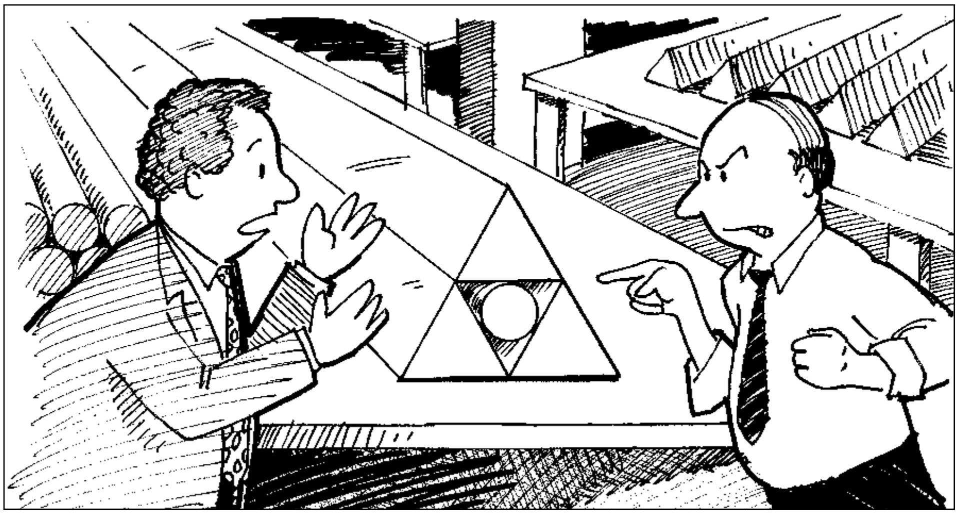
FUN WITH FUNDAMENTALS

Bar nonsense



Problem 171 — Three rights can sometimes stack up to one wrong, as this month's problem by Dave Ahmad of Metuchen, N.J., demonstrates.

"… just because I screwed up once before …," muttered Lucius Bluff. "Of course I ordered 3.5-in.-diam. rods! You can see for yourself!"

Bluff had interspersed the circular rods with some three-cornered rods.

"There is no *waay* that those circular rods are that large," retorted Theodore McSnibb. "Why, they fit snugly between the three-cornered rods, which are 5 in. on each side.

To settle the argument, Bluff and McSnibb took a random sample of one circular rod surrounded by three 3-cornered rods. They found that this configuration forms a large equilateral triangle that is 10 in. on a side. The inner triangle that holds the circular rod is also equilateral, and its sides are tangent to the circular cross-section of the rod. What is the diameter of the rod?

Send your answer to:
Fun With Fundamentals
POWER TRANSMISSION DESIGN
Penton Publishing
1100 Superior Ave.
Cleveland, OH 44114-2543

Technical consultant: Jack Couillard, Menasha, Wis.

Solution to last month's problem 170 — You're no name dropper if you answered **60 deg.** Here's how the publicity shot became an action photo.

Let:

E = Rod's modulus of elasticity, given as 30×10^6

R = Radius of curvature at the neutral axis, in.

I = Moment of inertia of a section of rod, lb-in.

M = Bending moment, lb

σ = Bending stress, given as 49,000 psi

C = Distance from the beam's neutral axis to extreme fiber, given as 1/32 in. ÷ 2, or 1/64 in.

θ = Angle of circular arc, deg

L = Length of arc, given as 10 in.

From the mechanics of beams, we know that, for beams with symmetrical sections in pure bending:

$$\sigma = \frac{MC}{I}$$

or,

$$M = \frac{\sigma I}{C} \qquad (1)$$

also,

$$M = \frac{EI}{R} \qquad (2)$$

Set (1) and (2) equal to each other and solve for R.

$$R = \frac{EC}{\sigma} = \frac{(30 \times 10^6)(1/64 \text{ in.})}{49{,}000 \text{ psi}}$$

$$= 9.6 \text{ in.}$$

Knowing R, we can now solve for θ.

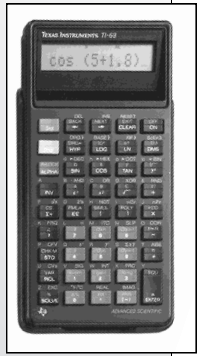
$$\frac{L}{2\pi R} = \frac{\theta}{360 \text{ deg}}$$

$$\theta = \frac{(360 \text{ deg})L}{2\pi R} = \frac{(360 \text{ deg})(10 \text{ in.})}{2\pi(9.6 \text{ in.})}$$

$$= 60 \text{ deg}$$

Contest winner — Congratulations to 8th grader Bogdan Tache of North Canton, Ohio, who won our February contest by having his name drawn from the 253 contestants who answered correctly out of a total of 271 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.

Notice of design revision for problem #164 (Sept. '93) — It has come to our attention that certain calculations in the design of the "Bungee Jump" attraction at the Megalopolis Amusement Park were in error, and that persons using the ride may be subjected to dangerous and unfortunate consequences. As a result of correspondence from various outside engineering consultants, the Park directors have suspended the project until further notice.

Yes, the brake drum would not have provided enough force to stop the jumper. Because of this negligence (and the possibility of a wrongful death suit from the survivors of the first person to ride the "Bungee Jump"), we had a special drawing of those who wrote to tell us about it.

Congratulations to F.O. Underwood of Sacramento, Calif. A TI-68 is in the mail to him!