

Foundation for Trophy

THIS ISSUE'S PUZZLE

This puzzle was originally created by an Australian actuary. I've revised the wording, and I'm also withholding his name until the next issue as the puzzle may be found online (especially now that many books have been digitized).

The figure skating committee has decided to install a trophy for one of the longtime champions in the center of a large artificial pond near the champion's house. The pond has a perfectly horizontal base. The sides are perpendicular to the base everywhere. Three identical metal cubes would serve as a foundation for the trophy. The cubes would be placed next to each other side by side.

Once the first cube was positioned on the pond's base, the level of water rose three inches. The water level rose an additional four inches when the second cube was placed on the bottom of the pond. Finally, when all cubes sat on the bottom, the water level was 11 inches higher than it was before any cube was placed in the pond.

What's the volume of the foundation?

PREVIOUS ISSUE PUZZLES

Amazing Equations

Bob is a man in his early 40s, the father



of two daughters, Jessica and Mary, and their kid brother, Billy. He walks up to his elder daughter's bedroom and finds Jessica writing quadratic equations. The first two attract his attention.

Bob: "What are these equations?"

Jessica: "Well, the roots are positive integers in both equations. The roots of the first equation are Billy's age and my age. The roots of the second equation are Mary's age and Billy's age."

Bob: "How remarkable! All of your coefficients are integers, and the sum of the three coefficients in each equation is a prime number."

Jessica: "Yep, can you find anything else?"

Bob: "OK, let me try. I'll substitute your age for x in the second equation. What am I getting ... Wow! It's a square number and a power of 2!"

Jessica: "It's interesting that now anyone can figure out our ages just based on your remarks ... except yours, Dad."

Can you?

Answers:

- Jessica: 18
- Mary: 14
- Billy: 2

Solution:

Let J , M , and B be Jessica's, Mary's, and Billy's ages, respectively.

Then the first equation can be written

as $a(x-J)(x-B) = ax^2 - a(J+B)x + aJB$ for some number a . The sum of the integer coefficients is then $a - a(J+B) + aJB = a(J-1)(B-1)$. Since this sum is a prime number, and we know that J has to be greater than 2, a must be 1 and B must be 2. So, Billy is 2 years old. We also deduce that $J-1$ is a prime. Analogously, from the second equation, $M-1$ is a prime. Therefore, both J and M are even numbers.

When we substitute J for x in the second equation, we get $(J-M)(J-2)$ is a square number and a power of 2. Such numbers are 4, 16, 64, 256, etc. Because J and M are both even numbers, the factors $J-M$ and $J-2$ must be even, too. Four can be eliminated since Mary would be 2, which is impossible (we know Billy is the youngest). Sixteen needs factors of 4 and 4 or 2 and 8. The former case results again in Mary's being the same age as Billy. The latter case is eliminated since Jessica would be 10 and $J-1$ wouldn't be prime. Two hundred and fifty-six and above are eliminated since the ages of Jessica and Mary would be too high (we know that Bob is in his early 40s). Finally, the only suitable case is 64, which results in Jessica being 18 and Mary 14.

Chess Puzzle

White to move and mate in three.

Initial position:

White – full starting position: Ke1, Qd1, Ra1, Rh1, Nb1, Ng1, Bc1, Bf1, pawns a2, b2, c2, d2, e2, f2, g2, h2.

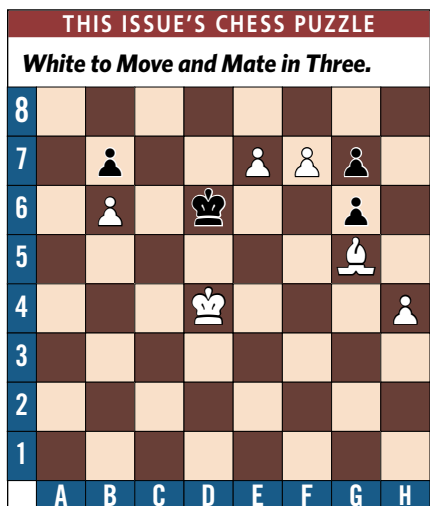
Black – Kh4.

Solution Case A

1. d4 Kh5
2. Qd3 Kg4
3. Qh3#

Solution Case B

1. d4 Kg4
2. e4+ Kh4
3. g3#



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SOLVER LISTS

Because of an administrative deadline, names of only those people who submitted correct solutions by July 31, 2007, are shown on the lists.

Equation Puzzle: Jon Anderson, Bob Bartholomew, Ted Berker, Bob Byrne, David Cahn, Bill Carroll, John Cook, Mike Crooks, William Cross, Mark Danburg-Wyld, Paul Dennee, Gregory Dreher, Brian Eastman, Mark Evans, Michael Failor, Megan Farris, Bill Feldman, Jerry Francis, Bruce Fuller, Christophe Gaboriaud, Rui Guo, Yehuda Haber, Rachel Hemphill, Yang Ho, John Hubenschmidt, Alex Kozmin, Chi Kwok,

Alan Lange, Tom Langer, Tom Legere, Philip Lehpamer, Doug Levy, Sonny Liu, Lee Michelson, Brian Miller, Chris Norman, David Oakden, Don Onnen, George Papazicos, Stephen Peeples, David Promislow, Steven Russ, Leonid Shteyman, Noam Segal, Philip Silverman, Sally Smith, John Snyder, Don Sondergeld, Al Spooner, Doug Szper, Tony Torelli, David Uhland, Virginia Young

Chess Puzzle: Bill Carroll, Mike Crooks, Alan Erlebacher, Michael Failor, Michael Katz, Sam Keller, Todd Kennedy, Alex Kozmin, Philip Lehpamer, Mark Mercier, Lee Michelson, Chris Norman, Don

Onnen, Harry Ploss, Bruce and Chris Sartain, Noam Segal, Leonid Shteyman, Don Sondergeld, Andrew Witte

Solutions may be e-mailed to cont_puzzles@yahoo.com or mailed to Puzzles, 25 Sparrow Walk, Newtown, Pa. 18940.

In order to make the solver lists (separately maintained for the regular and chess puzzles), please make sure that your answers and solutions are received by **September 30, 2007**. Depending on the response volume, solver lists may contain only the names of people who solved puzzles on the first attempt.

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