

Amazing Equations

THIS ISSUE'S PUZZLE

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?

PREVIOUS ISSUE PUZZLES

Loot Distribution

Eight bandits robbed a bank for \$10,000, which they took in \$100 bills. The robbers are ranked according to their prior con-

viction record with the most senior thief being the one with most felonies committed. In order to split the 100 bills among themselves, the following procedure was established.

The most senior felon proposes a distribution of the loot. All the robbers then vote, and if 50 percent or more agree, the proposed distribution takes place. Otherwise, the proposal is rejected, and the most senior bandit gets killed. Then the second most senior robber proposes a distribution, and the process continues until a plan is voted for.

The robbers are also perfect logicians (can this happen in real life?) so they know how each of them will vote. There are no grudges to be held during votes as the thieves don't believe in emotions. Being rational, they have preferences: First is to remain alive, next is to end up with as much money as possible, and finally, if given a choice between otherwise equal outcomes, to have fewer thieves to divide the loot. The most senior bandit proposes a plan that maximizes his money and that he knows won't get rejected.

The moment he puts his proposal up for a vote, the ninth thief shows up. This is the one who was on the lookout, and the one all the other robbers "forgot" about. He was ranked last. Now that he's in the picture, he has to be accounted for.

Will the proposal change? If so, how different are the proposals? How much money will the latecomer get? Show all work.

Therefore, the latecomer was lucky to arrive at the final moment.

Solution

Let's start with the case of only one thief remaining. He's the most senior guy who can vote for his own proposal and get 100 percent of the vote. In this case, he gets the whole loot.

There aren't many changes in the case of two robbers remaining: The biggest felon guarantees at least 50 percent by proposing anything he wants. So he keeps all the money, and the other bandit is left with nothing.

If there were three robbers, the most senior one needs one other person to vote for his plan. If his plan is voted down, he'll die and then there will be only two thieves left. We already know what happens when there are only two people left: The least violent person receives nothing. Therefore, he could be bought off with just one \$100 bill. As a logician, the least senior robber knows, something is better than nothing. The second thief will get nothing in this case.

In the case of four robbers, the guy with the longest rap sheet needs to persuade one other person to guarantee 50 percent of the vote. He could give the least violent thief two bills, but his greed makes him realize that if his plan is scuttled, there will be only three felons left. When there are three bandits left, the middle-ranked person (among the three) knows he will get nothing; so the distributor buys off the third-ranked person's vote with one bill.

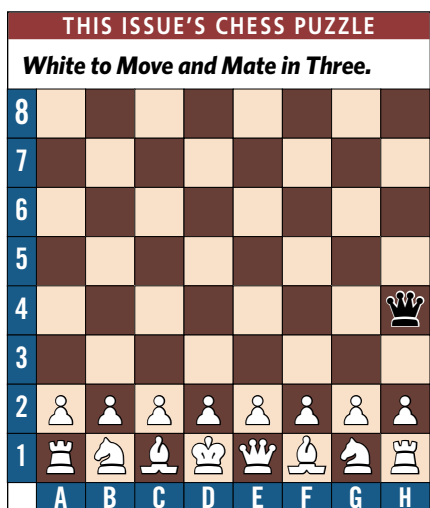
The pattern should be evident now. With eight guys, the most senior robber needs three other people to vote for him. He recruits bandits ranked 3, 5, and 7 with one \$100 bill each, leaving \$9,700 for himself. With nine people, the biggest felon will also have to include the latecomer to have enough votes. He'll keep \$9,600. Those thieves will all vote for the plan because if they don't, they'll be stuck with the second-ranked robber's plan, in which they all get nothing.

Answers

The proposal will change to include the latecomer.

In the original case, the most senior thief gives three \$100 bills—one to the third, one to the fifth, and one to the seventh robber, all ranked in the descending order of their rap sheet's length. He keeps \$9,700.

In the revised case, the third, fifth, seventh, and the ninth robber each get one \$100 bill, the most senior guy keeps \$9,600.



Chess Puzzle

White to move and mate in three.

Initial position: White – Kc2, Qg5, Rg2, Ne1, Ne4, Bb7, pawns g4, h5. Black – Kh3, Rh4, Nh1, Nh6, Bh2, pawn f4

Solution—Case A1

1. Ba6 f3; 2. Bf1 Rh5; 3. Qh5#

Solution—Case A2

1. Ba6 f3; 2. Bf1 f3xg2; 3. Bg2#

Solution—Case A3

1. Ba6 f3; 2. Bf1 Nh-; 3. Nf2#

Solution—Case A4

1. Ba6 f3; 2. Bf1 all other moves; 3. Rg2#

Solution—Case B

1. Ba6 Nh-; 2. Nf2#

Solution—Case C1

1. Ba6 Bg1; 2. Rh2 Kh2; 3. Qh4#

Solution—Case C2

1. Ba6 Bg1; 2. Rh2 Bh2; 3. Bf1#

Solution—Case D

1. Ba6 Bg3; 2. Bf1 all moves; 3. Rf2#

Solution—Case E1

1. Ba6 Nxc4; 2. Qf5 Rh5; 3. Qxc5#

Solution—Case E2

1. Ba6 Nxc4; 2. Qf5 all other moves; 3. Ng5#

Solution—Case F1

1. Ba6 Rxc4; 2. Qh4 Rxh4; 3. Ng5#

Solution—Case F2

1. Ba6 Rxc4; 2. Qh4 Kxc4; 3. Rh2#

Solution—Case G

1. Ba6 Rxh5; 2. Qh5#

SOLVER LISTS

Due to an administrative deadline, names of only those people whose correct solutions were received by the puzzles department editor on or before May 31, 2007, are shown on the lists.

Loot Puzzle: *Shahmeer Aarbi, Steve Altschuld, Zach Aters, John Baldan, Bob Bartholomew, Richard Bottelli, Geoff Bridges, Bob Byrne, Bill Carroll, Mike Crooks, William Cross, Tom Dahl, Mark Danburg-Wyld, Andrew Dean, Mark Evans, Mike Failor, Patrick Flanagan, Christophe Gaboriaud, Yehuda Haber, John Herder, Bob Howard, John Hubenschmidt, Scott*

Humpert, Darrell Johnson, Ben Kester, Chi Kwok, Lee Michelson, Chris Norman, David Oakden, Stephen Peeples, David Promislow, Jason Russ, Noam Segal, Leonid Shteyman, Al Spooner, David Stults, Tony Torelli, Pete Whipple

Chess Puzzle: *Robert Burrell, Bill Carroll, Mike Crooks, Frank Knorr, Mark Mercier, Lee Michelson, Harry Ploss, Noam Segal, Andrew Witte, Lee Zinzow*

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 **July 31, 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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