Math League News

■ **Use the Internet to View Scores or Send Comments** to comments@mathleague.com.

■ **Contest Registration and Books of Past Contests** Register for next year by mail or on the internet right now! Renew now so you don't forget later! *You may ask us to bill you this fall.* We sponsor an *Algebra Course I Contest* and contests for grades 4, 5, 6, 7, and 8. Use the registration form enclosed with Contest #6 to register for contests or to **Order Books of Past Contests**.

■ **2023-2024 Contest Dates** We schedule the six contests to be held four weeks apart (mostly) and to end in March. Next year's contest (and alternate) dates, all Tuesdays, are October 17 (Oct. 24), November 14 (Nov. 21), December 12 (Dec. 19), January 16 (Jan. 23), February 13 (Feb. 20), and March 12 (Mar. 19). Have a testing or other conflict? Now is a good time to put an alternate date on your calendar!

■ **Test Security Procedures** Students are expected to sign the honor pledge posted on our website, affirming that they "will neither give nor receive help with any of the Math League Contest questions either before or during any of the Math League Contests." Of course, in the end contest security is really a cooperative effort. Schools should do whatever they can to prevent premature disclosure of questions and/or answers. For our part, we are always monitoring the results for any suspicious outcomes, which we then investigate thoroughly.

■ **End-of-Year Awards and Certificates** Symbols identify winners. We ship plaques to the advisors. Errors? Write to *Math Plaques, P.O. Box 17, Tenafly, NJ 07670-0017.* Identify the award, contest level, your name, and the school's name and address. The envelope for Contest #5 contained Certificates of Merit for the highest scoring students overall and in each grade for the year. Do you need extra certificates for ties? If so, send a **self-addressed, stamped envelope large enough to hold certificates (you need to use *TRIPLE* postage)** to *Certificates, P.O. Box 17, Tenafly, NJ 07670-0017.* (Please allow one week.)

■ **General Comments About the Contest (and the Year)** Karen Haar said, "Thank you so much for making it easy for our students to take paper exams and submit scores." Yanli Cui said, "Thank you so very much for a wonderful year! Our students really enjoyed doing these Math League Exams!" Catherine VanNetta said, "On behalf of my colleagues, we want to thank you all so much for such interesting problems. Our students are really enjoying the challenge and feel thrilled to solve a problem correctly and present the solution in our debriefs. Hopefully we'll have even more participants next year." Wes Loewer said, "It was another good contest...thanks for another good year of Math League Competitions. They are a highlight for our math students and teachers." Robert Morewood said, "Thanks for another year of stimulating questions. The students did appreciate finishing with some easier ones!"
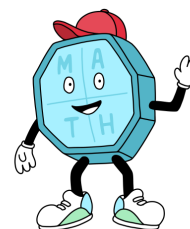
■ **Question 6-5: Appeal (accepted) and Alternate Solution** Tim Thayer and at least one other advisor appealed on behalf of students who submitted their answer to this question in percentage form. Tim said "While I don't accept percentages for probabilities, what is your rule? Is 37.5% an acceptable answer to 6-5?" Math League policy is that mathematically equivalent answers are always accepted, as long as they do not demonstrate question-specific lack of mathematical knowledge. In this case 3/8 and 37.5% are equivalent answers and should both be accepted as correct. Catherine VanNetta and her colleague James Povilonis submitted an alternative, more visual solution for 6-5 targeted to students with limited experience with probabilities. It starts with a 2x2 table that shows the four possible combinations of even and/or odd numbers to be multiplied, demonstrating that the probability that their product is even is 3/4 and the probability that their product is odd is 1/4. That is followed with a 4x4 table listing the four possible outcomes of each multiplication as a dimension (in other words, each dimension has even, even, even, odd as the options). Filling in the 16 cells with whether the sum is even or odd results in 10 of 16 cells marked even and 6 of 16 marked odd. The answer for the probability of an odd outcome is thus 6/16 or 3/8.

■ **Question 6-6: Comment and Alternate Solution** Wes Loewer said, "I did notice something afterwards on #6 that I thought I should mention. There is no mention that x itself has to be an integer. If x were allowed to be a real number, then there would be an infinite number of solutions. Pick any n^2 greater than $4^{2000} + 4^{2023}$ and you can easily find a real number solution for x to 4 significant digits using logs. I suppose that since it was stated that there were exactly 3 solutions, one could argue that this implied that x was an integer, but this should probably be clarified." We agree on all counts; future publications of this question will definitely clarify that x must be an integer! James Povilonis submitted an alternate solution in which he factored 4^{2000}, which is clearly a perfect square, out of each term, leaving $4^{23}+4^y+4^0$ (where $y = 2000 - x$) which must also be a perfect square to find solutions. He then used logic similar to that presented in our official solution by converting everything to powers of 2 and then considering the three possible cases.

Statistics / Contest #6
Prob #, % Correct (*all reported scores*)

Prob #	% Correct	Prob #	% Correct
6-1	77%	6-4	53%
6-2	76%	6-5	19%
6-3	62%	6-6	7%

SEE YOU NEXT YEAR!!