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 enclosed form to register for contests or to **Order Books of Past Contests**.

■ **2012-2013 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 Oct. 16(23), Nov. 13 (20), Dec. 11(18), Jan. 8(15), Feb. 12(19), and Mar. 12(19). Please note that starting in October 2012, each alternate date will be on the Tuesday **following** the official date!! *Do you have a testing or other conflict?* If so, right now is a good time to put the alternate date on your calendar!

■ **A Note on Contest Dates and Score Submissions** One advisor wrote in to say, "I am on spring break and do not have access to all my student's papers. I will not be back in time for deadline. ... I know it is hard to avoid holidays and breaks but maybe you could look at doing the last exam in April after Easter. This should avoid all schools' spring breaks." We did at one point administer the last contest in April, but then we were unable to get the plaques to schools before summer vacation. Note that we do accept late scores (with an explanation) until late March.

■ **Test Security Procedures** One advisor wrote in to say, "I had more 5's and a rare 6 on this contest. I understand that another high school gave the Math League Contest a week before us due to scheduling conflicts. I would suspect that some of my students found out about the contest questions ahead of time. Not sure what to do to prevent this... but something to take into consideration." We do have procedures designed to prevent such leaks. 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 instance, schools giving the contest before the official contest date should not return the papers to students until after that official date.

■ **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)** Cyndee Hudson said, "Everyone (grades 9-12) could try [to] get several right, didn't require trig or pre-calc. Great year. Thanks." Robert Morewood said, "A nice diversity of questions." Timothy Baumgartner said, "Thanks again for a great year with lots of interesting questions." Nola Forbes said, "This contest saw our school's best results ever! It was great to follow-up on our low score from the last contest. A nice way to wrap-up our season." David Hankin said, "Thanks for another excellent contest." Matt Timmins said, "Thanks for creating another fine contest. This year's edition proved more challenging than most. Many thanks." Dave Ollar said, "Very well-done test. Good level of overall difficulty I thought." Sam Koski said, "We really enjoyed the tests this year." Mark Luce said, "Very nice contest. I liked the problems. Thank you, and we will be back for more next year!" Fred Harwood said, "[My students] enjoyed it and the younger ones were engaged throughout. Well done, and thank you for another excellent year of contests." Jamie Bassett said, "Thank you again for your excellent tests! I think this was one of the toughest years I remember, yet there were always problems that were accessible to the younger solvers." Dana Rubin said, "My students and I love Math League and have increased interest in our Math Team significantly during the past five years. Thanks again for another fun year of math!" Ed Groth said, "Thanks for another fun year. The month-by-month competitions keep the energy going through the year, and also get kids excited for a lot of the annual tests. I also enjoy 'posting' the top 20 cumulative scores in the school each month—kids flock to my room to see how they did and where they stand in the 'rankings.' ... It sure is a heated fight for the top!" Bill Tabrisky said, "Thank you for all the efforts you've put into creating interesting and challenging sets of problems over these many years."

■ **Question 6-2: Appeals (Denied)** Jennifer Heinz appealed on behalf of a student who put 2, 7, 31 as the answer for this question. Since the question specifically asks for Dad's age, the student did not answer the question and credit could not be given. Another advisor appealed on behalf of an answer of 37, based on the idea that the three ages could be 1, 2, and 37. This is an incorrect answer, since the question specifies that each age is a prime number and 1 is not prime.

■ **Question 6-4: Comments, Appeals (Denied), and Alternate Solution** Mark Luce said, "Some of my students did complain that the graph in problem 4 could have been clearer." Chris Heathfield appealed, saying, "The graph of the given function $y = f(x)$ can easily [be] misunderstood to have a horizontal asymptote along the line $y = 1$. If that were so, there would only be four solutions to the desired equation. ... Also, in light of this should the solution of 4 be permissible? I'm OK either way, but for a student quickly writing this would seem to be a reasonable interpretation." The appeal is denied; while it is close, a careful viewing of the graph shows that the upper portion of the right and left branches of the graph are slightly above $y = 1$. (To clarify, carefully draw the horizontal line $y = 1$ on the graph we provided.) One student wrote to us with an appeal for the same incorrect answer of 4, based on different logic. His theory was that the statement $f(x) = 1/f(x)$ could be read as a definition, such that the $f(x)$ in question was simply the reciprocal of the graphed function. This appeal is also denied; when writing a single mathematical equation, one may not use the same function notation to represent two different functions. (It would be equivalent to writing $x = 1/x$ and then claiming that the x on the left-hand side was a different x from the one on the right-hand side. If we were defining a new function, we would have to use two different functions, such as: "Let $g(x) = 1/f(x)$.") Finally, Sean Murray sent in an alternate approach that one of his students used to answer this question correctly. The student rearranged the given equation to get $(f(x) + 1)(f(x) - 1) = 0$. He reasoned that if the original function were shifted vertically up 1 unit, the graph would cross the x-axis twice, giving two solutions, and if the original function were shifted vertically down 1 unit, the graph would cross the x-axis four times, for a total of 6 solutions to $f(x) = 1/f(x)$. Per Sean, "He did not add that those would have to be unique solutions, but you can see that if they were not unique, than the original $f(x)$ would not be a function."

■ **Question 6-5: Comments and Appeals (Accepted)** Several of our advisors wrote in to point out that there were correct answers other than the one we originally designated as the official answer to Question 6-5. Among the first to bring the issue to our attention were Ted Heavenrich, Bill Tabrisky, Tom Wharton, Ed Groth, and David Hankin. They are, of course, correct, and any student who gave an answer of –3, –3/2, or –1/2, or any combination of those numbers, was given credit. In general, the function $g(x) = x^{f(x)}$ is defined for $x > 0$. Given the question, our original solution was based on the assumption that $x + 1 > 0$. But for discrete integral values of $f(x)$, $x^{f(x)}$ may be extended to other real values that we did not consider since they are not part of the domain of $g(x)$ in general. Since we did not exclude such values explicitly in Question 6-5, we are accepting the answers of $x = -3$ and $x = -3/2$ as correct, as well as $x = -1/2$ (the official answer).

■ **Question 6-6: Comments** Apparently Question #6 was a bit too easy to guess correctly, as pointed out by several of our advisors and verified by the statistics. Robert Morewood said, "I particularly liked #6. Unfortunately, some of my students admitted to getting the right answer easily by misreading the problem! 5 green balls, probability of green is one-half, how many balls in the bag?!?" Jeff Schwartzman said, "A lot of my students got Problem 6-6 correct by mere guessing (since 10 = 2 x 5)." Timothy Baumgartner said, "One comment: I think that many of my students who answered Question 6-6 correctly did so through a naive approach which nonetheless gave the right response. That usually doesn't happen!"

Statistics / Contest #6

Prob #, % Correct (*all reported scores*)

6-1	86%	6-4	23%
6-2	79%	6-5	42%
6-3	67%	6-6	65%