



# Math League News

■ **Our Calculator Rule** Our contests allow both the TI-89 and HP-48. You may use any calculator without a QWERTY keyboard.

■ **Our Internet Score Center** All students who take the paper and pencil version of our contests and whose scores you report must have been tested at exactly the same time. Don't list students from any later class period. Instructions for submitting scores appear on each contest envelope. Scores you enter may be reviewed at any time by returning to the Internet Score Center. About 3 weeks after a contest, scores appear on our Web site, [www.mathleague.com](http://www.mathleague.com). Late scores must be accompanied by a brief explanation of the reason for lateness. Scores you enter may be reviewed at any time by returning to the Internet Score Center. About 3 weeks after a contest, scores appear on our Web site, [www.mathleague.com](http://www.mathleague.com). Late scores must be accompanied by a brief explanation of the reason for lateness.

■ **Contest Dates** Future HS contest dates (and alternates), all Tuesdays, are November 14 (Nov. 21), December 12 (Dec. 19), January 16 (Jan. 23), February 13 (Feb. 20), and March 12 (Mar. 19). Please note that each alternate date is on the Tuesday following the official date!! For vacations, special testing days, or other *known* disruptions of the normal school day on a contest date, please *give the contest on the following Tuesday*. If your scores are late, meaning beyond the week of an alternate date listed above, please submit a brief explanation. We reserve the right to refuse late scores lacking an explanation. We sponsor an *Algebra Course I Contest* in April, as well as contests for grades 4, 5, 6, 7, & 8. See [www.mathleague.com](http://www.mathleague.com) for information.

■ **Administer This Year's Contests Online** Any school that is registered for any of our contests for the 2023-2024 school year may register at <http://online.mathleague.com> for the 2023-2024 Online Contests at no cost. Advantages of administering the online versions of our contests rather than the paper and pencil ones are that you do not have to grade your students' papers and that you do not have to submit any scores at our Score Report Center ~ these tasks are done automatically for you when your students take our contests online. If you decide to use this free service, you must set up your account and set the day you are going to administer each contest at least one day in advance of the actual contest date.

■ **Eligibility Rules** Only students officially registered as students at your school may participate. That's our rule.

■ **Authentication of Scores** To give credibility to our results, we authenticate scores high enough to win recognition. Awards indicate compliance with our rules. Please print the Selected Math League Rules (posted on the same page as this Newsletter) and have students read them and then sign them to confirm knowledge of the rules. *Keep* the signed sheets. Do *not* send them to us unless we request authentication from you.

■ **Past Contests Online** Teachers of any school registered for any of our 2023-2024 contests can now purchase online versions of the past contests for any selected grade (4th Grade through High School) for \$9.95 per grade level for use throughout this school year at <http://online.mathleague.com>. For this fee, all students in your school can take all the past contests for a specific grade online. We grade each contest for you, provide you with answers and solutions, and keep statistics on each student's performance.

■ **We Are on Facebook!** Like us at <https://www.facebook.com/TheMathLeagueInc>

■ **Send Your Comments** to [comments@mathleague.com](mailto:comments@mathleague.com).

■ **Possible Change to our Calculator Rule?** For a long time now, Math League policy has been to allow calculator use during our high school contests, with the only exception being calculators with a QWERTY keyboard. We are now in the process of reevaluating that policy, and we would love to hear your input! There are several possibilities under consideration. Option 1: leave the policy as is. Option 2: continue to allow calculator use, but tighten the restriction to rule out the use of CAS calculators. (CAS calculators can occasionally transform questions we have designed with the intent that they be extremely difficult into questions that are easy or even trivial. Option 3: prohibit calculator use entirely. What do you think? Which option should we adopt? Or is there a fourth option you think we should consider?

■ **General Comment About the Contest** Robert Morewood said, "Thanks for a great contest to start the year! To my surprise, the students here did better on #2 than on # 1."

■ **Question 1-6: Comments and Alternate Solution** Chip Rollinson said, "I had several students guess and check to find a solution with their calculators. After doing the problem, I also grabbed a CAS calculator (which my students do not have) to see what it could do. It quickly was able to factor the 13th degree polynomial which makes question #6 trivial if a student has a CAS calculator. It does seem like an unfair question as a result. Bummer." See the discussion of a possible change to our calculator rule above! Robert Morewood said, "One of my students claims to have done #6 by long division (I have not checked that solution) but it took well over 45 minutes to complete that calculation! My own solution to #6 used complex numbers. Since  $g(x)$  has only one real zero and both zeros of  $f(x)$  must be zeros of  $g(x)$ , we are looking for an  $f(x)$  with complex zeros:  $x = (1 \pm \sqrt{1-4a})/2$ , so  $a > 0$ . But  $a = 1$  is easily ruled out since  $[(1 + \sqrt{-3})/2]^3 = -1$ , making  $[(1 + \sqrt{-3})/2]^{13} = [(1 + \sqrt{-3})/2]$ . Also the triangle inequality gives:  $|x|^{13} < |x| + 90$ , which (using a calculator for the power - the absolute value is real) rules out  $a \geq 3$ . Actually checking that, for  $a = 2$ ,  $x = (1 + \sqrt{-7})/2$  is indeed a zero of  $g(x)$  is a little bit laborious: binomial square 3 times in a row  $((x^2)^2)^2$ , multiply by the previous square  $(x^2)^2$  then by the original  $x$  before adding  $x$  and 90 to get zero."

## Statistics / Contest #1

Prob #, % Correct (all reported scores)

1-1	79%	1-4	46%
1-2	59%	1-5	39%
1-3	58%	1-6	16%