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.

■ Use the Internet to View Scores or Send Comments to comments@mathleague.com. You can see your results at *www.mathleague.com*!

■ Dates of Final HS Contest and Algebra Contest Our final contest of this school year is March 15 (with an alternate date of March 22). In addition, this year happens to be the 21st year of our annual April *Algebra Course I* contest. There's still time for your school to register! Go to **www.mathleague.com**.

■ 2016-2017 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 18 (Oct. 25), November 15 (Nov. 22), December 13 (Dec. 20), January 10 (Jan. 17), February 7 (Feb. 14), and March 14 (Mar. 21). Have a testing or other conflict? Now is a good time to put an alternate date on calendar!

■ Rescheduling a Contest and Submitting Results Do you have a scheduling problem? If school closings **or testing days** mandate contest rescheduling, our rules permit you to use an alternate contest date. Try to give the contest the week after the regularly scheduled date. If scores are late, attach a brief explanation. Late scores unaccompanied by such an explanation will not be accepted.

■ End-of-Year Awards Engraving of awards begins March 27th. We give plaques to the highest-scoring school in each region and to the 2 schools and the 2 students with the highest totals in the entire League. *Winning schools must submit their results to our Internet Score Report Center by Match 31st.* Results submitted later *cannot* be used to determine winners. A teacher once asked, "*Has there been any thought to using enrollment figures to divide the schools into two divisions? Personally, I don't care whether we ever receive any team recognition, as my students enjoy the mathematical challenges provided.*" Our groupings are not organized to "even out" the competition. Competition is one feature of our academic enrichment activity, but enrichment should be the main goal. Only a few schools can expect to win, but all schools can profit.

■ General Comments About Contest #5: Henry Valencia said, "Thank you for yet another great set of problems. My students struggled, but the problems were awesome!" Mathew Vea said, "All in all, it was a fair but challenging round." Ed Rollmann said, "Teachers across the state look forward to this contest each and every year. Thanks for the time and effort that your organization puts into this activity." Abdulkerim Akyalcin said, "I always take these tests with my students and enjoy them. In this one I finished the test in 20 minutes (I got all of them right:)). I thought it was an easy set of problems. I was expecting most of my students would get a perfect score so as a school we could get our first perfect score of 30. However, we got one of our lowest scores. :(Maybe on the last one we can get a perfect score. Looking forward to #6. Thank you again for another great set of problems." David Hoffman said, "Looks like the team didn't eat their Wheaties that morning! Anyway, once again, you have supplied us with tough creative problems. Bravo." Mathew Vea said, "In general, this contest seemed like it was surprisingly challenging for my students."

■ Question 5-1: Comment Mathew Vea said, "Most of my students missed [Question 5-1], which was elementary, but required careful thought."

■ Question 5-2: Comments and Appeals (Accepted and Rejected) We received many comments and appeals on Question 5-2. The first group of appeals had to do with an ambiguity in the wording of the question. Cindy Wilker, Ben Dillon, and Kevin Horstman all appealed on behalf of students who interpreted the question as asking which plus sign should be removed from the **second** sequence mentioned, 12+3+4+5+6+7+8+9=54, in order to get the desired total of 99. Students who interpreted the question in this manner would have been correct to say that the fourth plus sign should be removed. Since this interpretation is not unreasonable given the wording of the question, students who answered "fourth" should be given credit. The second group of appeals had to do with the requirement of an ordinal number in the answer. This issue was raised by David Doster, Kaleen Graessle, Frederick Deppe, Ross Arseneau, Ben Dillon, Nicole Kitagawa, Larry Davidson, and Mathew Vea who all appealed on behalf of students who wrote "6" instead of "sixth" as their answers. Although the question does specify that the answer should be an ordinal number, both in words and by example, the appeal is accepted. As a result of these successful appeals, advisers should now give credit for each of the following answers: "sixth," "fourth," "6th," "4th," "6," and "4." Another appeal was submitted by Mike Kraemer on behalf of students who submitted "(6,7)" as their answer, presumably indicating their thinking that it was the plus sign between the digits 6 and 7 that should be removed. The appeal is rejected, and answers of "(6,7)" should not be given credit.

■ Question 5-4: Comments and Alternative Solution Mathew Vea said, "I thought that 5-4 was a good problem, but more difficult than usual for a problem 4.'" Chip Rollinson said, "5-4 proved to be the most challenging. One student reported using coordinate geometry to figure out the answer." Peter Knapp suggested an alternative solution, saying "[Question 5-4] can be done without using side lengths. Let the smaller shaded region have area X, and the white triangular region on the bottom have area A. If you look at the combined region of those two, you will realize that the large white rectangle in the upper left has area $A + X$ and the white region in the upper right has area A (as either white region of area A combined with the smaller shaded region forms one of the large triangles). Then, using the similarity between the smaller shaded region and the triangle across the bottom, the sides of the two triangles have a ratio of 2:1, so the ratio of their areas are 4:1. Thus, $A = 4X$. From there, if you notice that $150 + A$ is half of the area of the square, you can solve for X pretty easily."

■ Question 5-6: Comments and Alternative Solution Several advisers wrote in expressing concern that the official solution to question 5-6 was hard to follow. Kevin Horstman and Ben Dillon have raised the issue. Consider the following alternative explanation: Since we have replacement, the probability of drawing any colored medal on each draw is the same. Each draw is independent. If we denote, s, g and b as the respective probabilities of drawing a silver, gold, or bronze medal on each draw, then the probability of drawing 2 gold and 2 silver medals will be the same for any order of 4 drawings. We need only calculate the number of different sequences of length 4 having 2 silver and 2 gold. Clearly this is the number of different permutations of the symbols SSGG. This is 4!/(2!2!) (Same as choosing two pairs of positions). Hence the probability is $6s^2g^2$. Similarly the probability of choosing two bronze, a silver and a gold is $4!/2!\ sgb^2$. In fact we can observe that on each drawing $p + g + b = 1$.Further for 4 drawings, the probability of obtaining a particular sequence is exactly the corresponding term in the expansion $(s + g + b)^4$.

Statistics / Contest #5

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

5-1	53%	5-4	25%
5-2	82%	5-5	18%
5-3	49%	5-6	16%