# 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 23 (with an alternate date of March 17). In addition, this year happens to be the 16th year of our annual April *Algebra Course I* contest. There's still time for your school to register! Go to **www.mathleague.com**.

**■ 2010-2011 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. 19(12), Nov. 16 (9), Dec. 14(7), Jan. 11(4), Feb. 22(15), and Mar. 22(15). If you have a testing or other conflict, right now is a good time to put an alternate date on your 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 prior to the regularly scheduled date, so the results can still be submitted on time. Report your scores by Friday of the official contest week. 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 31st. 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:** James Conlee said, "Great (tough) contest! ... #5 challenges all students, mainly because of the 30-minute time limit." Donald Brown said, "Overall one of the most interesting contests ever! The scores were all over the place. I had several students only get Problem 6 correct. There were multiple students who only got Problems 4, 5, and 6 correct. A very wild mixture." Chris Irvine said, "We had 45 students elect to participate in this contest, which was great! Thanks for giving us the opportunity to challenge our math students." Ginny Magid said, "The teachers in our department enjoyed this contest as a challenge to ourselves, but we were disappointed that it was not as accessible as previous contests have been for underclassmen (those students taking geometry or algebra 2). We prefer ones where every student can have some level of success." Micole Roy said, "Great contest!"

**■ Question 5-2: Comments and Appeals (Accepted and Denied)** Several advisors wrote in to comment that our use of the word "different" made this question ambiguous. These advisors included Sidney Lee, Leeanne Branham, Margaret Hoffert, Michael Campbell and Keith Calkins. As intended, "different" meant "distinct," and the intended interpretation lead to the original official answer of 10, as explained in the solutions. As the advisors pointed out, however, "different" could also have been interpreted as meaning "different from 100." Under that interpretation, the answer would have been 9. We will therefore accept both 9 and 10 as correct answers. Other advisors reported that the use of the variable $n$ in two places within the second sentence was confusing to some students. While we understand that a student unfamiliar with such phrasing might find it confusing, it is a fairly standard way to express questions of this type. Since it is not in any way ambiguous, answers such as 109 are incorrect.

**■ Question 5-4: Comments, Alternate Solutions and Appeal (Accepted)** Question 5-4 got quite a range of responses from our advisors. Donald Brown said, "Problem 5-4 is one of my all time favorite problems. I'll probably use a version of it as a bonus question on next year's trigonometry final exam." Warren Tucker said, "Liked this question. Good review of trig identities." Fred Harwood expressed both sides of popular opinion, saying, "My younger students were put off by the trig question as they had no way to start into it. I liked it because it made me think of the old trig identities I haven't needed in years (decades?)." Bob Boldra said, "Number 4 made a lot of our students go crazy. Good Job." We're not sure whether the questions were a good job or making the students go crazy was the good job, but either way, we thank you for the compliment! Several advisors suggested alternate solutions. Jack E. Josey, Jr. (after stating that "the solution you provided was very clever") and Keith Calkins each suggested solving for the value of tan $x$ (presumably using the quadratic formula), which turns out to be $2 \pm \sqrt{3}$, and then finding or knowing the arctan of that value to determine the value of $x$ itself. James Conlee suggested using a graphic approach to find the value of $x$.

**■ Question 5-5: Alternate Solution** We would like to suggest that there is a third approach to this question beyond the two methods set forth in the official solutions. A solver could simply pick specific functions that satisfy the requirements of the question. For example, let $g(x) = 3x$. Then $f(x) = 2x$, $F(x) = \frac{x}{2}$, and $G(x) = \frac{x}{3}$. $F(2010) = 1005 = 3015/3 = G(3015)$. Therefore, $n = 3015$.

**■ Question 5-6: Comments and Alternate Solutions** Sidney Lee said, "I liked the geometric reasoning on number 6. Good problem!" Fred Harwood said, "I liked the elegance of #6 because it was attainable with various approaches and by various grades." Leon La Spina said, "Nice application of 'dynamic geometry' reasoning!" There was, on the other hand, some less-than-positive feedback about the clarity of the labeling on our diagram. Several advisors, including Chris Bolognese, Kelly Ogden, and Leon La Spina, reported that students were confused as to whether the '8' in the diagram was intended to be a label for the base of the rectangle or the side of the parallelogram. There were several alternative solutions proposed by advisors. James Conlee suggested drawing the diagram on a coordinate plane, sketching the image in quadrant I. The length of the base of the parallelogram (through the Pythagorean Theorem) is $\sqrt{80}$, and the equation of the base is $y = -.5x + 4$. He found the height of the parallelogram by drawing the altitude from (8,5) and writing the equation of the altitude line by using the point-slope form of the equation, $y = 2(x - 8) + 5$ (knowing that perpendicular lines have opposite reciprocal slopes). Then he solved to get the point of intersection of the base and height at (6,1). He found the distance between (6,1) and (8,5) to get the height of the parallelogram ($\sqrt{20}$), then found the area. He further reports that some of his students used trigonometry to find the angles, and then find the height of the parallelogram. Yet another alternative solution was proposed by Chip Rollinson and one of his students, Elena Kingston, who each began solving by proving that the right triangle with legs 4 and 8 formed in the lower left part of the rectangle is similar to the right triangles formed by drawing the altitude of the isosceles triangle with legs of 5. Finding the height of the parallelogram was then a simple matter of using proportional sides of the similar right triangles.

## Statistics / Contest #5

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

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|---|---|---|---|
| 5-1 | 81% | 5-4 | 30% |
| 5-2 | 54% | 5-5 | 47% |
| 5-3 | 69% | 5-6 | 24% |