Math Zoom Summer Camp 2010 Assessment Test Cover Sheet

Your name (please print) _____ _____
Last *First*

Address _____

Phone # _____

Email _____ (please print legibly)

Number of pages (not including this cover sheet) _____

Math Zoom Summer Camp 2010 Assessment Test

- The Assessment Test aims to determine the skill levels of students with little or no experiences in math competitions, for the purpose of placement in the Math Zoom Summer Camp. If you meet one of the following requirements, you are not required to submit the Assessment Test:
  (a) Qualified for AIME;
  (b) Scored 19 or above in AMC 8;
  (c) Entered the MathCounts State level competition as an individual or in a team;
  (d) Top performer in ARML;
  (e) Good performance in other math contests comparable to the above—please provide details.
- There are 16 problems in this test. Give yourself 5 days to work on them. You don't have to solve all the problems. Solve as many of the problems as you can. Choose **six (6)** of your favorite solutions and submit them. You are encouraged to submit more than six if possible. Don't be discouraged if you can't solve six of them; simply send whatever you have done after 7 days.
- All of these problems can be solved using only elementary techniques. Some are quite easy, and some pretty challenging. The problems are roughly grouped by subject area, **not ordered by difficulty**. Most of the time, you need to find clever ways to combine the elementary techniques in order to find a solution.
- Complete solutions are required for all problems. Partial credits are given to well-reasoned progress toward a solution, even though the solution is incorrect or incomplete. Do not simply submit an *unsupported* answer. You should include all significant steps in your reasoning and computation.
- There are a cover sheet and an answer sheet. Print out both sheets, and make several copies of the blank answer sheet. Fill out the top of each answer sheet as you go, and then fill out the cover sheet when you're finished. **Start each problem on a new answer sheet.**
- **All the work you present must be your own**.
- You must submit your solutions by regular mail, e-mail or fax (714-784-7838) as soon as possible. Make sure that the cover sheet is the first page of your submission, and that it is completely filled out.

  Solutions are to be mailed to the following address:

  Math Zoom Summer Camp
  5420 Trabuco Road, Suite 180
  Irvine, CA 92620

  If you e-mail your solutions, please send them to

  mathcamp@mathzoom.org

  E-mailed solutions may be written and scanned or typed in TEX. They should be sent as an attachment in either .doc or .pdf format. If you write and scan your solutions, insert the scans into a .doc or .pdf file, and send just the one file.

Please go to the next page for the problems.

Math Zoom Summer Camp 2010
Assessment Test

1. The mean of five numbers is 138. If they are listed from small to large, the mean of the first three numbers is 127, and the mean of the last three numbers is 148. Find the number in the middle.

2. Gold Toothed Brendan and Peg Legged Samuel went to hunt for treasures. Gold Toothed Brendan found 31 more diamonds than Peg Legged Samuel. Also, the number of diamonds of Gold Toothed Brendan was one more than 4 times the number of diamonds of Peg Legged Samuel. How many diamonds did each of them find?

3. A middle school has 780 students, some of which go to Math Olympiad classes. Among those who attend Math Olympiad classes, $\frac{8}{17}$ are in 6th grade, and $\frac{9}{23}$ are in 7th grade. How many students do NOT attend Math Olympiad classes?

4. The sum of the ages of three children is 32. The age of the oldest is twice the age of the youngest. The ages of the two older children differ by three years. What is the age of the youngest child?

5. A road consists of uphill, flat and downhill sections in that order. The distances of the three sections are in the ratios of $1 : 2 : 3$ with a total distance of 20 miles. The times JoAnn spends on the three sections are in the ratios of $4 : 5 : 6$. She walks at a speed of 2.5 miles per hour uphill. What's the total time she spends on the road?

6. Which number has more positive factors, 2009 or 2010?

7. The ten-digit integer $\overline{1a2a3a4a5a}$ is divisible by 11. What is digit a? (The horizontal bar indicates that "$1a2a3a4a5a$" is a single number, not a product.)

8. How many times does the digit 1 appear in the list of integers from 0 to 100 inclusive?

9. How many integers between 200 and 700 consist of three distinct digits?

10. During a party, a total of 78 handshakes occurred. If each person shook hands once with each of the other people, how many people were at the party?

11. Solve for x: $\frac{x}{1 \cdot 2} + \frac{x}{2 \cdot 3} + \frac{x}{3 \cdot 4} + \cdots + \frac{x}{2009 \cdot 2010} = 2009$

12. Let a and b be real numbers and $(2a-1)^2 = -|b+1|$, find the value of $\left(\frac{1}{a}\right)^2 + \left(\frac{1}{b}\right)^{2009}$.

13. Given that $ABCD$ is a square, and points E, F, G, and H are on sides $\overline{AD}$, $\overline{AB}$, $\overline{BC}$, and $\overline{CD}$ respectively. $AF = BG = 5$, and $BF = CH = DE = 12$, compute the area of $EFGH$.

14. An equilateral triangle ABC with side length 36 has a circle inscribed in it. A second circle is tangent to the first circle and also tangent to two sides of the triangle. What is the area of the smaller circle? Express your answer in terms of π.

15. In triangle ABC, $AB = BC$. Let D be a point on $\overline{BC}$, and assume that $AC = AD = DB$. Find the measure of the angle $\angle ABC$.

16. Given a rectanglular piece of paper $ABCD$, $AB = 1$, and $BC = k > 1$. Fold the paper once so that the points A and C coincide. The area of the non-overlapping region of the paper is $\sqrt{15}$. Find the value of k.

Math Zoom Summer Camp 2010 Assessment Test Answer Sheet

Your name (please print) _____

Problem Number ___ Page ___ of ___

Write neatly! Write all work inside the box. Do NOT write on the back of the page.