MATHCOUNTS®

2007

Chapter Competition
Target Round
Problems 1 and 2

Name

School

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This section of the competition consists of eight problems, which will be presented in pairs. Work on one pair of problems will be completed and answers will be collected before the next pair is distributed. The time limit for each pair of problems is six minutes. The first pair of problems is on the other side of this sheet. When told to do so, turn the page over and begin working. Record only final answers in the designated blanks on the problem sheet. All answers must be complete, legible and simplified to lowest terms. This round assumes the use of calculators, and calculations may also be done on scratch paper, but no other aids are allowed. If you complete the problems before time is called, use the time remaining to check your answers.

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1. The symbols ♣, ♥, ♠, and ♦ each represent a distinct digit that has not been used already in the subtraction problem below. Whenever a symbol appears more than once, it represents the same digit each time. What is the digit that ♣ represents in the following subtraction problem?

\[
\begin{array}{c}
6 \heartsuit \spadesuit \\
- \spadesuit 8 \spadesuit \\
\hline
1 \spadesuit \spadesuit
\end{array}
\]

2. An 8-inch by 8-inch square is folded along a diagonal creating a triangular region. This resulting triangular region is then folded so that the right angle vertex just meets the midpoint of the hypotenuse. What is the area of the resulting trapezoidal figure?
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School ______________________

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3. The distance between two cities on a map is 4 centimeters. If the scale is 0.5 cm = 1 km, how far apart are the actual cities?

4. Six years ago a vacant lot was turned into a park. At that time 46 trees were planted. Three years ago 50 trees were planted in the park, and 60 trees were planted in the park today. Each tree was planted as a seed. Assuming that all of these planted trees survive and no other trees are added in the next 10 years, what will be the average age of the trees in the park 10 years from today? Express your answer to the nearest whole number.
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2007
- Chapter Competition -
Target Round
Problems 5 and 6

Name ____________________________

School __________________________

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5. In order to compute the area of a particular circle, Juan first measures the length of its diameter. The actual diameter is 20 cm, but Juan’s measurement has an error of up to 20%. What is the largest possible percent error in Juan’s computed area of the circle?

6. A quadrilateral in the plane has vertices at (1, 3), (1, 1), (2, 1) and (2006, 2007). What is the area of the quadrilateral?
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2007
-
Chapter Competition -
Target Round
Problems 7 and 8

Name ____________________________

School __________________________

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7. Six boys and six girls are seated randomly in a row of 12 chairs. What is the probability that no two boys are seated next to one another and no two girls are seated next to one another? Express your answer as a common fraction.

8. Dr. Lease leaves his house at exactly 7:20 a.m. every morning. When he averages 45 miles per hour, he arrives at his workplace five minutes late. When he averages 63 miles per hour, he arrives five minutes early. What speed should Dr. Lease average to arrive at his workplace precisely on time? Express your answer as a decimal to the nearest tenth.