MATHCOUNTS®

2004
■ National Competition ■
Target Round
Problems 1 and 2

Name _____

School _____

State _____

DO NOT BEGIN UNTIL YOU ARE INSTRUCTED TO DO SO.

This round consists of eight problems, which will be presented in pairs. Work on one pair of problems will be completed 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 your final answer in the designated space on the problem sheet. All answers must be complete, legible and simplified to lowest terms. Calculators are allowed, and calculations may also be done on scratch paper, but no other aids are permitted.

Total Correct	Scorer's Initials

1. The average heart rate of a shrew is 800 beats per minute, as compared to an elephant with a heart rate of 25 beats per minute. If 1 billion heartbeats is a natural life span for each animal, on average, how many more years do elephants live than shrews? Assume each year is 365 days. Express your answer to the nearest whole number.

1. _____

2. An edgy spider walks only along the edges from A to B of the dodecahedron formed by the net shown. What is the number of edges in the shortest path that the spider could take?

2. _____
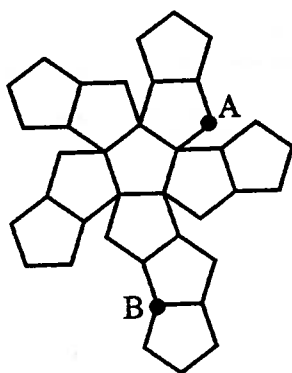
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2004
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Problems 3 and 4

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Total Correct	Scorer's Initials

3. In the addition problem below, each digit from 0 through 6 is
    used exactly once and E ≠ 0. The number "AB" is a two-digit
    prime number, with a tens digit of A and a units digit of B. What
    is the value of A + B?

3. _____

$$
\begin{array}{r}
A\ B \\
+\,C\ D \\
\hline
E\ F\ G
\end{array}
$$

4. Given that a and b are real numbers such that $-3 \leq a \leq 1$ and
    $-2 \leq b \leq 4$, and values for a and b are chosen at random, what
    is the probability that the product $a \cdot b$ is positive? Express your
    answer as a common fraction.

4. _____

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2004
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Target Round
Problems 5 and 6

Name _____

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5. What is the least integer N greater than 2004 for which the positive difference between the square of the number that is five more than N and the square of N is also a perfect square?

5. _____

6. Joe will randomly select two letters from the word CAMP, four letters from the word HERBS, and three letters from the word GLOW. What is the probability that he will have all of the letters from the word PROBLEM? Express your answer as a common fraction.

6. _____

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2004
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Target Round
Problems 7 and 8

Name _____

School _____

State _____

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7. The table shows the fractional number of students at each grade level who buy a school yearbook at Cold Springs Middle School. There are the same number of 7th grade students and 8th grade students who attend the school, but 50 fewer 6th grade students than 7th grade students. Of the 790 students in the school, how many buy a yearbook?

7. _____

Grade Level .	6	7	8
Fraction of students who buy a yearbook	$\dfrac{9}{10}$	$\dfrac{7}{8}$	$\dfrac{3}{5}$

8. A collection S of integers is defined by the following three rules: (I) 2 is in S; (II) for every x in S, $3x$ and $x + 7$ are also in S; (III) no integers except those defined by rules (I) and (II) are in S. What is the smallest integer greater than 2004 which is NOT in S?

8. _____