MATHCOUNTS®

2008
■ National Competition ■
Team Round
Problems 1–10

State _____

_____ , Captain

_____

_____

_____

DO NOT BEGIN UNTIL YOU ARE INSTRUCTED TO DO SO.

This section of the competition consists of 10 problems which the team has 20 minutes to complete. Team members may work together in any way to solve the problems. Team members may talk during this section of the competition. This round assumes the use of calculators, and calculations may also be done on scratch paper, but no other aids are allowed. All answers must be complete, legible and simplified to lowest terms. The team captain must record the team's official answers on his/her own problem sheet, which is the only sheet that will be scored.

Total Correct	Scorer's Initials

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1. A rectangular strip of paper 16 units long and 1 unit wide is divided into 16 unit squares. Starting at the left end of the strip the integers from 1 to 16 are written in order, one in each square. The strip is then folded so that the right half completely covers the left half. This action is repeated until the strip is one unit long. At this point how many squares are beneath the square that has 10 written on it?

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

1. _____ squares

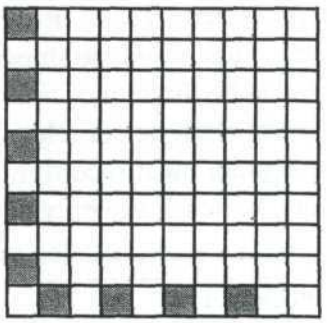
2. A 4-by-4 square board is divided into 16 unit squares. Each unit square is one solid color; 4 are blue, 5 are red and 7 are green. A bug randomly hops about the board. Each hop can be any distance and always takes him to a square that is different in color than the unit square he just hopped from. If the bug starts on a red square, what is the probability that its third hop lands him on a red square? Express your answer as a common fraction.

2. _____

3. The marching band has more than 100 members but fewer than 200 members. When they line up in rows of 4 there is one extra person; when they line up in rows of 5 there are two extra people; and when they line up in rows of 7 there are three extra people. How many members are in the marching band?

3. _____ members

4. In this 10-by-10 square grid, initially 9 unit squares are shaded, as shown. Every minute, any unit square that is shaded remains shaded, and any unit square that shares at least two sides with shaded unit squares becomes shaded. When no more unit squares can become shaded, what is the number of unit squares that are shaded?



4. _____ unit squares

5. Within a 4×4 grid of unit squares, there are squares of five various sizes (1×1 through 4×4) each of which is comprised entirely of whole unit squares. In each of the 16 unit squares, write the total number of squares (1×1 through 4×4) that contain that square. One square has already been filled in to show that eight squares (one 1×1, two 2×2, two 3×3 and one 4×4) contain that square. What is the sum of the 16 numbers shown when the grid is completely filled in?

	6		

5. _____

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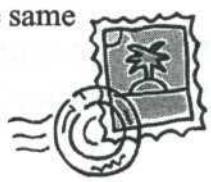
6. Yesterday, Teddy played a game repeatedly on his computer and won exactly 85% of the games he played. Today, Teddy played the same game repeatedly, winning every game he played, until his over-all winning percentage for yesterday and today was exactly 94%. What is the minimum number of games that he played today?

6. _____ games

7. Diane has one 1¢ stamp, two identical 2¢ stamps, and so on, up to nine identical 9¢ stamps. In how many different arrangements can Diane paste exactly 10¢ worth of postage in a row across the top of an envelope? (Note, however, that simply rotating or inverting a stamp, or exchanging the positions of two stamps with the same denomination should be considered the same arrangement.)



7. _____ arrangements

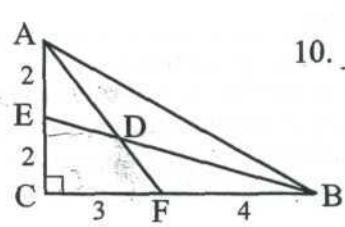
8. A regular hexagon is truncated to form a regular dodecagon (12-gon) by removing identical isosceles triangles from its six corners. What percent of the area of the original hexagon was removed? Express your answer to the nearest tenth.

8. _____ %

9. Five different rockets, A, B, C, D and E, are to be launched from two separate launch pads labeled 1 and 2. Each pad can accommodate only one rocket at a time. The rockets can launch from either pad, in any order and at any time (sequentially or simultaneously). One example of a launch pattern is (C1, A1D2, E1B2) where the two commas separate three different launching times. Including the example given, what is the total number of different possible launch patterns?

9. _____ launch patterns

10. In the figure, what is the area of triangle ABD? Express your answer as a common fraction.



10. _____ sq units

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