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# MATHCOUNTS®

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**2015**  
■ **School Competition** ■  
**Team Round**  
**Problems 1–10**

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Team  
Members \_\_\_\_\_, 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 to each other during this section of the competition. This round assumes the use of calculators, and calculations also may 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 competition booklet, which is the only booklet that will be scored. If the team completes the problems before time is called, use the remaining time to check your answers.

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Total Correct	Scorer's Initials

**Raytheon**

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1. \_\_\_\_\_

The counting numbers are listed in an array of six columns, labeled A through F, so that the rows alternate between counting from left to right and right to left. If this pattern continues, what number would be the 40th entry in column C?

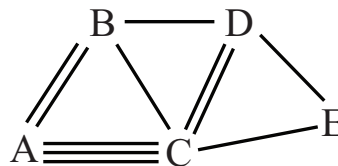
A	B	C	D	E	F
1	2	3	4	5	6
12	11	10	9	8	7
13	14	15	16	17	18
24	23	22	21	20	19
25	26	27	28	29	30

2. \_\_\_\_\_ marbles

Sally has a bag of marbles to share with her friends. Sue chooses first and takes  $\frac{1}{3}$  of the marbles out of the bag. Next, Bill takes  $\frac{1}{4}$  of the remaining marbles. Brian then gets  $\frac{1}{2}$  of the remaining marbles, which leaves 75 marbles for Sally. How many marbles did Sally's friends take?

3. \_\_\_\_\_ routes

Each line segment in the diagram represents a distinct road between two cities. If the roads can only be used to go between cities in alphabetical order (but not every city must be visited), how many routes are there from A to E?

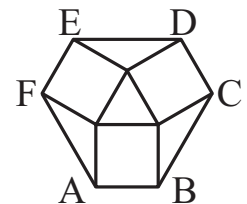


4. \_\_\_\_\_

The solution to  $x^2 + bx + c = 0$  of least value is 4 more than the solution to  $x^2 + 5x + 4 = 0$  of least value. The solution to  $x^2 + bx + c = 0$  of greatest value is 4 more than the solution to  $x^2 + 5x + 4 = 0$  of greatest value. What is the value of  $b + c$ ?

5. \_\_\_\_\_ units

A square is constructed on each side of an equilateral triangle, and segments are drawn between adjacent external vertices of the three squares to form hexagon ABCDEF as shown. If the equilateral triangle has sides of length  $\sqrt{3} - 1$  units, what is the perimeter of hexagon ABCDEF?



6.          ways Six volleyball teams, each of which consists of three men and three women, are competing in a tournament. A reporter wants to interview one person from each team, being sure to have three men and three women total. How many ways can the six people to be interviewed be chosen?
7.                      All terms of an arithmetic sequence are integers. The first term is 535, the last term is 567, and the sequence has  $n$  terms. What is the sum of all possible values of  $n$ ?
8.                      What is the greatest integer that leaves the same remainder when divided into each of the integers 3712, 3814 and 3865?
9.                      Three fair standard six-sided dice are rolled. What is the probability that the sum of the three numbers rolled does not exceed 10? Express your answer as common fraction.
10.            numbers How many numbers of the form  $\frac{1}{a}$ , where  $a$  is an integer such that  $1 < a < 100$ , can be written as a terminating decimal?

