MATHCOUNTS®

2013
■ State Competition ■
Team Round
Problems 1–10

School _____

Chapter _____

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.

Total Correct	Scorer's Initials

1. _____

The single-digit prime numbers 2, 3, 5 and 7 are used to replace a, b, c and d in the multiplication table shown here. The four products are found and then added together. What is the greatest possible value of this sum?

×	a	b
c		
d		

2. _____ pieces

The circular pizza, shown here, is cut 5 times with straight line cuts before being removed from the pan. What is the maximum number of pieces that can be made which contain none of the pizza's outer crust, located around its circumference?

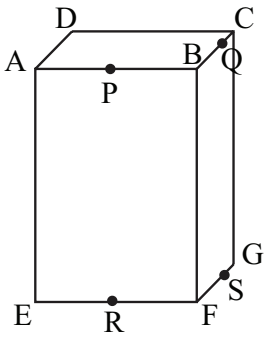
3. _____ equations

After tossing a red, then a green and, finally, a white standard six-faced die, Patrick used the numbers showing on the upper faces of each die, in order, to create the incorrect equation below, such that red – green = white. By rotating each die a quarter turn in some direction so that the number on the top face moves to a lateral face, he finds that he can make a correct equation. Given that the opposite faces of a die have a sum of 7, how many correct equations are possible?

$$4 - 3 = 2$$

4. _____ ft^3

A square prism has dimensions 5' × 5' × 10', where ABCD is a square. AP = ER = 2 ft and QC = SG = 1 ft. The plane containing $\overleftrightarrow{PQ}$ and $\overleftrightarrow{RS}$ slices the original prism into two new prisms. What is the volume of the larger of these two prisms?



5. _____

What is the sum of all real numbers x such that $4^x - 6 \times 2^x + 8 = 0$?

6. _____ units^2 In square units, what is the area of the region bounded by the graph of $|x - y| + |x + y| = 6$?

7. _____ collections How many collections of six positive, odd integers have a sum of 18? Note that 1 + 1 + 1 + 3 + 3 + 9 and 9 + 1 + 3 + 1 + 3 + 1 are considered to be the same collection.

8. _____ ways In how many different ways can 15,015 be represented as the sum of two or more consecutive positive integers written in ascending order?

9. _____ Call a positive integer *squarish* if it contains the digits of the squares of its digits in order but not necessarily contiguous. For example, 14,263 contains $1^2 = 1$, $4^2 = 16$ and $2^2 = 4$. However, it is not squarish because it does not contain $3^2 = 9$, and $6^2 = 36$ is not in order. What is the smallest squarish number that includes at least one digit greater than 1?

10. _____ in^2 A square of side length 1 inch is drawn with its center A on a circle O of radius 1 inch such that a side of the square is perpendicular to $\overline{OA}$, as shown. What is the area of the shaded region? Express your answer as a decimal to the nearest hundredth.