
MATHCOUNTS®

2017
■ Chapter Competition ■
Team Round
Problems 1–10

School _____

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

Raytheon

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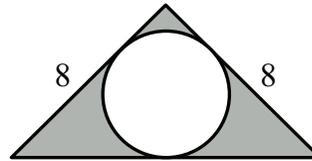
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1. _____ A *Lagado number* is a number of the form $3n + 1$ where n is a nonnegative integer. A *Lagado prime* is a Lagado number greater than 1 which is not divisible by any Lagado number other than 1 and itself. What is the fifth Lagado prime?

2. _____ in² A circle is inscribed in a right isosceles triangle whose legs are 8 inches long. How many square inches are in the area of the shaded portion? Express your answer as a decimal rounded to the nearest hundredth.



3. _____ pairs A standard deck of playing cards has 52 cards divided into four suits (clubs, diamonds, hearts, spades). Each suit consists of nine “number cards”, each containing a different number from 2 to 10, and four “face cards” that include a jack, a queen, a king and an ace. In the game of Cribbage, points are earned if you can combine two cards that sum to 15. Jacks, queens and kings each have a value of 10, aces each have a value of 1, and all number cards have a value of the number shown. How many different unordered pairs of two cards sum to 15 in a standard 52-card deck?

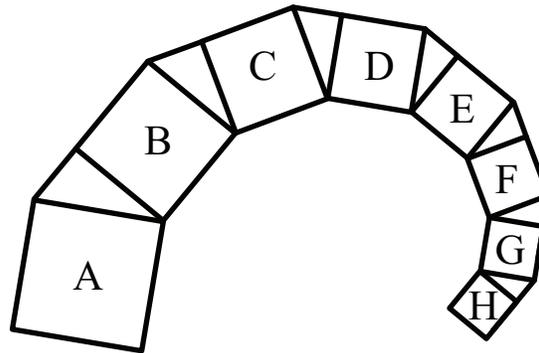
4. _____ The sequence 1, 3, 6, 10, 15, ... is called the *triangular numbers*, and the n th element of the sequence is found by adding the first n positive integers. What is the positive integer that, when multiplied by any triangular number, always yields a product one less than a perfect square?

5. _____ Points A(-7, 4) and B(13, -11) are two points in the coordinate plane. P is on segment AB and divides it so that $AP:PB = 2:3$. What is the product of the coordinates of P?

6. _____ What is the greatest number that evenly divides the sum of any six consecutive whole numbers?

7. _____ All of the possible sequences of four consecutive positive integers less than 200 are created. One of these sequences is called orderly if the smallest member is divisible by 2, the next smallest member is divisible by 3, the next smallest is divisible by 4, and the largest is divisible by 5. What is the probability that a randomly-selected sequence is orderly? Express your answer as a common fraction.

8. _____ This *Pythagorean Claw* is composed of eight squares, labeled A through H and seven 30-60-90 right triangles. For each triangle, its hypotenuse is the side of a square, and the side opposite its 60-degree angle is the side of a different square. Which letter represents the largest square with area less than one-half that of square A?



9. _____ What is the greatest two-digit prime number such that the sum of its digits is also a prime number?

10. _____ If n is a positive integer less than 100, what is the sum of all possible values of n for which $n^2 + 55$ is a perfect square?