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# MATHCOUNTS®

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2017  
■ State Competition ■  
Target Round  
Problems 1 & 2

Name \_\_\_\_\_

School \_\_\_\_\_

Chapter \_\_\_\_\_

**DO NOT BEGIN UNTIL YOU ARE INSTRUCTED TO DO SO.**

This section of the competition consists of eight problems, which will be presented in pairs. Work on one pair of problems will be completed and answers will be collected 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. 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. Record only final answers in the blanks in the left-hand column of the problem sheets. If you complete the problems before time is called, use the time remaining to check your answers.

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Problem 1	Problem 2	Scorer's Initials



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- NextThought

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1. \_\_\_\_\_ What is the value of the expression  $p^3 + q^3 + r^3 + 3(p + q)(q + r)(p + r)$  if  $p = 2$ ,  $q = 4$  and  $r = 5$ ?

2. \_\_\_\_\_ Nina's two dogs, Biter and Nipper, normally eat an entire bag of dog food kibbles in 10 days. She has fed them both for 7 days when Biter breaks a tooth and stops eating the hard food. It takes Nipper 9 more days to finish the bag. What is the ratio of the number of days it would take Biter to eat the whole bag alone to the number of days it would take Nipper to eat the whole bag alone? Express your answer as a common fraction.

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# MATHCOUNTS®

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2017  
■ State Competition ■  
Target Round  
Problems 3 & 4

Name \_\_\_\_\_

School \_\_\_\_\_

Chapter \_\_\_\_\_

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Problem 3	Problem 4	Scorer's Initials

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3. \_\_\_\_\_ Akili has two tests next week. The probability that he will pass the first test, science, is  $\frac{3}{4}$ . How he does on that test affects how he will do on his math test. If he passes science, then the probability that he will also pass the math test is  $\frac{4}{5}$ ; otherwise, the probability is only  $\frac{1}{3}$  that he will pass the math test. What is the probability he passes exactly one test? Express your answer as a common fraction.

4. \_\_\_\_\_ The addition table shown has rows and columns labeled with integers  $a, b, c$  and  $d$ , in that order. A few of the sums in the table are already filled in; for example, the table shows that  $a + d = n - 2$ . When all sixteen sums are filled in, the sum of the sixteen entries in the table is  $16n + k$ , where  $k$  is an integer. What is the value of  $k$ ?

$+$	$a$	$b$	$c$	$d$
$a$	$n+10$			$n-2$
$b$				
$c$			$n+6$	
$d$		$n+3$		

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# MATHCOUNTS®

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2017  
■ State Competition ■  
Target Round  
Problems 5 & 6

Name \_\_\_\_\_

School \_\_\_\_\_

Chapter \_\_\_\_\_

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Problem 5	Problem 6	Scorer's Initials

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5. \_\_\_\_\_ In the set of numbers  $\{5, 8, 10, 16, n\}$  the mean and median are the same. What is the sum of all possible values of  $n$ ? Express your answer as a common fraction.

6. \_\_\_\_\_  $\text{units}^2$  The lengths of the parallel bases of a trapezoid are  $7.4 + x$  and  $15.6 - x$ , where  $x$  is a real number. The height of the trapezoid is 12. What is the area of the trapezoid?

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# MATHCOUNTS®

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2017  
■ State Competition ■  
Target Round  
Problems 7 & 8

Name \_\_\_\_\_

School \_\_\_\_\_

Chapter \_\_\_\_\_

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Problem 7	Problem 8	Scorer's Initials

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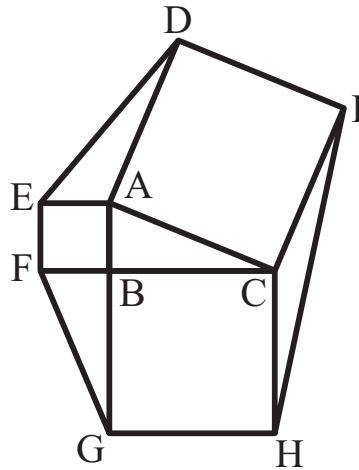
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7. \_\_\_\_\_ units<sup>2</sup>

The figure shows right triangle ABC with side lengths 5, 12 and 13. Squares are drawn on each side, and segments DE, FG and HI are drawn between vertices of the squares as shown. What is the area of hexagon DEFGHI?



8. \_\_\_\_\_ units

An M-shaped curve is created by graphing the parabola  $y = x^2$  in the coordinate plane, and then reflecting the part of the parabola that is above the line  $y = 1$  across the line  $y = 1$ . There is a horizontal line that intersects the M-shaped curve at four points A, B, C, and D so that  $AB = BC = CD$ . What is the distance AB? Express your answer as a common fraction in simplest radical form.

