
MATHCOUNTS®

2016
■ 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.

Problem 1	Problem 2	Scorer's Initials



**2016 MATHCOUNTS
National Competition Sponsor**

NATIONAL SPONSORS

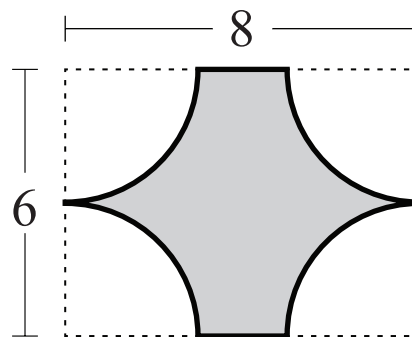
Raytheon Company
Northrop Grumman Foundation
U.S. Department of Defense
National Society of Professional Engineers
CNA Foundation
Phillips 66
Texas Instruments Incorporated
3Mgives
Art of Problem Solving
NextThought

FOUNDING SPONSORS: National Society of Professional Engineers, National Council of Teachers of Mathematics and CNA Foundation

Copyright MATHCOUNTS, Inc. 2016. All rights reserved.

1. _____ Starting at the origin, a bug crawls 1 unit up, 2 units right, 3 units down and 4 units left. From this new point, the bug repeats this entire sequence of four moves 2015 more times, for a total of 2016 times. The coordinates of the bug's final location are (a, b) . What is the value of $a + b$?

2. _____ inches A rectangular piece of cardboard measuring 6 inches by 8 inches is trimmed identically on all four corners, as shown, so that each trimmed corner is a quarter circle of greatest possible area. What is the perimeter of the resulting figure? Express your answer in terms of π .



MATHCOUNTS®

2016
■ State Competition ■
Target Round
Problems 3 & 4

Name _____

School _____

Chapter _____

DO NOT BEGIN UNTIL YOU ARE INSTRUCTED TO DO SO.

Problem 3	Problem 4	Scorer's Initials

Raytheon

**2016 MATHCOUNTS
National Competition Sponsor**

NATIONAL SPONSORS

Raytheon Company
Northrop Grumman Foundation
U.S. Department of Defense
National Society of Professional Engineers
CNA Foundation
Phillips 66
Texas Instruments Incorporated
3Mgives
Art of Problem Solving
NextThought

FOUNDING SPONSORS: National Society of Professional Engineers, National Council of Teachers of Mathematics and CNA Foundation

Copyright MATHCOUNTS, Inc. 2016. All rights reserved.

3. _____ percent A fair coin is flipped four times. Written as a percent, what is the probability of getting two heads and two tails, in any order? Express your answer to the nearest tenth.

4. _____ units The areas of three faces of a rectangular prism are 54, 24 and 36 units². What is the length of the space diagonal of this prism? Express your answer in simplest radical form.

MATHCOUNTS®

2016
■ State Competition ■
Target Round
Problems 5 & 6

Name _____

School _____

Chapter _____

DO NOT BEGIN UNTIL YOU ARE INSTRUCTED TO DO SO.

Problem 5	Problem 6	Scorer's Initials

Raytheon

**2016 MATHCOUNTS
National Competition Sponsor**

NATIONAL SPONSORS

Raytheon Company
Northrop Grumman Foundation
U.S. Department of Defense
National Society of Professional Engineers
CNA Foundation
Phillips 66
Texas Instruments Incorporated
3Mgives
Art of Problem Solving
NextThought

FOUNDING SPONSORS: National Society of Professional Engineers, National Council of Teachers of Mathematics and CNA Foundation

Copyright MATHCOUNTS, Inc. 2016. All rights reserved.

5. _____ in² Two 8-inch by 10-inch sheets of paper are placed flat on top of a 2-foot by 3-foot rectangular table. Nothing else is on the table, and the area of the table not covered by the sheets of paper is 708 in². In square inches, what is the area of the overlap between the two sheets of paper?

6. _____ Each card in a particular deck of cards contains a number denoting its value from 2 to 6, inclusive. The deck is made up of four cards of each value for a total of 20 cards. If two of these cards are chosen at random and without replacement, what is the probability that the sum of their values is less than 10? Express your answer as a common fraction.

MATHCOUNTS®

2016
■ State Competition ■
Target Round
Problems 7 & 8

Name _____

School _____

Chapter _____

DO NOT BEGIN UNTIL YOU ARE INSTRUCTED TO DO SO.

Problem 7	Problem 8	Scorer's Initials

Raytheon

**2016 MATHCOUNTS
National Competition Sponsor**

NATIONAL SPONSORS

Raytheon Company
Northrop Grumman Foundation
U.S. Department of Defense
National Society of Professional Engineers
CNA Foundation
Phillips 66
Texas Instruments Incorporated
3Mgives
Art of Problem Solving
NextThought

FOUNDING SPONSORS: National Society of Professional Engineers, National Council of Teachers of Mathematics and CNA Foundation

Copyright MATHCOUNTS, Inc. 2016. All rights reserved.

7. _____ If $(x^2 + 3x + 6)(x^2 + ax + b) = x^4 + mx^2 + n$ for integers a, b, m and n , what is the product of m and n ?

8. _____ units^3 The polygon shown here is constructed from two squares and six equilateral triangles, each of side length 6 units. This polygon may be folded into a polyhedron by creasing along the dotted lines and joining adjacent edges as indicated by the arrows. What is the volume of the resulting polyhedron? Express your answer in simplest radical form.

