2025 RTX MATHCOUNTS National Competition

Monday, May 12, 2025, Washington, DC

Rank	Student	State	Grade
1	Nathan Liu	TX	8
2	Brandon Ni	MA	7
S	Alexander Svoronos	CT	7
S	Advait Joshi	NJ	7
Q	Jason Bo	CA	7
Q	Victor Yang	NY	7
Q	Andrew Du	VA	8
Q	Shlok Mukund	MA	7
C	Justin Kim	CA	7
C	Alexander Yang	WA	8
C	Lucas Li	NC	8
C	Ryan Zhang	NY	8
13	Edwin Gao	FL	8
14	Roland Li	IN	7
15	Ethan Imanuel	NJ	8
16	Shaheem Samsudeen	TX	7
17	Sophia Han	OR	8
18	William Wu	IL	7
19	Arjun Raman	IN	8
20	Jonathan Wu	UT	8
21	Easton Wei	NJ	8
22	Aashita Mandiwal	UT	8
23	Aiden Wei	GA	8
24	Eric Xie	MD	8
25	Bowen Shan	AZ	8
26	Eric Huang	MA	8
27	Soham Samanta	MA	8
28	Vivaan Mukherjee	WA	8
29	Leo Hong	NC	8
30	Andy Liu	CA	8
31	Henry Lu	OH	8
32	Benjamin Lu	PA	8
33	Arnav Bhatia	FL	8
34	Max Tsai	NV	8
35	Maxwell Sun	NH	8
36	Roger Huang	MD	8
37	Jiyan Singh	WI	7
38	Vivek Kalyankar	AR	7
39	James Stewart	TX	6
40	Isaac Chan-Osborn	IL	7
41	Ian Shan	AZ	6
42	Jay Wang	NJ	7
43	Saamik Agrawal	WA	8
44	Derrick Chen	NY	7
45	Ethan Shi	CT	8
46	William Xin	WA	8
47	Adam Deng	UT	8
48	Jason Zhou	LA	8
49	Hayden Hughes	CT	8
50	Leo Shen	UT	6
51	Kevin Cheng	OR	8
52	Sophia Chen	IN	7
53	Shawn Bi	VA	8
54	Eric Jin	MI	8
55	Rananjay Parmar	FL	8
56	Hrishabh Bhowmik	IN	8

Rank	Team
1	Massachusetts
2	New York
3	Washington
4	Utah
5	Oregon
6	Florida
7	Indiana
8	Connecticut
9	New Jersey
10	Virginia
11	Texas
12	North Carolina
13	California
14	Maryland
15	Wisconsin
16	Ohio
17	Illinois
18	Arizona
19	New Hampshire
20	Georgia
21	State Department
22	Missouri
23	Colorado

Written Competition Champion - Nathan Liu, Texas

Written Competition Runner-Up - Alexander Svoronos, Connecticut

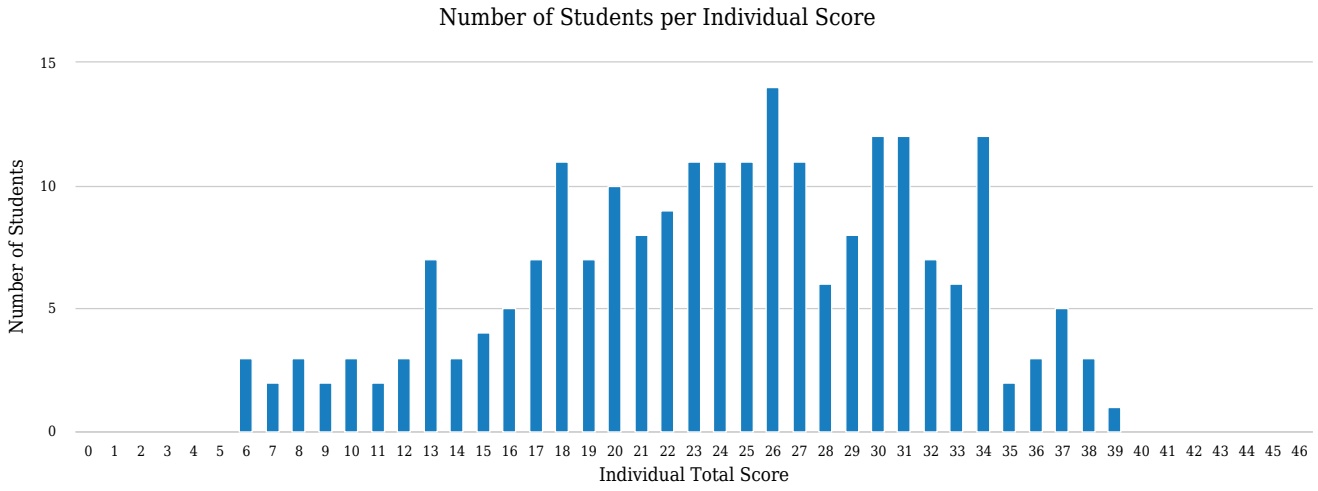
C = Countdown Round Competitor *Q = Countdown Round Quarterfinalist* *S = Countdown Round Semifinalist*

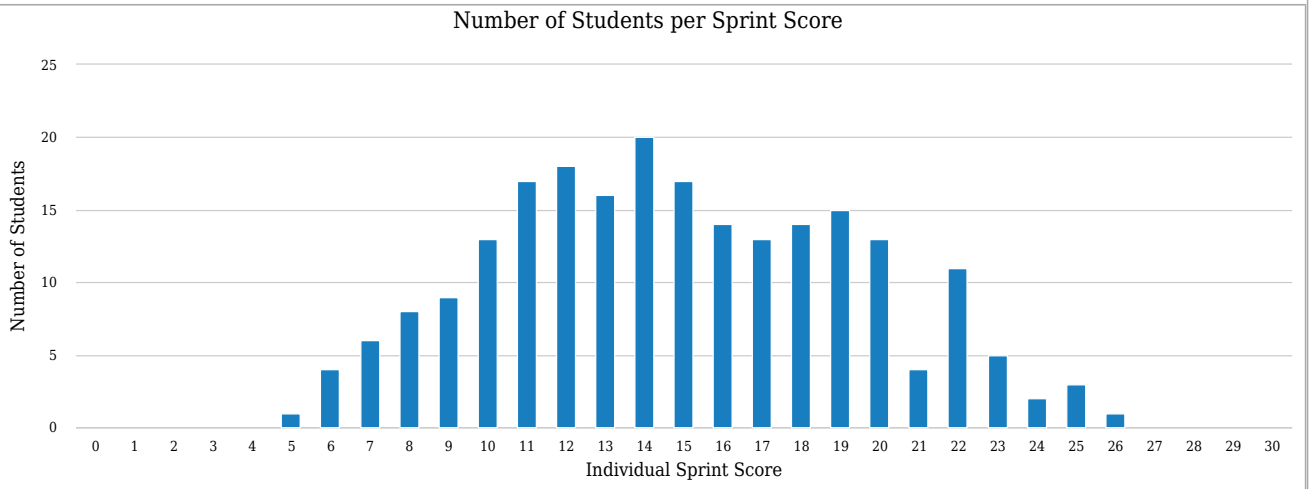
National Competition Statistical Analysis

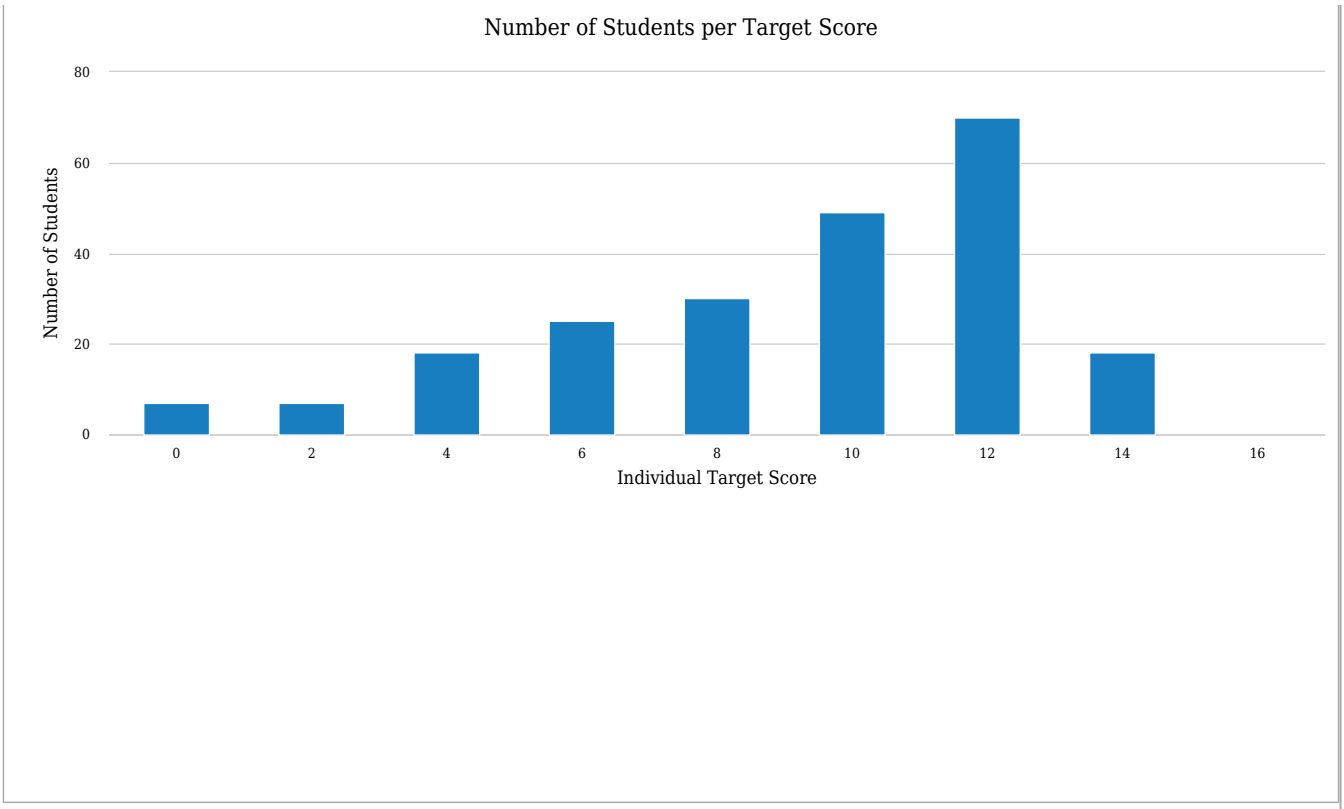
	INDIV. TOTAL	SPRINT SCORE	TARGET SCORE	TEAM TOTAL	TEAM ROUND
Minimum	6.00	5.00	0.00	12.75	2.00
Average	24.03	14.84	9.19	33.53	9.50
Maximum	39.00	26.00	14.00	49.50	16.00
Standard Deviation	7.64	4.58	3.49	8.88	3.10

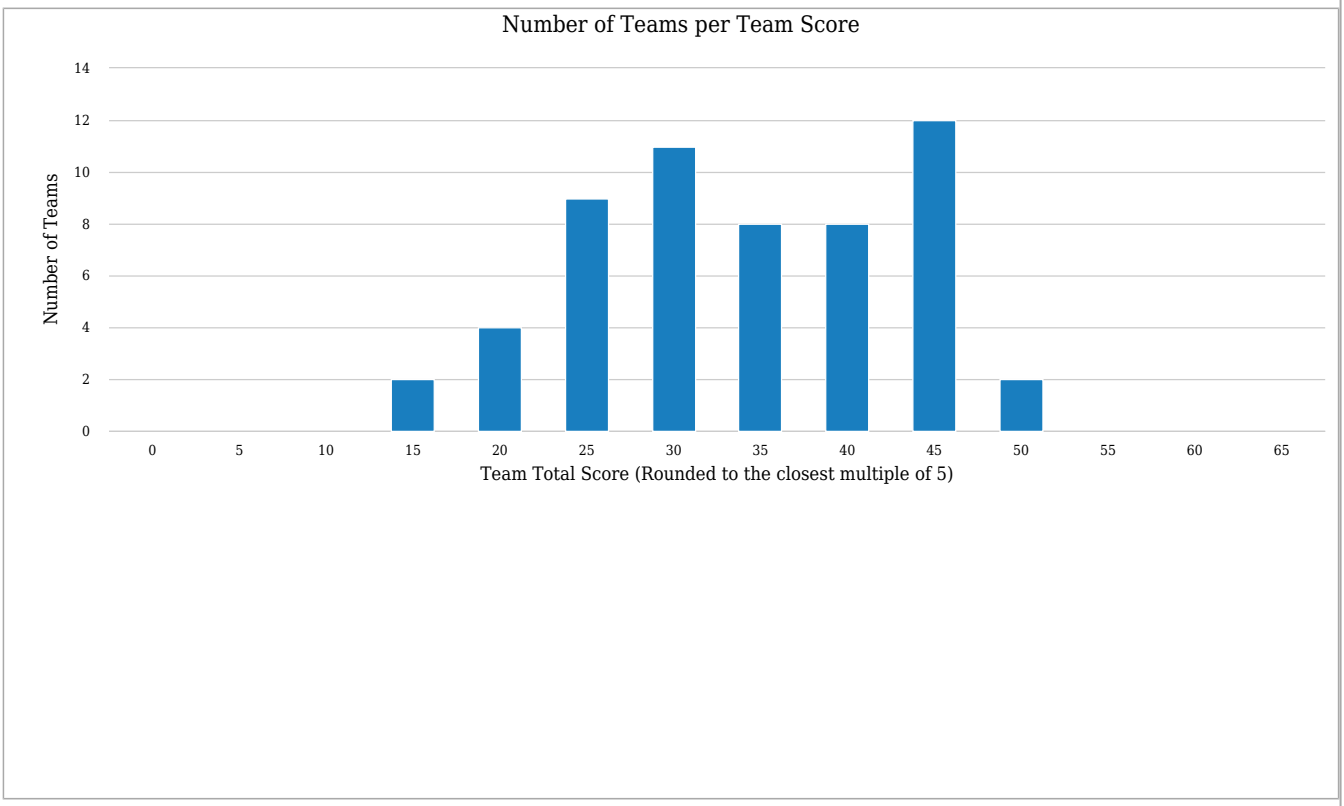
Grade	Male	Female	Unknown	TOTAL
6	22	5	0	27
7	58	10	0	68
8	106	23	0	129
Unknown	0	0	0	0
Total	186	38	0	224

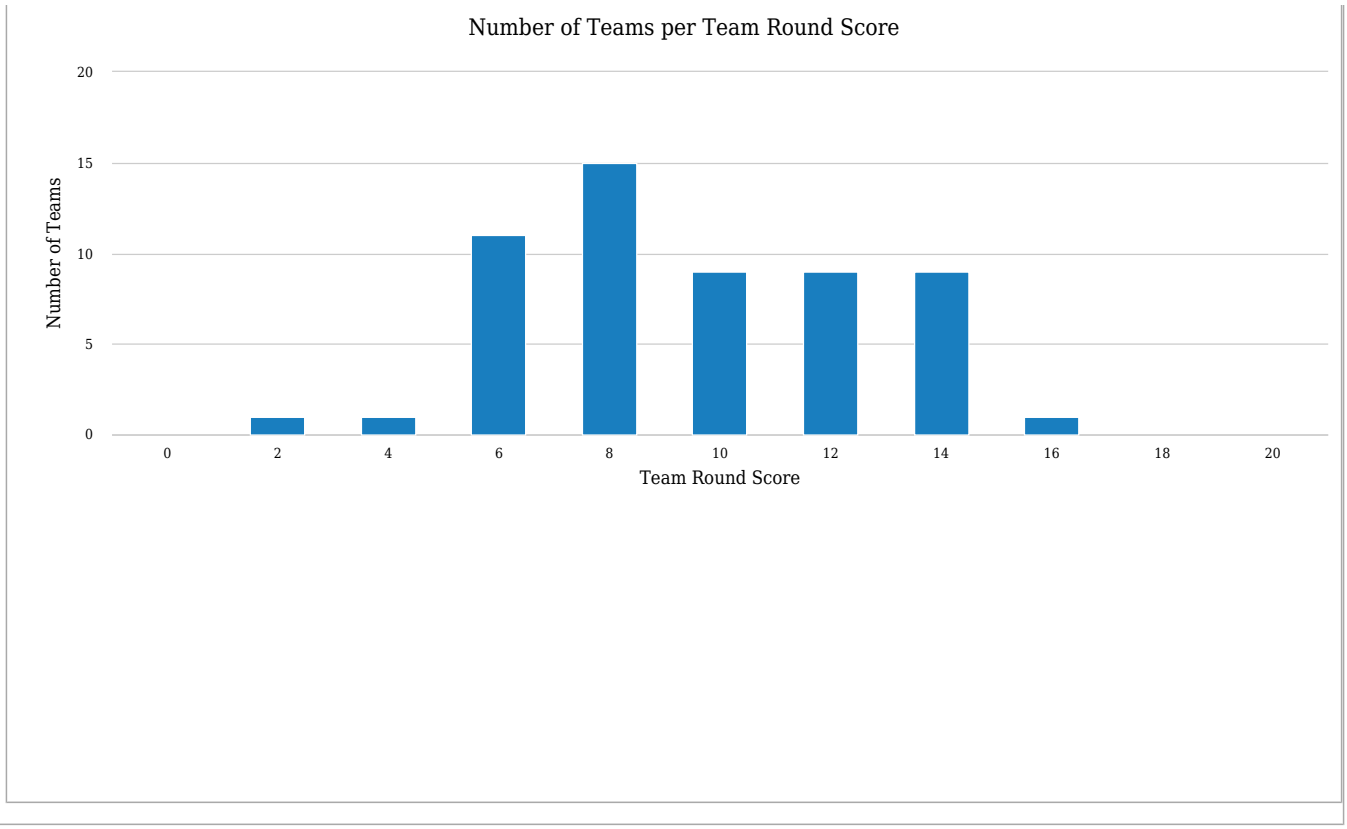
National Competition Score Distributions



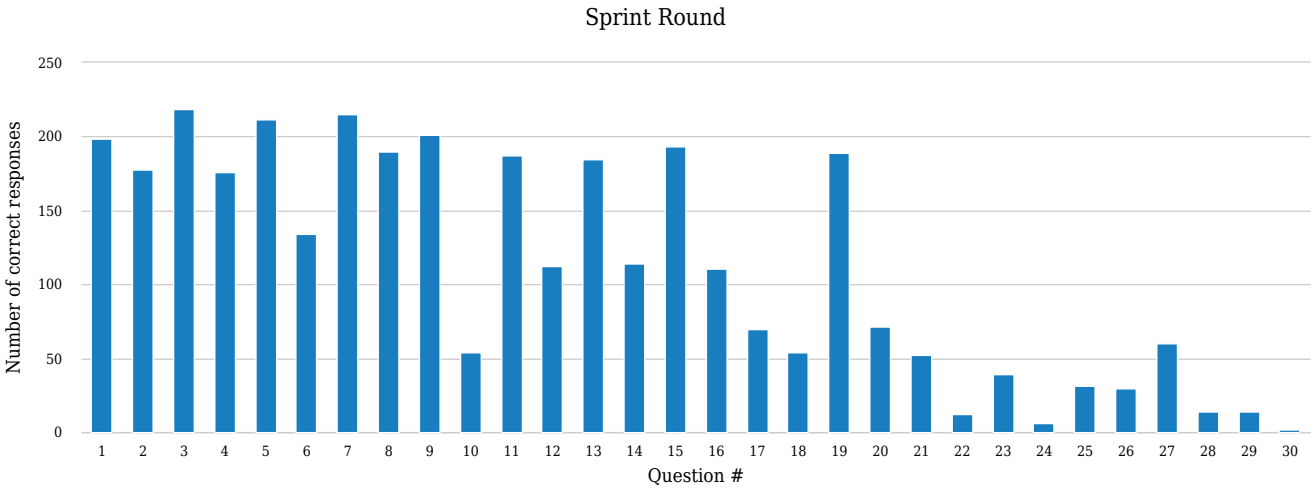


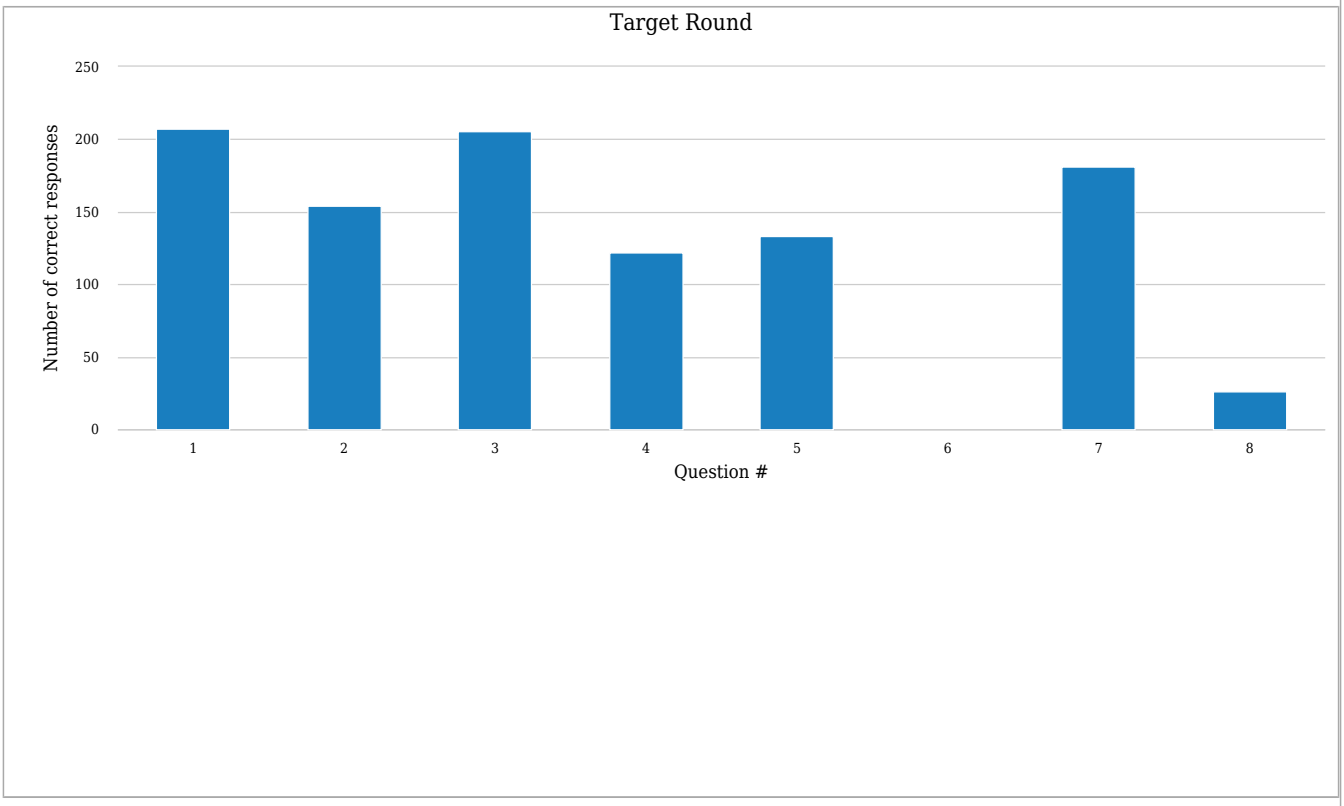

Number of Students per Target Score
Number of Students
80
60
40
20
0
0
2
4
6
8
10
12
14
16
Individual Target Score

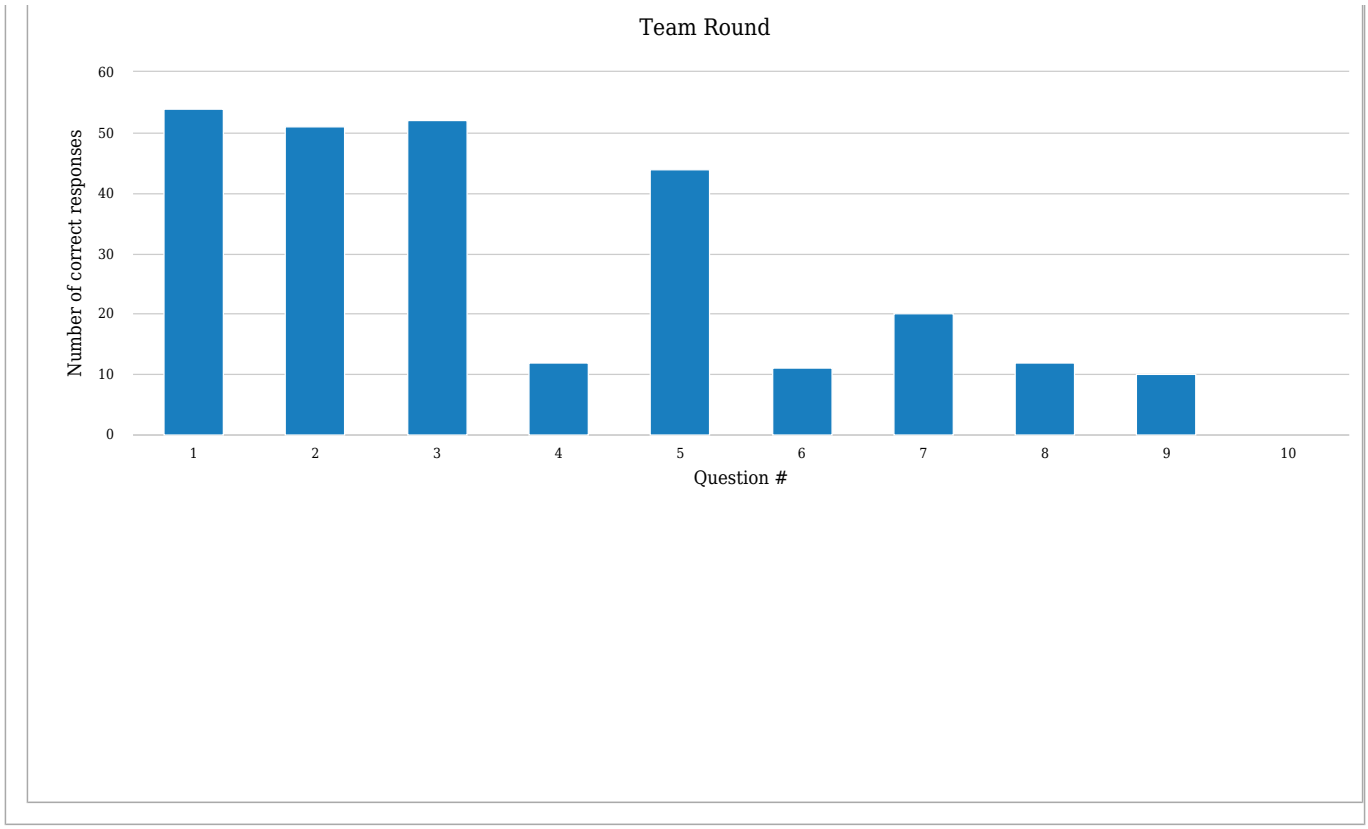

Number of Teams per Team Score
Number of Teams
14
12
10
8
6
4
2
0
0
5
10
15
20
25
30
35
40
45
50
55
60
65
Team Total Score (Rounded to the closest multiple of 5)


Number of Teams per Team Round Score
Number of Teams
20
15
10
5
0
0
2
4
6
8
10
12
14
16
18
20
Team Round Score

National Competition Question Analysis






Team Round
Number of correct responses
60
50
40
30
20
10
0
1
2
3
4
5
6
7
8
9
10
Question #

MATHCOUNTS®

2025 National Competition
Answer Key

The appropriate units (or their abbreviations) are provided in the answer blanks.

Note to coordinators: Answers to the Tiebreaker Round problems appear in the Tiebreaker Round Booklet.

Title Sponsors

RTX

Department of Defense DoDSTEM Science · Technology · Engineering · Mathematics

National Sponsors

Northrop Grumman Foundation ▪ National Society of Professional Engineers ▪ 3Mgives
Texas Instruments, Inc. ▪ Art of Problem Solving

Founding Sponsors: National Society of Professional Engineers, National Council of Teachers of Mathematics and CNA Insurance

Copyright MATHCOUNTS, Inc. 2025. All rights reserved.

Sprint Round Answers

1. 24

2. 4

3. 6 inches

4. Saturday

5. $ 26 or 26.00

6. 18 values

7. 784 questions

8. 107

9. 15

10. 89 positive integers

11. 47 pints

12. $(-1, -3)$

13. 120

14. 2

15. 114 members

16. 5

17. 56 values

18. 2500

19. 24 in^2

20. 22

21. $\frac{3+2\sqrt{3}}{3}$

22. 891 positive integers

23. 4 ways

24. $\frac{319}{2025}$

25. -420

26. $\frac{35}{12}$ cm

27. $-\frac{51}{4}$

28. 1800 factors

29. 24,502,500

30. $\frac{16}{243}$

Target Round Answers

1. 7 thingamajigs

2. 120 permutations

3. 36 students

4. $\frac{41}{100}$

5. 0.999 in^2

6. 90.08 %

7. 340

8. 219.85 cm^2

Team Round Answers

1. 30 stickers

2. Floor 18

3. 13 students

4. 32 paths

5. 16,665

6. 52 %

7. 0.73 units

8. 50 cm^2

9. $\frac{1}{3}$

10. $2\sqrt{561}$ in^2

Copyright MATHCOUNTS, Inc. 2024. All rights reserved. 2025 National Answer Key

MATHCOUNTS®

2025 National Competition
Sprint Round Problems 1–30

DO NOT BEGIN UNTIL YOU ARE INSTRUCTED TO DO SO.

This section of the competition consists of 30 problems. You will have 40 minutes to complete all the problems. You are not allowed to use calculators, books or other aids during this round. If you are wearing a calculator wrist watch, please give it to your proctor now. Calculations may be done on scratch paper. All answers must be complete, legible and simplified to lowest terms. Record final answers in the corresponding blanks on the provided **Sprint Round Answer Sheet**. If you complete the problems before time is called, use the remaining time to check your answers.

In each written round of the competition, the required unit for the answer is included in the answer blank. The plural form of the unit is always used, even if the answer appears to require the singular form of the unit. The unit provided in the answer blank is the only form of the answer that will be accepted.

Title Sponsors

RTX

Department of Defense DoDSTEM Science · Technology · Engineering · Mathematics

National Sponsors

Northrop Grumman Foundation ▪ National Society of Professional Engineers ▪ 3Mgives
Texas Instruments, Inc. ▪ Art of Problem Solving

Founding Sponsors: National Society of Professional Engineers, National Council of Teachers of Mathematics and CNA Insurance

Copyright MATHCOUNTS, Inc. 2025. All rights reserved.

1. _____ What is the greatest of three consecutive even integers that sum to 66?

2. _____ If the point (a, a) is the same distance from $(3, -2)$ as it is from $(-2, 5)$, what is the value of a?

3. _____ inches Kate bought a box at the post office with a volume of 144 in^3. If the box has a length of 8 inches and a width of 3 inches, what is its height, in inches?

4. _____ The month of August has 31 days and the month of September has 30 days. If August 23 falls on a Sunday, what day of the week will October 31 fall on?

5. $ _____ Aisha bought 12 pounds of candy, some blue and the rest purple. The blue candies cost \$2.00 per pound, and the purple candies cost \$2.50 per pound. If she bought twice as many pounds of blue candy as purple candy, how many dollars did Aisha spend on the 12 pounds of candy?

Copyright MATHCOUNTS, Inc. 2024. All rights reserved. 2025 National Sprint Round

6. _____ values

How many positive integer values of d satisfy $7 + 2d + d^2 \leq 20d + 22$?

7. _____ questions

If one MATHCOUNTS question writer can write 56 questions in 30 days, how many questions can seven MATHCOUNTS question writers write in 60 days at the same rate?

8. _____

It is currently 2:15 a.m., and Davis has his alarm set for 7:36 a.m. If Davis falls asleep now, he will get 25% less sleep than if he had fallen asleep m minutes ago. What is the value of m?

9. _____

If the mean and the median of the integers 10, 15 and x are equal, what is the absolute difference between the two possible values of x?

10. _____ positive integers

For how many positive integers b does there exist a positive real number $a < b$ with $\frac{a}{b} = \frac{a+b}{180}$?

Copyright MATHCOUNTS, Inc. 2024. All rights reserved. 2025 National Sprint Round

11. _____ pints

Peter Piper picked seven pints of plums, six pounds of parsnips, and two pecks of pickled peppers. If four parsnips weigh one pound, three parsnips have a volume of one pint, and a peck is sixteen pints, then how many total pints of produce did Peter Piper pick?

12. ____(,)

The area of quadrilateral WXYZ with vertices W(–4, –1), X(–1, 3), Y(2, –1) and $Z(a, b)$ is 18 units^2. The diagonals of the quadrilateral are perpendicular to each other and intersect at a point inside WXYZ. If a and b are integers, what is the ordered pair (a, b)?

13. _____

A particular set consists of five distinct positive integers with an arithmetic mean of 4. A sixth positive integer, greater than all five in the original set, is included in the set, making the median 4. What is the sum of the squares of the integers in the original set?

14. _____

What is the sum of all real numbers x such that $4^{x+1} - 65 \times 2^x + 16 = 0$?

15. _____ members

The Happy Valley Jazz Band members are freshman and sophomore students at Happy Valley High. On Wednesday, 30 freshmen and 0 sophomores missed band practice, resulting in a 2:5 ratio of freshman to sophomores at practice. On Thursday, 30 freshmen and 48 sophomores missed band practice, resulting in a 2:1 ratio of freshman to sophomores at practice. What is the total number of members in the Happy Valley Jazz Band?

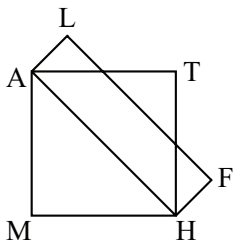
Copyright MATHCOUNTS, Inc. 2024. All rights reserved. 2025 National Sprint Round

16. _____ Albert flips a fair coin four times. If n is the number of heads he obtains, what is the expected value of n^2?

17. _____ values The base-5 positive integer N has only nonzero digits which sum to 7. How many values of N are possible?

18. _____ On a number line, the terms of the arithmetic progression 0, 4, 8, 12, ... are each marked with an orange dot, and the terms of the arithmetic progression 2, 5, 8, 11, ... are each marked with a green dot. What is the sum of all integers from 1 to 100, inclusive, that are not marked with either color dot?

19. _____ in^2 Square MATH has an area of 64 in^2 and rectangle HALF has an area of 32 in^2. What is the area of the region common to both square MATH and rectangle HALF, in square inches?

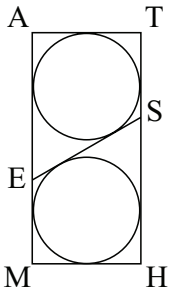


20. _____ What is the sum of the digits of the smallest positive multiple of 121 whose digits are all the same?

Copyright MATHCOUNTS, Inc. 2024. All rights reserved. 2025 National Sprint Round

21. _____

In rectangle MATH, point E lies on side MA and point S lies on side TH so that $m\angle SEA = 60$ degrees. Both quadrilaterals MESH and SEAT have an inscribed circle tangent to all four of their sides. What is the ratio of MA to AT? Express your answer as a common fraction in simplest radical form.

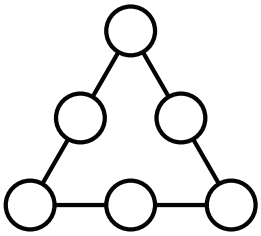


22. _____ integers

How many positive integers with three or fewer digits have the property that the cubes of their digits sum to at least 100? One such integer to include is 5, since $5^3 = 125$.

23. _____ ways

In how many ways can the integers 0 to 5 be placed exactly once in the six circles in the figure shown so that the sums of the three numbers along each side of the triangle are the same? Two placements are considered the same if one can be reflected and/or rotated to match the other.



24. _____

If two numbers a and b are chosen from the set {1, 2, 3, 4, ..., 45} with replacement, what is the probability that $\text{LCM}(a, b) + \text{GCD}(a, b) = a + b$? Express your answer as a common fraction.

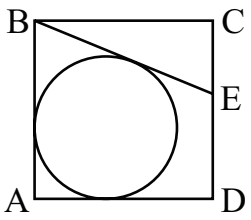
25. _____

Let $f(k)$ be the least value of x satisfying the equation $x^2 + \left(\frac{k^2+1}{k}\right)x + 1 = 0$. What is the value of $f(10) + f(11) + \cdots + f(29) + f(30)$?

Copyright MATHCOUNTS, Inc. 2024. All rights reserved. 2025 National Sprint Round

26. _____ cm

In the figure shown, a circle is tangent to sides AB and AD of square ABCD and is tangent to segment BE. If the circle has radius 2 cm and the square has side length 5 cm, what is the length of segment DE, in centimeters? Express your answer as a common fraction.



27. _____

Let r and s be the real number solutions to $x^2 + 9x + 12 = 0$. What is the value of $\frac{r^2}{r+1} + \frac{s^2}{s+1}$? Express your answer as a common fraction.

28. _____ factors

The sets A and B are independently and uniformly randomly chosen subsets of {1, 2, 3, 4, …, 100}. Let P be the conditional probability that the intersection of A and B has exactly three elements, given that the union of A and B is the entire set {1, 2, 3, 4, …, 100}. When P is written in lowest terms as $\frac{m}{n}$, how many positive integer factors does m have?

29. _____

What is the value of the expression shown?

$$\frac{(1! + 2! + 3!)(2! + 3! + 4!)(3! + 4! + 5!)\cdots(98! + 99! + 100!)}{(1! - 3(2!) + 3!)(2! - 3(3!) + 4!)(3! - 3(4!) + 5!)\cdots(98! - 3(99!) + 100!)}$$

30. _____

Spencer is playing a game with a machine. The machine will dispense a whole number of candies where the probability of dispensing 0 candies is $\frac{1}{3}$. If $k > 0$, the probability of getting k candies is $\frac{2}{5}$ times the probability of getting $k - 1$ candies plus $\frac{3}{5}$ the probability of getting $k + 1$ candies. What is the probability that Spencer gets 4 candies when he plays the game? Express your answer as a common fraction.

Copyright MATHCOUNTS, Inc. 2024. All rights reserved. 2025 National Sprint Round

MATHCOUNTS®

2025 National Competition
Target Round Problems 1–8

0
1
2
3
4
5
6
7
8
9

Name _____

State _____

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.

Title Sponsors

RTX

Department of Defense DoDSTEM Science · Technology · Engineering · Mathematics

National Sponsors

Northrop Grumman Foundation ▪ National Society of Professional Engineers ▪ 3Mgives
Texas Instruments, Inc. ▪ Art of Problem Solving

Founding Sponsors: National Society of Professional Engineers, National Council of Teachers of Mathematics and CNA Insurance

Copyright MATHCOUNTS, Inc. 2025. All rights reserved.

1. thinga-majigs

Two thingamajigs and one doohickey, together, weigh the same as three widgets. Two widgets and one thingamajig, together, weigh the same as one doohickey. How many thingamajigs have the weight of one doohickey?

2. permu-tations

How many permutations of the letters in the word TRIVIA have the A positioned between the two Is, but not necessarily consecutively? Two such permutations to include are IAITRV and VITRAI.

Copyright MATHCOUNTS, Inc. 2024. All rights reserved. 2025 National Target Round

3. _____ students

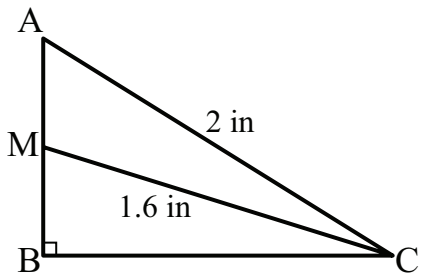
Professor Steele gives a quiz to all the students in his class. Afterwards, he finds that the average grade among the top four students was 99, and the average grade among all the students besides the top four was 72. If the average grade for the whole class was 75, then what is the total number of students in the class?

4. _____

A bag contains 6 marbles, 3 of which are red and 3 of which are blue. Magnus draws 3 marbles from the bag at random, without replacement, and then puts all 3 of his drawn marbles back into the bag. Melinda then draws 3 marbles from the bag at random, without replacement. What is the probability that Melinda drew the same number of red marbles as Magnus? Express your answer as a common fraction.

Copyright MATHCOUNTS, Inc. 2024. All rights reserved. 2025 National Target Round

5. _____ in^2 Right triangle ABC has hypotenuse AC. Point M is the midpoint of side AB. If CM = 1.6 inches and AC = 2 inches, what is the area of triangle ABC, in square inches? Express your answer as a decimal to the nearest thousandth.

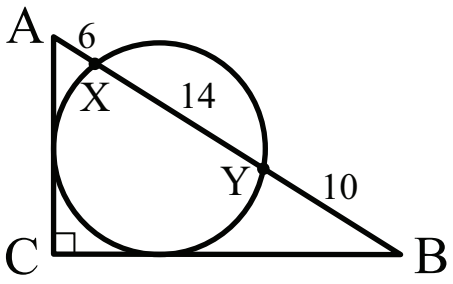


6. _____ % Suppose Jason and Kenny play a game of tennis, in which Jason wins each point independently with probability 70%. A player wins the game when he has scored at least four points and at least two more points than his opponent. What is the probability that Jason wins the game? Express your answer to the nearest hundredth of a percent.

Copyright MATHCOUNTS, Inc. 2024. All rights reserved. 2025 National Target Round

7. _____ Soumendra thinks of two three-digit positive integers and announces that their greatest common divisor is 20 and their least common multiple is 1440. What is the sum of Soumendra's two integers?

8. _____ cm^2 The figure shows a circle tangent to legs AC and BC of right triangle ABC. The circle intersects hypotenuse AB at X and Y, and AX = 6 cm, XY = 14 cm and YB = 10 cm. What is the area of triangle ABC, in square centimeters? Express your answer as a decimal to the nearest hundredth.



Copyright MATHCOUNTS, Inc. 2024. All rights reserved. 2025 National Target Round

MATHCOUNTS®

2025 National Competition
Team Round Problems 1–10

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 in the corresponding blanks on the provided **Team Round Answer Sheet**. ANSWER BOOKS **WILL NOT** BE SCORED. If the team completes the problems before time is called, use the remaining time to check your answers.

Title Sponsors

RTX

Department of Defense DoDSTEM Science · Technology · Engineering · Mathematics

National Sponsors

Northrop Grumman Foundation ▪ National Society of Professional Engineers ▪ 3Mgives
Texas Instruments, Inc. ▪ Art of Problem Solving

Founding Sponsors: National Society of Professional Engineers, National Council of Teachers of Mathematics and CNA Insurance

Copyright MATHCOUNTS, Inc. 2025. All rights reserved.

1. _____ stickers

Jillian has $\frac{2}{3}$ the number of stickers that David has. Once Jillian gives two of her stickers to David, David will have twice as many stickers as Jillian will have left. How many stickers do they have all together?

2. Floor _____

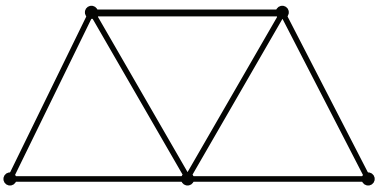
Frannie lives in an apartment building with 75 floors, each of which has the same height. Her apartment is on a floor between her two friends, Maeve and Rachel. Maeve's apartment is on floor 62. Rachel's apartment is on floor 7. The distance between Frannie's floor and Maeve's floor is four times the distance between Frannie's floor and Rachel's floor. On what floor does Frannie live?

3. _____ students

Mr. Wilson is holding class elections with two candidates running for class president. The losing candidate received 31% of the vote, expressed to the nearest whole percent. If each student in class voted for one of the two candidates, what is the least possible number of students in Mr. Wilson's class?

4. _____ paths

The figure shows three adjacent triangles that together form a trapezoid. How many distinct paths begin at any of the five triangle vertices and travel along each of the seven triangle sides exactly once, where paths are considered distinct if they start at different vertices or traverse the sides in a different order?



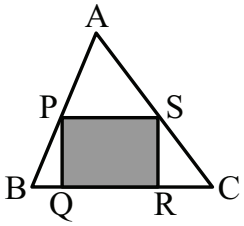
5. _____

What is the sum of all positive integers with at most four digits whose digits sum to exactly 3? Examples of such integers include 3, 12 and 2010.

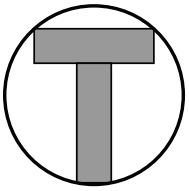
Copyright MATHCOUNTS, Inc. 2024. All rights reserved. 2025 National Team Round

6. _____ % Jacob has a magic coin machine. Each coin produced by the machine has a $\frac{1}{7}$ chance of being a nickel and a $\frac{2}{7}$ chance each of being a dime, a quarter, or a half dollar, independent of all other coins. If this machine produces four coins, what is the probability that their total value is less than a dollar? Express your answer to the nearest whole percent.

7. _____ units Triangle ABC, shown here, has AB = 13, BC = 14 and CA = 15. Rectangle PQRS is inscribed in triangle ABC so that its area is exactly $\frac{1}{4}$ that of triangle ABC. What is the least possible length of segment BQ, in units? Express your answer as a decimal to the nearest hundredth.



8. _____ cm^2



Two congruent rectangles are constructed inside a circle of radius 10 cm so that the rectangles are adjacent to each other, and each rectangle has two vertices on the circle, as shown. If each rectangle has diagonal length 14 cm, what is the area of each rectangle, in square centimeters?

9. _____ For any positive real numbers a and b, let $a \blacktriangle b$ be a positive real number such that the operation $\blacktriangle$ is commutative (meaning $a \blacktriangle b = b \blacktriangle a$ for any positive real numbers a and b) and associative (meaning $a \blacktriangle (b \blacktriangle c) = (a \blacktriangle b) \blacktriangle c$ for any positive real numbers a, b, and c). Suppose it also satisfies $a \blacktriangle (1/b) = 1/(a \blacktriangle b)$ for any positive real numbers a and b; and $(a - 1) \blacktriangle (a + 1) = 2/a$ for any real number $a > 1$. What is the value of $4 \blacktriangle 11$? Express your answer as a common fraction.

10. _____ in^2 A non-right pyramid ABCDE has square base ABCD and apex E. The areas of the triangular faces are given by ABE = 20 in^2, BCE = 25 in^2, CDE = 19 in^2 and DAE = 16 in^2. What is the area of base ABCD, in square inches? Express your answer in simplest radical form.

Copyright MATHCOUNTS, Inc. 2024. All rights reserved. 2025 National Team Round

please send a thank you to...

OUR AMAZING SPONSORS!

Mathletes and coaches, please show your appreciation! MATHCOUNTS programs would not be possible without support from generous sponsors. Please take a moment to write a thank-you note to the contacts listed below for RTX, the title sponsor of the National Competition, as well as the other title, lead, national and founding sponsors of MATHCOUNTS. Telling sponsor contacts about your own experiences in MATHCOUNTS and expressing your gratitude mean so much!

Ms. Keri Connors
Executive Director, Global Affairs
RTX
c/o Naomi Ward
MATHCOUNTS Foundation
1420 King Street
Alexandria, VA 22314

Mr. Louie R. Lopez
Director
U.S. Department of Defense STEM
c/o Naomi Ward
MATHCOUNTS Foundation
1420 King Street
Alexandria, VA 22314

Ms. Carolyn Cavicchio
Senior Director, Global Corporate Citizenship & Executive Director
Northrop Grumman Foundation
2980 Fairview Park Drive
Falls Church, VA 22042

Ms. Monika Schulz, CAE
Executive Director & CEO
National Society of Professional Engineers
1420 King Street
Alexandria, VA 22314

Ms. Jacqueline Berry
Senior Manager, 3Mgives Corporate Community Investment
3M
3M Center, Building 225-1S-23
St. Paul, MN 55144-1000

Ms. Jennifer Kass
Director, Marketing
Texas Instruments
13532 North Central Expressway
MS 3821
Dallas, TX 75243

Mr. Richard Rusczyk
Founder & CEO
Art of Problem Solving
15330 Avenue of Science
San Diego, CA 92128

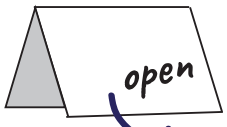
Ms. Raissa Correa
Corporate Social Responsibility Director
CNA Insurance
151 North Franklin Street, Floor 6
Chicago, IL 60606

Mr. Ken Krehbiel
Executive Director
National Council of Teachers of Mathematics
1906 Association Drive
Reston, VA 20191-1502

The Mathlete's Guide to... SNAIL MAIL!

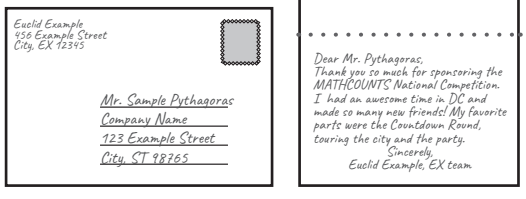
Euclid Example, a Mathlete from the EX state team, is writing a note to Mr. Sample Pythagoras, a sponsor contact.
LET'S SEE HOW HE DOES IT!

Option A: FOLDED CARD



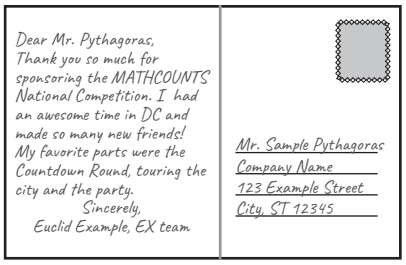
Euclid leaves the half above the fold blank.

On the envelope, Euclid writes the recipient's name and address towards the bottom right and his own name and address at the top left.



Option B: POSTCARD

Euclid always puts a stamp in the top right corner.



On the right side, Euclid writes Mr. Pythagoras's full name on Line 1, company on Line 2, street address on Line 3, and city, state and ZIP code on Line 4. Write nothing else on the right side!

Euclid writes a note thanking Mr. Pythagoras and saying what he enjoyed about the event. When you write your own note, be sure to...

- Start with an opener, like Euclid did with "Dear Mr. Pythagoras."
- Leave margins instead of writing all the way to the edge.
- End with a closing that includes your team name, like Euclid did with "Sincerely, Euclid Example, EX team."