

MATHCOUNTS®

2026 STATE COMPETITION Countdown Round Problems 1–80

**This booklet contains problems to be used in the
Countdown Round.**

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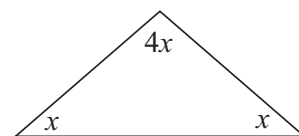
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1. _____ (degrees)

The degree measure of the vertex of an isosceles triangle is four times the measure of each base angle. What is the degree measure of the vertex angle?



2. _____

An increasing arithmetic progression of integers contains the terms 1 and 26. What is the second least possible value for the common difference?

3. _____

If $2^x = 7$ and $4^x = 49$, what is the value of 8^x ?

4. _____ (integers)

For how many positive integers n is $2 < \sqrt{n} < 3$?

5. _____

The average (arithmetic mean) of the set $\{2, 6, x\}$ is doubled when 5 is added to every element. What is the value of x ?

6. _____

What is the integer closest to the square root of 2026?

7. _____

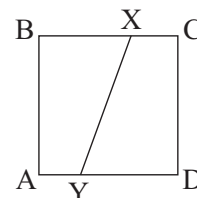
Let n be a positive integer. If the quantity $n(7 - n)$ is positive, but less than or equal to 10, what is the sum of the four possible values of n ?

8. _____ (packs)

The math team is selling chocolates. Each student receives the same number of chocolates to sell. Amy sells her chocolates in packs of 5, Bart sells his in packs of 3, and Camie sells hers in equal-sized packs of more than 6 but less than 10. All chocolates are sold with no leftovers. If no student receives more than 50 chocolates to sell, how many packs did Camie sell?

9. _____ (cm)

A line through the center of square ABCD divides it into two congruent quadrilaterals ABXY and CDYX, each of which has perimeter 32 cm and area 50 cm^2 . What is the length of segment XY, in cm?



10. _____ (integers)

How many three-digit positive integers contain a digit less than 2?

11. _____ (multiples)

How many positive multiples of 6^5 are also divisors of 6^6 ?

12. _____ (lines)

How many lines of symmetry of a regular 2026-gon go through its center?

13. _____

Rich rolls two fair, standard six-sided dice. What is the probability that the product of the two numbers rolled is a perfect square? Express your answer as a common fraction.

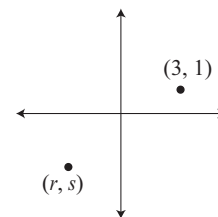
14. _____ (ways)

Anya, Bob, Carrie, Deb and Eric are going to the theater. They want to sit together in consecutive seats in the same row, and Anya must sit at one end of the row. If the theater has 10 rows, each with 37 seats, in how many ways can the 5 friends be seated?

15. _____ Jack writes all nine of the positive four-digit integers whose digits can be arranged to form 2026. What is the median of all the numbers that Jack writes?
16. _____ (feet) Tommy wants to paint all four walls of his room, including the door, and install a carpet over the entire floor. If the room requires 100 square feet of carpet and 320 square feet of paint, what is the tallest Tommy's room can be, in feet?
17. _____ A rectangular dartboard is split into four rectangular regions as shown. The probabilities of hitting two of the regions are given. The probabilities of hitting the other two regions are p and q . Given that the dartboard will always be hit and each point on the dartboard is equally likely to be hit, what is the value of p ? Express your answer as a common fraction.
- | | |
|----------------|-----|
| $\frac{1}{8}$ | p |
| $\frac{3}{40}$ | q |
18. _____ If s , t , u and v are integers satisfying $stuv = 16$, what is the least possible value of $|s + t + u + v|$?
19. _____ (ordered pairs) How many ordered pairs (x, y) of positive integers have a least common multiple that is a factor of 4?
20. _____ If $x + \frac{2}{x} = 5$, what is $x^2 + \frac{4}{x^2}$?
21. _____ (miles) Katie and Jake are running a race, and both are running at constant speeds. When Katie completes her first mile, she sees Jake is one-third of a mile behind her. When Jake completes his first mile, how many miles behind Katie is he? Express your answer as a common fraction.
22. _____ A rectangle has integer side lengths, with a length of at most 10 and a width of at most 8. If the area of the rectangle is at least 70, what is the sum of the perimeters of all distinct qualifying rectangles?
23. _____ (integers) How many positive integers n satisfy the inequality $-2 \leq n^2 - 4n \leq 18$?
24. _____ If $a \# b = 3a - b$ for integers a and b , what is the value of $3 \# 4$?
25. _____ (minutes) Moreno is driving on a highway where the speed limit is 55 miles per hour. After 1 hour, the speed limit increases to 70 miles per hour. If Moreno drives the speed limit the whole way and his average speed for the entire journey is 65 miles per hour, how many minutes did Moreno drive 70 miles per hour?

26. _____ What is the value of $\sqrt{10 + \sqrt{8000} + \sqrt{10,000}}$?

27. _____ The distance between the point $(3, 1)$ and (r, s) is $5\sqrt{2}$. If r and s are both negative integers, what is the value of the product rs ?



28. _____ (coins) A magic coin exchange machine can exchange coins as follows:

3 silver coins $\rightarrow$ 2 gold + 1 bronze

3 gold coins $\rightarrow$ 1 silver + 4 bronze

Johnny starts with 10 gold coins. After exchanging coins as many times as possible, how many coins will he have in total?

29. _____ Two arithmetic sequences of numbers are shown:

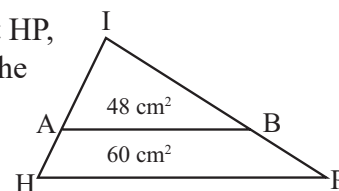
List A: 5, 9, 13, ..., 41, 45

List B: 3, 8, 13, ..., 53, 63

Let a and b be the respective arithmetic means of the items in List A and List B. What is the arithmetic mean of a and b ?

30. _____ If $19 + \sqrt{c} = 22$, what is the value of $c^2 + 7$?

31. _____ In the drawing shown, segment AB is parallel to segment HP, with A lying on segment IH and B lying on segment IP; the areas of the two enclosed regions are given. What is the ratio of IA to IH? Express your answer as a common fraction.



32. _____ What is the sum of the single-digit positive integers that are divisors of 840?

33. _____ If $xy + x + y = 35$ and $(x + 1)(y + 2) = 53$, what is the value of x ?

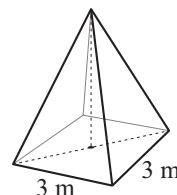
34. _____ A prime number is called egregious if it is 1 more than a perfect square. What is the *product* of the smallest three egregious prime numbers?

35. _____ There is a $\frac{2}{3}$ chance of rain on Saturday and a $\frac{1}{2}$ chance of rain on Sunday. Assuming the events are independent, what is the probability that it rains on exactly one of the two days? Express your answer as a common fraction.

36. _____ (permutations) How many different ordered three-letter permutations can be formed using three of the seven letters in the word ALGEBRA?

37. _____ If $x^2 + x = 6$, what is the sum of all possible values of $x^2 - x$?
38. _____ (ways) Emma and Steve are splitting a pizza with 6 slices, each with a different topping. Each of them wants 3 slices, but Emma will take the slice with anchovies. How many ways are there for them to split the pizza?
39. _____ A regular hexagon has side length 1. If a diagonal is defined as a line segment connecting two non-adjacent vertices, what is the product of the lengths of its nine diagonals?
40. _____ Let x , y and z be positive integers such that $x + z = 5$, $y + z = 6$, and $xy = 6$. What is the value of z ?
41. _____ (ways) A committee has two first-year members, two second-year members and two third-year members. How many ways are there to pair each member of the committee up with another member of the committee if the two first-year members cannot be paired with each other?
42. _____ For each positive integer n , let $f(n)$ be the greatest integer not exceeding the value of $\sqrt{n}$. For example, $f(10) = 3$. What is the value of $f(20) + f(26)$?
43. _____ If x is a positive integer such that $\frac{x+4}{3x+1} = \frac{2x+8}{5x+3}$, what is the value of x ?
44. _____ Marina tosses a fair coin four times. What is the probability that at least two of the four tosses land on heads? Express your answer as a common fraction.
45. _____ A rectangle has integer side lengths, and each diagonal has a length of $\sqrt{34}$. What is its area?
46. _____ The prime factorization of 2026 is 2×1013 . What is the greatest perfect square that evenly divides both 2026^2 and 2^{2026} ?
47. _____ A triangle has one of its side lengths equal to the product of the other two. If two of its side lengths are 3 and 4, what is the length of the third side? Express your answer as a common fraction.
48. _____ The number 2 is at least 10 percent and no more than 20 percent of the positive whole number N . What is the sum of the possible values of N ?
49. _____ What is the value of $3^4 + 4^3 - 5^2$?
50. _____ (ways) Oscar has 7 books, and he wants to give 3 books to Chelsea. In how many ways can he choose which books to give her?

51. _____ Which positive integer $x > 1$ satisfies $\frac{x^3 - 1}{x - 1} = 13$?
52. _____ If $xy - 4x = 7$ and $xy + 4x = 9$, what is the value of y ?
53. _____ (permutations) How many permutations of 2026 neither begin with a zero nor have two of the same digit in consecutive positions?
54. _____ (years old) Nine years ago, Simon was four times as old as Ava was, and four years ago, Simon was three times as old as Ava was. How many years old is Simon now?
55. _____ What is the value of $(27 \times 7) + (3 \times 37)$?
56. _____ (integers) How many positive integers less than or equal to 256 are perfect squares with a units digit of 6?
57. _____ What is the absolute difference between the two solutions of the equation $x^2 + 6x + 8 = 0$?
58. _____ (desserts) The Jolly Dodger Cafe menu includes 10 entrees, 4 sides, 6 appetizers and some number of desserts. The meal deal includes exactly 1 entree and 1 side, and either 1 appetizer *or* 1 dessert. If there are 440 different ways to order the meal deal, how many different desserts are on the menu?
59. _____ (m³) A pyramid with a square base of side length 3 meters has a height equal to the length of the diagonal of the base. What is the volume of the pyramid, in cubic meters? Express your answer in simplest radical form.
60. _____ (integers) How many positive *odd* three-digit integers are there such that their digits add up to 4?
61. _____ (people) A professor asks her students to add up the two numbers in their birthday (month + day). For example, Ana's birthday is May 4th, so she would add $5 + 4 = 9$. Ana says, "At least two people in this room are going to have the same sum". What is the minimum number of people that must be in the room to guarantee Ana's statement is correct?
62. _____ (days) Liam is reading two books, one with 100 pages and one with 200 pages. He can read up to 20 pages a night, but refuses to read from the same book two nights in a row. What is the fewest number of days it could take Liam to finish both books?



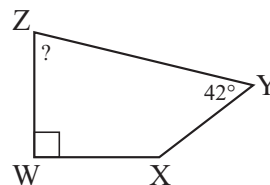
63. _____ (cubes) A 4-inch by 4-inch by 4-inch cube is painted orange on all its faces. The cube is then cut into unit cubes of edge length 1 inch. How many of the unit cubes have no paint on any face?

64. _____ A spinner can land on any of the numbers 1, 3, 5 and 6 with equal probability. Jamie spins the spinner twice. What is the probability that the sum of his two spins will be even? Express your answer as a common fraction.

65. _____ What is the sum of all *even* positive integers that are divisors of 24?

66. _____ What is the least possible product among any three distinct numbers chosen from the set $\{-3, 1, -5, 4, 9\}$?

67. _____ (degrees) In quadrilateral WXYZ, the measure of angle W is 90 degrees, the measure of angle X is twice the measure of angle Z, and the measure of angle Y is 42 degrees. What is the measure of angle Z, in degrees?



68. _____ What is the remainder when 3^{879} is divided by 5?

69. _____ (combinations) The Grendel children have won a total of 25 tickets at the arcade, which can be exchanged at the prize booth. The prizes include pencils for 5 tickets or sticky hands for 10 tickets. How many combinations of prizes can the children purchase, if they want to have no tickets left over?

70. _____ What is the smallest positive three-digit integer whose digits are all even and distinct?

71. _____ What is the value of $\frac{2+0 \times 2+6}{2 \times 0+2 \times 6}$? Express your answer as a common fraction.

72. _____ Given a finite set A of nonzero integers, such that the probability of randomly selecting a positive value from set A is $\frac{13}{20}$, what is the probability of randomly selecting a negative value from set A? Express your answer as a common fraction.

73. _____ The perimeter of an equilateral triangle with side length 8 is equal to the perimeter of a square. What is the area of the square?

74. _____ What is the value of $(1 - 2) + (3 - 4) + (5 - 6) + \dots + (2025 - 2026)$?

75. _____ By how much does the range of the dataset 1, 3, 5, 17, -2, 4 increase when appending the numbers 4, -3, 1, 20, 15?

76. _____ The integer 168 is one less than a perfect square. What is the least three-digit integer with this property?
77. _____ What is the value of $2^4 + 3^3 + 4^2$?
78. _____ (arrange-
ments) How many arrangements of the letters in the word CUBES have the two vowels next to each other?
79. _____ What is the sum of the first 2^3 positive integers?
80. _____ If $15x = 30$ and $x + y = 5$, what is the value of y ?