MATHCOUNTS®

2025 State Competition

Countdown Round Problems 1–80

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

1. _____ (cm^3) The dimensions of a *ROXBOX* are 8 cm by 5 cm by 9 cm. The new and improved *SUPERROXBOX* is 25% longer, 20% wider and $33\frac{1}{3}$% deeper than the original *ROXBOX*. What is the volume of the *SUPERROXBOX*, in cubic centimeters?

2. _____ A standard, fair six-sided die is rolled. What is the probability that the number rolled is not a prime number? Express your answer as a common fraction.

3. _____ The number 2025, which is equal to $3^4 \times 5^2$, has the property that the product of its distinct prime factors is also the number of factors it has. What is the least positive integer with at least two distinct prime factors with this property?

4. _____ (values) A triangle has two sides of lengths 8 and 13. How many possible integer values are there for the length of the third side?

5. _____ The product of an integer x and 6 is 10 greater than the sum of x and 25. What is the value of x?

6. _____ (sets) A music quiz offers 8 different songs for analysis. Jordan must select exactly 5 out of those 8 songs to analyze. How many different sets of songs can Jordan choose, if order of the song analysis does not matter?

7. _____ For what integer value of r does the equation $x^2 + rx + 6 = 0$ have $x = 2$ and $x = 3$ as solutions?

8. _____ If $x + y = 25$ and $y + z = 60$, what is the absolute difference between x and z?

9. _____ What is the median of the 25 products after Ethan correctly fills in the 5×5 multiplication table shown?

×	1	2	3	4	5
1					
2					
3					
4					
5					

10. _____ (points) The average of Melanie's 19 classmates' scores on an exam was 58 points. Melanie's score was then included in the average, which raised the average by 2 points. How many points did Melanie score?

11. _____ Riley divides the number x by 24 and gets 15 as her answer. Gavin multiplies the same number x by 20. What answer should he get?

12. _____ (integers) How many four-digit odd integers with four distinct digits can be formed using the digits 2, 3, 4, 7 and 9?

13. _____ (cm) A right triangle with integer side lengths has an area of 30 cm^2 and a perimeter of 30 cm. How many centimeters long is the hypotenuse?

14. _____ If $(x + 1)^2 = 6x$, what is the value of $(x - 2)^2$?

15. _____ (integers) How many positive integers less than or equal to 70 have at least three distinct prime factors?

16. _____ What is the sum of the elements in row 4 of Pascal's triangle if the topmost row, consisting of a single 1, is defined as row 0?

17. _____ (zags) The planet of Zigzag has two currencies: zigs and zags. If 3 zigs are equivalent in value to 5.4 zags, how many zags are equivalent in value to 25 zigs?

18. _____ (cm^2) A piece of wire is bent into the shape of a regular hexagon with area 1 cm^2. The same piece of wire is then re-bent into the shape of an equilateral triangle. What is the area of this triangle, in square centimeters? Express your answer as a common fraction.

19. _____ What is the units digit in the product of the first 27 prime numbers?

20. _____ (years old) Two years ago, Spot was four times as old as Rover was. Next year, Fido will be four times as old as Rover will be. If the sum of the ages of Fido, Rover and Spot is 24 years, how many years old is Rover?

21. _____ (rows) Lyle has 120 toy soldiers, which he wants to arrange in a rectangular formation with no more than 20 soldiers in any row or column. What is the sum of all possible numbers of rows which Lyle's formation can have?

22. _____ (degrees) The degree measures of the interior angles of a hexagon form an arithmetic progression. What is the median of these angle measures, in degrees?

23. _____ ($) Chelsea can complete a portrait of a dog in 3 hours and 20 minutes. If she charges $150 for each portrait, how many dollars is she earning per hour?

24. _____ (in^2) What is the area, in square inches, of an isosceles right triangle with perimeter $2+\sqrt{2}$ inches? Express your answer as a common fraction.

25. _____ The Fibonacci sequence starts with the following pattern of numbers: 1, 1, 2, 3, 5, 8, 13, 21, ..., where each number after the first two is the sum of the previous two. What is the 11th number in this sequence?

26. _____ (integers) How many positive integers x satisfy the inequality $(x + 2)(x - 8) < 0$?

27. _____ (points) In Mr. Thompson's science class, the test scores for 25 students varied between 65 and 94 points. What is the range of these scores?

28. _____ (triangles) How many non-congruent equilateral triangles with integer side length have area less than or equal to $100\sqrt{3}$?

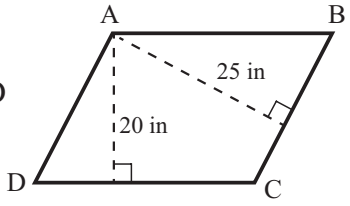
29. _____ An arithmetic sequence has 17 terms. If the first and last terms are 17 and 49 respectively, what is the common difference between consecutive terms in this sequence?

30. _____ What is the value of $\left(2-\frac{1}{3}\right) \times \left(2-\frac{1}{5}\right) \times \left(2-\frac{1}{7}\right)$? Express your answer as a common fraction.

31. _____ What is the probability that a randomly chosen positive integer divisor of 8! is a perfect square? Express your answer as a common fraction.

32. _____ If x and y are real numbers for which $2x - y = 3$ and $x + 2y = 4$, what is the value of $x + y$?

33. _____ (inches) In parallelogram ABCD, the distance between sides AB and CD is 20 inches, and the distance between sides AD and BC is 25 inches. If parallelogram ABCD has area 700 in^2, what is the length of its longer side, in inches?



34. _____ What is the value of $\frac{3}{4+\frac{5}{6}}$? Express your answer as a common fraction.

35. _____ (divisors) How many positive integer divisors does 432 have?

36. _____ (shrimp) During their annual shrimp eating contest, Mason ate 25 more shrimp than Steve, and Jeff ate 37 less shrimp than Steve. If only Mason, Steve and Jeff compete in the contest, what is the absolute difference between the average number of shrimp eaten per contestant and the number of shrimp that Steve ate?

37. _____ If $\sqrt{\sqrt{a}+600} = \sqrt{a}$, what is the value of a?

38. _____ (inches) A 16-foot long board is cut into two pieces with lengths in the ratio of 7:5. How many inches long is the longer piece?

39. _____ Five standard, fair six-sided dice are rolled. What is the expected value of the sum of the values shown on the top faces of the dice? Express your answer as a common fraction.

40. _____ If x and y are real numbers satisfying $(x + 1)(x + 2) = y + 1$ and $(x - 1)(x - 2) = y - 1$, what is the value of y? Express your answer as a common fraction.

41. _____ (feet) A *smoot* is a unit of distance equal to exactly 5 feet 7 inches. If a skyscraper is 144 smoots tall, how many feet tall is it?

42. _____ (students) At lunch, 60% of students chose to eat pizza, while 20% picked nachos. If 144 students selected pizza, and no student chose more than one meal, how many students chose nachos?

43. _____ The product of two positive integers is 10 more than their sum. The difference between the two integers is 10. What is the value of their sum?

44. _____ (cm^3) A right rectangular prism has length 24 cm, width 8 cm and height 6 cm. What is the volume of the rectangular prism, in cubic centimeters?

45. _____ (factors) How many positive integer factors does 2025^3 have?

46. _____ (seconds) A kilobyte is 1 thousand bytes, and a gigabyte is 1 billion bytes. A computer can transfer files at a constant rate of 150 kilobytes every 0.004 seconds. How many seconds will it take to transfer 24 gigabytes of files?

47. _____ The arithmetic mean of x, 25, 30 and 43 is 35. What is the value of x?

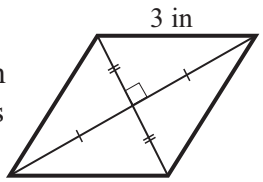
48. _____ (degrees) What is the interior angle sum, in degrees, of a convex octagon?

49. _____ What is the greatest positive integer that is a divisor of all numbers of the form $n^2 - n$, where n is a positive integer?

50. _____ What is the least possible value of a perfect square whose digits sum to 13?

51. _____ If x, y and z are positive integers for which $x + y + z = 20$ and $x^2 + y^2 + z^2 = 222$, what is the value of $xy + xz + yz$?

52. _____ (inches) A rhombus has side length 3 inches and one diagonal of length 4 inches. How many inches long is its other diagonal? Express your answer in simplest radical form.



53. _____ ($) Kevin is covering a floor with carpet that costs $3.50 per square foot. How much will it cost to purchase enough carpet to completely cover a rectangular room that measures 20 feet by 40 feet?

54. _____ A bag contains 3 red marbles and 4 blue marbles. Three marbles are drawn from the bag at random and without replacement. What is the probability that the marbles drawn will alternate in color, either a red-blue-red sequence or a blue-red-blue sequence? Express your answer as a common fraction.

55. _____ (integers) The number 2025 is the square of a positive integer with units digit 5. How many positive integers less than or equal to 202,500 have this property?

56. _____ Five friends competed for the greatest step count in a day. Alicia's step count was lower than Connie's and higher than Darren's. Bryce had the second lowest step count. Jack's step count was lower than Bryce's. Who had the third highest step count?

57. _____ Valeria makes a list of all the positive integers n that produce only integer solutions to the quadratic equation $x^2 + 20x + n = 0$. What is the absolute difference between the greatest and least values on Valeria's list?

58. _____ (digits) The terminating decimal expansion of $\frac{1}{16} = 0.0625$ has four digits to the right of the decimal point. How many digits are to the right of the decimal point in the terminating decimal expansion of $\frac{1}{1024}$?

59. _____ (in^2) When the side lengths of a regular pentagon are all tripled, its area, in square inches, is the sum of 30 in^2 and triple the original area. What is the area of the original pentagon, in square inches?

60. _____ If the point $(x, y) = (2, 1)$ lies on the graph of $y = (x - 1)^2 + (x + 1) + b$, what is the value of b?

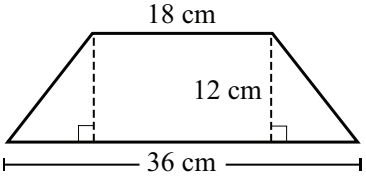
61. _____ (triangular numbers) A triangular number is a positive integer of the form $1 + 2 + 3 + \cdots + n$, where n is a positive integer. How many triangular numbers less than or equal to 100 are multiples of 6?

62. _____ (%) Jean-Francois spins a spinner with eight equal sections labeled 1, 1, 2, 3, 5, 8, 13 and 21. What is the probability that the spinner stops on a prime number? Express your answer as a percent.

63. _____ (minutes) Larry can make 7 pizzas in 9 minutes. Harry can make 7 pizzas in 12 minutes. Mary can make 4 pizzas in 6 minutes. Working together, how many minutes will it take the three friends to make 730 pizzas?

64. _____ (leaps) A grasshopper chases a flea that starts 30 feet ahead of the grasshopper. For every 12-inch leap of the flea, the grasshopper makes a 30-inch leap at the same time. How many leaps will the grasshopper have to make to catch up to the flea?

65. _____ (cm) How many centimeters is the perimeter of an isosceles trapezoid with base lengths of 18 cm and 36 cm and a height of 12 cm?



66. _____ (integers) For how many integers x is $\sqrt{25 - |5 - x|^2} \geq 0$?

67. _____ What is the value of $5^2 - 6^2 - 7^2 + 8^2$?

68. _____ (%) Three standard fair six-sided dice are rolled. The product of the three numbers rolled is odd. What is the probability that the sum of the three numbers rolled is odd? Express your answer as a percent.

69. _____ If the polynomial $x^2 + px + q$ has the two roots $x = -4$ and $x = 6$, what is the value of $p + q$?

70. _____ (postcards) Daisy and her two friends all started collecting postcards this year. They each have a different number of postcards, and the average number of postcards in their collections is 14. Daisy has the smallest collection. What is the greatest number of postcards that can be in Daisy's collection?

71. _____ (cm^2) Three of the vertices of a cube can be joined to form an equilateral triangle with area $4\sqrt{3}$ cm^2. What is the surface area of the cube, in square centimeters?

72. _____ (calories) A Crispy Crunch Bar has 400 calories and is divided into 15 smaller squares. If Jacque eats 3 squares on Tuesday, how many calories did he consume from the bar that day?

73. _____ Jon and Tim each flip a fair coin four times. What is the probability that Jon obtained the same number of heads as Tim? Express your answer as a common fraction.

74. _____ What is the value of $(1 + 2 + 3)^2 - (1^2 + 2^2 + 3^2)$?

75. _____ (cm) Triangle ABC, with integer side lengths, has two sides of lengths 33 cm and 42 cm. What is the smallest possible perimeter of triangle ABC, in centimeters?

76. _____ If $x + y = 4$ and $x - y = -2$, what is the value of x?

77. _____ (unit cubes) Estrella is building a model staircase with 1 cm unit cubes. To make a staircase that has 2 steps and is 8 cm wide, she uses 24 unit cubes. How many unit cubes will she use to make a staircase that has 7 steps and is 8 cm wide, if each step is 1 cm high and 1 cm deep?

78. _____ (integers) How many positive integers x satisfy the inequality $-22 < x(10 - x) < 22$?

79. _____ Two standard fair six-sided dice are rolled. What is the probability that the absolute difference of the two numbers rolled is less than 3? Express your answer as a common fraction.

80. _____ (yards) What is the perimeter, in yards, of a group of ten square tables, each of side length 1 yard, that are arranged in the shape of this T, as shown?