MATHCOUNTS®

2024 CHAPTER COMPETITION
Countdown Round Problems 1−80

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

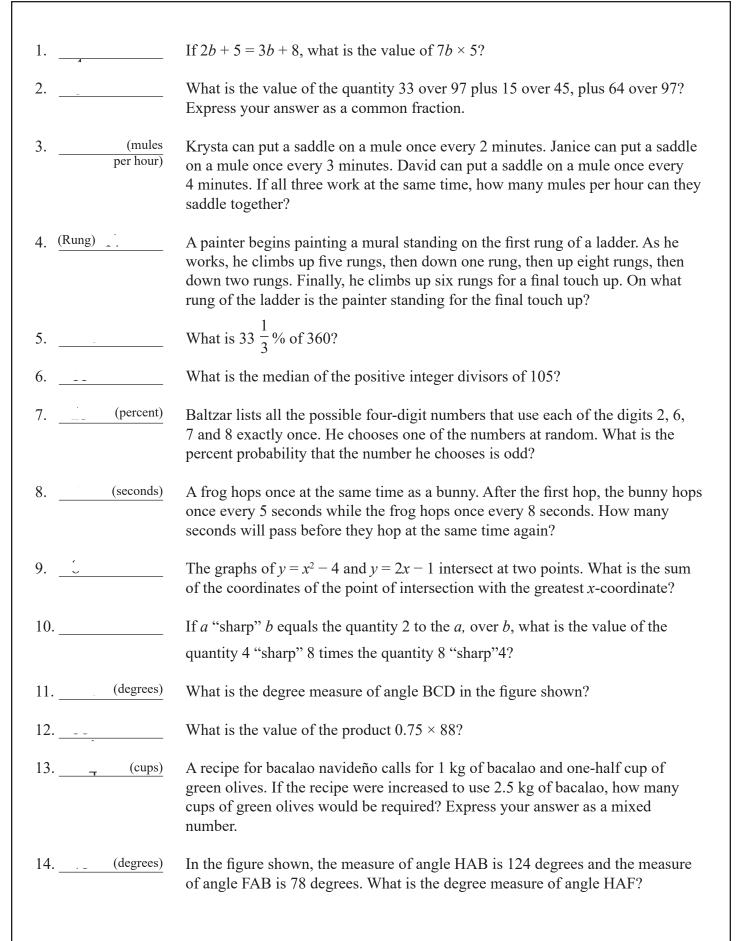1. _____ If $2b + 5 = 3b + 8$, what is the value of $7b \times 5$?

2. _____ What is the value of the quantity 33 over 97 plus 15 over 45, plus 64 over 97? Express your answer as a common fraction.

3. _____ (mules per hour) Krysta can put a saddle on a mule once every 2 minutes. Janice can put a saddle on a mule once every 3 minutes. David can put a saddle on a mule once every 4 minutes. If all three work at the same time, how many mules per hour can they saddle together?

4. (Rung) _____ A painter begins painting a mural standing on the first rung of a ladder. As he works, he climbs up five rungs, then down one rung, then up eight rungs, then down two rungs. Finally, he climbs up six rungs for a final touch up. On what rung of the ladder is the painter standing for the final touch up?

5. _____ What is $33\frac{1}{3}\%$ of 360?

6. _____ What is the median of the positive integer divisors of 105?

7. _____ (percent) Baltzar lists all the possible four-digit numbers that use each of the digits 2, 6, 7 and 8 exactly once. He chooses one of the numbers at random. What is the percent probability that the number he chooses is odd?

8. _____ (seconds) A frog hops once at the same time as a bunny. After the first hop, the bunny hops once every 5 seconds while the frog hops once every 8 seconds. How many seconds will pass before they hop at the same time again?

9. _____ The graphs of $y = x^2 - 4$ and $y = 2x - 1$ intersect at two points. What is the sum of the coordinates of the point of intersection with the greatest x-coordinate?

10. _____ If a "sharp" b equals the quantity 2 to the a, over b, what is the value of the quantity 4 "sharp" 8 times the quantity 8 "sharp" 4?

11. _____ (degrees) What is the degree measure of angle BCD in the figure shown?

12. _____ What is the value of the product 0.75×88?

13. _____ (cups) A recipe for bacalao navideño calls for 1 kg of bacalao and one-half cup of green olives. If the recipe were increased to use 2.5 kg of bacalao, how many cups of green olives would be required? Express your answer as a mixed number.

14. _____ (degrees) In the figure shown, the measure of angle HAB is 124 degrees and the measure of angle FAB is 78 degrees. What is the degree measure of angle HAF?

15. _____ (eggs)   For every egg laid by Mary the marine iguana, Seema the sea snake lays 6 eggs. Seema has 15 more eggs than Mary. How many eggs do they have all together?

16. _____ (years)   Fiona is 30 years old, and her daughter is one-third Fiona's age. In how many years will Fiona's daughter be half as old as Fiona?

17. _____ (cents)   Charles bought five packs of gum, and Martha bought seven packs of gum. The cost of each pack of gum was $1.66. What was the total cost, in cents, of the packs of gum that Charles and Martha bought?

18. _____ (units)   In the figure shown, ABCD is a rectangle, AB bisects EF, BC = 16, AF = 5, CD = 3 and EF = 8. What is CF in units?

19. _____   What is the value of 51×53?

20. _____ (dinner specials)   A dinner special consists of exactly one appetizer, one entree and one dessert. If there are four appetizers, ten entrees, and three desserts from which to choose, how many unique dinner specials are there?

21. _____   An integer is 120 less than its cube. What is the value of this integer?

22. _____ (minutes)   Each of Dr. Rundell's six students gives a presentation, and the total length of all the presentations is three hours. If one student's presentation is 45 minutes, and another student's presentation is 35 minutes, how many minutes is the average length of the other four students' presentations?

23. _____   If a "anchor" b equals the quantity a to the b minus the quantity b to the a, what is the value of 2024 "anchor" the quantity 3 "anchor" 2?

24. _____   Right triangle ABC has legs of lengths x cm and 6 cm and a hypotenuse of length the square root of 40 centimeters. What is the value of x?

25. _____   If $3m + 4p = 52$ and $6m + 3p = 69$, what is the value of $m - p$?

26. _____ (servings)   A 40-ounce jar of peanut butter has exactly 35 servings. How many complete servings are in a 28-ounce jar?

27. _____   What is the integer value of the greatest element in the set 1, 5^3, 3^5, 4^5, 7^3?

28. _____ (degrees)   If the measure of an angle is 38 degrees less than the measure of its supplement, what is the degree measure of the angle?

29. _____   The greatest divisor of k that is less than k is 70. What is the value of k?

30. _____ (dollars)   A neighborhood of 99 families has a mean household income of $50,000. How many dollars is the new mean household income when an additional family moves into the neighborhood and has a household income of $100,000?

31. _____ (dollars)   At the Make-a-Monkey store, it costs $29.99 to make a monkey. Each monkey has one of four possible types of fur, one of four accessories, and one of three sound effects. Bob went to the Make-a-Monkey Store and decided to make one of every possible type of monkey. To the nearest dollar, how much money did Bob spend at the Make-a-Monkey Store?

32. _____ (units)   The two lines $y = x - 13$ and $y = -2x + 5$ intersect at a point P. What is the distance between the origin and P, in units? Express your answer in simplest radical form.

33. _____ (hours)   It takes Leo 27 hours to paint $\frac{3}{8}$ of his most famous painting. At this rate, how many hours, in total, does it take Leo to complete the entire painting?

34. _____ (diagonals)   How many diagonals does a regular octagon have?

35. _____   If $a = 2^{2020}$ and b equals the LCM of 36 and 75, what is the value of the GCD of a and b?

36. _____ (dollars)   Patricio has $30 more than Greta. They join 10 friends who carry an average of $20 for lunch. Once Patricio and Greta join them, the average amount of money carried by each person in the party becomes $24. How many dollars is Patricio carrying?

37. _____   Alex rolls two fair, six-sided dice with faces numbreed 1 through 6, and Isa rolls one fair, standard twelve-sided die with faces numbered 1 through 12. What is the probability that the sum of the numbers showing on Alex's two dice equals the number showing on Isa's die? Express your answer as a common fraction.

38. _____ (minutes)   Louisa can rake the leaves in her family's yard in 30 minutes. Her brother can rake the leaves in 45 minutes. How many minutes would Louisa and her brother take to rake the leaves if they worked together?

39. _____ (factors)   How many positive factors does 1025 have?

40. _____   What common fraction is equivalent to zero point six, four repeating?

41. _____   What is the units digit of the sum 1 cubed, plus 2 cubed, plus 3 cubed, and so on, plus 10 cubed?

42. _____ (days)   How many days are there from January 2, 2024 to December 25, 2024, inclusive?

43. _____ (cm²) In the figure shown, a circle of radius 5 cm and a circle of radius 7 cm are externally tangent to each other, and internally tangent to a circle of radius 12 cm. How many square centimeters is the area of the gray region? Express your answer in terms of pi.

44. _____ If x is less than 0 and x plus 3 is the reciprocal of x minus 3, what is the value of x? Express your answer in simplest radical form.

45. _____ What is the value of $\dfrac{1}{5} + \dfrac{1}{60} + \dfrac{1}{240} + \dfrac{1}{720}$? Express your answer as a common fraction.

46. _____ (miles) How many miles will a runner travel in an 8-lap race where the course is a circle of radius 2 miles? Express your answer in terms of pi.

47. _____ What is the sum of the mean and the mode of 10, 50, 30, 40, 10, 60 and 10?

48. _____ (miles) Ravi rides the train into the zoo going 10 mi/h. He then gets off and walks back to his starting point at a speed of 2 mi/h. His total journey took 3 hours. How many miles into the zoo did Ravi ride the train?

49. _____ What is the value of the sum 1 squared, plus 2 squared, plus 3 squared, and so on, plus 10 squared?

50. _____ What is the sum of the first 20 odd positive integers?

51. _____ Dove rolls two fair, standard six-sided dice. What is the probability that the sum of the numbers she rolled is a prime number? Express your answer as a common fraction.

52. _____ (cm) The distance from the center of a circle to a chord is 5 cm. If the length of the chord is 24 cm, what is the radius of the circle, in centimeters?

53. _____ What is the sum of the positive factors of 56?

54. _____ What is the value of the quantity 3 to the 4th plus 3 squared plus 1, all over the quantity 3 squared plus 3 plus 1?

55. _____ What is the least prime number that divides all six-digit positive integers of the form ABABAB?

56. _____ What is the positive value of n for which 8, to the quantity n squared, times 4 to the n equals 2? Express your answer as a common fraction.

57. _____ What is the mean of the data set: the square root of 2, the square root of 2 plus 2023, negative 2 root 2 plus 2023, 4046?

58. _____ (prime numbers)   How many prime numbers p exist for which p is less than 100 and p minus 1 is a perfect square?

59. _____   What is $\frac{1}{3}$ of 60% of 189,450?

60. _____   What is the sum of the coefficients in the expansion of the quantity $x + 3y$ to the 4th?

61. _____ (dollars)   Anabel has twice as much money as Cam. Kira has $8 less than Cam. Simon has six times as much money as Kira. If Kira has $32.50, how many dollars do Anabel, Cam, Kira and Simon have all together?

62. ___2___ (necklaces)   How many different circular necklaces are there with six equally spaced gems consisting of three identical red rubies and three identical blue sapphire? Two necklaces are the same if one can be rotated or flipped to create the other.

63. _____ (cups)   If Twila's puppy eats three-fourths cup of puppy food twice a day, how many cups of food does the puppy eat in a week? Express your answer as a mixed number.

64. _____ (feet)   The area of Mrs. Schimmoller's rectangular classroom is 525 ft², and its width is three-sevenths its length. What is the sum of its length and width, in feet?

65. ___2___   A circle is inscribed in a square, which is inscribed in another circle. What is the ratio of the area of the larger circle to the smaller circle?

66. _____ (percent)   Sylvie received a giant bag of 300 gumballs on her birthday. She sorted the gumballs and found 120 were pink, 15 were white, 45 were blue, and 30 were green. The remaining gumballs were red. What percent of the gumballs were red?

67. _____   What is the coefficient of ab^6 in the expansion of the quantity a plus b to the 7th?

68. _____   The sum of three consecutive prime numbers is 59. What is the greatest of these three prime numbers?

69. _____ (factors)   How many positive factors does $2^4 \times 3^5 \times 7^2$ have?

70. _____ (glasses)   There are three shelves in the kitchen cabinet. They hold a total of 40 glasses. The first and second shelves hold a total of 33 glasses. The second and third shelves hold a total of 28 glasses. How many glasses does the second shelf hold?

71. _____   The points (3, 2) and (–1, 2) lie on the graph of y equals the absolute value of the quantity x minus k, where k is a fixed constant. What is the sum of the solutions to the absolute value of the quantity x minus k equals 0?

72. _____ What is the value of the expression $\dfrac{1}{3} - 0.3333$? Express your answer as a common fraction.

73. _____ A bag contains 2 each of red, green, blue, yellow and white marbles. Fred randomly draws 2 marbles without replacement. What is the probability that Fred's two marbles are the same color? Express your answer as a common fraction.

74. _____ (fish) Each of 10 tanks contains at least one fish. Each tank contains a different number of fish, except for two tanks that contain the same number of fish. What is the smallest total number of fish the 10 tanks could contain?

75. _____ If x and y are positive real numbers such that $x^2 y = 8$ and $xy^2 = 125$, what is the value of $x + y$? Express your answer as a common fraction.

76. _____ The edges of a cube are tripled in length to produce a new, larger cube. What is the ratio of the surface area of the larger cube to the surface area of the smaller cube?

77. _____ (times) The volume of a certain cone is equal to the volume of a certain sphere. Given that the radius of the sphere and the base radius of the cone are equal, the height of the cone is how many times its base radius?

78. _____ (stalks) Izzy grows corn on her farm. There are 8 stalks of corn in the first row. Every row after the first row has 3 more stalks of corn than the preceding row. If the farm has 25 rows of corn, how many stalks of corn are on Izzy's farm?

79. _____ Donnie randomly chooses two distinct positive integers less than 10. What is the probability that their sum is greater than or equal to their product? Express your answer as a common fraction.

80. _____ (rocks) A box contains more than 150 rocks. The rocks can be divided into equal shares among 4, 5, 6 or 9 children with 1 rock left over each time. What is the least number of rocks that the box can contain?