

## Past MATHCOUNTS Contest Questions

Note: MATHCOUNTS is a national middle-school contest; these are the MATHCOUNTS questions most appropriate for 4th and 5th grade students.

The questions are separated by the level of contest: school, then chapter, then state.

Feel free to skip questions, or raise your hand to ask for hints!

## School-level Questions, 2024

**Sprint 2** \_\_\_\_\_ What is the tens digit of this sum? 
$$\begin{array}{r} 12,345 \\ +56,789 \\ \hline \end{array}$$

**Sprint 3** \_\_\_\_\_ Dora drinks a 12-ounce can of cola. Erika drinks half of a 20-ounce bottle of cola. How many more ounces of cola does Dora drink than Erika?

**Sprint 4** \_\_\_\_\_ What is the result when one hundred twenty-eight thousand is subtracted from one million?

**Sprint 7** \_\_\_\_\_ On Monday at 8 p.m., the temperature measured  $-17$  degrees. Between 8 p.m. on Monday and 6 a.m. on Tuesday, the temperature increased  $23$  degrees. On Tuesday, between 6 a.m. and 3 p.m., the temperature decreased  $5$  degrees. What was the temperature on Tuesday at 3 p.m.?

**Sprint 8** \_\_\_\_\_ The table shows all five lunch options on Friday at a middle school and the number of students that ordered each. Based on this, what percent of the lunch orders on Friday were for spaghetti?

LUNCH	ORDERS
Pizza	132
Nuggets	112
Burger	88
Spaghetti	44
Salad	24

**Sprint 9** \_\_\_\_\_ What is the 40th positive odd integer?

**Sprint 10** \_\_\_\_\_ What is the value of the expression  $1 + \frac{2}{1 - \frac{2}{3}}$ , in simplest form?

**Sprint 12** \_\_\_\_\_ For each rock-paper-scissors match, paper beats rock, rock beats scissors, scissors beat paper and two identical items result in a tie. Based on this table, which summarizes the

results of Kalyani and Mark's last 200 matches, how many matches did Kalyani win?

		KALYANI		
		Rock	Paper	Scissors
MARK	Rock	30	24	20
	Paper	26	21	21
	Scissors	20	20	18

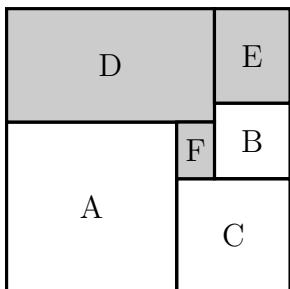
**Sprint 14** \_\_\_\_\_ Maria was born on January 1, 2000. Her mother was born on January 1, 1975, and her father was born on January 1, 1970. In what year was the sum of their ages 100?

**Sprint 15** \_\_\_\_\_ A bicycle that originally cost \$200 is on sale for \$140. By what percent was the price reduced?

**Sprint 16** \_\_\_\_\_ Jay's dog outgrew his rectangular pen that measured 10 feet by 14 feet. To make it larger, he increased each side length by the same amount, which increased the pen's area by 81 square feet. What is the greater side length of the larger pen?

**Sprint 19** \_\_\_\_\_ Kendra surveyed 100 people who own a dog or a cat, or both. Of those surveyed, 15 own both a dog and a cat, and the number of people who own a dog is four times the number of people who own a cat. How many people surveyed own a cat?

**Sprint 22** \_\_\_\_\_ The square labeled A has area 81 units<sup>2</sup>. The square labeled B has area 16 units<sup>2</sup>. The square labeled C has area 36 units<sup>2</sup>. These three squares along with the shaded, non-overlapping rectangles labeled D, E and F are arranged to form a large square as shown. What is the area of rectangle D?





**Sprint 26** \_\_\_\_\_ If two standard, fair 6-sided dice are rolled, what is the probability that the product of the two numbers rolled is a perfect square? Express your answer as a common fraction.

**Target 3** \_\_\_\_\_ Penelope and George go trick-or-treating together. Penelope gets 152 pieces of candy, and George gets 124 pieces of candy. Penelope eats 5 pieces of candy every day, and George eats 4 pieces of candy every day. After how many days will George have the same amount of candy as Penelope?

**Target 7** \_\_\_\_\_ Alan, Ben and Craig, who have three distinct ages, are among five children running a race. Assuming there are no ties, in how many different orders can the five children finish the race with Alan, Ben and Craig in order from oldest to youngest?

**Team 2** \_\_\_\_\_ How many ways are there to arrange the four integers 1, 2, 3 and 4 in a row so that no two adjacent numbers have a sum of 5?

**Team 4** \_\_\_\_\_ In the  $5 \times 5$  grid shown, each row and each column is to contain the integers 1 through 5 exactly once with one integer per cell. The sum of the two integers in each (thickly) outlined pair of cells is 5. What is the product of the integers in the four corner cells that are shaded?

		2		
1				
				1
				3

## Chapter-level Questions, 2024

**Sprint 5** \_\_\_\_\_ What is the perimeter of a square whose area is  $9\text{cm}^2$ ?

**Sprint 8** \_\_\_\_\_ Vinnie is ordering a 2-topping pizza, and the table shows the three choices of meat and five choices of vegetable toppings offered. How many different combinations of one meat topping and one vegetable topping are there?

Meats	Vegetables	
Pepperoni	Olives	Spinach
Sausage	Onions	Tomatoes
Bacon	Peppers	

**Sprint 10** \_\_\_\_\_ Mr. Juarez can type 84 words per minute. How many words can Mr. Juarez type in 2 minutes and 30 seconds?

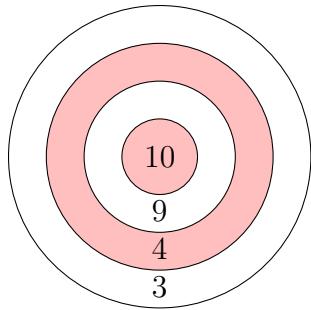
**Sprint 15** \_\_\_\_\_ The area of a rectangle is  $24\text{cm}^2$ . If the length of the rectangle is 1.5 times its width, what is the rectangle's perimeter?

**Sprint 16** \_\_\_\_\_ The product of two integers is 36. What is the greatest difference the two numbers could have?

**Target 1** \_\_\_\_\_ There are 130 members of the Kelly family attending the family reunion cookout at the park. Each picnic table at the park seats eight people. What is the minimum number of picnic tables needed when the entire family sits down to eat together?

**Target 2** \_\_\_\_\_ Yang arranges one  $4\times 4$ -inch square tile and five  $2\times 2$ -inch square tiles to form one large square. With no overlapping tiles and no space between adjacent tiles, what is the area of the large square?

**Team 1** \_\_\_\_\_ Four concentric circles form the dart board shown with regions worth 3, 4, 9 and 10 points. Assuming every dart hits the board in one of these regions, what is the least number of darts needed to score exactly 45 points?



**Team 2** \_\_\_\_\_ The ages, in years, of a family of five are 40, 38, 13, 10, 7. In 5 years, what will be the mean of these family members' ages? Express your answer as a decimal to the nearest tenth. (The mean of five numbers is their sum divided by 5.)

**Team 5** \_\_\_\_\_ Jack brought a huge box of dog treats to share with the 20 total Golden Retrievers and Airedales at the dog park. Each Golden Retriever received 3 treats and each Airedale received 5 treats. If the Golden Retrievers received 20 more treats than the Airedales, how many Golden Retrievers were there?

**Countdown 3** \_\_\_\_\_ 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?

**Countdown 4** \_\_\_\_\_ 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?

**Countdown 5** \_\_\_\_\_ What is  $33\frac{1}{3}\%$  of 360?

**Countdown 7** \_\_\_\_\_ 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.

**Countdown 8** \_\_\_\_\_ 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?

**Countdown 12** \_\_\_\_\_ What is the value of the product  $0.75 \times 88$ ?

**Countdown 13** \_\_\_\_\_ 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.

**Countdown 15** \_\_\_\_\_ 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?

**Countdown 16** \_\_\_\_\_ 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?

**Countdown 20** \_\_\_\_\_ 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?

**Countdown 21** \_\_\_\_\_ An integer is 120 less than its cube. What is the value of this integer?

**Countdown 31** \_\_\_\_\_ 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?

**Countdown 34** \_\_\_\_\_ How many diagonals does a regular octagon have?

**Countdown 42** \_\_\_\_\_ How many days are there from January 2, 2024 to December 25, 2024, inclusive (i.e., including both those days)?



**Countdown 50** \_\_\_\_\_ What is the sum of the first 20 odd positive integers?

**Countdown 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. (DMK: this is a common question type, “Somebody rolls two dice; what’s the probability of \_\_\_\_\_?”)

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

**Countdown 66** \_\_\_\_\_ 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?

**Countdown 68** \_\_\_\_\_ The sum of three consecutive prime numbers is 59. What is the greatest of these three prime numbers? (DMK: lots of questions involve prime numbers; it can be useful to memorize all the primes up to 20 or 30, at least.)

**Countdown 70** \_\_\_\_\_ 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?

**Countdown 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.

**Countdown 74** \_\_\_\_\_ 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?

**Countdown 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?



## State-level Questions, 2024

**Sprint 1** \_\_\_\_\_ If ten more than twice a number equals 48, what is that number?

**Sprint 2** \_\_\_\_\_ If 10 eggs cost \$0.75, how much will 32 eggs cost?

**Sprint 3** \_\_\_\_\_ The arithmetic mean of  $3, -4, 2, 0, 8$  and  $x$  is 2. What is the value of  $x$ ?

**Sprint 4** \_\_\_\_\_ Suppose  $y$  is a two-digit multiple of both 4 and 6. The product the digits of  $y$  is 18. What is the value of  $y$ ?

**Sprint 5** \_\_\_\_\_ Emily spelled each word on a 20-word spelling test. She earned 5 points for each word spelled correctly. Three points were subtracted for each word spelled incorrectly. Emily earned a score of 68. How many words did Emily spell incorrectly?

**Sprint 6** \_\_\_\_\_ Carter has several tokens, each worth 25, 10 or 5 cents. The weight of a 25-cent token is 25 grams, the weight of a 10-cent token is 10 grams, and the weight of a 5-cent token is 5 grams. If the combined weight of all of Carter's tokens is 435 grams, what is the total value of his tokens?

**Sprint 8** \_\_\_\_\_ A recipe calls for one 32-ounce jar of pickles, one packet of powdered drink mix, and  $\frac{3}{4}$  cup of sugar. If the recipe amounts are increased proportionally so that 12 cups of sugar are used, how many ounces of pickles will be used?

**Sprint 9** \_\_\_\_\_ The mean of three positive integers  $a, b$ , and  $c$  is 10, and the median of these integers is 5. What is the greatest possible value for  $c$ ? (Need to know: mean of three numbers is their sum divided by 3; median is the “middle” number, what’s left after you remove the largest and smallest numbers.)

**Sprint 14** \_\_\_\_\_ Robyn can travel from Lincoln to Omaha in 4 different ways and from Omaha to Des Moines in 3 different ways. How many different round trips can Robyn make from Lincoln to Des Moines that pass through Omaha in both directions?



**Target 1** \_\_\_\_\_ A glass jar holding identical cotton balls weighs 16 ounces. When the number of cotton balls in the glass jar is tripled, the total weight of the glass jar is 24 ounces. How many ounces does the empty glass jar weigh?

**Target 3** \_\_\_\_\_ A group of 84 people attended the zoo field trip. For the trip to the zoo, 63 people rode the bus and the remaining people were in cars with 3 people in each car. On the return trip, the same cars carried 4 people each, and the remaining people rode the bus. How many people rode the bus on the return trip?

**Target 5** \_\_\_\_\_ On Monday, 5 mushrooms popped up in Sean's yard. On Tuesday, 15 new mushrooms popped up, for a total of 20 mushrooms. On Wednesday, 45 new mushrooms popped up. On Thursday, 135 new mushrooms popped up. If this pattern continues with the number of new mushrooms tripling each day, in total, how many mushrooms will be in Sean's yard at the end of the day on Sunday?

**Team 3** \_\_\_\_\_ Aditya writes down some of his favorite numbers. Every number on his list is a prime number, and no two numbers on his list share any digits in common. What is the greatest possible number of terms in Aditya's list?

**Team 4** \_\_\_\_\_ In the exciting new game of Hyperfootball, two teams compete against each other for points. The only ways to score points are by getting a touchdown, a smackdown or a shutdown worth 6, 10 and 15 points, respectively. What is the greatest integer score that a team cannot have during a game of Hyperfootball?

**Countdown 2** \_\_\_\_\_ If the ratio of the side lengths of two squares is 1:2, what is the ratio of the area of the smaller square to the larger square? Express your answer as a common fraction.

**Countdown 3** \_\_\_\_\_ The *You'll Walk All Over Us* tile store sells 4-inch by 4-inch ceramic tiles in boxes of 40. Prisha purchased the minimum number of 4-inch by 4-inch ceramic tiles needed to cover a 10-ft by 12-ft room. How many boxes did she buy?

**Countdown 4** \_\_\_\_\_ Ten years from now, Theo will be twice as old as he was 4 years ago. How old is Theo now?



**Countdown 7** \_\_\_\_\_ A convex polygon has an unknown number of sides. When all the diagonals from a single vertex are drawn, seven non-overlapping triangles are created. How many sides does the polygon have?

**Countdown 9** \_\_\_\_\_ The local cooking school offers five classes each Friday. Each class lasts 1 hour and 15 minutes. There is a 20-minute break between classes. If the first class begins at 8:00am, how many minutes past noon is it when the final class finishes?

**Countdown 10** \_\_\_\_\_ Four pumpkins have an average weight of 15 pounds, and the average weight of three of those pumpkins is 13 pounds. How many pounds does the fourth pumpkin weigh? (Remember: “average” of four numbers is their sum divided by 4; average of three numbers is their sum divided by 3.)

**Countdown 11** \_\_\_\_\_ There are two distinct (different) numbers twice as far from 15 as they are from 75. What is the sum of those two numbers?

**Countdown 12** \_\_\_\_\_ A *triangular number* is a positive integer that can be written in the form  $\frac{n(n+1)}{2}$ , where  $n$  is an integer. In 1796, Carl Friedrich Gauss proved that every positive integer is the sum of at most three triangular numbers. What is the greatest of the 3 distinct triangular numbers that sum to 40?

**Countdown 13** \_\_\_\_\_ For what value of  $x$  do the points  $(x, x - 2)$ ,  $(x - 3, x)$ , and  $(0, 0)$  lie on the same line? Express your answer as a common fraction.

**Countdown 14** \_\_\_\_\_ What is the positive value of  $x$  that satisfies  $\sqrt{\sqrt{x} + 600} = 25$ ?

**Countdown 16** \_\_\_\_\_ Gabriel and his two brothers went to the aquarium and spent a total of \$116. Gabriel spent \$9 more than Mario, and Ernesto spent \$4 less than Mario. How many dollars did Ernesto spend?

**Countdown 17** \_\_\_\_\_ Virginia rides her bike every day. She rides 12 miles every Monday, 5 miles every Tuesday, 15 miles every Saturday, and 6 miles every other day of the week. Given that May 1, 2023 was a Monday, how many miles did Virginia ride in May of 2023?

**Countdown 18** \_\_\_\_\_ A rectangular cake is sliced lengthwise eight times and widthwise six times to form 1-inch by 1-inch squares on the top surface. In square inches, what is the area of the top surface of the cake?

**Countdown 21** \_\_\_\_\_ Spencer met some space Martians on the way to school. The pink Martians had five eyes and the green Martians had four eyes. There were three times as many pink Martians as green Martians. If Spencer saw 133 Martian eyes, how many pink Martians did she see?

**Countdown 22** \_\_\_\_\_ What is the value of  $\frac{5^2 - 1^2 + 6^2 - 2^2 + 7^2 - 3^2}{4}$ ?

**Countdown 24** \_\_\_\_\_ Mrs. Green can buy six pumpkins for the same price as 15 cornstalks. How many cornstalks can she buy for the price of eight pumpkins?

**Countdown 25** \_\_\_\_\_ In how many ways can Alice, Bob and four other friends stand in a line if Alice cannot stand next to Bob?

**Countdown 26** \_\_\_\_\_ Let  $a \clubsuit b = |a - b| + |b - a|$ . What is the value of  $9 \clubsuit 7$ ? (Notation:  $|x|$  is the absolute value of  $x$ , which turns negative numbers into positive numbers, and does not change positive numbers; for example,  $|-5| = 5$ ,  $|5| = 5$ ,  $|-13| = 13$ ,  $|13| = 13$ .)

**Countdown 27** \_\_\_\_\_ How many two-digit integers are multiples of eight?

**Countdown 30** \_\_\_\_\_ The value of  $(1 - \frac{1}{2}) \times (1 - \frac{2}{3}) \times (1 - \frac{3}{4}) \times \cdots \times (1 - \frac{9}{10})$  can be expressed as  $\frac{1}{n!}$ . What is the value of  $n$ ? (Need to know: the factorial operator is defined as  $n! = n \times (n - 1) \times (n - 2) \times \cdots \times 1$ ; for example,  $4! = 4 \times 3 \times 2 \times 1 = 24$ .)

**Countdown 31** \_\_\_\_\_ If A, B and C are non-identical sets that each have 18 elements, what is the least possible number of elements in the union of A, B and C? (“Union” is all of the elements combined, ignoring duplicates; for example, if A contains numbers 1, 2, and 3, and B contains 3, 4, and 5, then the union is 1, 2, 3, 4, and 5.)

**Countdown 32** \_\_\_\_\_ What is the greatest prime factor of  $333 \times 17$ ?



**Countdown 37** \_\_\_\_\_ Randy is the youngest of four brothers whose ages are all distinct positive integers. The average of the four brothers' ages is 10 years. What is Randy's greatest possible age, in years?

**Countdown 41** \_\_\_\_\_ A restaurant sells Nepali momo dumplings in baskets of 5 or 8. What is the greatest exact number of momos that *cannot* be purchased with whole baskets?

**Countdown 43** \_\_\_\_\_ The distance between the centers of two circles is 42 inches, and the distance between the two circles is 27 inches. What is the sum of the lengths of the radii of the circles, in inches? ("Radii" is the plural of "radius," half the diameter. Hint: draw a picture!)

**Countdown 46** \_\_\_\_\_ The arithmetic mean of 10, 9, 3,  $x$  and  $y$  is 5. What is the value of  $x + y$ ?

**Countdown 47** \_\_\_\_\_ Two numbers have a sum of 36. What is the greatest possible product of the two numbers?

**Countdown 49** \_\_\_\_\_ Justin, Pierce and Eli are running a race. Justin runs twice as fast as Eli, and Pierce runs three times as fast as Eli. If Justin finishes the race in 36 minutes, how many minutes does it take Pierce to finish the race?

**Countdown 54** \_\_\_\_\_ How many positive perfect squares have fewer than four digits?

**Countdown 56** \_\_\_\_\_ Fran builds a fence around her square-shaped backyard to keep her new puppy safe. If the area of her backyard is  $1024\text{m}^2$ , what is the minimum length of fencing, in meters, that Fran will need to enclose her backyard?

**Countdown 60** \_\_\_\_\_ What is the absolute difference between the mean and the median of the prime numbers less than 20? Express your answer as a common fraction.

**Countdown 61** \_\_\_\_\_ If three carpenters can build three fences in three days, then how many days does it take one carpenter to build two fences?



**Countdown 63** \_\_\_\_\_ If  $n$  is a two-digit integer for which  $n + 1$ ,  $\frac{n}{2} + 1$ ,  $\frac{n}{3}$ , and  $\frac{n}{6} + 1$  are all perfect squares, what is the value of  $n$ ?

**Countdown 66** \_\_\_\_\_ If  $f(x) = x + 3$  and  $g(x) = 3x^2 - 2x + 7$ , what is the value of  $g(f(5))$ ?

**Countdown 71** \_\_\_\_\_ A shop sells all teacups at one price and all saucers at another price. Carson pays \$67 for three teacups and two saucers. Daylon pays \$57 for a teacup and five saucers. How many dollars will Eidan pay for one teacup?

**Countdown 72** \_\_\_\_\_ Devlyn made a batch of between 50 and 70 cupcakes. When they are packaged in groups of 3, 4 or 5 cupcakes, there is always one cupcake left over. How many cupcakes will be left over if they are packaged in groups of 7 cupcakes?

**Countdown 75** \_\_\_\_\_ How many distinct arrangements are there of the letters in the word ENGINEER?