"Math is Cool" Championships -- 2023-24

5th Grade

Mental Math Solutions

	Answer	Solution
1	12 [pieces]	Jake got three bags of candy for his birthday. The first bag had three pieces, the second bag had four pieces, and the final bag had five pieces. How many pieces of candy did Jake get for his birthday? **3+4+5 = 12**
2	25 [units squared]	What is the area in square units of a square with side length 5 units? **5^2 = 25**
3	9	What is x plus seven minus two if x equals four? **4 + 7 - 2 = 9**
4	30	What is twenty percent of one hundred fifty? **0.1*150 = 15** **15x2 = 30**
5	494	A palindrome is a whole number that reads the same forwards or backwards, such as two hundred thirty two. What is the largest palindrome that is less than five hundred? **494 < 500**
6	7	What is the average of the following set: two, eight, fourteen, five, six **2+8+14+5+6= 35** **35/5 = 7**
7	5 [sides]	A sequence of shapes begins with: triangle, pentagon, square, octagon, then keeps repeating in the same order. How many sides does the twenty-sixth shape in the sequence have? **Triangle, pentagon, square, octagon = 3, 5, 4, 8** **26/4 = 6 r2, so the 26th shape is a pentagon.**

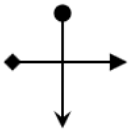
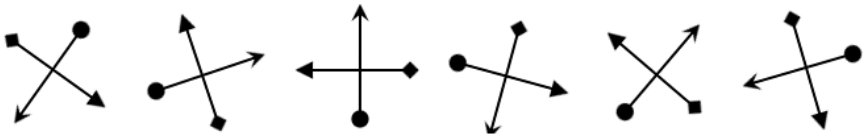
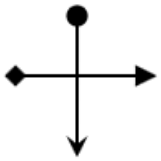
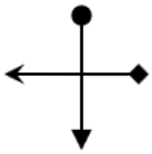
8	201 [pennies]	Carter has twelve quarters, eleven dimes, seven nickels, and four pennies. He is buying a chocolate bar that costs two dollars and forty-eight cents. If he is returned his change in pennies, how many pennies will he get back? **First calculating how much he has, we get:** **12*0.25+11*0.10+7*0.05+4*0.01=4.49** **Change: 4.49-2.48 =2.01 = 201 pennies**

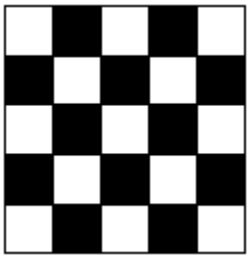
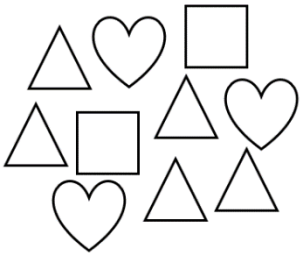
"Math is Cool" Championships -- 2023-24

5th Grade

Individual Test Solutions

	Answer	Solution
1	480	Evaluate: 1 + 23 + 456 1 + 23+ 456 = 480
2	55 [pieces of candy]	Mrs. Kelly wants to give each of her 25 students 3 pieces of candy for the last day of school. She has already bought 20 pieces of candy. How many more pieces of candy does she need to buy? She needs 25×3=75 in total Now she needs 75-20=55 more pieces
3	7	What digit is in the thousandths place of the following number? 1234.5678 **The 7 is in the thousandths place.**
4	100 [ft squared]	In square feet, what is the area of a rectangle with sides of length 5 feet and 20 feet? 5×20 = 100
5	11	What is the smallest prime number that is greater than 10? 11 is prime.
6	200	What is 25% of 800? 0.25×800 = 200
7	[x=] 11	Four times my favorite number equals 44. What is my favorite number? 4x = 44 x = 11

8	4 [figure #]	Which figure number, 1, 2, 3, 4, 5 or 6, is not a rotation of the figure shown at the top?   1 2 3 4 5 6 Figure at top:  Figure 4: 
9	2	Multiply, and write your answer as an integer: $6\frac{1}{2} * \frac{4}{13}$ 6 ½ = $\frac{12}{2}$ + ½ = $\frac{13}{2}$ 13/2 * 4/13 = 2
10	37 [pennies]	Amy went to the store to buy 3 cookies for 25 cents each, but only brought 38 cents. How many more pennies would she need? 75 – 38 = 37 pennies
11	12	Find the mean of the following data set: {5, 10, 11, 15, 19}. 5+10+11+15+19 = 60 60/5 = 12
12	150 [minutes]	Michael runs 10 miles up a hill at a steady 4 miles per hour. How long will it take for him to reach the top, in minutes? 10mi ÷ 4m/h = 2.5 hours 2.5 hr × 60 min/hr = 150 min
13	48 [degrees]	In triangle ABC, angle A has a measure of 53 degrees, and angle B has a measure of 79 degrees. In degrees, what is the measure of angle C? The sum of the angles of a triangle are 180 degrees. 180-53-79=48

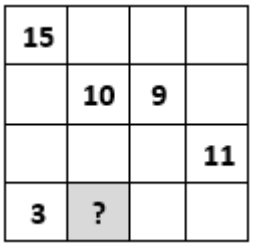
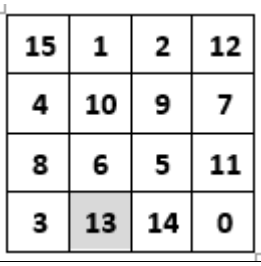
14	4	The grid consists of unit squares painted black and white in a checkerboard pattern.  How many of the following rules will result in a grid that contains the same number of black and white squares? At the beginning of each rule, start from the original grid. • Add one more row following the same pattern. • Add one more column following the same pattern. • First add one more row, then add one more column, following the same pattern. • First add one more row, then one more column, then one more row, following the same pattern. First add one more row, then one more column, then one more row, then one more column, following the same pattern. **All of them except the last one result in an even number of squares, thus an equal number of black and white.**
15	30 [percent]	At Kamiak Elementary School, all 50 5th grade students do exactly one activity: robotics, math team, or science club. If 10 students do robotics, and 25 do math team, what percent of students do science club? 50-10-25 = 15 15/50 = 30%
16	480	What is the product of the first 3 even numbers that are greater than 5? 6×8×10 = 480
17	50 [%]	One shape is randomly selected from the group of shapes shown here. As a percentage, what is the probability that the chosen shape is a triangle?  10 total shapes, 5 triangles 5/10 = 50%
18	26	The first three terms in an arithmetic sequence are 2, 6, and 10. What is the 7th term? Continuing the pattern of +4, we get: 2,6,10,14,18,22,**26**
19	18 [inches]	How many inches are in one-half yard? ½ yard = 1.5 feet 1.5 x 12 = 18 inches
20	6 [ways]	In how many ways can you rearrange the letters in the word MAMA? MAMA, MAAM, MMAA, AMAM, AMMA, AAMM

21	77	What is the sum of the prime numbers that are less than 20? 2+3+5+7+11+13+17+19=77
22	385 [cubic inches]	What is the volume in cubic inches of a box with sides of length 5, 7, and 11 inches? 5*7*11
23	8	What is one-half of one-fifth of two-thirds of 120? Two thirds of 120 = 2/3*120=80. One fifth of 80 = 1/5*80=16 One half of 16 = $\frac{1}{2}$*16=8
24	75 [cars]	There are 5 cars for every 3 trucks parked in a used vehicle lot. If there are a total of 120 cars and trucks in the lot, how many cars are there? 5 cars: 3 trucks, 8 total 5/8 = x/120 x = 75
25	64 [fluid ounces]	Seth has a 16 fluid ounce water bottle that starts full at the start of each day. Throughout the day, he keeps drinking from it and must refill it 3 times, and at the end of the day, it is empty. How many fluid ounces of water did he drink? **He first drinks 16 oz. until it is empty, then refills and drinks 16 oz. 3 more times for a total of 16+16+16+16 = 64 oz.**
26	13	A new function is defined as follows: $x\Delta y = 2x + xy - 3$ Find the value of: $4\Delta(1\Delta3)$ **First, $1\Delta3$ = 2(1)+(1)(3)-3=2** **Next, $4\Delta2$ = 2(4)+(4)(2)-3 =13**
27	5 [colors]	On crazy sock day, ten students each have two different colored socks on. No two of the students have the same pair of colors. What is the smallest possible number of different colors of socks they are wearing? **If the colors are: A, B, C, D, E:** **1. AB** **2. AC** **3. BC** **4. AD** **5. BD** **6. CD** **7. AE** **8. BE** **9. CE** **10. DE**

28	16	What is the sum of the range and median of the following set of numbers: {10, 6, 3, 5, 2, 7, 9, 1, 11} **Range: 11-1 = 10** **Median: 6** **Sum: 10+6= 16**
29	8 [minutes]	Aadi's parents were driving her from their house to the Math Is Cool competition, which was 12 miles away, at a rate of 20 miles per hour. When they were one-third of the way there, she realized they would be late, so she told her parents to speed up, and they drove the rest of the way at triple their previous speed. How many more minutes did it take them to reach the Math Is Cool competition after they increased their rate? **Since they drove 1/3 of the way, which was 12 miles, they had gone (1/3)*(12 miles)=4 miles, so 12-4=8 miles were left. Once they tripled their speed, they went from 20 mph to 20*3=60 mph.** **(8 miles) / (60 miles/hour) * (60 minutes/hour) = 8 minutes.**
30	242	What is the sum of the first 5 terms in the geometric series whose first 3 terms are: 2, 6, 18, and so on **The pattern is multiplying by 3, so the first 5 terms are: 2, 6, 18, 54, 162.** **Adding them, we get: 2+6+18+54+162=728**
31	6	What is the value of x times y if x plus y equals 5 and x minus y equals 1? **x+y=5 and x-y=1 so adding them you get 2x=6 => x=3.**
32	128	Biff and Eho are playing a game where they both start counting from 1, but Biff adds 2 each time and Eho multiplies by 2 each time. So, they both say 1 at the same time, then Biff says 3 and Eho says 2 at the same time. What number will Eho say when his number is at least 5 times Biff's number for the first time? **If we count up the numbers, we see:** **Biff Eho** **1 1** **3 2** **5 4** **7 8** **9 16** **11 32** **13 64** **15 128** **So the answer is 128**

33	5 [%]	Huckson was getting ready for school, but realized he forgot to put on his socks. He quickly got 2 socks out of his drawer without checking the colors. His drawer had 2 red socks, 4 yellow socks, and 10 blue socks. As a percentage, what is the probability that he grabbed 2 yellow socks? **There is a total of 2+4+10=16 socks. The probability the first sock was yellow is 4/16, and the second one is 3/15; multiplying those we get 1/20.** **To write as a percent, we do 100% * 1/20 = 5%**
34	158 [$]	Aurora-Jo goes to Target to buy a shirt. She has 3 coupons: 20% off any shirt more than $60, 25% off any shirt more than $70, and 35% off any shirt more than $75. She finds 3 shirts that she likes, priced at $65, $72, and $80. If she uses every coupon exactly once, how much will she pay in dollars to buy all 3 shirts? **65-0.20*65 = $52** **72-0.25*72 = $54** **80-0.35*80 = $52** **$52+$54+$52 = $158.**
35	340 [$]	For a fund raising event, Veda bought 15 objects costing a total of $860 to raffle off. She created three prize boxes, with each box containing 5 objects. Each of the objects individually cost either $100, $70 or $50. Each of the three prize boxes has a different total value of the five objects it contains. What is the largest possible value, in dollars, of the objects in one of the prize boxes? **There are three different types of objects: A, B and C.** **A + B + C = 15 total objects** **100A + 70B + 50C = 860, or** **10A + 7B + 5C = 86** **Can use guess and check to discover that A = 1, B = 3 and C = 11.** **To get the highest possible value of 5 objects, take 1A, 2B and 2C. (Note – it can't be 1A, 3B and 1C because each box has to be different).** **100(1) + 70(2) + 50(2) = 340**

36	1008 [monster cows]	William and Vishal are traveling to 2 different solar systems, System W and System V, respectively. System W has 7 planets, which each have 12 moons. Each moon has 11 cities that have an average of 3 monster cows each. System V has 9 planets that each have 6 moons. Each moon in system V has 14 cities and an average of 5 monster cows at each city. How many more monster cows does System V have than System W? **System W: 7*12*11*3 = 2772** **System V: 9*6*14*5 = 3780** **3780-2772 = 1008**
37	57	Chicken poppers come in boxes of 5 or 7. Mir asks Aditya to buy a certain number of chicken poppers, and that number is greater than 15. Aditya goes to buy the poppers, but then realizes that it is impossible to buy the exact number of chicken poppers that Mir asked for. What is the sum of every possible number of chicken poppers that Mir might have asked for? **We can start at 16 and then check each value up.** **16 is not possible** **17 = 2(5) + (7)** **Since 17 didn't work, no other number ending in 2 or 7 won't work since you can just add 5.** **18 is not possible** **19 = (5) + 2(7)** **Since 19 didn't work, no other number ending in 4 or 9 won't work.** **20 = 4(5)** **No number ending in 0 or 5 won't work** **21 = 3(7)** **No number ending in 1 or 6 won't work** **22 = already checked 17** **Only numbers ending in 3 or 8 are left, and checking 28 next also isn't a case since 7*4 works.** **This means the impossible values are 16, 18, and 23, so adding them we get a final answer of 16+18+23=57.**

38	13	Fill in each square in the following grid so that all squares contain a different whole number, and the sum of the numbers in each row, column and diagonal equals 30. What number replaces the question mark in the shaded square?  
39	36	Fidel rolls 3 fair six-sided dice, and uses the 3 numbers that are on top to form the largest 3-digit number possible. Lexi uses the same 3 digits that Fidel does, but creates the smallest number possible. The probability that Fidel's number is the same as Lexi's can be written as a reduced common fraction 1/m. What is the value of m? **For the numbers to be the same, that means every digit must be the same. Since there are 3 dice, the total number of possible outcomes from rolling them is 6*6*6 = 216. If every digit is the same, then the only cases that work are 111, 222, 333, 444, 555, and 666. This means that the probability both of their numbers are the same is 6/216, which simplifies to 1/36, so m=36.**

40	50 [square inches]	In square inches, what is the area of a circle inscribed in a square that is inscribed in a circle that is inscribed in a square that is inscribed in a circle of circumference 16π inches? Approximate π with a value of 3.1, and round your final answer to the nearest integer number of square inches. **If the outer circle has a circumference of 16pi, its diameter is 16pi/pi = 16. This means that the diagonal of the larger square is 16, and dividing that by sqrt2, we get the side length of the square is 8sqrt2. Since the diameter of the middle circle is the same length as the side length of the larger square, its diameter is 8sqrt2, which, by repeating the previous process, we see is also the diagonal of the small square, so we have to divide it by sqrt 2 again to get the small square's side length. This means that its side length is 8sqrt2/sqrt2 = 8, which is also the diameter of the innermost circle. Since the diameter of the innermost circle is 8, its radius is 8/2=4, and then by using the formula pi*r^2, we get pi*4^2 = 16pi. Then, by approximating pi as 3.1 (anything 3.1 or more accurate works), we see that 16(3.1) = 49.6, which rounds to 50.**

"Math is Cool" Championships -- 2023-24

5th Grade

Multiple Choice Solutions

	Answer	Solution
USE THE FOLLOWING INFORMATION TO SOLVE PROBLEMS #1 THROUGH #3. Yareli and Francisco went on an Easter egg hunt. Yareli collected four pink, seven yellow, eight green, one purple, and five blue eggs. One of the pink eggs was decorated with stars, four of the green eggs were decorated with stripes, and three of the blue eggs were decorated with polka dots.  Francisco collected two pink, four green and four purple eggs. Two of the green eggs were decorated with stripes.		
1	*C*	How many more eggs does Yareli have than Francisco? A) 5 B) 10 C) 15 D) 25 E) Answer not given. **Yareli has 4 + 7 + 8 + 5 + 1 = 25.** **Francisco has 2 + 4 + 4 = 10** **25 – 10 = 15**
2	*C*	All of the eggs have been hard-boiled. A single hard-boiled egg weighs about 50 grams. If Yareli and Francisco put their eggs together, approximately how many kilograms of eggs do they have? A) 0.1 kg B) 1.0 kg C) 1.75 kg D) 2.25 kg E) Answer not given. **Together, they have 35 eggs.** **35 x 50 g/egg = 1750g** **1750/1000 = 1.75 kg**

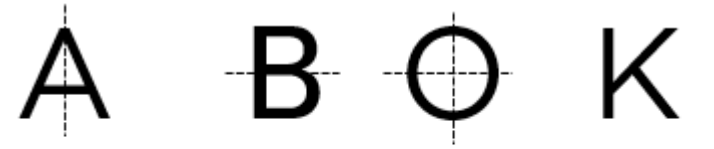
3	*A*	Yareli randomly selects one of her eggs. She pulls out a solid-colored egg, with no decorations. What is the probability that it is pink? A) 3/17 B) 5/18 C) 4/19 D) 5/19 E) Answer not given. **She has a total of 17 solid-colored eggs with no decorations, and 3 of those are pink.**

USE THE FOLLOWING INFORMATION TO SOLVE PROBLEMS #4 THROUGH #7.

The 26 capital letters in the English language are shown here. Some of the letters are symmetric (a mirror image) over a vertical line drawn through the middle of the letter, some of the letters are symmetric over a horizontal line drawn through the middle of the letter, and some letters are symmetric over both lines. Other letters are not symmetric in either direction.

A B C D E F G H I
J K L M N O P Q R
S T U V W X Y Z

Examples:



Symmetric Over Vertical line	Symmetric Over Horizontal line	Symmetric Over both lines	Symmetric Over no lines

4	*C*	Some of the letters consist of only straight lines, such as the W. Other letters include or consist of 'curvy' sections, such as the R. How many of the letters only consist of straight lines? A) 12 B) 14 C) 15 D) 17 E) Answer not given. A, E, F, H, I, K, L, M, N, T, V, W, X, Y, Z
5	*A*	How many letters are <u>only</u> symmetric over a vertical line? A) 7 B) 8 C) 10 D) 11 E) Answer not given. A, M, T, U, V, W, Y

6	B	How many <u>more</u> letters are symmetric in only one direction (either vertical or horizontal) compared to letters that are symmetric in both directions? A) 6 B) 7 C) 8 D) 9 E) Answer not given. **Vertical only:** A, M, T, U, V, W, Y Horizontal only: B, C, D, E Total = 11 Both: H, I, O, X Total = 4 11 – 4 = 7
7	D	The entire alphabet is going to be typed repeatedly, starting with ABCDEFGHIJKLMNOPQRSTUVWXYZABCD… The … at the end indicates that the sequence continues infinitely, with the alphabet being typed over and over. The first letter in the sequence is A, the second letter is B, and so on. What is the 2024^{th} letter in the sequence? A) P B) Q C) T D) V E) Answer not given. **2024/26 = 77 r 22** **The 22^{nd} letter is V.**

USE THE FOLLOWING INFORMATION TO SOLVE PROBLEMS #8 THROUGH #10.

The following table shows the number of visitors in 2022 at the Top 10 visited National Parks (NP) in the United States.

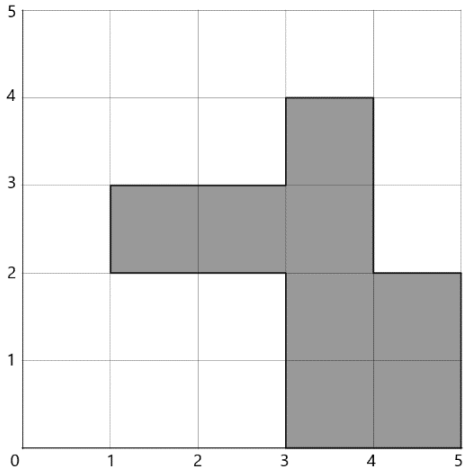
Park Name	Number of Visitors in 2022
Acadia NP	3,970,260
Cuyahoga Valley NP	2,913,312
Glacier NP	2,908,458
Grand Canyon NP	4,732,101
Great Smoky Mountains NP	12,937,633
Joshua Tree NP	3,058,294
Rocky Mountain NP	4,300,424
Yellowstone NP	3,290,242
Yosemite NP	3,667,550
Zion NP	4,692,417

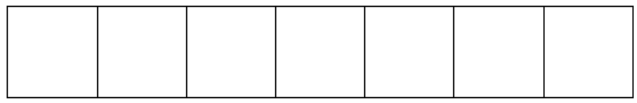
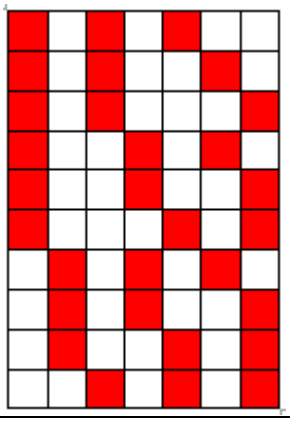
8	B	Out of the following choices, which park had the fewest number of visitors in 2022? A) Acadia B) Joshua Tree C) Rocky Mountain D) Yellowstone E) Yosemite **Joshua Tree was the fewest of these choices, with 3,058,294**
9	A	Out of the ten parks, how many of them have visitor numbers that are divisible by 9? A) 3 B) 4 C) 5 D) 7 E) Answer not given. **A number is divisible by 9 if the sum of its digits is divisible by 9. This is true for Acadia (3970269), Glacier (2908458), and Grand Canyon (4732101).**
10	C	Out of the ten parks, approximately what percent of the visitors went to Great Smoky Mountains? Pick the best answer. A) 7% B) 15% C) 26% D) 38% E) 42% **You could round each number off to the nearest million: 4+3+3+5+13+3+4+3+4+5 = 47, which could be rounded off to 50. Great Smoky Mountains is about 13, and 13/50 = 26/100 = 26%. Therefore, choice C is the closest estimate. The actual percentage is 27.8%, so the estimate is pretty good.**

"Math is Cool" Championships -- 2023-24

5th Grade

Team Test Solutions

	Answer	Solution
1	77 [items]	Yolia makes tie-dye clothing and sells it at the Tri-Cities arts and crafts festival. On the first day of the festival, she sells the following items. How many total items did she sell on the first day? **27 + 14 + 36 = 77** **Yolia's Tie-dye Booth** **Item** / **Number sold** T-shirt / 27 Sweatpants / 14 Bandanas / 36
2	16 [units]	The horizontal or vertical distance between each grid number on the coordinate plane is 1 unit. In units, what is the perimeter of the figure shown here? **The perimeter is equivalent to a 4x4 square, with a perimeter of 16. Or, just pick a spot, and count up the unit lengths around the perimeter.** 
3	22 [hours]	Sumaya is traveling in her self-driving car at a constant rate of 55 miles per hour. At this rate, how many hours will it take to travel 1,210 miles? **1210/55 = 22**
4	4 [factors]	How many positive factors does the number 55 have? **1, 5, 11, 55**
5	15552 [cubes]	Jackson is trying to make a 24 inch by 18 inch by 36 inch rectangular prism out of 1-inch cubes. How many cubes will he need? **24x18x36 = 15,552 cubic inches**

6	174	What is the sum of the next 2 terms in the sequence that starts: 1, 4, 2, 8, 6, 24, 22… **The pattern is to multiply by 4, then subtract 2, so the next two terms are:** **22*4 = 88** **88-2 = 86** **88+86 = 174**
7	4 [miles]	Howen went on a 5-day road trip, and kept track of how many miles he drove each day. He drove 346 miles on the first day, 213 miles on the second day, 512 miles on the third day, 377 miles on the fourth day, and 367 miles on the final day. What is the positive difference between the mean number of miles driven per day and the median number of miles driven per day? **The median is 367 miles.** **The sum is 346+213+512+377+367=1815** **The mean is 1815/5 = 363**
8	10 [ways]	In how many different ways can three squares in the following shape, made of unit squares, be colored red, such that no two neighboring squares are colored red?  

9	64 [= A]	Jim, John, and Jake are playing a dice game, where they take turns rolling a pair of fair 6-sided dice. Jim goes first, then John, then Jake. Jim wins if he rolls a sum of 5, John wins if he rolls a product of 6, and Jake wins if the positive difference between the two dice is 4. The game will continue until one of them wins, and ends once one has won. The probability that Jake wins on his first turn can be written as a common fraction A/729. What is A? **During the first round:** **When Jim rolls, he has a 4/36 (or 1/9) chance of winning, with the pairs: (1,4), (2,3), (3,2), (4,1).** **For John to win, Jim must have not won on his first turn, which has a probability of 1-1/9 = 8/9, times the chance that John also wins, which is also 4/36, from the pairs: (1,6), (2,3), (3,2), (6,1). This gives a final probability of 8/9*1/9=8/81.** **Next, for Jake to win, Jim and John both need to not win on their first turns, which has a probability of 8/9*8/9=64/81, and Jake also needs to win, which has a probability of 4/36 yet again, from the pairs: (1,5), (2,6), (5,1), (6,2). This gives a probability of 64/81*4/36 = 64/729.** **Thus, the answer is 64.**
10	1691	What is the largest 4-digit whole number that satisfies the following conditions: • The leftmost digit is a perfect square • The 2 leftmost digits in order create a two-digit perfect square • The 3 leftmost digits in order create a 3-digit perfect square The 2 rightmost digits in order create a triangular number **Using clue 1, the leftmost digit is either a 1, 4, or 9. Then with clue two, we can rule out the first digit being a 9, and our two options for the first 2 digits are 16 and 49. With rule 3, the only option left is 169, since no 2-digit square starts with 49. The last 2 digits are 9_, and must create a triangular number, which only leaves us with the option of 91. Our final number is 1691.**

"Math is Cool" Championships -- 2023-24

5th Grade

Linda Moore Triple Jump Solutions

	Answer	Solution
1	16	Evaluate: $(2 \times 3 + 5) + 5$ **(6 + 5) + 5 = 11 + 5 = 16**
2	70 [ounces]	How many ounces are in 4 pounds and 6 ounces? **4 lbs * 16 oz/lbs = 64 oz** **64 + 6 = 70 ounces**
3	2	Find the sum: $\frac{5}{6}+\frac{2}{3}+\frac{1}{2}$ **Making a common denominator, we get: 5/6+4/6+3/6 = 12/6 = 2**
4	48 [triangles]	Altogether, 27 trapezoids and 6 hexagons have the same number of sides as how many triangles? **27*4 + 6*6 = 144 sides** **144/3 = 48**
5	23	The following puzzle contains 4 unknown numbers (a, b, c and d) and 6 total equations, 3 across the rows and 3 down the columns. For example, the equation reading down the right-most column is: 20 – d = 8. What is the value of a + b + c + d? 5 × a = 20 - + - c × b = d = = = 1 + 7 = 8 **5a = 20 => a=4** **a+b = 7 => 4+b = 7 => b=3** **5-c = 1 => c=4** **20-d = 8 => d=12** **d is the largest with a value of 12** **a + b + c + d = 4 + 3 + 4 + 12 = 23**

6	30 [percent]	Out of the 200 fifth graders at Grant Elementary School, 44 of them are in chess club, 51 of them are in robotics, and 3/7 of the remainder play football. None of the students does more than one of these activities. What percent of the students do none of these 3 activities? **200 – 44 – 51 = 105** **3/7 * 105 = 45 in football** **105 – 45 = 60 do none of the 3.** **60 out of 200 is the same as 30 out of 100, which is 30%**
7	23 [years]	Aditya's older brother is six years older than him. The sum of their ages is 40 years. In years, how old is Aditya's brother? **A + (A + 6) = 40** **2A = 34** **A = 17** **17 + 6 = 23** **Or, use guess and check.**
8	81 [students]	There are 100 students at Lincoln Middle School. Every student has either 0, 1, or 2 siblings, with at least one student in each category. On 'bring your sibling to school day', every student brought all their siblings, and a total of 117 siblings showed up. What is the maximum number of students that could have had exactly 1 sibling? **If we discount the number of siblings that show up, the maximum number of students with 1 sibling is 98, leaving one student with 0 siblings and 1 student with 2 siblings; this gives us a total of 100 siblings. If we change one of the students who has 1 sibling to one that has 2 siblings, our new total is now 101 siblings (two 2's, one 0, and 97 1's). This means that for each 1 decrease in students with 1 sibling for a student with two siblings, we see an overall increase of 1. Since we need to reach 117 from 101, we need another 16 2's, so 16 less 1's. Finally, 97-16 = 81 students with 1 sibling.**
9	4 [integers]	A 3-digit integer is called *stupendous* if it has a prime factorization consisting of two 2-digit integers such that one of them is the sum of the digits of the other. How many *stupendous* 3-digit integers are there? **The 3-digit integer must be the product of two 2-digit prime numbers, so start by listing the primes to see which primes equal the sum of the digits of other primes.** **11x29 = 319** **13x67 = 871** **11x83 = 913** **11x47 = 517**

10	11	Parker and Packard are playing a game where they both roll 2 fair 6-sided dice, and whoever gets the higher sum wins. As a reduced fraction, the probability that they tie, but they also roll the exact same pair of numbers, is x/216. What is x? **First, let's say Parker rolls the same number twice. This has a probability of 1/6, because his second roll has a 1/6 chance of matching his first. Packard has a 1/6 chance his first dice is the same, and 1/6 his second matches, too, giving an overall probability of 1/6*1/6*1/6 = 1/216** **The other case is Parker rolling two different numbers. There is a 5/6 chance of this, since the second dice has a 5/6 chance of being different from the first. Packard's first roll has a 2/6 chance of matching on of Parker's 2 rolls, and his second roll has to match the other value, giving it a 1/6 probability. This gives an overall probability of 5/6*2/6*1/6 = 10/216** **So, the final answer is 1/216+10/216 = 11/216 => x=11**

"Math is Cool" Championships -- 2023-24

5th Grade

College Bowl Round #1 Solutions

	Answer	Solution
1	700	What number is ten times as much as seventy? **10x70 = 700**
2	18 [cm]	What is the perimeter in centimeters of a triangle with side lengths six centimeters, four centimeters, and eight centimeters? **6 + 4 + 8 = 18**
3	6 [prime nos.]	How many prime numbers are between one and fifteen? **2, 3, 5, 7, 11, 13**
4	12 [%]	There are twenty-five students in Mrs. Maxson's fourth grade class, and three of them are named Ryan. If she randomly selects one student, what is the probability in percent that their name is Ryan? **3/25 = 12/100 = 12%**
5	4048 [= x]	What is the value of 'x' if 'x' minus two thousand twenty-four equals two thousand twenty-four? **X – 2024 = 2024** **X = 4048**
6	4 [=x]	The mean of the following data set is six. What is the value of x? Five, three, seven, x, eleven **5, 3, 7, x, 11** **Sum must = 30** **5 + 3 + 7 + 11 = 26** **x = 30 – 26 = 4**
7	323 [nickels]	Three hundred eighty-five pennies and one hundred twenty-three dimes have the same value as how many nickels? **385 + 1230 = 1615 cents** **1615/5 = 323**
8	22	What is the next number in the following sequence? One, one, two, four, seven, eleven, sixteen, and so on. **Pattern is: +0, +1, +2, and so on. 16 + 6 = 22**

9	88 [$]	The tennis coach at Pullman High School bought eight new cans of tennis balls for three dollars each. The golf coach bought eight new sleeves of golf balls for fourteen dollars each. How many more dollars did the golf coach spend than the tennis coach? **8(14 – 3) = 88**
10	15 [cu units]	Lila makes a rectangular prism by placing five unit cubes in a row, then adding two more rows of five unit cubes on top of that. What is the volume of the final rectangular prism, in cubic units? **It takes 5x3 = 15 units cubes. 15x1 cubic unit = 15 cubic units**

"Math is Cool" Championships -- 2023-24

5th grade

College Bowl Round #2 Solutions

	Answer	Solution
1	92,055 [ninety two thousand fifty-five]	What is ninety thousand plus two thousand plus fifty plus five? **90000 + 2000 + 50 + 5 = 92,055**
2	2 [m]	The perimeter of a trapezoid is fifteen meters. Three of the side lengths are four, five, and four meters. In meters, what is the length of the fourth side? **4 + 5 + 4 = 13** **15 – 13 = 2**
3	35	If a plus b equals twelve, and a equals seven, what is the product of a and b? **a + b = 12** **7 + b = 12, b = 5** **7x5 = 35**
4	11 [%]	Maya randomly selects a whole number from one to one hundred, inclusive. What is the probability in percent that she chooses a multiple of nine? **100 numbers total. 11 multiples of 9, from 9*1 to 9*11.** **11/100 = 11%**
5	30	What is the Least Common Multiple of six and ten? **Multiples of 6: 6, 12, 18, 24, 30, …** **Multiples of 10: 10, 20, 30, …**
6	5 [=x]	If the median of the following data set equals five, what is the value of x? Two, nine, ten, one, x **The median is the middle value. The only way to get a median of 5 is if x = 5. 1, 2, 5, 9, 10**
7	48 [inches]	In inches, what is the positive difference between twelve yards and forty feet? **12*3 = 36 feet** **40 – 36 = 4 feet** **4*12 = 48 inches**

8	55	What number should be in the blank of the following sequence? Sixty-three, fifty-nine, blank, fifty-one, forty-seven, and so on. **Pattern is -4.**
9	50 [$]	Packard's grandpa gave him one hundred thirty dollars to spend on baseball equipment. Packard bought two pairs of baseball pants that cost twenty-four dollars each and one pair of batting gloves that cost thirty-two dollars. How many dollars does Packard have left? **130 – 2(24) – 32 = 50**
10	15300 [cu meters]	A barge on the Columbia River holds one hundred freight containers. Each freight container is a rectangular prism with dimensions seventeen meters by three meters by three meters. What is the total volume of the freight containers on the barge in cubic meters? **17x3x3x100 = 15300**

"Math is Cool" Championships -- 2023-24

5th grade

College Bowl Round #3 Solutions

	Answer	Solution
1	34	Which of the following numbers is the smallest: thirty-four, fifty-one, seventy-eight, thirty-nine, forty-two **34 < 39 < 42 < 51 < 78**
2	45 [sq. ft]	A rectangular ping-pong table measures nine feet by five feet. What is the area of the table in square feet? **9x5 = 45**
3	20	What number should be in the blank of the following sequence? Five, blank, eighty, three hundred twenty, one thousand two hundred eighty, and so on. **Pattern is x4.**
4	3 [ways]	Four friends are at Silverwood Theme Park. They want to ride the bumper cars, with two friends in each car. In how many different ways can they form teams of two? The order of the friends in each car is not important. **Call the friends A, B, C, D** **Possible teams:** **AB/CD** **AC/BD** **AD/BC**
5	1	What is the Greatest Common Factor of fifteen and eleven? **11 is prime, so it's only factors are 1 and 11.**
6	50 [%]	A bag contains seven orange jelly beans, five green jelly beans and two blue jelly beans. If one jelly bean is randomly selected, what is the probability in percent that it is not orange? **7 + 5 + 2 = 14** **7 of them are not orange** **7/14 = $\frac{1}{2}$ = 50%**
7	18 [= x]	The following set of data consists of whole numbers. If the range of the data set equals fifteen, what is the value of x? Twelve, three, seven, x, thirteen **3, 7, 12, 13, x** **3 is the smallest value, and 3 + 15 = 18.**

8	68	What number minus fifty-three equals fifteen? **? – 53 = 15** **? = 15 + 53 = 68**
9	294 [sq inches]	Nino's coin bank is shaped like a cube, with side lengths of seven inches. What is the surface area of the coin bank, in square inches? **7x7x7 = 343**
10	125 [pennies]	How many pennies are needed to evenly exchange in value for 25 nickels? **25 nickels = 25x5 = 125 cents = 125 pennies**

"Math is Cool" Championships -- 2023-24

5th grade

College Bowl Round #4 Solutions

	Answer	Solution
1	30000 [thirty thousand]	What is twenty-seven thousand five hundred seventy-five rounded to the nearest ten thousand? **27,575 = 30000 to the nearest 10000.**
2	1 [obtuse angle]	How many of the following angle measurements are obtuse? Twenty-five degrees, ninety degrees, fifteen degrees, seventy-two degrees, one hundred twenty degrees **An obtuse angle is > 90° and < 180°. Only 120° is obtuse.**
3	12	What is the sum of the next two numbers in the geometric sequence that begins as follows: Two hundred forty-three, eighty-one, twenty-seven, and so on **Dividing by 3 each times gives: 81, 27, 9, 3, …** **9 + 3 = 12**
4	60 [%]	A standard ten-sided die (singular of dice) is numbered zero through nine. When the die is rolled once, what is the probability in percent that the number showing is five or less? **The numbers are: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9** **Six of them are '5 or less'.** **6/10 = 60 %**
5	383	What is the largest whole number that is less than eight times six times four times two? **8x6x4x2 = 384** **Next smallest whole number is 383.**
6	21 [median]	What is the median of the following data set? Seventeen, thirty-three, five, twenty-five **5, 17, 25, 33** **Median is in the middle, or (17 + 25)/2 = 42/2 = 21**
7	20 [times]	Adri writes down all of the integers from one to one hundred. How many times does she write the digit five? **Starting with 5, 15, …, 95, there are 10 numbers that end in 5. From 50 to 59, there are 10 numbers that start with 5.** **10 + 10 = 20**

8	7 [calculators]	Mr. Perez got new calculators for his classroom, and each calculator needs four batteries. He has three packages of batteries with ten batteries in each package. What is the maximum number of calculators that can be completely filled with batteries? **7*4 = 28, with 2 batteries left over**
9	4 [units]	What is the radius, in units, of a circle with an area of sixteen pi square units? **Area = πr^2** **r^2 = 16, r = 4**
10	4067	What is fifty percent of eight thousand one hundred thirty-four? **8134/2 = 4067**

"Math is Cool" Championships -- 2023-24

5th grade

College Bowl Round #5 Solutions

	Answer	Solution
1	5631 [five thousand six hundred thirty-one]	What is the sum of one thousand three hundred ninety-nine and four thousand two hundred thirty-two? **1399 + 4232 = 5631**
2	4 [shapes]	How many of the following shapes have four sides? Trapezoid, square, triangle, pentagon, parallelogram, rectangle, star **Trapezoid, square, parallelogram, rectangle all have 4 sides.**
3	625	What is the next number in the following sequence? One, five, twenty-five, one hundred twenty-five, and so on **Pattern is x5**
4	12 [ways]	In how many ways can the letters in the word book, spelled B-O-O-K, be arranged? **4!/2! = 24/2 = 12**
5	17 [multiples of 3]	How many multiples of three are between eleven and sixty-two? **First one is 3*4 = 12** **Last one is 3*20 = 60** **20 – 3 = 17**
6	4 [cookies]	Bryce and Yusuf each have some cookies. Bryce says to Yusuf, if you give me one of your cookies, we would have the same number. Yusuf says, but if you gave me one of yours, I would have five times as many as you. How many cookies does Yusuf currently have? **If Y – 1 = B + 1, they must be 2 cookies apart. 1 and 3 doesn't work, but 2 and 4 does work.**
7	295 [degrees]	If one of the interior angles of a parallelogram measures sixty-five degrees, what is the sum of the other three interior angle measurements, in degrees? **360 – 65 = 295**

8	33 [pens]	Julisa has five red pens. She has eight more black pens than red pens. She has ten more blue pens than red pens. How many pens does she have all together? **5 red** **5 + 8 = 13 black** **5 + 10 = 15 blue** **5 + 13 + 15 = 33**
9	1 [= mode]	Find the mode of the following set of numbers: One, three, nine, three, ten, nine, one, one **1, 1, 1, 3, 3, 9, 9, 10**
10	114 [minutes]	The Barbie movie starts at eleven PM and ends at twelve fifty-four AM the next day. How long is the movie in minutes? **1 hour + 54 minutes = 60 + 54 = 114 minutes**

"Math is Cool" Championships -- 2023-24

5th grade

College Bowl Round #6 Solutions

	Answer	Solution
1	9 [comic books]	Naveen has been saving two dollars a week for fourteen weeks. He wants to spend his savings on comic books. They cost three dollars each. What is the maximum number of comic books that he can buy? **He has: 2x14 = $28** **3x9 = $27 with $1 left over.**
2	459 [cm]	Four meters and fifty-nine centimeters is equal to how many centimeters? **1 meter = 100 cm** **4 meters = 400 cm** **400 + 59 = 459**
3	14	What is the next number in the following sequence? Two, five, eight, eleven, and so on **Pattern is +3**
4	81 [sq units]	In square units, what is the area of a square that has a perimeter of 36 units? **36/4 = 9, side length** **Area = 9^2 = 81 square units**
5	40 [%]	All ten letters used to spell Math Is Cool are placed in a bag. If one letter is randomly selected, what is the probability in percent that it is a vowel? **10 letters total. 4 are vowels (A, I, O, O)** **4/10 = 40%**
6	14 [$]	Warren has ten dollars more than a third of Penny's money. If Penny has twelve dollars, how many dollars does Warren have? **1/3(12) = 4** **4 + 10 = 14**
7	40 [inches]	What is the perimeter in inches of a rectangle with area of 19 square inches, if all of the side lengths are whole numbers? **The dimensions must be 19x1, therefore the perimeter = 2(19 + 1) = 2x20 = 40.**
8	3	What is the greatest prime factor of twenty-four? **Factors of 24: 1, 2, 3, 4, 6, 8, 12, 24** **The greatest prime is 3.**

9	4 [= mean]	Find the mean of the following set of numbers: One, two, three, four, five, six, seven **1+2+3+4+5+6+7 = 28** **28/7 = 4**
10	15 [$]	Yessica wants to buy a jump rope that costs ten dollars, a video game that costs nineteen dollars, and a book that costs ten dollars. She has four dollars from her allowance and twenty dollars of birthday money. How many more dollars does she need to buy all three items? **She needs: 10 + 19 + 10 = 39$** **She has: 4 + 20 = 24$** **39 – 24 = 15**

"Math is Cool" Championships -- 2023-24

5th grade

College Bowl EXTRA

	Answer	Solution
1	27,000 [twenty-seven thousand]	What is the product of nine and three thousand? **9x3000 = 27,000**
2	24 [yards]	A rectangular storage unit is twenty-one feet long and fifteen feet wide. What is its perimeter in yards? **2(21 + 15) = 72** **72/3 = 24**
3	3 [factors]	How many distinct factors does the number twenty-five have? **1, 5, 25**
4	0 [= product]	What is the product of all of the digits in the number thirty-seven thousand two hundred five? **37,205 contains a 0, therefore the product of the digits will equal 0.**
5	25 [%]	Two fair coins are flipped. What is the probability in percent that they both come up heads? **The outcomes are HH, HT, TH, TT**
6	6	What is the units digit of six raised to the sixth power? **6 raised to any power ends in 6.** **6, 36, 216, etc.**
7	7200 [seconds]	How many seconds are in two hours? **2 hours * 60 min/hr * 60 sec/min = 7200**
8	123	Nine plus ninety-nine plus nine hundred ninety-nine equals nine times what number? **9 + 99 + 999 = 1107** **1107/9 = 123**
9	18	What is the sum of the number of faces on a cube and the number of edges on a cube? **Faces = 6** **Edges = 12** **Sum = 18**
10	2078	What is the positive difference between four thousand one hundred two and two thousand twenty-four? **4102 – 2024 = 2078**