"Math is Cool" Championships -- 2022-23

5th Grade

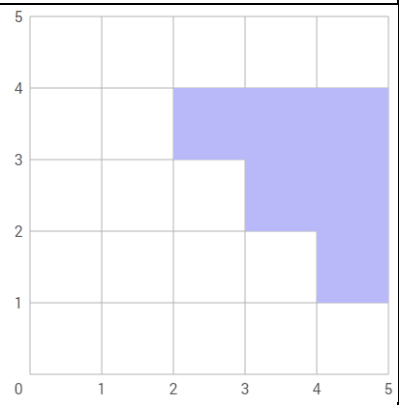
Mental Math Solutions

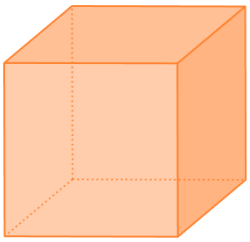
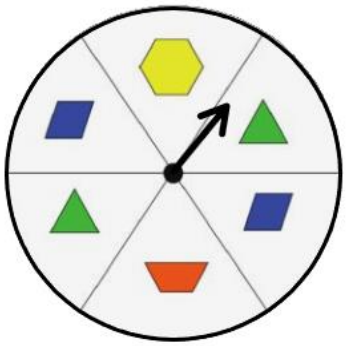
	Answer	Solution
1	40 [students]	If ten out of every twenty-five students at Medina Elementary School are on the math team, then how many of the 100 total students are on the math team? 10*4 = 40, or 10/25 = 40/100
2	25	What is five squared? 5×5=25
3	33 [combinations]	Sebastian goes to Ferdinand's Creamery to get an ice cream cone with one scoop of ice cream. They have three types of cones and eleven flavors of ice cream. How many different combinations of one cone and one flavor can Sebastian order? 3*11 = 33
4	90 [cents]	How many cents are fourteen nickels and two dimes worth? 14×5+2×10=90
5	[x=] 16	What is the value of x if x plus seven equals twenty-three? x = 23 – 7 = 16
6	23	Find the sum of the next two terms in the arithmetic sequence that begins: one, four, seven, and so on. 10+13 = 23
7	36 [cm]	What is the perimeter in centimeters of a square with an area of eighty-one square centimeters? Sqrt(81)×4=36
8	8 [factors]	How many positive integer factors does twenty-four have? 1, 2, 3, 4, 6, 8, 12, 24

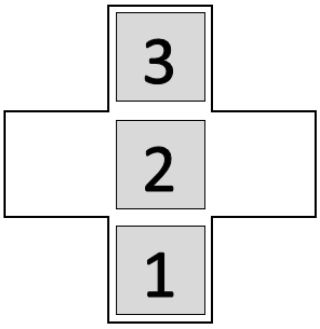
"Math is Cool" Championships -- 2022-23

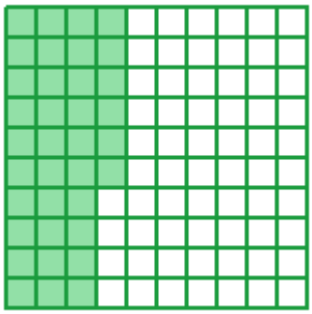
5th Grade

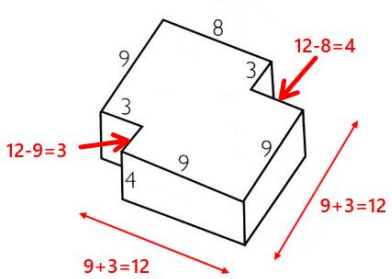
Individual Test Solutions

	Answer	Solution
1	168	Evaluate: 123 + 45 123+45 = 168
2	6 [square units]	Each square on the following grid represents one square unit. What is the area in square units of the shaded area? 6 squares are shaded. 
3	3	Which of the following numbers is a factor of 15? 7, 2, 4, 3, 9 3*5 = 15
4	105 [cents]	Elijah has 5 pennies, 4 nickels, 3 dimes, and 2 quarters. What is the value of the money that he has in cents? 5×1+4×5+3×10+2×25=105
5	4	Evaluate: $8 \times \frac{2}{4}$ 8*2/4=4
6	35 [donuts]	Jasmine eats 5 donuts every day for one week. How many total donuts did she eat? 5×7
7	100	I'm thinking of a number. When I cut it in half and then add 7, I get 57. What is my number? 100/2 = 50 and 50+7 = 57
8	13	Solve for y if y = 2x + 3 and x = 5 2(5) + 3 = 13
9	170 [points]	Mir scored 85% on his test. If his test was out of 200 points, how many points did he score? 85% of 100 = 85 85x2 = 170

10	14	What is the sum of the number of faces and vertices on this cube? You can count up the 6 faces from the figure and the 8 vertices. 6+8 = 14 
11	48	Evaluate: $6 \times [5 + (6 \div 2)]$ 6x(5+3) = 6x8 = 35
12	80 [degrees]	A triangle has 2 angles that measure 40 and 60 degrees respectively. What is the measure of the third angle, in degrees? 180-(40+60)=80
13	57	What is the next number in this sequence? 1, 3, 7, 13, 21, 31, 43, ? Pattern is +2, +4, +6, … 43 + 14 = 57
14	2 [cm]	Twenty millimeters equals how many centimeters? 1 cm = 10 mm
15	14	What is the mean (average) of the following set of numbers? {1, 2, 3, 4, 5, 6, 77} 1+2+3+4+5+6+77=98 98/7=14
16	25 [times]	The following spinner is divided into six equal sections. When the spinner is spun 50 times, what is the expected number of times that it will land on a shape which has four sides? The quadrilaterals (4 sides) are half of the sections, therefore the best prediction is half of the spins, or 50/2 = 25. 
17	36 [units squared]	What is the area in square units of a triangle with a base of length 12 units, and a height equal to half of its base? If the height is half, then it is just $\frac{1}{2}$*12*6=36

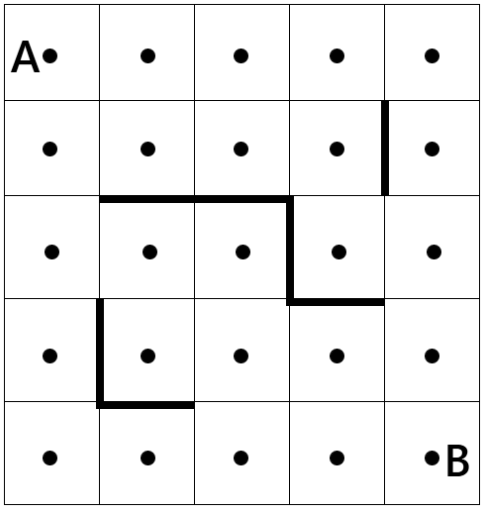
18	8 [moves]	A cross-shaped puzzle box contains three numbered blocks. The blocks can slide left, right, up or down, if there is an available space (no jumping). The object is to rearrange the numbers to read 1, 2, 3 from top to bottom. What is the minimum number of moves needed to accomplish this, where a 'move' consists of only sliding one space at a time?  Slide the 2 over (1). Slide the 1 up (2), then over (3). Slide the 3 down (4), then down again (5). Slide the 1 over (6), then up (7). Slide the 2 over (8).
19	4 [minutes]	Aiden is filling up a 50-gallon tub with water. The pump fills the tub at 5 gallons per minute for the first minute, then 10 gallons per minute for the second minute, then 15 gallons per minute for the third minute and so on. After how many minutes will the tub be full? 5 + 10 + 15 + 20 = 50, so it is full after 4 minutes.
20	6 [x =]	For the following list of data, the median is 5. What is the value of x? {1, 10, x, 4, 11, 2} For an even number of data values, the median equals the mean of the middle two. Since the median = 5, x must = 6, since (4 + 6)/2 = 5.
21	12	Billie rolls 2 fair six-sided dice. The probability that the sum of the two numbers showing equals 4 can be written as a reduced common fraction 1/A. What is A? There is a 3/36 chance of a sum of 4 (13,22,31), which simplifies to 1/12.
22	66	Leo the lion and Peter the parrot start counting at the same time and same rate. Leo starts at 0 and counts up by 11s, while Peter starts at 90 and counts down by 4s. At what number will they meet? After each number, the difference decreases by 11+4=15, so it'll take 6 numbers before they reach, so they'll reach at 66. Or: Leo: 0, 11, 22, 33, 44, 55, 66 (7^{th} number). Peter: 90, 86, 82, 78, 74, 70, 66 (7^{th} number).

23	668200	Write as an integer: 668.2×10^3 Scientific notation, move the decimal place three places to the right.
24	420	What is the sum of the first 20 even positive integers? The first 20 even numbers are 2,4…,40, which average to 21, so it is just 20*21=420, otherwise they can just add all 20 numbers
25	15 [girls]	Jefferson Elementary school has 3 fifth grade classes. Each class has 30 students, a mixture of boys and girls. The first class has 14 boys, and the second class has 17 boys. If there are a total of 44 girls in the three classes combined, then how many girls are in the third class? Let's go by class First class: 30-14=16 girls Second Class: 30-17=13 girls 44-16-13=15 girls in class 3
26	1 [unit squared]	What is the positive difference in area, in square units, of a square with side length 15 units, and a rectangle with sides of length 14 units and 16 units? 15*15=225 14*16=224 225-224=1
27	36 [%]	What percentage of the following shape, composed of unit squares, is shaded? It is a 10x10 grid, and 36 of the 100 unit squares are shaded. 
28	686 [pages]	Shohom listens to audiobooks every day. On Monday, he listened for 5 minutes. On Tuesday he listened for 8 minutes. On Wednesday he listened for 11 minutes, and on Thursday he listened for 14 minutes. He continues this pattern for a total of 14 days, listening 3 minutes more each day. If each minute of an audiobook is equivalent to 2 pages of a real book, how many total pages has he listened to over the course of the 14 days? 5+8+11+14+…+41+44=(5+44)+(8+41)+(11+38)…+(23+26)=7(49)=343 (343 minutes)*(2 pages/minute)=686 pages

29	1191 [cents]	A king-size Math Kat chocolate bar costs $1.49, including tax. Soren goes to the store to buy as many as he can. He realizes that he can buy 7 of them, and have some money left over, but he does not have enough money to buy 8. What is the maximum number of cents he could have? 8 bars costs 8*149=1192 cents. That means that the maximum amount of money he could have and still only be able to buy 7 bars is 1191 cents.
30	492 [cubic units]	What is the volume in cubic units of the figure shown here, with all measurements shown in units? The shape has a constant height of 4 units, and all angles that appear to be right angles are right angles.  By adding the sides, can see that the original prism was 12x12 before the corners were cut out. Therefore the original volume would be 12x12x4 = 576. Have to subtract the volume of the two missing corners, which are 3x3x4 and 3x4x4. 576 – 36 – 48 = 492.
31	30	A jar contains 12 blue marbles, 8 green marbles, and 5 orange marbles. Two marbles will be chosen randomly and without replacement. The probability that both marbles are orange can be written as a reduced common fraction 1/A. What is A? 5/25*4/24=1/30
32	66 [years old]	Mr. E and his grandson have the same birthday (month and day). For 6 consecutive birthdays, Mr. E has been an integral number of times as old as his grandson, in years. How many years old did Mr. E turn on the sixth joint birthday that this occurred? Assume Mr. E is under a hundred years old. The simplest way to try and make this possible is by making his grandson be 1-6 for the six years. Since his age is a multiple of his grandson's, whenever is grandson's age is even, his age must also be even, meaning it works the same for odd numbers. This means that when his grandson turns 5, he is turning _5, so when his grandson turns 6, he turns _6. _6 is only a factor of 6 if the _ is a 3, 6, or 9 (36, 66, 96). Testing for 4, only 64 is a multiple, so Mr. E is turning 66 on the sixth birthday.

33	39	Ingrid owns an unusual farm. On this farm there are 2-headed cows (with 4 legs) and 3 headed chickens (with 2 legs). If there are a total of 45 heads and 38 legs from the cows and the chickens, what is the product of the number of cows and the number of chickens? Assume that all of the heads are chickens, therefore there would be 45/3 = 15 chickens. 15 chickens would only have 30 legs though. Try replacing 4 chickens with 4 cows: now there are 38 legs, but only 41 heads. Replace one cow with 2 chickens: now there are 38 legs and 45 heads. Alternatively: First set up a system of equations where we'll say x is the number of cows and y is the number of chickens. 2x+3y=45 4x+2y=38 Divide the second equation by negative 2, and then add the equations: 2x+3y=45 -2x-y=-19 2y=26 y=13 Then plug that back in to either equation: 2x+3(13)=45 2x+39=45 2x=6 x=3 So our final answer is 3*13=39
34	28 [items]	Yiyang goes to Mathmart to buy rulers, protractors, and cubes. Each ruler costs 2 dollars, each protractor costs 3 dollars, and each cube costs 1.50 dollars. She has 50 dollars and needs to buy at least 4 of each item. What is the maximum number of items that she can afford to buy? To buy 4 of each thing, the cost is 4(2+3+1.5)=26 dollars, which leaves her with 24 dollars, with which she needs to only buy the cheapest thing, so she can get the most. 24/1.5=16. She can get 4 of each (12 things total), and then another 16 cubes, for a total of 28 things.

35	38 [minutes]	Ishaan wakes up at 7:30 AM. He takes 15 minutes to get ready for school, and then starts walking there at 3 miles per hour. Halfway through his 1 mile walk to school he realizes he left his backpack at home and sprints back home at 10 miles per hour. He then runs all the way to school at a pace of 6 miles per hour. How many total minutes elapsed from the time he woke up until the time he arrived at school? First, let's convert mph to minutes per mile. 3mph=20 minutes per mile, 6mph=10 minutes per mile, 10mph=6 minutes per mile. At 20 minutes per mile, it'll take 10 minutes to walk a half mile, at 6 minutes per mile, it'll take 3 minutes to sprint back a half mile, and at 10 minutes per mile, it'll take 10 minutes to run the mile to school. This means his overall time from waking up to reaching school (including getting ready) is 15+10+3+10=38 minutes. 38 minutes after 7:30 is 8:08, so the answer is 8+0+8=16.
36	86968	Addy is thinking of a positive 5-digit integer. The number is a palindrome, which means it reads the same forwards and backwards (e.g., 121 or 13531). No digit in the number is repeated more than 3 times. The number is divisible by 4. What is the greatest possible number she could be thinking of? We'll call the number abcba since it's a palindrome. Number = abcba Since it is divisible by 4, the last 2 digits have to be divisible by 4, which means ba is divisible by 4. We want "a" to be as high as possible, but it can't be 9 since then the number would be odd and couldn't be divisible by 4. This means that a is 8, and the number is 8bcb8, and b8 is divisible by 4. Testing cases, 98 doesn't work, 88 does, but then you would have 88c88, which repeats 8 4 times, which can't happen. 78 also doesn't work, so 68 is the highest it could be. This means the number is 86c68, and since we want it as high as possible, c=9. This leaves us with the final result of 86968.
37	48 [arrangements]	How many ways can you rearrange the letters in the word ANGLE, if the A and the N must be next to each other? Since the A and the N have to stay together you can think of them as one letter. Therefore, there are 4 "letters" in the word, and the number of arrangements is 4! = 24. However, the A and N can be either AN or NA, so have to multiply that by 2. 24x2 = 48.

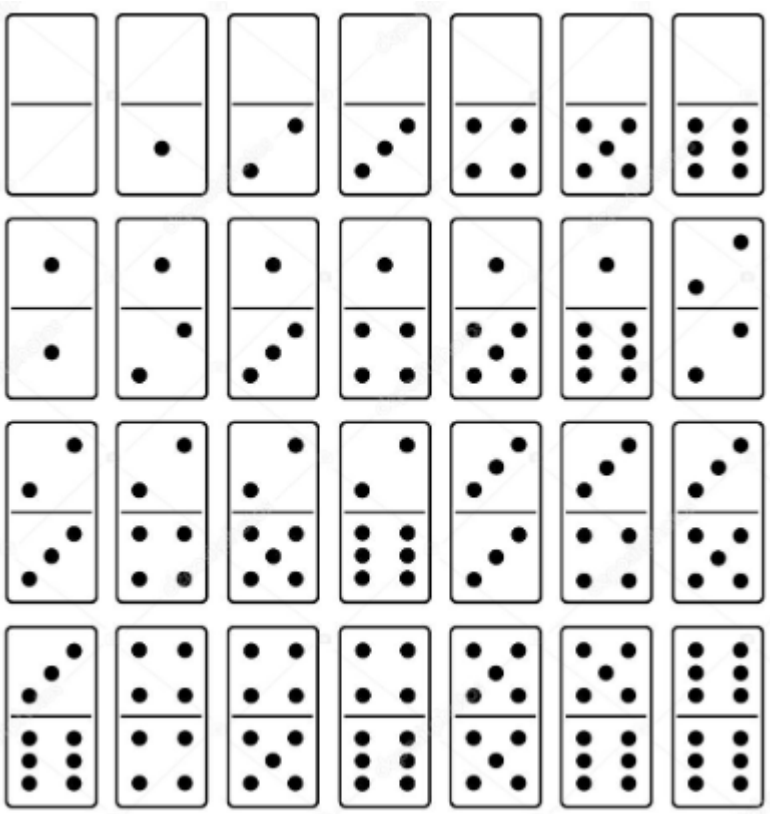
38	9	What is the units digit of $1^{2023} + 2^{2023}$? 1^anything = 1 2^1 = 2 2^2 = 4 2^3 = 8 2^4 = 16 The powers of 2 will then repeat, ending in 2, 4, 8 and 6, so a cycle of four. 2023/4 = 505 r3, therefore 2^2023 will end in an 8. 1 + 8 = 9
39	12 [paths]	In the following grid, the object is to move from point A to point B by moving to the right one dot or down one dot at a time. Additionally, the "obstacles" (heavy bold lines) may not be crossed. Following these rules, how many different paths can be taken from A to B?  R = one move to right D = one move down Paths from A to B are: RRRRDDDD RRRDDRDD RRDRDRDD RDRRDRDD DDDDRRRR DDRDRRRD DDRDRRDR DDRDRDRR DDRRDRRD DDRRDRDR DDRRDDRR DRRRDRDD

40	98 [units squared]	What is the area in square units of a square that has a diagonal of length 14 units? Area of a square = $d^2/2 = 14^2/2 = 98$. Or, The side length is 14/sqrt(2)=7sqrt(2), so the area is [7sqrt(2)]^2=98

"Math is Cool" Championships -- 2022-23

5th Grade

Multiple Choice Solutions

	Answer	Solution
USE THE FOLLOWING INFORMATION TO SOLVE PROBLEMS #1 THROUGH #3. A domino set consists of 28 tiles. Each tile is split into two half-tiles, marked with the values 0 through 6 on each half-tile. (The blank half-tiles have a value of 0). There are four rows of dominoes here, starting with Row 1 at the top, followed by Rows 2, 3 and 4. 		
1	*C*	How many different ways can the dominoes be arranged in rows and columns to form a rectangle so that there are no extra dominoes leftover? For example, in the figure shown above, there are 4 rows and 7 columns, which can be written as an ordered pair (4, 7). A different ordering of the rows and column would count as a different arrangement. A) 2 B) 4 C) 6 D) 7 E) Answer not given. The arrangements are: 1x28, 28x1 2x14, 14x2 4x7, 7x4

2	A	For the dominoes in Row 3 of the figure above, how many total dots are on the seven dominoes? A) 47 B) 49 C) 50 D) 51 E) Answer not given. 2(4) + 3(5) + 4(2) + 5(2) + 6 = 47
3	C	For the dominoes in the figure, what is the median of all of the numbers on all of the half-tiles? Include the blank half-tiles as '0's. A) 2 B) 2.5 C) 3 D) 3.5 E) Answer not given. There are 8 of each number 0 through 6, for a total of 56 numbers. Since it is even, the median will be in the middle, or half-way between positions 28 and 29. Positions 1-8 are '0', 9-16 are '1', 17-24 are '2'. Therefore, both 28 and 29 are going to be '3', so the median is 3.
USE THE FOLLOWING INFORMATION TO SOLVE PROBLEMS #4 THROUGH #6. Markee's Bike Shop sells bicycles, tricycles, and quadricycles. All bicycles have two wheels, all tricycles have three wheels, and all quadricycles have four wheels. All of the cycles are equipped with the appropriate number of wheels, and there are no extra wheels in the shop.		
4	E [21]	If there are four bicycles, three tricycles and one quadricycle on the showroom floor, how many total wheels are there on the showroom floor? A) 17 B) 18 C) 19 D) 20 E) Answer not given. B: 4*2 = 8 T: 3*3 = 9 Q: 4 8+9+4 = 21
5	A	If there are 17 wheels in the back room, all attached to one of the three types of cycles, what is the maximum number of quadricycles that could possibly be in the back room? A) 3 B) 4 C) 5 D) 6 E) Answer not given. 4*4 = 16 wheels, can't be this because there is only 1 wheel left over. 3*4 = 12, plus one tricycle and one bicycle.

6	*C*	If there are 17 wheels in the back room, all attached to one of the three types of cycles, how many different combinations of bicycles, tricycles, and quadricycles might be stored in the back room? For example, one possible combination is: 0 quadricycles, 5 tricycles and 1 bicycle. A) 6 B) 7 C) 8 D) 9 E) Answer not given. The possible combinations are: **B** **T** **Q** 1 1 3 3 1 2 5 1 1 7 1 0 0 3 2 2 3 1 4 3 0 1 5 0

USE THE FOLLOWING INFORMATION TO SOLVE PROBLEMS #7 THROUGH #10.

Mrs. Earley's 5th grade class did a project where they counted the number of students who visited their school library each day for one full week. Here is some of the data they collected:

- 80 students visited the library on Friday.
- The number of visitors on Monday and Wednesday were both half that of Friday.
- The ratio of visitors on Tuesday to that on Thursday was 1:2.
- On Thursday, there were 8 more visitors than on Monday.
- The ratio of students who checked out books to those who did not check out books was 1:3.

7	*B*	How many students visited the library on Monday and Tuesday combined? A) 40 B) 64 C) 48 D) 82 E) Answer not given. From the data, the number of visitors was: M – 40 T – 24 W – 40 Th – 48 F – 80 M + T = 40 + 24 = 64

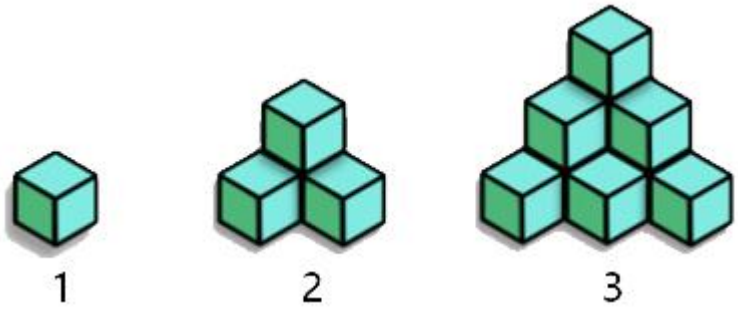
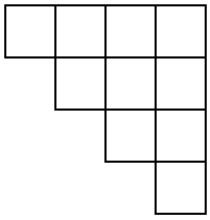
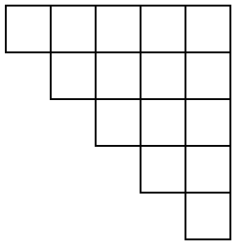
8	A	How many more students visited the library on Friday compared to Thursday? A) 32 B) 48 C) 52 D) 80 E) Answer not given. F – Th = 80 – 48 = 32
9	C	What fraction of the total visitors for the week came on Tuesday? Express your answer as a reduced fraction. A) $\frac{1}{2}$ B) 1/7 C) 3/29 D) 4/37 E) Answer not given. Total = 232 Tuesday/232 = 24/232 = 3/29
10	B	How many students checked out books during the week? A) 48 B) 58 C) 62 D) 74 E) Answer not given. The ratio of did to did not is 1:3, therefore $\frac{1}{4}$ of the students checked out books. 232(1/4) = 58.

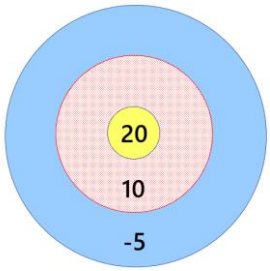
"Math is Cool" Championships -- 2022-23

5th Grade

Team Test Solutions

	Answer	Solution
1	350 [miles]	Sowjanyaa biked 5 hours a day every day for one week at a constant rate of 10 miles per hour. How many total miles did she bike? 5*10*7=350
2	14 [units]	A rectangle has an area of 10 square units, and one side length of 2 units. What is the perimeter of the rectangle, in units? 10/2=5 2(2+5)=14
3	50 [integers]	How many integers from 1 to 100, including 1 and 100, are divisible by 2? 2*1 through 2*50 = 50 integers

4	35 [blocks]	Unit blocks are stacked in the following pattern, where the first stack contains 1 block, the second stack contains 4 blocks, and the third stack contains 10 blocks. If this pattern continues, how many blocks will the fifth stack contain?  1 2 3 In the 4th stack, adding a bottom row of 10 blocks.  Therefore, 10 + 10 = 20 blocks in 4th stack. In the 5th stack, adding a bottom row of 15 blocks:  Therefore, 20 + 15 = 35 blocks in 5th stack.
5	64	What is the sum of the first 8 positive odd integers? Sum of the first n odd numbers is n^2, therefore the answer is 8^2=64 Or, 1+3+5+7+9+11+13+15 = 64
6	5 [seconds]	The formula $t = \sqrt{\frac{h}{5}}$ calculates the amount of time t (in seconds) it takes for a ball to drop to the ground from a height h (in meters). How long, in seconds, would it take a ball to drop from a height of 125 meters? Sqrt(125/5)=5

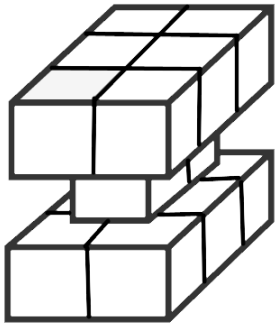
7	6	Bryan and his friend Noah are playing a card game with 10 cards numbered 1 through 10. They each draw a different card from the deck and they give hints for each other to guess their card. Bryan starts by saying, "My number is divisible by 3." To which Noah responds, "My number is even and I'll be able to tell what your number is if you tell me whether it is prime or composite." What is the number on Noah's card? Since Bryan's card is divisible by three, it is either 3, 6, or 9. Since Noah says that he'll be able to tell what the card is whether it's prime or composite, he has narrowed it down to two options, meaning he has either 3, 6, or 9. Since his card is even, he must have 6.
8	6 [y =]	If $3x + 4 = 16$, and $y = x + 2$, what is y? $3x=12$ $x=4$ $y = x + 2 = 4 + 2 = 6$
9	12 [hacky-sacks]	Three friends all have a different number of hacky-sacks, and each of them has at least 1 hacky-sack. The average number of hacky-sacks per person for the group is 6, and the median number of hack-sacks is 5. What is the greatest number of hacky-sacks that one of the friends could have? The sum must be 18, and the middle number is 5: 1, 5, 12
10	20 [points]	A circular dartboard is made up of three concentric circles. The radii of the circles are 1, 3, and 5 units. Hitting the center circle is worth 20 points, the middle ring is worth 10 points, and the outer ring is a penalty of -5 points. When a dart is thrown, it always lands randomly somewhere on the board. If a round consists of a dart being thrown 25 times, on average how many points will be awarded in one round?  The area of the center circle is 1π, the area of the middle ring is 8π and the area of the outer ring is 16π. The total area is 25π. The darts will hit the regions in proportion to their areas: Center: 1 hit Middle: 8 hits Outer: 16 hits Points: 1(20) + 8(10) + 16(-5) = 20

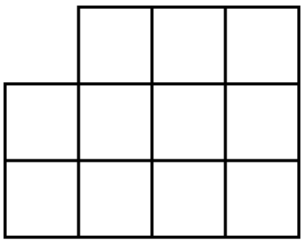
"Math is Cool" Championships -- 2022-23

5th Grade

Linda Moore Triple Jump Solutions

	Answer	Solution
1	45 [points]	Franklin Elementary School's basketball team played a game against Sunnyside Elementary School's Basketball Team. If Franklin scored nine 2-point baskets and nine 3-point baskets, how many total points did they score? 9*2+9*3=45
2	41	What is the next number in the sequence? 2, 6, 5, 15, 14, 42, … The pattern is ×3, -1
3	288 [sq. in]	How many square inches are in 2 square feet? 1 Square foot has 12×12=144 square inches, so 2 square feet has 2×144=288 square inches
4	44 [%]	Mr. Mielke has a class of 25 guitar students. Fourteen of the students are girls and the rest are boys. He picks one person at random for a guitar solo. What is the probability in percent that he chooses a boy? There are 25-14=11 boys, so the probability is 11/25=44/100 = 44%.
5	65	What is the sum of all the integers that are more than 10 but less than 16? 11+12+13+14+15=65
6	196 [digits]	How many digits have to be written in order to write down every integer from 1 to 101, including 1 and 101? 1 – 9 = 10 10 – 99 = 90x2 = 180 100 – 101 = 6 10 + 180 + 6 = 196

7	54213	List the following 5 numbers from least to greatest. Your answer should be in the form of a 5-digit number containing the digits 1 through 5 (referring to numbers 1 through 5 listed above), such as 53421 or 34215. 1) 10 2) π^2 3) $\sqrt{105}$ 4) 9 5) 35/4 35/4 = 8.75 π^2 is greater than 9 but less than 10, could approximate by doing 3.1x3.1 $\sqrt{105}$ will be > 10 Therefore, order is: 54213
8	66 [pieces]	Ziyi bought a big bag of candy. She gave half of the pieces to her friend Mo, and then Ziyi ate 5 pieces. She gave half of the remaining pieces to her brother, and then gave 3 pieces to her dad. If Ziyi has 11 pieces of candy left, how many pieces did she start with? Work backwards: 11+3=14 14*2=28 28+5=33 33*2=66
9	46 [sq. units]	Fourteen identical unit cubes are glued together in layers, with 6 cubes on the bottom, 2 cubes in the middle, and 6 cubes on top. The top and bottom layers completely cover the faces of the middle layer. What is the surface area of the figure, in square units?  For each 2x3 prism, the total surface area is 2x2 + 2x3 + 2x6 = 22, therefore 44 total. However, have to subtract 2 units from each that are being covered. 44 – 4 = 40. Add in the exposed surfaces of the middle layer = 2x1 + 2x2 = 6. Total = 46.

10	48 [rectangles]	Given the following grid composed of unit squares, how many rectangles, of any size, appear in the figure? 1x1 – 11 1x2 – 8 1x3 – 5 1x4 – 2 2x1 – 7 3x1 – 3 2x4 – 1 3x3 – 1 3x2 - 2 

"Math is Cool" Championships -- 2022-23

5th Grade

College Bowl Round #1 Solutions

	Answer	Solution
1	110	What is the sum of eleven and ninety-nine? 11+99=110
2	50 [%]	When rolling a fair six-sided die, what is the probability in percent of rolling an even number? 3/6 = 50%
3	65	What is the product of five and thirteen? 13*5 = 65
4	100	Shen and Diya are playing a game where they each count by fives starting at fifty. Shen counts down while Diya counts up. For example, after 1 second, Shen will say forty-five and Diya will say fifty-five, and after two seconds, Shen will say forty and Diya will say sixty. At five seconds, what will be the sum of the two numbers they say? The sum is always 100 since Shen goes down by 5 and Diya goes up by 5. Otherwise, Shen says 50-5*5=25 and Diya says 50+5*5=75. 25+75=100
5	66	What is the sum of the next two terms in the following sequence that begins with: Two, four, seven, eleven, sixteen, twenty-two, and so on. The pattern is +2,+3,+4,+5,+6. The next terms are 22+7=29, 29+8=37, 29 + 37 = 66
6	26 [nickels]	How many nickels are equivalent to five pennies, five dimes, and three quarters? 5+5*10+3*25=130 130/5=26

7	5 [books]	There is a box of free books at a garage sale. Jack takes one-half of the books, and Lucy takes one-sixth of the number of books that are remaining. If there were originally twelve books, how many books are left? 12-1/2*12=6 6-1/6*6=5
8	2 [=x]	Solve for x if two times x plus seven equals eleven. 2x+7=11 => 2x=4 => x=2
9	8 [cm]	What is the side length in centimeters of a regular nonagon with a perimeter of seventy-two centimeters? 72/9=8
10	6 [ways]	In how many distinct ways can you rearrange the letters in the word DOG, spelled D-O-G? DOG, DGO, OGD, ODG, GDO, GOD

"Math is Cool" Championships -- 2022-23

5th grade

College Bowl Round #2 Solutions

	Answer	Solution
1	2 [hours]	Marcelo practices playing guitar fifteen minutes a day, six days a week, and on the seventh day, he practices for thirty minutes. How many hours does Marcelo practice guitar every week? 6*15+1*30=120 120/60=2
2	3 [zeroes]	How many zeroes are in the sum of one-thousand two-hundred fifty-six and three-thousand seven-hundred forty-four? 1256+3744=5000, which has 3 0s
3	7 [units]	On the coordinate plane, how many units apart are the points negative two comma eight and five comma eight? (-2, 8) and (5, 8) are 7 units apart
4	20	What is the next number in the following sequence that begins with: Three, six, four, eight, six, twelve, ten, and so on. The pattern is x2, -2 Since 12-2=10, the next step is x2 10*2=20
5	393	What is the smallest three-digit palindrome whose digits sum to fifteen? If it is 1_1, then the middle digit would have to be 13, if it is 2_2, then the middle digit would have to be 11, so 393 is the smallest one that works.
6	60 [ways]	A group of five students is forming a math club. They need to pick a president, a vice-president, and a secretary. How many ways can they distribute these three positions, if a person can only hold one position? There are 5 people they can choose for president, then the remaining 4 can be vp, and then any of the remaining 3 can be secretary, so it is 5*4*3=60.

7	280 [minutes]	How many minutes are between one fifteen pm and five fifty-five pm on the same day? 4 hours and 40 minutes 4*60+40=280
8	20 [students]	Mrs. Carlson lined up her students. Counting from the back of the line, Landen is the sixteenth student in line, and counting from the front of the line, he is the fifth student in line. How many total students are in line? Since he's the 16th from the back, there are 15 behind him. And from the front there are 4 students in front of him. 15+1(Landen himself)+4=20
9	17	What is one plus two plus three plus five plus six? [PROCTOR NOTE – READ THAT ONE CAREFULLY!] 1+2+3+5+6 = 17
10	49 [square inches]	What is the area in square inches of a square with sides of length seven inches? 7*7=49

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College Bowl Round #3 Solutions

	Answer	Solution
1	35 [$]	An adult ticket to the museum costs fifteen dollars, and a ticket for a child is five dollars cheaper. A father went to the museum with his two children. How much in dollars did they have to pay for their tickets? 15 + 10 + 10 = 35
2	4	What is the greatest common factor of eight and twelve? 8=4*2 and 12=4*3
3	10	What is the sum of the first three prime numbers? 2+3+5=10
4	25 [%]	Daveen rolls a fair six-sided dice, and also flips a coin. What is the probability in percent that he rolls a prime number and flips heads on the coin? 2,3,5 work, so 3/6=1/2 $\frac{1}{2}$*1/2=1/4 = 25%
5	3 [= 3x]	If two times x plus 5 equals 7 times x, what is the value of 3 times x? 2x+5=7x => 5=5x => x=1 => 3x=3
6	5 [feet]	What is the perimeter, in feet, of a regular dodecagon with side lengths of five inches? 5*12/12=5
7	26 [minutes]	Sahil is writing math questions for a math competition. It takes him five minutes to write a hard question, and two minutes to write an easy question. How many minutes will it take him to write four hard questions and three easy questions? 5*4+2*3=20+6=26

8	60 [%]	There are eight boys and twelve girls in Ms. Devine's math class. If she randomly chooses one student, what is the probability in percent that she chooses a girl? 12/20 = 60/100 = 60%
9	1368	What is one-hundred twenty-three plus four-hundred fifty-six plus seven-hundred eighty-nine? 123 + 456 + 789 = 1368
10	72 [inches]	How many inches are in two yards? 1 yard = 3 ft, 1 ft = 12 inches 2*12*3 = 72 inches

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College Bowl Round #4 Solutions

	Answer	Solution
1	17 [houses]	On one side of Jenna Road the houses are numbered with the consecutive odd integers from one to nineteen. On the other side of Jenna Road, the houses are numbered with the consecutive even integers from two to fourteen. How many houses are there on Jenna Road? 1 – 14 plus 15, 17 and 19 = 17 houses.
2	20 [years]	Vishal's brother is one fourth of Vishal's age in years. If his brother is five years old, how old is Vishal in years? 4*5=20
3	25 [%]	If one card is randomly selected from a standard deck of playing cards, what is the probability in percent that it is a diamond? There are four suits, $\frac{1}{4}$ = 25%
4	4	What is the sum of the mean, median, and mode of the following data set: Zero, one, one, three, five Mode: 1 Median: 1 Mean: 10/5=2 1+1+2=4
5	2	What whole number is equal to three halves plus eight sixteenths? 3/2+8/16=1.5+0.5=2
6	17 [multiples]	How many multiples of fifty are between two-hundred ten and one-thousand sixty? 250,300,350,400,450,500,550,600 650,700,750,800,850,900,950,1000 1050

7	70	The mean of four numbers is twenty. A fifth number is added, and the new mean is thirty. What is the fifth number? The sum of the first 4 is 4*20=80 The sum of the 5 is 5*30=150 150-80=70
8	120 [months]	How many months are in one decade? 10*12=120
9	6 [angles]	How many interior angles does a regular hexagon have? A regular hexagon has six sides and six interior angles
10	125	What is the next number in the following geometric sequence, that begins with: One, five, twenty-five, and so on. Multiply by 5 each time.

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College Bowl Round #5 Solutions

	Answer	Solution
1	20	What is the range of the following data set: Five, eleven, twenty-five, twenty-three, nine, eight, twelve. 25 – 5 = 20
2	200 [miles]	Eho is driving at fifty miles per hour. If he drives for four hours, how many miles will he have driven? 50*4=200
3	0	How many congruent sides does a scalene triangle have? A scalene triangle has no equal sides.
4	20 [pieces of gum]	Four Hershey Bars are worth five Reece's Peanut Butter Cups. Three Reece's Peanut Butter Cups are worth four pieces of gum. How many pieces of gum are twelve Hershey's Bars worth? 12 Hershey's Bars = 15 Reece's Peanut Butter Cups 15 Reece's Peanut Butter Cups = 20 pieces of gum
5	3	What is the smallest prime factor of two-hundred thirty-one? 231=3*7*11
6	720	What is the next number in the sequence that begins: One, two, six, twenty-four, one-hundred twenty, and so on. Pattern is: x2, x3, x4, etc. 120x6 = 720 Or, n!
7	165 [degrees]	The current time shown on an analog clock is twelve-thirty pm. How many degrees is the smaller angle formed by the hour and minute hands? Each hour is 30 degrees since 1/12*360=30. So the hours from 1 to 6 are 5*30=150, and the hour hand is hallway between 12 and 1, so 150+15=165

8	60 [cups of water]	It takes fifteen cups of water and one cup of lemon juice to make one gallon of lemonade. How many cups of water will it take to make four gallons of lemonade? 15*4=60
9	6 [ways]	How many different ways can you arrange a yellow chair, a red chair, and a green chair in a line? yrg,ygr,gry,gyr,ryg,rgy Or, 3! = 6
10	5	Evaluate: one plus two minus three plus four minus five plus six 1+2=3; 3-3=0; 0+4=4; 4-5=-1; -1+6=5

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College Bowl Round #6 Solutions

	Answer	Solution
1	10	What is one-half of one-third of sixty? 1/3*60=20; ½*20=10
2	30 [%]	A bag contains six red marbles, eleven green marbles, and three black marbles. If a single marble is randomly selected, what is the probability in percent that it is red? 6 + 11 + 3 = 20 marbles 6/20 = 30/100 = 30%
3	16	What is the sum of the first four positive odd integers? 1+3+5+7=16
4	8 [meters]	The area of a circle is sixteen times pi square meters. What is the diameter of the circle in meters? Pi*r^2=16pi => r^2=16 => r=4 D=2r=2(4)=8
5	13 [pieces]	William has a long iron rod. He cuts it into four equal pieces. Then, he cuts three of the pieces into three equal pieces each and he cuts the fourth piece into four equal pieces. How many pieces does William now have? First – cut into 4 pieces Second – 3 pieces*3=9 Third – 1 piece*4=4 9+4=13
6	2 [prime numbers]	How many prime numbers are between twenty-five and thirty-five? 29 and 31
7	12 [=x]	The mean of the numbers fourteen, seventeen, fourteen, eighteen, and x is fifteen. What is the value of x? The sum equals 15*5 = 75 75 – 14 – 17 – 14 – 18 = 12

8	4 [polygons]	How many of the following shapes are polygons? Circle, triangle, trapezoid, cube, hexagon, pyramid, rectangle Triangle, trapezoid, hexagon and rectangle are polygons.
9	14 [floor]	Eloise and Clara live in a skyscraper. Clara lives twelve floors above Eloise. One day Eloise went to visit Clara, and she took the stairs up from her apartment to Clara's apartment. Half-way up she was on the eighth floor. On what number floor does Clara live? Eloise had gone up 6 floors to get to the 8^{th}. Another 6 floors will take her to the 14^{th} floor.
10	4 [units]	How many units apart on a number line are the numbers negative one-half and positive seven-halves? The distance from -1/2 to 0 is $\frac{1}{2}$. $\frac{1}{2}$ + 7/2 = 8/2 = 4

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College Bowl EXTRA

	Answer	Solution
1	100 [cubic inches]	What is the volume in cubic inches of a rectangular prism with a length of five inches, a width of two inches, and a height of ten inches? 5*10*2=100
2	16	What is one-fifth of eighty percent of one-hundred? 80% of 100 = 80 1/5 of 80 = 16
3	7	What is the median of the following data set? Seven, four, three, twenty-one, nine, seven 3, 4, 7, 7, 9, 21 The average of 7 and 7 is 7
4	4 [days]	Biff drinks twelve cups of water a day. How many days will it take him to drink three gallons of water? 1 gallon = 16 cups 3 gallons = 48 cups 48/12 = 4 days
5	36 [cm^2]	What is the area in square centimeters of a square with a perimeter of twenty-four cm? 24/4 = 6 cm per side 6 x 6 = 36
6	7	What is the quotient of thirty-five and five? 35/5=7
7	42	What is the sum of three times four [pause] plus five times six? [3*4 + 5*6] = 12+30 = 42

8	205	Find the next number in the sequence that begins with: Five, fifteen, ten, thirty, twenty-five, seventy-five, seventy, two-hundred ten, and so on. The pattern is x3, -5 Since 70*3=210, then next step is -5, and 210-5=205
9	3	How many distinct arrangements are there of the letters in the word ADD, spelled A-D-D ADD, DAD, DDA
10	16	What is the square root of two-hundred fifty six? Sqrt(256)=16