"Math is Cool" Championships-2003-04

7^{th} - 8^{th} Grade - October 24, 2003
Individual Contest

Express all answers as reduced fractions unless stated otherwise.
Leave answers in terms of π where applicable.
Do not round any answers unless stated otherwise.
Record all answers on the colored cover sheet.

1	How many positive two-digit numbers are divisible by 15?
2	Find the arithmetic mean of the following number set: {38, 176, 23, 44, 89, 212}
3	The Lewis and Clark Math Team recently had a party. Each person that entered was assigned a different number. The numbers were assigned consecutively starting at 13. The last person received the number 101. How many people attended the party?
4	Which expression represents the greatest number: -6/7, -7/8, or -17/20?
5	What is the volume of a rectangular prism with sides 4, 5, and 7?
6	Libbey can answer "Even Steven's'" trivia questions at a rate of 10 questions every 3 minutes. How many questions can she answer in 1 hour?
7	If the Swordsman Ice Cream Court has 8 different flavors of yogurt, 3 different bowl sizes, and 24 toppings, how many combinations of one yogurt in one bowl with one topping are possible?
8	What is the probability of drawing a heart or a 7 from a regular deck of 52 cards?
9	Express $.\overline{82}$ as a common fraction.
10	In terms of π, what is the area of a circle whose circumference is 16π?
11	What is the midpoint of the line segment connected by the two points: (3,8) and (5,2)?
12	If a*b=1/a+1/b, for what decimal value of a is a*0.2=10?
13	Shaniqua is making a triangle that has two sides of lengths 91 and 40. What is the mean of all integral values that are possible for the third side?
14	A certain number of people are standing in a circle holding numbers in consecutive order. If person 8 is standing across from person 177, how many people are standing in the circle?
15	In a geometric sequence, you multiply each term by a constant factor ***f*** to get the next term of the sequence. In the geometric sequence -4/9, 2/3, -1 ..., what is ***f***?

16	Eric has seven pairs of red socks, one pair of blue socks, eight pairs of white socks, two pairs of gold socks, five pairs of orange socks, and one purple sock in his sock drawer. If he draws socks at random, how many socks must he draw to be sure that he has at least three matching pairs of socks?
17	What is the ratio of the complement of angle x to the supplement of angle x if x = 60 degrees?
18	The town of Colinsville has 1,000,000 residents. Every year it's population decreases by 10%. Nathansville has 100,000 residents, and each year it's population gains twice the number of people Colinsville loses the same year. What is the positive difference in the two town's populations after two years?
19	David is fishing in his canoe. It springs a leak, and David immediately begins bailing water at a rate of 3 gallons per minute. David knows from past fishing trips that it takes 72 gallons of water to sink his canoe. If David's canoe sinks 1.2 hours after springing a leak, at what rate, on average, did water enter David's canoe? Give your answer in gallons per minute.
20	The perimeter of a regular nonagon is 47 units. If each side is increased by 5, what is the perimeter of the new figure?
21	Elise hates John's CDs. She runs over 5/6 of them in her Jeep. Then she takes half of those remaining and incinerates them. Then Elise takes sandpaper to 3/4 of the CDs still left. Finally, she breaks 2/3 of those remaining with her bare hands. Poor John now has 1 CD left. How many did he start with?
22	The sum of the interior angles of a certain polygon is 3240 degrees. How many sides does this polygon have?
23	Lou was ***x*** years old ***y*** years ago. How old was Lou ***z*** years ago in terms of ***x*** and ***y***?
24	The number of math problems David can write is inversely proportional to the outside temperature. If it is 50 degrees outside, David can write 50 questions. How many questions can David write if it is 100 degrees outside?
25	If there are 18 people in a room and each person puts his or her name in a hat, what is the probability that exactly 17 people draw their own name?
26	If a man walks 4 miles east followed by 5 miles south and then 3 miles east again, how far in miles, is he from his original starting location? Answer in miles.
27	Find the sum of m and b in the equation of the line in form y = mx + b that connects the points (3, 7) and (7, 18)? Express your answer as a common fraction.
28	Every four minutes, David says "Math." Every seven minutes, Andy says "Is." Every eighteen minutes, Gregg says "Cool." All of them say their words at 9:00 AM. What is the next time they all say their words at the same time?
29	In Penguinland, a certain wildfire has an initial size of 5 acres. Every 10 minutes, it doubles its area. If Penguinland has a total area of 10240 acres, how many minutes will it be before the wildfire spreads over all of Penguinland, assuming that it continues to spread at this rate?

Challenge Questions

30	Franky's mom wants him to mow the lawn. Unfortunately, Franky is exceptionally lazy and only mows 70% of the unmowed lawn at a time. So his mom settles for him to mow a total of 95% of the lawn. How many times must Franky mow the lawn in order to have mowed at least 95% of it?
31	Let c be a positive real number. Find a value for c such that the polynomial $x^2 + cx + 4$ has exactly one real root.
32	Nathan and Andy both have water bottles. Nathan's water bottle is cylindrical, while Andy's water bottle is conical. If their base radii are the same and Nathan's water bottle holds twice as much water as Andy's water bottle, what is the ratio of the height of Nathan's water bottle to the height of Andy's? Express your answer as a percentage.
33	David starts working on a 1000 piece puzzle at 1:00p.m. Two hours later Rebecca joins him. If David can place 1 piece per minute and the puzzle is finished at 8:00 p.m., how many pieces per minute does Rebecca place?
34	There are 5 trogs in 1 dor. There are 4 dors in 3 strongs. There are 2 strongs in 17 bads. If Andy has 40 trogs, 8 dors, and 8 strongs, how many bads does he have total?
35	A regular hexagon is inscribed in a circle of radius 4. The area between the circumference of the circle and the perimeter of the hexagon is shaded. What is the area of the shaded region?
36	Chellie Bob designed a fair 7-faced die. In three separate rolls of this die, what is the probability that she will roll two 1s and one 6, in no particular order?
37	What is the length of the space diagonal in a cube whose surface area is 384 square units?
38	Water flows through a pipe at a rate of 100 cubic inches per minute into a 1200 cubic inch capacity tank. In a certain amount of time, the tank becomes 30% full and then the flow rate slows down to 75 cubic inches per minute. For an equal amount of time as before, the pipe continues to fill the tank and then is shut off. How many cubic inches of water are in the tank at this time?
39	If planet X has a diameter of 100,000 yards and rotates once every 30 hours, how fast is the planet rotating at the equator in miles per hour?
40	On a straight road, an inspecting officer traveled from the rear to the front of an army column, and back, while the column marched forward its own length. If the officer and the column maintained steady (but different) speeds, what was the ratio of their speeds, faster to slower?

"Math is Cool" Championships-2003-04

7^{th} - 8^{th} Grade - October 24, 2003
Individual Multiple Choice Contest

Record answers on colored sheet

Each day, for the next ten days, Bob watches enviously as his 5 neighbors leave their houses for their jobs as math professors at MIC University. Because he has little else to do, he records their speed in miles per hour as they pass his house. Bob recorded the speeds in the table shown below.

	Bob's Table of His Neighbors' Speeds				
Drivers	Plank	Bohr	Pauli	Broglie	Heisenberg
S P E E D S	33	31	35	36	32
	32	30	34	37	33
	34	31	35	33	34
	31	30	33	38	31
	30	29	34	36	33
	30	30	35	35	32
	37	28	34	32	35
	32	29	36	35	31
	30	30	34	36	35
	31	32	37	35	34

1	What is the highest recorded speed in the table? A. 34 B. 35 C. 36 D. 37 E. 38
2	Who has the lowest average speed? A. Plank B. Bohr C. Pauli D. Broglie E. Heisenberg
3	Use the above data to determine the probability that Plank will be driving above 32 mph tomorrow. A. 1/5 B. 3/10 C. 1/2 D. 2/3 E. 4/5
4	Which driver has a mean speed that is less than their median speed? A. Plank B. Bohr C. Pauli D. Broglie E. Heisenberg
5	Although the posted speed limit is 30 mph on Bob's street, a policeman will ticket a driver only when he or she travels at least 20% above the posted speed limit. From the table, who likely receives the most number of speeding tickets? A. Plank B. Bohr C. Pauli D. Broglie E. Heisenberg

6	Bob calculates Plank's average speed. He then compares this to the posted speed to predict how fast Plank would be going if the posted speed limit is 70 mph. What will Bob's prediction be in mph? A. 74 B. 74 2/3 C. 72 D. 72 1/2 E. None of the Above
7	What fraction of the speed limit is most common for Bob's neighbors to be traveling? A. 7/6 B. 6/5 C. 5/3 D. 3/2 E. 7/4
8	One day, Bhor leaves his apartment complex traveling to MIC University at his median speed. Twelve minutes later, Heisenberg leaves the same complex traveling at his mean speed. Remarkably, both Bohr and Heisenberg arrive at MIC University at the same time. How far away, in miles, is the university? A. 2.2 B. 62 C. 66 D. 100 E. 132
9	This past weekend, Broglie had extra classes to teach, so he needed to drive to MIC University on both Saturday and Sunday. Bob now has 12 values for Broglie's speed in miles per hour. Adding these two speeds causes the mean to increase by 0.7. What is the sum of those two values? A. 67 B. 70.6 C. 77.8 D. 79 E. 91

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Team Contest

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Record all answers on colored cover sheet.

1	A crazy old man in the woods has three satellite dishes on his log cabin. Satellite dish #1 is capable of receiving 146 channels. Satellite dish #2 is capable of receiving 110 channels. Satellite dish #3 is capable of receiving 208 channels. Satellite dishes #1 and #2 share 42 channels, satellites #2 and #3 share 58, and satellites #1 and #3 share 61. The three satellites together share 30 channels. How many distinct channels can the crazy old man watch with his three satellite dishes?
2	Radio stations use 4 letters for their call-letters. The first letter must be a W or a K. How many different call-letter strings are possible if no letter may be repeated within a string?
3	If $xy = 8$ and $x + y = xy - 2$, find $x^2y + xy^2$.
4	Lee owns a biotech company. He sells genetically altered poplar trees for $100 per dozen and growth-enhanced tomatoes for $0.50 each. How many quarters must Farmer Sampson bring with him to buy 6 trees and 12 tomatoes?
5	Linus inherits $100,000 and invests it in two certificates of deposit. One certificate pays 6% simple interest and the other pays 4.5% simple interest annually. If Linus's total interest is $5025 the first year, how much money in dollars, is invested at the 4.5% rate?
6	M is proportional to a, b, and c and inversely proportional to d and e. When $a = 2$, $b = 6$, $c = 7$, $d = 14$, and $e = 3$, $M = 2$. Find c when $M = 12$, $a = 4$, $b = 4$, $d = 6$, and $e = 14$.
7	Find the slope of the line passing through the points at which $y = x^3 + 4x^2 - x - 2$ and $y = x^3 + x^2 + 2x + 34$ intersect.
8	Each day there is a 10% chance of rain. What is the probability that in 4 days it will rain exactly once? Express as a decimal.
9	If Libbey, Lee, Keisha, Brian, Megan, and Colin are standing in a line, and Libbey and Lee have to stand next to each other, Keisha and Brian have to stand next to each other, and Colin and Megan CANNOT stand next to each other, how many ways can they stand in line?
10	A traffic light cycles between green for two minutes, yellow for one minute and red for two minutes. When the light is green, two cars go through the intersection each second, when it is yellow, four cars pass through the intersection each second, and when it is red, no cars pass through each second. If the light turns green at 1:00p.m., how many cars pass through the intersection between 1:00p.m. and 7:00p.m.?

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Pressure Round

1	An n-gon is a polygon with n sides. For a certain n-gon, the number of diagonals that can be drawn is more than 10 times the number of sides. What is the smallest possible value for n?
2	Simplify to a single fraction containing only one h: $\dfrac{\frac{1}{a+h} - \frac{1}{a}}{h}$
3	Silly Meghan said at 10:03 PM, "It is 8 hours and 12 minutes after 6 hours and 54 minutes before the end of my 2 hour and 31 minute long appointment. What time did her appointment begin?
4	Farmer Sampson is selling pumpkins for Halloween, but nobody wants to buy them. Each day, he reduces the price by 10 percent. After how many days, of reducing his price, will the price of the pumpkins be less than 50 percent of the original price?
5	What is the most specific name for the polygon with endpoints (2,1), (4,3), (10,0), and (8,-2)?

"Math is Cool" Championships-2003-04

7^{th} - 8^{th} Grade - October 24, 2003

Mental Math

Express all answers as reduced fractions in terms of radicals and π, where applicable, unless otherwise instructed.

Person 1		
1	What is the sum in degrees of the interior angles of a heptagon?	900[E]
2	What is the slope of the line connecting the points (5,-8) and (7,4)?	6
3	Josh and Colin are mowing lawns to make money to buy new math books. Josh can mow a lawn in three hours. Colin can mow the same lawn in one hour. How many minutes would it take them to mow that lawn together?	45 (minutes)
4	What is the sum of the first 9 odd positive numbers?	81
Person 2		
1	Solve for x in the following equation. $3x+12=4x-9$	$x=21$
2	What is the sum of the first 4 prime numbers?	17
3	In the pattern: 1, 1, 2, 3, 5 , 8, 13... what is the next number?	21
4	What is the square root of the quantity 3 raised to the 3^{rd} power divided by 3?	3
Person 3		
1	What is the base of a triangle with area 24 and height of 8?	6
2	If Libbey has 5 shirts, 6 pairs of pants, and 3 sweaters, how many different outfits can she wear?	90
3	What is the square root of 225?	15
4	How many degrees are between the hands on an analog clock at 3:12?	24[E]
Person 4		
1	What is the volume of a cylinder with radius 3 and height of 10?	90π
2	If $f(x) = x^2 - 5$, what is f(4)?	11
3	A simple barcode is created by alternating 5 black lines with 4 white spaces. There are two possible thicknesses for the lines and two thicknesses for the spaces. How many barcodes are possible?	512
4	Simplify two to the seventh power times 2 factorial divided by four to the fourth power.	1

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College Knowledge Bowl Questions #1

1	The probability that Libbey will eat breakfast on any given day is 4/5. The probability that she will eat toast if she eats breakfast is 1/4. The probability that she will butter the toast if she eats it, is 3/5. What is the probability that Libbey ate buttered toast for breakfast this morning?	3/25
2	I take a positive number, square it, add 3 to the answer, divide it by the square root of 16, and then add the two least primes that are greater than the result of the answer. I get 31. What was the original number?	5
3	Mr. Layton assigns 1 page on Day 1, 4 pages on Day 2, 9 pages the Day 3, and so forth. The book he uses has 300 pages total. On which day will he assign the section containing the last page?	Day 10
4	Biff is pushing a boulder up a 41 foot hill. He pushes it up 5 feet every day, but every night, Eho sneaks up and pushes it back 2 feet. How many days will it take for Biff to get the boulder to the top of the hill?	13 [days]
5	Colin and Carl are playing frisbee. Colin gets the frisbee to Carl 3 out of 5 times, and out of those 3 times, Carl catches it twice. If Colin throws the frisbee 75 times, how many of those times would Carl catch it?	30
6	What is the geometric mean of 2 and 128?	16
7	How many ways can you pick four flags out of an assortment of ten?	210
	Extra Question: Only use it if needed	
8	Evaluate 9 factorial.	362880

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College Knowledge Bowl Questions #2

1	How many ways can you arrange the letters in the word BANANA?	60
2	What is the volume of a cone with a radius of 7 and a height of 18?	294π
3	What is the fifth prime Fibonacci number?	89
4	Express as a reduced improper fraction: 5.121212 repeating.	169/33
5	Find the smaller diagonal of a rhombus with an area of 30 and with diagonals that sum to 19.	4
6	Evaluate 8 factorial divided by the quantity 2 to the seventh power times 3 to the second power.	35
7	A full 10-gallon tank is being drained at a rate of $\frac{1}{2}$ gallons per minute but is being filled by a hose pumping in 1/3 gallons per minute. How many minutes will it take to drain the tank completely?	60 [minutes]
	Extra Question: Only use it if needed	
8	Solve for x in the equation $3x^{3/2} - 9x^{1/2} + 6x^{-1/2} = 0$.	$x = 1, x = 2$

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College Knowledge Bowl Questions #3

1	Suppose two cards are drawn at random from a standard deck of 52 cards. What is the probability they make a pair?	1/17
2	What is the surface area of a sphere whose volume is $500\pi/3$?	100π
3	Find the number of degrees in the acute angle of a parallelogram whose obtuse angle is 125 degrees.	55 [degrees]
4	How many thirds are in one-sixth?	$\frac{1}{2}$ or equiv.
5	How many times does the digit 5 appear in the integers 1 through 75?	18
6	What is the square root of the cube root of 64?	2
7	The sum of three numbers is 81 and their ratio is 3 to 7 to 17. What is the smallest of these three numbers?	9
	Extra Question: Only use it if needed	
8	What is the largest prime factor of 95 factorial?	89

"Math is Cool" Championships - 2003-04

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School Name_____Team #_____

Proctor Name_____Room #_____

Final Score:

Full Name:_____

1st Score

Out of 40

Individual Contest - Score Sheet

DO NOT WRITE IN SHADED REGIONS

	Answer	1 or 0	1 or 0
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

	Answer	1 or 0	1 or 0
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			

"Math is Cool" Championships - 2003-04

7th - 8th Grade - October 24, 2003

School Name_____Team #_____

Proctor Name_____Room #_____

Final Score:

Individual Multiple Choice Contest-Score Sheet

1st Score

Out of 18

Correct responses are worth 2 points, incorrect responses are worth -1 point and no response is 0 points.

DO NOT WRITE IN SHADED REGIONS

	Answer		
1	○ ○ ○ ○ ○ A B C D E		
2	○ ○ ○ ○ ○ A B C D E		
3	○ ○ ○ ○ ○ A B C D E		
4	○ ○ ○ ○ ○ A B C D E		
5	○ ○ ○ ○ ○ A B C D E		
6	○ ○ ○ ○ ○ A B C D E		
7	○ ○ ○ ○ ○ A B C D E		
8	○ ○ ○ ○ ○ A B C D E		
9	○ ○ ○ ○ ○ A B C D E		

"Math is Cool" Championships - 2003-04

7th - 8th Grade - October 24, 2003

School Name_____Team #_____

Proctor Name_____Room #_____

Final Score:

Team Contest-Score Sheet

1st Score

Out of 10

DO NOT WRITE IN SHADED REGIONS

	Answer	1 or 0	1 or 0
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

"Math is Cool" Championships - 2003-04

7th - 8th Grade - October 24, 2003

School Name_____Team #_____

Proctor Name_____Room #_____

Final Score:

Pressure Round

"Math is Cool" Championships -- 2003-04

7th & 8th Grade - October 24, 2003

School Name_____Team #_____

Proctor Name_____Room #_____

Key

Full Name:_____

1st Score

Out of 40

Individual Contest - Score Sheet

DO NOT WRITE IN SHADED REGIONS

	Answer	1 or 0	1 or 0
1	6[numbers]		
2	97		
3	89[people]		
4	-17/20		
5	140		
6	200 [questions]		
7	576[combinations]		
8	4/13		
9	82/99		
10	64π		
11	(4,5)		
12	.2		
13	91		
14	338[people]		
15	-3/2		
16	11[socks]		
17	1/4		
18	330,000 [people]		
19	4 [gallons per minute]		
20	92 [units]		

	Answer	1 or 0	1 or 0
21	144[CDS]		
22	20[sides]		
23	x + y - z		
24	25 [questions]		
25	0		
26	p74[miles]		
27	3/2 or 1 1/2		
28	1:12 PM		
29	110[minutes]		
30	3 [times]		
31	[c =] 4		
32	150[%]		
33	29/15 [pieces per minute]	1 14/15	
34	170 [bads]		
35	16π - 24p3 [un^2]		
36	3/343		
37	$8\sqrt{3}$		
38	630 [in^3]		
39	125 π/66 [mph]		
40	(1 + p2):1		

"Math is Cool" Championships -- 2003-04

7th & 8th Grade - October 24, 2003

School Name_____Team #_____

Proctor Name_____Room #_____

Key

Individual Multiple Choice Contest-Score Sheet

1st Score

Out of 18

Correct responses are worth 2 points, incorrect responses are worth -1 point and no response is 0 points.

DO NOT WRITE IN SHADED REGIONS

	Answer	-1, 0 or 2	-1, 0 or 2
1	E		
2	B		
3	B		
4	D		
5	D		
6	B		
7	A		
8	C		
9	D		

"Math is Cool" Championships -- 2003-04

7th & 8th Grade - October 24, 2003

School Name_____Team #_____

Proctor Name_____Room #_____

Key

1st Score

Out of 10

Team Contest-Score Sheet

DO NOT WRITE IN SHADED REGIONS

	Answer	1 or 0	1 or 0
1	333[channels]		
2	27600[call-letter strings]		
3	48		
4	224 [quarters]		
5	[$]65,000		
6	63		
7	16		
8	.2916		
9	48[ways]		
10	34,560[cars]		

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School Name_____Team #_____

Proctor Name_____Room #_____

Key

"Math is Cool" Championships -- 2003-04

7th & 8th Grade - October 24, 2003

School Name_____Team #_____

Proctor Name_____Room #_____

Key

Pressure Round - Score Sheet

	Answer		
1.	24		
2.	$\frac{-1}{a(a+h)}$ or $\frac{-1}{a^2+ah}$		
3.	6:14 PM		
4.	7[days]		
5.	parallelogram		

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School Name_____Team #_____

Proctor Name_____Room #_____

Pressure Round #1

Answer for Question #____Answer_____

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School Name_____Team #_____

Proctor Name_____Room #_____

Pressure Round #2

Answer for Question #___Answer_____

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School Name_____Team #_____

Proctor Name_____Room #_____

Pressure Round #3

Answer for Question #___Answer_____

"Math is Cool" Championships -- 2003-04

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School Name_____Team #_____

Proctor Name_____Room #_____

Pressure Round #4

Answer for Question #___Answer_____

"Math is Cool" Championships -- 2003-04

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School Name_____Team #_____

Proctor Name_____Room #_____

Pressure Round #5

Answer for Question #___Answer_____

"Math is Cool" Championships -- 2003-04

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School Name_____Team #_____

Proctor Name_____Room #_____

Pressure Round

Round Number	1	2	3	4	5	
Question Turned In						Total
Score	1 or 0	2 or 0	3 or 0	4 or 0	5 or 0	

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School Name_____Team #_____

Proctor Name_____Room #_____

Individual Multiple Choice

Sum of 4 Individual Multiple Choice Tests