"Math is Cool" Masters-2003

Sponsored by: The Engraver and Lemaster & Daniels PLLC

7th & 8th Grade - May 10, 2003

Individual Contest

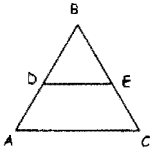
Express all answers as reduced fractions unless stated otherwise.
Leave answers in terms of π where applicable.
Do not round any answers unless stated otherwise.
Record all answers on the colored cover sheet.

1	What is the median of the following set of data: {3, 6, 20, 16, 1}
2	Solve for x: $x^2 + 5 = 14$
3	What is the perimeter of a rectangle with area 20 and one side length of 4?
4	What is the probability of drawing a heart from a standard deck of cards in one draw? (Express answer as a reduced fraction.)
5	Solve for a: $\frac{a - b}{c} = d$
6	If the ratio of boys to girls in a class is 2:3 and there are 15 girls, how many boys are there?
7	What is the least common multiple of 105 and 77?
8	What is the next term in the following sequence? 3, 12, 48, 192...
9	Evaluate: 3^5
10	Libbey lives 10 miles directly west of town and Sarah lives 24 miles directly north of town. In miles, what is the shortest distance between where they live?
11	A toothpick company wants to know the durability of its toothpicks. A research firm found that the probability a toothpick would break increased by a factor of two for each minute it was used. For example, during the first minute, the probability the toothpick would break was 1/256, and the probability it would break in the second minute was 1/128. Using this model, during what minute would the toothpick be "guaranteed" to break?
12	x#y is defined to be $\frac{x + y}{x - y}$. What is 3#(7#5)?

13	Evaluate when x = -2: $(4x^2 - 2x + 4)/(2 - x)$
14	Billy wants to buy a can of Spam, which cost $0.95. How many ways can he pay for the Spam using only quarters, dimes, and nickels?
15	How many digits are in the product of the following three numbers 709, 38147 and 5951?
16	What is the slope of the line which passes through the points (-7, 2) and (-7, 8)?
17	What is the volume of a cylinder, in inches^3, which is 5 inches tall and has a diameter of 6 inches?
18	Evaluate: $\sqrt{13 + \sqrt{133 + \sqrt{5^3 - 4}}}$
19	How many factors does the number 500 have?
20	Factor completely: $x^3 - 3x^2 - 10x$
21	The entire Calculus class stands equally spaced in a circle and person number 6 is facing person number 16. If 14 people leave for solo ensemble, how many students are left?
22	How much floor space, in square feet, will 432 3inch x 4 inch tiles cover?
23	For what values of x does $4^{3x+2} = 8^{x-1}$?
24	Convert .6125 to a fraction.
25	The sum of 11 consecutive integers is 110. What is the smallest of these integers?
26	If Bob can paint the fence in 3 hours and Joe can paint it in 2 hours, how long, in minutes, will it take them to paint it together?
27	Jane takes a drink of water every 30 minutes. Barbie takes a drink of water every 55 minutes. If they both drink at 8:51 a.m., when will they drink again at the same time?
28	Keisha makes 70% of her free throws. What is the probability that out of two shots, she makes the first one and misses the second one?
29	In the advanced zoology class, team-taught by Mrs. Tanner, 20 students got 65% or better and 20 students got 95% or worse. If there are 25 students in the class, how many students were outside of the 65% through 95% range?

Challenge Questions

30	If two sides of a square are decreased in length 20% and the other two sides increased by 20%, by what percentage does the area decrease?

31	Silas has $50 and wants to stock his aviary with exactly 50 parrots. He can buy three different colors of parrots: blue ones for $10 each, red ones for $2 each, and yellow ones for $0.50 each. If he spends all his money, how many yellow parrots does he buy?
32	A grid of 1" by 1" squares is placed in a 8" by 12" box. If a diagonal is drawn in the box, how many grid squares are intersected by the line?
33	Lisa has 3 stacks of stickers. The second stack has 1/4 more stickers than the first, and the third stack has 1/4 more stickers than the second. How many stickers does the first stack hold if Lisa has 976 stickers?
34	Bear Max and Max B. were racing Go Karts. Since Bear Max was 50 lbs heavier, Max B. decided it was only fair to let Bear Max start early. Bear Max travels 20 km/hr and Max B. travels at 38 km/hr. After Max B started, Bear Max only went another 30 km before Max B. passed him. How much of a head start did Max B. give Bear Max, in minutes?
35	Triangle ABC is an equilateral triangle. D is located on $\overline{AB}$ and E is located on $\overline{BC}$ such that $\overline{DE}$ is parallel to $\overline{AC}$. AC has length 14 and DE has length 9. What is the length of EC? 
36	Colin has 10 light switches, and starts with them all off. He then flips every switch, then every 2nd switch (2, 4, 6...), then every 3rd switch, etc. up to every tenth switch. Once he is done, how many switches are turned on?
37	If there are 6 white marbles, 4 black marbles, and 5 orange marbles in a bag, what is the probability of drawing two orange marbles in a row (with replacement)?
38	Five band students decide to help their director get ready for the concert, each not knowing that the others are helping. The first student enters the band room and takes two-thirds of the stands in the band room to the stage. Then the second student enters the band room and takes two thirds of the remaining stands to the band room. This process continues with the remaining three band students. When the director came to the band room, there were only 2 stands in the room. How many stands were there originally?
39	Three raffle tickets denoted x, y, and z respectively are marked with consecutive positive 3-digit numbers. It is noticed that these numbers satisfy the equation 5(y - 101) = x. What is the third number?
40	Ten distinct points lie on a circle. Find the number of all possible polygons constituted by connecting points.

"Math is Cool" Championships-2003

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7th & 8th Grade - May 10, 2003

Individual Multiple Choice Contest

Parabolic Peak has a ski and snowboard park constructed on it. It has 5 ski lifts and 22 different runs. Ski lifts run at different speeds. Amateurs use the ski lifts on runs of less difficulty. The ski lifts on these runs have a slower speed than the ski lifts that serve the more experienced skiers. The more experienced skiers like the more difficult runs. The following is data on the ski lifts:

Ski Lift Name	Speed	Total number of chairs on ski lift	Number of passengers per chair	How many passengers can ride per hour	Length of chair lift in one direction in feet
Powder Puff	4 mph	50	2	1056	1000
The Denominator		80	4	2112	2000
Inferno	10 mph		6	4752	4000
Vertical Limit	12 mph	120		6336	3000
Vertex Locator	15 mph	75	1		2500

Questions:

1	How many feet apart are the chairs on the Powder Puff Ski Lift? A) 20 ft B) 30 ft C) 40 ft D) 50 ft E) Answer not given
2	How many passengers can ride the Vertical Limit Ski Lift in 3.5 hours? A) 6336 B) 12000 C) 18842 D) 21700 E) Answer not given
3	If the speed of the Powder Puff Ski lift was increased to 8 mph, how many passengers could ride the chair lift in 2 hours? A) 2000 B) 4123 C) 4244 D) 4512 E) Answer not given
4	What is the total number of feet of Cable on Parabolic Peak? A) 20000 B) 22000 C) 25000 D) 28000 E) Answer not given
5	It costs $100 per foot in one direction to build a ski lift. How much, in dollars, did it cost to build all 5 ski lifts on Parabolic Peak? A) $832 B) $729,000 C) $455,000 D) $124,000 E) Answer not given
6	What is the speed of The Denominator Ski Lift? A) 4 mph B) 5 mph C) 6 mph D) 7 mph E) Answer not given
7	What is the total number of chairs on the Inferno Ski Lift? A) 110 B) 120 C) 130 D) 140 E) Answer not given
8	What is the number of passengers per chair on the Vertical Limit Ski Lift? A) 6 B) 7 C) 8 D) 9 E) Answer not given
9	How many passengers per hour can ride the Vertex Locator? A) 1184 B) 1186 C) 1188 D) 1190 E) Answer not given

"Math is Cool" Masters-2003

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7^{th} & 8^{th} Grade - May 10, 2003

Team Contest

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	What is the average, or mean, of the following set of data: {1,3,5,7,9,11,13,15,17,19}
2	What is the sum of all prime numbers between 10 and 20?
3	Find the value of x: x+y = 8 z+x = 11 y+z = 13
4	What is the positive difference between the least common multiple and the greatest common factor of 160 and 184?
5	Simplify and write $\frac{24x^3y^{-8}}{8x^{-5}y^4}$ without negative exponents.
6	What is the largest root in the equation: $-12x^{-1/2} - x^{1/2} + x^{3/2} = 0$?
7	The outside of a cube was painted. The cube was then divided into smaller congruent cubes, each 3 inches on an edge. If 12 of these smaller cubes had exactly 2 painted faces, what was the surface area of the original cube in square inches?
8	In Mr. Smith's math class, 1/3 of the boys and 1/2 of the girls take Spanish. If 3/4 of the class is composed of girls, what fraction of the class takes Spanish?
9	Arrange the letters x, y, z in order of increasing magnitude if: $x = 3^{100}, y = 2^{150}, z = 5^{70}$
10	In an equilateral triangle, the area is numerically equal to its perimeter. What is the radius of a circle inscribed in the triangle?

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7^{th} & 8^{th} Grade - May 10, 2003

Pressure Round

1	How many integers have squares less than 29?
2	There are 12 books on a shelf. There are 3 different Chemistry books, 5 different Geology books, and 4 different Physics books. How many ways can these books be arranged if all the books of the same subject must be together?
3	How many distinct prime factors does 156 have?
4	Solve for all x: $3x^2 - 15 + 5x - 2x^2 + 7 - 3x = 0$
5	If $x + y = 12$, $xy = 18$ and $x > y$, what is $x - y$?

"Math is Cool" Masters-2003

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7th & 8th Grade - May 10, 2003

Mental Math Contest

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

Person #1		
1	Find the next number: 99, 105, 98, 107, 97, ...	109
2	Kerry rode her horse at 16 mph for 12 miles. For how many minutes was she riding?	45 [minutes]
3	Find the base length of a triangle with area 72 and height 3.	48
4	What is the sum of the interior angles of a hexagon, in degrees?	720[°]
Person #2		
1	How many 3 inch by 4 inch tiles are needed to cover a floor that is 9 feet by 4 feet?	432 [tiles]
2	What is the area of a square with side length 2.5? Write answer as a decimal.	6.25
3	Sue, Joe and Emily have a whole pie to share equally. If they want their pie to last for two days, how much would Joe get the first day? (Express as a fraction of the whole pie)	1/6
4	A man meets 5 new friends at a party. How many handshakes will occur if each person shakes hands with the others once?	15
Person #3		
1	What is the greatest prime number less than 31?	29
2	What is one-half plus one-third of one-twelfth?	19/36
3	What is the mode of the following set of data? {20 ,7, 7, 20, 13, 17, 20}	20
4	By how much does the perimeter of a regular heptagon with side length 5 exceed the perimeter of a regular nonagan of side length 3?	8
Person #4		
1	If a cereal bar has 4% of your daily fiber, how many cereal bars must you eat to get 100% of your daily fiber from cereal bars?	25 [cereal bars]
2	If 2 four-sided dice are rolled, what are the odds in favor of getting matching numbers?	1/3 or 1:3
3	If 8 candy bars cost $ .50, how much will 120 candy bars cost in dollars?	[$] 7.50
4	How many legs do 5 farmers, a dozen chickens and 6 cows have?	58 [legs]

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7th & 8th Grade - May 10, 2003

College Knowledge Bowl Questions #1		
1	Jim is reading Moby Dick. Becoming bored, he multiplies the 2 page numbers that he sees in front of him. The product he gets is 40,200. What is the smaller of the two page numbers?	200
2	Find "a" so that the solutions to the following equation $x^2 + ax + 12 = 0$ are $x = -3$ and $x = -4$.	7
3	What is the sum of the prime factors of 4389?	40
4	Find the value of "a" so that the midpoint between (3,7) and (5,a) is (4,14).	21
5	Find the largest value of "a" so that the distance between (1,4) and (4,a) is 5.	8
6	What is the geometric mean between 50 and 8?	20
7	What are the new coordinates of the point (4,5) if it is reflected about the line $y = x$?	(5,4)
	Number 8 is an extra question. Only use it if needed.	
8	Factor: $x^2 - 121$	(x+11)(x-11) order doesn't matter

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College Knowledge Bowl Questions #2		
1	What is the units digit of 4^{2002}	6
2	Ryan has at least one each of a penny, nickel, dime, and quarter. If he has $1.50 and more nickels than dimes, what is the largest possible number of dimes he could have?	7 [dimes]
3	The average of Jake's first 5 test scores is 88. What does he have to get on his next test to bring his overall average up to 93?	118
4	If a game of Robo Rally lasts for 9.8 hours on average, and the "accelerated version" takes only $^2/_7$ the time of the regular version, how long, as a decimal number of hours, will the average "accelerated version" of Robo Rally last?	2.8 [hrs]
5	Colin can write 30 math questions in 6 hours. Josh can write 30 questions in 3 hours. How many hours will it take them to write 60 questions if they work together?	4 [hours]
6	What is the slope of a line that passes through the points (-1, 4) and (2,3)?	-1/3
7	Dan has 27 coins, all quarters and nickels, that add up to $6.55. How many nickels does he have?	1 [nickel]
	Number 8 is an extra question. Only use it if needed.	
8	Find the distance between the two points (12, 7) and (15,11).	5

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College Knowledge Bowl Questions #3		
1	What is the equation, in slope-intercept form, of the line perpendicular to the line y = (2/3)x + 7 and passes through the origin?	y =(-3/2)x
2	If you pull 3 cards at random out of a standard deck, what is the probability of getting 3 of a kind?	1/425
3	What is the volume of a cylinder with radius 7 and height 9?	441π
4	If Biff is twice as old as Tracy and Kim's age is 5 less than Biff's, how old, in years, is Tracy if Kim is 31?	18 [years]
5	Two concentric circles with r = 4 and r = 6. Two particles go along each of them at uniform constant speed. How much faster must the outer one go than the inner one for them to move equally fast as seen from their centers?	3/2 [times faster]
6	What is the equation of a line in the form y = mx + b that intersects the points (-6,7) and (2,3)?	$y = \frac{-1}{2}x + 4$
7	In a tree there are squirrels, bluebirds, and 3-legged guoglehogs. If there are 58 legs and 22 animals and half of the animals are bluebirds, how many more guoglehogs are there than squirrels?	5
	Number 8 is an extra question. Only use it if needed.	
8	Lee and Aaron are doing math problems. Aaron can do a math problem in 3 minutes. Lee can do a math problem in 2 minutes. If Aaron starts doing problems at 3:30 p.m. and Lee starts at 4:00 p.m., at what time will they have completed the same number of problems?	5:00 p.m.

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Math is Cool" Masters -- 2003

7th and 8th Grade - May 10, 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	10		
2	60		
3	x=3		
4	3672		
5	$\frac{3x^8}{y^{12}}$		
6	4		
7	486 [sq in]		
8	11/24		
9	y, x, z order matters		
10	2		

Math is Cool" Masters -- 2003

7th and 8th Grade - May 10, 2003

School Name_____Team #_____

Proctor Name_____Room #_____

Key

Pressure Round - Score Sheet

	Answer		
1	11		
2	103,680		
3	3		
4	[x =] -4 or 2 both answers needed		
5	$6\sqrt{2}$		