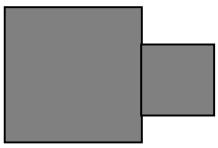
"Math is Cool" Masters-2001-02

Sponsored by: Wilbert Precast Inc & ZAK Designs

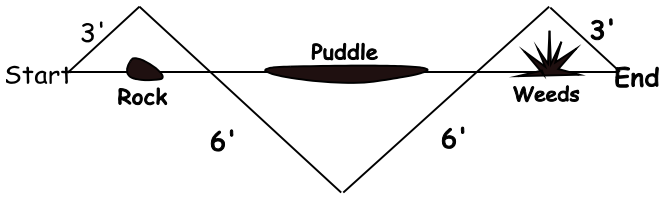
7th & 8th Grade - May 11, 2002

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	Evaluate when $x = -2$: $-3x^2 - 4x - 4$
2	 If the areas of the squares shown are 49 cm^2 and 81 cm^2, what is the perimeter of the figure?
3	Ryan rides his tricycle at 8 mph. How many hours will it take him to go from mile marker 214 to 158?
4	Evaluate: $\frac{1 + 2 + 3 + \ldots\ldots + 100}{2 + 4 + 6 + \ldots\ldots + 200}$
5	What is the equation of the line passing through the points (-1, -6) and (2,3) in slope intercept form?
6	Today is April 18th. What date will it be two days before a week after tomorrow?
7	Jake has 8 Snoopy socks, 4 Mickey Mouse socks, 6 Elmo socks, 10 blue socks, and 2 Mighty Mouse socks. How many socks will Jake have to draw to make sure that he has a matching pair?
8	When Josh went to make some Super Concentrated Orange Juice, he found that 4/7 of the can of concentrate had been used. If it takes 36 cans of water for every 1.5 cans of concentrate, how many cans of water will he need for the amount of concentrate he found? Write your answer as an improper fraction.
9	Mason Jiller opened his math book and multiplied the 2 page numbers that were facing him. Their product was 12,210. What was the largest of the two numbers?
10	How many integer values of x satisfy the double inequality? $-10 < 14x-18 < 26$

11	If 150% of a number is 450, what is 10% of the number?
12	Aaron flies down a 10 mile ski run in 15 minutes. Merck takes twice as much time to go down the same run. What is the difference between their average speeds? Express your answer in terms of miles per hour.
13	A ball is dropped 243 feet. Each time the ball hits the ground it bounces back up 2/3 the height it has fallen. Find the total distance, in feet, traveled when the ball hits the ground the 5^{th} time.
14	Paul sneezes every 10 seconds. Lee sneezes every 15 seconds. Josh sneezes every 4 seconds. Colin is timing and starts his timer when all of them sneeze at the same time. What is the least number of seconds it would it take for there to be a total of 22 sneezes, counting the first three sneezes?
15	What is the ones digit of 7^{22}?
16	L†M†P is defined as $L^M - M^P + P^L$. Evaluate 1†3†2
17	There are 5 geometry books, 7 algebra books, and 8 trigonometry books in a box. Nineteen kids each pull one book from the box without looking. What is the probability that the book left is a geometry book? (Write the answer as a fraction.)
18	Rob takes a True/False test and guesses randomly on every problem. If there are 5 questions, what is the probability that he will answer all the problems correctly? (Write the answer as a fraction.)
19	What is the probability of drawing a queen or a black ace out of a standard deck of cards? (Write the answer as a fraction.)
20	Tom Hanks is stranded on an island. He eats one fourth of his food supply on the first day. On the second day, he eats one fourth of the remaining food. On the third day, he eats one fourth of the remaining food. If he had $^3/_4$ of a pound left after the third day, how many pounds of food did he start with?
21	What is the sum, in degrees, of all of the interior angles of a regular pentagon?
22	If the planet Bjrshploy rotates around the sun π times in π days, how many times will the planet rotate around the sun in 56 hours if Planet Bjrshploy has a 14 hour day?
23	What is the sum of 12_5 and 2_4 in base 6?
24	Evaluate: $((((2)^6)^{1/3})^4)$
25	If a fair 6-sided die is tossed four times, what is the probability of rolling the same number each time? (Write the answer as a fraction.)

26	Michael rode his bike cross country and dodged every obstacle in his path and made 90 degree turns to get back to the path every time. If Dan went over or through every obstacle, how much farther, in feet, did Michael ride than Dan? 
27	Last year a calculator cost $150 and a computer cost $1200. This year the cost of the computer decreased 5% and cost of the calculator increased by 40%. What was the net percentage increase of the cost of the calculator and computer combined?
28	Libbey and Colin are biking in the mountains of Southern Montana. They are headed to Earthquake Lake to take pictures of Freeze to Death Mountain. Going to the lake, they averaged 8 miles an hour, and returning they averaged 12 miles per hour. If the entire trip took 10 hours, how long did the trip to the lake take?
29	How many positive primes have a remainder of zero when divided by 2001?
# Challenge Problems	
30	A rectangle has an area of 60 in^2. If its diagonal length is 13, what is the perimeter of the rectangle?
31	A beetle sits on each square of a 9x9 checkerboard. Each beetle can crawl diagonally to a neighboring square, leaving some squares empty and others with multiple beetles. What is the smallest possible number of empty squares after each beetle has moved exactly once?
32	Rhonda wanted to determine the number of fish in a pond. Through sampling, she determined that the ratio of trout to salmon was 3 to 4. She then added 900 salmon and determined that the probability of catching a trout was 15/53.(Assume trout and salmon are equal in difficulty to catch.) How many total fish were initially in the pond if only trout and salmon were in the pond?
33	The sum of the perimeters of three squares is 48 units. What is the smallest possible sum of their areas?

34	A group of people is standing in a circle spaced evenly apart. Each person is assigned a number starting with 1 and increasing in order as they go around the circle by 1. Each person is assigned only one number. It is noted that the person assigned the number 53 is standing directly across from the person assigned the number 123. What is the number assigned to the person standing directly across from the person assigned the number 80?
35	Two regular 6-sided dice were rolled and it was determined that the probability of rolling a sum of x was 1/12. What is the sum of all possible values of x?
36	At the Annual Math Open held at Cow Pi Beach, the Mathletes outnumbered the Trimathletes 7:x. If a competitor was chosen at random, the probability that it was a Trimathlete was y/12. What is the product of x and y?
37	The absent minded professor lost part of her data on the trip to and from her laboratory. This is the information she has: a) She traveled to and from the laboratory along the same route. b) The sum of the average speeds going and coming was 50mph. c) The average speed for the entire trip going and coming was 24 mph. d) The average speed going to the laboratory was faster than the average speed of the return trip. Help the professor find the average speed of the return trip.
38	Abe pushed a boulder up a 40 foot hill. He pushes it 12 feet each day, and each night it rolls down x feet, where x is an integral value . Abe reached the top of the hill with the boulder on the 7^{th} day. What is the sum of all the possible values of x?
39	Lobochevsky rolled two dice three times and recorded their sums. He noticed that the three numbers in the order that they were rolled formed an arithmetic sequence with the difference of the sequence being prime and positive. How many ways could this event occur?
40	Biff turned x years old in the year x^2 and Eho turned x + 1 years old in the year $(x+1)^2$ both of which occurred in the same century. The positive difference in the years they were born is 70 years. What is the sum of the years they were born in?

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7th & 8th Grade, May 11, 2002

Individual Multiple Choice Contest

Julie's Farm Fresh Eggs

Julie owns a small fresh egg business. She has 50 laying hens, of which 96% produce one egg per day. The rest do not produce. Of the eggs collected each day, 1 egg is not fit for selling. These eggs will be considered defective. Julie sells her eggs for $1.50 per dozen and only sells a full dozen at a time.

For simplicity, assume months are 30 days long (one year is 360 days).

Costs			
Food		**Miscellaneous**	
Layena Crumbles	$9.00 per 50 lb bag	Electricity	$2.00 per month
Chicken Scratch	$7.00 per 70 lb bag	Egg cartons (holds 1 dozen eggs)	$0.25 each
Oyster Shell	$14.00 per 40 lb bag		

Daily Food Rations for all 50 chickens
Each day Julie feeds her chickens: 2 lbs of Layena Crumbles 3 lbs of Chicken Scratch $\frac{1}{2}$ lb of Oyster Shell

Using the above information, solve the following questions:

1	If Julie were to sell one egg, how much would it cost to purchase? A)$1.25 B) $12.50 C) 1.25¢ D) 12.5¢ E) Answer not given
2	If Julie sells all of her non-defective eggs, how many cartons of eggs would Julie sell each month? A) 110 B) 117 C) 120 D) 127 E) Answer not given
3	How much does Julie spend each day to feed her chickens? A) $30 B) 83.5¢ C) 30¢ D) $83.5 E) Answer not given
4	How much does it cost to feed one chicken Oyster Shell per year? (Assume all chickens eat equal amounts.) A)$1.26 B) 63¢ C) $4.00 D) $2.32 E) Answer not given
5	What is the best estimate of how much Julie spends on food to produce one egg that is fit to sell? A) 5¢ B) 1¢ C) 50¢ D) 1.8¢
6	How much profit will Julie make each month? A) $120.10 B) $121.50 C) $119.20 D) $181.18 E) Answer not given
7	If Julie raises the price of her eggs to $2.00 per dozen, how much profit would she earn in one year? A) $1500.20 B) $2345.40 C) $2800.40 D) $1610.20 E) Answer not given
8	A dozen eggs contains 3 defective eggs. If 4 eggs are chosen at random what is the probability that all 4 eggs are good? A) 1/2 B) 14/55 C) 1/4 D) 17/61 E) Answer not given
9	If a chicken is chosen at random, what is the probability it did not lay an egg that day? A) 1/25 B) 3/50 C) 24/25 D) 1/48 E) Answer not given

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7^{th} & 8^{th} Grade - May 11, 2002

Team Contest

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Record all answers on colored cover sheet.

1	What is the y-intercept of the equation y = -(1/3) x - π?
2	An 18 ounce jar of peanut butter costs $1.98 and a 12 ounce jar of peanut butter costs $1.56. How much do you save, in dollars, per 36 ounces by buying the peanut butter that is cheaper per ounce?
3	If f(x) = 3x - 18, what does ***a*** equal when f(***a***) = -24?
4	Evaluate n!/(n-1)! when n = 71.
5	If 7 hefalumps equal 4 woosels, and 8 woosels equal 10 honeypots, how many hefalumps are in 25 honeypots?
6	How many four digit numbers have exactly two 9's in them?
7	Factor: $x^2 - 8x + 12$
8	Consider 4 objects, each with a different weight. What is the maximum number of pair wise weight comparisons that could be required to order the weights from lightest to heaviest?
9	If 5 people can burn 5 CDs in 5 minutes, how many people are required burn 20 CDs in 20 minutes?
10	***Definition: A sequence is arithmetic if the differences between the consecutive terms are the same.*** The following sequence is an arithmetic sequence. Find the sum of the missing terms. 5,__ ,__ ,__ ,__ ,__ ,9

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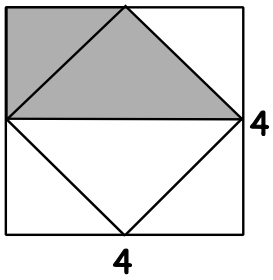
7th & 8th Grade - May 11, 2002

Pressure Round

1	If the area of the larger square is 16. The vertices of the square inside the larger square are at the midpoints of the sides. What is the area of the shaded region? 
2	A 1st grade class starts with 100 students. During the summer between 1st and 2nd grade they lose 2 students. During the summer between 2nd and 3rd grade they lose 4 more students. During the summer between 3rd and 4th grade they lose 8 more students, and so on. What grade would have the class been starting when no more students are left?
3	5 coins were flipped at once. There were exactly *x* heads showing. The probability that this event would occur is 5/32. What is the sum of all possible values of x.
4	If p is a positive integer, what is the sum of all possible remainders when p^3 is divided by 7?
5	Evaluate: $\frac{2^8}{2^2} - \sqrt[3]{8}$

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7th & 8th Grade - May 11, 2002

Mental Math

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

Person 1		
1	There are goats and chickens in Farmer Gregg's barnyard. If there are 33 heads and 106 feet, how many goats are there?	20 [goats]
2	What is the area of a triangle with a base 8 and a height of 4?	16
3	What is the circumference of a circle with a radius of 5?	10π
4	Solve for x: 4x-3 = 61	16
Person 2		
1	The dimensions of a flowered tile are 3 feet by 7 feet. How many flowered tiles are needed to cover a wall that is 30 feet wide and 56 feet tall?	80 [tiles]
2	What is the greatest common factor of 14 and 35?	7
3	In a recipe, the ratio of eggs to sugar is 2 eggs per 25 grams of sugar. How many eggs are needed for 175 grams of sugar?	14 [eggs]
4	What is the cube root of 8?	2
Person 3		
1	What is the sum of the distinct prime factors of 81?	3
2	What is the surface area of a cube with side length 3?	54
3	Biff has 27 coins. Their total value is $5.35. If all of his coins are quarters and nickels, how many quarters does he have?	20 [quarters]
4	Evaluate: 5 factorial.	120
Person 4		
1	What is 35% of 60?	21
2	What is the sum of all the prime numbers between 30 and 40?	68
3	What is the smallest number in this set: { 2/3, 3/5, 4/5 }	3/5 or .6
4	The sum of Biff and Eho's ages is 23. What will the sum of their ages be in 7 years?	37[years]

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7th & 8th Grade - May 11, 2002

College Knowledge Bowl Questions #1

1	Lisa's scores on the first five calculus tests were 94, 93, 100, 94 and 89. What score must Lisa get on the last test to get an average of 95?	100
2	Mara is twice as old as Maureen. Maureen is three times as old as Marlee. If the sum of their ages is 90, how old is Maureen in years?	27[years]
3	If the difference between two numbers is 12, and their sum is 76, what is the smaller number?	32
4	Mara has $25.00 to spend at the mall. The sales tax is 8.00%. If Mara buys an item that has sales tax, what is the maximum price of the item in dollars, rounded to the nearest cent?	[$]23.15
5	A large group of department store Santas are standing in a circle. If the 99th Santa is standing directly across from the 201st Santa, how many Santas are there total?	204 [Santas]
6	What is the next number in the following sequence? 0, 7, 15, 24, 34, 45, ___	57
7	How many different ways can you arrange the letters in the word "SPATULA"? (All letters are capital letters)	2520[ways]
	Extra Question: Only use it if needed	
8	What is the measure, in degrees, of the largest angle in a triangle with an angle ratio of 1:2:3?	90[E]

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College Knowledge Bowl Questions #2

1	Eho bought a TV for $507.60 after a 6% discount. In dollars, what was the original price of the TV?	[$]540
2	What is the measure, in degrees, of each interior angle of a regular nonagon?	140[E]
3	If today is Thursday, what day will it be 139 days from today?	Wednesday
4	What is the lateral surface area of a cone with slant height 30 and base radius 10?	300π
5	If Laine can eat one pie in 20 minutes and Libbey takes 45 minutes to eat one pie, how many more pies can Laine eat in one day than Libbey can?	40 [pies
6	If the ratio of girls to boys in a class is 19:13, and there are 128 students, how many boys are in the class?	52 [boys]
7	Kerry has $25.00 to spend at the mall. What percentage does she have left after spending $18.00 on a CD?	28[%]
	Extra Question: Only use it if needed	
8	What is the probability of getting 3 heads and 2 tails when a coin is flipped 5 times?	5/16

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7th & 8th Grade - May 11, 2002

College Knowledge Bowl Questions #3

1	What is the slope of a line that passes through the points (3, 5) and (-6, 5)	0
2	In a goat race, the goat with the average speed of 10 mph finishes in 3.5 hours, and the goat with the broken leg finishes in 5 hours. What is the second goat's average speed?	7 [mph]
3	Laine, Christine, and Makaya cart a goat with a broken leg up a hill 35 feet each day, but every night, the cart slides back down 4 feet. How many days will it take them to get the goat up the hill if the hill is 306 feet tall?	10 [days]
4	Christine has 23 necklaces, 7 shades of eyeshadow, and 12 bracelets. How many combinations of necklaces, eyeshadow, and bracelets can she make if she uses only one of each?	1932
5	Sarah spent 1 day, 5 hours, and 10 minutes in Toledo. How many seconds did she spend there?	105,000 [seconds]
6	If the math teams airplane must land in Chicago for a competition by 6:00 a.m. Central Time, and the flight from Spokane to Chicago takes 2 $\frac{1}{2}$ hours, at what time Pacific Time must their plane leave the airport? Remember, Chicago falls under the Central Time Zone, which is 2 hours ahead of the Pacific Time Zone.	1:30 a.m.
7	What is the area of a trapezoid with bases 5 and 15 and a height of 6?	60 [units^2]
	Extra Question: Only use it if needed	
8	A ton is 2000 pounds. How much, in dollars, would 800 pounds of grain cost if 3/4 of a ton of grain cost 210 dollars?	[$]112.00

"Math is Cool" Masters - 2001-02

7th & 8th Grade - May 11, 2002

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" Masters - 2001-02

7th & 8th Grade - May 11, 2002

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			
2			
3			
4			
5			
6			
7			
8			
9			

"Math is Cool" Masters - 2001-02

7th & 8th Grade - May 11, 2002

School Name_____Team #_____

Proctor Name_____Room #_____

Final Score:

1st Score

Out of 10

Team 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			

"Math is Cool" Masters - 2001-02

7th & 8th Grade - May 11, 2002

School Name_____Team #_____

Proctor Name_____Room #_____

Final Score:

"Math is Cool" Masters -- 2001-02

7th & 8th grade - May 11, 2002

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	-8		
2	50 [cm]		
3	7 [hours]		
4	$\frac{1}{2}$		
5	y = 3x - 3		
6	April 24th		
7	6 [socks]		
8	72/7 [cans of water]		
9	111		
10	3		
11	30		
12	20 [mph]		
13	1023 [ft]		
14	48 [seconds]		
15	9		
16	-6		
17	1/4		
18	1/32		
19	3 / 26		
20	16/9 [lbs]		

	Answer	1 or 0	1 or 0
21	540 [E]		
22	4 [times]		
23	$13_{[6]}$		
24	256		
25	1 / 216		
26	$24-12\sqrt{2}$ [feet]		
27	0 [%]		
28	6 [hours]		
29	0		
30	34 [inches]		
31	9 [squares]		
32	1750 [fish]		
33	48 [units^2]		
34	10		
35	14		
36	25		
37	20 [mph]		
38	7		
39	13 [ways]		
40	2450		

"Math is Cool" Masters -- 2001-02

7th & 8th grade - May 11, 2002

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

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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	(0, -π) or -π		
2	[$] .72		
3	-2		
4	71		
5	35 [hefalumps]		
6	459 [numbers]		
7	(x-6)(x-2)		
8	4		
9	5 [people]		
10	35		

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School Name_____Team #_____

Proctor Name_____Room #_____

Key

Pressure Round - Score Sheet

	Answer		
1.	6 [units^2]		
2.	7[th]		
3.	5		
4.	7		
5.	62		

Solution to boulder problem

x Slide down	day1	night 1	day2	night 2	day 3	night 3	day 4	night 4	day 5	night 5	day 6	night 6	day 7	qualified
1	12	11	23	22	34	33	45	reached						
2	12	10	22	20	32	30	42	reached						
3	12	9	21	18	30	27	39	36	48	reached				
4	12	8	20	16	28	24	36	32	44	reached				
5	12	7	19	14	26	21	33	28	40	reached				
6	12	6	18	12	24	18	30	24	36	30	42	reached		
7	12	5	17	10	22	15	27	20	32	25	37	30	42	**
8	12	4	16	8	20	12	24	16	28	20	32	24	36	
9	12	3	15	6	18	9	21	12	24	15	27	18	30	
10	12	2	14	4	16	6	18	8	20	10	22	12	24	
11	12	1	13	2	14	3	15	4	16	5	17	6	18	
12	No gain													