"Math is Cool" Masters – 2008-09

Sponsored by: EKA Chemicals & REC Silicon

7th & 8th Grade – December 6, 2008

Individual Multiple Choice Contest

Helen's lifelong dream has been to drive a Porsche Boxster. However, the car is very expensive. After years of hard work and saving, Helen decides to try to purchase her Porsche. Below is a list of options for her car.

P O R S C H E

Model		Color		Interior		Extra Options	
Sport	$55,250	Red	$3125	Black	$1225	Stripes	$775
Convertible	$60,700	Black	$2750	Red	$1750	DVD Player	$1525
Coupe	$65,125	Yellow	$2925	Grey	$1050	GPS	$3300

1	Helen wants to buy a black convertible with red interior, stripes, and a GPS. How much does this car cost? A) $69,275 B) $65,975 C) $70,800 D) $68,500 E) Answer not given.
2	If Helen only chooses one model and color, what is the difference between the least and most expensive combination? A) $10,075 B) $10,250 C) $9,875 D) $15,825 E) Answer not given.
3	How many total combinations are there of Porsches, including model, color, interior, and exactly two extra options? A) 49 B) 81 C) 27 D) 243 E) Answer not given.
4	Helen buys a black coupe with black interior and takes out a loan at 6% interest compounded annually, that doesn't require payments for the first two years. To the nearest dollar, how much interest will be added to the loan in two years? A) $4,146 B) $8,292 C) $8,541 D) $107,796 E) Answer not given.
5	If the probability that Helen chooses a convertible is 1/4, the probability of choosing a red color is 3/4, the probability of choosing a black interior is 2/5, and the probability of choosing GPS is 1/7. What is the probability that Helen chooses a red convertible, without black interior or GPS? A) 27/280 B) 18/35 C) 3/4 D) 9/28 E)Answer not given
6	Unfortunately, the bank refuses to loan Helen the money, so she decides to rob the bank. In order to succeed, she needs to pick three accomplices among Adam, Bella, Charlie, and Dan. However, Charlie and Dan cannot work together. How many distinct groups of three accomplices can Helen choose? A) 2 B) 4 C) 6 D) 12 E) Answer not given
7	In the end, Helen decides to pick Bella, Dan, and Adam. Bella leans a ladder against the bank wall so that it makes a 45° angle with the ground and the base of the ladder is 10 feet away from the bank wall. If Bella pushes the bottom of the ladder toward the base of the building to make a 60° angle with the ground, how much higher is the top of the ladder than before, in feet? A) $5\sqrt{2}$ B) $5\sqrt{3}-10$ C) $5\sqrt{3}$ D) $5\sqrt{6}-10$ E) Answer not given
8	The daring thieves deftly ascend the ladder and find themselves facing the vault's keypad. Helen only has 4.5 minutes before the guards come, and it takes her 3 seconds to try each code. She has received prior information that the code is 9 digits long, uses the digits 1-9 exactly once, and that the digits alternate between odd and even. What is the probability that she will enter the correct code before the guards come? A) 1/2 B) 1/3 C) 1/36 D) 1/72 E) Answer not given.
9	Finally, Helen skillfully escapes the police and drives away at 80 mph. If the radii of her tires are 10 inches each, how many minutes will it take for one tire to make 114048/π revolutions? A) 22 B) 25 C) 27 D) 30 E) Answer not given.

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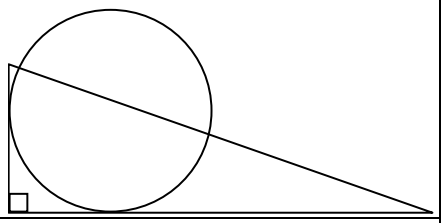
8th Grade – December 6, 2008

Team Contest

1	Find the median of all primes between 30 and 50.
2	I want to make a quilt with an ocean theme. A fabric store sells 7 different patterns of cloth with ocean designs, each of which comes in green or blue. How many ways can I pick two fabrics with ocean designs so that both the pattern and the color are different?
3	Find the sum of all 3-digit positive integers divisible without remainder by exactly 8 out of 9 single-digit positive integers.
4	Matt is playing with some toys in the shape of geometric solids. He has a square pyramid, a cube, a tetrahedron, and an octagonal prism. What is the total number of faces on all Matt's toys?
5	Randy drives at 54 miles per hour and Alex at 45 miles per hour. In the time it takes Alex to travel 120 miles, how many miles does Randy travel?
6	The complex fraction 2 over 3 over 4 can be interpreted in two different ways. Find the sum of the two possible interpretations, as a simplified common fraction with one integer numerator and one integer denominator.
7	The sum of a number and its reciprocal is 5. What is the sum of the square of the number and the square of its reciprocal?
8	A circle of radius 5 inches is tangent to the triangle at two points, as shown. How many inches are in the distance between the center of the circle and the right angle vertex of the triangle? 
9	A solid plastic cube of edge length 10 cm has a cylindrical hole of integer diameter drilled straight through from the center of one face to the center of the opposite face. What is the least possible diameter (in cm) of this hole such that the volume of the solid remaining is less than half the volume of the original cube?
10	One of the dots on a fair tetrahedral (4-sided) die is chosen at random, and is moved to different face of the die (chosen at random). Harshini rolls this modified die. As a reduced fraction, find the probability that she will roll a 3.

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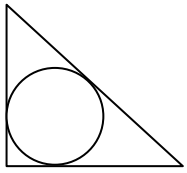
8th Grade – December 6, 2008

Pressure Round Contest

1	Seventeen unit cubes (1 by 1 by 1) are stacked face to face to produce a figure with the smallest possible surface area. What is this surface area, in square units?
2	Artie takes a 3-digit counting number and puts a "3" on its right end. Bethany takes the same 3-digit number and puts a "3" on its left end. The positive difference between the two 4-digit numbers they create is 2286. What was the original 3-digit number?
3	A red light and a blue light flash together for the first time at 1:00 PM. The red light flashes every $1\frac{2}{3}$ minutes and the blue light every $\frac{x}{y}$ minutes, where $\frac{x}{y}$ is a fraction between $\frac{1}{2}$ and 1 that is equivalent to a whole number of seconds. The two lights next flash together at 1:15 PM, when the red light flashes for the 10^{th} time and the blue light flashes for the nth time. Give all possible values for n.
4	My number is a positive integer with exactly two distinct prime factors. It has four digits, whose sum is a multiple of 3. My number is a palindrome, reading the same backwards as forwards. What is my number?
5	What is the radius, in centimeters, of the inscribed circle of an isosceles right triangle with legs measuring 12 cm? 

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8th Grade – December 6, 2008

Mental Math Contest

PERSON 1		
1.1	On a certain piano, the ratio of black keys to white keys is 9 to 13. If there are 88 keys on this piano, what is the difference between the number of white keys and the number of black keys on the piano?	16 [keys]
1.2	What is the number of distinct ways to arrange the letters in the word common, spelled C-O-M-M-O-N?	180 [ways]
1.3	What is the height in centimeters of a right triangle with sides of length 5 centimeters, 12 centimeters and 13 centimeters, if the base of the triangle is the hypotenuse? Answer as a common fraction.	60/13 [cm]
1.4	Which fraction has the larger value: $\frac{7}{19}$ or $\frac{70}{189}$	70/189
PERSON 2		
2.1	What are the odds against drawing the queen of spades, when drawing one card from a standard deck? Answer as a ratio using the word 'to'.	51 to 1
2.2	How many diagonals can be drawn in a convex pentagon?	5 [diagonals]
2.3	A data set consists of 16 numbers. There are two 8s, three 9s, four 10s, five 11s and two 12s. What is the median of this data set?	10
2.4	Evaluate three to the eighth power times four to the eighth power divided by twelve to the sixth power.	144
PERSON 3		
3.1	Palindromes are numbers that look the same when their digits are reversed. For example, one thousand two hundred twenty-one is a palindrome. How many palindromes are there between one hundred and two hundred?	10 [palindromes]
3.2	What is the volume in cubic inches of a cylinder with radius 3 inches and height 10 inches?	90π [in^3]
3.3	Evaluate eight factorial divided by the quantity seven times five times three times one.	384
3.4	What is the sum of the first four positive integers that can be written as the product of two consecutive integers?	40
PERSON 4		
4.1	Nine is 30 percent of what number?	30
4.2	A cube has two opposite vertices cut off. The resulting solid has two triangular faces and six pentagonal faces. How many edges does this solid have?	18 [edges]
4.3	M times N equals negative 20. How many ordered pairs of integers M comma N are possible?	12 [pairs]
4.4	Hugh has a cylindrical fish tank with fifty fish in it. Each fish has a volume of pi cubic inches. The radius of the tank is 5 inches. If Hugh takes all of his fish out of the tank, by how many inches does the water level drop?	2 [in]

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COLLEGE KNOWLEDGE BOWL ROUND #1

#	Problem	Answer
1	If two sides of a triangle are three and fourteen, find the sum of all whole number possibilities for the third side.	70
2	A chipmunk, Harold, can eat an acorn in five minutes. Another, Henry, can eat two acorns in seven minutes. How long, in minutes, will it take for Harold and Henry to eat a combined total of seventeen acorns?	35 [min]
3	Is the triangle with sides of length 10, 24 and 27 a right triangle, acute triangle or an obtuse triangle?	Obtuse
4	How many ways are there to rearrange the letters in the word "GREENLAND," spelled "G – R – E – E – N – L – A – N – D."	90720 [ways]
5	What is the surface area of a cone with a base of radius five units and a height of twelve units in square units?	90π
6	What is the probability of rolling a sum of four or greater with two six-sided dice?	11/12
7	Biff and Eho both headed north at 11 a.m. at full speed. After 4 hours Biff was 16 miles ahead. What did Biff consider full speed if Eho's speed was 16 mph.	20 [mph]
	Extra Problem – Only if Needed	
8	I am blindly picking pairs of socks out of a drawer that has ten blue socks, seven red socks, and eight white socks. How many socks do I need to pick in order to ensure that I have two pairs of each color?	22 [socks]

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COLLEGE KNOWLEDGE BOWL ROUND #2

#	Problem	Answer
1	A snail crawls up a ten-foot tree. Each day he climbs one foot, but at night he slides down a quarter of a foot. On what day does the snail reach the top of the tree?	13^{th} [day]
2	A cylinder has a base with a radius of three centimeters and a height of 4 centimeters. A sphere has the same volume as the cylinder. Find the radius of the sphere, in centimeters.	3 [cm]
3	Each hour a grandfather clock strikes the number of times corresponding to the hour of the day. How many times does the clock strike in a day?	156 [times]
4	Find a number such that if 5 times the number is decreased by 14, the result is twice the opposite of the number.	2
5	Together Plato and Socrates picked 92 quarts of berries. If Plato picked 6 more quarts than Socrates, how many quarts did Plato pick?	49 [quarts]
6	The ratio of red marbles to blue marbles is 5 to 7. If there are 156 marbles in the bag, how many marbles are red?	65 [red marbles]
7	What number is 160 percent of 60?	96
	Extra Problem – Only if Needed	
8	Give the contrapositive of the statement, "If it is raining, it is wet outside."	If it is not wet outside, it is not raining.

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COLLEGE KNOWLEDGE BOWL ROUND #3

#	Problem	Answer
1	The probability that Trevor is sarcastic is six sevenths, that Matt is smirking is one half, that Maddie is smiling is eleven thirteenths, and that Tim is screaming is four fifths. What is the probability that Trevor is sarcastic, Matt is not smirking, Maddie is smiling, and Tim is not screaming?	33/455
2	The average of the first 6 weights was 3 pounds. The average of the next 14 weights was 13 pounds. What was the overall average of all the weights?	10 [pounds]
3	How many factors does the number two-hundred fifty-seven have?	2 [factors]
4	Find the units digit of seven to the forty-first power.	7
5	Leonardo and Michelangelo turned out paintings whose areas were in a ratio of 14 to 13. During the period in question, the total area of their paintings was 1080 square units. How many square units were painted by Leonardo?	560 [un^2]
6	Biff and Eho have only 20 chickens left. If they began with 80 chickens, what percent of the original flock remains?	25 [%]
7	Express the number zero point zero one three one three one three and so on as a fraction.	13/990
	Extra Problem – Only if Needed	
8	Find the sum of the prime numbers between thirty and fifty, inclusive.	199

"Math is Cool" Masters – 2008-09

7th & 8th Grade – December 6, 2008

KEY

School Name_____Team #_____

Proctor Name_____Room #_____

First Score

(out of 18)

STUDENT NAME_____

INDIVIDUAL MULTIPLE CHOICE - 15 minutes

This test is the only test where you will be penalized for incorrect responses. You will receive 2 points for a correct letter response, 0 points for leaving it blank and -1 point for an incorrect response. It is not necessary to write your personal name on the test, but you may put it at the bottom of the test so your coach will be able to give you back the correct test. This test is taken individually, but it is part of your team score, including zeros for missing team members. Your team score will be calculated by taking the mean of your four team members' scores. When you are prompted to begin, tear off the colored sheet and begin testing. ***Since this is a multiple choice test, ONLY a letter response should be indicated as an answer on the answer sheet.*** *No talking during the test.*

DO NOT WRITE IN SHADED REGIONS

Answer		-1, 0 or 2	-1, 0 or 2
1	A		
2	B		
3	B		
4	C		
5	A		
6	A		
7	D		
8	E [1/32]		
9	C		

"Math is Cool" Masters – 2008-09

8th Grade – December 6, 2008

KEY

School Name_____Team #_____

Proctor Name_____Room #_____

First Score

(out of 20)

STUDENT NAME_____

Team Contest – Score Sheet

TEAM TEST - 15 minutes

When you are prompted to begin, tear off the colored sheet and give a copy of the test to each of your team members and begin testing. Each problem is scored as ***2 or 0****. Record all answers on the colored answer sheet.*

DO NOT WRITE IN SHADED REGIONS

	Answer	2 or 0	2 or 0
1	41		
2	42 [ways]		
3	2424		
4	25 [faces]		
5	144 [miles]		
6	17/6		
7	23		
8	$5\sqrt{2}$ [in]		
9	8 [cm]		
10	17/60		

"Math is Cool" Masters – 2008-09

8th Grade – December 6, 2008

KEY

School Name_____Team #_____

Proctor Name_____Room #_____

STUDENT NAME_____

PRESSURE ROUND - 10 minutes

When it is time to begin, you will be handed a packet of questions. There is a copy of the questions for each team member. Two minutes after the start of the test you are expected to submit an answer for one of the questions (it can simply be a guess). The maximum value of this answer is 1 point. In another two minutes you are expected to submit another answer to one of the four remaining questions; its maximum value is two points. This process will continue until all the questions are answered and each consecutive question's worth will go up by one point. You must submit your answers on the colored sheets given to you. If you do not have an answer at the end of a two minute period, you must still submit an answer sheet with an identified question number on it. Failure to do so will result in loss of points. This event is timed, and you will be given a verbal 5 second warning and told to hold your answer sheet up in the air. You may keep working as the sheets are collected.

Pressure Round Answers

	Answer
1	42 [un^2]
2	587
3	[n=] 21 or 26 [both required, either order]
4	3993
5	$12-6\sqrt{2}$ [cm]

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7th & 8th Grade – December 6, 2008

School Name_____Team #_____

Proctor Name_____Room #_____

STUDENT NAME_____

Final Score

First Score
(out of 18)

INDIVIDUAL MULTIPLE CHOICE - 15 minutes

This test is the only test where you will be penalized for incorrect responses. You will receive 2 points for a correct letter response, 0 points for leaving it blank and -1 point for an incorrect response. It is not necessary to write your personal name on the test, but you may put it at the bottom of the test so your coach will be able to give you back the correct test. This test is taken individually, but it is part of your team score, including zeros for missing team members. Your team score will be calculated by taking the mean of your four team members' scores. When you are prompted to begin, tear off the colored sheet and begin testing. ***Since this is a multiple choice test, ONLY a letter response should be indicated as an answer on the answer sheet.*** *No talking during the test.*

DO NOT WRITE IN SHADED REGIONS

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

FINAL SCORE

"Math is Cool" Masters – 2008-09

8th Grade – December 6, 2008

School Name_____Team #_____

Proctor Name_____Room #_____

First Score

(out of 20)

STUDENT NAME_____

Team Contest – Score Sheet

TEAM TEST - 15 minutes

When you are prompted to begin, tear off the colored sheet and give a copy of the test to each of your team members and begin testing. Each problem is scored as ***2 or 0****. Record all answers on the colored answer sheet.*

DO NOT WRITE IN SHADED REGIONS

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