"Math is Cool" Championships – 2005-06
Sponsored by: EKA Chemicals
8th Grade – October 28, 2005
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: 18.36 + 209.8 [Express answer as a decimal.]
2	Evaluate: 1.3 x 2.04 [Express answer as a decimal.]
3	Evaluate: 39.552/.24 [Express answer as a decimal.]
4	Evaluate: 3/4 + 1/6
5	Express 7.24 as an improper fraction.
6	Evaluate: $8\frac{1}{3} - 7\frac{3}{4}$
7	What quadrant of the Cartesian plane does the point (-4,7) lie in?
8	What is the sum of the number of sides on a rhombus, the number of positive integers that are factors of 4, and the number of points necessary to uniquely determine a line?
9	How many natural numbers between 20 & 30 are prime?
10	What is the volume of a right rectangular prism with dimensions of 11, 13, and 14?
11	What value of q satisfies the following? 4q - 3(2q + 7) = 5(1 - 9q) - 126-7q
12	A large pen contains (human) farmers and pigs. If there are 42 heads and 158 feet, how many pigs are there?
13	If a = 3b, b = 5c, d = 2c, and e = 7d, what is the ratio of e to a, expressed as a fraction?
14	What is the least common multiple of 105 and 175?
15	An entomologist places a centipede with 100 feet on a scale, but notes that only 80 of its feet touch the scale; the rest are being raised in the air. If the scale reads .16 grams, what is the true weight of the centipede, in grams? [Express answer as a decimal.]

16	If today is SATURDAY, what day of the week will it be in 243 days?
17	A slug is trying to climb up a 1000 cm slide. Each day, it climbs 7 cm, but each night it slips back 3 cm. If the slug begins its climb on day one, on which day will it reach the top?
18	A trolley driver begins his route with no passengers. At his first stop he picks up 17 people. At the second stop, 8 people get off and 24 people get on. At the third stop, 13 people get off and 34 people get on. How many people are on the trolley at this point?
19	The product of three and one less than my favorite positive number is five-thirds of the sum of two and my favorite number. What is my favorite positive number?
20	A line passes through the points (1, 4), (3, -2), and (a, 19). What is the value of a?
21	What is the volume, in cubic centimeters, of a right rectangular pyramid with a height measuring 8 cm and a base measuring 3 cm by 19 cm?
22	If the number 7 costs \$1.49, the number 17 costs \$2.98, and the number 171 costs \$4.47, how much will the number 17177 cost, in dollars?
23	When drawing two marbles from a bag containing 4 green, 7 orange, and 10 black marbles, what is the probability of getting a green and an orange?
24	When two cards are drawn from a standard 52-card deck, what is the probability they are from different suits?
25	What is the next term in the sequence 4, 5, 7, 11, 19, 35, 67, ___
26	What is the area of a right triangle with a hypotenuse of 17 and a leg measuring 8?
27	Three people (A, B, and C) are suspects in an investigation and made the following statements. If exactly one statement is true, who committed the crime, A, B, or C? A: B is innocent. B: I'm guilty. C: A is innocent.
28	What is the units digit of 7^{79}?
29	When two standard six-sided dice are rolled, what is the probability that they sum to ten?

Challenge Questions

30	When I'm playing with my daughter's cubic blocks, I can construct a cube if I do not use nine blocks, or I can construct a larger cube if I had 118 more blocks. My daughter has how many blocks?
31	(2x-3)(3x-7) is equivalent to $ax^2 + bx + c$. What is the value of $a + b + c$?
32	The values of d that satisfy d^2 - 4d = 60 are a and b. Evaluate: |a-b|
33	What is the length, in cm, of the longest line segment that can be contained in a right circular cylinder with a base radius of 6 cm and a height of 8 cm?
34	What is the probability that when four coins are flipped, three of them are heads?
35	What are the coordinates, in (x, y) form, of the point where the lines 5x - 3y = 2 and 2x + y = 25 intersect?
36	What is the sum of the infinite geometric series $3 + 1 + \frac{1}{3} + \cdots$?
37	In circle O, chord AB is 10 cm long and chord CD intersects AB at E such that AE=6 cm and CE=3 cm. What is the length of DE, in cm?
38	What is the sum of all of the positive multiples of 6 less than 200?
39	If the perimeter of a square is equal to the circumference of a circle, what is the ratio of the square's area to that of the circle?
40	What is the equation, in slope-intercept form, of the line passing through the point (1, 7) and parallel to the line 3x - 2y = 41?

"Math is Cool" Championships – 2005-06
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7th & 8th Grade – October 28, 2005
Individual Multiple Choice Contest

At Frontier Middle School…
- ❖ The total student population is 271 students.
- ❖ Students may or may not turn out for a sport; but only one sport is allowed.
- ❖ Students may or may not participate on the math team.
- ❖ Each student may take at most one English, one Physics and/or one PE
- ❖ Students may take more than one Math class if they choose to take math at all.

Sport / Activity	# in Sport / Activity	# Also in Math	# Also in English	# Also in Physics	# Also in P. E.	Total
Football	55	6	55	12	50	178
Cross Country	83	70	83	79	8	323
Girls Swimming	25	19	2	23	7	76
Girls Soccer	26	20	25	19	3	93
Volleyball	14	7	7	7	7	42
Math Team	91	91	2	91	0	275
Totals	294	213	174	231	75	987

Record only a letter as your answer on the colored sheet.

1	How many students are playing football?
	A) 178 B) 105 C) 55 D) 294 E) insufficient data

2	At most, how many members of the math team are also competing in a sport?
	A) 68 B) 66 C) 83 D) 91 E) insufficient data

3	How many students are on the volleyball team?
	A) 14 B) 42 C) 7 D) 28 E) insufficient data
4	What is the least number of Math team members who are also competing in a sport?
	A) 91 B) 68 C) 203 D) 23 E) insufficient data
5	How many people are taking English?
	A) 83 B) 174 C) 172 D) 55 E) insufficient data
6	If all students on the Math Team also competed in a sport, how many students at Frontier Middle School would be involved in a sport or activity?
	A) 203 B) 180 C) 213 D) 190 E) insufficient data
7	All the students on the Math Team are taking two Math classes. What is the fewest number of the 271 students who are taking Math classes assuming that non-Math Team members only take one math class?
	A) 213 B) 122 C) 123 D) 91 E) insufficient data
8	What is the probability that a randomly chosen football player is also taking Physics.
	A) 55/178 B) 12/55 C) 55/91 D) 6/178 E) insufficient data
9	From the girls soccer team, what is the least number of students that are taking Math, English and Physics? All students are taking at least one of these classes.
	A) 12 B) 64 C) 25 D) 19 E) insufficient data

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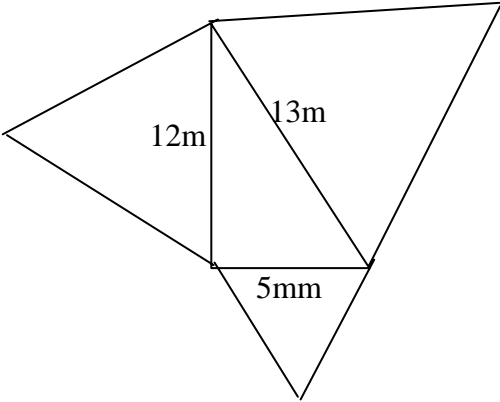### 8th Grade – October 28, 2005
Team Contest

Express all answers as reduced fractions unless stated otherwise.
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Record all answers on the colored cover sheet.

1	A boarding kennel can accommodate 24 cats or 18 dogs. If 8 dogs are being boarded, how many cats could the kennel accommodate?
2	If $\frac{1}{x}+\frac{1}{y}=3$ and x + y = 6, what is the value of x² + y²?
3	A circle with radius 4 inches is inscribed in a square. How many inches is the shortest distance from one of the square's vertices to the circle?
4	The base 8 number $2310_8 = 2 \cdot 8^3 + 3 \cdot 8^2 + 1 \cdot 8^1 + 0 \cdot 8^0$, which is equal to 1224 in base 10. What is the value of the base 10 number 959 in base 8?
5	In a game of dice, Mickie and Charlie are rolling a single standard die. If an even number is rolled, Mickie wins. Charlie wins if a 3 or a 5 is rolled. When a 1 is rolled, no one wins and the die is rolled again and play is continued until someone wins. What is the probability that Charlie will win?
6	Herkamer McGillicutty wants to pour a three foot wide rectangular concrete walkway around his backyard garden. If the dimensions of the rectangular garden are 12 feet by 15 feet and he wants the walkway to be 4 inches thick, how many cubic yards of concrete does he need? Express your answer as a mixed number.
7	What is the smallest positive integer with exactly 7 positive integer divisors?

8	How many ways can 15 be expressed as the sum of 1s, 3s and/or 4s?
9	If three dots are chosen at random from the given 3 × 4 array, what is the probability that they will be the vertices of a right triangle? • • • • • • • • • • • •
10	A right triangle has sides 5 mm, 12 mm and 13 mm. Three equilateral triangles are drawn such that each shares one side with the right triangle, as shown. What is the sum of the areas of the three equilateral triangles, in mm^2?

1	What is the smallest positive multiple of 9 with all its digits even?
2	For the set of 5 numbers {2, 3 – n, n^3, $\frac{n^2}{2}$, -2n}, Alan claims that 2 is largest, Barbara claims that 3 – n is largest, Carla claims that n^3 is largest, Dan claims that $\frac{n^2}{2}$ is largest, and Ellen claims that –2n is largest (where "largest" means greater than every other number in the set for a given value of n). For how many of these people is it possible to find a value of n that makes his or her claim true?
3	Before they went into the Mathemagic Shop, Albert had $100 and Beth had $50. At the shop, they spent a total of $88. After this, Albert had 3 times as much money left as Beth did. Who spent more money, Albert or Beth, and how many dollars more? (Both the name and the number of dollars must be correct.)
4	Let segment $\overline{AB}$ be the diameter of a circle with center C and area 36π. Then P is a point on the circle such that AC = 2AP (where $\overline{AC}$ and $\overline{AP}$ are line segments). Find the length of segment $\overline{PB}$.
5	Square ABCD has the same perimeter as triangle EFG. The sides of triangle EFG form a geometric sequence with the longest side 18 cm and the constant ratio 3/2. Find the area of square ABCD in square centimeters, and give your answer as a decimal. (In a geometric sequence, each term is multiplied by the same factor to get the following term; this factor is called the constant ratio.)

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7th & 8th Grade – October 28, 2005
Mental Math Contest

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

PERSON 1		
1.1	Evaluate 2 to the sixth power.	64
1.2	What is the area of a circle with circumference 12π?	36π [un^2]
1.3	What is 20% of 5?	1
1.4	If 6x plus 11 equals negative seven, what is x?	[x=] -3
PERSON 2		
2.1	What is the next number in the sequence: 1,8,27,64,___?	125
2.2	What is the sum of the first 5 odd positive integers?	25
2.3	What is the sum of two fifths and five sevenths?	39/35
2.4	What is the probability of getting a sum of 9 when 2 six-sided fair dice are rolled?	1/9
PERSON 3		
3.1	What is the 5th odd number greater than 400?	409
3.2	What is the area of a circle with radius of square root of nine?	9π [un^2]
3.3	What is the distance from the point 0 comma 3 to the point 4 comma 0?	5
3.4	What is the square root of 169?	13
PERSON 4		
4.1	How many ways can the letters in the word purple, P-U-R-P-L-E be arranged if the third letter must be p?	120 [ways]
4.2	Solve for x: x squared plus 2x equals -1.	-1
4.3	Evaluate the larger quantity of the following two choices: 3 to the fourth power or 4 cubed	81
4.4	What is the sum, in degrees, of the exterior angles of a dodecagon?	360 [°]

COLLEGE KNOWLEDGE BOWL ROUND #1

#	Problem	Answer
1	What is the length of the other leg of a right triangle with hypotenuse 39 and a leg of length 15?	36
2	The ratio of the interior angles of a quadrilateral is 1 to 2 to 3 to 4. What is the degree measure of the largest of these angles?	144 [°]
3	A sphere has surface area of 64π square inches. What is the circumference about the equator, in inches?	8π [in]
4	Colin, Will, Sampson, and Daniel are going to the movies. How many ways can they sit in a row of four chairs if Sampson and Colin refuse to sit next to each other?	12 [ways]
5	99 red balloons are floating in the summer sky. One is popped by a super high tech jetfighter. Half of the remaining float into space. The jetfighter then pops three more balloons. Half of the remaining float into space. The jetfighter pops one more and then all but one balloon floats into space. How many red balloons floated into space?	93 [balloons]
6	There are two different real numbers such that when each one is squared, both result in 333. What is the product of these two numbers?	-333
7	What is the probability of rolling 2 fair dice and having the product of the rolls be odd?	$\frac{1}{4}$
	### Extra Problem – Only if Needed	
EX	Limes cost 25 cents and coconuts cost 50 cents. Daniel puts a lime in a coconut and drinks them both up. He has 100 dimes and 250 nickels. How many lime and coconut combinations can he drink up?	30 [Comb]

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COLLEGE KNOWLEDGE BOWL ROUND #2

#	Problem	Answer
1	Josh makes 3 out of every 5 free throws he shoots. If he has missed 18 free throws, how many has he made?	27 [free throws]
2	What is the distance between the points (-5,-5) and (4,7)?	15
3	Caleb scores 100 on his first 10 tests. What must he score on his eleventh test to be able to get a zero on his twelfth and have a mean average of 90?	80
4	The probability of a certain sum of two six sided dice appearing is 1/12. What is the product of the two possible sums of the dice?	40
5	What is the sum of the first 13 positive odd integers?	169
6	What is one two base three plus two one base three, in base two?	1100 [2] [base 2]
7	What is the units digit of three to the ninth power?	3
	Extra Problem – Only if Needed	
EX	There are 4500 competitors in "Math is Cool". If the ratio of girls to boys is 5:4, how many boys compete?	2000 [boys]

COLLEGE KNOWLEDGE BOWL ROUND #3

#	Problem	Answer
1	Caleb and David bought a 175 foot piece of licorice. If Caleb paid $2.50 and David paid $1.00 for the licorice, how much, in feet, of the 175 feet of licorice did Caleb buy?	125 [ft]
2	If x squared minus 69 equals 100 and x is a positive number, what is x?	13
3	A triangle has sides of length 5 and 15. What is the difference between the maximum integer length of the third side and minimum integer length of the third side?	8
4	Will drives five miles per hour over the speed limit for an hour before being pulled over by a policeman. After fifteen minutes, the policeman sends Will on his way. He drives for another hour at the speed limit. If he traveled 125 miles total, what was the speed limit, in miles per hour?	60 [mph]
5	Three hours ago, I set my alarm to ring in 300 minutes. How many seconds from now will it ring?	7200 [sec]
6	What is two thirds of thirty percent of fifty percent of 120?	12
7	The probability that it rains on a given day is one tenth. The probability Josh doesn't go outside on a given day is two sevenths. On a given day, what is the probability Josh goes outside and it is sunny?	9/14
	Extra Problem – Only if Needed	
8	There are 5 widgits in 3 whatsits. There are 6 whatsits in 5 whosits. 3 whosits make a toog. Grace has 36 widgits. How many toogs can she make?	6 [toogs]

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School Name_____Team #_____

Proctor Name_____Room #_____

STUDENT NAME_____

Individual Contest – Score Sheet
DO NOT WRITE IN SHADED REGIONS

	Answer	1 or 0	1 or 0		Answer	1 or 0	1 or 0
1	228.16			21	152 [cm^3]		
2	2.652			22	[$] 7.45		
3	164.8			23	2/15		
4	11/12			24	13/17		
5	181/25			25	131		
6	7/12			26	60 [un^2]		
7	II or 2 or second			27	A		
8	9			28	3		
9	2			29	1/12		
10	2002 [un^3]			30	225 [blocks]		
11	-2			31	4		
12	37 [pigs]			32	16		
13	14/15			33	$4\sqrt{13}$ [cm]		
14	525			34	1/4		
15	.16 [grams]			35	(7,11)		
16	Thursday			36	9/2		
17	250[th day]			37	8 [cm]		
18	55 [people]			38	3366		
19	19/4			39	π/4		
20	-4			40	Y = 3/2 x + 11/2		

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School Name_____Team #_____

Proctor Name_____Room #_____

STUDENT NAME_____

Individual Multiple Choice Contest – Score Sheet

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

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School Name_____Team #_____

Proctor Name_____Room #_____

STUDENT NAME_____

Team Contest – Score Sheet

DO NOT WRITE IN SHADED REGIONS

	Answer	2 or 0	2 or 0
1	13 [cats]		
2	32		
3	$4\sqrt{2}-4$ [in]		
4	1677 [8]		
5	2/5		
6	$2\frac{4}{9}$ [yd³]		
7	64		
8	15 [ways]		
9	9/22		
10	$\frac{169\sqrt{3}}{2}$ [mm²]		

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School Name_____Team #_____

Proctor Name_____Room #_____

STUDENT NAME_____

Pressure Round Answers

	Answer
1	288
2	5 [people]
3	Albert, [$] 19
4	$3\sqrt{15}$ [units]
5	90.25 [cm^2]