"Math is Cool" Championships – 2005-06

Sponsored by: IEEE - Central Washington Section

7th 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: 1487 – 649
2	Evaluate: 18.36 + 209.8 [Express answer as a decimal.]
3	Evaluate: 18^2
4	Evaluate: 1.3 x 2.04 [Express answer as a decimal.]
5	What is the remainder when 217 is divided by 73?
6	Evaluate: 12/35 x 7/4
7	Evaluate: 39.552/.24 [Express answer as a decimal.]
8	Evaluate: 3/4 + 1/6
9	Express 7.24 as an improper fraction.
10	Evaluate: $8\frac{1}{3} - 7\frac{3}{4}$
11	Evaluate: (2 + 3) x 7 – 5 ÷ 2
12	What is the name of a polygon with six sides?
13	What is the sum of the number of faces on a tetrahedron, the number of sides of a triangle, and the number of days in a week?
14	What quadrant of the Cartesian plane does the point (-4,7) lie in?
15	How many natural numbers between 20 & 30 are prime?
16	On a one-week temporary job, I got a raise every day. I was paid $110 the first day, double that the second day, $40 more the third day, 3/2 of that the fourth day, 110% of that the fifth day, $15 more the sixth day, and 125% of that the last day. How much did I make that week, in dollars?

17	A large pen contains (human) farmers and pigs. If there are 42 heads and 158 feet, how many pigs are there?
18	If a = 3b, b = 5c, d = 2c, and e = 7d, what is the ratio of e to a, expressed as a fraction?
19	What is the perimeter, in cm, of a rectangle with an area of 36 square centimeters and a side measuring 4 cm?
20	What is the volume of a right rectangular prism with dimensions of 11, 13, and 14?
21	What is the least common multiple of 105 and 175?
22	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.]
23	If today is SATURDAY, what day of the week will it be in 243 days?
24	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?
25	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?
26	What are the coordinates, in (x, y) form, of the midpoint of the line segment with endpoints at (4, -5) and (-3, 9)?
27	A line passes through the points (1, 4), (3, -2), and (a, 19). What is the value of a?
28	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?
29	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?

Challenge Questions	
30	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?
31	What is the next term in the sequence 4, 5, 7, 11, 19, 35, 67, ___
32	What is the area of a right triangle with a hypotenuse of 17 and a leg measuring 8?
33	What is the units digit of 7^{79}?
34	When two standard six-sided dice are rolled, what is the probability that they sum to ten?
35	(2x-3)(3x-7) is equivalent to $ax^2 + bx + c$. What is the value of $a + b + c$?
36	The values of d that satisfy $d^2 - 4d = 60$ are a and b. Evaluate: |a-b|
37	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?
38	What is the probability that when four coins are flipped, three of them are heads?
39	What is the sum of all of the positive multiples of 6 less than 200?
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?

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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

"Math is Cool" Championships – 2005-06

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7th Grade – October 28, 2005

Team Contest

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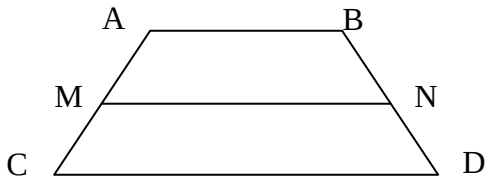
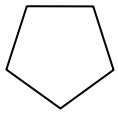
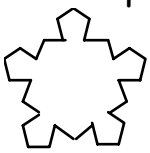
Record all answers on the colored cover sheet.

1	M and N are midpoints of $\overline{AC}$ and $\overline{BD}$ respectively. If the height of trapezoid ABCD is 6 inches and its area is 75 square inches, how many inches is the length of $\overline{MN}$? Express your answer as a decimal. 
2	How many degrees are in the measure of one exterior angle of a regular octagon?
3	A snake is climbing a perfectly cylindrical tree trunk. At the last moment when the very tip of its tail is in contact with the ground, the uppermost part of its face is 8 feet above the ground and its body completely wraps around the tree trunk twice. If the radius of the tree trunk is $\frac{6}{\pi}$ inches, to the nearest foot, how long is the snake?
4	A boarding kennel can accommodate 24 cats or 18 dogs. If 8 dogs are being boarded, how many cats could the kennel accommodate?
5	The decimal representation of 99! will end in how many zeros?
6	One estimate of the total population on earth is 6,450,002,746 people. Also, several internet sources estimate the number of cells in the human body to be approximately 50,000,000,000,000. If we assume these estimates to be true, how many human cells are there on earth? Answer in scientific notation with the mantissa (the decimal part) rounded to the nearest thousandth.

7	What is the maximum number of points of intersection of a square, a rectangle and a circle?
8	How many ways can 15 be expressed as the sum of 1s, 3s and/or 4s?
9	A regular pentagon with side length 9 cm is changed in the following way: each edge is divided into three congruent segments. The middle segment is removed and four of the five sides of a smaller regular pentagon are placed in the gap, connecting the ends of the remaining two segments as shown. If this process is repeated to form a third shape, what will the number of centimeters in its perimeter be?  Shape 1  Shape 2
10	What is the sum of the positive two-digit integers that do not contain the digit 8?

"Math is Cool" Championships – 2005-06

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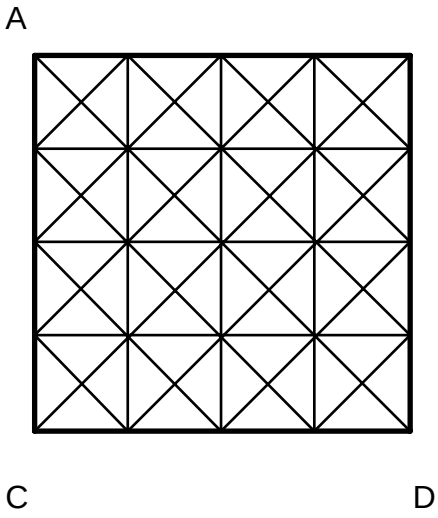
7th Grade – October 28, 2005

Pressure Round Contest

1	In simplest form, find the value of $\sqrt{b^2 - 4ac}$ if a = 2, b = 6, and c = 3.
2	Figure ABCD is a square 4 cm on a side, subdivided into squares of 1 cm on side. Each small square is further subdivided by both diagonals. Find the total length of all line segments except the sides of the large square ABCD, in cm. 
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.)

"Math is Cool" Championships – 2005-06

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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 [°]

"Math is Cool" Championships – 2005-06

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7th Grade – October 28, 2005

COLLEGE KNOWLEDGE BOWL ROUND #1

#	Problem	Answer
1	How many ways can the letters in the word PICNIC be arranged?	180 [ways]
2	How many diagonals does a nonagon have?	27 [diag]
3	Daniel is driving to Seattle. If he drives half the distance at 50 mph and half the distance at 25 mph, what is his average speed, in miles per hour, expressed as a mixed number?	33 1/3 [mph]
4	A snake slithers at 5 mph. A rabbit hops at 10 mph. If they start at the same place, how many minutes must the rabbit wait to start if they are to arrive at a point 5 miles away at the same time?	30 [min]
5	Keisha and Libbey are playing a game. Keisha has a 5/7 probability of winning each game. What is the probability Keisha wins 2 out of the next 3 games?	150/343
6	Brian has 40 ft of fencing. What is the maximum area his fencing could enclose, in square feet?	$400/\pi$ [ft^2]
7	A car's top speed is directly proportional to its horsepower. If a 100-horsepower car can travel at 75 miles per hour, how fast, in miles per hour, can a 300-horsepower car travel?	225 [mph]
	Extra Problem – Only if Needed	
8	Solve for x: Two to the power 2x equals 256.	[x=] 4

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7th Grade – October 28, 2005

COLLEGE KNOWLEDGE BOWL ROUND #2

#	Problem	Answer
1	What is the probability of drawing a jack or a red card from a standard deck of 52 cards on the second draw knowing that the first card was a red king?	9/17
2	Jim, Billy and Eric all failed their math test. The average of their three scores was 57. Jim's score was 58 and Billy's score as 54. What was Eric's score?	59
3	Solve for x: Four to the power x equals 1024.	5
4	What is the sum of the first twenty positive integers?	210
5	What is the sum of the x-coordinate of the x-intercept and the y-coordinate of the y-intercept in the following linear equation? 5x minus 3y equals 15	-2
6	X is directly proportional to y. If x = 3 when y = 6, what is x when y = 20?	10
7	Mathland has a fluctuating population. Three years ago, it had a population of 1,000. It then grew by ten percent. The next year, this population fell by ten percent. Finally it grew by ten percent again. What is it's population now?	1089 [peo]
	Extra Problem – Only if Needed	
8	Sampson's class has right and left-handed students. If there are 12 left handed students, and right handed students outnumber lefties 4 to 3, how many students are in the class?	28 [stu]

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7th Grade – October 28, 2005

COLLEGE KNOWLEDGE BOWL ROUND #3

#	Problem	Answer
1	While reading a book, Will notices that the product of the two pages he sees just happens to be his favorite number, 600. What is the sum of the two pages?	49
2	Let the operation "hat" be defined as x hat y equals x raised to the y power minus y raised to the x power. What is 2 "hat" 5?	7
3	Sampson has dimes and quarters in his pocket. If he has 40 coins which total $5.80, how many quarters does he have?	12 [quarters]
4	Daniel takes a math test on April 14, 2006. If he cannot study on the day of a test, how many days after this test does he have to study for his next test on July 22, 2006?	98 [days]
5	Math is Cool University offers algebra and trig. 310 students take algebra and 430 take trig. If there are 600 students and students must take either algebra or trig, how many take both?	140 [stu]
6	Josh played a hundred videogames and won 60 percent of the time. What percentage must he win in his next hundred games to have won 140 games total?	80 [%]
7	Daniel has 99 red balloons. He gives a third to Sampson. He then gives a third of the remaining to Josh. He then gives some to Colin and has 7 left over. How many balloons did Colin receive?	37 [balloons]
	Extra Problem – Only if Needed	
8	A square of side length 4 is inscribed in a circle. What is the area of the circle?	8π [un^2]

"Math is Cool" Championships – 2005-06

7th Grade – October 28, 2005

Final Score:
KEY

First Score

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
1	838		
2	228.16		
3	324		
4	2.652		
5	71		
6	3/5		
7	164.8		
8	11/12		
9	181/25		
10	7/12		
11	65/2		
12	Hexagon		
13	14		
14	II or 2 or second		
15	2		
16	[$] 2408		
17	37 [pigs]		
18	14/15		
19	26 [cm]		
20	2002 [un^3]		

	Answer	1 or 0	1 or 0
21	525		
22	.16 [grams]		
23	Thursday		
24	250[th day]		
25	55 [people]		
26	(1/2, 2)		
27	-4		
28	152 [cm^3]		
29	[$] 7.45		
30	2/15		
31	131		
32	60 [un^2]		
33	3		
34	1/12		
35	4		
36	16		
37	$4\sqrt{13}$ [cm]		
38	1/4		
39	3366		
40	Y=3/2 x + 11/2		

"Math is Cool" Championships – 2005-06

7th Grade – October 28, 2005

School Name_____Team #_____

Proctor Name_____Room #_____

Final Score:
KEY

First Score

(out of 18)

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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7th Grade – October 28, 2005

School Name_____Team #_____

Proctor Name_____Room #_____

Final Score:
KEY

First Score

(out of 20)

STUDENT NAME_____

Team Contest – Score Sheet

DO NOT WRITE IN SHADED REGIONS

	Answer	2 or 0	2 or 0
1	12.5 [inches]		
2	45 [o]		
3	8 [feet]		
4	13 [cats]		
5	22 [zeros]		
6	3.225×10^{23}		
7	24 [points]		
8	15 [ways]		
9	180 [cm]		
10	3626		

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School Name_____Team #_____

Proctor Name_____Room #_____

Final Score:
KEY

First Score

STUDENT NAME_____

Pressure Round Answers

Answer	
1	$2\sqrt{3}$
2	$24 + 32\sqrt{2}$ [cm]
3	Albert, [$] 19
4	$3\sqrt{15}$ [units]
5	90.25 [cm^2]