"Math is Cool" Championships-2001-02

November 9, 2001

Individual Contest, Grade 8

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.

1. Simplify: $22 + 3 \times 2 + 44$

2. Simplify: $(1024 + 16)^0 \times (-256 + 32)^0$

3. Silly Sampson wears a tie 3/4 of the school year. If a school year is 180 days, how many days total does he wear a tie?

4. Simplify: $3^2 \cdot [(16 - 8) \div 2] + 15 \div 5$

5. Simplify: $8(x + y) - 2(3x - y)$

6. Sarah received a car that had cost $10,000. If her parents paid for half, and her grandma paid for a fourth, how much did her grandma pay?

7. Sue is twice as old as Todd. In 5 years, Todd will be 10 years old. How old is Sue now in years?

8. Jamie can run a mile in 5 minutes and 30 seconds. How long would it take Jamie to run 3.5 miles? Give answer in terms of minutes rounded to the nearest tenths place.

9. What is the sum of the exterior angles of a nonagon?

10. After a math competition, 10 people shake hands with each other exactly once. How many handshakes occur?

11. Jon flips a quarter 3 times. What is the probability that he will flip three heads in a row?

12. Sampson has 5 shirts, 3 pairs of pants, and 2 pairs of shoes. Assuming an outfit is comprised of one shirt, one pair of pants and one pair of shoes, how many possible combinations of outfits does he have?

13. There are llamas and turkeys on a farm. If there are 70 legs and 20 heads, how many llamas are there?

14. Jamie can run a mile in 5 minutes and 30 seconds. What is her average speed in feet per second? (Hint: There are 5280 feet in a mile.)

15. The price of a car was originally $1000. After one day, the price was decreased by 10%. The next day the decision was made to raise the price by 10%. What is the price of the car now?

16. Joel runs five miles due east and then five miles due north. After that, he runs 3 miles due east again. How far (in miles) is he from his original point? (Not how far has he run). Leave answer in radical form.

17. If every dimension of a cube is increased by a factor of 2, what is the ratio of the surface areas of the old cube to the new cube?

18. The sum of two numbers is 24 and the sum of their squares is 488. What is the product of the two numbers?

19. The space shuttle orbits the earth 3π times in 4π hours. How many times does the shuttle orbit in 4 days?

20. Keisha, Libbey, and Colin have a total of $132. If Libbey has 3 times as much money as Keisha has and Colin has half as much as Libbey has, how much money, in dollars, does Colin have?

21. If Abe can eat 5 pizzas in 5 minutes, and Max can eat 5 pizzas in 10 minutes, how long, in seconds, will it take them to eat one pizza together?

22. Silas pushes a boulder up a 31 ft. hill. Every day, he pushes it up 3ft., and every night, it slides back down 1 ft. How many days will it take him to reach the top of the hill?

23. In how many ways can the letters in the word "JOHNSON" be arranged?

24. Is $x = \sqrt{137}$ a solution for the following inequality? $2x - 4 \leq 20$

25. There are 60 cats. The ratio of gray cats to black cats is 8 to 7. How many gray cats are there?

26. Biff has 30 liters of pure ethanol, how much water must be added for the solution to be diluted to 60% ethanol solution?

27. Big Bad Bear Max has a 52 oz. X-Treme Gulp. If he drinks 1 oz. in his first period class, 2 oz. in his second period, 3 oz. in his 3rd period class, and continues on during his 4th, 5th, and 6th periods, then resumes with 1 oz. the next day in his 1st period, in which period will he finish the X-Treme Gulp?

28. Libbey has a 30 page active reading assignment. If she spends 6 minutes and 40 seconds to read one page and takes a 5 minute break every 10 pages, how long, in minutes, does it take her to complete the assignment?

29. You are given 10 feet of fencing to make a cat pen. What is the maximum area the pen could be? (Express answer in terms of π)

Challenge Questions

30. Josh has 6 blue socks, 2 purple socks, and 5 white socks. How many times will he have to draw a sock out of his drawer to ensure that he gets 3 pairs of matching socks?

31. If Ring says "Math is Cool" every 2 minutes, and Laine says the same thing every 3 minutes, how many times will the phrase be said at the same time in 59 minutes if they both start out saying it together?

32. A car travels 5 miles in 20 minutes on the way to its destination, then travels back 5 miles to where it began and makes the trip in 5 minutes. What was the average speed, in miles per hour, for the entire trip?

33. There are 4 widgets in 3 whatsits, 5 whatsits in 7 whosits, and 14 whosits in 13 wrockets. How many widgets are in 39 wrockets?

34. Evaluate: $11100011_2 + 11010011_2$ in base 2

35. What is the farthest distance between vertices in a rectangular prism with lengths of 3, 4, and 12?

36. An urn contains green and red marbles. After drawing a red marble, the probability of drawing a second red marble is 1/5. How many marbles were in the urn originally if the probability of drawing the first red marble was1/4?

37. How many vertices are there on a dodecahedron?

38. If 8 men can assemble 16 machines in 12 days, how many days will be required for 15 men to assemble 50 machines?

39. Sam has 2 ostrich eggs. Sam lives in a building with 36 floors. He is told that if he drops an ostrich egg from a certain floor or higher, the egg will break. If he drops an egg from any lower floor, the egg will not break. His job is to determine the lowest floor at which the egg will break. What is the minimum number of drops required that will guarantee that Sam will know the distinct floor as soon as the second egg breaks?

40. In a certain factory, there are switches numbered from 1 to 100 that are currently in the "on" position. Cale, the caretaker, starts switching the switches to the "off" position, starting with the multiples of 1. He then goes back and switches all of the switches numbered with a multiple of 2 to the opposite direction, and then switches all of the multiples of 3 in the opposite direction again, and continues to do so until he reaches the multiples of 100. How many switches are now in the "off" position?

"Math is Cool" Championships-2001-02

November 9, 2001

Team Contest, Grade 8

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.

1. Simplify: $\sqrt{(\sqrt{2} \cdot \sqrt[4]{\frac{16}{4}} \cdot 81^{\frac{1}{4}} \cdot 2^{\frac{2}{4}} \cdot 3\sqrt{2})}$

2. How many terms are in the sequence {1, 5, 9, 13 ... 101}?

3. You and your friend have devised a dice game in which a roll of a 1, 2, or 3 will win you \$2 and a roll of 4, 5, of 6 wins nothing. The game costs \$1 per roll. If you begin playing the game with \$10, how much would you expect to leave with after 10 times playing the game?

4. Given, $\log_b a = c$ if and only if $a = b^c$. Evaluate: $\log_3 27$?

5. Given $f(x) = x^2 + 3x + 9$, simplify $\frac{f(x+h) - f(x)}{h}$

6. Find the area of the *unshaded* region. The side length of the square is 4. Express your answer in terms of π.

7. Expand: $(a + b)^4$

8. Give the slope-intercept form of a line passing through (-4,-27) and (4, -3).

9. Find the area of the equilateral triangle with side length 6.

10. What is the minimum number of Wednesday's there can be in one year?

"Math is Cool" Championships-2001-02

November 9, 2001

Pressure Round, Grade 8

1. Solve the following equation for x:

$$\frac{3}{x+4} + \frac{7x}{x^2-16} = \frac{6}{x-4}$$

2. How many 8s are there between 0 and 100?

3. There is a seven digit phone number. The sum of its digits is 40. There are three perfect squares, four odd numbers, three even numbers, and all of the value of all the digits are in descending order. What is the phone number?

4. How many days are in four consecutive years assuming one of the years does not end in 00?

5. Evaluate: $2^0(2^0 + 2^1 + 2^2 + 2^3)$

"Math is Cool" Championships-2001-02

November 9, 2001

Mental Math, Grade 8

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

	Person 1	
1	Solve the following equation for x: $2x - 4 = 10$	7
2	What is the largest number in the set: .625, .627, .613, and .621	.627
3	What is the square root of 225?	15
4	Let n be an integer. Write an expression that allows you to find one more than the square of the integer n.	$n^2 + 1$
	Person 2	
1	What is the units digit of $1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8 \times 9 \times 10$?	0
2	What is the lowest common multiple of 12 and 18?	36
3	Solve: $2^2 \times 3^3$	108
4	Let n be an integer. Write an expression that allows you to find 14 less than the integer n.	n-14
	Person 3	
1	What is the area of a triangle with a base of 5 and a height of 4?	10
2	Arielle's hair is 6 inches long now. If it grows $\frac{1}{2}$ inch a month, how long, in feet, will it be a year from now?	1 (ft.)
3	In three games, Sarah scores 4 goals, 0 goals, and 2 goals, respectively. On average, how many goals does she score a game?	2
4	In the equation $x + y + z = 72$, what is z when $x = 13$ and $y = 27$?	32
	Person 4	
1	Solve for n: $257^n = 257^{17} \div 257^{12}$	5
2	Evaluate: $\frac{1}{4} \cdot \frac{1}{3} \cdot \frac{1}{2}$	$\frac{1}{24}$
3	What is 30 divided by one-half?	60
4	Find the volume of a cube with a side length of 3.	27

"Math is Cool" Championships-2001-02

November 9, 2001

Individual Multiple Choice Contest, Grade 8

Sampsonwood's Theme Park

	Pythagorean Twister	Archimedes Spiral of Doom	Euclid's Vomit-Inducer	The One-Sided Moebius Strip	The Klien Barrel
Keisha	2		3	5	7
Lee	3	4	5		2
Max		5		11	13
John	3	4	2	7	6
Cale		1	3	7	5
Hamilton	2	8	6		8
Wayne		13	11	9	3

1	After riding all of the rides all day, Wayne found that he had ridden the Pythagorean Twister $\frac{1}{5}$ of the total number of times he rode. How many times did he ride the Pythagorean Twister? A) 9 B) $\frac{36}{5}$ C) 6 D) 8 E) answer not given
2	John and Wayne both want to ride the Pythagorean Twister, which has 30 seats. Assuming each seat is adjacent to two other seats and the Pythagorean Twister is circular, what is the probability that John and Wayne will sit next to each other? A) $\frac{1}{15}$ B) $\frac{1}{30}$ C) $\frac{2}{29}$ D) $\frac{1}{29}$ E) answer not given
3	Keisha is annoying and curious. She wants to know how many times, total, that everyone went on a ride. She says, thank you. A) 210 B) 211 C)301 D) 201 E) answer not given

4	Max is 4'3" tall. If all the rides at Sampsonwood's Theme Park require someone to be at least 60" tall to ride, how tall must the platforms of Max's shoes be if he is to ride the rides? A) 1'9" B) 1'7" C) 0'7" D) 0'9" E) answer not given
5	Hamilton loves prime numbers and decides to finish the day having his total sum of rides be a prime number. He is also afraid of the One-Sided Mobius Strip. Therefore, he will ride it the minimum number of times necessary to have his total number of rides be prime. How many times will he ride the One-Sided Mobius stip? A) 5 B) 3 C) 7 D) 2 E) answer not given
6	Max rode the Pythagorean Twister $2 \cdot 3^0$ more times than Cale. How many times did Cale ride the Pythagorean Twister, if the total number of times everyone rode the Pythagorean Twister is 25? A) 2 B) 4 C) 6 D) 8 E) answer not given
7	Archimedes Spiral of Doom takes 2 minutes to ride and Keisha had to wait in line the first time for 5 minutes. The second time, she waited 9 minutes, the third, also 9 minutes, the fourth, 13 minutes, the fifth, 2 minutes, the sixth, 6 minutes, and the last few times it took 8 minutes, 43 minutes, 7 minutes, 5 minutes, and 11 minutes. If she spent a total of 140 minutes at Archimedes Spiral of Doom, how many times did Keisha get to ride? A) 9 B) 10 C) 11 D) 14 E) answer not given
8	Lee loves rides and circles, so he rode rides a total of $(20\pi^3) \cdot (\frac{\pi}{\pi^4})$ times. How many times did he ride the One-Sided Moebius Strip? A) 6π B) 6 C) 4 D) 5π E) answer not given
9	Max rode the Euclid's Vomit-Inducer the number of times he rode Archimedes Spiral of Doom minus 2 plus the number of times he rode the One-Sided Moebius Strip plus 1. A) 15 B) 17 C) 20 D) 10 E) answer not given

"Math is Cool" Championships-2001-02

November 9, 2001

Grade 8

College Knowledge Bowl Questions #1

1	What is the distance between the points (1,2) and (4,6)?	5
2	What is the tens digit of $1226 \times 42 - 14$?	7
3	Jamie scored an 87, a 91, a 56, a 106, and a 97 on the past 5 tests she took. What score must she get on her next test to get an average of 92?	115
4	How many factors does 36 have?	9
5	What is the smallest value of x that satisfies the equation $(x+7)^2 = 64$	-15
6	Evaluate when $x = 3$: $2x^2 + 5x - 18$	15
7	Sarah and Carl have camels and kangaroos. If there are 20 legs and 7 heads, how many camels do they have?	3 (camels)
Number 8 is an extra question. Only use it if needed.		
8	What is the radius of a sphere with surface area 100π?	5

"Math is Cool" Championships-2001-02

November 9, 2001

Grade 8

College Knowledge Bowl Questions #2

1	Dan can do math problems at a rate of 5 problems a minute, with an accuracy of 3 problems correct. How long will it take him to get 51 problems correct?	17 (min)
2	Randy needs to see 1,440 cows before he fall asleep. If he sees one cow every 3 seconds, how many minutes will it take for him to fall asleep?	72 (min)
3	What is the probability that Makaya will roll a sum of 6 on two fair six-sided dice?	$\frac{5}{36}$
4	Libbey and Christine bought 170 lb. of meat. If pork costs \$1.50 per lb. and lamb costs \$2.75 per lb., and they bought \$103.50 worth of pork, how many pounds of lamb did they buy?	101 (lb.)
5	Solve for x: $16^x = 64$	3/2 or 1.5
6	Libbey has 16 gemstones on each bracelet, and she has 208 gemstones total. How many bracelets does she have?	13
7	Evaluate for x = 5: $2x^3 + 3x^2 + 4x + 5$	350
Number 8 is an extra question. Only use it if needed.		
8	3.2 is what percent of 64	5(%)

"Math is Cool" Championships-2001-02

November 9, 2001

Grade 8

College Knowledge Bowl Questions #3

1	How many feet are in $5\frac{1}{3}$ yards?	16 (ft)
2	What is $27^{\frac{2}{3}}$?	9
3	An integer n when divided by 7 has a quotient of 15 and a remainder of 4. What is the integer n?	109
4	Solve: $2^3 + 2^2 - \sqrt{4}$	10
5	A moth can beat its wings 10 times a second. After drinking a triple-shot caramel latte, the rate increases by 30%. How many times does it beat its wings in a half hour if it has just had a triple-shot caramel latte?	23,400
6	The Lewis and Clark Math Team found that they could arrange themselves in groups of 7, 14 and 21 with one left over. What is the minimum number of students that could be on the Math Team?	43
7	Three pennies are thrown at once. What is the probability that exactly 2 are heads?	3/8
Number 8 is an extra question. Only use it if needed.		
8	In a standard deck of 52 cards, what is the probability of drawing, with replacement, a jack and then a 7?	$\frac{1}{169}$

Math is Cool" Championships -- 2001-02

8th Grade - November 9, 2001

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	72		
2	1		
3	135 (days)		
4	39		
5	$2x + 10y$		
6	($)2,500		
7	10 (years)		
8	19.3 (min)		
9	360(°)		
10	45(handshakes)		
11	1/8		
12	30 (outfits)		
13	15 (llamas)		
14	16 (ft/s)		
15	($)990		
16	$\sqrt{89}$ (miles)		
17	1:4		
18	44		
19	72 (orbits)		
20	($) 36		

	Answer		
21	40 (sec)		
22	15 (days)		
23	1260		
24	yes		
25	32 (cats)		
26	20 (liters)		
27	4th (period)		
28	210 (minutes)		
29	$25/\pi$ (ft^2)		
30	8 (times)		
31	10 (times)		
32	24 (mph)		
33	40 (widgets)		
34	$11011011O_{(2)}$		
35	13		
36	16 (marbles)		
37	20		
38	20(days)		
39	8		
40	10 (switches)		

Math is Cool" Championships -- 2001-02

8th Grade - November 9, 2001

School Name_____Team #_____

Proctor Name_____Room #_____

Key

1st Score

Out of 18

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

Math is Cool" Championships -- 2001-02

8th Grade - November 9, 2001

School Name_____Team #_____

Proctor Name_____Room #_____

Key

Team Contest-Score Sheet

1st Score

Out of 10

DO NOT WRITE IN SHADED REGIONS

	Answer		
1	6		
2	26		
3	$10		
4	3		
5	2x+h+3		
6	$16 - 4\pi$		
7	$a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4$		
8	y = 3x-15		
9	$9\sqrt{3}$		
10	52		

Math is Cool" Championships -- 2001-02

8th Grade - November 9, 2001

School Name_____Team #_____

Proctor Name_____Room #_____

Key

Pressure Round - Score Sheet

	Answer		
1	(x =) 9		
2	20		
3	987-6541		
4	1461		
5	15		