"Math is Cool" Masters-2000-01

Sponsored by: Western Polymer Corporation and ZAK Designs

7^{th} & 8^{th} Grade - May 12, 2001

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. An angle in radians is converted into degrees by multiplying by the constant $\frac{180}{\pi}$. What is the measure in degrees of an angle with radian measure $\frac{\pi}{2}$?

2. Solve for x: $2x + 36 = 70$

3. Evaluate when x = 2 and y = 5: $2xy^2 + 5y$

4. Evaluate: $\frac{2}{5} + \frac{5}{6} - \frac{6}{15}$

5. How many points are necessary to determine a plane?

6. Evaluate: $(2000^0 - 200^0)x(20^0 + 2^0)$

7. What is the 2000^{th} digit in the decimal expansion of 2/9?

8. Evaluate for x = 1: $\frac{x^2 - 6x + 8}{x - 4}$

9. Evaluate: (7)(6)(5)..... (-5)(-6)(-7)

10. This year, Krista averaged $18 per concert ticket. If she spent a total of $126 on concerts this year, how many concerts did she attend this year?

11. Apples cost $.52 per pound and mangos cost $1.32 per pound. If Oscor buys 4.5 pounds of apples and 6.25 pounds of mangos, how much does she spend in dollars?

12. What is the y-intercept of the equation $y=3x-\pi$?

13. Dustin, with nothing better to do, starts saying all the digits of all the positive integers, starting at 1. What is the 25^{th} digit he will say?

14. What is the length of a line segment with endpoints (6,18) and (1,6)?

15. Two gears are placed next to each other, one with 8 teeth and the other with 24 teeth. How many complete rotations will the smaller gear make in the time it takes the large gear to make 180 complete rotations?

16. For every 15 minutes of class, Tangent Man spends 10 minutes teaching the class, and spends 5 minutes being distracted by the class. Class lasts 50 minutes a day for 180 days. How many hours does Tangent Man actually teach the class in 180 days?

17. Nicole has a picture that is 3 x 5 inches. The photograph was printed with 1200 DPI (dots per square inch). How many total dots are there on the picture?

18. What is the sum of the interior angles of a pentagon, in degrees?

19. A pyramid is created by stacking blocks in squares. For instance, the top layer has 1 block, the second layer has 4 blocks, the third layer has 9 blocks. How many blocks are in a pyramid with 5 layers?

20. On planet Silasisfunnylooking, there are two types of aliens: ChittyChittys and Bangbangs. A ChittyChitty has 3 feet and a Bangbang has 7. If there are 21 aliens and Astronaut WalrusWalrus counts 119 feet, how many ChittyChittys are there?

21. Stevie has a list of all the integers from 1 to 100, inclusive. He proceeds to cross out all the multiples of 2, 4, and 6. How many numbers are left?

22. How many distinct non-overlapping triangles can be created in a convex quadrilateral by connecting the vertices?

23. How many ways can two boys and two girls be seated in a row of four seats if the boys must be separated?

24. When a Superball is dropped out of a 2nd story window, it bounces 12 feet. Dropped out of a 3rd story window, it bounces 17 feet, and dropped out of a 4th story window, it bounces 22 feet. How high will it bounce when dropped out of a 101st story window?

25. A pipe fills a swimming pool at a rate of 18 cubic feet per minute. The pool has a width of 15 feet, a length of 50 feet, and an average depth of 6 feet. How many minutes will it take to fill the pool?

26. What is the volume of a cube with surface area of 24 square inches?

27. How many points are 5 units away from the origin that have integer values for both the x and y coordinates?

28. The pressure of a gas is inversely proportional to its volume. If the volume is 50 cc, the pressure is 20 psi. What is the pressure, in psi, when the volume is 25 cc?

29. In triangle ABC, a median is drawn from point A to the midpoint of BC, labeled D. If the area of triangle ABC is 38, what is the area of triangle ABD?

30. Find the units digit of $\left(\left(\left(2\right)^{3}\right)^{4}\right)^{5}$

Challenge Questions

31. Evaluate: $\frac{n!}{(n-1)!} + n$ when n=100.

32. At the "Math is Cool" Championships for high school students, 2/5 of the students are competing for the first time, 3/10 are competing for the 2nd time, and 270 have competed three or more times. How many students are competing?

33. 7 pairwise non-collinear points are drawn in a plane, and then connected with lines. What is the maximum number of lines that can be drawn?

34. What positive number equals one plus its own reciprocal?

35. With 100 feet of fence and a wall 20 feet long, what is the area, in square feet, of the biggest square or rectangular enclosure you can build for your pet badger?

36. Libbey, Christine and Keisha are racing. The probabilities that Libbey, Christine and Keisha will win are 1/3 , 1/4, and 5/12 respectively. The day before the race Keisha decides not to compete because she must prepare for Mu Alpha Theta spring math competition. What is the probability now, that Libbey will win the race?

37. A bull is tied to an outside corner of a barn 50 feet by 30 feet with a 60 foot long rope. What is the total area, in square feet, he has available to roam outside of the barn?

38. Lee can row his boat on Uber Lake at 5 miles per hour. On the Rebu River it takes him the same amount of time to row 5 miles downstream as it does to row 3 miles upstream. What is the speed of the river current in miles per hour?

39. Solve for x: $x - 2 = \sqrt{12 + \sqrt{12 + \sqrt{12 + \ldots}}}$

40. What is the volume of an octahedron with side length 6?

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Individual Multiple Choice Contest

1. How many letters are in the alphabet if A = 1, B = 2, etc., and you exclude all letters with a prime value?
   A) 9 B) 18 C) 17 D) 8 E) Answer not given

2. Dustin accidentally hits Krista's car. There is $1,400 worth of damage to Dustin's car and $2,100 worth of damage to Krista's car. Since Krista was speeding when Dustin hit her, the insurance company decides she is responsible for 10% of the damage to her car, and Dustin must pay the rest. How much does Dustin have to pay to get both cars fixed?

   A) $3290 B) $1400 C) $ 3000 D) $3102 E) Answer not given

3. There are 2 factional widgets for every 3 tinkerbokers. There is 1 tinkerboker for every 5 hankerpanks. How many factional widgets are in 11 hankerpanks?
   A) 10 B) 55 C) 22/15 D) 15/44 E) Answer not given

4. What is the equation of a line perpendicular to the line $2x + 3y = 12$ and passing through the origin, in slope intercept form?

   A) $y = 2x/3$ B) $y = -2x/3$ C) $y= -x/2$ D) Answer not given

5. Given: $f(x) = -3x + 14$
   $g(x) = x^2 + 2$
   Calculate: $g(f(7))$

   A) 51 B) 25 C) -7 D) -139 E) Answer not given

6. The point (3, -4) is in what quadrant?
   A) 1 B) 2 C) 3 D) 4 E) Answer not given

7. Enrico Suave makes soap during the night. Soap is made out of fat. It costs him $3.00 per pound for fat. 10% of the fat is wasted and he calculates that he spends $60 on supplies over a month. If he charges $15.00 per 1/4 pound of soap, to the nearest pound, how many pounds of fat will Enrico need, to make $552 in a month?
   A) 10 B) 16 C) 12 D) 9 E) Answer not given

8. Solution A is a solution of water and hydrochloric acid and is 70% water. How many liters of water should be added to 30 liters of solution A to create a solution with 20% hydrochloric acid?
   A) 30 B) 10 C) 5 D) 15 E) Answer not given

9. If Upton drove to work at an average speed of 30 mph and back home at an average speed of 20 mph, what was his average speed, in miles per hour, for the whole trip?

   A) 25 B) 27 C) 22 D) 50 E) Answer not given

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7^{th} & 8^{th} Grade - May 12, 2001

Team Contest

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1. What is the perimeter of a semicircle with area 2π ?

2. If Joel reverses the digits on his favorite positive two digit number and subtracts the new number from the old, the difference is 72. What is Joel's number? (Assume that the digits in Joel's favorite number are positive.)

3. Evaluate: $10^{-2} + 10^{2}$ (Put in decimal form)

4. If the earth is 93 million miles from the sun, and the moon is 180,000 miles from the earth, what is the maximum possible distance from the sun to the moon? Express your answer in scientific notation.

5. What is the length of the longest leg of a 30-60-90 triangle with hypotenuse of length 18?

6. Dustin's hair grows one and a half inches every year. His hair is now two and a half inches long. If he shaved his head, how many months (assume all months are of equal length) would it take to grow his hair back to its current length?

7. There are 15 balloons at a store with papers inside that have discounts on them. One has 75% off, two have 50% off, five have 25% off, and seven have 10% off. What are the chances of getting at least 50% off if you choose one at random?

8. If Krista were to give Amy one of her candy bars, Amy would have twice as many as Krista. If Amy were to give Krista one of her candy bars, they would both have the same number. How many candy bars does Krista have?

9. Mara's sea-food warehouse sells bushels of chickens. If the price increased by 20% by what % must the price be decreased to return to the original price. (Round to the nearest percent)

10. Silas always gets 45 out 50 right when he takes a test. What is the probability that given 3 questions that he gets all three questions correct.

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Pressure Round

1. Ana's favorite palindrome number has 8 digits. The 3^{rd} digit is greater than the 1^{st} digit and less than the 4^{th} digit. The 4^{th} digit is a 6 and the last is two times the 5^{th} digit divided by 3. The greatest single digit prime number occurs twice. What is Ana's favorite palindrome number?

2. At Bulk-N-Save, the Math Team can buy candy bars at $30 for a box of 144. At the grocery store, candy bars are 3 for a dollar. How much can the Math Team save by buying 288 candy bars at Bulk-N-Save?

3. Evaluate $2^{10} - 10^2 + 3^5 - 2^4 - 40$

4. Evaluate: $((x + 1^2) + 1)^2$ when x=10

5. The probability of drawing a red marble from a bowl of red, white, and blue marbles is 5/9. If the probability of drawing a white marble is the same as drawing a blue marble, what is the probability of drawing a white marble?

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7^{th} & 8^{th} Grade - May 12, 2001

Mental Math

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

	Person #1	
1	What is the volume of a cube with side length 6 cm?	216 (cm^3)
2	How many ways can the letters in "DREW" be arranged?	24(ways)
3	What is the sum of the first five prime numbers?	28
4	What is the first square number greater than 100?	121
	Person #2	
1	What is the area of a right triangle with legs of 16 and 5?	40
2	What is the probability of getting a prime number when a die is rolled?	$\frac{1}{2}$
3	Solve for x: $x^2 - 3 = 22$	$x = \pm 5$
4	If today is Saturday, what day of the week will it be 100 days from now?	Monday
	Person #3	
1	What is the radius of a circle with area 81π?	9
2	What is $\frac{1}{2}$ of 2/3 of 3/4?	1/4
3	How many "3x5" cards can be cut from a piece of paper 3 feet by 5 feet?	144(cards)
4	Simplify: 1/8 - 1/6	-1/24
	Person #4	
1	What is the length of the hypotenuse of a right triangle with legs 10 and 24?	26
2	What is the sum of the first ten even natural numbers?	110
3	Evaluate: 5!	120
4	What is the area of a trapezoid with bases 4 and 12 and a vertical height of 5?	40

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College Knowledge Bowl Questions #1

1	Silas has a collection of foreign coins worth 8 cents and 5 cents. What is the largest price of something he could not pay for exactly, using 8-cent and 5-cent coins?	27 (cents)
2	What is the area of a trapezoid with bases of lengths 18 and 24, and a height of 6?	126
3	How many diagonals can be drawn in a polygon with 13 sides?	65
4	What is the sum of the exterior angles of an octagon?	360(°)
5	The numbers on my calculator buttons have worn off. If button *A* *times* button B *plus* button *C* = 71, what is the value of button *C*?	8
6	Three of the angles of a quadrilateral measure 70 degrees each. What is the measure of the fourth angle?	150 (degrees)
7	A goat is tied to a post with a 32 foot leash in the middle of a field. How much area can the goat roam over?	1024π (square ft.)
	Extra Question: Only use it if needed	
	If f(x) = 3x-18, what does x equal when f(x) is 18?	12

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College Knowledge Bowl Questions #2

1	Drew is the tallest guy in his group of 5. Adam is shorter than Burford. Pat is not the shortest. Silas is taller than Pat but is not the third tallest. Burford is not one of the three tallest people. Who is the shortest in Drew's group?	Adam
2	A collector's edition solar-powered flashlight is sold for three times the value of a regular flashlight. The store then marks the price of solar-powered flashlights down ten percent. If a solar-powered flashlight costs $5.40, after the discount, what is the price of a regular flashlight?	$2
3	Solve for x: $x^2 - x - 12 = 0$	x=4 or -3 Need both answers
4	A "Math is Cool" cup can hold 10 oz of water. What is the least number of full "Math is Cool" cups that would cause a 1.5 gallon basin to overflow?	20(cups)
5	Evaluate: $\frac{10!}{6!}$ (Read as 10 factorial divided by 6 factorial)	5040
6	What is the product of the two smallest prime numbers greater than 47?	3127
7	Oksana needs an average of 7.5 hours of sleep per night to be rested for her "Math is Cool" competition on Friday. On Monday she gets 4 hours of sleep. On Tuesday she gets 5 hours of sleep. On Wednesday she gets 6 hours of sleep. At least how many hours of sleep must she get on Thursday to be well rested?	15 (hours)
	Extra Question: Only use it if needed	
	Evaluate 0!	1

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College Knowledge Bowl Questions #3

1	If Silas can eat 3 cookies in 10 seconds and Drew can eat 10 cookies in one minute, how many minutes will it take for them, together, to eat 420 cookies?	15 (minutes)
2	How many pints are in 3 gallons?	24(pints)
3	If Berde has 2 pairs of shoes, 3 pairs of pants, and 8 shirts, how many outfits can he make?	48(outfits)
4	How many factors does 24 have?	8(factors)
5	What is the lowest prime greater than 200?	211
6	Drew is going to start losing half his hair every year. He is 18 and has all of his hair now. How old will he be when he has 1/32 of his hair?	23(years old)
7	Evaluate 7!	5040
	Extra Question: Only use it if needed	
	What is the surface area of a cylinder with radius 2 and height 2?	16π(square units)

"Math is Cool" Masters -- 2000-01

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School Name_____Team #_____

Proctor Name_____Room #_____

Key

Name:_____

1st Score

Out of 40

Individual Contest - Score Sheet

DO NOT WRITE IN SHADED REGIONS

	Answer	1 or 0	1 or 0
1	90 (degrees)		
2	17		
3	125		
4	5/6		
5	3(points)		
6	0		
7	2		
8	-1		
9	0		
10	7(concerts)		
11	($)10.59		
12	(0,- π) or -π (only one answer)		
13	7		
14	13		
15	540(rotations)		
16	100(hours)		
17	18000(dots)		
18	540(°)		
19	55(blocks)		
20	7(ChittyChittys)		

	Answer	1 or 0	1 or 0
21	50(numbers)		
22	4		
23	12(ways)		
24	507 (feet)		
25	250 (minutes)		
26	8 (cubic inches)		
27	12		
28	40 (psi)		
29	19		
30	6		
31	200		
32	900(students)		
33	21		
34	$(1+\sqrt{5})/2$		
35	900(sq ft)		
36	4/7		
37	2950π(sq ft)		
38	5/4 (miles per hour)		
39	6		
40	$72\sqrt{2}$		

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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, 0 or 2	-1, 0 or 2
1	C		
2	A		
3	C		
4	D		
5	A		
6	D		
7	C		
8	D		
9	E		

"Math is Cool" Masters -- 2000-01

7th and 8th Grade - May 12, 2001

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	$4 + 2\pi$		
2	91		
3	100.01		
4	9.318×10^7		
5	$9\sqrt{3}$		
6	20(months)		
7	1/5		
8	5		
9	17(%)		
10	729/1000		

"Math is Cool" Masters -- 2000-01

7th and 8th Grade - May 12, 2001

School Name_____Team #_____

Proctor Name_____Room #_____

Key

Pressure Round - Score Sheet

	Answer		
1	47,566,574		
2	$36		
3	1111		
4	144		
5	2/9		