"Math Is Cool" Championships-1997-8

November 7, 1997 8th Grade

Individual Contest

Express all answers as reduced fractions unless stated otherwise.
Leave answers in terms of π.
Do not round any answers unless stated.

1. What is 34th digit to the right of the decimal point in the decimal expansion of 2/13?

2. Solve for n: $n! = (n-1)! + (n-2)!$

3. Find the length of the diagonal of a square whose area is numerically equal to the perimeter.

4. Evaluate:

$$5^3 - \cfrac{3^2 - (8 - 11)}{7 - \cfrac{4 - (4 - 18)}{5 - \cfrac{2^2 + 12}{5 + 3}}}$$

5. One year the population of a town increases by 2%. It decreases by 5% the next year. If the population is then 62 less than the original population, what was the original population of the town?

6. The sum of two consecutive odd integers divided by one-half is equal to fifty-six. What is the smallest of the two integers?

7. Factor completely: $x^2-11x-12$

8. What is the sum of two consecutive angles in a regular parallelogram?

9. Katie drives from Aytown to Beetown at 70 m.p.h., then drives back along the same route at 20 m.p.h. What was her average speed? (Write answer as a mixed number)

10. Where does the line containing the points (0,5) and (7/3,12) and the line containing the points (0,-2) and (-9,-8) intersect?

11. What is the distance between the points (-1,-2) and (4,10)?

12. Write $.\overline{57}$ as a fraction.

13. The ratio of a the perimeter of two similar octagons is 5:3. What is the ratio of their areas?

14. What is the volume of a cone with base area of 21 and a vertical height of 91?

15. What is the length of the median to the hypotenuse for a right triangle with hypotenuse length 14?

16. Two pipes are used to fill a tube. Used alone one pipe can fill the tube in 10 minutes and the other 15 minutes. If both pipes are used, how long will it take to fill the tube?

17. The difference between your parents' age is 4. What is the difference in their ages 25 years from now?

18. An urn contains 5 red marbles, 17 green marbles, 9 purple marbles, and 11 orange marbles. On the first draw what is the probability that the marble will be purple?

19. There are ostriches and elephants in a field. There is a total of 44 feet and 17 heads, how many elephants are in the field?

20. Eliminate all radicals: $\sqrt{135+\sqrt{75+\sqrt{32+\sqrt{16}}}}$

21. A math team with 120 students wins first place. If each student of the winning team shook the hands of all their team members once, how many hand shakes took place?

22. $A \otimes B = A + B - AB$

$A \Leftrightarrow B = \dfrac{A+B}{A-B}$

Find: $(3 \otimes 5) + (8 \Leftrightarrow 4)$

23. What is the smallest number that is the product of five distinct primes?

24. Silas multiplied a number by its square root in his head and got a product of 15625. What was Silas's original number?

25. What is the area of a square inscribed in a circle with radius of length $2\sqrt{2}$?

26. If two six-sided die are rolled, what is the probability their sum is 9?

27. If one diagonal of a rhombus is 8 units long, and the other is 6 units long, what is the perimeter of the rhombus?

28. If x, y, and z are positive integers, solve for x in terms of y and/or z: $\dfrac{xy}{z} = \dfrac{yz}{x}$

29. What is the diameter of a circle with area equal to 289π?

30. What is the sum of 12_8 and 15_7 in base 3?

"Math Is Cool" Championships-1997-8

Individual Multiple Choice Contest, 8th Grade

November 7th , 1997

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1. If n is an integer which one of the following is a perfect square:

A) $49n^2 - 16n - 4$ B) $49n^2 - 42n + 9$ C) $n^2 + 4$ D) answer not given E) infinite

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2. How many ordered pairs of positive odd integers (x,y) satisfy $x + y = 1997$

A) 0 B)1 C)998 D) answer not given E) infinite

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3. If $3^x = 5$, what is the value of 3^{2x+3}?

A)$\log_3 5$ B) 1/120 C) 675 D) answer not given E) undefined

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4. How many integer solutions are there to equation $|5x + 3| \leq 101$.

A) 37 B) 19 C) 20 D) answer not given E) infinite

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5. What month will it be 1231 days after February 28th 1997?

A) July B) August C) September D) answer not given E) Not enough information given

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6. A square table is positioned on an un-level surface so that all four legs of equal length are sitting firmly on the surface. What is the least number of degrees θ ($\theta > 0$) that you can rotate the table and the table will still be stable?

A) 45° B) 90° C) 360° D) answer not given E) Not enough information given

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7. Of 150 students , 50 are taking math and 32 are taking science. Of the 32 who are taking science, 2 also take math. How many neither take math nor science?

A) 68 B) 100 C) 66 D) answer not given E) Not enough information given

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8. What is the base 7 number 3456_7 in base 10?

A) 3456 B) 3455 C) 1266 D) answer not given E)undefined

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9. What is the slope of the line perpendicular to y = 3 and passing through (2, 3)?

A) 0 B) 1 C) 2/3 D) answer not given E)undefined

"Math Is Cool" Championships-1997-8

Team Test, 8th Grade

November 7, 1997

Express all answers as reduced fractions in terms of radicals

1. If a team of four can do 10 problems in 15 minutes, how long does it take one person to do one problem in terms of seconds?

2. Eho bought 8 chickens for his chicken ranch. The price for each chicken was the same. If the total cost for all 8 chickens including 5% sales tax was $27.30, What was the price of one chicken without tax?

3. How many distinct triangles have a perimeter of 10 units and integer length sides?

4. Given $\left(\frac{x}{2}-\frac{2}{x}\right)^2 = 0$, find the value of x^4.

5. How many cubes of 5 centimeters on a side does it take to make a cube 1 meter on a side?

6. A 5 by 5 square is composed of 25 unit squares. How many unit squares are entirely contained within the inscribed circle of diameter 5?

7. Simplify: $\frac{7!5!3!1!}{6!4!2!0!}$.

8. How many three-digit lock combinations can be created if each digit is one of the numbers from 0 through 5?

9. In your math class you want an average of 90% on your tests. Your average on your first 4 tests is 88%. What must you receive on the fifth test to have an average of 90%

10. You increase the sides of a square by 30%, what is the percentage of increase of the area?

"Math Is Cool" Championships-1997-8

Pressure Round Contest, 8th Grade

November 7th , 1997

1. There are 20 coins in a bank. If the coins are only dimes and quarters and they total $4.25, how many dimes are there?

2. Roy can do his home work assignment in three hours, while Shawn can do the same homework assignment in two hours. How long would it take them to complete the homework assignment if they were working together?(Give answer in hours and minutes)

3. Without the wind blowing a plane can from point A to point B in 10 hours. With a tail wind, the same trip takes 8 hours. Assuming point A and B are 800 miles apart, how fast is the wind blowing?

4. Solve for x: $\sqrt{21+\sqrt{x+3}} = 5$

5. Find the sum of: 3+6+9+.....+51

"Math Is Cool" Championships-1996-7

March 7, 1997

Mental Math, Grade 8

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

Person #1

1. What is one-fifth the sum of 13 and 12?
2. What is the radius of a circle with diameter 36π?
3. What is the area of a square with perimeter 24?
4. Evaluate 13 squared.

Person #2

1. What are the prime factors of 18
2. The sum of two angles in a triangle is 103^0. What is the measure of the third angle in degrees.
3. Evaluate 4 factorial.
4. What is the lowest common multiple of 5 and 23?

Person#3

1. What is the sum of the first four primes?
2. What is 35% of 70?
3. What is the result of the sum of nine and the product of seven and eight?
4. The sum of two numbers is 34 while the difference between them is four. What is the smaller of the two?

Person#4

1. What is the sum of the exterior angles of a pentagon?
2. The length of the legs of a right triangle are five and 12. What is the length of the hypotenuse?
3. Evaluate three to the fifth power?
4. Evaluate $1 + 2 + 3 + ...+ 7 + 8$.

"Math Is Cool" Championships -- 1997-8

November 7, 1997 8th Grade

College Knowledge Bowl Questions #1

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1. How many multiples of both 3 and 4 are there between 0 and 100 inclusive?

Answer:9

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2. If a coin is tossed 3 times what is the probability that heads appears at least once?

Answer: 7/8

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3. What are the prime factors of 144?

Answer: 2 and 3

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4. Solve for x: $2^x = 512$

Answer: 9

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5. Evaluate: 2 + 4 + 6 + 8 + ... + 16 + 18 + 20

Answer: 110

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6. State the next number in the sequence of: 2, 3, 6, 11, 18, ...

Answer: 27

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7. If the difference between two numbers is 9, and their product is 36, what is the larger number?

Answer: 12

Extra: Only Use if Needed

If Roy folds 3 papers every 6 seconds and Travis staples 20 papers a minute, how long will it be before Roy folds 50 more papers than Travis staples?

Answer: 300 seconds or 5 minutes

"Math Is Cool" Championships-1996-7

November 7, 1997 8th Grade

College Knowledge Bowl Questions #2

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1. There is 24 pigs and 12 chickens in a field. How many feet are in the field?

Answer: 120

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2. A student bought a calculator for 100 dollars. Later he sold the calculator for $115. He then repurchased the same calculator for $125. He then sold it for $135. What was his profit?

Answer: $25

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3. Find the greatest value:

a. 63% b. 5/8 c. $\sqrt{\frac{5}{8}}$ d. $\left(\frac{5}{8}\right)^2$

Answer: c or square root of 5/8

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4. 2.5 is what percent of 40?

Answer: 6.25%

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5. How many distinct arrangements of the letters in the word "algebra" are possible? (None of the letters are capital.)

Answer: 2520

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6. What is the fewest number of sundays that there can be in any one calender year?

Answer: 52

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7. Simplify: $\sqrt[3]{\frac{27}{64}}$

Answer: 3/4

Extra Question if needed:
A school choir found they could arrange themselves in rows of 6, 8 and 10 with no one left over. What is the minimum number of students in the choir?

Answer:120

"Math Is Cool" Championships-1997-8

November 7, 1997 8th Grade

College Knowledge Bowl Questions #3

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1. A volleyball team wins 400 of its first 450 games. How many of the remaining 550 games must they win in order to average 82.3% wins for the season/

Answer: 423

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2. The measure of the angles of a triangle ore in ratio 4:5:6.What is the measure of the largest angle in degrees?

Answer: 72^0

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3. With the draw of a single card from a deck of 52 cards, what is the probability the card is red or a black king?

Answer: 7/13

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4. If each dimension of a cube is tripled, what is the ratio of the new volume to the old volume?

Answer: 27:1

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5. How many consecutive zeros are found at the end of 50 factorial?

Answer: 12

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6. Twelve people attended a party. The males all ate 2 cookies each and the females all ate 7 cookies each. If a total of 49 cookies were eaten, how many females attended the party?

Answer:5

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7. Two trains are headed directly towards each other at 90 mph and 74 mph. How many miles apart are they 30 minutes before impact?

Answer: 82 miles or 82

Extra question if needed:

How many ordered integral triples (a,b,c) have the property that each number is the product of the other two?
Answer: 2

"Math Is Cool" Championships -- 1997-8

November 7, 1997 8th Grade

Individual Contest - Score Sheet

Score:

KEY

Full Name:_____ School:_____

DO NOT WRITE IN SHADED REGIONS

	Answer		
1.	8		
2.	2		
3.	$4\sqrt{2}$		
4.	113		
5.	2000		
6.	13		
7.	(X-12)(x+1)		
8.	180^0		
9.	31 1/9		
10.	(-3,-4)		
11.	13		
12.	19/33		
13.	25:9		
14.	637		
15.	7		

	Answer		
16.	6 or 6minutes		
17.	4		
18.	3/14		
19.	5		
20.	12		
21.	7140		
22.	-4		
23.	2310		
24.	625		
25.	16		
26.	1/9		
27.	20		
28.	X=Z or Z		
29.	34		
30.	211_3		

"Math Is Cool" Championships -- 1997-8

November 7, 1997 8th Grade

Individual Multiple Choice Contest - Score Sheet

Score:
KEY

School:_____ Team #:_____

DO NOT WRITE IN SHADED REGIONS

Correct responses are worth 2 points, incorrect responses are worth -1 point and no response is 0 points.

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

"Math Is Cool" Championships -- 1997-8

November 7, 1997 8th Grade

Team Contest - Score Sheet

Score:
KEY

School:_____ Team #:_____

DO NOT WRITE IN SHADED REGIONS

	Answer		
1.	360 or 360 seconds		
2.	$3.25		
3.	2		
4.	16		
5.	8000		
6.	9		
7.	105		
8.	216		
9.	98%		
10.	69%		

"Math Is Cool" Championships -- 1997-8

November 7, 1997 8th Grade

Pressure Round - Score Sheet

	Answer		
1.	5		
2.	1hr 12min		
3.	20 mph		
4.	13		
5.	459		

"Math Is Cool" Championships -- 1997-8

November 7, 1997 8th Grade

Mental Math - Score Sheet

School:_____ Team #:_____

A. 1. 5

2. 18π

3. 36

4. 169

B. 1. 2, 3

2. 77

3. 24

4. 115

C. 1. 17

2. 24.5

3. 65

4. 15

D. 1. 360°

2. 13

3. 243

4. 36