"Math Is Cool" Championships-1998-9

Sponsored by: The Engraver

8th Grade - October 30, 1998

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.

1. Find the percent of the cost increase of an item if in 1966 the cost was $24.00 and in 1998 the cost was $66.00.

2. The mean of three consecutive integers is 98. What is the largest of these three integers?

3. Write $.\overline{232}$ as a quotient of two integers.

4. Find a point that is equidistant from (3,8) and (-5, 12), such that the original two points and the new point are collinear.

5. Identify the next term in the sequence.
   2, 3, 5, 7, 11, 13, 17, 19, 23, 29,____

6. What is the sum of the interior angles of a regular decagon?

7. Alerian can mow the same lawn twice as fast as Bryceson. Together they can mow the lawn in 2 hours and 40 minutes. How long would it take Alerian to mow the lawn by herself?

8. Ryan can ride his bike downhill to school in 20 minutes. Returning along the same route back up the hill takes Ryan 1 hour. The length of the trip one way is six miles. What is Ryan's average speed for the round trip?

9. Choose any positive number you would like. Multiply the number by 6, take the result and add 12, take that result and divide by 3, take that result and subtract 4. Then take that result and divide by your original number, then multiply that result by 17. What number do you have?

10. How many prime integers are factors of 81?

11. What is the units digit of 4^{35}?

12. Express in simplest form: $\sqrt{7\frac{1}{9}}$ (Leave answer as an improper fraction.)

13. What is the value of $\frac{1}{x^2}+\frac{1}{y}$ if $\sqrt{x}=2$ and $y=\frac{1}{5}$? (Write answer as an improper fraction.)

14. How many 3-digit numbers are divisible by 23?

15. The ratio of boys to girls at a school program is 3 to 5. How many girls are present if 256 students attend the program?

16. Evaluate: x^2y^5z if x = 4, y = $\frac{1}{2}$ and z = 2.

17. Find the slope of the line passing through the points (2,3) and (-4,-9).

18. A floor is being covered with square tiles 3 inches on a side. How many tiles would it take to cover a floor 12 feet by 14 feet?

19. Find the distance between the two points (3,4) and (8,3).

20. Evaluate: $4(3^2 + 18) + (10)(12) \div (10)(6) + 14$.

21. Solve for all values of x: $(x-5)^2 = 144$

22. What is the 1998^{th} digit to the right of the decimal point in the decimal expansion of the quotient of 3 and 111?

23. What is the perimeter of a semicircle with radius 4?

24. If $x + y - z = -8$ and $x + y + z = 34$, what is z?

25. There are 103 honors students in 10^{th} grade. If 45 take honors science/math and 78 take honors English/history, how many take all honors courses?

26. Find the missing number: $\frac{5+3}{8+7} = \frac{5}{8} + \underline{?}$

27. There are fish in a pond. If Ashley can catch 10 fish per hour, how many blue fish will Ashley catch in 4 hours if the probability of catching a blue fish is 1/8?

28. □:◊ as x:y. If □ = 4 and x% of y is 250% what does ◊ equal?

29. Eliminate all Radicals: $\sqrt{10 + \sqrt{29 + \sqrt{44 + \sqrt{25}}}}$

30. What is the product of all four whole number factors of 14?

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Individual Multiple Choice Contest

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1. If the measure of only one angle in an isosceles triangle is 40^0, then the other angles in the triangle would each have a measure of:

A) 75° B) 100° C) 70° D) 65.5° E) 40° F) Answer not given

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2. Silas has 14 books. Of these books, three are identical Geometry books, six are identical Pre-Calculus books and the remainder are identical Calculus books. How many distinct ways can Silas arrange these books on a single shelf, side by side?

A) 172 B) 90 C) 54 D) 120 E) 756 F) Answer not given

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3. The product of a negative integer and its reciprocal is always

A) prime B) odd C) even D) 1 E) can not be determined

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4. What does $x^2 - 3x + 2$ factors into, where all coefficients are integral?

A) $(x - 1)^2$ B) $(x - 2)(x + 1)$ C) $x(x-2)$ D) $(x - 2)(x - 1)$

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5. Given that $f(x) = x^2 - 3x + 2$, find $f(2)$.

A) 1 B) 0 C) 5 D) 8 E) 3 F) Answer not given

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6. Find the sum of $1 + 6 + 11 + 16 + ...+ 206$.

A) 240 B) 385 C) 356 D) 4347 E) 32 F) Answer not given

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7. How many consecutive zeros are at the end of $32!$?

A) 2 B) 4 C) 0 D) 32 E) 6 F) Answer not given

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8. On Monday the price of a item is discounted by 15%. Then on Wednesday the new price is discounted by 30%. This is equivalent to a single discount of how much? Express your answer as a percent to the nearest tenths place.

A) 45.2% B) 0% C) 50.5% D) 40.5% E) 15.5% F) Answer not given

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9. What is the mean score of the following ten tests: 87, 95, 36, 54, 92, 99, 98, 100, 99, 100?

A) 100 B) 86 C) 88 D) 96.5 E) 36 F) Answer not given

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Team Contest

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1. What is the quotient of the lowest common multiple of the first four prime numbers and the greatest common factor of the first 20 positive integers?

2. Name all the positive integers that are their own multiplicative inverse.

3. If 6 times a number is decreased by 5, the result is 7 more than 4 times the number decreased by 5. Find the number.

4. Katie is 2 years older than Joel. In 4 years, her age will be 8 less than twice his age. How old is Katie now?

5. The speed of a boat in still water is 5 miles per hour. If the boat travels 3 miles downstream in the same amount of time it takes to travel 1.5 miles upstream, what is the speed of the current?

6. Lillie's first three test scores on her math tests were 90%, 72%, and 99%. Lillie wants to get a 90% average in her Math class. What score does she need to get on her last test to have a 90% in her math class?

7. Given $a - b = 2$ and $a^2 - b^2 = 10$ find the value of $a + b$.

8. The length of the hypotenuse of a right triangle is 20. What is the length of the median to the hypotenuse?

9. How many distinct triangles with sides of integral lengths have a perimeter of length 15 where the length of one of the sides is always 3?

10. Simplify: $\dfrac{n!}{(n-1)!}$

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Pressure Round Contest

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1. When 7 is added to the reciprocal of twice a number, the result is the reciprocal of four times the number. Find the number.

2. What number must be added to both the numerator and the denominator of 15/17 to make the result equal to 5/6?

3. What is the remainder when (834 + 299 + 784 + 80014 + 1 + 1 + 1 +1) is divided by 5?

4. A number increased by 2 is 5 less than twice the number. Find the number.

5. Find the missing number: $\frac{1}{5} = \sqrt{\frac{x}{125}}$

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Mental Math

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Person A

1. Evaluate: $5^2 + \sqrt[3]{8}$ (Read: Evaluate the sum of five squared and cube root of eight)
2. What is 40% of 20?
3. The sum of three consecutive integers is 21. What is the smallest number?
4. What is 1998 rounded to the nearest tens place?

Person B

1. 1 kilometer minus 1 meter is how many meters?
2. What is the units digit of the product of the first 75 prime numbers?
3. Evaluate 3! (Read: Evaluate Three Factorial)
4. Evaluate 2^6

Person C

1. What is the greatest common factor of 18 and 81?
2. What is the area of a square with perimeter 36?
3. Convert .35 to a reduced fraction.
4. What is the reciprocal of the sum of 3/4 and 1/7?

Person D

1. What is the mean of 5, 6, 2 and 3?
2. If the sum of the ages of 3 monkeys 2 years ago was 20, what is the sum of their ages today?
3. In 5 hours, how many degrees does the hour hand rotate?
4. The area of an isosceles right triangle is 32. What is the length of one of the legs?

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College Knowledge Bowl Questions #1

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1. What are the prime factors of 420?

Answer: 2,3,5,7 (any order)

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2. If it takes 8 whatsits to make a thingamajig, how many whatsits does it take to make 7 & 3/4 thingamajigs?

Answer: 62

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3. If every dimension of a pyramid is doubled, what is the ratio of the new volume to the old?

Answer: 8:1

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4. Each side of a triangle has a different positive integer as its length. What is the least possible perimeter of this triangle?

Answer: 9

---

5. What month will it be 1999 days after October 30th?

Answer: April

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6. Solve for x: $2^x = 256$ (Read: 2 raised to the x power = 256)

Answer: 8

---

7. 7 is what percent of 400?

Answer: 1.75% or 1.75

Extra Question: If Nicole writes 30 words every 2 minutes on the chalkboard and Joel follows behind her, erasing at a rate of 14 words every minute, how long will it be before there are 100 words written on the board?

Answer: 100 min.

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8th Grade - October 30, 1998

College Knowledge Bowl Questions #2

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1. If the difference between two numbers is 15 and their product is 76, what is the smaller number?

Answer: 4

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2. If the circumference and area of a circle are equal, what is its radius?

Answer: 2

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3. Which of the following is the largest value of: a. 8/17 b. 21/43 c. 25/49

Answer: c or 25/49

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4. Simplify: $\sqrt[3]{\frac{8}{64}}$ (Read: The cube root of the quantity 8 divided by 64)

Answer: 1/2

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5. Drew has 57 coins in his pocket, all of which are dimes and nickels with a total value equal of $4.55. How many nickels does he have?

Answer: 23

---

6. If a die is tossed 4 times in a row, what is the probability a 3 would appear all four times?

Answer: 1/1296

---

7. If the difference between two numbers is 9, and their product is 90, what is the larger number?

Answer: 15

Extra Question: Jina's birthday is on October 29th . If this is considered to be 1029, what is its smallest prime factor?

Answer: 3

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College Knowledge Bowl Questions #3

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1. With the draw of a single card from a deck of 52 cards, what is the probability the card drawn is a red king or an ace?

Answer: 3/26

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2. Find the measurement of each interior angle of a regular octagon.

Answer: 135

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3. If the exterior angle of a regular polygon has a measurement of 90°, how many sides does the polygon have?

Answer: 4

---

4. What geometric figure is formed by two rays with a common end point?

Answer: angle

---

5. 16π units is what percent of a circle with radius 8?

Answer: 25%

---

6. How many diagonals can be drawn in a hexagon?

Answer: 9

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7. What is the sum of the interior angles of a pentagon?

Answer: 540

Extra Question: Given that $f(x) = \frac{x+2}{x-3}$, find f(3).

Answer: undefined

Math Is Cool" Championships -- 1998-9

8th Grade - October 30, 1998

School Name_____Team #_____

Proctor Name_____Room #_____

Key

Full Name:_____

1st Score

Out of 30

Individual Contest - Score Sheet

DO NOT WRITE IN SHADED REGIONS

	Answer		
1.	175%		
2.	99		
3.	23/99		
4.	(-1,10)		
5.	31		
6.	1440		
7.	4 (hours)		
8.	9 (mph)		
9.	34		
10.	1		
11.	4		
12.	8/3		
13.	81/16		
14.	39		
15.	160		

	Answer		
16.	1		
17.	2		
18.	2688		
19.	$\sqrt{26}$		
20.	124		
21.	-7,17		
22.	7		
23.	$8 + 4\pi$		
24.	21		
25.	20		
26.	-11/120		
27.	5		
28.	8/5		
29.	4		
30.	196		

Math Is Cool" Championships -- 1998-9

8th Grade - October 30, 1998

School Name_____Team #_____

Proctor Name_____Room #_____

Key

Individual Multiple Choice Contest-Score Sheet

1st Score

Out of 18

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.	C		
2.	F		
3.	D		
4.	D		
5.	B		
6.	D		
7.	F		
8.	D		
9.	B		

Math Is Cool" Championships -- 1998-9

8th Grade - October 30, 1998

School Name_____Team #_____

Proctor Name_____Room #_____

Key

Team Contest-Score Sheet

1st Score

Out of 10

DO NOT WRITE IN SHADED REGIONS

	Answer		
1.	210		
2.	1		
3.	7/2		
4.	8		
5.	5/3(mph)		
6.	99%		
7.	5		
8.	10		
9.	2		
10.	n		

Math Is Cool" Championships -- 1998-9

8th Grade - October 30, 1998

School Name_____Team #_____

Proctor Name_____Room #_____

Key

Mental Math - Score Sheet

A. 1. 27

2. 8

3. 6

4. 2000

B. 1. 999

2. 0

3. 6

4. 64

C. 1. 9

2. 81

3. 7/20

4. 28/25

D. 1. 4

2. 26

3. 150

4. 8

Math Is Cool" Championships -- 1998-9

8th Grade - October 30, 1998

School Name_____Team #_____

Proctor Name_____Room #_____

Key

Pressure Round - Score Sheet

	Answer		
1.	-1/28		
2.	-5		
3.	0		
4.	7		
5.	5		