

"Math is Cool" Championships – 2016-17

October 19, 2016

STUDENT NAME: _____ **School Name:** _____
Proctor Name: _____ **Team #:** _____ **Room #:** _____

High School Individual Contest – Score Sheet DO NOT WRITE IN SHADED REGIONS

	Answer	1 or 0	1 or 0
1	11236		
2	3		
3	[x=] 7		
4	25 [%]		
5	2		
6	3		
7	13		
8	36 [sq cm]		
9	48 [ways]		
10	21 [instructors]		
11	52 [units]		
12	49		
13	26 [cm]		
14	92		
15	20 [vertices]		
1-15 TOTAL:			

	Answer	1 or 0	1 or 0
16	20		
17	6		
18	1		
19	3 [units]		
20	4		
21	2		
22	0		
23	5 [deg]		
24	12		
25	2 [times]		
26	6		
27	18 [squares]		
28	2		
29	3 [points]		
30	43		
16-30 TOTAL:			

	Answer	1 or 0	1 or 0
31	5 [primes]		
32	148		
33	44		
34	18 [days]		
35	0 [numbers]		
36	1 [solutions]		
37	84 [terms]		
38	4		
39	5 [units]		
40	29 [ordered pairs]		
31-40 TOTAL:			

"Math is Cool" Championships – 2016-17

October 19, 2016

Total Correct:

STUDENT NAME: _____ **School Name:** _____
Proctor Name: _____ **Team #:** _____ **Room #:** _____

High School Individual Contest – Score Sheet

DO NOT WRITE IN SHADED REGIONS

	Answer	1 or 0	1 or 0
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
1-15 TOTAL:			

	Answer	1 or 0	1 or 0
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
16-30 TOTAL:			

	Answer	1 or 0	1 or 0
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
31-40 TOTAL:			

“Math is Cool” Championships – 2016-17

Sponsored by:

October 19, 2016

High School Mental Math Contest

Follow along as your proctor reads these instructions to you. Your Mental Math score sheet is on the back.

GENERAL INSTRUCTIONS applying to all tests:

- *Good sportsmanship is expected throughout the competition by all involved, both competitors and observers. Display of poor sportsmanship may result in disqualification.*
- *Calculators or any other aids may not be used on any portion of this contest.*
- *Unless stated otherwise, all rational, non-integer answers need to be expressed as reduced common fractions except in case of problems dealing with money. In the case of problems requiring dollar answers, answer as a decimal rounded to the nearest hundredth (ie, to the nearest cent).*
- *All radicals must be simplified and all denominators must be rationalized.*
- *Units are not necessary as part of your answer unless it is a problem that deals with time and in that case, a.m. or p.m. is required. However, if you choose to use units, they must be correct.*
- *Leave all answers in terms of π where applicable.*
- *Do not round any answers unless stated otherwise.*
- *Record all answers on the colored cover sheets in the answer column only.*
- *Make sure all answer sheets have all the information (name, team number, etc.) at the top of the sheet filled out.*
- *Tests will be scored as a 0 if answers are not recorded on the answer sheets.*
- *Blank answer sheets and answer sheets with no name will be scored as a 0.*

Mental Math – 30 sec per question

8 problems read orally to everyone - Approximately 8% of Individual Score - 25% of team score

*When it is time to begin, the proctor will read the first question twice. You may not do any writing or talking while arriving at a solution. Once you have a solution, record it on the sheet in front of you. **You may not change or cross out answers once you have written an answer down. If there are eraser marks, write-overs, or crossed-out answers, they will be marked wrong.** Once all students have laid their pencils on the desk, another question will be asked. If a student doesn't lay his/her pencil down, the maximum wait time is 30 seconds after completion of the second reading of the question before another question is asked. You may continue to work on a problem while the next question is being read. The value of each question is a one or zero. Each student will be asked the same eight questions. Individual scores used to determine individual placing will be determined by the sum of the Mental Math score and the Individual Test score for each individual. In addition, the top three Mental Math scores from one team will be totaled and doubled and will contribute to 25% of the team score.*

“Math is Cool” Championships – 2016-17

Sponsored by:

High School – October 19, 2016

Mental Math Contest

Mental Math – 30 sec per question

8 problems read orally to everyone - Approximately 8% of Individual Score - 25% of team score

*When it is time to begin, the proctor will read the first question twice. You may not do any writing or talking while arriving at a solution. Once you have a solution, record it on the sheet in front of you. **You may not change or cross out answers once you have written an answer down. If there are eraser marks, write-overs, or crossed-out answers, they will be marked wrong.** Once all students have laid their pencils on the desk, another question will be asked. If a student doesn't lay his/her pencil down, the maximum wait time is 30 seconds after completion of the second reading of the question before another question is asked. You may continue to work on a problem while the next question is being read. The value of each question is a one or zero. Each student will be asked the same eight questions. Individual scores used to determine individual placing will be determined by the sum of the Mental Math score and the Individual Test score for each individual. In addition, the top three Mental Math scores from one team will be totaled and doubled and will contribute to 25% of the team score.*

#	Problem
1	What is the sum of the even integers between 1 and 11?
2	If I flip a fair coin 3 times, in how many ways can I get exactly 2 heads?
3	A rectangle with integer width and length has an area equal to 60. How many different perimeters are possible?
4	If f of x equals three x plus ten; what is f -inverse of thirty-seven?
5	A rectangle measuring 12 by 6 inches is divided into 4 triangles by drawing its two diagonals. What is the smallest area of any of the triangles in square inches?
6	What is the sum of the integers from negative ten to positive fifteen inclusive?
7	In the graph of the parabola, $12y$ equals x -squared minus $4x$ plus 7, [PAUSE] what is the distance from the vertex to the focus?
8	I am dealt two cards from a standard 52-card deck. In how many ways can I get a pair, that is, two cards of the same value; 2-fours, 2-kings, etc.?

“Math is Cool” Championships – 2016-17

Sponsored by:

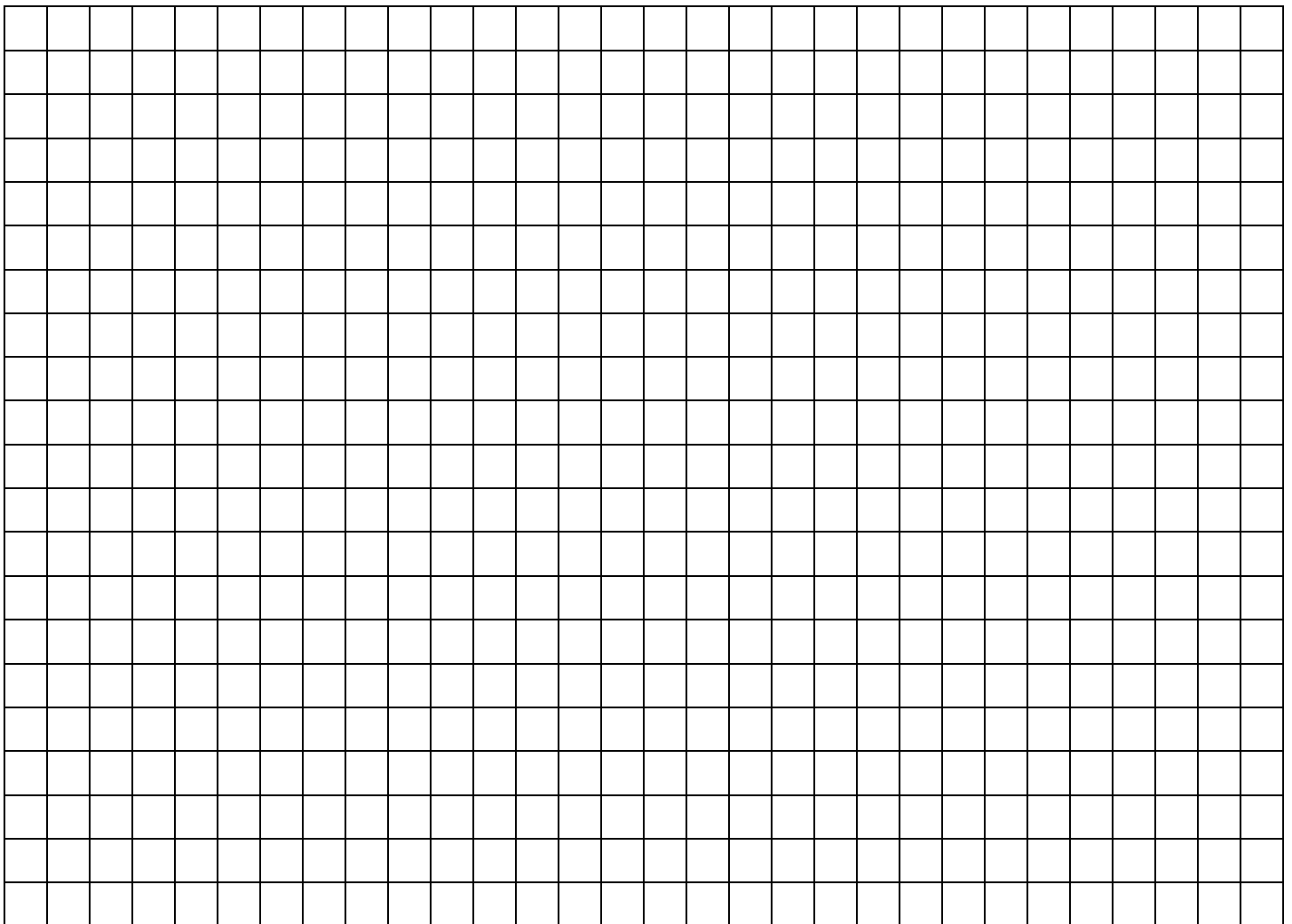
October 19, 2016

High School Individual Contest

Tear this cover sheet and scratch paper off and fill out the top of the colored answer sheet prior to the start of the test. The graph below is for your use, if needed.

INDIVIDUAL TEST – High School - 35 minutes

You may NOT be seated next to anyone from your school. If you are MOVE NOW to avoid being disqualified! When you are prompted to begin, tear off the colored sheet and begin testing. Make sure your name and school are recorded on the answer sheet. The raw score will be 2 points for correct answers to problems 1-30 and 3 points for 31-40. Record your answers on the score sheet. No talking during the test. You will be given a 5 minute time warning.



“Math is Cool” Championships – 2016-17

Sponsored by:

October 19, 2016

High School Individual Contest

Questions 1-30: 2 points each	
1	Calculate: 106^2 .
2	How many of the following are rational numbers $\{\pi, 4, \sqrt{2}, \sqrt{4}, \frac{1}{7}\}$?
3	Solve for x : $4(x + 5) - 6 = 2(3x - 1) + 2$
4	A store owner has a sale that reduces the price of a coat by 20%. By what percent does she have to raise the price to get back to the original cost?
5	Evaluate: $17 - 14 - ((5 - 3)^2 - 6) - 9/3$.
6	What is the sum of the solutions to the equation: $x^2 - 1 = 3(x + 1)$
7	What is the largest prime factor of $2^{12} - 1$?
8	A square is inscribed in a circle of area 18π square centimeters. What is the area of the square, in square centimeters?
9	Three couples go to a movie and sit in the same row in six consecutive seats. In how many ways can they sit if the couples stay next to each other?
10	There are 463 students in the tenth grade at King High School. Each student takes a class during each of the 6 periods in a day and class size is restricted to 28 students. Each instructor teaches at most 5 classes; what is the minimal number of instructors required to teach the tenth graders?
11	Two congruent circles of radius 6 have centers that are 20 units apart. The length of a string stretched around the exterior of the circles has length $m + n\pi$, what is $m + n$?
12	A right triangle with integer side lengths has one side of length 7. What is the sum of lengths of the other two sides?
13	What is the largest perimeter of a rectangle of area of 12 square centimeters that can be constructed using integer side lengths?
14	My scores on the first four tests are: 87, 84, 94 and 91. The last test is worth double. What do I have to score to have an overall average of 90?
15	A dodecahedron has 12 regular pentagons as faces. How many vertices does it have?
16	How many positive three-digit numbers are odd and divisible by 23?
17	How many 4-digit binary numbers are 2-digit base 10 numbers?
18	The equation of the line that goes through the point (2, 4) and is parallel to the line $3x - 2y = 1$ is written in the form: $Ax + By = C$ where A is positive and A, B, and C have no common factors. What is $ A + B + C $?
19	The surface area, greater than 0, of a sphere is equal to its volume in magnitude. What is its radius?

20	My mom has 4 bills in her purse; a \$1 bill, two \$5 bills and a \$10 bill. For my birthday, I randomly select two bills. What is the probability that I get \$15 total? Multiply your answer by 12.
21	If $i = \sqrt{-1}$, what is $\frac{(1+i)^2}{i}$?
22	If $a > b > c > 0$ then how many of these statements are guaranteed to be true: $\frac{1}{a} > \frac{1}{c}$, $\frac{1}{c} < \frac{a}{b}$, $-\frac{b}{a} < -\frac{a}{c}$
23	How many degrees larger is the measure of each interior angle of a regular nonagon than a regular octagon?
24	Find the minimum value of: $x^2 + 4x + 16$
25	How many times does the graph of $\frac{x^2}{9} - \frac{y^2}{4} = 1$ cross the x-axis?
26	Find the geometric mean of 3, 9, 8.
27	A 7x4 grid is drawn on a piece of paper. If the two diagonals are drawn, how many squares on the grid have a line through them?
28	Let (x, y) be the point that is 60% of the way from the point $(2, 3)$ to the point $(7, -7)$. What is $x + y$?
29	Of these points what is the maximum number of points that are collinear? $\{(0, -1), (1, 2), (3, 0), (1, 1), (-3, -2)\}$
30	If $\sqrt{x} + \sqrt{y} = 7$ and $xy = 9$, what is $x + y$?

Challenge Questions: 3 pts each

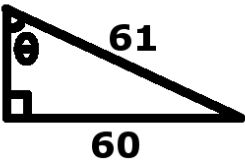
31	How many prime numbers less than 200 can be expressed as the difference of two positive perfect cubes?
32	What is the determinant of the matrix $\begin{bmatrix} 1 & 3 & 6 \\ 8 & 0 & 4 \\ 0 & 5 & 3 \end{bmatrix}$?
33	What is the average of all 2-digit numbers whose digits consist only of the numbers 1, 3, 4 and 8?
34	A contractor bids a remodel quoting 3 days to complete the job with her current crew of workers. If she had 3 more workers, the crew could finish in 2 days. If all workers do the same amount of work each day, how long would it take for one worker to complete the job?
35	How many prime numbers are greater than $10! + 1$ and less than $10! + 10$?
36	How many real solutions are there to the equation: $3x^5 + x^3 + 5x^2 + 6 = 0$?
37	The expression $(a + b + c + d)^6$ is expanded and like terms combined. How many terms are in the resulting expression?
38	An angle is chosen randomly from the interval $\theta \in [0, 2\pi)$. Let p be the probability that $\cos(2\theta) > \cos(\theta)$. What is 12 times p ?
39	A triangle has sides of length 10, 14, and 16. The altitude is drawn from the vertex to the side of length 16 and divides it into two smaller segments. What is the length of the shorter segment?
40	Let x and y denote nonzero integers. How many ordered pairs (x, y) are there that satisfy the following equation? $\frac{1}{x} + \frac{1}{y} = \frac{1}{12}$

"Math is Cool" Championships – 2016-17

Sponsored by:

11th & 12th Grade – October 19, 2016

Individual Multiple Choice Contest

1	<p>Which of the following is equivalent to $3^x + 3^x + 3^x + 3^x + 3^x + 3^x$?</p> <p>A) 6^x B) $2 * 3^{x+1}$ C) $2 * 3^x$ D) $6 * 3^{x+1}$ E) <i>NOTA</i></p>
2	<p>List J, K and L from smallest to largest: $J = 11^{34}, K = 169^{17}, L = 3^{68}$</p> <p>A) <i>K J L</i> B) <i>J K L</i> C) <i>L J K</i> D) <i>L K J</i> E) <i>NOTA</i></p>
3	<p>Find $\sec\theta$.</p> <div style="text-align: center;">  </div> <p>A) $\frac{3}{20}$ B) $\frac{61}{9}$ C) $\frac{60}{11}$ D) $\frac{61}{11}$ E) <i>NOTA</i></p>
4	<p>If $\theta = 15^\circ$, what is the value of $\sin^4\theta - \cos^4\theta - 2\sin^2\theta$?</p> <p>A) $\frac{\sqrt{3}}{2}$ B) $-\frac{\sqrt{3}}{2}$ C) $\frac{1}{2}$ D) -1 E) <i>NOTA</i></p>
5	<p>Find the units digit of $3487^{49} * 31728^{102}$.</p> <p>A) 2 B) 4 C) 6 D) 8 E) <i>NOTA</i></p>
6	<p>Write the base 12 repeating decimal $0.2\bar{4}_{12}$ as a fraction in base 10.</p> <p>A) $\frac{24}{143}$ B) $\frac{1}{5}$ C) $\frac{11}{45}$ D) $\frac{13}{66}$ E) <i>NOTA</i></p>
7	<p>Given a 3x3x3 grid of points forming a cube. In how many ways, can we choose 3 of the points so that they are in a line?</p> <p>A) 32 B) 43 C) 64 D) 67 E) <i>NOTA</i></p>
8	<p>What is the area of the ellipse defined by: $4x^2 + 9y^2 - 16x + 18y = 11$?</p> <p>A) π B) 6π C) 12π D) 24π E) <i>NOTA</i></p>
9	<p>At a picnic, 5 identical pies are given out to 5 people at random, where anyone could have 0-5 pies. How many ways can the pies be given out?</p> <p>A) 120 B) 126 C) 180 D) 625 E) <i>NOTA</i></p>
10	<p>Evaluate:</p> $\sum_{n=1}^{\infty} \frac{n}{2^n}$ <p>A) 1 B) $\frac{3}{2}$ C) 2 D) 4 E) <i>NOTA</i></p>

“Math is Cool” Championships – 2016-17

Sponsored by:

11th & 12th Grade – October 19, 2016

Team Contest

1	How many positive integers less than 30 are relatively prime to 30?
2	What is the square of the distance from the origin to the point $(5, \frac{\pi}{3}, 5\sqrt{3})$ given in cylindrical coordinates.
3	What is the positive difference between 2016 and the sum of its proper factors?
4	Find the average of the roots of the polynomial equation: $x^3 - 21x^2 - 2016 = 0$
5	Evaluate: $\frac{\frac{-1}{\frac{-1}{\dots} - \sqrt{2 + \sqrt{2 + \sqrt{2 + \dots}}}}}{-1} - \sqrt{2 + \sqrt{2 + \sqrt{2 + \dots}}}$
6	What is the average value of the slope of the tangent line of the function $y = 3x^4 - 3x^3 - 3x^2 + 3x - 3$ between $x = -3$ and $x = 4$?
7	Define vectors $\begin{aligned} \mathbf{x} &= 4\hat{i} + \hat{j} - 2\hat{k}, \\ \mathbf{y} &= 2\hat{i} - 3\hat{j} + \hat{k}, \\ \mathbf{z} &= \hat{i} - \hat{k}. \end{aligned}$ The vector $\mathbf{P} = \langle 4, 5, -3 \rangle$ is expressible as a unique linear combination of \mathbf{x} , \mathbf{y} , and \mathbf{z} . Find $a - b + c$ given that $\mathbf{P} = a\mathbf{x} + b\mathbf{y} + c\mathbf{z}$.
8	A pair of circles that share a common point have common outer tangents that meet in an angle of $\frac{\pi}{3}$. What is the ratio of the large circle's radius to the smaller circle's radius?
9	The sum of the geometric series: $\frac{13}{3} + \frac{26}{9i} - \frac{52}{27} - \frac{104}{81i} + \dots$ can be written as $a + bi$, where $i = \sqrt{-1}$. What is $a - b$?
10	On a dense planetoid, light is lensed by intense gravity to follow a parabolic path given by $-x^2 + bx$. A flagpost c feet tall on this planetoid casts an eight-foot shadow when light passes the top of the post at an angle of $\frac{3\pi}{4}$ from the horizon. Find $c + b$.

“Math is Cool” Championships – 2016-17

Sponsored by:

11th & 12th Grade – October 19, 2016

Pressure Round Contest

1	Six distinct integers $a_1, a_2, a_3, a_4, a_5, a_6$ are chosen randomly. Let p be the probability that at least two of them differ by a multiple of 5. What is 30 times p ?
2	Let $r, s,$ and t be the solutions to the following equation: $x^3 - 3x^2 + 5x - 8 = 0$. What is $r^2 + s^2 + t^2$?
3	Mike chooses a 5-digit positive integer, rearranges its digits yielding a smaller number and subtracts the new integer he gets from the original integer. He then multiplies that difference by an unknown 3-digit integer to get the number S . Six of the seven digits of S , in random order, are 8, 1, 2, 9, 9 and 4. What is the 7 th digit of S ?
4	Label the three sides of an acute triangle a, b and c . Suppose the following relationship holds: $(a + b + c)(a + b - c) = 3ab$. What is the measure, in degrees, of the angle opposite the side of length c ?
5	An arithmetic sequence has $a_3 = 12$ and $a_7 = 15$. What is the sum $a_7 + a_8 + \dots + a_{15}$?

“Math is Cool” Championships – 2016-17
 Sponsored by:
 11th & 12th Grade – October 19, 2016

COLLEGE KNOWLEDGE BOWL ROUND #1 – SET 1

#	Problem	Answer
1	What is the number that is 4 times the cubed root of 512?	32
2	How many positive factors does 68 have?	6 [factors]
3	What is the area bounded by the equation thirty-two x squared plus two y squared equals sixty four?	8 pi [sq un]
4	If a city of 100 people increases by 25 in the first year, then 60 percent more in the second year. How many people are in the city after the second year?	200 [people]
5	Express the base two number: one-zero-zero-one [pause] squared in base four.	1101_4 or one-one-zero-one base 4.
6	What is the sum of the first 10 Fibonacci numbers if the first number is one?	143
7	How many ways are there for a haberdasher to sell one hat each to 4 people out of a stock of 8 distinct hats?	1680 [ways]
8	What is the difference between the sum of the first 5 prime numbers and the next 5 prime numbers?	73
9	How many points with integer value coordinates are exactly thirty-six units away from the origin?	4 [points]
10	Polygons are made by connecting vertices of a regular dodecagon. How many regular polygons can be made?	10 [polygons]

“Math is Cool” Championships – 2016-17
 Sponsored by:
 11th & 12th Grade – October 19, 2016

COLLEGE KNOWLEDGE BOWL ROUND #2 – SET 2

#	Problem	Answer
1	An octopus, with 8 legs, is in class with 5 crabs and 3 dogs. If crabs have 6 legs how many legs are in the classroom?	50 [legs]
2	What is the sum of the factors of 78?	168
3	The graph of the function $y = x$ and the graph of the function $y = \cos(x)$ intersect in how many points?	1 [point]
4	120 has n factors, how many positive factors does n have?	5 [factors]
5	What is the volume of a tetrahedron with edge length three?	$\frac{9\sqrt{2}}{4}$ nine root 2 over 4. [cu units]
6	How many ways are there to reorder the letters in the word 'C-A-L-C-U-L-U-S'?	5040 [ways]
7	The average test score in a calculus class of 20 students is 75%. What is the minimum number of additional students at 100% would need to join the class to make an average class test score at least 85%?	14 [students]
8	There is a farm with cows and chickens. Between the cows and chickens, there are 46 legs and 18 heads. How many chickens are there?	13 [chickens]
9	The graph of the polar equation, $\sin(\theta) = \frac{5}{r}$ is what shape?	line
10	An isosceles trapezoid has base angles of 60 degrees. The lengths of the bases are 5 and 21 units. What is the length of one of its diagonals?	19 [units]

“Math is Cool” Championships – 2016-17

Sponsored by:

11th & 12th Grade – October 19, 2016

COLLEGE KNOWLEDGE BOWL ROUND #3 – SET 3

#	Problem	Answer
1	What is the sum of the roots of the polynomial four x-cubed minus 3 x plus 9?	0
2	What is the units digit of 24 to the power of 16?	6
3	What is the limit as x approaches infinity, of the function one hundred over the quantity x squared plus five?	0
4	A cube is inscribed in a sphere with a surface area of one hundred forty-four pi. What is the surface area of the cube?	288 [sq units]
5	What is the quantity log base sixteen of two thirds plus log base sixteen of ninety-six? Answer as a fraction.	3/2
6	What is the product of five plus four i and its conjugate?	41
7	What is 5 factorial times 6 factorial divided by 7 factorial represented as a mixed number?	17 and 1/7
8	The sum of x squared and y squared is 58, the quantity x plus y squared is equal to 16. What is the value of the quantity x times y.	-21
9	What is the volume of the parallelepiped formed by the vectors: 4 j plus 3 k [pause] 3 j plus 4 k [pause] and 5 i plus 5 j plus 5 k?	35 [cu units]
10	What is the cotangent of the angle in the first quadrant if the sine of the angle is twenty one over twenty nine?	20/21

"Math is Cool" Championships – 2016-17

Sponsored by:
11th & 12th Grade – October 19, 2016

COLLEGE KNOWLEDGE BOWL ROUND #4 – SET 4

#	Problem	Answer
1	What is the least common multiple of the numbers 4, 6 and 7?	84
2	How much larger is the mean of the smallest 50 positive integers than the mean of the largest 50 negative integers?	51
3	What would you add to both the numerator and denominator to turn the fraction $\frac{7}{9}$ into $\frac{10}{11}$?	13
4	What is the sum of the first 5 decimal places of the quantity $\frac{584}{999}$ divided by 999?	30
5	Consider the sequence $x_n = \sqrt{n}$. After eliminating all the rational numbers from the sequence, what is the 100 th number?	Square root of 110
6	A glass is three fourths full and one eighth of glass capacity is emptied to fill a glass that can hold 15 ounces. How much liquid was originally in the first glass?	90 [ounces]
7	I have a spinner separated into 7 equal sections numbered one to seven. What is the probability of spinning a sum of seven with two spins?	$\frac{6}{49}$
8	Amy and Bert go to the store with the same amount of money, Amy spends \$435 and Bert spends \$324 and has two-fifths of his money left. How many dollars did Amy have left?	[\$] 105
9	What is the largest value of x less than 2π such that the sine of x times the cosine of x equals one-fourth?	$\frac{17\pi}{12}$
10	If the log base b of 32 is five-thirds, what is the base b ?	8

“Math is Cool” Championships – 2016-17
 Sponsored by:
 11th & 12th Grade – October 19, 2016

COLLEGE KNOWLEDGE BOWL ROUND #5 – SET 5

#	Problem	Answer
1	What is four plus five minus ten times five plus three?	-38
2	Expressed as a decimal, how many times greater is 50 times 55 than the quantity 20 times 25?	5.5
3	Find the minimum point of the graph, y equals three x squared plus eighteen x minus thirty?	Negative 3 comma negative 57
4	If the sum of two numbers is twenty, and the product is five, what is the sum of the reciprocals of the two numbers?	4
5	A train leaves point A at 4am and reaches point B at 8am. Another train leaves point B at 6am and reaches point A at 12:00pm. How many minutes after the train leaves station B will the two meet?	72 [minutes]
6	One hundred eighty-six plus x is equal to sixty percent of four hundred sixty five. Find x.	93
7	If f of x is eighteen minus four x, what is f-inverse of negative ten?	7
8	A pyramid has a base of 50 and a height of 8, if the base area is doubled and the height is halved, What is the ratio of the new volume to the old volume?	1 OR 1 to 1.
9	What is the log base 2 of the quantity cosine squared of 30 degrees minus sine squared of 30 degrees?	-1
10	What is the volume of the shape with equation x squared over four, plus y squared over sixteen, equals one minus z squared over nine?	32 pi [cu units]

“Math is Cool” Championships – 2016-17
 Sponsored by:
 11th & 12th Grade – October 19, 2016

COLLEGE KNOWLEDGE BOWL ROUND #6 – SET 6

#	Problem	Answer
1	The units digit and the hundreds digit are interchanged in the number 6574. What is the sum of the original number and the new number?	13049
2	Evaluate the area between the x axis and the line y equals 4 x plus 6 from x equals 1 to 4.	48 [sq units]
3	What is the square of the length of the longest median in a triangle with side lengths of 8, 15, and 17?	241
4	Evaluate 7 to the 4 th power.	2401
5	What is the lateral surface area of a cone with radius five and height twelve?	65 pi [sq un]
6	What is the area of the shape with vertices at the point three comma one, the point one comma negative one, the point negative three comma one and the point negative two comma negative one?	9 [sq units]
7	In the binomial expansion of 2x plus 3y quantity to the 6 th power. What is the coefficient in front of the x-cubed, y-cubed term?	4320
8	Fully factor 6 x squared plus 5 x minus 6.	3x minus 2 times 2x plus 3 OR reversed
9	Arden is solving a parabola with equation x squared minus 4x plus 12y plus 40 equals 0. What are the coordinates of the focus?	Two comma negative 6.
10	What is the maximum value of the function f of x equals x cubed minus 6 x squared plus 9 x minus 6 on the closed interval from 0 to 3?	-2

"Math is Cool" Championships – 2016-17

Sponsored by:
High School – October 19, 2016

COLLEGE KNOWLEDGE BOWL ROUND – EXTRA

#	Problem	Answer
1	What is the measure in degrees of the smaller angle between the hour and minute hands of a analog clock at four forty-four?	122 [degrees]
2	How many two digit numbers do not contain a prime number as one of the digits?	30 [numbers]
3	38 is what percent of 95?	40 [%]
4	You take out a loan of \$3500 and you pay the principle and 60% interest. How much will you pay back in total?	[\$] 5600
5	What is 75 times 750?	56250
6	How many seconds are there in 3 hours?	10800
7	Find the harmonic mean of 3 and 27.	Twenty seven over five. $\frac{27}{5}$

Final Score:

KEY

(Out of 8)

“Math is Cool” Championships -- 2016-17

School: _____ Room # _____ Team # _____

Name: _____ Proctor: _____

High School

Mental Math – 30 sec per question

8 problems read orally to everyone - Approximately 8% of Individual Score - 25% of team score

*When it is time to begin, the proctor will read the first question twice. You may not do any writing or talking while arriving at a solution. Once you have a solution, record it on the sheet in front of you. **You may not change or cross out answers once you have written an answer down. If there are eraser marks, write-overs, or crossed-out answers, they will be marked wrong.** Once all students have laid their pencils on the desk, another question will be asked. If a student doesn't lay his/her pencil down, the maximum wait time is 30 seconds after completion of the second reading of the question before another question is asked. You may continue to work on a problem while the next question is being read. The value of each question is a one or zero. Each student will be asked the same eight questions. Individual scores used to determine individual placing will be determined by the sum of the Mental Math score and the Individual Test score for each individual. In addition, the top three Mental Math scores from one team will be totaled and doubled and will contribute to 25% of the team score.*

	Answer	1 or 0	1 or 0
1	30		
2	3 [ways]		
3	6		
4	9		
5	18 [sq in]		
6	65		
7	3		
8	78 [ways]		

Math is Cool” Championships – 2016-17
 11th & 12th Grade – October 19, 2016

Final Score:
KEY

Student Name _____

Proctor Name _____ Room # _____

First Score
 (out of 20)

SCHOOL NAME _____ **Team #** _____

INDIVIDUAL MULTIPLE CHOICE - 15 minutes – 10 problems – 20% of team score

*This test is the only test where you will be penalized for incorrect responses. You will receive 2 points for a correct letter response, 0 points for leaving it blank and -1 point for an incorrect response. It is not necessary to write your personal name on the test, but you may put it at the bottom of the test so your coach will be able to give you back the correct test. This test is taken individually, but it is part of your team score, including zeros for missing team members. Your team score will be calculated by taking the mean of your four team members' scores. When you are prompted to begin, tear off the colored sheet and begin testing. **Since this is a multiple choice test, ONLY a letter response should be indicated as an answer on the answer sheet. No talking during the test.***

DO NOT WRITE IN SHADED REGIONS

	Answer	-1, 0 or 2	-1, 0 or 2
1	B		
2	C		
3	D		
4	D		
5	D		
6	D		
7	B		
8	B		
9	B		
10	C		

“Math is Cool” Championships – 2016-17
 11th & 12th Grade – October 19, 2016

Final Score: KEY

First Score (out of 10)

SCHOOL NAME _____ Team # _____

Proctor Name _____ Room # _____

Team Contest – Score Sheet

TEAM TEST - 15 minutes – 30% of team score

*When you are prompted to begin, tear off the colored sheet and give a copy of the test to each of your team members and begin testing. Each problem is scored as **1 or 0**. Record all answers on the colored answer sheet.*

DO NOT WRITE IN SHADED REGIONS

	Answer	1 or 0	1 or 0
1	8 [integers]		
2	100		
3	4536		
4	7		
5	1		
6	36		
7	1		
8	3		
9	5		
10	71		

“Math is Cool” Championships – 2016-17
11th & 12th Grade – October 19, 2016

Final Score:

KEY

First Score

Proctor Name _____ Room # _____

SCHOOL NAME _____ **Team #** _____

PRESSURE ROUND - 10 minutes - 5 problems - 5 rounds - 15% of team score

When it is time to begin, you will be handed a packet of five problems. There is a copy of the problems for each team member. Two minutes after the start of the test you are expected to submit an answer for one of the problems (it can simply be a guess). The maximum value of this answer is 1 point. In another two minutes you are expected to submit another answer to one of the four remaining problems; its maximum value is two points. This process will continue until all the problems are answered and each consecutive problem's worth will go up by one point. You must submit your answers on the colored sheets given to you. If you do not have an answer at the end of a two minute period, you must still submit an answer sheet with an identified problem number on it. Failure to do so will result in loss of points. This event is timed, and you will be given a verbal 5 second warning and told to hold your answer sheet up in the air. You may keep working as the sheets are collected. If a team answers the same question more than once, only the first answer will be scored and the other attempts will be ignored.

Pressure Round Answers

Answer	
1	30
2	-1
3	3
4	60 [degrees]
5	162

Final Score:

(Out of 8)

“Math is Cool” Championships -- 2016-17

School: _____ Room # _____ Team # _____

Name: _____ Proctor: _____

High School

Mental Math – 30 sec per question

8 problems read orally to everyone - Approximately 8% of Individual Score - 25% of team score

*When it is time to begin, the proctor will read the first question twice. You may not do any writing or talking while arriving at a solution. Once you have a solution, record it on the sheet in front of you. **You may not change or cross out answers once you have written an answer down. If there are eraser marks, write-overs, or crossed-out answers, they will be marked wrong.** Once all students have laid their pencils on the desk, another question will be asked. If a student doesn't lay his/her pencil down, the maximum wait time is 30 seconds after completion of the second reading of the question before another question is asked. You may continue to work on a problem while the next question is being read. The value of each question is a one or zero. Each student will be asked the same eight questions. Individual scores used to determine individual placing will be determined by the sum of the Mental Math score and the Individual Test score for each individual. In addition, the top three Mental Math scores from one team will be totaled and doubled and will contribute to 25% of the team score.*

	Answer	1 or 0	1 or 0
1			
2			
3			
4			
5			
6			
7			
8			

Math is Cool” Championships – 2016-17

11th & 12th Grade – October 19, 2016

Final Score:

Student Name _____

Proctor Name _____ Room # _____

First Score (out of 20)

SCHOOL NAME _____ **Team #** _____

INDIVIDUAL MULTIPLE CHOICE - 15 minutes – 10 problems – 20% of team score

*This test is the only test where you will be penalized for incorrect responses. You will receive 2 points for a correct letter response, 0 points for leaving it blank and -1 point for an incorrect response. It is not necessary to write your personal name on the test, but you may put it at the bottom of the test so your coach will be able to give you back the correct test. This test is taken individually, but it is part of your team score, including zeros for missing team members. Your team score will be calculated by taking the mean of your four team members’ scores. When you are prompted to begin, tear off the colored sheet and begin testing. **Since this is a multiple choice test, ONLY a letter response should be indicated as an answer on the answer sheet. No talking during the test.***

DO NOT WRITE IN SHADED REGIONS

	Answer	-1, 0 or 2	-1, 0 or 2
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

“Math is Cool” Championships – 2016-17
 11th & 12th Grade – October 19, 2016

Final Score:

First Score
(out of 10)

SCHOOL NAME _____ **Team #** _____

Proctor Name _____ **Room #** _____

Team Contest – Score Sheet

TEAM TEST - 15 minutes – 30% of team score

*When you are prompted to begin, tear off the colored sheet and give a copy of the test to each of your team members and begin testing. Each problem is scored as **1 or 0**. Record all answers on the colored answer sheet.*

DO NOT WRITE IN SHADED REGIONS

	Answer	1 or 0	1 or 0
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			