"Math is Cool" Masters – 2014-15

December 6, 2014

Total Correct: KEY

STUDENT NAME: _____ **School Name:** _____

Proctor Name: _____ Team #: _____ Room #: _____

PRE-CALCULUS - Individual Contest – Score Sheet
DO NOT WRITE IN SHADED REGIONS

	Answer	1 or 0	1 or 0
1	64/27		
2	91		
3	73		
4	36		
5	$4\sqrt{10}$		
6	48		
7	2187		
8	1474		
9	338		
10	$2\frac{1}{12}$		
11	80		
12	$\frac{5}{72}$		
13	$\frac{\pi}{3}, 1.35, \frac{17}{12}$		
14	120		
15	$-\frac{1}{2}, \frac{3}{2}$ [any order]		
1-15 TOTAL:			

	Answer	1 or 0	1 or 0
16	81π		
17	2/15		
18	$\frac{5}{2}\log_2 3$		
19	$7\sqrt{149}\pi$		
20	7		
21	8		
22	$2 * 617$		
23	2, -2		
24	200/3		
25	$5\sqrt{13}$		
26	9		
27	2187		
28	8		
29	$66 - 196i$		
30	112585		
16-30 TOTAL:			

	Answer	1 or 0	1 or 0
31	1/5		
32	$\frac{\sqrt{85}}{2}$		
33	$\frac{1443}{4}$		
34	27		
35	$20\sqrt{6}\pi$		
36	51,840		
37	70		
38	{1, 2, 2, 3} any order		
39	2		
40	B, D [any order]		
31-40 TOTAL:			

PRE-CALCULUS

Total Correct:

"Math is Cool" Masters – 2014-15

December 6, 2014

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1			
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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:			

PRE-CALCULUS

"Math is Cool" Masters – 2014-15

December 6, 2014

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1-15 TOTAL:			

	Answer	1 or 0	1 or 0
16	81π		
17	2/15		
18	$\frac{5}{2}\log_2 3$		
19	$7\sqrt{149}\pi$		
20	7		
21	8		
22	$10t + 8$		
23	2, -2 [any order]		
24	200/3		
25	$\frac{x^3}{3} + \frac{x^2}{2} + c$		
26	9		
27	2187		
28	8		
29	$66 - 196i$		
30	112585		
16-30 TOTAL:			

	Answer	1 or 0	1 or 0
31	4		
32	$\frac{\sqrt{85}}{2}$		
33	$\frac{1443}{4}$		
34	$\sqrt{93}$		
35	$20\sqrt{6}\pi$		
36	51,840		
37	70		
38	{1, 2, 2, 3} [any order]		
39	2		
40	B, D [any order]		
31-40 TOTAL:			

CALCULUS

Total Correct:

"Math is Cool" Masters – 2014-15

December 6, 2014

STUDENT NAME: _____ **School Name:** _____

Proctor Name: _____ Team #: _____ Room #: _____

CALCULUS - Individual Contest – Score Sheet
DO NOT WRITE IN SHADED REGIONS

	Answer	1 or 0	1 or 0
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10			
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12			
13			
14			
15			
1-15 TOTAL:			

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16			
17			
18			
19			
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21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
16-30 TOTAL:			

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

CALCULUS

"Math is Cool" Masters – 2014-15

Sponsored by: AkzoNobel

December 6, 2014

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 <u>all</u> 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 problems dealing with money. In the case of problems requiring dollar answers, answer as a decimal rounded to the neares 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.*

<u>Mental Math</u> – 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" Masters – 2014-15

Sponsored by: AkzoNobel

High School – December 6, 2014

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 area, in square meters, of an equilateral triangle with sides measuring four meters?
2	What is the difference between the smallest four-digit counting number and the largest two-digit counting number?
3	If the function H-of-K is two-K-minus-three, evaluate H-of-H-of-thirty.
4	What is the sum of three of the interior angles of a regular nonagon?
5	The probability that I get Problem One correct is one-third, the probability that I get Problem Two correct is one-fourth, and these two events are mutually exclusive. What is the probability that I get neither problem correct?
6	The sum of five consecutive integers is one-thousand nine-hundred fifty-five. What is the median of these five numbers?
7	What is the remainder when one-thousand two-hundred forty-eight is divided by nine?
8	Express fourteen as the sum of three different prime numbers.

“Math is Cool” Masters – 2014-15

Sponsored by: AkzoNobel

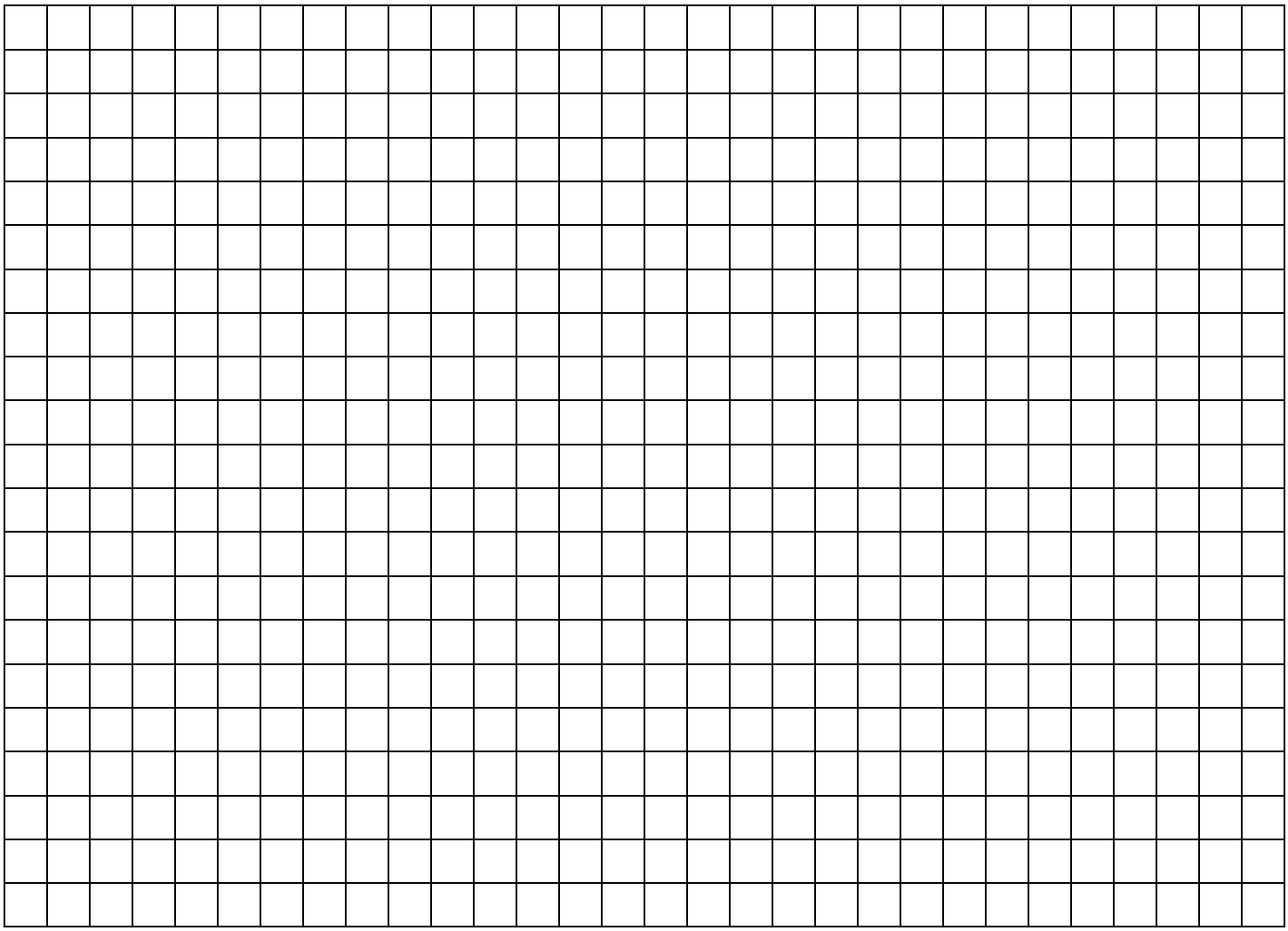
December 6, 2014

PRE-CALCULUS - 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 – PRE-CALCULUS - 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" Masters – 2014-15

Sponsored by: AkzoNobel

December 6, 2014

PRE-CALCULUS - Individual Contest

	Questions 1-30: 2 points each
1	Evaluate: $\left(\frac{3}{4}\right)^{-3}$
2	What is the tenth term of an arithmetic sequence with a first term of 10 and a common difference of 9?
3	Evaluate: $1 + (9 - 3)^2 \div 4 \times 8$
4	What is the perimeter, in meters, of a square with an area of 81 m^2?
5	Express in simplest radical form: $\sqrt{160}$
6	What is the area, in square meters, of an isosceles triangle with sides measuring 10 m, 10 m, and 16 m?
7	Simplify: $\frac{3^3 * 9}{3^{-2}}$
8	If $f(x) = 9x + 7$, and $g(x) = x^2 + 19$, what is the value of $f(g(12))$?
9	An angle of 807098 degrees is coterminal to an angle of $Q°$, where $0 \leq Q < 360$? What is the value of Q?
10	Evaluate: $4\frac{5}{6} - 2\frac{3}{4}$ **as a mixed number**.
11	If the number of Leprechauns is inversely proportional to the square of the number of Fairies, and there are currently 180 Leprechauns and 80 Fairies, how many Leprechauns will there be when there are 120 Fairies?
12	When three standard six-sided dice are rolled, what is the probability that the numbers shown have a product of 12?
13	Order the following from smallest to largest: $\frac{17}{12}, 1.35, \frac{\pi}{3}$
14	How many 3 digit numbers have digits that are in strictly descending order?
15	What are the values of x if $x^2 + 9 - 4x + 3x^2 = 12$?
16	A right circular cone has a volume of 135π m^3 and a height of 5 m. What is the area of the base of the cone, in square meters?
17	What is the eighth term of a recursive sequence with first term $b_1 = 2$ and subsequent terms $b_c = \frac{b_{c-1}}{b_{c-1}+1}$?
18	Simplify: $\log_4 9 + \log_4 27$ in terms of $\log_2 3$.
19	What is the lateral surface area, in square meters, of a cone with a radius of 7 m and a height of 10 m?

20	How many positive even integers less than 3000 are perfect cubes?
21	What is the thousands digit of 12^5 ?
22	What is the prime factorization of the number 1234?
23	Name all of the distinct roots of $x^3 + 2x^2 - 4x - 8 = 0$.
24	If you move west at 75 miles per hour then return the same distance at 60 miles per hour what is your average speed?
25	What is the distance between the points on the graph of $f(x) = x^2 - 5x + 2$ where $x = 12$ and $= 11$?
26	Evaluate $A + B + C$ if $$3A - 3B = -6$$ $$A + C = 7$$ $$4B + 2C = 22$$
27	Find the sum of the infinite geometric sequence whose fifth term is 144 and whose sixth term is 96.
28	What is the tens digit of $4^7 + 12^2 + 9^4$?
29	Simplify: $(12i + 2)(-4i + 1)^2$
30	A sequence of matrices is given by $M_n = \begin{bmatrix} 2^n & 1 \\ 0 & n \end{bmatrix}$ for positive integers n. Find the determinant of $\sum_{n=0}^{10} M_n$.

PRE-CALCULUS

Challenge Questions: 3 pts each	
31	The probability of getting exactly 3 heads when flipping a certain unfair coin four times is 0.0256. What is the probability of getting heads on a single flip of this coin? Answer as a common fraction.
32	A triangle with side lengths of 8, 15, and 17 has both an inscribed and circumscribed circle. What is the distance between the centers of those circles?
33	What is the mean of all the three digit counting numbers that can be made using each of the numbers 1, 3, 5 and 4 at most once each?
34	Find the sum of the digits of the decimal expansion of $\frac{90}{91}$ before repeating.
35	What is the area of the ellipse with equation $2x^2 + 3y^2 + 4x + 36y = 10$?
36	What is the least common multiple of 2160, 1152, and 3240?
37	Find the seventh pentagonal number.
38	There are many data sets of counting numbers with a mean, unique mode, median, and range that are all equal. Some of them have fewer elements than others, and some have the smallest possible number of elements. Give an example of a set with this smallest possible number of elements, including the number 1 as your smallest element. E.g. if you believed the fewest possible elements was 2, and that the set {1, 10} satisfied all the criteria, that could be your answer.
39	A Euchre deck has A, K, Q, J, 10, and 9 in each of the four suits. After I shuffle mine, I peek quickly to see where the spades are and determine that the Queen is above the Jack, the 10 is below the King, the 9 is touching the Ace, the Queen and 10 have exactly one other spade between them, but the Jack and Ace have no other spades between them. How many orders are possible for the spades, not considering the locations of the other suits?
40	After the Crime of the Century, five masterminds are arrested. All of them know which one of them committed the Crime, and they make the following statements in order, having heard all of the preceding statements: A: It wasn't B or C. B: It was C or D. C: It wasn't E or me. D: Exactly one of A, B, or C is lying. E: At least two of A, B, C, or D are telling the truth. If exactly one of C & D lied, list which masterminds might have committed the Crime.

PRE-CALCULUS

“Math is Cool” Masters – 2014-15

Sponsored by: AkzoNobel

December 6, 2014

CALCULUS - Individual Contest

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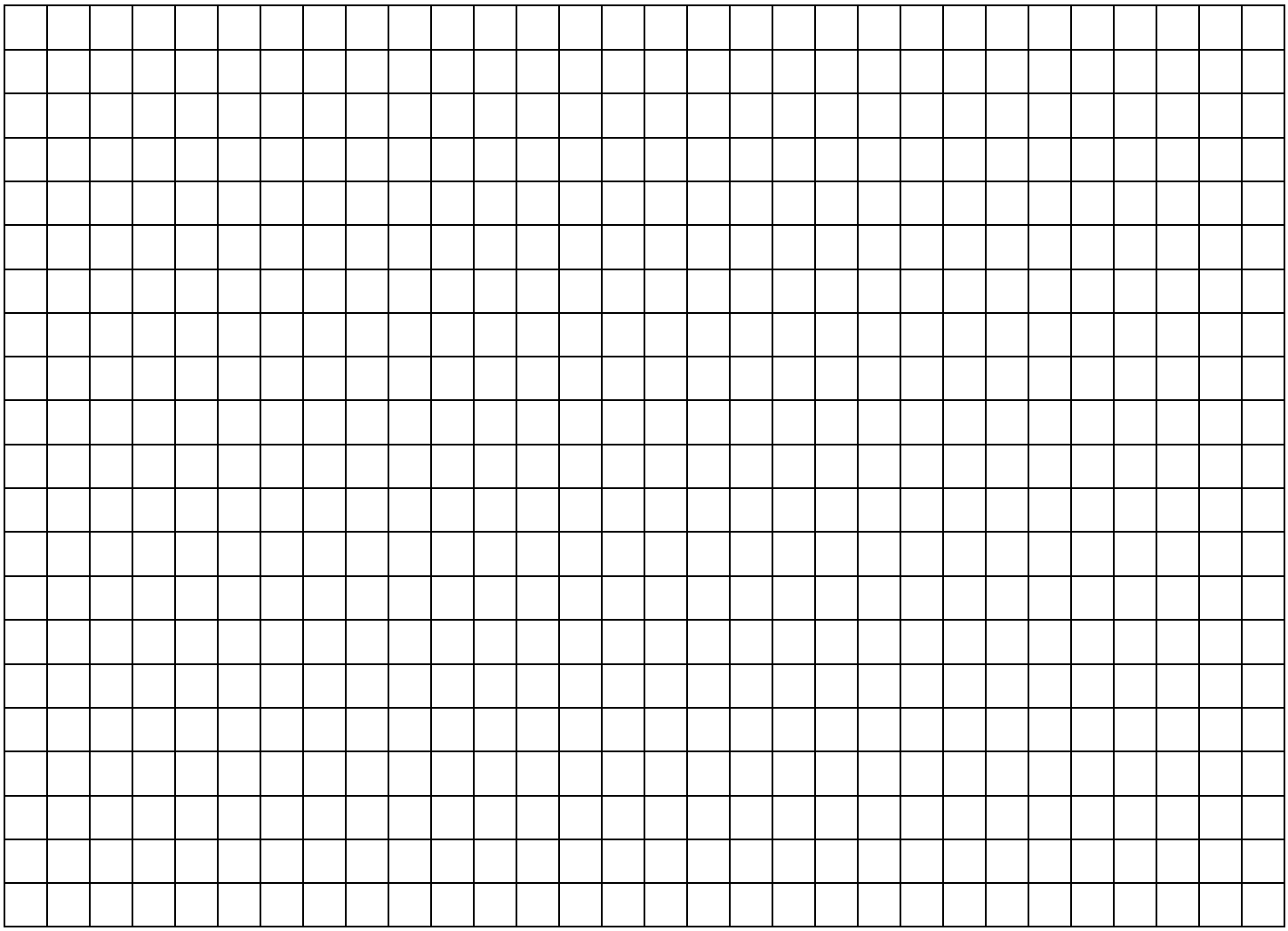

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December 6, 2014

CALCULUS - Individual Contest

	Questions 1-30: 2 points each
1	Evaluate: $\left(\frac{3}{4}\right)^{-3}$
2	What is the tenth term of an arithmetic sequence with a first term of 10 and a common difference of 9?
3	Evaluate: $1 + (9-3)^2 \div 4 \times 8$
4	What is the perimeter, in meters, of a square with an area of 81 m^2?
5	Express in simplest radical form: $\sqrt{160}$
6	What is the area, in square meters, of an isosceles triangle with sides measuring 10 m, 10 m, and 16 m?
7	Simplify: $\frac{3^3 * 9}{3^{-2}}$
8	If $f(x) = 9x + 7$, and $g(x) = x^2 + 19$, what is the value of $f(g(12))$?
9	An angle of 807098 degrees is coterminal to an angle of $Q°$, where $0 \leq Q < 360$? What is the value of Q?
10	Evaluate: $4\frac{5}{6} - 2\frac{3}{4}$ **as a mixed number**.
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17	What is the eighth term of a recursive sequence with first term $b_1 = 2$ and subsequent terms $b_c = \frac{b_{c-1}}{b_{c-1}+1}$?
18	Simplify: $\log_4 9 + \log_4 27$ in terms of $\log_2 3$.
19	What is the lateral surface area, in square meters, of a cone with a radius of 7 m and a height of 10 m?

20	How many positive even integers less than 3000 are perfect cubes?
21	What is the thousands digit of 12^5 ?
22	What is the acceleration function of a car whose velocity function is equal to $5t^2 + 8t$, where t is time?
23	Name all of the distinct roots of $x^3 + 2x^2 - 4x - 8 = 0$.
24	If you move west at 75 miles per hour then return the same distance at 60 miles per hour what is your average speed?
25	Evaluate: $\int (x^2 + x)dx$
26	Evaluate $A + B + C$ if $$3A - 3B = -6$$ $$A + C = 7$$ $$4B + 2C = 22$$
27	Find the sum of the infinite geometric sequence whose fifth term is 144 and whose sixth term is 96.
28	What is the tens digit of $4^7 + 12^2 + 9^4$?
29	Simplify: $(12i + 2)(-4i + 1)^2$
30	A sequence of matrices is given by $M_n = \begin{bmatrix} 2^n & 1 \\ 0 & n \end{bmatrix}$ for positive integers n. Find the determinant of $\sum_{n=0}^{10} M_n$.

CALCULUS

Challenge Questions: 3 pts each	
31	What is the tens digit of 123^{45}?
32	A triangle with side lengths of 8, 15, and 17 has both an inscribed and circumscribed circle. What is the distance between the centers of those circles?
33	What is the mean of all the three digit counting numbers that can be made using each of the numbers 1, 3, 5 and 4 at most once each?
34	An ant is standing on an edge of a regular octahedron one inch from a vertex, and wants to reach another point that is on an edge one inch from a vertex. Of all of the ant's possible destination points, the ant chooses to go to one that *requires* as much walking as possible, but then the ant walks there by the shortest possible route. If the octahedron's edges measure six inches each, how many inches did the ant walk?
35	What is the area of the ellipse with equation $2x^2 + 3y^2 + 4x + 36y = 10$?
36	What is the least common multiple of 2160, 1152, and 3240?
37	Find the seventh pentagonal number.
38	There are many data sets of counting numbers with a mean, unique mode, median, and range that are all equal. Some of them have fewer elements than others, and some have the smallest possible number of elements. Give an example of a set with this smallest possible number of elements, including the number 1 as your smallest element. E.g. if you believed the fewest possible elements was 2, and that the set {1, 10} satisfied all the criteria, that could be your answer.
39	A Euchre deck has A, K, Q, J, 10, and 9 in each of the four suits. After I shuffle mine, I peek quickly to see where the spades are and determine that the Queen is above the Jack, the 10 is below the King, the 9 is touching the Ace, the Queen and 10 have exactly one other spade between them, but the Jack and Ace have no other spades between them. How many orders are possible for the spades, not considering the locations of the other suits?
40	After the Crime of the Century, five masterminds are arrested. All of them know which one of them committed the Crime, and they make the following statements in order, having heard all of the preceding statements: A: It wasn't B or C. B: It was C or D. C: It wasn't E or me. D: Exactly one of A, B, or C is lying. E: At least two of A, B, C, or D are telling the truth. If exactly one of C & D lied, list which masterminds might have committed the Crime.

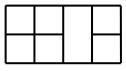
CALCULUS

"Math is Cool" Masters – 2014-15

Sponsored by: AkzoNobel

11th & 12th Grade – December 6, 2014

Individual Multiple Choice Contest

1	Find the coefficient of x^2 in the expansion of $(4x+5)^4$ when like terms are combined. A) 400 B) 800 C) 1600 D) 2400 E) Answer not given.
2	What is the maximum number of regions into which 12 lines can divide a plane? A) 67 B) 79 C) 144 D) 4096 E) Answer not given.
3	Express $0.31\overline{7}$ as a fraction. A) $\frac{283}{900}$ B) $\frac{71}{225}$ C) $\frac{29}{60}$ D) $\frac{143}{450}$ E) Answer not given.
4	What is the smallest value, n, so that $3^n + 5^n + 7^n$ is a 5 digit number? A) 5 B) 6 C) 7 D) 8 E) Answer not given.
5	What is the second smallest 4-digit number, the sum of whose digits is the 7th smallest prime number? A) 1059 B) 1079 C) 1088 D) 9710 E) Answer not given.
6	A circle with a radius of $\sqrt{3}$ is circumscribed by a regular hexagon. Find the area outside of the circle, but inside of the hexagon. A) $3\pi - \frac{9\sqrt{3}}{2}$ B) $6\sqrt{3} - 3\pi$ C) $9\sqrt{3} - 3\pi$ D) $3\pi - 3\sqrt{3}$ E) Answer not given.
7	How many rectangles of any size or shape appear in the grid of unit squares which is missing a line segment?  A) 18 B) 19 C) 20 D) 21 E) Answer not given.
8	What is the missing term of the sequence 1000, 729, 512, 349, ____, 185, 184, …? A) 238 B) 240 C) 242 D) 244 E) Answer not given.
9	If two people each pick a random integer between 1 and 10 inclusive, what is the probability they share at least one prime factor? A) $\frac{37}{100}$ B) $\frac{19}{50}$ C) $\frac{39}{100}$ D) $\frac{2}{5}$ E) Answer not given.
10	How many quadrants does the function $\lvert x^3 - 3x + 2\rvert - 1$ exist in? A) 1 B) 2 C) 3 D) 4 E) Answer not given.

"Math is Cool" Masters – 2014-15

Sponsored by: AkzoNobel

11th & 12th Grade – December 6, 2014

Team Contest

1	What are the eigenvalues of $\begin{bmatrix} 1 & 32 \\ 1 & 5 \end{bmatrix}$?
2	What is the equation, in $y = mx + b$ form, of the line normal to the equation $f(x) = x^2 + 2x + 3$ at the point where $x = 4$?
3	How many three digit multiples of 17 contain at least 2 different digits?
4	What is the volume of an octahedron with edge lengths of 5 inches?
5	Richard is an avid dog book collector, keeping them next to one another on a single shelf. He has 3 books about corgis, 2 books about shiba inus, 3 books about huskies, and 4 books about dachshunds. In how many ways can Richard rearrange the dog books if he wants to keep books about the same breed of dog together?
6	Find the area of the region formed by the lines *y* equals three *x* minus six, *y* equals three, *x* equals six, and the x axis. Express your answer as a reduced IMPROPER fraction.
7	What is the harmonic mean of 7, 8, and 3?
8	What is the greatest common factor of 2160, 1152, and 3240?
9	If 58 of the interior angles of a polygon sum to 10092, what do the other 2 angles sum to?
10	I wrote down the counting numbers up to (and including) N, and then I averaged the numbers I had written. I got an answer of 10.75, but then I realized I had forgotten to write M in the list! What is the maximum possible value of $N \times M$?

"Math is Cool" Masters – 2014-15

Sponsored by: AkzoNobel

11th & 12th Grade – December 6, 2014

Pressure Round Contest

1	The data set $\{3, 8, x, 6, 3, 9, y, 7\}$ has a mean of $\frac{25}{4}$ and a median of $\frac{20}{3}$. What is the maximum possible product of x and y?
2	Evaluate: $\sum_{n=1}^{7} \frac{6}{n^2+3n}$
3	How many permutations of the word DIVIDE have at least one I between the two D's?
4	What is the product of the integers greater than 10 and less than 17?
5	Consider a 3 by 4 rectangular array of twelve lattice points. How many triangles can be made using three of these points as vertices?

"Math is Cool" Masters – 2014-15

Sponsored by: AkzoNobel

11th & 12th Grade – December 6, 2014

COLLEGE KNOWLEDGE BOWL ROUND #1 – SET 1

#	Problem	Answer
1	In degrees, what is the inverse cosine of the cosine of one hundred degrees?	100 [degrees]
2	What is the measure of a single exterior angle of a regular dodecagon?	30 [degrees]
3	When the secret number is divided by four and the result is decreased by fifty-six, the final result is ninety-eight. What is the secret number?	616
4	How many factors of one hundred twenty are multiples of two?	12
5	What values of X have the property that the absolute value of the quantity X-plus-twelve [PAUSE] is one-thousand seven-hundred ninety-four?	-1806, 1782
6	What is the missing term (the BLANK) of the sequence two, three, six, eighteen, one hundred eight, BLANK, two hundred nine thousand nine hundred fifty-two, and so on?	1944
7	What is the largest area, in square meters, you can enclose by using twenty-nine meters of fencing?	$\frac{841}{4\pi}$
8	Toschium has a half-life of twenty seconds. How many grams of a forty kilogram sample will remain after two minutes?	625
9	A bag contains 4 red marbles, 9 blue marbles, and 25 green marbles. When one marble is drawn, what is the probability that it is not red?	$\frac{17}{19}$
10	Evaluate the continued fraction expression four-plus-[PAUSE]-seven-over-the-quantity-four-plus-[PAUSE]-seven-over-the-quantity-four-plus-[PAUSE]-seven-over-the quantity… and so on.	$2+\sqrt{11}$

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COLLEGE KNOWLEDGE BOWL ROUND #2 – SET 2

#	Problem	Answer
1	Find the derivative-of-F-with-respect-to-X if F-of-X-is-one-plus-X-plus-X-squared.	$1 + 2x$
2	How many positive integers are factors of one-hundred eight?	12
3	When the magic number is decreased by thirty-seven and the result is increased by eighty-six, the final result is ninety-nine. What is the magic number?	50
4	Sally rolls a standard die two times. What is the probability that the sum of these numbers is at least 9?	5/18
5	How many lattice points are exactly nine units from the origin?	4
6	Evaluate the base-two-logarithm-of-twenty-seven times the base-three-logarithm-of-one-thousand-twenty-four.	30
7	How many five-digit numbers are not palindromes?	89100
8	Find the equation, in slope-intercept form, of the line which is the perpendicular bisector of the segment whose endpoints are the points one-COMMA-one and five-COMMA-three.	$y = -2x + 8$
9	What number is twice the sum of fifty-nine and thirty-eight?	194
10	How many people must it take for at least five hundred unique handshakes to occur? Different hands on the same people do not count as unique.	33

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11th & 12th Grade – December 6, 2014

COLLEGE KNOWLEDGE BOWL ROUND #3 – SET 3

#	Problem	Answer
1	What is the period of the function cosine-X-plus-sine-X-plus-cosine-two-X?	2π
2	What is the sum of the values of a two-by-two identity matrix?	2
3	What is the sum of the smallest three-digit palindromic counting number and the largest two-digit palindromic counting number?	200
4	What is two-thirds of six-fifths of one-fourth?	$\frac{1}{5}$
5	In how many points do the graphs of Y-equals-X-squared-plus-four and X-equals-Y-squared-plus-twelve intersect?	0
6	Bora drives twenty miles south to Federal Way to visit her parents. Then she drives twelve miles east to visit Stacey in Algona. The shortest distance from Bora's starting point to Algona in simplest radical form is B-root-C. What is the value of B divided by C?	$\frac{2}{17}$
7	What is the area, in square meters, of a circle circumscribed around a square with an area of one-hundred-sixty-nine?	$\frac{169\pi}{2}$
8	How many multiples of twelve are factors of one-thousand eight-hundred?	12
9	How many milliliters are in three-point-eight kiloliters?	3,800,000
10	Compute five factorial plus four factorial plus the product of six factorial and three factorial.	4464

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COLLEGE KNOWLEDGE BOWL ROUND #4 – SET 4

#	Problem	Answer
1	Express twelve degrees, six minutes, nine seconds as a decimal number of degrees.	12.1025 [degrees]
2	What is the sum of the roots of two-X-cubed-plus-three-X-squared-minus-four-X-plus-five-equals-zero?	$-\frac{3}{2}$
3	What is the volume, in cubic meters, of a cone with a base of radius of five meters and a height of 2π meters?	$\frac{50\pi^2}{3}$
4	A triangle with side lengths of six, eight, and ten meters is inscribed within a circle. What is the area, in square meters, within the circle but outside the triangle?	$25\pi - 24$
5	What is the sum of the arithmetic mean of two, three, and thirty-six and the geometric mean of two, three, and thirty-six?	$\frac{59}{3}$
6	Two delegates from Arrakis, three from House Harkonnen, and two from House Atreides sit at a round table, but each delegation sits together. In how many distinguishable ways could the delegates sit?	48
7	At twelve fifty-two PM Robert began filling his fifty-two-gallon bathtub at a rate of one quart a minute. If Robert falls asleep and forgets to turn off his water, at what time will his bathtub overflow?	4:20 PM
8	How many ways can you divide 16 apples amongst 7 people where everyone gets at least 2 apples?	28
9	Evaluate: $\log_8 128$	$\frac{7}{3}$
10	What is the cosecant of the smallest angle in a right triangle with legs with lengths of twenty meters and twenty-one meters?	$\frac{29}{20}$

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COLLEGE KNOWLEDGE BOWL ROUND #5 – SET 5

#	Problem	Answer
1	Express C-I-S-three-PI-over-four as a complex number in rectangular form.	$-\frac{\sqrt{2}}{2}+\frac{\sqrt{2}}{2}i$
2	What value(s) of B satisfy the equation ninety-seven-minus-three-B-equals-forty-nine?	16
3	How many diagonals can be drawn in a dodecagon?	54
4	What is the ninth term of an arithmetic sequence with first term three and common difference four?	35
5	Express the base two number one-zero-one-one-zero-one-one-one-zero-one-one-one-one as a base eight number.	13357_8
6	Evaluate negative nine [PAUSE] minus the cube of negative eight [PAUSE] minus seven times negative six.	545
7	David's dad has a tent in the shape of a cone with a height of six feet and a floor area of twenty-five-PI square feet. David has a smaller conical tent positioned in the center of his dad's tent with a height of four feet and a floor area of nine-PI square feet. What is the volume, in cubic feet, within his dad's tent and outside David's?	38pi [cubic feet]
8	What is the equation of the line through the point two-COMMA-six that is perpendicular to the line that passes through the points one-COMMA-four and negative-three-COMMA-six. Give your answer in the form Y-equals-M-X-plus-B.	$y = 2x + 2$
9	There are five dogs in a yard. Each dog has four feet. Each foot has four toes. There are four fleas between each pair of adjacent toes. How many fleas are there?	240
10	What is the sum of the counting numbers between one-hundred and one-hundred fifty, inclusive?	6375

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COLLEGE KNOWLEDGE BOWL ROUND #6 – SET 6

#	Problem	Answer
1	One eighth of one twelfth of my number is two times the product of three and twelve. What is my number?	6912
2	Convert the binary number one-zero-zero-one-one to a base four number.	103 [base 4]
3	What is the product of the largest and smallest two-digit prime numbers?	1067
4	Bill has two gallons of a twenty-five percent alcohol solution. How many QUARTS of water must he add to get a ten percent alcohol solution?	12
5	What is seventy-two percent of two-hundred twenty-five?	162
6	What is the seventh term of a geometric sequence with a first term of twenty-one and a common ratio of two?	1344
7	Given two vertical angles, one of measure X-squared-minus-four, and the other of measure X-squared-plus-five-X-plus-six, what is the value of X?	-2
8	What is the radius, in meters, of a sphere with a volume of one-hundred-pi cubic meters?	$\sqrt[3]{75}$
9	How many ways are there to arrange the letters in "ALABAMA", spelled A-L-A-B-A-M-A?	210
10	If it is five forty-three PM now, what time will it be once the minute hand has traveled eight-PI-over-four radians?	6:43 PM

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COLLEGE KNOWLEDGE BOWL ROUND – EXTRA

#	Problem	Answer
1	Evaluate the limit as X goes to zero of the product of the quantities X-plus-four and X-plus-nine.	36
2	What is the value of four factorial plus three factorial?	30
3	What is four to the third power, divided by two?	32
4	What is 123 mod 9?	6
5	Evaluate: $9 + 8 \times 7$	65
6	What is the prime factorization, expressed in exponential form, of 1200?	$2^4 \cdot 3 \cdot 5^2$
7	When a fair coin is flipped four times, what is the probability that the first two flips are the same as the fourth?	$\frac{1}{4}$

Final Score:

KEY

(Out of 8)

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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	4 [square] root 3		
2	901		
3	111		
4	420		
5	5/12		
6	391		
7	6		
8	7+5+2		

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11th & 12th Grade – December 6, 2014

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

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11th & 12th Grade – December 6, 2014

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	-3, 9		
2	$y = -\frac{1}{10}x + \frac{137}{5}$ TFC		
3	53		
4	$\frac{125\sqrt{2}}{3}$		
5	41472 [ways]		
6	21/2		
7	$\frac{504}{101}$		
8	72		
9	348		
10	336		

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11th & 12th Grade – December 6, 2014

Final Score: KEY

Proctor Name _____ Room # _____

First Score

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	$\frac{437}{9}$
2	$\frac{539}{180}$
3	90
4	5765760
5	200

Final Score:

(Out of 8)

"Math is Cool" Masters -- 2014-15

School: _____ Room # _____ Team # _____

Name: _____ Proctor: _____

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

Math is Cool" Masters – 2014-15

11th & 12th Grade – December 6, 2014

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

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

"Math is Cool" Masters – 2014-15

11th & 12th Grade – December 6, 2014

Final Score:

SCHOOL NAME _____ **Team #** _____

Proctor Name _____ Room # _____

First Score
(out of 10)

Team Contest – Score Sheet

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DO NOT WRITE IN SHADED REGIONS

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