"Math is Cool" Championships – 2012-13

October 19, 2012
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 fraction 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.*

Final Score:

(Out of 8)

"Math is Cool" Championships -- 2012-13

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			

Final Score:

"Math is Cool" Championships – 2012-13

October 19, 2012

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

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

High School Grade 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:			

High School

"Math is Cool" Championships – 2012-13

October 19, 2012
High School Individual Contest

Tear this sheet off and fill out top of answer sheet on following page prior to the start of the test.

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 fraction 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.*

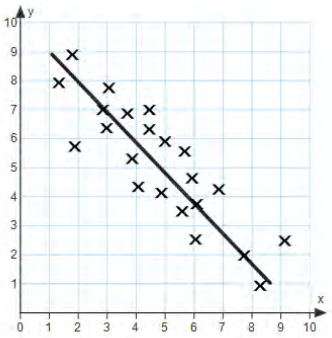
INDIVIDUAL TEST - 35 minutes

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 – 2012-13

October 19, 2012
High School Individual Contest

	Questions 1-30: 2 points each
1	Simplify and write as a reduced fraction. $2^3 \cdot 6^{-3}$
2	What is the sum of the next two numbers in the arithmetic sequence: 8, 15, 22, 29, _____, _____?
3	What is the area, in square inches, of a right triangle with hypotenuse 17 inches and one leg of 8 inches?
4	Solve for *x*: $4x + 7 = 3(2x + 5) - 8$
5	How many diagonals can be drawn in a regular hexagon?
6	What is the slope of the line $4x - 2y = 5$
7	What is the area, in square centimeters, of a circle that has a circumference of 10π cm?
8	Let: $A = 2^{30}$ $B = 3^{20}$ $C = 10^{10}$ Put the values A, B, C in order from smallest to largest
9	What is the volume of a cube if the diagonal drawn on one of its faces is $5\sqrt{2}$ units?
10	A rhombus has one interior angle of $37°$. What is the measure, in degrees, of one of the angles formed by the intersection of its diagonals?
11	If $f(x) = 2x^2 + x - 4$. What is $f(-2)$?
12	Solve for x: $x^2 + 8x - 33 = 0$
13	Donuts cost 60 cents each and a dozen for 5 dollars. What is the most number of donuts that I can buy with $18.00?
14	What is the positive difference between the median and the mean of the data: 5, 7, 9, 10, 13, 15, 18
15	Evaluate: $(1 + 2) \cdot 3 + 4/5$.

16	Which of the following best estimates the correlation in the data below? A) -1.0 B)-0.8 C) 0.0 D) 0.4 
17	What is the lateral surface area of a cone with a base area of 441π in^2 and volume of 2940π in^3?
18	How many subsets does the set of positive one-digit prime numbers have?
19	What is the maximum number of two-inch by three-inch stickers that can fit inside a five-inch by twelve-inch space without overlapping?
20	In a certain game of chance, I flip three coins. If they are all the same, I receive $10, otherwise I must pay $2. What is the expected number of dollars I will receive? (A positive/negative answer indicates an expected gain/loss)
21	How many ways are there to rearrange the letters in the word 'LEVERAGE'?
22	How many non-congruent triangles are there with integer side lengths and a perimeter of 11?
23	The average test score of a class of 12 students was 80%. The average of eight of those students was 75%, what was the average of the other 4 students?
24	A point P is exterior to a circle of radius 4 units and is 9 units from its center, O. A tangent line is drawn from point P to the circle intersecting it at point Q. How long is the segment PQ?
25	A polygon with an area of 18 cm^2 and a perimeter of 12 cm is similar to a polygon with a perimeter of 30 cm. What is the other polygon's area, in square centimeters?
26	It's Holiday time! There is a present for each of the critters: Beary, Porcupiney, Squirrely, and Rabbity. If each critter goes to the tree and takes a random present, what is the probability that they will all get their respective gifts?
27	What is $$\frac{\left(2^{\frac{3}{2}} \cdot 8^{-2}\right)^{\frac{1}{3}}}{16^{-\frac{3}{2}} \cdot \sqrt{2}}?$$

28	The math club membership consists of 12 algebra students and 8 geometry students. If the faculty advisor needs to select four students to be officers but must select at least one algebra and one geometry student. In how many ways can he do this?
29	Evaluate: $11_2 + 22_3 + 33_4 + 44_5 + 55_6$ and express the answer in base 10.
30	Evaluate: $$\sum_{n=3}^{10} (n-1)^2$$

Challenge Questions: 3 pts each	
31	In a 3x3 grid of squares, one starts in the upper left square and on each move, goes to an adjacent square (horizontal or vertical). After 3 moves, in how many squares can one land?
32	Express the domain of $q(r) = \sqrt{4-3r}$ in interval notation if the domain and range are both subsets of the real numbers.
33	My coin collection has nickels, dimes, and quarters. If the total value of the 32 coins in my collection is \$3.55 and there are twice as many of one kind of coin as another, how many nickels are there?
34	How many terms are in the expansion of $(a+b)^3(c+d+e)^4$?
35	What is the remainder when 12! is divided by 13?
36	The polar graph of $r = 2^\theta, 1 \le r < 1000$ intersects the x-axis in how many points?
37	The solutions to the equation $2x^3 + 17x + b = 0$ form an arithmetic sequence. What is the value of *b*?
38	Energy regulators in the USS Enterprise have 5 pins with which to drain excess energy. These identical pins are to be divided into one or more groups. For example: a grouping of 2 and 3 pins is one such configuration (groups of 3 and 2 pins is the same). How many different configurations are possible?
39	Evaluate: $$\sum_{x=1}^{\infty} \frac{1}{x^2+4x+3}$$
40	What is the Cartesian point $(\sqrt{3}, 1, 2)$ expressed in cylindrical coordinates?

Math is Cool" Championships – 2012-13

9th & 10th Grade – October 19, 2012

Final Score:

First Score

(out of 20)

Student Name_____

Proctor Name_____Room #_____

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			
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9			
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"Math is Cool" Championships – 2012-13

9th & 10th Grade – October 19, 2012
Individual Multiple Choice Contest

1	What is the hundreds digit of 5^{168}? A) 1 B) 4 C) 6 D) 8 E) Answer not given.
2	What is the remainder when $9x^2 - 5x + 6$ is divided by $x - 1$? A) $x - 6$ B) 6 C) 10 D) 20 E) Answer not given.
3	Evaluate: $-1 - (-1 - 1)^{-1}(-1)$ A) -3/2 B) -1 C) 0 D) 1 E) Answer not given.
4	Frank flipped a coin 6 times and got 3 heads and 3 tails. The 3 heads occurred consecutively. In how many ways can this happen? A) 2 B) 4 C) 6 D) 20 E) Answer not given.
5	Evaluate: $\sqrt{20 + \sqrt{20 + \cdots}}$. A) $2\sqrt{5}$ B) 5 C) $\sqrt{30}$ D) $4\sqrt{5}$ E) Answer not given.
6	An ant is travelling across the surface of a regular tetrahedron of edge length 4 cm. If the ant begins at the center of one face of the tetrahedron and walks to the center of an adjacent face, how far did the ant travel, in centimeters? A) $\frac{4\sqrt{3}}{3}$ B) $\frac{6\sqrt{3}}{3}$ C) $\frac{8\sqrt{3}}{3}$ D) $\frac{16\sqrt{3}}{3}$ E) Answer not given.
7	What is the equation of the axis of symmetry of the parabola with equation $y = 3x^2 + 24x - 18$? A) $y = 4$ B) $x = 4$ C) $x = 8$ D) $x = -8$ E) Answer not given.
8	Two circles have radii of 8 and 12 cm and have centers 40 cm apart. What is the length, in centimeters, of one of their common internal tangents? A) $20\sqrt{3}$ B) $40\sqrt{2}$ C) $40\sqrt{3}$ D) 80 E) Answer not given.
9	Evaluate: $\log 10^{(\log_{81} 49)(\log_7 36)(\log_6 27)}$ A) 1 B) $\log_6 10$ C) $2\log_3 7$ D) 3 E) Answer not given.
10	Express the base-two number 101111001_2 as a base-four number. A) 13301_4 B) 11321_4 C) 11331_4 D) 12321_4 E) Answer not given.

Math is Cool" Championships – 2012-13

11th & 12th Grade – October 19, 2012

Final Score:

First Score

(out of 20)

Student Name_____

Proctor Name_____Room #_____

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			
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"Math is Cool" Championships – 2012-13

Sponsored by:

11th & 12th Grade – October 19, 2012

Individual Multiple Choice Contest

1	What is the hundreds digit of 5^{168}? A) 1 B) 4 C) 6 D) 8 E) Answer not given.
2	What is the remainder when $9x^2 - 5x + 6$ is divided by $x - 1$? A) $x - 6$ B) 6 C) 10 D) 20 E) Answer not given.
3	Evaluate: $-1 - (-1 - 1)^{-1}(-1)$ A) -3/2 B) -1 C) 0 D) 1 E) Answer not given.
4	What is the eccentricity of a circle with an area of 4π square meters centered at the point (-2, 3)? A) 0 B) 2/3 C) 1 D) 2 E) Answer not given.
5	Evaluate: $\sqrt{20 + \sqrt{20 + \cdots}}$. A) $2\sqrt{5}$ B) 5 C) $\sqrt{30}$ D) $4\sqrt{5}$ E) Answer not given.
6	An ant is travelling across the surface of a regular tetrahedron of edge length 4 cm. If the ant begins at the center of one face of the tetrahedron and walks to the center of an adjacent face, how far did the ant travel, in centimeters? A) $\frac{4\sqrt{3}}{3}$ B) $\frac{6\sqrt{3}}{3}$ C) $\frac{8\sqrt{3}}{3}$ D) $\frac{16\sqrt{3}}{3}$ E) Answer not given.
7	What is the (1,3) entry of the matrix $\begin{bmatrix} 0 & 1 & 1 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}^{10}$? A) 1 B) 2 C) 3 D) 10 E) Answer not given.
8	Two circles have radii of 8 and 12 cm and have centers 40 cm apart. What is the length, in centimeters, of one of their common internal tangents? A) $20\sqrt{3}$ B) $40\sqrt{2}$ C) $40\sqrt{3}$ D) 80 E) Answer not given.
9	Evaluate: $\log 10^{(\log_{81} 49)(\log_7 36)(\log_6 27)}$ A) 1 B) $\log_6 10$ C) $2\log_3 7$ D) 3 E) Answer not given.
10	The four perpendicular bisectors of a quadrilateral all meet in a single point. What is the most precise term for this quadrilateral that is guaranteed to be true? A) Cyclic B) Rectangle C) Rhombus D) Trapezoid E) Answer not given.

"Math is Cool" Championships – 2012-13

9th & 10th Grade – October 19, 2012

Final Score:

SCHOOL NAME_____Team # _____

First Score
(out of 10)

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			
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"Math is Cool" Championships – 2012-13

9th & 10th Grade – October 19, 2012
Team Contest

1	What is the smallest positive integer, *n*, such that 60*n* is a perfect square?
2	What is the measure, in degrees, of one of the interior angles in a regular 18-sided polygon?
3	It takes Mr. Snuffles three hours to knit a sweater. It takes Fluffykins 5 hours to knit three sweaters. How many hours would it take them together to knit seven sweaters? Answer as a decimal.
4	Express the range of the function $c(b) = 5b^2 + 40b - 7$ in interval notation, given that the domain and range are subsets of the real numbers.
5	Express as an ordered triple (j, k, l) the solution to the system of equations: $4j - k + 2l = -6$ $-2j + 3k + l = 2$ $2j - l = 4$
6	What is the sum of the reciprocals of the squares of the roots of the parabola: $x^2 + 7x + 10$?
7	Express the product of the base-eight numbers 34_8 and 13_8 as a base-eight number.
8	Suppose that for two positive integers *a* and *b*, $\sqrt{a} + \sqrt{b} = \sqrt{8 + \sqrt{60}}$ What is the positive difference between *a* and *b*?
9	Evaluate: $\sqrt{1 + \sqrt{2^1 + \sqrt{2^3 + \sqrt{2^7 + \sqrt{2^{15} + \cdots}}}}}$
10	ABCD is a square of side length 2. Semicircles of diameter 2 are drawn on each side into the interior of the square. What is the area of the 4 petals created by the overlapping semicircles?

"Math is Cool" Championships – 2012-13

11th & 12th Grade – October 19, 2012

Final Score:

SCHOOL NAME_____Team # _____

First Score
(out of 10)

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			

"Math is Cool" Championships – 2012-13

Sponsored by:

11th & 12th Grade – October 19, 2012

Team Contest

1	What is the smallest positive integer, *n*, such that 60*n* is a perfect square?
2	What is the measure, in degrees, of the smaller angle between the two vectors: $\sqrt{3}\vec{\imath} + \vec{\jmath}$ and $\vec{\imath} + \sqrt{3}\vec{\jmath}$?
3	It takes Mr. Snuffles three hours to knit a sweater. It takes Fluffykins 5 hours to knit three sweaters. How many hours would it take them together to knit seven sweaters? Answer as a decimal.
4	Express the range of the function $c(b) = 5b^2 + 40b - 7$ in interval notation, given that the domain and range are subsets of the real numbers.
5	Express as an ordered triple (j, k, l) the solution to the system of equations: $$4j - k + 2l = -6$$ $$-2j + 3k + l = 2$$ $$2j - l = 4$$
6	What is the determinant of the following matrix? $$\begin{bmatrix} 8 & 3 & 2 & 0 \\ 0 & 4 & 1 & 5 \\ 1 & 6 & 9 & 3 \\ 7 & 1 & 0 & 2 \end{bmatrix}$$
7	Express the product of the base-eight numbers 34_8 and 13_8 as a base-eight number.
8	Suppose that for two positive integers *a* and *b*, $$\sqrt{a} + \sqrt{b} = \sqrt{8 + \sqrt{60}}$$ What is the positive difference between *a* and *b*?
9	Evaluate: $\sqrt{1 + \sqrt{2^1 + \sqrt{2^3 + \sqrt{2^7 + \sqrt{2^{15} + \cdots}}}}}$
10	When three points are chosen on a circle, what is the probability that they are contained in a $45°$ arc?

"Math is Cool" Championships – 2012-13

9th & 10th Grade – October 19, 2012
Pressure Round Contest

1	When three fair six-sided dice are rolled, what is the probability the numbers shown on their upper faces sum to eight?
2	On a road trip, a group of friends pool their money to pay for a hotel room. If there had been one more friend, the price per person would have been two dollars less. If there had been two fewer friends, the price per person would have been six dollars more. What was the total price of the hotel room, in dollars?
3	What is the sum of the arithmetic, geometric and harmonic means of 3, 15, and 75?
4	Tom was supposed to first pick a number and then add 5 and multiply by 3. Instead, he added 3 and multiplied by 5 getting 60. What number would he get by doing the correct operations?
5	What is the sum of the distinct digits of the decimal expansion of: $\frac{937}{990}$?

"Math is Cool" Championships – 2012-13

Sponsored by:

11th & 12th Grade – October 19, 2012

Pressure Round Contest

1	Evaluate: $\cfrac{1}{2+\cfrac{3}{2+\cfrac{3}{2+\cfrac{3}{2+\cdots}}}}$
2	On a road trip, a group of friends pool their money to pay for a hotel room. If there had been one more friend, the price per person would have been two dollars less. If there had been two fewer friends, the price per person would have been six dollars more. What was the total price of the hotel room, in dollars?
3	What is the sum of the arithmetic, geometric and harmonic means of 3, 15, and 75?
4	What is the area, in square units, of the ellipse with equation $4x^2 + 9y^2 + 8x + 36y = 100$?
5	What is the sum of the distinct digits of the decimal expansion of: $\frac{937}{990}$?

College Bowls

9th & 10th

SETS 1-6

w/Extra Questions at the end.

COLLEGE BOWLS INSTRUCTIONS

Read these to the competitors before first round:

COLLEGE BOWLS - up to 10 minutes per round – 10 problems per round – 10% of team score

1. *All competitors must be facing the front of the room in one row. All spectators need to be behind the competitors.*
2. *A maximum of ten questions per round will be scored. It is OK for both teams to score the same number of points! The proctor will record the points earned on each team's score sheet.*
3. *You may use scratch paper and pencil. You may talk with your teammates while arriving at a solution. An Electronic College Bowl Apparatus (CBA) will be used to identify the first team to have an answer.*
4. *During these rounds, the questions will be read twice and a maximum time of 45 seconds will be allowed for you to answer after the second reading of the question is complete. If a team buzzes in after the second reading and gives an incorrect response, the other team has the remainder of the 45 seconds to respond. You may interrupt (buzz in) while a question is being read, however, if you do, the proctor will stop and an immediate response is needed. If the correct response is given, a new question will be asked. Otherwise, the question will be reread for the other team, making sure it has two full readings. Forty-five seconds will be given for the team to respond from the completion of the last reading. If an immediate response is not given after a team pulls the string, their lack of an answer in a timely manner is considered incorrect. In the event that only one team is competing in a round (i.e., one team is absent), the team competing will have a maximum of 30 seconds in which to buzz in.*
5. *You do not need to wait to be acknowledged by the proctor; however, it is your right to do so if you would like to be acknowledged.*
6. *If two students from the same team answer at the same time with different answers, the answer will be considered incorrect.*
7. *If a problem arises with one of the questions, an extra question will be asked to replace that question. There is only one extra question per round. If the round finishes early, you need to stay in the room for the remaining time.*

"Math is Cool" Championships – 2012-13

9th & 10th Grade – October 19, 2012

COLLEGE KNOWLEDGE BOWL ROUND #1 – SET 1

#	Problem	Answer
1	What number is fourteen more than the product of eight and eleven?	102
2	What is the volume, in cubic centimeters, of a cube with edges measuring 15 centimeters?	3375 [cm^3]
3	How many distinct handshakes between two people can occur in a room with thirty-one people?	465
4	For how many distinct values can Bertha make exact change with 1 quarter, 2 dimes, and 3 nickels?	12 [values]
5	What is the median of the data $3, 19, 1, -5, 14, 8$ and 14?	8
6	In how many ways can one arrange 2 sets of identical twins and 1 set of identical triplets in a row if the twins and triplets must sit next to each other?	6 [ways]
7	What is the coefficient of the x-cubed term in the expansion of the quantity two x plus three to the fifth power?	720
8	Four to what power equals five hundred twelve?	9/2
9	How many positive integral factors of 3024 are multiples of perfect squares?	32
10	What is two-three-six base 9 times one-six base 9 in base 9?	Four-zero-one-zero [base 9]

"Math is Cool" Championships – 2012-13

9th & 10th Grade – October 19, 2012

COLLEGE KNOWLEDGE BOWL ROUND #2 - SET 2

#	Problem	Answer
1	What is the mode of the data 12, 2, 10, 5, 7, 9, 5 and 11?	5
2	Evaluate: Eighty-three squared minus seventy-seven squared.	960
3	I am standing 6 feet away from the base of a nearby streetlight. If my shadow is 12 feet long and I am 5 feet tall, then how tall is the streetlight?	15/2 (or) Fifteen halves [ft]
4	What is the sixth term of a geometric sequence with a first term of 21 and a common ratio of 2?	672
5	7 is 50 percent of 25 percent of 175 percent of what number?	32
6	What is the probability that a randomly chosen two-digit number is a perfect square?	1/15
7	What is the remainder when seven to the fifth power is divided by six?	1
8	If a polygon has 16 times as many diagonals as sides. How many sides does it have?	35
9	What is the sum of the even numbers between 21 and 41?	310
10	What is the sum of the infinite geometric sequence: one minus one-half plus one-fourth minus one-eighth and so on.	2/3

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9th & 10th Grade – October 19, 2012

COLLEGE KNOWLEDGE BOWL ROUND #3 - SET 3

#	Problem	Answer
1	What is the product of the greatest common factor and least common multiple of 33 and 39?	1287
2	A 40 grams mass of shredded wheat has 8 grams of fiber. If I hold a mass of shredded wheat that has 5 grams of fiber, how many grams of shredded wheat do I have?	25 [grams]
3	What is the ratio between the areas of the circumscribed circle about a square with sides of length 6 and the inscribed circle in the same square?	2 or "2 to 1"
4	Evaluate as a mixed number: four and five-sixths minus one and one-half.	3 & 1/3
5	How many integers between 60 and 90 are prime numbers?	7
6	What is the slope of the line perpendicular to the line passing through the points seven comma ten and negative two comma negative seventeen?	-1/3
7	Evaluate: Eighty-one to the negative three-fourths power.	1/27
8	A bacterium doubles every 15 minutes; if the initial number of bacteria in a petri dish is 2, then how many full hours does the bacteria need in order for its population to be over 9000?	4 [hours]
9	Squirrel, Lion, Chicken, and T-Rex are at a pie restaurant. They are splitting a blackberry pie and are splitting the bill accordingly. Squirrel has to pay $7.50. T-Rex ate 1/8 of the pie. Chicken and Lion together ate 50% of the pie. In dollars, what is the total cost of the pie?	[$] 20
10	An equilateral triangle is inscribed within a circle of radius 2 inches? What is the area of the triangle in square inches?	$3\sqrt{3}$ [in^2]

"Math is Cool" Championships – 2012-13

9th & 10th Grade – October 19, 2012

COLLEGE KNOWLEDGE BOWL ROUND #4 - SET 4

#	Problem	Answer
1	Evaluate the positive difference between the cubes of five and six.	91
2	Evaluate: forty-eight squared.	2304
3	What is the sum of the roots of the equation: two x-squared minus three x plus four?	3/2
4	What is the area, in square centimeters, of a parallelogram with sides measuring 8 and 15 cm and an interior angle measuring thirty degrees?	60 [cm^2]
5	Bertha's parents recently installed a foot-wide walkway around their circular pool. If the pool and walkway is 18 feet across in total, then what is the area of the pool?	64π [$feet^2$]
6	There are three blue books, four yellow books, and six green books on a shelf. How many distinct ways can these books be arranged on a shelf if a colored book is indistinguishable from another book of the same color?	60060
7	What is the smallest positive integer with exactly nine positive factors?	36
8	What is the sum of all the terms in the infinite geometric sequence with common ratio one-sixth and third term one?	216/5
9	What is the sum of the 30 smallest positive perfect squares?	9455
10	If j of k equals three times five to the kth-power minus seventy-two, evaluate j-inverse of 303.	3

"Math is Cool" Championships – 2012-13

9th & 10th Grade – October 19, 2012

COLLEGE KNOWLEDGE BOWL ROUND #5 - SET 5

#	Problem	Answer
1	Evaluate: thirty-six times two hundred eighteen.	7848
2	Kelsey is putting on some clothes. She has five wigs, three tutus, two pairs of sunglasses, five swimsuits, six watches, and four socks. If an outfit is comprised of one of each article, how many distinct outfits can she make?	3600 [outfits]
3	How many positive factors does the number 1152 have?	24 [factors]
4	What is the surface area, in square centimeters, of a right rectangular box with edges measuring 7, 8, and 5 cm?	262 [cm^2]
5	Teddy is twice as old as Frankie. In ten years from now, Frankie will be 75% of Teddy's age. How old is Frankie now?	5 [years]
6	What is the sum of the first 10 triangular numbers?	220
7	Approximate the square root of 56 to the nearest tenth.	7.5 or seven point five
8	A ball is dropped off a 30 m high building. If the ball can bounce back up to 1/3 of its drop height, then what is the total distance traveled by the ball when it has come to rest?	60 [m]
9	What is the area of the triangle defined by the points one comma one; three comma four; and five comma two?	5 [sq un]
10	What is the domain of the function as a subset of the real numbers: f of x equals one over the square root of the quantity nine minus x-squared?	x between negative three and three non-inclusive.

"Math is Cool" Championships – 2012-13

9th & 10th Grade – October 19, 2012

COLLEGE KNOWLEDGE BOWL ROUND #6 - SET 6

#	Problem	Answer
1	What is one hundred five squared?	11025
2	A pool is filled automatically at a rate of 35 gallons per hour, and empties at a rate of 720 gallons per day. How much less water is there in the pool after 72 hours?	360 [gallons]
3	What is the sum of the factors of 84?	224
4	Evaluate 2 to the eleventh power minus 6 to the fourth power.	752
5	Evaluate as a decimal: two point six times four point one two.	10.712 or ten point seven one two.
6	How much money in cents would one save in purchasing a twenty-dollar product in a state with six point six percent sales tax instead of in a state with ten percent sales tax?	68 [cents]
7	What is the sum of the arithmetic sequence five, eight, and so on up to thirty-five?	220
8	An isosceles triangle with side lengths five, five and six has an inscribed circle. What is the radius of the inscribed circle?	3/2 [un]
9	Evaluate in base six the sum of the base six numbers three four four two and four one zero five.	11551 $[_6]$
10	What is the six hundredth term of the sequence that begins one, two, two, three, three, three, four, four, four, four, et cetera?	35

"Math is Cool" Championships – 2012-13

9th & 10th Grade – October 19, 2012

COLLEGE KNOWLEDGE BOWL ROUND - EXTRA

#	Problem	Answer
1	An icosahedron has 8 more faces than vertices. How many edges does it have?	30 [edges]
2	What is the probability of drawing a queen of diamonds and then a king of hearts from a standard deck of fifty-two cards?	$\frac{1}{2652}$
3	The graph of x squared minus eight x plus three passes through which quadrants?	One, two, and four
4	A bag has 6 blue marbles and 4 red marbles, what is the probability of drawing two marbles of the same color without replacement?	7/15
5	If the sum of two numbers is five and the product is three, what is the sum of the squares of the two numbers?	19
6	What is the unit vector in the same direction as the vector fifteen i minus twenty j?	$\frac{3}{5}i - \frac{4}{5}j$
7	What is the limit as x approaches 2 of the quantity x-squared plus x minus six over the quantity x-squared minus four?	5/4
8	What is the equation for the horizontal asymptote of the equation y equals e to the x?	y = 0. Must includes the "y="

College Bowls

11^{th} & 12^{th}

SETS 1-6

w/Extra Questions at the end.

COLLEGE BOWLS INSTRUCTIONS

Read these to the competitors before first round:

COLLEGE BOWLS - up to 10 minutes per round – 10 problems per round – 10% of team score

1. *All competitors must be facing the front of the room in one row. All spectators need to be behind the competitors.*
2. *A maximum of ten questions per round will be scored. It is OK for both teams to score the same number of points! The proctor will record the points earned on each team's score sheet.*
3. *You may use scratch paper and pencil. You may talk with your teammates while arriving at a solution. An Electronic College Bowl Apparatus (CBA) will be used to identify the first team to have an answer.*
4. *During these rounds, the questions will be read twice and a maximum time of 45 seconds will be allowed for you to answer after the second reading of the question is complete. If a team buzzes in after the second reading and gives an incorrect response, the other team has the remainder of the 45 seconds to respond. You may interrupt (buzz in) while a question is being read, however, if you do, the proctor will stop and an immediate response is needed. If the correct response is given, a new question will be asked. Otherwise, the question will be reread for the other team, making sure it has two full readings. Forty-five seconds will be given for the team to respond from the completion of the last reading. If an immediate response is not given after a team pulls the string, their lack of an answer in a timely manner is considered incorrect. In the event that only one team is competing in a round (i.e., one team is absent), the team competing will have a maximum of 30 seconds in which to buzz in.*
5. *You do not need to wait to be acknowledged by the proctor; however, it is your right to do so if you would like to be acknowledged.*
6. *If two students from the same team answer at the same time with different answers, the answer will be considered incorrect.*
7. *If a problem arises with one of the questions, an extra question will be asked to replace that question. There is only one extra question per round. If the round finishes early, you need to stay in the room for the remaining time.*

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COLLEGE KNOWLEDGE BOWL ROUND #1 – SET 1

#	Problem	Answer
1	What number is fourteen more than the product of eight and eleven?	102
2	What is the median of the data $3, 19, 1, -5, 14, 8$ and 14?	8
3	Simplify the log base eight of thirty-two.	5/3
4	For how many distinct values can Bertha make exact change with 1 quarter, 2 dimes, and 3 nickels?	12 [values]
5	What is the sum of the infinite geometric sequence whose 3rd term is 8 and whose common ratio is one-third?	108
6	In how many ways can one arrange 2 sets of identical twins and 1 set of identical triplets in a row if the twins and triplets must sit next to each other?	6 [ways]
7	What is the coefficient of the x-cubed term in the expansion of the quantity two x plus three to the fifth power?	720
8	Four to what power equals five hundred twelve?	9/2
9	Four couples are seated around a round table with 9 seats for dinner. If each couple has to sit next to each other, then how many ways are there to arrange the couples?	384 [ways]
10	What is two-three-six base 9 times one-six base 9 in base 9?	Four-zero-one-zero [base 9]

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COLLEGE KNOWLEDGE BOWL ROUND #2 - SET 2

#	Problem	Answer
1	What is the mode of the data 12, 2, 10, 5, 7, 9, 5 and 11?	5
2	Evaluate: Eighty-three squared minus seventy-seven squared.	960
3	What is the greatest area that I can encompass with a 10-foot long length of rope?	$\frac{25}{\pi}$ [feet^2]
4	What is the sixth term of a geometric sequence with a first term of 21 and a common ratio of 2?	672
5	What is the area of a regular hexagon of side length 3 cm?	$\frac{27\sqrt{3}}{2}$ [cm^2]
6	What is the probability that a randomly chosen two-digit number is a perfect square?	1/15
7	What is the remainder when seven to the fifth power is divided by six?	1
8	If a polygon has 16 times as many diagonals as sides. How many sides does it have?	35
9	What is cosine squared of 15 degrees?	$\frac{2+\sqrt{3}}{4}$ The quantity two plus root 3, over 4.
10	What is the sum of the infinite geometric sequence: one minus one-half plus one-fourth minus one-eighth and so on.	2/3

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COLLEGE KNOWLEDGE BOWL ROUND #3 - SET 3

#	Problem	Answer
1	What is the product of the greatest common factor and least common multiple of 33 and 39?	1287
2	A 40 grams mass of shredded wheat has 8 grams of fiber. If I hold a mass of shredded wheat that has 5 grams of fiber, how many grams of shredded wheat do I have?	25 [grams]
3	Evaluate: Twenty to the fourth power divided by ten to the fifth power.	8/5
4	Evaluate as a mixed number: four and five-sixths minus one and one-half.	3 & 1/3
5	If f of 3 x equals 18 x-squared plus 6 x minus 1, what is f of negative 1?	-1
6	What is the slope of the line perpendicular to the line passing through the points seven comma ten and negative two comma negative seventeen?	-1/3
7	Evaluate: Eighty-one to the negative three-fourths power.	1/27
8	A bacterium doubles every 15 minutes; if the initial number of bacteria in a petri dish is 2, then how many full hours does the bacteria need in order for its population to be over 9000?	4 [hours]
9	The point negative 4 comma 5 is reflected about the x axis and about the line x equal 1, what is the sum of the x and y coordinates?	1
10	An equilateral triangle is inscribed within a circle of radius 2 inches? What is the area of the triangle in square inches?	$3\sqrt{3}$ [in^2]

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COLLEGE KNOWLEDGE BOWL ROUND #4 - SET 4

#	Problem	Answer
1	Evaluate the positive difference between the cubes of five and six.	91
2	Evaluate: forty-eight squared.	2304
3	Butters is making a batch of peanut butter sunshine, which is comprised of 15% peanut, 30% butter, and 55% sunshine. He has 20 liters of peanut and 18 liters of butter. If he has an unlimited amount of sunshine, what is the volume of the biggest batch of peanut butter sunshine he can make?	60 [liters]
4	What is the area, in square centimeters, of a parallelogram with sides measuring 8 and 15 cm and an interior angle measuring thirty degrees?	60 [cm^2]
5	What is the surface area, in square meters, of an icosahedron with edges measuring 4 meters?	$80\sqrt{3}$ [sq m]
6	There are three blue books, four yellow books, and six green books on a shelf. How many distinct ways can these books be arranged on a shelf if a colored book is indistinguishable from another book of the same color?	60060
7	What is the smallest positive integer with exactly nine positive factors?	36
8	What are the coordinates of the vertex of the parabola given by eight x-squared plus 16 x equals y + 10.	(-1, -18) or negative one comma negative eighteen.
9	What is the sum of the 30 smallest positive perfect squares?	9455
10	If j of k equals three times five to the kth-power minus seventy-two, evaluate j-inverse of 303.	3

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COLLEGE KNOWLEDGE BOWL ROUND #5 - SET 5

#	Problem	Answer
1	Evaluate: thirty-six times two hundred eighteen.	7848
2	Kelsey is putting on some clothes. She has five wigs, three tutus, two pairs of sunglasses, five swimsuits, six watches, and four socks. If an outfit is comprised of one of each article, how many distinct outfits can she make?	3600 [outfits]
3	If an angle is in the first quadrant and it's cosine is fifteen-seventeenths, what is the tangent of the angle?	8/15
4	What is the surface area, in square centimeters, of a right rectangular box with edges measuring 7, 8, and 5 cm?	262 [cm^2]
5	Evaluate in terms of *i*, where i equals the square root of negative one: the complex number two plus i times the complex number four minus three i.	$11 - 2i$
6	What is the sum of the first 10 triangular numbers?	220
7	Approximate the square root of 56 to the nearest tenth.	7.5 or seven point five
8	A ball is dropped off a 30 m high building. If the ball can bounce back up to 1/3 of its drop height, then what is the total distance traveled by the ball when it has come to rest?	60 [m]
9	What is the sine of 15 degrees times the sine of 75 degrees?	1/4
10	What is the domain of the function as a subset of the real numbers: f of x equals one over the square root of the quantity nine minus x-squared?	x between negative three and three non-inclusive.

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COLLEGE KNOWLEDGE BOWL ROUND #6 - SET 6

#	Problem	Answer
1	What is one hundred five squared?	11025
2	A pool is filled automatically at a rate of 35 gallons per hour, and empties at a rate of 720 gallons per day. How much less water is there in the pool after 72 hours?	360 [gallons]
3	If f of x equals 4 x plus 10, what is f-inverse of 30?	5
4	Evaluate 2 to the eleventh power minus 6 to the fourth power.	752
5	All of the points equidistant to the points one comma one and four comma negative one forms what kind of graph?	Line
6	How much money in cents would one save in purchasing a twenty-dollar product in a state with six point six percent sales tax instead of in a state with ten percent sales tax?	68 [cents]
7	What is the sum of the arithmetic sequence five, eight, and so on up to thirty-five?	220
8	An isosceles triangle with side lengths five, five and six has an inscribed circle. What is the radius of the inscribed circle?	3/2 [un]
9	What is the complex number one plus i to the power of twelve?	-64
10	What is the six hundredth term of the sequence that begins one, two, two, three, three, three, four, four, four, four, et cetera?	35

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COLLEGE KNOWLEDGE BOWL ROUND - EXTRA

#	Problem	Answer
1	If the sum of two numbers is five and the product is three, what is the sum of the squares of the two numbers?	19
2	What is the unit vector in the same direction as the vector fifteen i minus twenty j?	$\frac{3}{5}i - \frac{4}{5}j$
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4	What is the equation for the horizontal asymptote of the equation y equals e to the x?	y = 0. Must includes the "y="
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7	The graph of x squared minus eight x plus three passes through which quadrants?	One, two, and four
8	A bag has 6 blue marbles and 4 red marbles, what is the probability of drawing two marbles of the same color without replacement?	7/15