

"Math is Cool" Masters – 2015-16

December 5, 2015

Total Correct:
KEY

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

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

	Answer	1 or 0	1 or 0
1	[x =] 18		
2	24 [licorice dogs]		
3	71/105		
4	3		
5	[\$]143007990		
6	500000 [inches]		
7	360		
8	5 [integers]		
9	[b =] 1		
10	4.5		
11	32 [centimeters]		
12	15		
13	2 [holes per second]		
14	110		
15	4 [ways]		
1-15 TOTAL:			

	Answer	1 or 0	1 or 0
16	1/2		
17	[x =] 33		
18	1/2		
19	15 [anteaters]		
20	0.001		
21	5x - 4y = -12		
22	08/02/16		
23	(-8, 0)		
24	$33\frac{1}{3}$ [%] or $\frac{100}{3}$ [%] or 33.3 [%]		
25	$\frac{402}{613}$		
26	45		
27	4		
28	7		
29	3/7		
30	(3, -3)		
16-30 TOTAL:			

	Answer	1 or 0	1 or 0
31	37		
32	41		
33	48 [cm ²]		
34	221.5π [ft ²] or $\frac{443\pi}{2}$ [ft ²]		
35	$\frac{6}{\sqrt{3}}$ [cm] or 2√3 [cm]		
36	10		
37	[Mr.] Blue		
38	3614.4 [seconds]		
39	$\frac{28}{143}$		
40	108 - 36√3 - 12π [cm ²] or equivalent		
31-40 TOTAL:			

GEOMETRY

"Math is Cool" Masters – 2015-16

December 5, 2015

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

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

Geometry - 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:			

GEOMETRY

"Math is Cool" Masters – 2015-16

December 5, 2015

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

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

ALGEBRA 2 - Individual Contest – Score Sheet DO NOT WRITE IN SHADED REGIONS

	Answer	1 or 0	1 or 0
1	65		
2	18		
3	288π		
4	$(-2,3)$		
5	123,722		
6	$-3, \frac{5}{2}$ (any order)		
7	1120		
8	$\frac{100D}{K}$ or $\frac{100D}{K}$		
9	1260		
10	44 [%]		
11	414		
12	3		
13	-11		
14	1925		
15	32		
1-15 TOTAL:			

	Answer	1 or 0	1 or 0
16	49/15		
17	6		
18	$\frac{4\sqrt{14}}{3}$		
19	16		
20	30		
21	1728		
22	812349, 3879 (any order)		
23	9/20		
24	$(-\frac{7}{2}, 2)$		
25	9		
26	$1\frac{11}{15}$		
27	62		
28	180		
29	9		
30	$\frac{39\sqrt{2}}{10}$		
16-30 TOTAL:			

	Answer	1 or 0	1 or 0
31	151,200		
32	411/617		
33	8000π		
34	6		
35	37,050		
36	-5,876		
37	8		
38	(1, -2,0)		
39	23/5		
40	12-21-2015		
31-40 TOTAL:			

ALGEBRA 2

"Math is Cool" Masters – 2015-16

December 5, 2015

Total Correct:

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

ALGEBRA 2 - 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:			

ALGEBRA 2

“Math is Cool” Masters – 2015-16

December 5, 2015
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 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” Masters – 2015-16

High School – December 5, 2015

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 perimeter, in meters, of a right triangle with an area of twenty-four square meters and a leg measuring eight meters?
2	Express three-thousand four-hundred fifty-seven point two six eight nine in scientific notation rounded to two significant digits.
3	What is the surface area of a right rectangular prism with edges measuring three meters, six meters, and seven meters?
4	What is the units digit of 27^{27} ?
5	What is the sum of the terms of an infinite geometric sequence with first term twenty-eight and common ratio one-fourth?
6	Superman is chasing Green Lantern at a speed of five thousand miles per hour, but Green Lantern is flying away at a speed of forty-six hundred miles per hour. If they started one thousand miles apart, how many hours would it take for Superman to catch Green Lantern?
7	What is the maximum possible perimeter, in meters, of a rectangle with an area of one-hundred twenty square meters and sides that are integer numbers of meters?
8	When two cards are drawn from a standard fifty-two-card deck, what is the probability that they are of different ranks?

“Math is Cool” Masters – 2015-16

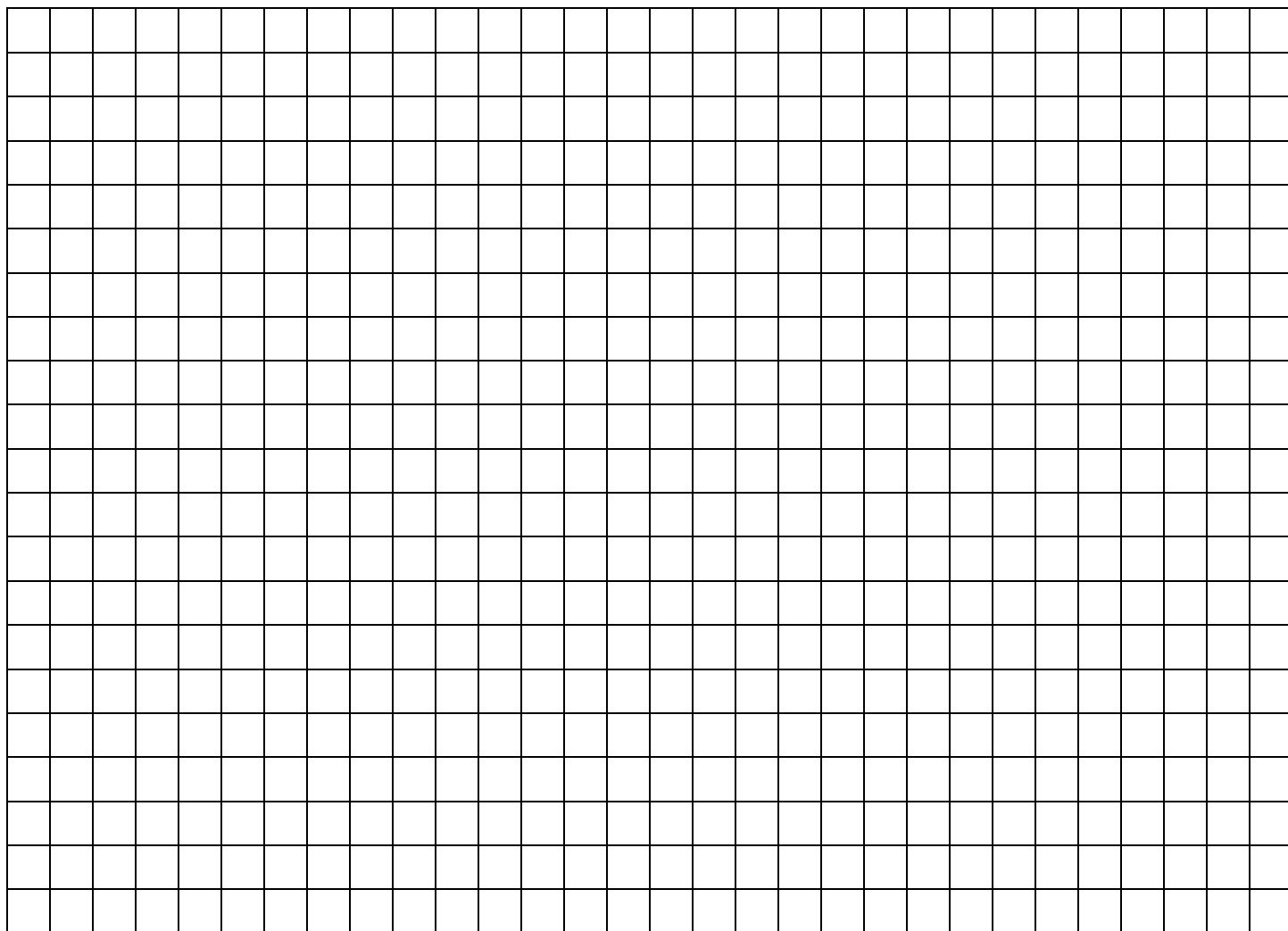
December 5, 2015

GEOMETRY - 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 – GEOMETRY - 35 minutes

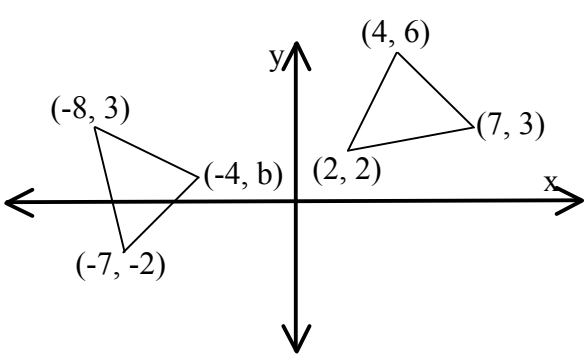
You may NOT be seated next to anyone from your school. If you are MOVE NOW to avoid being disqualified! When you are prompted to begin, tear off the colored sheet and begin testing. Make sure your name and school are recorded on the answer sheet. The raw score will be 2 points for correct answers to 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.



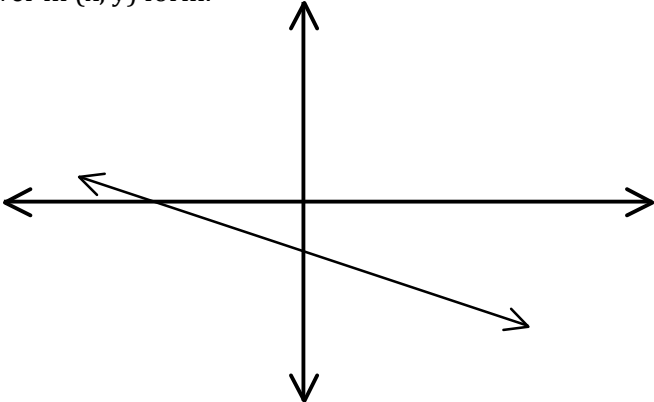
“Math is Cool” Masters – 2015-16

December 5, 2015

GEOMETRY - Individual Contest

Questions 1-30: 2 points each	
1	What is the value of x for the following equation: $10x - 50 = 130$
2	Amy gives Marco half of her licorice dogs. Marco gives a third of the licorice dogs he got from Amy to Aisha. Aisha eats all four of the licorice dogs she gets from Marco. How many licorice dogs did Amy have to start with?
3	What is the sum of $\frac{1}{3} + \frac{1}{5} + \frac{1}{7}$?
4	If 5^x is less than 600 and the value of x is an integer, what is the largest possible value of x ?
5	According to boxofficemojo.com on September 27, 2015, the 2013 movie Frozen had lifetime gross box office earnings of \$400,738,009 and the 2014 movie The Lego Movie had lifetime gross box office earnings of \$257,730,019. At that time, what was the number of dollars in the positive difference in lifetime gross box office earnings between the two movies?
6	What is the number of inches in the radius of a circle with a circumference of 1000000π inches?
7	Evaluate: $(13 + 7)(16 - 7)(50 - 48)$
8	How many positive odd two-digit integers are divisible by 11?
9	The two triangles shown are congruent. What is the value of b ? 
10	In the function $3x - 2y = 10$, every time the value of x goes up by 2, the value of y goes up by 3. As a decimal, by how much does the value of y go up if the value of x goes up by 3?
11	What is the number of centimeters in the perimeter of a square whose area is 64 cm^2 ?
12	If $a * b = \frac{3ab}{10}$, what is the value of $100 * 0.5$?
13	Elsa can three-hole punch 200 sheets of paper in 5 minutes. How many holes per second is this?
14	What is the sum of the consecutive integers from 5 to 15, including 5 and 15?
15	A marching band has twenty-seven members. What is the number of possible ways to arrange the members in rows each having the same number of people?

<p>16</p>	<p>Fred writes WASH ME in the dust covering the outside of a dirty window. From inside the window all of the letters appear as horizontal reflections of what he originally wrote. As a common fraction, what is the ratio of letters that appear different after the reflection to letters that appear unchanged after the reflection?</p>
<p>17</p>	<p>Solve for x: $\frac{3x-15}{12} = 7$</p>
<p>18</p>	<p>If Georgie spins the two spinners, what is the probability that the sum of the two resulting numbers is even? Assume the spinners stop at random locations on the circles when spun, that sections 1 and 2 have the same area as each other and combine to have the same area as section 3 on the left spinner, and that all 6 sections have the same area on the right spinner.</p> <div style="text-align: center;"> </div>
<p>19</p>	<p>Four bears and two anteaters weigh the same as two cows. Three bears weigh the same as one cow and six anteaters. One cow and one bear weigh the same as twenty-two anteaters. What is the number of anteaters that weigh the same as one cow?</p> <div style="text-align: center;"> </div>
<p>20</p>	<p>Evaluate $\frac{22}{7} - \pi$. Express your answer as a decimal rounded to the nearest thousandth.</p>
<p>21</p>	<p>Rewrite the following linear equation in the form $Ax + By = C$, where A, B and C are integers whose greatest common factor is 1 and A is positive:</p> $y = \frac{5}{4}x + 3$
<p>22</p>	<p>Today's date, 12/05/15, has the following property: $\frac{\text{year}}{\text{day}} + \text{month} = \text{year}$</p> <p>In the form xx/xx/xx, what will be the next date to have this property? Be sure to include a 0 in the tens place for any single-digit numbers.</p>
<p>23</p>	<p>On the graph shown below the dashed figure is the image after a dilation with scale factor of $\frac{1}{2}$. In (x, y) form, what are the coordinates of the center of dilation?</p> <div style="text-align: center;"> </div>
<p>24</p>	<p>When two friends share an apartment, they each pay \$600 per month. If a third friend moves in and the three share the rent equally, by what percent does each of the original two friends' share decrease?</p>

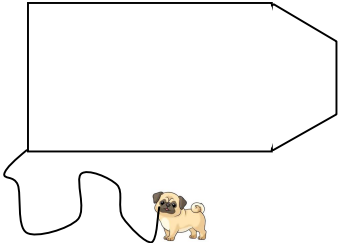
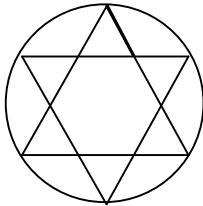
25	<p>In a survey, 2918 people were asked whether they ski, snowboard, do both or do neither. The results are shown in the table. As a common fraction, what is the probability that someone who completed the survey skis given that they also snowboard?</p>	<table border="1" data-bbox="1149 212 1398 359"> <tbody> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </tbody> </table>				
26	<p>Let a equal the sum of all positive odd two-digit integers. Let b equal the sum of all positive even two-digit integers. What is the value of $a - b$?</p>					
27	<p>The mean of three positive integers is 60. Exactly two of the integers are odd and distinct from each other. These two odd integers have two digits and have the property that one is the same as the other but with its digits reversed. What is the smallest possible value of the even integer?</p>					
28	<p>The base-x number 1234_x equals 466 in base-10. What is the value of x?</p>					
29	<p>Cham Kancellor wants his jersey to have a two-digit prime number on the back that remains a prime number when the digits are reversed. If a number is chosen at random from the set of two-digit prime numbers, as a common fraction, what is the probability that Cham will get what he wants?</p>					
30	<p>Observe the line shown on the coordinate plane below along with the point with coordinates $(4\frac{2}{3}, 2)$. If a line is drawn through the point with coordinates $(4\frac{2}{3}, 2)$ so that it intersects the given line at a right angle, what will be the coordinates of the point of intersection. Give your answer in (x, y) form.</p> 					

6 ft

10 ft
shed

A

Challenge Questions: 3 pts each

31	If $x - y = 5$ and $xy = 6$, then what is the value of $x^2 + y^2$?
32	The expression $\sqrt{10 + \sqrt{10 + \sqrt{10 + \dots}}}$ is equivalent to the expression $\frac{1 \pm \sqrt{a}}{2}$, where a is a positive integer. What is the value of a ?
33	A rectangular prism has dimensions 3 by 6 by 8 cm. An amount of water with a volume of 48 cm^3 fills the prism to within 2 cm of the top. What is the number of square centimeters in the area of the rectangular face on which the prism rests?
34	<p>Benji is tied to the corner of a shed in the middle of an open field, as shown. The perimeter of the shed resembles a rectangle on three sides and the three sides on the right are in the shape of half of a regular hexagon. The two long straight sides of the shed are each 10 feet long and the straight side on the left is 6 feet long. Benji's leash is 16 feet long. In terms of π, what is the number of square feet in the area of the yard over which Benji can walk?</p> <div style="text-align: center;">  </div>
35	<p>A regular six-pointed star is inscribed in a circle with radius 6 centimeters as shown. What is the number of centimeters in the length of \overline{AB}?</p> <div style="text-align: center;">  </div>
36	The expression $\sqrt{10 + 2\sqrt{21}}$ can be rewritten in the form $\sqrt{a} + \sqrt{b}$, where a and b are positive integers. What is the value of $a + b$?
37	<p>Three of the following statements are false.</p> <ol style="list-style-type: none"> 1. Mr. Red: "Mr. Blue did it". 2. Mr. Blue: "Mr. Red did it". 3. Mr. Green: "Mr. Blue's telling the truth". 4. Mr. Yellow: "Mr. Green's not lying". <p>Who did it?</p>

$(3\sqrt{3} - 3) \text{ cm}$

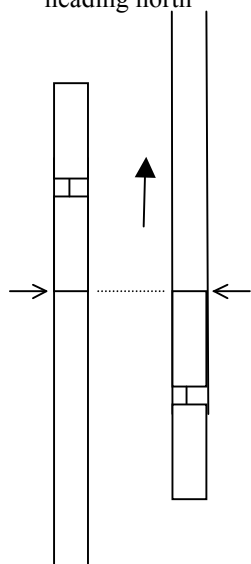
$(3\sqrt{3} - 3) \text{ cm}$

38

A train that is a tenth of a mile long leaves the station traveling northbound at an average speed of 45 miles per hour. A second train that is a fifth of a mile long leaves the same station at the same time traveling southbound at an average speed of 30 miles per hour. After how many seconds will the back ends of the two trains be exactly 75 miles apart? Assume that the fronts of the trains are lined up as shown in the diagram. Give your answer as a decimal.

front of train
heading south

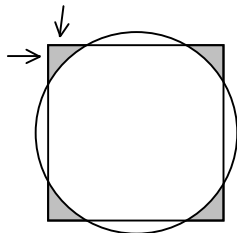
front of train
heading north

**39**

Mary has three red cards and six black cards. Larry has eight red cards and five black cards. Larry randomly chooses three of his cards and gives them to Mary. What is the probability that Mary then has more red cards in her hand than Larry has left in his?

40

A square has an area of 108 cm^2 . It overlaps with a circle such that each of its four corners extends outside the circle by $(3\sqrt{3} - 3) \text{ cm}$ on each edge, as shown. What is the number of square centimeters in the combined area of the shaded regions? Assume the four shaded sections are congruent.

**GEOMETRY**

“Math is Cool” Masters – 2015-16

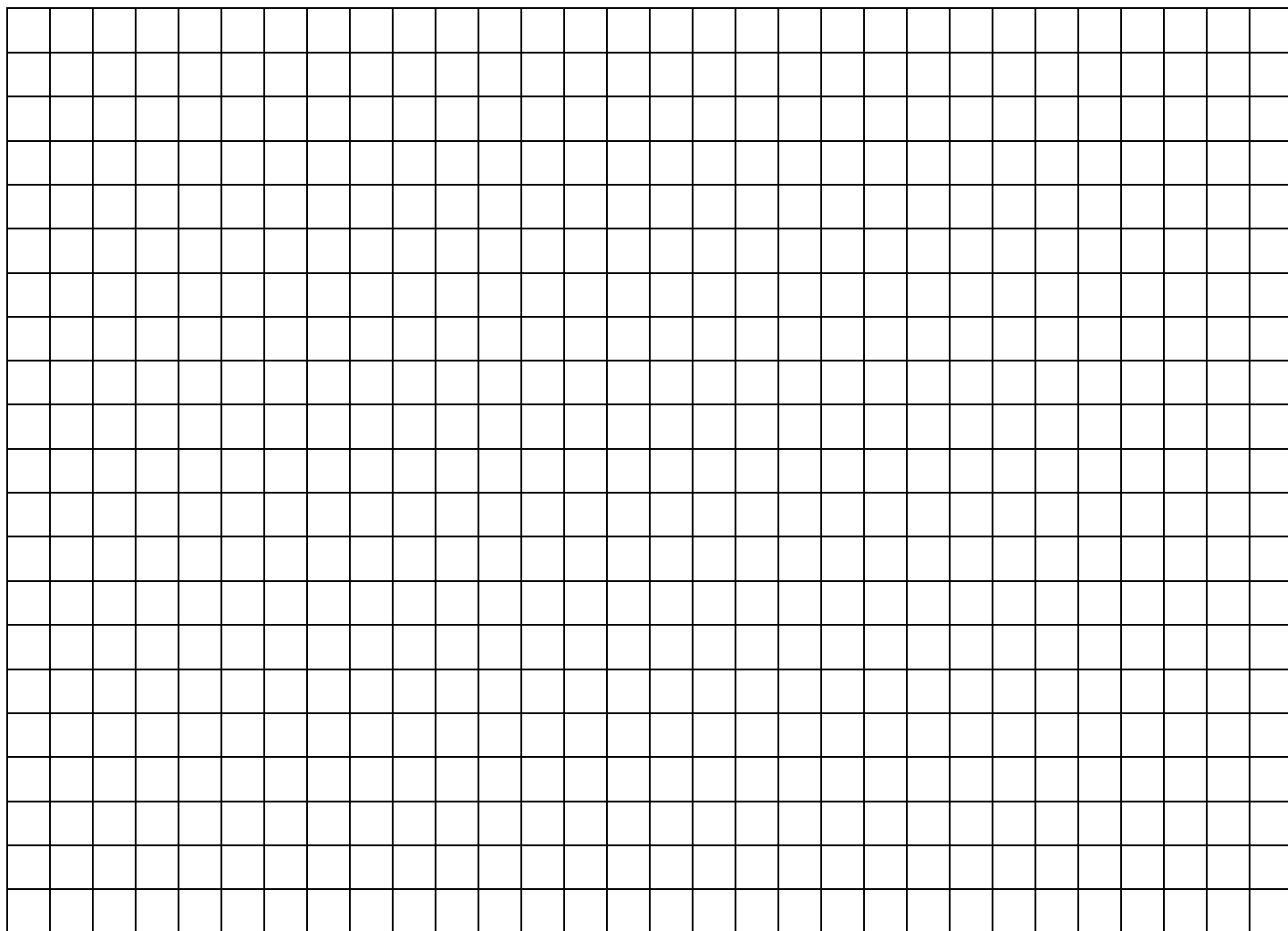
December 5, 2015

ALGEBRA 2 - 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 – ALGEBRA 2 - 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 – 2015-16

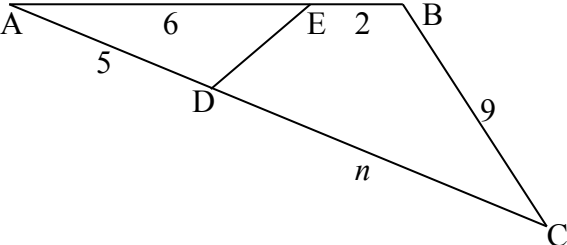
December 5, 2015

ALGEBRA 2 - Individual Contest

Questions 1-30: 2 points each	
1	Evaluate: $4 - 5 - (-8)(9) - 6$
2	If $c(b) = b(b + 1)(2b - 1)$, evaluate $c(2)$.
3	What is the volume, in cubic meters, of a sphere with a diameter of twelve meters?
4	What are the coordinates, in the form (x, y) , of the center of the conic section with equation $x^2 - 2y^2 + 4x + 12y = 25$?
5	What is the sum of 89142 and 34580?
6	What value(s) of t satisfy $2t^2 = 15 - t$?
7	Evaluate: $142^2 - 138^2$
8	If you can buy K kilograms of dirt for D dollars, how many dollars would 100 kilograms of dirt cost?
9	What is the sum, in degrees, of the interior angles in a nonagon?
10	The average of Eddie’s first three test scores is 92%. What is the lowest percentage Eddie can get on his fourth test to make sure his overall percentage doesn’t slip below 80%?
11	A recursive sequence is defined with first term $j_1 = 24$ and later terms $j_n = 2(j_{n-1} + 1)$. What is the value of j_5 ?
12	If $b(z) = 2z^3 + 5z - 7$, what is $b^{-1}(62)$?
13	What value(s) of g satisfy $\frac{g-3}{2g+4} = \frac{2g+1}{4g+17}$?
14	What is the sum of the three-digit perfect cubes?
15	If A , B , and C are distinct one-digit counting numbers, how many solutions are there to the equation $A + B = C$?
16	What value(s) of w satisfy $2w + 3(w - 4) = 5(6 - 2w) + 7$?
17	How many positive integer factors of 2754 are multiples of 18?
18	A triangle has sides measuring 6 m, 10 m, and 12 m. What is the length, in meters, of the altitude to the longest side?
19	Two circles with radii of 7 m and 19 m have their centers 20 m apart. A line segment is drawn from one circle to the other, tangent to both. What is the length, in meters, of that line segment?
20	How many elements are in the set of positive three-digit palindromes that are divisible by three?

21	I have nine different books I wish to put next to one another on a shelf. Two of the books have red covers, four are orange, and three have yellow covers. If I wish to keep all books of the same color next to one another, in how many ways can I arrange my books?
22	List which of these numbers is divisible by nine: 23678, 7849, 812349, 3879, 34568, 892345.
23	Bag A contains two orange marbles and three red marbles. Bag B contains four orange marbles and three red marbles. A single marble is drawn from Bag A and placed in Bag B, after which a single marble is drawn from Bag B. What is the probability that the last marble drawn is red?
24	Consider the function $s(r) = \log_3(14 - 3r - 2r^2)$ with a domain and range that are subsets of the real numbers. Express the domain in interval notation.
25	A red cubical box with edges measuring 3 inches contains a 2-by-2-by-1 black block and 23 identical white cubes with edges measuring 1 inch. In how many distinguishable ways can the contents of the box be arranged? Note that the box has an open top and a closed bottom, but the sides are indistinguishable.
26	Evaluate as a mixed number : $8\frac{9}{20} \div 4\frac{7}{8}$
27	What is the minimum possible perimeter, in square meters, of a rectangle with an area of 240 m ² and sides that are integer numbers of meters?
28	The complement of angle A is complementary to the supplement of angle B. What is the sum of the measures of angle A and angle B, in degrees?
29	What is the smallest possible number of regions in a figure containing two intersecting circles, at least one pair of perpendicular lines, and at least one pair of parallel lines?
30	What is the shortest distance from the point (5, -6) to the line $y = 7x - 2$?

Challenge Questions: 3 pts each

31	In how many ways can the characters in the domain name “dotcom.com” be arranged? The period counts as a character.
32	The probability that it will rain tomorrow is $\frac{2}{3}$. The probability that a meteor strikes the Earth tomorrow is $\frac{1}{1234}$ (it’s not our lucky day). What is the probability that we are not struck by a meteor tomorrow, but unfortunately it does rain?
33	A cow is tied to an external corner of a rectangular barn using a 100 m rope. If the barn measures 80 m by 60 m, what is the total area, in square meters, that the cow can graze?
34	What is the greatest common factor of 324 and 678?
35	What is the sum of the first 30 terms of an arithmetic sequence with first term 46 and common difference 82?
36	The terms of a sequence are defined by $h_n = (n - 1)! - (n + 2)!$. What is the sum of the terms from h_1 to h_5 ?
37	How many positive integer factors of 72 are also factors of 2568?
38	What is the solution, as an ordered pair in the form (q, p, m) , of the system of equations $q + p + m = -1$, $q - p - 2m = 3$, and $2q + 3p - m = -4$?
39	<p>In the figure to the right, $\angle AED \cong \angle DCB$, and all line segments are labeled in meters. What is the value of n?</p> 
40	Bouscalium has a half-life of 1 day. At 12:00:01 AM on 12-5-2015, your sample contains one kilogram of Bouscalium. What is the last date (in the form MM-DD-YYYY) on which you will have more than one centigram of Bouscalium in your sample at some point in the day?

ALGEBRA 2

“Math is Cool” Masters – 2015-16

9th & 10th Grade – December 5, 2015

Individual Multiple Choice Contest

1	A solid cube of white plastic is painted red on all faces and then cut into sixty-four congruent smaller cubes. How many of the smaller cubes are red on exactly two of their faces? A) 12 B) 24 C) 32 D) 36 E) Answer not given.
2	What is the sum of the squares of the roots of $x^2 + 2x + 3 = 0$? A) -3 B) 3 C) 2 D) -2 E) Answer not given.
3	Evaluate: $6 \times 7 + (8 \times 9^2 - 34) \div 2$ A) 349 B) 582 C) 680 D) 802 E) Answer not given.
4	What is the sum of the positive integer factors of 725? A) 854 B) 899 C) 930 D) 1225 E) Answer not given.
5	At my family reunion, there are 37 people with the first name Tom and 73 people with the last name Smith. If there are 7 Tom Smiths and a total of 337 people, how many people do not have Tom for a first name or Smith for a last name? A) 226 B) 231 C) 234 D) 236 E) Answer not given.
6	A geometric sequence has first term 3 and common ratio 2. What is the product of the first 5 terms? A) 128,416 B) 248,832 C) 385,248 D) 642,080 E) Answer not given.
7	All the Pinkney kids save their money and pitch in equally to buy an XCubeDX. If there had been one more kid, each kid would have paid \$40 less than they did. If there had been two fewer kids, each kid would have paid \$100 more than they did. How many dollars did the XCubeDX cost? A) \$8,400 B) \$9,000 C) \$9,600 D) \$10,200 E) Answer not given.
8	What is the lateral surface area, in square meters, of a right square pyramid with a base area of 144 m^2 and a volume of 384 m^3 ? A) 228 B) 232 C) 236 D) 240 E) Answer not given.
9	On the first leg of his journey, Dierk unicycled 20 miles at a speed of 15 miles per hour, and on the second leg he went 10 miles in 45 minutes. What was his average speed, in miles per hour, over his entire journey? A) 15 B) $\frac{50}{3}$ C) $\frac{72}{5}$ D) 20 E) Answer not given.
10	What is the mean of the median, mode, and range of the data set $\{5, 67, 8, 90, 6, 71, 67, 86\}$? A) 50 B) 73 C) 75 D) 80 E) Answer not given.

“Math is Cool” Masters – 2015-16

9th & 10th Grade – December 5, 2015

Team Contest

1	What are the coordinates, in the form (x, y) , of the point of intersection of the lines $y = 2x + 3$ and $2x + 3y = 4$?
2	How many positive two-digit integers are divisible by both of their digits?
3	What is the sum of the three smallest terms of the arithmetic sequence with first term 6 and common difference 5 that are also terms of the geometric sequence with first term 4 and common ratio 3?
4	It is possible to roll two balls into the corner of a rectangular room with vertical walls so that both of them touch the floor, both walls, and the other ball. If one of the balls has a radius of 4 m, what is the largest possible radius, in meters, of the other ball?
5	Quincy and Petra are playing a game in which they take turns rolling a die. The first person to roll a 6 or any number that was already rolled is the winner. What is the probability that the first player eventually wins the game?
6	I have 25 coins in my pocket worth a total of \$4.32. If each coin is either a penny, nickel, dime, or quarter, what is the largest number of nickels I could have?
7	It is currently 10:30 AM on Saturday. What day of the week will it be in one million seconds?
8	Caladrian currency comes in 3 tapple, 5 tapple, and 11 tapple denominations. What is the largest number of tapple that cannot be created using these denominations?
9	If G is the set of all four-digit positive integers with four distinct digits and H is the set of positive multiples of 4 less than 10,000, how many elements are in the set $G \cup H$?
10	Express any solution to the system of equations $r + s + t = 11$, $rst = -72$, and $rs + st + rt = -18$ in the form (r, s, t) .

“Math is Cool” Masters – 2015-16

9th & 10th Grade – December 5, 2015
Pressure Round Contest

1	The point $(4,1)$ is rotated 270° clockwise around the point $(-3, -8)$ to point K, which is then reflected across the line $x + y = 7$ to point J. What are the coordinates, in the form (x, y) , of point J.
2	Express $0.2\overline{31}$ as a reduced fraction.
3	How many diagonals can be drawn in a convex 20-gon that connect vertices that have at least two other vertices between their endpoints?
4	What is the missing term of the sequence 7, 8, 11, 18, __, 52, 83, 126?
5	What is the tens digit of 27^{27} ?

“Math is Cool” Masters – 2015-16

9th & 10th Grade – December 5, 2015

COLLEGE KNOWLEDGE BOWL ROUND #1 – SET 1

#	Problem	Answer
1	Evaluate the base four logarithm of two-hundred fifty-six.	4
2	Evaluate seven to the fourth power.	2401
3	A right triangle has a hypotenuse measuring seven meters and a leg measuring five meters. What is the length, in meters, of the other leg?	$2\sqrt{6}$
4	Arlo, Bo, and Cindy are in the same very hard math class, and their respective probabilities of passing the class are one-fourth, one-third, and one-half. What is the probability that none of them pass the class?	$\frac{1}{4}$
5	What is the mean of the data set {5, 16, 8, 90, 5, 1, 23, 4, 92}?	$\frac{244}{9}$
6	Evaluate eight-ninths minus three-fourths.	$\frac{5}{36}$
7	A terrarium contains lizards (four legs) and crickets (six legs). If there are twenty-nine heads and one-hundred fifty legs, how many crickets are there?	17
8	Express the base three number TWO-ZERO-ONE-TWO-ZERO-ONE as a base ten number.	532
9	What is the surface area, in square meters, of a regular icosahedron with edges measuring six meters?	$180\sqrt{3}$
10	What is the sum of the integers between 8 and 38, inclusive?	713

“Math is Cool” Masters – 2015-16

9th & 10th Grade – December 5, 2015

COLLEGE KNOWLEDGE BOWL ROUND #2 – SET 2

#	Problem	Answer
1	What is the volume, in cubic meters, of a cone with a base radius of four meters and a height of six meters?	32π
2	72 is 48 percent of what number?	150
3	When a coin is flipped four times, what is the probability that at least one of the first two flips is a head and at least one of the last two flips is a tail?	$\frac{9}{16}$
4	What is the tenth term of a geometric sequence with first term seven and common ratio two?	3584
5	What is the area, in square meters, of a right triangle with a longest side measuring eight meters and a smallest angle of 45 degrees?	16
6	If Q is inversely proportional to the cube of P and P is 12 when Q is 12, what is the value of Q when P is 4?	324
7	If eight liters of a 27 percent acid solution are combined with four liters of a 63 percent acid solution, what percentage of the resulting solution will be acid?	39
8	Express the product of the base five numbers THREE-FOUR and ONE-TWO-ZERO as a base five number.	10130
9	A bag contains three purple marbles and five blue marbles. When two marbles are drawn randomly, what is the probability they are the same color?	$\frac{13}{28}$
10	How many subsets of the one-digit positive integers contain exactly one prime number and at least two composite numbers?	88

“Math is Cool” Masters – 2015-16

9th & 10th Grade – December 5, 2015

COLLEGE KNOWLEDGE BOWL ROUND #3 – SET 3

#	Problem	Answer
1	What is the name of a line segment drawn from one vertex of a triangle to the midpoint of the opposite side?	Median
2	If Nancy could paint the room in four hours and Larry could paint the room in six hours, how many minutes would it take them to paint the room if they work together?	144
3	What is the sum of the measures, in degrees, of an interior angle of a regular seventeen-gon and an external angle of a regular seventeen-gon?	180
4	When the quantity TWO-N-MINUS-THREE raised to the fifth power is expanded and like terms are combined, what is the coefficient of the N-TO-THE-FOURTH-POWER term?	-240
5	Express the base two number ONE ZERO ZERO ONE ONE ONE ZERO ZERO ONE as a base eight number.	471
6	Evaluate as a decimal : $67.95 + 2.49 + 84.9$	155.34
7	A bag contains five green marbles and seven yellow marbles. Your friend draws two marbles, looks at them, and tells you that they are the same color. What is the probability that they are both yellow?	$\frac{21}{31}$
8	What is the measure, in degrees, of the smaller angle between the hour and minute hands of a 12-hour analog clock at 8:20 AM?	130
9	What is the median of the data set {4, 68, 4, 6, 80, 5, 13, 90, 1, 46, 3}?	6
10	What is the missing term (the BLANK) of the sequence 1, 1, 2, 3, 3, 4, BLANK, 5, 6, 27, 7, 8, 81?	9

“Math is Cool” Masters – 2015-16

9th & 10th Grade – December 5, 2015

COLLEGE KNOWLEDGE BOWL ROUND #4 – SET 4

#	Problem	Answer
1	Evaluate sixty-four raised to the two-thirds power.	16
2	My lucky coin has a $\frac{3}{5}$ probability of showing heads when it is flipped. If I flip it three times, what is the probability it shows heads exactly twice?	$\frac{54}{125}$
3	What is the most specific name that can be applied to any and all quadrilaterals with four congruent sides?	Rhombus
4	What is the remainder when 2,498 is divided by 79?	49
5	What is the prime factorization, in exponential form, of 945?	$3^3 \cdot 5 \cdot 7$
6	What is the harmonic mean of 8 and 12?	$\frac{48}{5}$
7	What is the mode of the data set {56, 9, 25, 1, 44, 80, 6, 80, 4, 51, 3, 46}?	80
8	On average, four chickens can lay six eggs in eight days. On average, how many eggs could six chickens lay in six days?	$\frac{27}{4}$
9	Two numbers sum to 2,835 and differ by 469. What is the value of the larger number?	1652
10	What is the area, in square meters, of an isosceles triangle with sides measuring eight meters and twenty meters?	$32\sqrt{6}$

“Math is Cool” Masters – 2015-16

9th & 10th Grade – December 5, 2015

COLLEGE KNOWLEDGE BOWL ROUND #5 – SET 5

#	Problem	Answer
1	What is the product of the three complex cube roots of negative eight?	-8
2	How many positive odd four-digit integers are palindromes?	50
3	If each couple must sit next to one another, in how many ways can three couples arrange themselves at a round table?	16
4	What is the sum of the 30 smallest even numbers greater than 40?	2130
5	What is the range of the data set {8, 95, 3, 678, 4, 13, 5, 34, 5, 689, 5, 67}?	686
6	When the digits of a positive two-digit integer are reversed, a new positive two-digit integer is created which is 27 less than the original number. What is the second-smallest possible value of the original number?	52
7	What is the circumference, in meters, of a circle with an area of two hundred fifty PI square meters?	$10\pi\sqrt{10}$
8	What is the equation, in slope-intercept (Y-EQUALS-M-X-PLUS-B) form, of the line through the points FOUR-COMMA-NEGATIVE-EIGHT and TWO-COMMA-SIX?	$y = -7x + 20$
9	What is the area, in square meters, of a right triangle with a longest side measuring eight meters and a smallest angle of 30 degrees?	$8\sqrt{3}$
10	What number is 349 less than the product of 83 and 59?	4548

“Math is Cool” Masters – 2015-16

9th & 10th Grade – December 5, 2015

COLLEGE KNOWLEDGE BOWL ROUND #6 – SET 6

#	Problem	Answer
1	Evaluate three to the negative fourth power.	$\frac{1}{81}$
2	If 2 Hyenas can be exchanged for 9 Giraffes and 8 Frogs can be exchanged for 15 Giraffes, how many Frogs could you get for 300 Hyenas?	720
3	How many deciliters are equivalent to eight kiloliters?	80,000
4	Express the square root of 368 in simplest radical form.	$4\sqrt{23}$
5	Two polyhedrons are similar. The smaller one has a surface area of 50 m ² and a volume of 30 m ³ . If the larger one has a surface area of 5000 m ² , what is its volume, in cubic meters?	30,000
6	Consider a triangle with sides measuring 6 meters, 10 meters, and 12 meters. When an angle bisector of the largest angle is drawn, what is the length of the shorter segment into which the opposite side is divided?	$\frac{9}{2}$
7	If two sides of a triangle measure nineteen meters and ninety-one meters, what is the shortest possible integer length, in meters, of the third side?	73
8	How many positive integers are factors of 684?	18
9	The student council must consist of two underclasspeople and two upperclasspeople. If four underclasspeople and five upperclasspeople are running for the student council, how many different student councils are possible?	60
10	What is the solution, as an ordered pair in the form S-COMMA-R, of the system of equations TWO-S-PLUS-R-EQUALS-ELEVEN and S-MINUS-THREE-R-EQUALS-NEGATIVE-TWELVE?	(3,5)

“Math is Cool” Masters – 2015-16

High School – December 5, 2015

COLLEGE KNOWLEDGE BOWL ROUND – EXTRA

#	Problem	Answer
1	The vertices of a regular n-gon are labeled from A to V in counter-clockwise order. If a line is drawn through vertex G and the center, what other vertex does it pass through?	R
2	What is the sum of the 20 largest odd numbers less than 50?	600
3	Evaluate seven factorial divided by four factorial.	210

Extra

Final Score:

KEY

(Out of 8)

“Math is Cool” Masters -- 2015-16

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	24		
2	3.5×10^3		
3	162		
4	3		
5	$\frac{112}{3}$		
6	$\frac{5}{2}$		
7	242		
8	$\frac{12}{13}$		

Math is Cool” Masters – 2015-16
 9th & 10th Grade – December 5, 2015

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

“Math is Cool” Masters – 2015-16
9th & 10th Grade – December 5, 2015

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	$\left(-\frac{5}{8}, \frac{7}{4}\right)$		
2	14		
3	239,148		
4	$8 + 4\sqrt{3}$		
5	$\frac{169}{324}$		
6	5		
7	Thursday		
8	7		
9	5915		
10	$(12, 2, -3)$ (any order)		

“Math is Cool” Masters – 2015-16
9th & 10th Grade – December 5, 2015

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	(8,19)
2	$\frac{229}{990}$
3	150
4	31
5	0

Final Score:

(Out of 8)

“Math is Cool” Masters -- 2015-16

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

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

Math is Cool” Masters – 2015-16

9th & 10th Grade – December 5, 2015

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” Masters – 2015-16
 9th & 10th Grade – December 5, 2015

Final Score:

First Score
(out of 10)

SCHOOL NAME _____ **Team #** _____

Proctor Name _____ Room # _____

Team Contest – Score Sheet

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