# Math is Cool" Masters – 2015-16

December 5, 2015

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

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

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

| | Answer | 1 or 0 | 1 or 0 |
|---|---|---|---|
| 1 | 3 [digits] | | |
| 2 | 360 | | |
| 3 | 71/105 | | |
| 4 | 110 | | |
| 5 | 3 | | |
| 6 | [$]143007990 | | |
| 7 | 500000 [inches] | | |
| 8 | 6 [orders] | | |
| 9 | 24 [licorice dogs] | | |
| 10 | 5 [integers] | | |
| 11 | [a =] -3 | | |
| 12 | 32 [centimeters] | | |
| 13 | 15 | | |
| 14 | 2 [holes per sec] | | |
| 15 | [b =] 1 | | |
| **1-15 TOTAL:** | | | |

| | Answer | 1 or 0 | 1 or 0 |
|---|---|---|---|
| 16 | 0.001 | | |
| 17 | 1/2 | | |
| 18 | 15 [anteaters] | | |
| 19 | 09/12/15 | | |
| 20 | [x =] 33 | | |
| 21 | 20 [%] | | |
| 22 | 46 [paths] | | |
| 23 | 1/2 | | |
| 24 | $33\frac{1}{3}$ [%] or $\frac{100}{3}$ [%] or $33.\bar{3}$ [%] | | |
| 25 | 402/613 | | |
| 26 | 45 | | |
| 27 | 5x - 4y = -12 | | |
| 28 | 10 [points of intersection] | | |
| 29 | 3/7 | | |
| 30 | 4 | | |
| **16-30 TOTAL:** | | | |

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

**ALGEBRA**

# Math is Cool" Masters – 2015-16

December 5, 2015

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

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

**ALGEBRA - 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**

# "Math is Cool" Masters – 2015-16

December 5, 2015
7th & 8th Grade 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 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.*

## 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

## 7th & 8th Grade – 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 number of square feet in the area of a square with a side length of one yard? |
| 2 | What is the product of one hundred ninety and one-half? |
| 3 | What percent of five is fifteen? |
| 4 | The mean of a set of six numbers is eighteen. What is the sum of the six numbers? |
| 5 | As a common fraction, what is the probability of drawing a card from a standard deck of cards that is not a red queen? |
| 6 | As a common fraction, what is the number of miles per minute in the speed of a car traveling thirty miles per hour? |
| 7 | On a coordinate plane, the point with coordinates one comma two is translated five units to the right. What is the sum of the coordinates of the new point? |
| 8 | As a common fraction, what fraction of the two-digit integers less than twenty have a units digit that is greater than its tens digit? |

# “Math is Cool” Masters – 2015-16

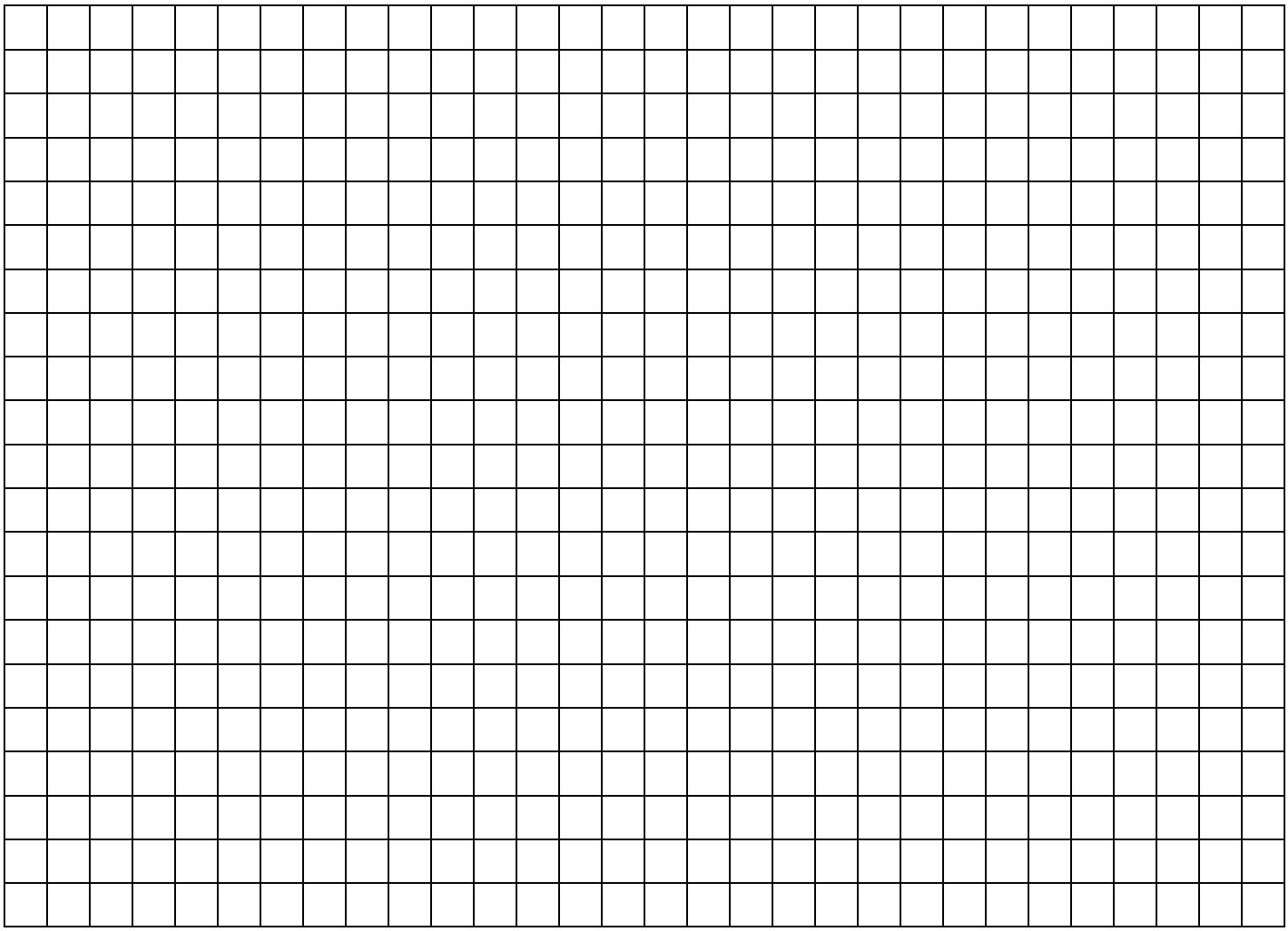
December 5, 2015

ALGEBRA - 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.**

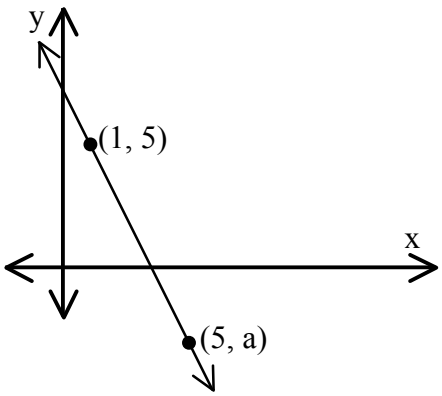
**INDIVIDUAL TEST – ALGEBRA - 35 minutes**

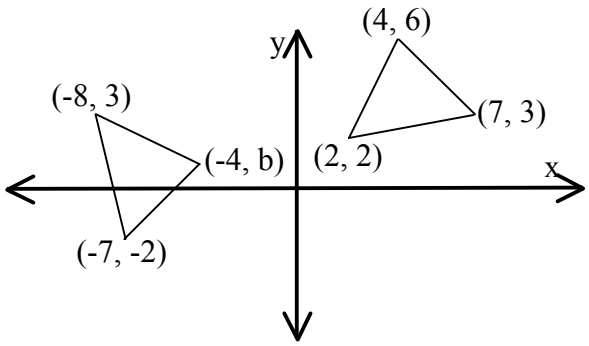
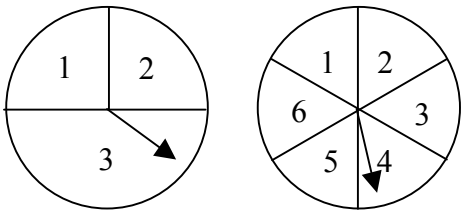
*You may NOT be seated next to anyone from your school. If you are MOVE NOW to avoid being disqualified! When you are prompted to begin, tear off the colored sheet and begin testing. Make sure your name and school are recorded on the answer sheet. The raw score will be 2 points for correct answers to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

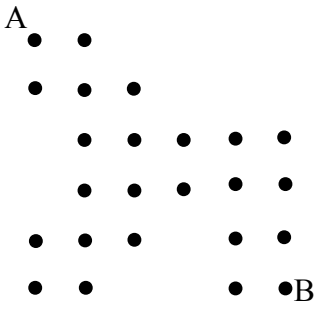
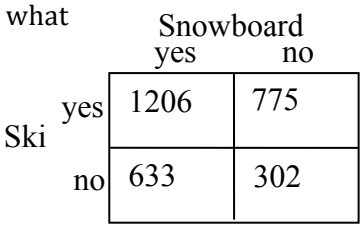


# "Math is Cool" Masters – 2015-16

December 5, 2015
ALGEBRA - Individual Contest

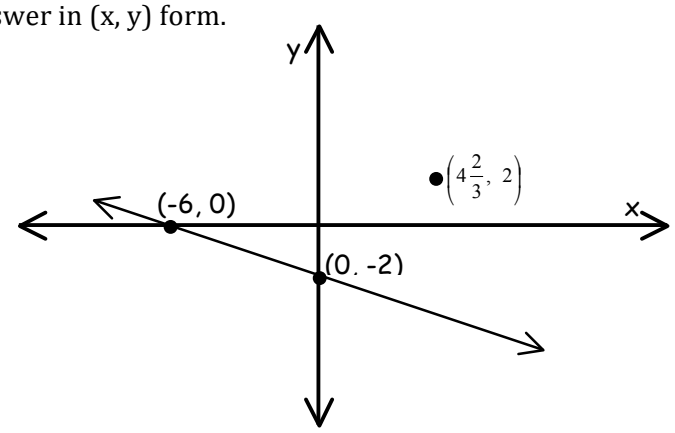
| | Questions 1-30: 2 points each |
|---|---|
| 1 | What is the number of digits in the product of 31 and 32? |
| 2 | Evaluate: (13 + 7)(16 - 7)(50 - 48) |
| 3 | What is the sum of $\frac{1}{3}+\frac{1}{5}+\frac{1}{7}$? |
| 4 | What is the sum of the consecutive integers from 5 to 15, including 5 and 15? |
| 5 | If $5^x$ is less than 600 and the value of x is an integer, what is the largest possible value of x? |
| 6 | 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? |
| 7 | What is the number of inches in the radius of a circle with a circumference of 1000000π inches? |
| 8 | In how many distinct orders can the letters of the word TRY be arranged? |
| 9 | 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? |
| 10 | How many positive odd two-digit integers are divisible by 11? |
| 11 | The slope of the line shown is -2. What is the value of a?   |
| 12 | What is the number of centimeters in the perimeter of a square whose area is 64 $cm^2$? |
| 13 | If a * b = $\frac{3ab}{10}$, what is the value of 100*0.5? |
| 14 | Elsa can three-hole punch 200 sheets of paper in 5 minutes. How many holes per second is this? |

| | |
|---|---|
| 15 | The two triangles shown are congruent. What is the value of b?<br>  |
| 16 | Evaluate $\frac{22}{7}$ - π. Express your answer as a decimal rounded to the nearest thousandth. |
| 17 | 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.<br>  |
| 18 | Four bears and two anteaters weigh the same as two cows.<br>Three bears weigh the same as one cow and six anteaters.<br>One cow and one bear weigh the same as twenty-two anteaters.<br>What is the number of anteaters that weigh the same as one cow?<br>  <br>  <br>  |
| 19 | The date August 17, 2015 can be written in the form 08/17/15. When written in this form, the three numbers can be arranged to form a Pythagorean Triple, because $8^2 + 15^2 = 17^2$. Written in the form xx/xx/xx, what was the next such Pythagorean Triple date? Be sure to include a 0 in the tens place for any single-digit numbers. Hint: this date has already occurred. |
| 20 | Solve for x: $\frac{3x-15}{12} = 7$ |
| 21 | The movie The Hobbit: An Unexpected Journey is 3 hours 10 minutes long. The Hobbit: The Desolation of Smaug is 3 hours 15 minutes long and The Hobbit: The Battle of the Five Armies is 3 hours long. Daniel is having a party to watch all three Hobbit movies. When he and his friends have watched all of the first two movies and 1 hour 7 minutes of the third, he notices that his friends are asleep. At this moment what percent of the total combined running time of the three movies is still left to watch in the third movie? |

| | |
|---|---|
| 22 | What is the number of distinct paths that can be drawn from A to B if your pencil may only be moved one unit down or one unit right each time it is moved. Assume the space between any two horizontally or vertically adjacent dots is one unit.<br>  |
| 23 | 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? |
| 24 | When two friends share an apartment, they each pay $600 per month. If a third friend moves in and the three share the rent equally, by what percent does each of the original two friends' share decrease? |
| 25 | In a survey, 2918 people were asked whether they ski, snowboard, do both or do neither. The results are shown in the table. As a common fraction, what is the probability that someone who completed the survey skis given that they also snowboard?<br>  |
| 26 | Let a equal the sum of all positive odd two-digit integers. Let b equal the sum of all positive even two-digit integers. What is the value of a - b? |
| 27 | Rewrite the following linear equation in the form Ax + By = C, where A, B and C are integers whose greatest common factor is 1 and A is positive:<br>$y = \frac{5}{4}x + 3$ |
| 28 | What is the maximum number of points of intersection of a square and a pentagon? |
| 29 | 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? |
| 30 | 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? |

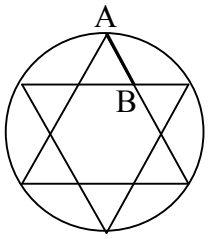
# Challenge Questions: 3 pts each

**31** Observe the line shown on the coordinate plane below along with the point with coordinates $\left(4\frac{2}{3},\ 2\right)$. If a line is drawn through the point with coordinates $\left(4\frac{2}{3},\ 2\right)$ 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.




**32** If $x - y = 5$ and $xy = 6$, then what is the value of $x^2 + y^2$?

**33** 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 $\overline{AB}$?

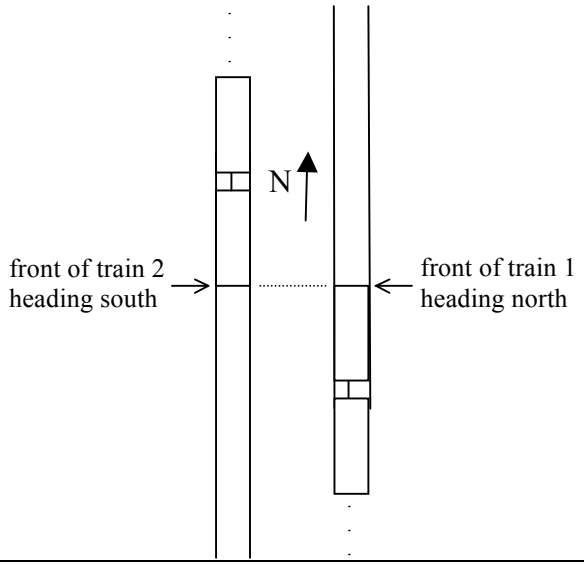
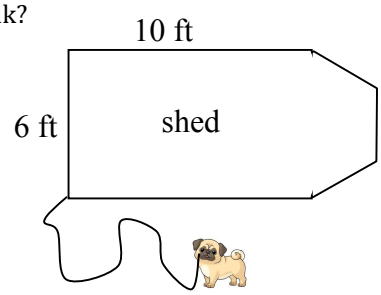
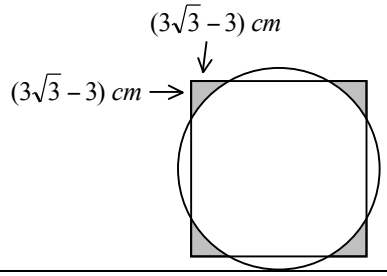



**34** A rectangular prism has dimensions 3 by 6 by 8 cm. An amount of water with a volume of 48 $cm^3$ fills the prism to within 2 cm of the top. What is the number of square centimeters in the area of the rectangular face on which the prism rests?

**35** Three of the following statements are false.

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".

Who did it?

| | |
|---|---|
| 36 | 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.<br>  <br> |
| 37 | 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?<br>  <br> |
| 38 | 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? |
| 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 that Larry has left in his? |
| 40 | A square has an area of 108 cm². It overlaps with a circle such that each of its four corners extends outside the circle by $(3\sqrt{3}-3)\ cm$ 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.<br>  <br> |

**ALGEBRA**

# "Math is Cool" Masters – 2015-16

## 8th Grade – December 5, 2015
## Individual Multiple Choice Contest

**Refer to this information for questions 1-4.** The number 2 is the smallest number that has two distinct factors. Its factors are {1 and 2}. The smallest number that has three distinct factors is 4 and the factors are {1, 2, and 4}. The smallest number with four distinct factors is 6 and the factors are {1, 2, 3, and 6}.

**1** What is the smallest number that has six distinct factors?

A) 30 B) 24 C) 20 D) 12 E) 10

**2** What is the name for the set of numbers that have exactly two distinct factors?

A) composite numbers B) even numbers
C) perfect square numbers D) prime numbers E) irrational numbers

**3** What is the smallest number that has seven distinct factors of which none is a perfect square?

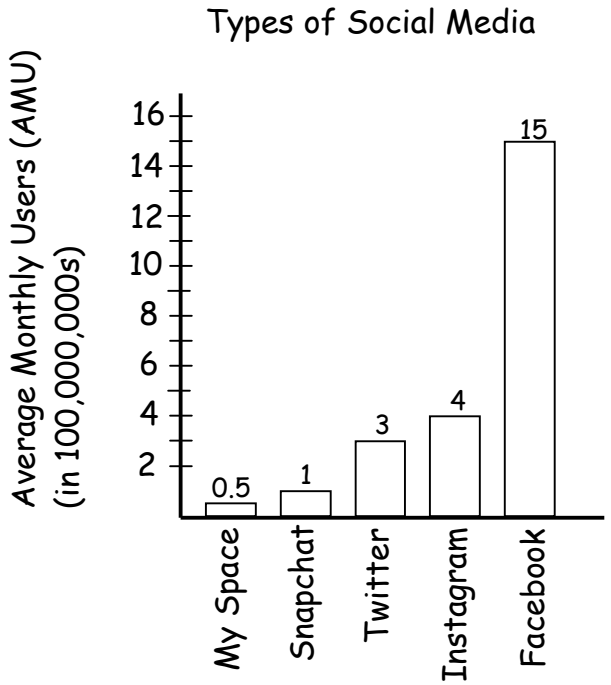
A) 24 B) 32 C) 50 D) 64
E) All numbers have at least one perfect square factor.

**4** What is the positive difference between the smallest number with eight distinct factors and the smallest number with nine distinct factors?

A) 24 B) 12 C) 8 D) 6 E) 4

Continue to questions 5-10 on the back of this page.

**Refer to this information for questions 5-7.** The bar graph shows the number of users of five different types of social media.



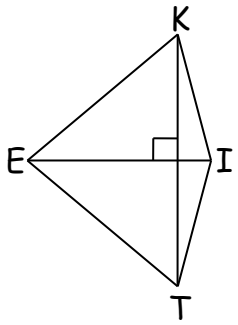

| | |
|---|---|
| 5 | How many times more AMU does Instagram have than My Space?<br>A) 2 B) 4 C) 6 D) 8 E) 30 |
| 6 | If the average number of Friends per Facebook account is 338, what is the total number of Facebook Friends?<br>A) $507x10^{11}$ B) $50.7x10^{11}$ C) $5.07x10^{11}$ D) $50.7x10^{9}$ E) $5.07x10^{10}$ |
| 7 | Bel has 822 Friends on her Facebook account and they all are Friends of each other and no one else. One day she and all of her Facebook Friends post one comment each on each other's timelines. What is the total number of posts that occur?<br>A) 337431 B) 338253 C) 675684 D) 677306 E) Answer not given. |

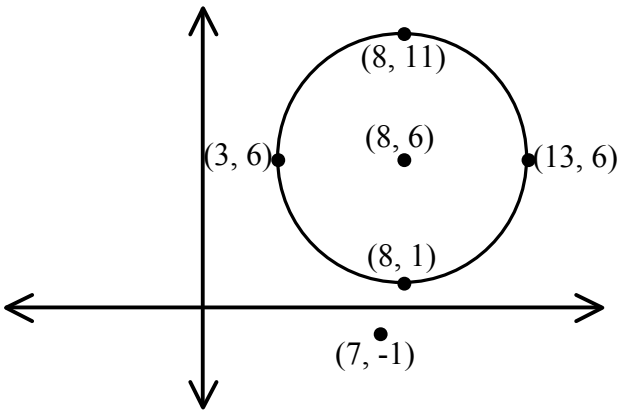
**Refer to this information for questions 8-10.** A square with side length 4 centimeters has a perimeter of 16 cm and an area of 16 $cm^2$. For this square the perimeter and area are numerically equivalent. A circle with radius 2 centimeters has a circumference and area that are numerically equivalent. A sphere with radius 6 centimeters has a surface area ($S=4\pi r^2$) and a volume ($V=\frac{4}{3}\pi r^3$) that are numerically equivalent.

| | |
|---|---|
| 8 | What is the number of centimeters in the side length of a cube such that its surface area and volume are numerically equivalent?<br>A) 6 B) 5 C) 4 D) 3 E) 2 |
| 9 | What is the number of centimeters in the radius of a sphere whose surface area is numerically 4 times its volume?<br>A) $\frac{1}{4}$ B) $\frac{2}{3}$ C) $\frac{3}{4}$ D) 4 E) 12 |
| 10 | What is the number of centimeters in the side length of an equilateral triangle whose area is numerically equivalent to its perimeter?<br>A) $6\sqrt{3}$ B) $4\sqrt{3}$ C) 4 D) 3 E) Answer not given. |

# "Math is Cool" Masters – 2015-16

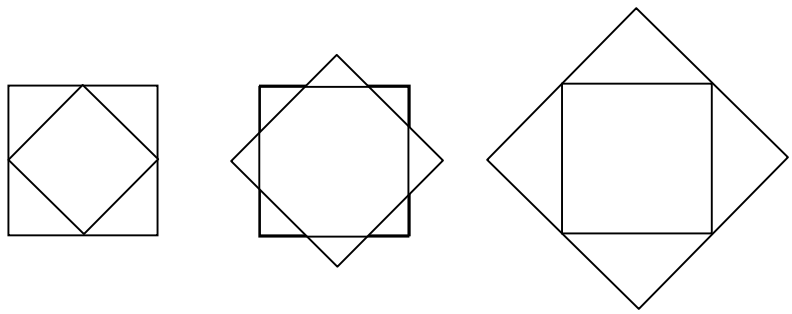
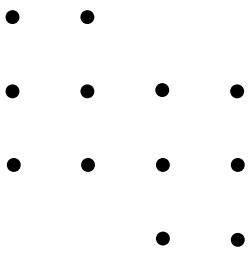
## 8th Grade – December 5, 2015
## Team Contest

| | |
|---|---|
| 1 | Boris is knitting a sweater. He can knit three rows every five minutes on average. His sweater will take 132 rows to complete. What is the number of minutes he will need to knit the sweater? |
| 2 | What is the sum of the distinct prime factors of 2015? |
| 3 | In kite KITE, $\overline{IE} \perp \overline{KT}$ and $m\angle KIT = 150°$. What is the number of degrees in $m\angle ITK$?   |
| 4 | What is the number of distinct three-letter arrangements of the letters in the word CLASSROOM? |
| 5 | What is the largest three-digit perfect square having the property that each of its digits is a nonzero perfect square? |
| 6 | What is the arithmetic mean of the following set of numbers? Give your answer as a mixed number in base 10.<br>$11_2$, $22_3$, $33_4$, $44_5$, $55_6$, $66_7$, $77_8$, $88_9$, $99_{10}$ |
| 7 | For $-20 \le x \le 20$, what is the number of solutions consisting of integer values for both x and y in the equation 3x - 5y = 11? |

| | |
|---|---|
| 8 | On the coordinate plane shown below, the circle has the equation $(x - 8)^2 + (y - 6)^2 = 25$. There are an infinite number of lines that can be drawn through the point (7, -1), some that intersect the circle in two points, some that intersect the circle in one point, and some that intersect the circle in no points. As an inequality in the form $a < m < b$, where $a$ represents the smallest slope and $b$ represents the largest slope, what is the range of possible slopes of all lines which intersect the circle in two points?<br>  <br> |
| 9 | A data set with eleven distinct positive integers has a range of 40, a mean of exactly 25, and a median of 24. What is the largest possible value in the data set? |
| 10 | What is the number of centimeters in the length of the side of a regular tetrahedron whose surface area is numerically equivalent to its volume? |

# "Math is Cool" Masters – 2015-16

## 8th Grade – December 5, 2015
## Pressure Round Contest

| | |
|---|---|
| 1 | A math class at Brown Middle School has twelve boys and eighteen girls. The percentage of students in this class who are boys is 12% less than the percentage of boys attending the school. There are 550 total students attending the school. How many girls attend the school? |
| 2 | Consider the two sets of numbers: A = {2, 3, 5, 7, 11, 13, 17, 19} and B = {4, 6, 8, 9, 10, 12, 14, 15, 16, 18, 20}. A number is chosen at random from each set. As a common fraction, what is the probability that the number chosen from set B is three times the number chosen from set A? |
| 3 | Each figure below is made of one square with horizontal and vertical sides and one square with slanted sides. In all three figures the squares with horizontal and vertical sides are congruent. In figure 1, the slanted square has its vertices at the midpoints of the sides of the horizontal and vertical square. In figure 2, both squares are congruent and all 8 small right triangles are congruent. In figure 3, the horizontal and vertical square has its vertices at the midpoints of the sides of the slanted square. The side lengths of the three slanted squares, from smallest to largest, can be represented by the series, $s, s \cdot a, s \cdot a^2$. What is the value of $a$?<br>Figure 1 Figure 2 Figure 3<br>  |
| 4 | What is the number of right triangles that can be drawn such that three of the dots are vertices? Assume the dots are evenly spaced horizontally and vertically.<br>  |
| 5 | A rectangle has a width of 5 inches. Its length is 60% longer than the width. What is the number of inches in the perimeter of the rectangle? |

# "Math is Cool" Masters – 2015-16

7th & 8th Grade – December 5, 2015

## COLLEGE KNOWLEDGE BOWL ROUND #1 – SET 1

| # | Problem | Answer |
|---|---|---|
| 1 | Imagine two congruent squares. The first one has its sides doubled and the second one has its sides divided in half. As a common fraction, what is the ratio of the area of the small square to the area of the large square? | $\frac{1}{16}$ or one over sixteen |
| 2 | A very large number consists of the positive integers from one through twelve written in consecutive order. As a common fraction, what fraction of the digits of this number are ones? | $\frac{1}{3}$ or one over three |
| 3 | What is the sum of the digits in the decimal representation of five eighths? | 13 |
| 4 | What is the number of seconds that elapse during a twenty-nine minute stretch of time? | 1740 [seconds] |
| 5 | Ellen divided thirty by six when she intended to multiply thirty by six. How many times smaller is the answer she got than the answer she intended to get? | 36 [times] |
| 6 | What is the mean of the positive integers from forty thousand to forty thousand three hundred? | 40150 (forty thousand one hundred and fifty) |
| 7 | In simplest radical form, what is the number of inches in the length of the long leg of a thirty-sixty-ninety triangle if the short leg is square root of six inches long? | $3\sqrt{2}$ [inches] or 3 root 2 |
| 8 | What is the sum of the positive integer factors of thirty-two? | 63 |
| 9 | Two lines have the equations two x minus three y equals six and four x plus three y equals negative six. How many units from the origin is their point of intersection? | 2 [units] |
| 10 | George has two coins that could be pennies, nickels, dimes or quarters. As a decimal and in cents, what is the median of all the possible values that his two coins could have? | 17.5 [cents] |

# "Math is Cool" Masters – 2015-16

7th & 8th Grade – December 5, 2015

## COLLEGE KNOWLEDGE BOWL ROUND #2 – SET 2

| # | Problem | Answer |
|---|---|---|
| 1 | What is the sum of the first five perfect cubes? | 225 |
| 2 | How many positive integer factors does one hundred and ten have? | 8 [factors] |
| 3 | Evaluate: forty-five plus forty-seven plus forty-nine plus fifty-one plus fifty-three plus fifty-five? | 300 |
| 4 | I flip five fair coins. As a common fraction, what is the probability that exactly three show tails? | $\frac{5}{16}$ or five over sixteen |
| 5 | If three woodchucks could chuck four pounds of wood in five minutes, how many pounds could a woodchuck chuck in half an hour? Assume all woodchucks chuck at the same average rate. | 8 [pounds] |
| 6 | What is the degree measure of an exterior angle of a regular decagon? | 36[°] |
| 7 | How many positive integer four-digit palindromes exist? | 90 [palindromes] |
| 8 | What is the measure, in degrees, of the lesser angle between the minute and hour hand on a clock at ten thirty PM? | 135[°] |
| 9 | It costs one dollar and twenty-one cents to buy one cookie and three twinkies, and fifty-nine cents to buy three cookies and one twinky. How much does it cost to buy one hundred cookies and one hundred twinkies? Express your answer in dollars. | [$]45 |
| 10 | I have two red socks, two blue socks, and two yellow socks in my drawer. I grab two socks at random. As a common fraction, what is the probability that the two socks are the same color? | $\frac{1}{5}$ or one over five |

# "Math is Cool" Masters – 2015-16

7th & 8th Grade – December 5, 2015

## COLLEGE KNOWLEDGE BOWL ROUND #3 – SET 3

| # | Problem | Answer |
|---|---|---|
| 1 | A room is full of kittens and puppies. There are a total of seventy-two paws and thirty-six ears. Assume all of the animals have four legs and two ears and that there are at least two kittens. What is the maximum possible number of puppies in the room? | 16 [puppies] |
| 2 | Point A has coordinates two comma three. What is the sum of the coordinates of A-prime after A is rotated one hundred eighty degrees about the origin? | -5 |
| 3 | What is the product of eleven and five hundred fifty-five? | 6105 |
| 4 | It takes three teachers three hours to write thirty-six test problems. Assuming the three teachers work at the same average rate, what is the number of minutes it would take for one teacher to write six test problems? | 90 [minutes] |
| 5 | What is the largest three-digit multiple of seventeen? | 986 |
| 6 | In the equation y equals twelve x minus twenty-four, what is the value of x when y equals sixty? | [x = ] 7 |
| 7 | The measures of the three angles of a particular triangle are integer amounts and form an arithmetic sequence. How many distinct sets of three angles exist that match this description? | 59 [sets of angles] |
| 8 | What is the sum of the positive two-digit integers? | 4905 |
| 9 | What is the number of square centimeters in the area of a square whose diagonal has a length of twelve centimeters? | 72 [$cm^2$] |
| 10 | Gerald has four science-fiction books and three adventure books. In how many distinct orders can he place them on his shelf if the science-fiction books must stay together? | 576 [orders] |

# "Math is Cool" Masters – 2015-16

7th & 8th Grade – December 5, 2015

## COLLEGE KNOWLEDGE BOWL ROUND #4 – SET 4

| # | Problem | Answer |
|---|---|---|
| 1 | Given the equation negative two x squared plus six x plus ten, what is the value of y when x equals negative three? | -26 |
| 2 | What is the number of centimeters in the height of a trapezoid with an area of twenty-four square centimeters and bases of length five and seven centimeters? | 4 [cm] |
| 3 | What is the equation of the line, parallel to the y-axis, which passes through the point with coordinates, negative nine comma six? | x = -9 |
| 4 | How many positive integer factors does the number one hundred and twenty have? | 16 [factors] |
| 5 | Two standard dice are rolled and the numbers showing are added. As a common fraction, what is the probability that the sum is not less than eight? | $\frac{5}{12}$ |
| 6 | Morris buys three erasers for eighty-eight cents each and one twenty-four pack of pencils for six dollars and thirty-nine cents and there is no sales tax. As a number of cents, what is the amount of change he receives if he pays with a ten dollar bill? | 97 [cents] |
| 7 | What is the product of two hundred ninety-eight and three hundred and two? | 89996 |
| 8 | The point C has coordinates negative four comma negative one. If C is reflected over the line with equation y equals x, what are the coordinates of the image, point C-prime? Answer in x comma y form. | (-1, -4) |
| 9 | What is the largest composite number less than three hundred? | 299 |
| 10 | In base ten, what is the smallest prime number that requires three digits when written in base five? | 29 |

# "Math is Cool" Masters – 2015-16

7th & 8th Grade – December 5, 2015

## COLLEGE KNOWLEDGE BOWL ROUND #5 – SET 5

| # | Problem | Answer |
|---|---|---|
| 1 | In the inequality two x plus five is less than or equal to twelve, what is the largest possible integer value of x? | 3 |
| 2 | Two cards are drawn at random from a standard deck. As a common fraction, what is the probability that they are both red? | $\frac{25}{102}$ |
| 3 | What is the remainder when one hundred-one is divided by twenty-nine? | 14 |
| 4 | How many prime numbers are there between thirty-five and fifty-five? | 5 [prime numbers] |
| 5 | As a common fraction, what is the sum of two-thirds plus one-eighth? | $\frac{19}{24}$ |
| 6 | The area of a triangle is fifty square meters. What is the number of meters in the height of the triangle, if the length of the base is twenty meters? | 5 [meters] |
| 7 | Ben is two years older than Simon. In one year, Ben will be twice Simon's age. How many years old is Simon now? | 1 [year] |
| 8 | In terms of pi, what is the number of cubic centimeters in the volume of a cylinder with a radius of four point five centimeters and a height of twelve centimeters? | $243\pi$ [$cm^3$] |
| 9 | The equation for a line on a coordinate plane is three x minus four y equals eight. Rewrite this equation in the form, y equals M X plus b. | $y = \frac{3}{4}x - 2$ or y = .75x - 2 or equivalent |
| 10 | A data set has twenty positive integer values. The mean of the data set is ten. What is the largest possible value of the median of the data set? | 17 |

# "Math is Cool" Masters – 2015-16

7th & 8th Grade – December 5, 2015

## COLLEGE KNOWLEDGE BOWL ROUND #6 – SET 6

| # | Problem | Answer |
|---|---|---|
| 1 | What is the number of diagonals in a convex nonagon? | 27 [diagonals] |
| 2 | How many distinct prime factors does ninety-six have? | 2 [prime factors] |
| 3 | What is the measure in degrees of the complement of the angle that is supplementary to a one hundred twenty-seven degree angle? | 37[°] |
| 4 | What is the base ten number, twenty, in base two? | $10100_{[2]}$ |
| 5 | What is the sum of the numbers from thirty-seven to fifty-three, including thirty-seven and fifty-three? | 765 |
| 6 | Millie brushes her teeth twice a day, for one hundred and fifty seconds each time, every day without fail. In hours and minutes, how much time does she spend brushing her teeth during the month of December? | 2 hours 35 minutes |
| 7 | Michael eats half of a cake on Monday. On Tuesday, he eats half of what remains of the cake. Each day for the next three days (W, Th, F) he eats half of what remains. What fraction of the original cake is left after he eats his portion on Friday? | $\frac{1}{32}$ |
| 8 | Two spheres have radii of two and three centimeters respectively. As a common fraction, what is the ratio of the volume of the small sphere to the volume of the large sphere? | $\frac{8}{27}$ |
| 9 | Solve the following equation for x: two x over three minus five over six equals two over nine. Answer as a common fraction. | $\frac{19}{12}$ |
| 10 | A circle with radius three units and center zero comma zero is drawn on a coordinate plane. How many points with integer coordinates are on or are inside the circle? | 29 [points] |

# "Math is Cool" Masters – 2015-16

7th & 8th Grade – December 5, 2015

## COLLEGE KNOWLEDGE BOWL ROUND – EXTRA

| # | Problem | Answer |
|---|---|---|
| 1 | In terms of pi, what is the number of square centimeters in the area of a circle with circumference of twenty-six pi? | $169\pi$ [$cm^2$] |
| 2 | As a decimal, what is the number of degrees in the measure of the larger angle formed by the hands of a clock at nine forty-five? | 337.5[°] |
| 3 | If x over y equals two-thirds and y over z equals three-fourths, as a common fraction, what does x over z equal? | $\frac{1}{2}$ |

Final Score:

KEY

(Out of 8)

# "Math is Cool" Masters -- 2015-16

School: _____ Room # _____ Team # _____

Name: _____ Proctor: _____

7th & 8th Grade **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** | 9 [square feet] | | |
| **2** | 95 | | |
| **3** | 300 [percent] | | |
| **4** | 108 | | |
| **5** | $\frac{25}{26}$ | | |
| **6** | $\frac{1}{2}$ [miles per minute] | | |
| **7** | 8 | | |
| **8** | $\frac{4}{5}$ | | |
| | | | |

# Math is Cool" Masters – 2015-16

8th 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 | D | | |
| 2 | D | | |
| 3 | E | | |
| 4 | B | | |
| 5 | D | | |
| 6 | C | | |
| 7 | E (676506) | | |
| 8 | A | | |
| 9 | C | | |
| 10 | B | | |
| | | | |

# "Math is Cool" Masters – 2015-16

8th 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 | 220 [minutes] | | |
| 2 | 49 | | |
| 3 | $15^{[\circ]}$ | | |
| 4 | 126 [arrangements] | | |
| 5 | 441 | | |
| 6 | $41\frac{2}{3}$ | | |
| 7 | 8 [solutions] | | |
| 8 | $-\frac{4}{3} < m < \frac{3}{4}$ | | |
| 9 | 55 | | |
| 10 | $6\sqrt{6}$ [cm] | | |
| | | | |

# "Math is Cool" Masters – 2015-16

8th 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 | 264 [girls] |
| 2 | $\frac{3}{88}$ |
| 3 | [a = ] $\sqrt{2}$ |
| 4 | 72 [right triangles] |
| 5 | 26 [in] |

Final Score:

(Out of 8)

# "Math is Cool" Masters -- 2015-16

School: _____ Room # _____ Team # _____

Name: _____ Proctor: _____

7th & 8th Grade Mental Math – 30 sec per question

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

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

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

# Math is Cool" Masters – 2015-16

8th 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

8th Grade – December 5, 2015

| Final Score: |
|---|
| |

**SCHOOL NAME** _____ **Team #** _____

Proctor Name _____ Room # _____

| First Score |
|---|
| (out of 10) |

## 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 | | | |
| | | | |