Use global search and replace to change the following variables.

--- Done by Test Writer ---

Year: #year → 2019-20

Grade: #grade → 11th-12th
     Check to make sure it has the proper grade or
     'High School' as appropriate

Champs: #champs → Championships or Masters
     For the individual test, delete the test and answer
sheet not being used.

--- Done by Site Coordinator ---

Date: #date → October 20, 2019
     "Official" date may be done by Test Writer

Sponsor: #sponsor → Sponsor SoSoBank or to blank

"Math is Cool" Masters – 2019-20
#sponsor
#date
High School Mental Math Contest

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

GENERAL INSTRUCTIONS applying to all tests:

Good sportsmanship is expected throughout the competition by <u>all</u> involved, both competitors and observers. Display of poor sportsmanship may result in disqualification.

Calculators or any other aids may not be used on any portion of this contest.

Unless stated otherwise, all rational, non-integer answers need to be expressed as reduced common fractions except in case of problems dealing with money. In the case of problems requiring dollar answers, answer as a decimal rounded to the nearest hundredth (ie, to the nearest cent).

All radicals must be simplified and all denominators must be rationalized.

Units are not necessary as part of your answer unless it is a problem that deals with time and in that case, a.m. or p.m. is required. However, if you choose to use units, they must be correct.

Leave all answers in terms of π where applicable.

Do not round any answers unless stated otherwise.

Record all answers on the colored cover sheets in the answer column only.

Make sure all answer sheets have all the information (name, team number, etc.) at the top of the sheet filled out.

Tests will be scored as a 0 if answers are not recorded on the answer sheets.

Blank answer sheets and answer sheets with no name will be scored as a 0.

Mental Math – 30 sec per question

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

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

"Math is Cool" Masters -- 2019-20

School:_____Room # _____ Team #_____

Name: _____Proctor: _____

High School   <u>Mental Math</u> – 30 sec per question

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

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

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

"Math is Cool" Masters – 2019-20
#sponsor
High School – #date
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	Evaluate: seven-eighths times sixteen.
2	Express sixty-two thousand six-hundred fifty-nine point seven eight nine in scientific notation rounded to two significant digits.
3	What is the measure of each interior angle in a regular hexagon?
4	How many unique ways are there to rearrange the letters in the word K-I-T-T-E-N.
5	What is the units digit of twenty-seven to the twenty-eighth power?
6	Evaluate: log base two of two-hundred fifty-six.
7	What is the sum of the terms of an infinite geometric series with first term sixteen and common ratio one-third?
8	What are the roots of the quadratic equation y equals two x squared plus four x minus thirty?

"Math is Cool" Masters -- 2019-20

School: _____ Room # _____ Team #_____

Name: _____ Proctor: _____

High School   <u>Mental Math</u> – 30 sec per question

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

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

	Answer
1	14
2	6.3×10^4
3	120 [degrees]
4	360
5	1
6	8
7	24
8	3, -5 [any order]

"Math is Cool" Masters – 2019-20

#date

Total # Correct:

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

Circle Math: **Geometry** **Algebra 2** **Pre-Calculus** **Calculus** Team #: _____ Room #: _____

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

	Answer	1 or 0	1 or 0			Answer	1 or 0	1 or 0			Answer	1 or 0	1 or 0	Math
1					16					31				
2					17					32				
3					18					33				
4					19					34				
5					20					35				
6					21					36				
7					22					37				
8					23					38				
9					24					39				
10					25					40				
11					26					41				**PreCal/**
12					27					42				**Calculus**
13					28					43				Only
14					29					44				
15					30					45				
1 -15 Total					**16 – 30 Total**					**31 – 45 Total**				

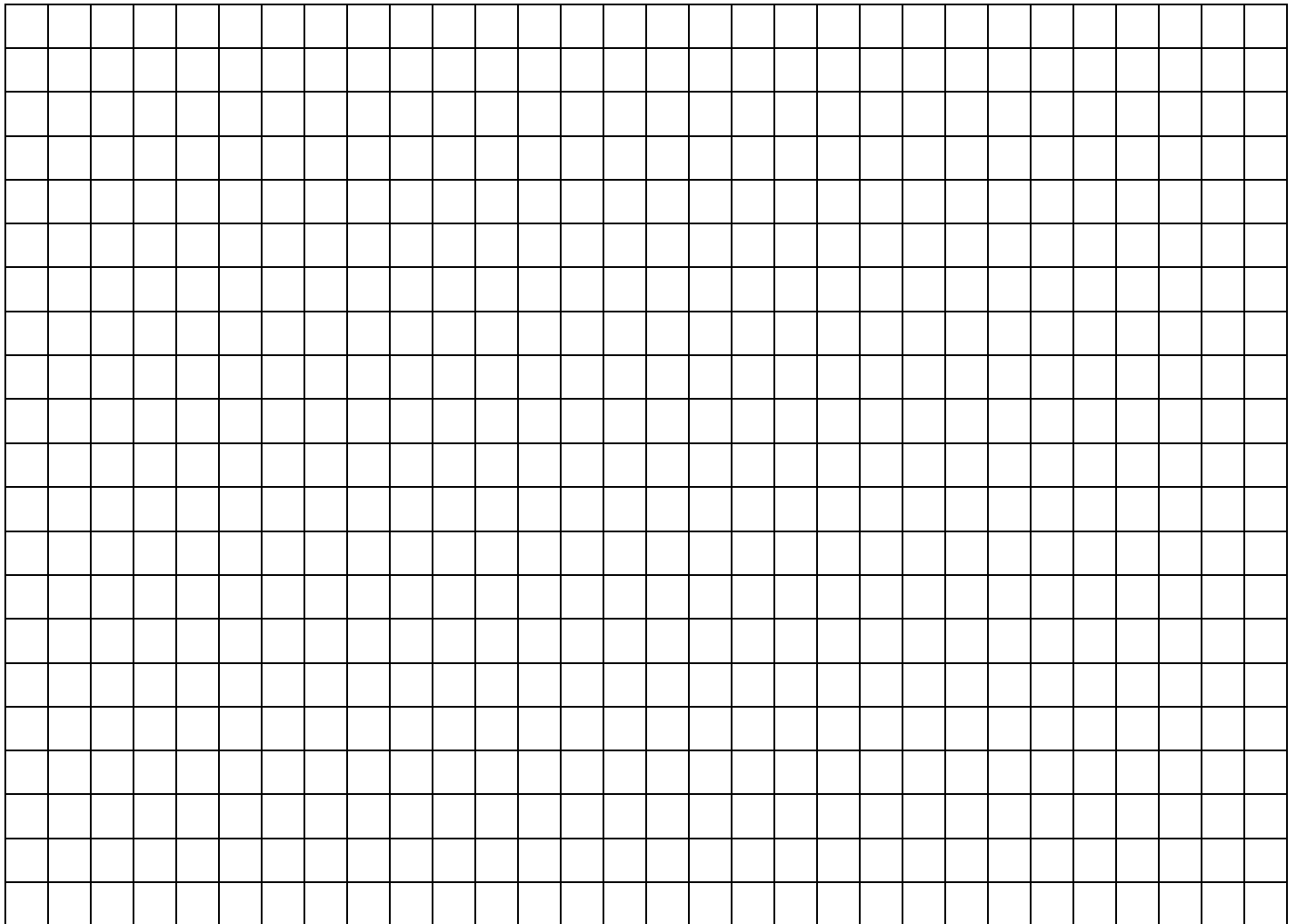# "Math is Cool" Masters – 2019-20

#sponsor

#date

High School Individual Contest

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

INDIVIDUAL TEST – High School - 35 minutes

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

"Math is Cool" Masters – 2019-20

High School Individual Contest

	Questions 1-30: 2 points each
1	Solve for x: $4x + 16 = -4$
2	Evaluate: $-4 + 5 * 7^3 - 18(2 * 4 * 5/3^2)$
3	A circle has diameter of 6 inches. In square inches, what is the area of the circle?
4	Find the remainder when 594 is divided by 23.
5	In $\triangle ABC$, $m\angle B = 61°$ and $m\angle C = 44°$. Find $m\angle A$, in degrees.
6	If $m < 0$, solve for m: $\|6m - 3\| = 9$
7	What is the largest integer less than $\sqrt{300}$?
8	In Joey's Awesome Bowling Alley, it costs \$2 to rent bowling shoes. It is required to wear bowling shoes in the bowling alley. In addition, it costs \$3 per one game of bowling. How many games can Richard bowl without spending more than \$15?
9	If $3x + 5 = 13$, evaluate: $(3x + 4)(3x + 3)(3x + 2)$
10	A pencil and five paper clips weigh the same as two erasers. A pencil weighs the same as 29 paper clips. How many paper clips weigh the same as 1 eraser?
11	Find the slope of the line passing through $(-3, 4)$ and $(2, -6)$.
12	A palindrome is a number that reads the same left-to-right as right-to-left. For example, 11, 121, and 1331 are palindromes. What is the smallest palindrome greater than 2019?
13	What is 30% of 5% of 45000?
14	Two fair six-sided dice, with sides numbered 1 through 6, are rolled. Find the probability that the values on the two top faces add up to at least 9. Express your answer as a common fraction.
15	Find, as a common fraction, the slope of a line perpendicular to the line with equation $2x + y = -5$.
16	In simplest radical form, what is the value of $\sqrt{2 * 3 * 4 * 5 * 6 * 7 * 10}$?

17	Determine the vertex of the parabola whose graph is the equation $y = 2x^2 - 8x + 9$. Write your answer as an ordered pair (x, y).
18	What is the mode of the following dataset? { 20, 7, -13, 18, 0, 24, -9, 3, 18, 19 }
19	In cubic meters, find the volume of a cone having a circular base with diameter 4 meters and height 9 meters.
20	Find the sum of all odd integers between 34 and 76.
21	What is the geometric mean of the numbers 1, 3, 9, 27, and 81?
22	Convert the base-7 number 426_7 into base-4.
23	Solve for x: $\dfrac{x-3}{x+7} = \dfrac{1}{3}$
24	The average test score of a class of twelve students was 80 points. The average score of eight of those students was 75 points. What was the average test score, in points, of the other four students?
25	Triangle ABC has sides with lengths of 5, $x - 5$, and $x - 4$. Triangle DEF has sides with lengths of 10, $x - 10$, and 16. Find x so that the two triangles have the same perimeter.
26	Solve for x: $\dfrac{3^{x+1}+3^{x+2}+3^{x+3}}{39} = 27$
27	Find the length of the line segment whose endpoints are the intersection of the circle $x^2 + y^2 = 100$ and the line $y = x + 2$.
28	If $f(x) = 3x - 4$ and $g(x) = x^2 + 2$, find $g(f(-1))$.
29	How many ways are there to arrange the letters in the word COMPUTER in a row, if the vowels must be in alphabetical order and the consonants must also be in alphabetical order?
30	The length of the base of an isosceles triangle is 10 meters and the length of the altitude from the vertex of the triangle to the base is 12 meters. Find the perimeter of the triangle, in meters.

Challenge Questions: 3 pts each

31	A team plays a series of 10 games, which they can either win, lose, or tie. How many possible outcomes exist, assuming we do not care about the order of wins, losses, and ties?
32	Given matrix $A = \begin{bmatrix} -4 & 3 & 2 \\ 4 & 7 & -3 \\ 5 & 2 & -3 \end{bmatrix}$, find the sum of the elements of the first column of A^{-1}.
33	Evaluate: $3 \cdot \sqrt[3]{24 + \sqrt[3]{24 + \sqrt[3]{24 + \cdots}}}$
34	A function f is defined on the set of positive integers as $f(n) = n - 3$ if $n \geq 1000$ and $f(n) = f(f(n + 5))$ if $n < 1000$. Find the value of $f(99)$.
35	If x and y are positive integers and $x^2 + 615 = 4^y$, what is the value of xy?
36	Jack chose nine different integers from 1 through 19 (inclusive) and found their sum. From the remaining ten integers, Jill chose nine and found their sum. If the ratio of Jack's sum to Jill's sum was $\dfrac{7}{15}$, which of the original nineteen integers was chosen by *neither* Jack nor Jill?
37	The choice of pizza toppings in Joey's new restaurant is obtained in an interesting manner: a flip of a fair, two-sided coin is used to decide whether to include pepperoni, then doing the same for sausage, mushrooms, and onions. What is the probability that two random pizzas in Joey's restaurant have at least one topping in common?
38	Two circles in the xy-plane have four common tangent lines, two external and two internal. The slopes of these lines, when written in increasing order, are 2, 3, 4, and m. Find the value of m.
39	If c is a solution to $x^2 - 20x + 13 = 0$, find the area of the circle centered at (c, c) that passes through the point $(13, 7)$.
40	Let $a = 20$, $b = 19$, and $c = 2019$. Evaluate: $$\frac{a^2 + b^2 + c^2 + 2ab + 2bc + 2ac}{a + b + c}$$

IF taking Pre-Calculus or Calculus, continue to questions 41 – 45

41	In quadrilateral $ABCD$, $m\angle ABC = 90°$, diagonal $\overline{AC}$ is perpendicular to side $\overline{CD}$, $AB = 18$, $BC = 21$, and $CD = 14$. Find the perimeter of the quadrilateral.
42	What is the smallest positive multiple of 75 that has exactly 75 positive integral factors (including 1 and the number itself)?
43	Five fair, six-sided dice, each having sides numbered 1,2,3,4,5,6, are rolled. Find the probability the top faces are showing exactly three of the same number, and the remaining two numbers are different from each other.
44	What is the remainder when $11^{2019} + 13^{2019}$ is divided by 144 ?
45	A quadrilateral is inscribed in a circle of radius $20\sqrt{2}$. Three sides of the quadrilateral have length 20. What is the length of the fourth side?

"Math is Cool" Masters – 2019-20

#date

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

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

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

	Answers
1	-5
2	1631
3	9π [sq. inches]
4	19
5	75 [degrees]
6	-1
7	17
8	4 [games]
9	1320
10	17 [paper clips]
11	-2
12	2112
13	675
14	5/18
15	1/2

	Answers
16	$60\sqrt{14}$
17	$(2, 1)$
18	18
19	12π [cubic meters]
20	1155
21	9
22	$3120_{[4]}$
23	8
24	90 [points]
25	20 [units]
26	3
27	$14\sqrt{2}$ [units]
28	51
29	56
30	36 [meters]

	Answers
31	66 [outcomes]
32	15
33	9
34	998
35	354
36	14
37	175/256
38	29/3
39	192π [sq. units]
40	2058
41	84 [units]
42	32400
43	$25/162$
44	72
45	50 [units]

Math is Cool" Masters – 2019-20
11th-12th Grade – #date

Student Name _____

Proctor Name _____ Room # _____

SCHOOL NAME _____ **Team #_____**

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

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

DO NOT WRITE IN SHADED REGIONS

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

1	The equation $\frac{x}{3} - \frac{x}{6} = 1$ has solution $x = k$. Find the value of $\frac{3k^2}{4}$. A) 6 B) 18 C) 27 D) 64 E) Answer not given.
2	What is the units digit of 618^8? A) 8 B) 6 C) 4 D) 2 E) Answer not given.
3	The slope through the points $(k, 6)$ and $(3, 15)$ is 3. What is the value of k? A) 9 B) 3 C) 30 D) 0 E) Answer not given.
4	What is the sum, in degrees, of the measures of all interior angles in a convex heptagon? A) 720° B) 900° C) 1260° D) 1440° E) Answer not given.
5	Three consecutive terms in an arithmetic sequence are x, $2x + 11$, and $4x - 3$. What is the common difference of this sequence? A) 49 B) 36 C) 25 D) 16 E) Answer not given.
6	If $\log_6 \sqrt{x - 7} + \log_{36}(x - 2) = 1$, find the sum of the digits of x. A) 4 B) 3 C) 2 D) 1 E) Answer not given.
7	The lengths of the parallel bases of a trapezoid are 14 inches and 7 inches. One of the legs has length 8 inches. How many integer values are possible for the length of the other leg? A) 6 B) 7 C) 8 D) 9 E) Answer not given.

8	Which of the following numbers is the largest?
	$$a = \sqrt[35]{3}, \quad b = \sqrt[40]{4}, \quad c = \sqrt[50]{5}, \quad d = \sqrt[60]{6}$$
	A) a B) b C) c D) d E) Answer not given.
9	How many ordered triples of positive integers (x, y, z) satisfy $LCM(x, y) = 72$, $LCM(x, z) = 600$, and $LCM(y, z) = 900$? A) 15 B) 16 C) 24 D) 27 E) Answer not given.
10	If $a, b, c,$ and d are integers such that $a + bc = 20$ and $cd - a = 19$, find the largest possible value of c. A) 380 B) 1 C) 2019 D) 39 E) Answer not given.

Math is Cool" Masters – 2019-20
11th-12th Grade – #date

Student Name _____

Proctor Name _____ Room # _____

SCHOOL NAME _____ **Team #_____**

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

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

DO NOT WRITE IN SHADED REGIONS

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

"Math is Cool" Masters – 2019-20
11th-12th Grade – #date

Final Score:

SCHOOL NAME _____ **Team #** _____

First Score
(out of 10)

Proctor Name _____ Room # _____

Team Contest – Score Sheet

TEAM TEST - 15 minutes – 30% of team score

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

DO NOT WRITE IN SHADED REGIONS

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

"Math is Cool" Masters – 2019-20

#sponsor
11th-12th Grade – #date
Team Contest

1	Express $42_5 + 42_8 + 101101_2$ in base 9.
2	Let $i = \sqrt{-1}$. Express $-2 + 2i$ in $re^{i\theta}$ form. Use $0 < \theta < 2\pi$ and $r > 0$.
3	What is the area, in square units, of a polygon ABCDE in the Cartesian plane, with vertices at A(3, 4), B(5, 11), C(12, 8), D(9, 5), and E(5, 6)?
4	Find the smallest solution to the equation: $$4^x - 8 * 2^x + 12 = 0$$
5	Find the determinant of the matrix: $$\begin{bmatrix} -1 & 9 & 6 & -7 \\ -3 & 0 & -8 & 1 \\ 8 & -5 & 2 & 7 \\ 2 & 9 & -4 & 3 \end{bmatrix}$$
6	Solve for x: $$\cfrac{12}{6 - \cfrac{4}{1 + \cfrac{6}{5 + \cfrac{3}{x + 1}}}} = 3$$
7	Jacob and Jillian run around a circular track at uniform speeds in opposite directions, starting from diametrically opposite points. They start at the same time, meet first after Jillian has ran 100 meters, and meet again 60 meters before Jacob completes one lap. What is the circumference of the track, in meters?

8	Stacey has three dice, described below: • Die #1 – Six sides, faces have numbers: 1, 3, 5, 7, 9, 11 • Die #2 – Six sides, faces have numbers: 0, 2, 4, 6, 8, 10 • Die #3 – Four sides, faces have numbers: 1, 2, 3, 4 Stacey rolls the three dice and then adds up the numbers in the bottom faces. What is the probability she obtains a sum greater than or equal to 16?
9	If a, b, c, and d are positive real numbers such that $a^2 + b^2 = c^2 + d^2 = 2020$ and $ac = bd = 800$, find the largest integer less than or equal to $a + b + c + d$.
10	How many ways are there to arrange the letters in the "word" MATHISCOOL so that at least one of MATH, IS, or COOL appears?

"Math is Cool" Masters – 2019-20
11th-12th Grade – #date

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	122
2	$2\sqrt{2}e^{\frac{3\pi}{4}i}$
3	30 [sq. units]
4	1
5	-1594
6	2
7	480 [meters]
8	$\dfrac{25}{72}$
9	120
10	187,902

"Math is Cool" Masters -- 2019-20

11th-12th Grade

School: _____ Team #_____

Proctor: _____ Room #_____

Pressure Round

Order Turned In	1	2	3	4	5	
Question Number						Total
Score	1 or 0	2 or 0	3 or 0	4 or 0	5 or 0	

After filling out the top of each of these half sheets, tear off the top sheet and give to your proctor so he/she can keep score.

"Math is Cool" Masters -- 2019-20

11th-12th Grade

School: _____ Team #_____

Proctor: _____ Room #_____

Pressure Round

Order Turned In	1	2	3	4	5	
Question Number						Total
Score	1 or 0	2 or 0	3 or 0	4 or 0	5 or 0	

After filling out the top of each of these half sheets, tear off the top sheet and give to your proctor so he/she can keep score.

"Math is Cool" Masters -- 2019-20

11th-12th Grade

School: _____ Team #_____

Proctor: _____ Room #_____

Pressure Round

#1

Answer for Question # _____ Answer: _____

"Math is Cool" Masters -- 2019-20

11th-12th Grade

School: _____ Team #_____

Proctor: _____ Room #_____

Pressure Round

#2

Answer for Question # _____ Answer: _____

"Math is Cool" Masters -- 2019-20

11th-12th Grade

School: _____ Team #_____

Proctor: _____ Room #_____

Pressure Round

#3

Answer for Question # _____ Answer: _____

"Math is Cool" Masters -- 2019-20

11th-12th Grade

School: _____ Team #_____

Proctor: _____ Room #_____

Pressure Round

#4

Answer for Question # _____ Answer: _____

"Math is Cool" Masters -- 2019-20

11th-12th Grade

School: _____ Team #_____

Proctor: _____ Room #_____

Pressure Round

#5

Answer for Question # _____ Answer: _____

"Math is Cool" Masters – 2019-20

1	What is the area of the ellipse with equation $x^2 + 4y^2 - 16x + 32y = 0$?
2	If $f(x) = \ln(\sqrt[4]{20736x})$, what is $f'(2)$? Express as a fraction.
3	Evaluate: $(5 - 5i)^3(6 + 6i)^2$
4	What is the product of the first 7 positive square integers?
5	What is the sum of the determinants for these two matrices? $$\begin{bmatrix} 2 & 4 & 1 \\ 0 & 5 & 2 \\ 9 & 9 & 9 \end{bmatrix}, \begin{bmatrix} -1 & -3 & 1 \\ 4 & 1 & -2 \\ 1 & -1 & -1 \end{bmatrix}$$

Final Score:
KEY

Proctor Name _____ Room #_____

SCHOOL NAME _____ **Team #**_____

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

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

Pressure Round Answers

	Answer
1	64π
2	$\dfrac{1}{8}$
3	$18000 - 18000i$
4	25,401,600
5	73

"Math is Cool" Masters -- 2019-20

High School

School: _____ Team #_____

Proctor: _____ Room #_____

College Bowl #1 10 Possible	College Bowl #2 10 Possible	College Bowl #3 10 Possible

Do not use tally marks.

COLLEGE BOWL ROUND 1

#	Problem	Answer
1	A right triangle has hypotenuse with length 34 and one leg with length 14. What is the length of the other leg, in simplest radical form?	$8\sqrt{15}$ [units]
2	What is the slope of the line passing through the points one hundred twenty-three comma forty-one and twenty-one comma negative three?	22/51 [twenty-two over fifty-one]
3	What is the probability of drawing a queen or diamond from a standard deck of 52 cards?	4/13 [Four-thirteenths]
4	What is the sum of the positive factors of three hundred thirty?	864
5	What is the sum of the roots of the equation $x^3 - 6x^2 + 10x - 4 = 0$ [read: x cubed minus six x squared plus ten x minus four equals zero]?	6
6	How many squares can be drawn on the lines of a 4 by 6 grid of one-unit squares?	50 [squares]
7	What is the coefficient of x in the expansion of the quantity 2x squared + 4x + 1 times the quantity negative 9x + 3.	3
8	Anju the cat has 600 pieces of crunchy treats. He gives half of his crunchy treats to Balderdash. Of the remaining, Anju gives half of those to Vanilla and Lotus to split evenly. Of the remaining amount, Anju gives an equal maximum integer amount to his four other cat friends. How many pieces of crunchy treats does Anju have l eft for himself?	2 [pieces]
9	License plates for a certain state consists of two letters followed by three digits. Each letter and digit must be distinct. How many different license plates can be issued?	468,000 [license plates]
10	Richard's backyard is filled with only cats and birds. He sees forty-one heads and one hundred ten feet. What is the positive difference between the number of birds and number of cats in Richard's backyard?	13

COLLEGE BOWL ROUND 2

#	Problem	Answer
1	What is the sum of the first 999 positive integers?	499,500
2	What are the coordinates of the vertex of a parabola with equation $2y - 135 = x^2 + 22x$?	(-11, 7)
3	If Stacey pulls 60 weeds in 90 minutes and Richard pulls 20 weeds in 40 minutes, then how many minutes would it take for them to pull 175 weeds together?	150 [minutes]
4	At what point does the line, six x plus 2 y equals 10, intersect with the line that goes through the points one comma seven and five comma ten?	(-1/3, 6) Negative one-third [comma] six
5	What is the sum of the two radii for an ellipse with equation $9x^2 - 54x + 25y^2 + 50y - 119 = 0$ [read: nine x squared minus fifty-four x plus twenty-five y squared plus fifty y minus one hundred nineteen equals zero]?	8
6	A cube is circumscribed by a sphere with a surface area of sixty-four pi square inches. What is the surface area of the cube in square inches?	128 [square inches]
7	Joyce hangs up a string of lights with 12 bulbs. For each bulb, there is a fifty percent chance that it will not light up, independent of other bulbs. What is the probability that at least 1 bulb will not light up?	$\dfrac{4095}{4096}$
8	What is the probability that two fair, six-sided dice are rolled and the sum is 10?	$\dfrac{1}{12}$
9	What is the measure, in degrees, of an interior angle of a regular 18-sided polygon?	160 [degrees]
10	Express the sum of 2 times log base 9 of 3 and log base 3 of 81 as a base ten number.	5

COLLEGE BOWL ROUND 3

#	Problem	Answer
1	Point A is 9 cm from a circle with radius 8 cm. Find the length of a segment tangent to the circle from point A.	15 [centimeters]
2	What is probability that a card randomly selected from a 52-card deck is red, given that it is a face card or a heart?	8/11
3	Evaluate sine of pi over 6, minus cosecant of pi over 6.	-3/2
4	Marcus is selling tennis balls in packs of three. They come in cylindrical containers with height of 12 inches each, in which three tennis balls fit perfectly. What is the volume of three tennis balls divided by the surface area of one tennis ball?	2
5	What is the coefficient of the x term in the expansion of $(3x - 2)^6$ [read: the quantity three x minus two to the sixth power]?	-576
6	How many ways can you rearrange the letters in the word CALCULUS, spelled C-A-L-C-U-L-U-S, so that the two letter Us are not next to each other?	3,780 [ways]
7	How many positive factors does the number one thousand eighty have?	32 [factors]
8	What is the slope of the line that is perpendicular to the line passing through the points (-3,5) and (6, 11)?	-3/2
9	What is the square root of the product of the numbers 2, 4 and 50?	20
10	An annulus [read: an-YOU-lus] is a shape consisting of two concentric circles. What is the area of an annulus where the smaller circle has radius of two and the larger circle has radius of thirteen? The area is the space outside the smaller circle and inside the larger circle.	165π [units squared]

COLLEGE BOWL ROUND 4

#	Problem	Answer
1	What is the product of the solutions to the equation $4x^3 - 17x^2 + x + 12 = 0$ [read: four x cubed minus seventeen x squared plus x plus 12 equals 0]?	-3
2	Evaluate: Eight factorial.	40,320
3	What is the probability of drawing two aces in a row from a standard 52-card deck, given that the cards are drawn without replacement?	1/221
4	What is the area of a regular hexagon circumscribed by a circle with radius of 6?	$54\sqrt{3}$ [units squared]
5	How many three-digit positive integers contain only even digits?	100
6	What is the product of the harmonic mean and the arithmetic mean of two and four?	8
7	A perfect number is a positive integer that equals the sum of its positive divisors, excluding itself. What is the second perfect number minus the first perfect number?	22
8	A triangle has side lengths of 7 and 12. What is the sum of all possible integer lengths of the third side?	156 [units]
9	What is the least common multiple of 168 and 468?	6,552
10	Evaluate five plus three times two minus six times three.	-7

COLLEGE BOWL ROUND 5

#	Problem	Answer
1	What is thirty-six squared minus fifteen squared?	1071
2	What is the 5th term in the geometric sequence that starts with one, then three?	81
3	Find the y-value where y equals two x squared, minus six x, plus five reaches a minimum.	1/2
4	Which of these numbers is largest: 3 raised to the 44th power, 9 raised to the 48th power, or 27raised to the 15th.	9 [raised] to the 48th [power]
5	A plate of nacho cheese costs two dollars, and a hotdog costs a dollar and fifty cents. If a total of 300 items were sold for five hundred twenty-five dollars, how many hotdogs were sold?	150 [hotdogs]
6	What is the cosine of eighteen pi over six?	-1
7	Two fair six-sided dice are being rolled. What is the probability a sum of 7 is rolled given that at least one 3 is rolled?	2/11
8	What is the volume of a hexagonal prism with apothem 6 and height 10?	720 radical 3 or 720 square root 3 [units cubed]
9	How many real solutions does the equation four x squared plus sixteen x plus sixteen have?	1 [solution]
10	What is the area of a square inscribed in a circle with diameter eight?	32 [units squared]

COLLEGE BOWL ROUND 6

#	Problem	Answer
1	What is the length, in inches, of the longest diagonal in a box with width 5 inches, height 8 inches, and length 2 inches?	$\sqrt{93}$ [inches]
2	What is the smallest integer, x, where the natural log of (x^2 - 36) minus the natural log of (x + 6) equals the natural log of (x - 6)?	7
3	Simplify: i to the 10th power, plus i to the 17th power, plus i to the negative 29th power.	-1
4	If p is a positive integer, what are the possible remainders when p^3 is divided by 7?	0, 1 and 6
5	Three students tried to find the sum of the first 20 primes. They wrote 635, 637 and 639. One student is correct. What is the correct number?	639
6	On a coed soccer team, the ratio of females to males is 3 to 2. When 3 males were not able to make it to a game, the ratio of females to males for that game was 2 to 1. How many males are on the team?	12 [males]
7	$1^2 + 2^2 + 3^2 + ... + k^2 = 650$ [read: one squared plus two squared plus three squared plus dot dot dot k squared equals six hundred fifty]. What is k?	12
8	Find the area of a square whose diagonals add up to a length of 10 root 2 inches.	25 [sq inches]
9	How many diagonals can be drawn in a convex polygon that has 48 sides?	1080 [diagonals]
10	Give all solutions to the equation: x squared, minus 6x, plus 9 equals 0.	[x =] 3

COLLEGE BOWL - EXTRA

#	Problem	Answer
1	What is the log base two thousand nineteen of four million seventy-six thousand three hundred sixty-one?	2
2	What is eleven to the fourth power?	14641
3	Express as a simplified fraction the number zero point one, two, three, one, two, three, dot dot dot.	41/333
4	Two concentric circles are drawn, and a chord of the larger circle is drawn that is tangent to the smaller circle. If the area between the two circles is 2π meters squared, what is the length, in meters, of the chord?	$2\sqrt{2}$ [meters]
5	What is one point one one, plus two point two two, plus three point three three, plus, dot dot dot, plus nine point nine nine?	49.95
6	Evaluate eleven factorial divided by seven factorial.	7920