"Math is Cool" Championships – 2017-18

October 28, 2017

Total Correct: KEY

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

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

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

	Answer	1 or 0	1 or 0
1	2916		
2	16		
3	41 [years]		
4	4		
5	1		
6	4884		
7	[x=] 11		
8	[$] 112		
9	4 [ways]		
10	32 [meters]		
11	50		
12	28 [cu in]		
13	17		
14	1115 [cents]		
15	9		
1-15 TOTAL:			

	Answer	1 or 0	1 or 0
16	55 [sq inches]		
17	13		
18	14		
19	12 [ways]		
20	30 [edges]		
21	6 [un]		
22	83		
23	54 [diagonals]		
24	1		
25	$4104_{[5]}$		
26	377		
27	8		
28	7		
29	9 [socks]		
30	180 [min]		
16-30 TOTAL:			

	Answer	1 or 0	1 or 0
31	7		
32	5		
33	33		
34	36 [sq un]		
35	60 [%]		
36	75		
37	-1		
38	10		
39	84 [cubes]		
40	10 [un]		
31-40 TOTAL:			

Total Correct:

"Math is Cool" Championships – 2017-18

October 28, 2017

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

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

High School 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:			

“Math is Cool” Championships – 2017-18

Sponsored by:

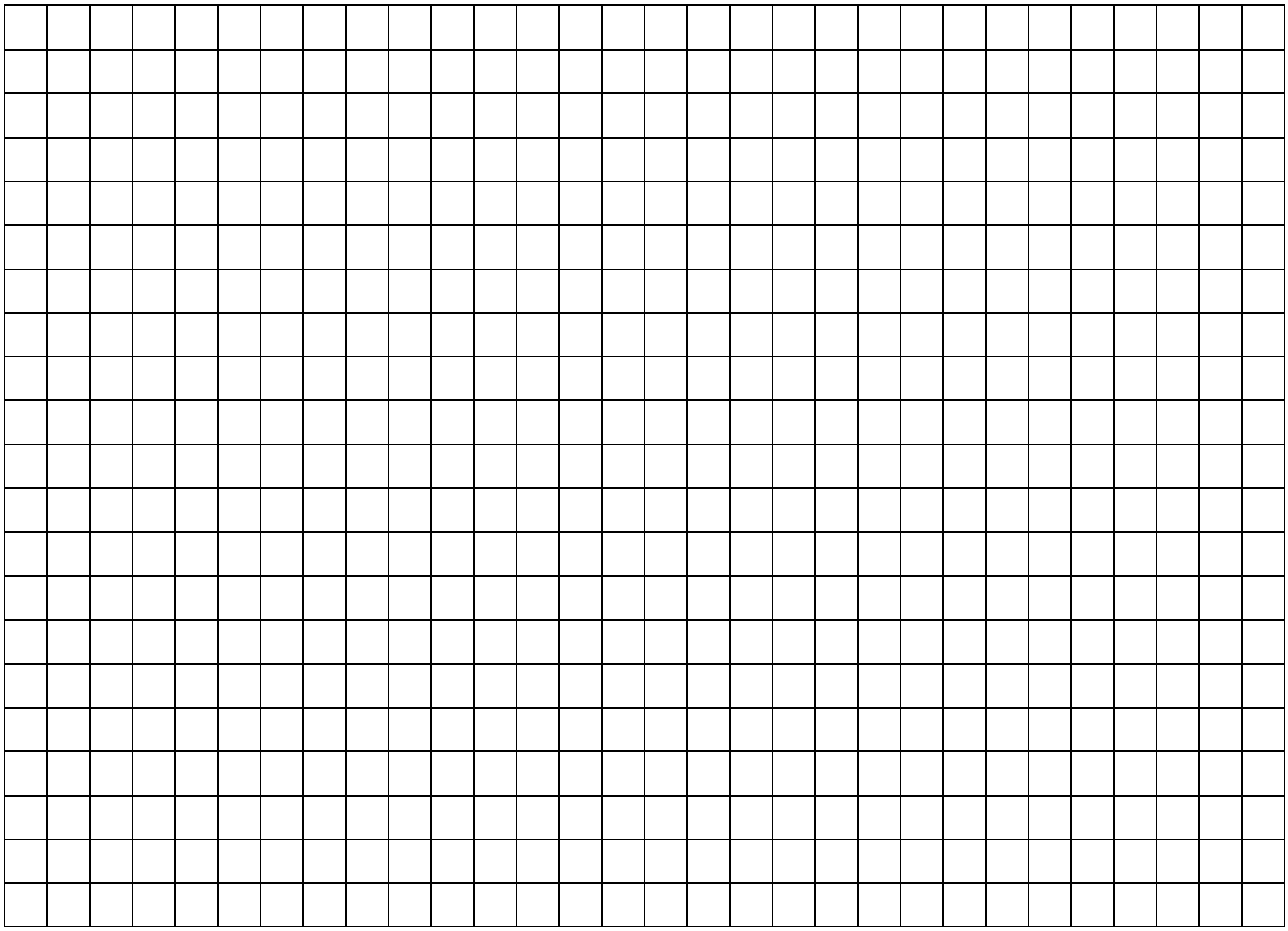
October 28, 2017

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" Championships – 2017-18

Sponsored by:

October 28, 2017

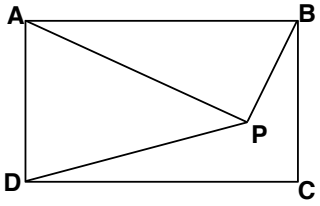
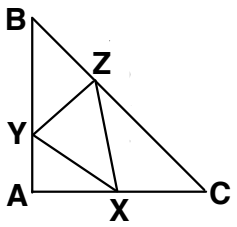
High School Individual Contest

All answers should be integers.

	Questions 1-30: 2 points each
1	Calculate 54^2.
2	The midpoint of the line segment connecting (3, 10) and (17, 2) is (a, b). What is $a + b$?
3	Five years ago, Bob was 3 times as old as his daughter Mary. Mary is now 17. How old is Bob now?
4	How many of the following are rational numbers: $\left\{e^2, -3, \sqrt{25}, \sqrt{\frac{16}{9}}, \frac{22}{7}\right\}$?
5	What is the positive difference between the average and median of the numbers: 12, 10, 16, 19, 13, 13, and 15?
6	What is 66×74?
7	Solve for x if $4(x-2) + 3x + 2 = 6x + 5$
8	A nice coat usually costs \$200. It is on sale for 20% off. Next Saturday, there is a special sale of 30% off last marked price. How much will the coat cost on Saturday?
9	There are 8 possibilities if I flip a fair coin three times. How many of those ways have more heads than tails?
10	All sides of a rectangle with area 60 square meters are integers. What is the minimum perimeter possible?
11	What is $100 - 99 + 98 - 97 + \cdots + 2 - 1$?
12	The volume of a cube is $\frac{7}{2}$ cubic inches. If I double the length of each side, what is the new volume?
13	A palindrome is a number that reads the same backwards as forwards. What is the sum of the digits of the smallest palindrome that is larger than 1234567?
14	The local taxi charges \$2.60 for a pickup, \$2.10 per mile and \$0.60 for each passenger. How many cents would a three-and-a-half-mile trip for two passengers cost?
15	Simplify: $\frac{9^4}{3^5+3^5+3^5}$

16	The two diagonals of a rhombus measure 10 inches and 11 inches. What is the area of the rhombus in square inches?
17	What is the largest prime factor of 1001?
18	What is the missing number X in this arithmetic sequence: 11.8, X, 16.2?
19	Mr. and Mrs. Jones are going to the movies with their two children. Unfortunately, the kids are not getting along. How many ways can the family sit in a row of four seats so that the kids are not next to each other?
20	A regular icosahedron is constructed with 20 equilateral triangles as faces. How many edges does it have?
21	Two chords $\overline{AB}$ and $\overline{CD}$ of a circle intersect at point P. If $\overline{AP} = 4$ and $\overline{PB} = 9$ and $\overline{CP} = 6$, what the length of $\overline{PD}$?
22	My Biology quiz average is 93 accounting for 70% of my grade. The final exam is worth the remaining 30%. What is the lowest score I can get on the final to maintain an average of 90?
23	A regular polygon has interior angles that measure 150 degrees. How many diagonals can be drawn in the polygon?
24	Evaluate: $\log_2(\log_2(\log_2 16))$
25	As a base 5 number, what is $(43_5)^2$?
26	If $i = \sqrt{-1}$, what is the square of the magnitude of the product: $(3 - 2i)(2 + 5i)$
27	What is the sum of the coefficients in the simplified expansion of $(2x - y + z)^3$?
28	For how many positive integers *n* less than 50 is $n^2 - n - 56$ divisible by 13?
29	A drawer contains white socks and black socks. If two socks are randomly drawn in succession, the probability of drawing two white socks is 7/12. What is the smallest number of socks that could have been in the drawer?
30	Three faucets are pouring water into a container. One would fill the container in 6 hours by itself, another in 8 hours and the last in 12 hours. Additionally, outflow from the container would empty the container in one day. How long, to the nearest minute, does the container take to fill from empty?

Challenge Questions: 3 pts each

31	Let *m* and *n* be the solutions to $2x^2 - 7x + 1 = 0$. What is $\frac{1}{m} + \frac{1}{n}$?
32	How many real solutions (a, b, c) are there to the set of equations: $ab = c, ac = b$ and $bc = a$?
33	Let a, b, c be the three roots of the polynomial expression $x^3 + 4x - 11$. What is $a^3 + b^3 + c^3$?
34	Consider a rectangle ABCD and an interior point P. If PA=7, PB=2 and PD=9, what is the measure of PC squared? 
35	An equal number of Algebra students and Geometry students were asked whether they got an 'A' in their class. All students answered Yes or No. If 80% of those who said No were Geometry students and 60% of those who said Yes were Algebra students; what percent of Geometry students said Yes?
36	Let $D_n = 1^n + 2^n + 3^n + 4^n$ for $1 \leq n \leq 100$. How many of the $D_n's$ are divisible by 5?
37	Let *a* be a solution to $x^2 - x + 1 = 0$. What is a^3?
38	What is the remainder when 10^{2017} is divided by 1001?
39	The product $7! \cdot 8! \cdot 9!$ is divisible by how many positive perfect cubes?
40	In the triangle below, angle A is a right angle and AB = AC = 2. The point X is the midpoint of AC and Y is chosen on AB and Z is chosen on BC. Let P be the smallest possible perimeter of ΔXYZ; what is P^2? 

"Math is Cool" Championships – 2017-18

Sponsored by:

October 28, 2017

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.*

<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.*

Final Score:

(Out of 8)

"Math is Cool" Championships -- 2017-18

School:_____Room # _____ Team #_____

Name: _____Proctor: _____

High School **Mental Math** – 30 sec per question

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

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

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

"Math is Cool" Championships – 2017-18

Sponsored by:

High School – October 28, 2017

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 six factorial divided by four factorial.
2	What is the sum of the first five positive perfect squares?
3	What is the solution to the equation 4 x minus 9 equals 11?
4	A triangle has integer side lengths and two of them are two and six. What is the sum of possible values for the third side?
5	I roll two fair six-sided dice and add the numbers on top. What is the ratio of the chance of getting a total of seven to the chance of getting a total of four expressed as a single number?
6	The five-digit number: seven – three – D – two – one is divisible by nine. What is the digit D?
7	How many positive numbers less than one hundred have exactly three positive factors?
8	In degrees, what is the measure of one interior angle of a regular decagon?

Final Score:
KEY
(Out of 8)

"Math is Cool" Championships -- 2017-18

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	30		
2	55		
3	[x=]5		
4	18		
5	2		
6	5		
7	4		
8	144 [°]		

Final Score:

Math is Cool" Championships – 2017-18

11th & 12thGrade – October 28, 2017

First Score

(out of 20)

Student Name _____

Proctor Name _____Room # _____

SCHOOL NAME _____**Team #**_____

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

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

DO NOT WRITE IN SHADED REGIONS

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

"Math is Cool" Championships – 2017-18

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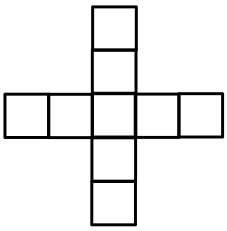
11th & 12thGrade – October 28, 2017

Individual Multiple Choice Contest

1	Compute the sum $173_8 + 1543_6$ A) 388_{12} B) 546 C) 1716 D) 2616 E) Answer not given.
2	What is the least common multiple of 38 and 95? A) 190 B) 722 C) 1805 D) 3610 E) Answer not given.
3	The wood turtle Telchar is walking to a potential food object at a calm 3 inches per second. After travelling 3 feet, it becomes clear that the object is indeed food, and he doubles his speed over the remaining foot of distance. What was his average speed in inches per second over the four-foot trek? A) $\frac{18}{7}$ B) $\frac{24}{7}$ C) $\frac{15}{4}$ D) $\frac{9}{2}$ E) Answer not given.
4	Find the determinant of $\begin{bmatrix} 1 & 2 & 1 \\ 0 & 2 & 3 \\ -7 & 1 & -7 \end{bmatrix}^{-1}$ A) -45 B) -39 C) $-\frac{1}{39}$ D) $-\frac{1}{45}$ E) Answer not given.
5	What is the product of the missing numbers in this geometric sequence: 4, ___, ___, 7? A) 14 B) 28 C) 30 D) Cannot be determined E) Answer not given.
6	Telchar the turtle is prowling a room when he finds a patch of sunlight. He settles in a random location such that his geometric center is on the patch. If the patch is a 24x30 inch rectangle and the turtle can be approximated by a circle of radius 2 inches, what is the probability that Telchar is entirely on the sun patch? A) $\frac{5}{9}$ B) $\frac{2}{3}$ C) $\frac{7}{9}$ D) $\frac{8}{9}$ E) Answer not given.
7	Let θ be the measure of the acute angle between the vectors $\langle -1,5,7 \rangle$ and $\langle -5,1,-1 \rangle$. What is the cosecant of θ? A) $\frac{1}{15}$ B) $\frac{4\sqrt{14}}{15}$ C) $\frac{15\sqrt{14}}{56}$ D) 15 E) Answer not given.
8	Let $f(x) = x^4 - 17x^3 + 16x^2 + 13x - 21$. What is the sum of the squares of its roots? A) 156 B) 239 C) 243 D) 257 E) Answer not given.

9	Each square in the figure is assigned an odd number from 1 to 17 without repetition. The five horizontal squares and the five vertical squares each add to 47. What number is in the middle square?  A) 7 B) 9 C) 13 D) 15 E) Answer not given.
10	What is the coefficient of the x^5 term in the expansion of $(x^4 - 3ix^3 - 2x + 6i)^4$ A) 72 B) 144 C) 1728 D) 2592 E) Answer not given.

Math is Cool" Championships – 2017-18

11th & 12thGrade – October 28, 2017

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	A		
3	B		
4	D		
5	B		
6	E $\left(\frac{13}{18}\right)$		
7	C		
8	C		
9	C		
10	C		

"Math is Cool" Championships – 2017-18

11th & 12thGrade – October 28, 2017

Final Score:

SCHOOL NAME _____ **Team #** _____

First Score
(out of 10)

Proctor Name _____ Room # _____

Team Contest – Score Sheet

TEAM TEST - 15 minutes – 30% of team score

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

DO NOT WRITE IN SHADED REGIONS

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

"Math is Cool" Championships – 2017-18

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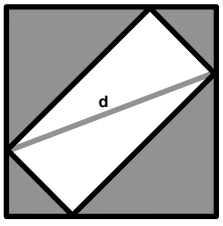
11th & 12thGrade – October 28, 2017

Team Contest

1	Three lines that are pairwise nonparallel intersect three parallel lines, and do not intersect each other in our figure. How many distinct angle measures does this create?
2	Evaluate in base 10: $101100101101_2 + 4AE0_{16}$
3	One morning due to traffic congestion a commuter averages a paltry 30 miles per hour on his 12-mile drive to work. On the way back, hearing the roads are even worse, the driver takes a different route that is 25% longer but manages to average 50 miles per hour. What was the average speed of both trips, rounded to the nearest whole mile per hour?
4	Telchar the turtle is continuously attempting to climb over a gate. Each individual attempt is independent, takes two minutes, and has 5% chance of success and 10% chance of Telchar falling off of the gate and onto his back, after which he takes a minute to flip himself over and try again. The rest of the time, he falls off but remains right-side up, requiring no extra time to try again. At the start of Telchar's first attempt, how many minutes are expected to pass before he scales the gate?
5	Two poles of heights 10 and 15 feet respectively are placed on and perpendicular to flat ground 23 feet apart. Wires are attached from the top of each pole to the base of the other. How high off the ground is the point where the wires cross, in feet?
6	Evaluate: $$\left[\sin\left(\frac{\pi}{12}\right)\sin\left(\frac{\pi}{6}\right) - \cos\left(\frac{\pi}{6}\right)\cos\left(\frac{\pi}{12}\right)\right]^{-2}$$
7	In how many distinct ways can the letters in the word AMALGAM be rearranged such that no two letters A are adjacent?
8	Given $$\frac{y}{x+\frac{y}{x+\frac{y}{\ddots}}} = \frac{x}{y+\frac{x}{y+\frac{x}{\ddots}}}$$ It is possible to relate *x* and *y* in an equation of the form: $$ay^2 + by + cx^2 + dx + e = 0$$ Find $a + 2b + 4c + 8d + 16e$ if $gcd(a, b, c, d, e) = 1$.
9	Isosceles right triangles are removed from each corner of a square, leaving a rectangle in the middle. The area of the gray triangles removed total 128 square units. What is length of the diagonal, *d*? 
10	Evaluate $$\frac{8}{1}+\frac{7}{2}+\frac{6}{4}+\frac{5}{8}+\cdots$$

"Math is Cool" Championships – 2017-18

11th & 12thGrade – October 28, 2017

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	6		
2	22029		
3	39 [mph]		
4	42 [minutes]		
5	6 [feet]		
6	2		
7	120 [ways]		
8	3		
9	16 [un]		
10	14		

“Math is Cool” Championships -- 2017-18

11th & 12thGrade

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” Championships -- 2017-18

11th & 12thGrade

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” Championships -- 2017-18

11th & 12thGrade

School: _____ Team #_____

Proctor: _____ Room #_____

Pressure Round #1

Answer for Question # _____ Answer: _____

“Math is Cool” Championships -- 2017-18

11th & 12thGrade

School: _____ Team #_____

Proctor: _____ Room #_____

Pressure Round #1

Answer for Question # _____ Answer: _____

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School: _____ Team #_____

Proctor: _____ Room #_____

Pressure Round #2

Answer for Question # _____ Answer: _____

“Math is Cool” Championships -- 2017-18

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School: _____ Team #_____

Proctor: _____ Room #_____

Pressure Round #2

Answer for Question # _____ Answer: _____

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11th & 12thGrade

School: _____ Team #_____

Proctor: _____ Room #_____

Pressure Round #3

Answer for Question # _____ Answer: _____

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School: _____ Team #_____

Proctor: _____ Room #_____

Pressure Round #3

Answer for Question # _____ Answer: _____

“Math is Cool” Championships -- 2017-18

11th & 12thGrade

School: _____ Team #_____

Proctor: _____ Room #_____

Pressure Round #4

Answer for Question # _____ Answer: _____

“Math is Cool” Championships -- 2017-18

11th & 12thGrade

School: _____ Team #_____

Proctor: _____ Room #_____

Pressure Round #4

Answer for Question # _____ Answer: _____

“Math is Cool” Championships -- 2017-18

11th & 12thGrade

School: _____ Team #_____

Proctor: _____ Room #_____

Pressure Round #5

Answer for Question # _____ Answer: _____

“Math is Cool” Championships -- 2017-18

11th & 12thGrade

School: _____ Team #_____

Proctor: _____ Room #_____

Pressure Round #5

Answer for Question # _____ Answer: _____

PRESSURE ROUND

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.

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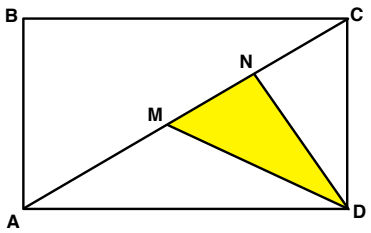
Pressure Round Contest

1	Fresh plums are 80% water by weight but prunes (dried plums) are only 10% water by weight. How many pounds of prunes will I get from 36 pounds of plums?
2	Let $f(x) = \frac{x^2+7x-30}{x-3}$. What is $f(2) + f(5) + f(6)$?
3	The area of rectangle *ABCD* is 30. The points M and N are on the diagonal AC as shown and $2(AM + NC) = 3MN$. What is the area of ΔMND? 
4	Solve for θ if $\cos(\theta)\cos(2\theta) = \frac{1}{4}$ and $0° \leq \theta \leq 90°$. Answer in degrees.
5	How many integer solutions are there to the inequality: $\lvert 3x + 5 \rvert < 23$?

PRESSURE ROUND

11th & 12thGrade

ANSWERS

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Final Score:
KEY
First Score

Proctor Name _____ Room #_____

SCHOOL NAME _____ Team #_____

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Pressure Round Answers

	Answer
1	8 [pounds]
2	43
3	6 [sq un]
4	36 [°]
5	15

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School: _____ Team #_____

Proctor: _____ Room #_____

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

Do not use tally marks.

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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 Bowls

11th & 12th

SETS 1-6

w/Extra Questions at the end.

COLLEGE BOWLS INSTRUCTIONS

Read these to the competitors before first round:

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

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

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COLLEGE KNOWLEDGE BOWL ROUND #1 – SET 1

#	Problem	Answer
1	What is 55 times 65?	3575
2	What is the ratio of 112 to 8?	14, or 14 to 1
3	If f of x equals 3x plus 4 and g of x equals 4x plus 5, what is g of f of 6?	93
4	Including the first digit 3, how many of the first six digits of pi are odd?	5
5	A boat is travelling 12 meters per hour east and encounters a current 5 meters per hour south. What is the magnitude of the resultant velocity?	13 [meters per hour]
6	In how many quadrants does the graph of the equation y equals 2 plus the absolute value of x cross?	2 [quadrants]
7	How many real solutions does the equation 9 x-squared plus 6 x plus 1 equals 0 have?	1
8	What is the digital root, that is the repeated sum of the digits, of 7 factorial?	9
9	Evaluate the secant of pi over 4	$\sqrt{2}$ or root 2
10	Not including face cards, how many cards in a standard 52-card deck have an even value?	20

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COLLEGE KNOWLEDGE BOWL ROUND #2 – SET 2

#	Problem	Answer
1	What is the sum of the odd numbers from 5 to 19 inclusive?	96
2	What is 17 divided by 16, rounded to the nearest hundredth?	1.06
3	How many subsets are there of a set containing 3 elements?	8 [elements]
4	What is the area between the x axis and the graph of y equals x plus 12 on the domain from 4 to 12?	160 [sq un]
5	What is the product of the two complex solutions to the equation x-cubed plus 125 equals 0?	25
6	What is the complex conjugate of the product of $(5 + i)$ and $(7 + 4i)$?	31 minus 27 i
7	Evaluate 2862 divided by 54.	53
8	How many isosceles triangles can be made by connecting three vertices of a regular pentagon?	10 [triangles]
9	What is the log base 128 of 1024?	$\frac{10}{7}$
10	How many positive factors does 2017 have?	2

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COLLEGE KNOWLEDGE BOWL ROUND #3 – SET 3

#	Problem	Answer
1	What is the minimum integer length of the last side of a triangle containing sides of lengths 17 and 8?	10
2	How many times does the digit 3 occur when writing the numbers from negative 40 and positive 40?	28 [times]
3	The log base 3 of 5 is equal to log base x of 5 times log base 3 of 4. What is x?	4
4	What is the sum of the solutions to the equation 5 x-cubed minus 6 x plus 7?	0
5	On the domain from -1 to 1 how many quadrants does the graph of y=arcsine of x exist in?	2 [quadrants]
6	In the binomial expansion of 5a plus 10b to the 4th power what is the coefficient of the term that has a b-squared in it?	15000
7	Not counting zero, what is the sum of the first three even numbers in the Fibonacci sequence?	44
8	In a room of 45 people how many distinct handshakes can be made?	990
9	On fair six-sided dice opposite faces sum to 7. If the sum of the top faces of three dice is 10. Take every possible outcome and find the sum of the opposite faces. What is the average of all those values?	11
10	A store sells Macs and PC's, Macs are 3 times as likely to be sold than a PC. If sales are independent, what is the probability that the next two computers sold are the same?	5/8

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COLLEGE KNOWLEDGE BOWL ROUND #4 – SET 4

#	Problem	Answer
1	What is the positive difference between the 15th positive multiple of 6 and the 14th positive multiple of 7?	8
2	How many numbers less than 30 are the product of two distinct prime numbers?	7
3	How many integers less than 12 are relatively prime to 12?	4 [integers]
4	What is the sum of the roots divided by the product of the roots, of the equation 142 x-squared plus 25 x plus 5 equals 0.	-5
5	What is the area of a rectangle that circumscribes the graph of x squared over 4, plus y squared equals 1?	8 [sq un]
6	What is the harmonic mean of 6, 12 and 14?	$\frac{28}{3}$
7	If a 12-liter bucket starts empty and is filling up at a rate of 3 liters per minute but is emptying at a rate of 2.4 liters per minute, how many minutes will it take for the bucket to be full?	20 [minutes]
8	58 is the sum of 4 consecutive numbers. What is the sum of the middle two numbers?	29
9	What is the period of cosine of x over 2, plus cosine of x over 3?	12π or 12 pi
10	What is the positive difference between the degree measure of interior angles of a regular octagon and those of a regular hexagon?	15 [degrees]

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COLLEGE KNOWLEDGE BOWL ROUND #5 – SET 5

#	Problem	Answer
1	A circle is divided into N sectors, such that their central angles form an arithmetic sequence. The largest is 81 degrees, and the smallest is 9 degrees. What is N?	8
2	How many zeroes are at the end of 30 factorial?	7 [zeroes]
3	A sector of a circle of radius 12 has an area of 144 square units. What is the measure of the central angle in radians?	2 [radians]
4	What is 100 mod 24?	4
5	What is the area of the shape enclosed by the polar equation r equals 4 cosine of theta minus 2 sine of theta?	5π or 5 pi
6	The single 1 being the 0^{th} row, how many times does the digit 3 appear in the 0^{th} row through 9^{th} row of Pascals triangle?	6 [times]
7	How many of the first 20 positive perfect squares end in 3?	0
8	In total, how many times is the digit one written when the numbers one through sixteen are written in base 2?	33 [ones]
9	How many peaks (local maxima) does the graph of y equals cosine of x have on the domain negative 20 to positive 15?	6 [peaks]
10	A farmer has 500 cows, it takes 6 dollars to feed each cow per week. The farmer sells 50 cows at the end of each week. At the end of the 5^{th} week, how much money has he spent?	[$]12000

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COLLEGE KNOWLEDGE BOWL ROUND #6 – SET 6

#	Problem	Answer
1	What is the product of the greatest common factor and least common multiple of 12, 15 and 18?	540
2	What is the imaginary number, *i*, raised to the 6 factorial power?	1
3	What is the smallest angle in degrees greater than 180 that has the same cosine as 107 degrees?	253 [degrees]
4	What is the smallest positive integer that when divided by 4 gives a remainder of 3, when divided by 3 gives a remainder of 2 and when divided by 2 gives a remainder of 1?	11
5	What is the farthest distance away from the origin on the graph of x-squared over 9 plus y-squared over 16 equals 9?	12
6	How many ways can a game of tic tac toe be played so that there is a winner on the fifth move?	1440 [ways]
7	What is the smallest sum of positive integer solutions to the equation $7x + 18y = 208$?	14
8	There are 24 four-digit integers using the digits 1,2,3, and 4 once each. How many of these numbers are greater than 2143?	16 [numbers]
9	What is the remainder when the base 8 number 4 3 2 6 is divided by 7?	1
10	What is area between the graph of y equals 3 x plus 5 and the graph of y equals x plus 5 from x equals 0 to 6?	36

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COLLEGE KNOWLEDGE BOWL ROUND – EXTRA

#	Problem	Answer
1	For n from 0 to infinity what is the sum of the infinite series 3 times 3/4 to the nth power.	12
2	What is the perimeter of a triangle with vertices (3,1), (7,4) and (9,1)	9 [$sq\ un.$]
3	What is the volume of the largest cube that could fit inside a sphere with radius the square root of 3?	8 [cu un]
4	How many of the first 10 positive perfect cubes can be written in either the form 7n, 7n+1 or 7n-1 for some integer n?	10 [numbers]
5	What are the last two digits of 21 to the 15th power?	01 both digits are needed in that order.
6	There are 11 balls in a bag: 3 red, 4 blue and 4 green. If you randomly choose two balls, what is the probability that they are all the same color?	3/11
7	Of the statements X, Y and Z, how many must be true for the following compound statement to be true: X and the quantity Y implies Z?	1 [statement]

Tie Break Question 2017 High School Championships

How many ways are there to arrange the letters in the word G-E-O-R-G-E so that no two consecutive letters are the same?

Tie Break Question 2017 High School Championships Solution

[84] There are 6 letters with 2 sets of repeated letters. In total, there are $\frac{6!}{2!2!} = \frac{720}{4} = 180$. To subtract the number of words with 2 G's, count them as one letter $\frac{5!}{2!} = 60$ ways. There are also 60 ways 2 E's appear. These double count the words with both 2 G's and 2 E's for which there are $4! = 24$ ways. The total is: $180 - 60 - 60 + 24 = 84$.