"Math Is Cool" Masters — 2021-22

11/12th Grade — Jan. 26, 2022

Sponsored by:

GENERAL INSTRUCTIONS applying to all tests:

- *Good sportsmanship is expected throughout the competition by all involved (competitors and observers). Display of poor sportsmanship will result in disqualification.*
- *Competitors may not use calculators or any other aids on any portion of this contest.*
- *Unless stated otherwise:*
  - *Express all rational, non-integer answers as common fractions, except in problems dealing with money, where you should give the answer as a decimal rounded to the nearest cent.*
  - *For 5th grade and up, all fractions and ratios must be reduced to simplest form, all radicals must be simplified, and all denominators must be rationalized.*
  - *Do not round or approximate answers. Leave answers in terms of π or other irrational quantities (e.g., √2), where applicable.*
- *Units are not necessary as part of your answer, unless it is a problem that deals with time, in which case, AM or PM is required. However, if you choose to use units, they must be correct.*
- *Record all answers on the colored cover sheets in the answer column only.*
- ***Be sure that the student name, school, team number, etc. has been filled out at the top of each answer sheet.***
- *Tests will be scored as a 0 if answers are not recorded correctly on the answer sheets.*
- *Blank answer sheets and answer sheets with no name will be scored as a 0.*

FINAL SCORES AND AWARDS

Individual awards are determined by both the Mental Math and Individual Test scores. Individual ties are broken based on the following, in this order: total scaled individual points, total number of correct answers on the Individual Test, Mental Math raw score, number of correct answers from Individual Test #31-40, number of correct answers from Individual Test #16-30, highest numbered question answered correctly on the Individual Test working backwards from #40.

Team (School) awards are based on the highest score from amongst each of the school's "teams of 4 students" in each event and is calculated as 2·(Sum of highest 3 Mental Math scores) + 2·(Avg. of Top 3 Ind. Multiple Choice) + 6·(Team) + 2·(Pressure) + 1·(College Bowl), for approximate weights of 25%, 20%, 30%, 15% and 10% respectively. Team ties are broken based on highest event score in order of the events, starting with Mental Math.

MENTAL MATH TEST - 30 sec./quest., 8 problems, ~8%/25% of individ./team scores

The proctor will read each question twice. You may not do any writing or talking while arriving at a solution. Record only your answer on your answer sheet. You may not change, cross out, erase, or write over an answer once you have written it down. The maximum wait time is 30 seconds after completion of the second reading of the question. Correct answers receive 1 point.

INDIVIDUAL TEST - 35 minutes, 40 problems, ~92% of individual score

When you are prompted to begin, tear off the colored answer sheet and begin testing. No talking during this individual test. You will be given a 5 minute time warning. Correct answers receive 2 points for problems 1-30 and 3 points for 31-40 (in the scaled score).

"Math Is Cool" Masters — 2021-22

High School — Jan. 26, 2022

Final Score *(out of 8)*

Room #	School Name	Student Name	Team #

Mental Math – ~25% of team score & ~8% of individual score

All students in the room will concurrently be asked the same eight questions in this individual test. 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 or her pencil down, the maximum wait time is 30 seconds after completion of the second reading of the question before the next question is read. You may continue to work on a problem (in your head) while the next question is being read. The raw score is 1 point per correct answer.*

STUDENT: DO NOT WRITE IN SHADED REGIONS (or anywhere else, other than the answer box)

	Answer	Scorer 2 0 or 1	Scorer 1 0 or 1
1			
2			
3			
4			
5			
6			
7			
8			
High School	**TOTAL:**		

"Math Is Cool" Masters — 2021-22

11/12th Grade — Jan. 26, 2022

Key

Mental Math Contest – Answer Key

30 seconds per question – ~25% of team score & ~8% of individual score

SCORERS — Write-overs, Cross-outs, and Erasures Must be Marked Incorrect (0)
Bracketed items […] in the answer key are optional.

11/12th Grade

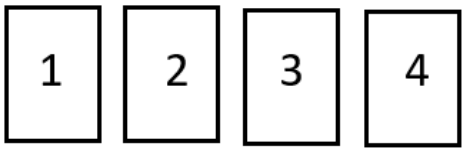
	Answer	
1	3	The number 19 can be expressed as the sum of three distinct prime numbers. What is the smallest of the three prime numbers?
2	50 [°]	How many degrees are in the acute angle formed by the hands of a clock at 2:20 pm?
3	2	How many of the numbers in the following set are greater than the mean of the set? {1, 2, 3, 4, 5, 12}
4	4000 [miles]	Gregg buys four new tires and a new spare tire for his tractor. He rotates the tires, including the spare tire, so that after driving 5000 miles, every tire has been used for the same number of miles. For how many miles was each tire used?
5	203 [inches]	The perimeter of a rectangle is 2006 inches. Its length is 800 inches. What is the width of the rectangle in inches?
6	55	What is the smallest composite number generated by n2 – n – 1, where n is a positive integer?
7	5	How many arithmetic sequences have at least 3 positive integer terms with a first term equal to 3 and a last term equal to 21.
8	21	What is the value of x if 410+410=2x?

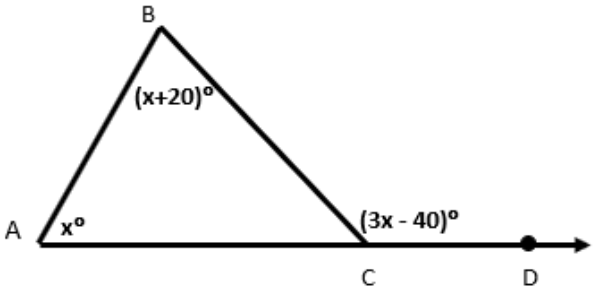
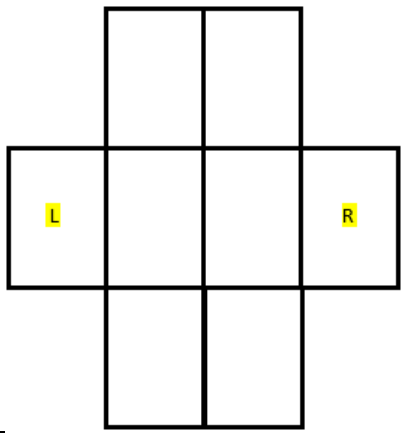
"Math Is Cool" Masters — 2021-22

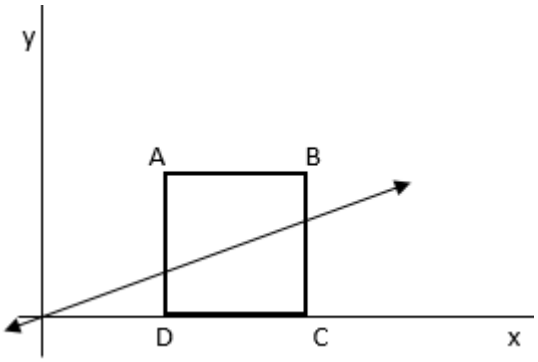
Jan. 26, 2022

High School Individual Contest

35 minutes, 40 problems, ~92% of individual score.
A 5-minute time warning will be given.

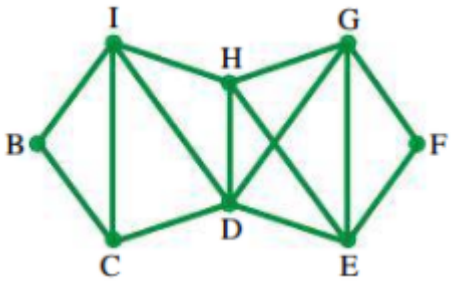
	Questions 1-30: 2 points each
1	How many prime factors does 12 have?
2	Let x = $5^{-2} + 10^{-1}$. What is 100x?
3	In a division problem, the divisor is 11, the quotient is 3, and the remainder is 4. What is the dividend?
4	The value of $\sqrt{260}$ is between two whole numbers. What is the larger of the two numbers?
5	A line segment on the coordinate plane has endpoints at (1000, -3000) and (-3004, 2004). The midpoint of the segment has coordinates (x, y). What is x?
6	If town A and town B are eight miles apart, and town C is ten miles from town B, what is the furthest possible distance (in miles) from town A to town C?
7	You are shown the following four cards. Each card has a single positive integer 1, 2, 3, or 4 on each side, but you can see only one side of each card. Numbers may be repeated on both sides of a card. How many of these cards must you turn over to verify that any card that has a 2 on one side also has a 4 on the opposite side? 
8	Solve for N: 6!·7! = N!
9	If 6 gallons of premium unleaded gasoline costs $21.60, how many dollars would it cost to completely fill a 15-gallon tank?
10	When a single card is drawn from a standard 52-card deck, the probability that it is not a king can be written as a reduced common fraction A/B. What is A + B ?
11	A line parallel to the line given by 2x + 3y = 6 passes through the point (x, 2), and intersects the y-axis at the point (0, -2). What is the value of x in the given point (x, 2)?
12	Sets X, Y and Z are defined as follows: X = {a, c, e, g} Y = {a, b, c} Z = {b, c, d, e, f} How many elements are in the following set? $Y \cup (X \cap Z)$

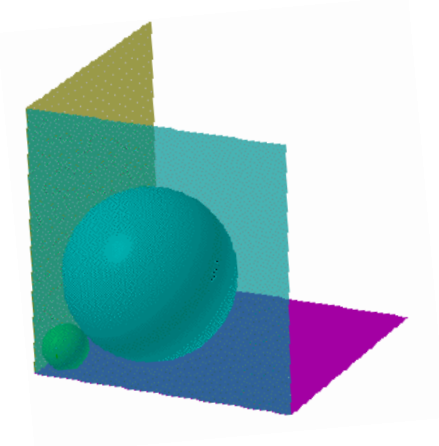
13	A geometric sequence has a first term of 3, and a common ratio of 4. What is the 5^{th} term in the sequence?
14	Triangle ABC has interior angles A and B as indicated, and exterior angle BCD as indicated. What is the measure of angle BCA, in degrees? 
15	You have three alarms in your room. Your cell phone alarm is set to ring every 30 minutes, your computer alarm is set to ring every 20 minutes, and your clock alarm is set to ring every 45 minutes. If all three alarms go off simultaneously at 12:34 pm on Monday, the next time that they will all go off simultaneously the same day can be written as A:BC pm on an analog clock, where A, B and C are single digit positive integers. What is A + B + C ?
16	Violet was asked by her teacher to subtract 3 from a certain number and then divide the result by 9. Instead, she subtracted 9 and then divided the result by 3, giving an answer of 43. What would her answer have been if she had worked the problem correctly?
17	How many positive three-digit integers contain only the digits 1, 2, and 3, assuming that digits may be repeated?
18	One of the Platonic solids is a regular octahedron. What is the sum of the number of faces and the number of vertices of a regular octahedron?
19	The digits 1, 2, 3, 4, 5, 6, 7, 8 are each to be placed in the following boxes, with one digit per box. No two consecutive numbers can be placed in boxes that are next to each other either horizontally, vertically or diagonally. For example, if the 5 is placed in the far left box, then neither the 4 nor the 6 can be placed in the box directly to the right of the 5 or in the two boxes that are diagonally above and below the 5. What is the positive difference between the two numbers that are placed in the left-most and the right-most boxes, labeled as 'L' and 'R'? 
20	The vertex of the graph of $y = x^2 - 4x + 5$ is at the point (x, y). What is x + y?

21	In the following figure, how many different paths are there to spell the word MATH, by moving from the letter M to the letter A to the letter T to the letter H? Moves can be made in a vertical or horizontal direction only, no diagonal moves are allowed. Letters cannot be skipped, moves can only be made to an immediately adjoining letter. M M A M M A T A M M A T H T A M
22	In a sequence of numbers that begins 1, 3, 2, …, each term after the first two terms is defined to be equal to the term preceding it minus the term preceding that. Therefore, the 3rd term in the sequence above = 3 – 1 = 2. Find the sum of the first 100 terms of the sequence.
23	An integer is randomly selected from 1 through 50. Given that the selected number is prime, the probability that it contains the digit 9 can be written as a reduced common fraction A/B. What is A + B?
24	As shown in the figure, ABCD is a unit square with D located at (1, 0) and C at (2, 0). Find the reciprocal of the slope of the line through the origin that bisects the area of the square. 
25	How many integers are not included in the solution to the following inequality? $\left\|\frac{x+2}{3}\right\| > 1$
26	The combined volumes of two cubes with integer side lengths are numerically equal to the combined lengths of their edges. How many units long is the side length of the larger cube?
27	The city of Calculusville has exactly 10,000 families. Each family owns exactly 0, 1 or 2 calculators. Every calculator belongs to a single family. More than half of the families have 1 calculator. Exactly half of the remaining families have 2 calculators. How many total calculators are there in Calculusville?
28	If Vishal and William leave their houses at the same time, walking directly toward each other, each at their own constant rate, they will meet after five minutes. If Vishal leaves three minutes later than William, they meet after Vishal has walked for three minutes. How many minutes would it take Vishal to walk all the way from his house to William's house?

29	If f(n) is a function such that f(1) = f(2) = f(3) = 1, and such that: $$f(n) = \frac{f(n-1) \cdot f(n-2) + 1}{f(n-3)}$$ for any integer n > 3, then what is the value of f(6)?
30	Find the remainder when the polynomial $x^5 + x^4 + x - 5$ is divided by the binomial x + 1.

Challenge Questions: 3 points each

31	An Euler path is a path that goes through every edge of a graph exactly once, where an edge is the line between two vertices. An Euler circuit is an Euler path that begins and ends at the same vertex. For example, given square ABCD, draw a line from vertex A to B to C to D and back to A, which creates an Euler circuit. In the graph shown here, how many different vertices could be used as a starting (and ending) point to create an Euler circuit? 
32	There exist integer solutions (x, y) for the following equation. What is the largest sum x + y that corresponds to a particular solution to the equation? $(x - 4)(x - 10) = 2^y$
33	Mandelbrot Middle School has nine members on their math team. In how many ways can the nine students be divided into three teams of three students each?
34	Given that $i^2 = -1$, for how many integers n is $(n + i)^4$ an integer?
35	Let N = 1234567891011…998999 be the natural number formed by writing the integers 1, 2, 3, …, 999 in order. The left-most digit is '1', the second digit from the left is '2', and so on. What is the 2022^{th} digit from the left?
36	Yesenia is running the last leg of a "fun run" relay race at her school's Sports Day. Her starting position is at the corner of the parking lot at coordinates (4, 4). She must run across the grass athletic field to touch the chain-link fence that has equation 2x + 2y + 6 = 0. Then she must cross the finish line located at coordinates (-1, 7). The shortest distance that Yesenia can travel is written as a reduced radical $A\sqrt{B}$, where A and B are both integers. What is A + B?
37	Ritika is stopped at a mile marker on an east-west county road. She decides to toss a fair coin 10 times. Each time, she will drive 1 mile east if the coin lands heads up, or she will drive 1 mile west if the coin lands tails up. After the 10 coin flips, the probability that Ritika ends up back at her starting point can be written as a reduced common fraction A/B. What is A + B?

38	Two spheres, a large exercise ball and a smaller plyometric ball, are placed in the corner of a storage closet, where the walls meet at a 90° angle. Both spheres are tangent to both walls, the floor, and are tangent to each other. The radius of the large exercise ball is 1 foot. The radius of the smaller plyometric ball, in feet, can be written in reduced radical form as $A - \sqrt{B}$, where A and B are positive integers. What is A + B? 
39	How many four-digit positive integers that end in 75 are divisible by 75?
40	Jerry and Elaine agree to meet at the coffee shop between 4 and 5 pm on Monday. They agree to each wait 20 minutes for the other to arrive, or to stay until 5 pm if their arrival time is after 4:40 pm. The probability that they will meet can be written as a reduced common fraction A/B. What is A + B?
IF taking Pre-Calculus or Calculus, continue to questions 41 - 45	
41	Matrix M shown below has an inverse matrix M^{-1}, which can be written: $M^{-1} = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ What is a + d ? $M = \begin{bmatrix} 4 & -1 \\ -6 & 2 \end{bmatrix}$
42	A 25 question individual mathematics competition test is scored as follows: 5 points for a correct answer, -4 points for an incorrect answer, -3 points for no answer (left blank). Manuel scored a total of 64 points. How many correct answers did he submit?
43	Find the sum of all possible solutions for 'x' in the following equation: $\log x - \log 5 = \log 2 - \log(x - 3)$
44	The following two conic sections intersect at a point (x, y) in Quadrant IV. What is x + y? $9x^2 - 4y^2 - 36x - 24y - 36 = 0$ $x^2 - 8x - y + 13 = 0$
45	When solving the following equation for 'x' in radians, the largest solution for 'x' can be written as $\frac{A\pi}{B}$, where A and B are both integers. What is A + B ? $sin^2(x) = \frac{1}{2}\sin(2x)\,, 0 \leq x < 2\pi$

"Math Is Cool" Masters – 2021-22

KEY

High School Individual Contest – Answer Key

SCORERS: Bracketed […] items in answer key are optional. Just mark the score as 0 or 1 and add up those values to reflect total correct. First Scorer – use the right-hand columns so 2nd scorer can do a blind scoring.

	Answer
1	2
2	14
3	37
4	16
5	-1002
6	18 [miles]
7	3
8	10
9	54 [$]
10	25
11	-6
12	4 [elements]
13	768
14	40 [degrees]
15	10

	Answer
16	15
17	27 [integers]
18	14
19	5
20	3
21	15 [paths]
22	5
23	17
24	3
25	7 [integers]
26	4 [units]
27	10000 [calculators]
28	15 [minutes]
29	7
30	-6

	Answer
31	0
32	16
33	280 [ways]
34	3 [integers]
35	0
36	60
37	[A + B =] 319
38	[A + B =] 5
39	30 [integers]
40	14
41	3
42	18 [correct answers]
43	5
44	1
45	9

"Math Is Cool" Masters – 2021-22

Total Correct (all columns)

Room # _____ SCHOOL NAME _____ STUDENT NAME _____ Team # _____

Individual Contest – Score Sheet

STUDENTS: 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:			

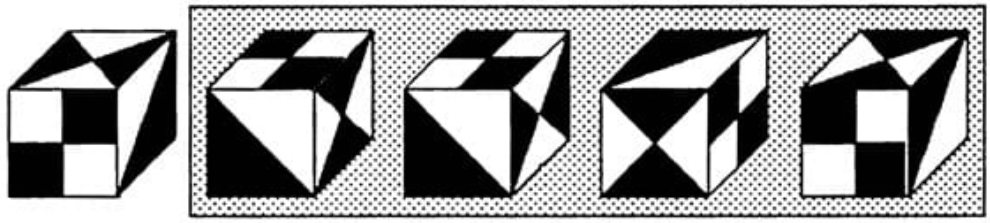
	Answer	1 or 0	1 or 0
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
16-30 TOTAL:			

	Answer	1 or 0	1 or 0
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			
45			
31-45 TOTAL:			

"Math Is Cool" Masters — 2021-22

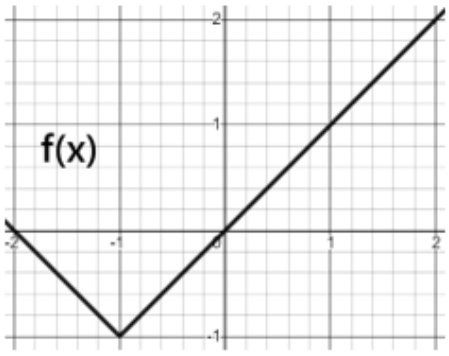
11/12th Grade — Jan. 26, 2022

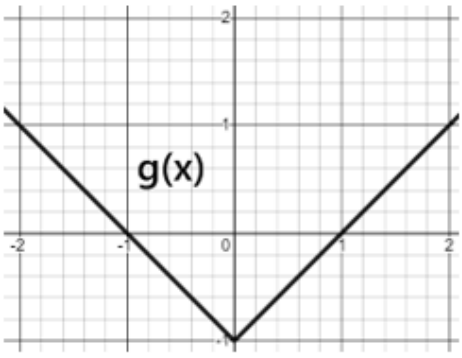
Individual Multiple Choice Contest

1	Which of the four cubes on the right could be another view of the three faces of the cube shown on the left?  A B C D A) Cube A only B) Cube B only C) Cube C only D) Cubes B and C E) Cubes C and D
2	Perform the following addition: MCCCLIV + DXIII A) MDCCCLXVII B) MCDLXXII C) MCDLVII D) MMDLXXVII E) Answer not given.
3	Given the following statement: If r > 0, then for all p and q such that pq does not equal 0, and such that pr > qr, Which of the following can be concluded? A) -p > -q B) -p > q C) $1 > \frac{q}{p}$ D) $1 < \frac{q}{p}$ E) Answer not given.
4	The mean age of a group of professors and administrators is 40 years. If the professors' mean age is 35 years, and the administrators' mean age is 50 years, what is the ratio of the number of professors to administrators? A) 3:2 B) 3:1 C) 2:3 D) 2:1 E) Answer not given.
5	Three standard 6-sided dice are thrown. What is the probability that the sum of the numbers showing on the dice is 17? A) $\frac{1}{216}$ B) $\frac{1}{108}$ C) $\frac{1}{72}$ D) $\frac{1}{54}$ E) Answer not given.

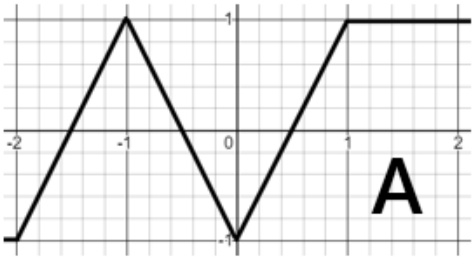
Continued on next page.

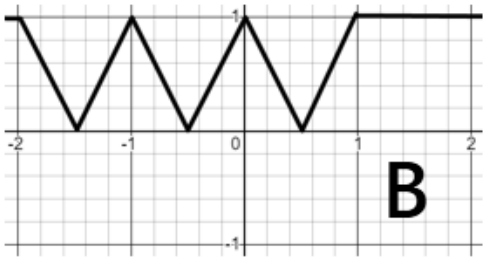
6 The functions f(x) and g(x) are shown in the following graph.

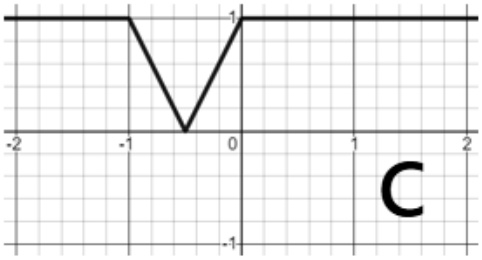


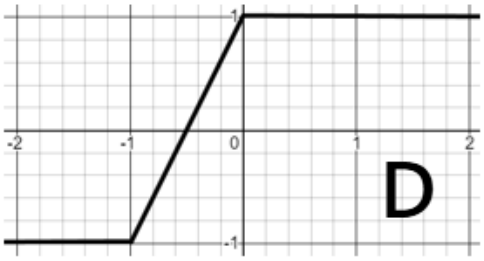


Which of the following graphs could be the graph of the function:
$|f(x) - g(x)|$?









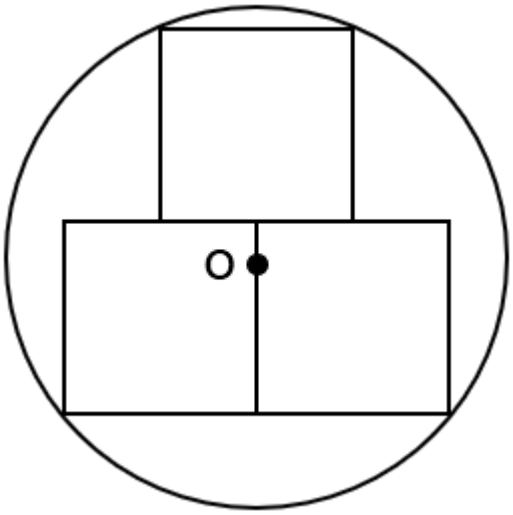
A) Graph A B) Graph B C) Graph C D) Graph D E) Answer not given.

7 Assume that all of the following inverse trigonometric values are angles that can exist in a triangle, or are equal to 0.

In radians, find the value of:
$\sin^{-1}(1) + \cos^{-1}(1) + \tan^{-1}(1)$

A) π B) $\frac{3\pi}{4}$ C) $\frac{5\pi}{4}$ D) $\frac{\pi}{2}$ E) Answer not given.

Continued on next page.

8	If $f(x) = 4^x$, then $f(x+1) - f(x) = ?$ A) 4 B) $2 \cdot f(x)$ C) $3 \cdot f(x)$ D) $4 \cdot f(x)$ E) Answer not given.
9	What is the sum of all possible products $x \cdot y$, where (x, y) is an integer solution to: $xy - 2x + y = 7$ A) 0 B) 12 C) 22 D) 24 E) 28
10	See the following figure, which shows three unit squares (side length equal to 1) inscribed in circle O. The top square is positioned exactly in the middle of the bottom two squares, such that the midpoint of the top square's bottom edge lies on the point where the bottom squares' upper corners meet. The radius of the circle is how many units?  A) $\sqrt{2}$ B) $\frac{\sqrt{5}}{2}$ C) $\frac{5\sqrt{2}}{14}$ D) $\frac{5\sqrt{17}}{16}$ E) Answer not given.

"Math Is Cool" Masters — 2021-22

11/12th Grade — Jan. 26, 2022

Key

Individual Multiple Choice Contest – Answer Key

11/12th Grade

Correct responses are worth 2 points, incorrect responses are worth -1 point, and absence of a response is worth 0 points.

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

"Math Is Cool" Masters — 2021-22

11/12th Grade — Jan. 26, 2022

Final Score *(out of 20)*

Room #	School Name	Student Name	Team #

Individ. Multiple Choice Contest – 15 minutes – ~20% of team score

This test is taken individually, but it is part of your team score, which will be calculated by taking the mean of the top 3 scores from your team. This test is the only test where you will be penalized for incorrect responses. You will receive two points for a correct letter response, zero points for leaving it blank, and minus one point for an incorrect response. When you are prompted to begin, tear off the colored answer sheet and begin testing. **ONLY a letter response should be listed as an answer on this answer sheet.**

Correct responses are worth 2 points, incorrect responses are worth -1 point, and absence of a response is worth 0 points.

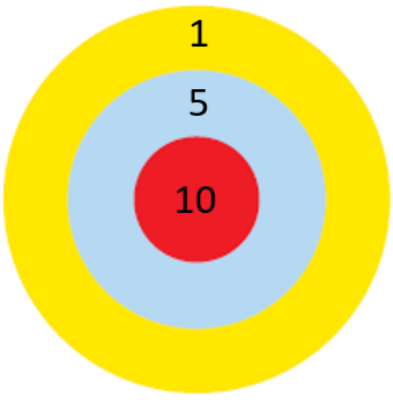
STUDENTS: DO NOT WRITE IN SHADED REGIONS

	Answer	Scorer 2 -1, 0, or 2	Scorer 1 -1, 0, or 2
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11/12th Grade	**TOTAL:**		

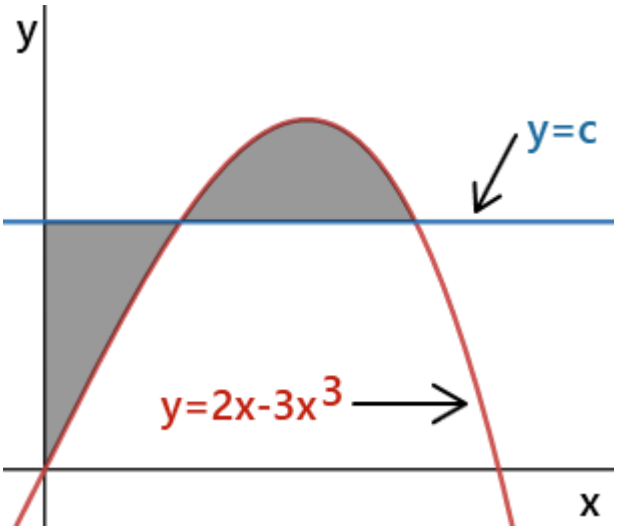
"Math Is Cool" Masters — 2021-22

11/12th Grade — Jan. 26, 2022

Team Contest

1	Jinu is five years old. His mother is 28 years old. How many years old will Jinu be when he is exactly half as old as his mother?
2	For what base value A will 3201_A equal the base 10 number 1665?
3	A three-digit number ending in 1 is given as ab1, where 'a' and 'b' represent the first two digits respectively. The sum of the digits, a + b + 1, is a two-digit number given as cd. The product of the digits c and d equals 8. What is the sum of all possible values for the original number ab1?
4	Nishka rode her bike $\frac{3}{4}$ of the way home before getting a flat tire. She walked the rest of the way home. If her walking time was twice as much as her biking time, how many times faster is her biking speed than her walking speed?
5	How many four-digit positive integers contain the digit pattern '75' at least once? The digits are located immediately next to each other as indicated.
6	In a particular community, it is known that androids always lie, and humans always tell the truth. Collectively, androids and humans are referred to as "beings". In a group of 10 "beings", the following statements are made: • The first being says: "At least one of us is an android". • The second being says: "At least two of us are androids". • The third being says: "At least three of us are androids". The pattern continues until the tenth being says: "At least ten of us are androids". How many of the "beings" are androids?
7	Determine the next number in the sequence: 5, 15, 37, 77, 141, 235, …
8	The dart board shown here consists of three concentric circles. The smallest circle (red) has a radius of 1 unit, the middle circle (blue) has a radius of 2 units, and the outer circle (yellow) has a radius of 3 units. The points shown are awarded for landing on each part of the dartboard, for example if your dart lands in the red section, you get 10 points. If you throw a dart, assume that it will land in a random location somewhere on the board. The expected value of this game, in points, can be written as a reduced fraction A/B. What is A + B ? 

Continued on next page.

9	The points A (1, 2), B (0, 0), and C (-1, 3) are plotted on the coordinate plane, forming angle ABC. The line y = mx + b is the angle bisector of ∠ABC. The slope of the line, m, can be written in the form: $A + B\sqrt{C}$, where A, B and C are integers. What is A + B + C ?
10	A horizontal line y = c intersects the curve $y = 2x - 3x^3$ in the first quadrant of the coordinate plane, as shown in the figure. Find the value of c as a reduced fraction A/B, such that the areas of the two shaded regions of the graph are equal. What is A + B ? 

"Math Is Cool" Masters — 2021-22

11/12th Grade — Jan. 26, 2022

Key

Team Contest – Answer Key

11/12th Grade

	Answer
1	23 [years]
2	[A=] 8
3	1872
4	6 [times]
5	279 [integers]
6	5 [androids]
7	365
8	[A+B=] 13
9	[A+B+C=] 14
10	[A+B=] 13

"Math Is Cool" Masters — 2021-22

11/12th Grade — Jan. 26, 2022

Final Score *(out of 10)*

Room # _____ **School Name** _____ **Team #** _____

Team Contest – 15 minutes – ~30% of team score

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

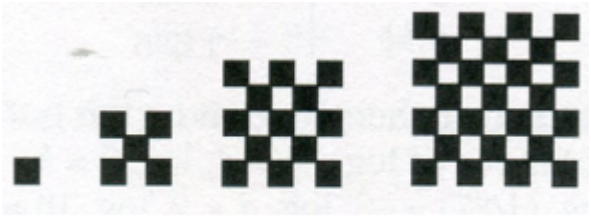
STUDENTS: DO NOT WRITE IN SHADED REGIONS

	Answer	Scorer 2 0 or 1	Scorer 1 0 or 1
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11/12th Grade	**TOTAL:**		

"Math Is Cool" Masters — 2021-22

11/12th Grade — Jan. 26, 2022

Pressure Round Contest

1	The first four figures of a pattern built with black tiles is shown following. How many black tiles will be required to build the twentieth figure in this pattern?  1 2 3 4
2	The ratio of widgets to gadgets is 2 to 3, and there are 2022 more gadgets than widgets. How many gadgets are there?
3	Rashida is writing a homework problem for her Algebra students. She wants them to find all solutions to the equation a + b + c = 12, where a, b, and c must all be non-negative integers, and {a, b, c} is an ordered triplet. She discovers that if she changes the "non-negative" condition of the problem for a, b and c to say "positive" instead, then the number of ordered triplet solutions will decrease. How many fewer solutions are there if a, b and c must all be positive integers?
4	The base-10 six-digit integer 2A00B4 is divisible by 9 and divisible by 11. What is the number?
5	Find the area in square units of Polygon ABCDE with the following vertices: A (-4, 3), B (1, 9), C (13, -6), D (5, -4), E (-2, -6)

"Math Is Cool" Masters — 2021-22

11/12th Grade — Jan. 26, 2022

Final Score *(out of 5)*

Room # _____ **School Name** _____ **Team #** _____

Pressure Round Score Sheet

Submittal # (order turned in)	1	2	3	4	5
Question #					
Proctor Score (circle value)	0 or 1	0 or 2	0 or 3	0 or 4	0 or 5
Scoring Room (checkmark)					

Team: Fill in the room, school, and Team #, then hand only this sheet to the Proctor.
Proctor: write in question number for each submittal and circle the score. Add up total.

"Math Is Cool" Masters — 2021-22

11/12th Grade — Jan. 26, 2022

Final Score *(out of 5)*

Room # _____ **School Name** _____

Pressure Round Score Sheet

Submittal # (order turned in)	1	2	3	4	5
Question #					
Proctor Score (circle value)	0 or 1	0 or 2	0 or 3	0 or 4	0 or 5
Scoring Room (checkmark)					

Team: Fill in the room, school, and Team #, then hand only this sheet to the Proctor.
Proctor: write in question number for each submittal and circle the score. Add up total.

"Math Is Cool" Masters — 2021-22

11/12th Grade — Jan. 26, 2022

Room # _____ **School Name** _____ **Team #** _____

Pressure Round Answer Submittal

Submittal #	for Question #	Answer
1 (at 2 minute mark)		

Team: Fill in the room, school, and Team # before the round starts.
Write the question number being answered and the associated answer (or a blank).
You may answer questions in any order. A question may not be answered more than once.

"Math Is Cool" Masters — 2021-22

11/12th Grade — Jan. 26, 2022

Room # _____ **School Name** _____ **Team #** _____

Pressure Round Answer Submittal

Submittal #	for Question #	Answer
1 (at 2 minute mark)		

Team: Fill in the room, school, and Team # before the round starts.
Write the question number being answered and the associated answer (or a blank).
You may answer questions in any order. A question may not be answered more than once.

"Math Is Cool" Masters — 2021-22

11/12th Grade — Jan. 26, 2022

Room # _____ **School Name** _____ **Team #** _____

Pressure Round Answer Submittal

Submittal #	for Question #	Answer
2 (at 4 minute mark)		

Team: Fill in the room, school, and Team # before the round starts.
Write the question number being answered and the associated answer (or a blank).
You may answer questions in any order. A question may not be answered more than once.

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Room # _____ **School Name** _____ **Team #** _____

Pressure Round Answer Submittal

Submittal #	for Question #	Answer
2 (at 4 minute mark)		

Team: Fill in the room, school, and Team # before the round starts.
Write the question number being answered and the associated answer (or a blank).
You may answer questions in any order. A question may not be answered more than once.

"Math Is Cool" Masters — 2021-22

11/12th Grade — Jan. 26, 2022

Room # _____ **School Name** _____ **Team #** _____

Pressure Round Answer Submittal

Submittal #	for Question #	Answer
3 (at 6 minute mark)		

Team: Fill in the room, school, and Team # before the round starts.
Write the question number being answered and the associated answer (or a blank).
You may answer questions in any order. A question may not be answered more than once.

"Math Is Cool" Masters — 2021-22

11/12th Grade — Jan. 26, 2022

Room # _____ **School Name** _____ **Team #** _____

Pressure Round Answer Submittal

Submittal #	for Question #	Answer
3 (at 6 minute mark)		

Team: Fill in the room, school, and Team # before the round starts.
Write the question number being answered and the associated answer (or a blank).
You may answer questions in any order. A question may not be answered more than once.

"Math Is Cool" Masters — 2021-22

11/12th Grade — Jan. 26, 2022

Room # _____ **School Name** _____ **Team #** _____

Pressure Round Answer Submittal

Submittal #	for Question #	Answer
4 (at 8 minute mark)		

Team: Fill in the room, school, and Team # before the round starts.
Write the question number being answered and the associated answer (or a blank).
You may answer questions in any order. A question may not be answered more than once.

"Math Is Cool" Masters — 2021-22

11/12th Grade — Jan. 26, 2022

Room # _____ **School Name** _____ **Team #** _____

Pressure Round Answer Submittal

Submittal #	for Question #	Answer
4 (at 8 minute mark)		

Team: Fill in the room, school, and Team # before the round starts.
Write the question number being answered and the associated answer (or a blank).
You may answer questions in any order. A question may not be answered more than once.

"Math Is Cool" Masters — 2021-22

11/12th Grade — Jan. 26, 2022

Room # _____ **School Name** _____ **Team #** _____

Pressure Round Answer Submittal

Submittal #	for Question #	Answer
5 (at 10 minute mark)		

Team: Fill in the room, school, and Team # before the round starts.
Write the question number being answered and the associated answer (or a blank).
You may answer questions in any order. A question may not be answered more than once.

"Math Is Cool" Masters — 2021-22

11/12th Grade — Jan. 26, 2022

Room # _____ **School Name** _____ **Team #** _____

Pressure Round Answer Submittal

Submittal #	for Question #	Answer
5 (at 10 minute mark)		

Team: Fill in the room, school, and Team # before the round starts.
Write the question number being answered and the associated answer (or a blank).
You may answer questions in any order. A question may not be answered more than once.

"Math Is Cool" Masters — 2021-22

11/12th Grade — Jan. 26, 2022

Room #	School Name	Team #

Total Score for Each Round

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

DO NOT USE TALLY MARKS ON THIS SHEET. WRITE THE TOTAL SCORE FOR EACH ROUND.

"Math Is Cool" Masters — 2021-22

11/12th Grade — Jan. 26, 2022

Room #	School Name	Team #

Total Score for Each Round

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

DO NOT USE TALLY MARKS ON THIS SHEET. WRITE THE TOTAL SCORE FOR EACH ROUND.

"Math Is Cool" Masters — 2021-22

11/12th Grade — Jan. 26, 2022

Proctor Copy

Mental Math Contest

MENTAL MATH – 30 seconds per question – ~25% of team score & ~8% of individual score

All students in the room will concurrently be asked the same eight questions in this individual test. 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 or her pencil down, the maximum wait time is 30 seconds after completion of the second reading of the question before the next question is read. You may continue to work on a problem (in your head) while the next question is being read. The raw score is 1 point per correct answer.*

1	The number 19 can be expressed as the sum of three distinct prime numbers. What is the smallest of the three prime numbers?	
2	How many degrees are in the acute angle formed by the hands of a clock at 2:20 pm?	
3	How many of the numbers in the following set are greater than the mean of the set? {1, 2, 3, 4, 5, 12}	
4	Gregg buys four new tires and a new spare tire for his tractor. He rotates the tires, including the spare tire, so that after driving 5000 miles, every tire has been used for the same number of miles. For how many miles was each tire used?	
5	The perimeter of a rectangle is 2006 inches. Its length is 800 inches. What is the width of the rectangle in inches?	
6	What is the smallest composite number generated by $n^2 - n - 1$, where n is a positive integer?	
7	How many arithmetic sequences have at least 3 positive integer terms with a first term equal to 3 and a last term equal to 21.	5
8	What is the value of x if $4^{10} + 4^{10} = 2^x$?	

"Math Is Cool" Masters — 2021-22

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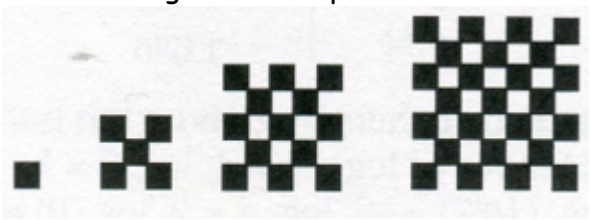
Key

Pressure Round Contest – Answer Key

11/12th Grade

	Answer
1	761 [black tiles]
2	6066 [gadgets]
3	36 [fewer solutions]
4	250074
5	126 [units squared]

1. The first four figures of a pattern built with black tiles is shown following. How many black tiles will be required to build the twentieth figure in this pattern?



2. The ratio of widgets to gadgets is 2 to 3, and there are 2022 more gadgets than widgets. How many gadgets are there?

3. Rashida is writing a homework problem for her Algebra students. She wants them to find all solutions to the equation a + b + c = 12, where a, b, and c must all be non-negative integers, and {a, b, c} is an ordered triplet. She discovers that if she changes the "non-negative" condition of the problem for a, b and c to say "positive" instead, then the number of ordered triplet solutions will decrease. How many fewer solutions are there if a, b and c must all be positive integers?

4. The six-digit number 2A00B4 is divisible by 9 and divisible by 11. What is the number?

5. Find the area of Polygon ABCDE with the following vertices:
A (-4, 3), B (1, 9), C (13, -6), D (5, -4), E (-2, -6)

"Math Is Cool" Masters — 2021-22

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Key

COLLEGE BOWL ROUND #1

#	Problem	Answer
1	There are 50 unpaired socks in a sock drawer. Fifteen are pink, 15 are purple, and the rest are yellow. How many socks do you have to take out of the drawer to have guaranteed that at least one sock of each color was taken out?	36
2	Find the sum of the values of x that satisfy the following equation: $\log_4(x) + \log_4(x + 6) = 2$	2
3	Construct the largest possible six-digit odd number, with no digit used more than once, and with a 9 in the tens place.	876593
4	Anita rolls 2 similar fair n-sided dice, where $n > 5$. What is n, if the most probable sum of the numbers obtained is 17?	16
5	How many ways can ten oranges be distributed among six people such that everyone receives at least one orange?	126 [ways]
6	What is the remainder when 3^{2022} is divided by 5?	4
7	A tennis ball is dropped from a height of twenty feet. Each time it hits the ground, it rebounds one-fourth the distance it has fallen. The total distance in feet that the ball will travel before it comes to rest can be written as a reduced common fraction A/B. What is A + B?	103
8	If $f(x) = 4x^2 + 17$, what is the value of $f(6) - f(5)$?	44
9	A non-isosceles triangle has integral sides of 4, 5, and x. Find the sum of all possible values of x.	26
10	The following expression can be written as $A \times 10^B$, where A and B are single-digit integers. What is A + B? $\frac{280 \times 10^6}{7 \times 10^3}$	8

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Key

COLLEGE BOWL ROUND #2

#	Problem	Answer
1	April bought a dozen roses at six dollars each, and May bought half a dozen roses at twelve dollars each. What was the average price per rose, in dollars?	8 [$]
2	Let P equal the product of 2,824,117,563 and 82,165,302,015. What is the number of digits in P?	21
3	A teacher divided 100 pencils among a group of 12 boys and girls. The boys each got 7 pencils, and the girls each got 9 pencils. How many girls were there?	8
4	Two baseball teams are playing in a best-of-7 series. In other words, once one team wins 4 games, the series ends. The two teams are evenly matched, so each has the same chance of winning any given game. The probability that the series goes exactly 5 games can be written as a reduced common fraction A/B. What is A + B?	5
5	The number of cubic feet in the volume of a cube is the same as the number of square inches in its surface area. What is the length of the edge of the cube in feet?	864
6	The mean of 11 numbers is 121. When one number is removed from the set, the average of the remaining 10 numbers is 120. What number was removed from the set?	131
7	Suppose that you have an infinite supply of 4-cent and 7-cent stamps. How many postage amounts between 1 cent and 1 dollar, inclusive, cannot be made using these stamps?	9
8	What is the largest prime factor of 504?	7
9	Find the sum of the values of x for which the following expression is undefined: $\frac{2}{x(x^2+5x-14)}$	-5
10	Find the geometric mean of 12 and 75.	30

"Math Is Cool" Masters — 2021-22

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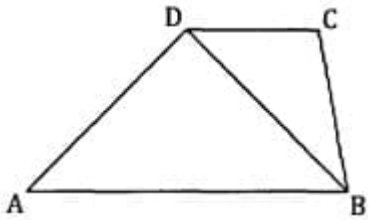
Key

COLLEGE BOWL ROUND #3

#	Problem	Answer
1	The following expression can be written as a reduced common fraction A/B. What is A + B? $\frac{1}{10}-\frac{1}{15}+\frac{1}{20}-\frac{1}{30}+\frac{1}{40}$	43
2	The mean of the following seven numbers is 4. What is the median of the seven numbers? {x, 17, x + 4, 4x - 3, -16, 9, x - 4}	7
3	Suppose that Amtrak has train service from Chicago IL to Detroit MI, and also from Detroit to Chicago, with trains leaving every hour on the hour from each city. The trip from one city to the other takes 4.5 hours, and all trains travel at the same speed. If you are on the train from Chicago to Detroit, how many trains going the other way will you pass?	9
4	Evaluate the following expression: $\left(\begin{vmatrix}5 & 6\\ 2 & -3\end{vmatrix}\right)^2-\sum_{n=1}^{4} n^2$	699
5	Find the sum of the values of x that satisfy the following equation: |x + 12| = 1794	-24
6	A box contains fewer than twenty marbles. If you reach into the box and randomly pull out two marbles without replacing them, you have a 50% chance of getting two blue marbles. How many blue marbles were in the box to begin with?	3
7	Evaluate, and give the answer in base 10 (do not include the base 10 in the answer): $111001_2 + 1011011_2$	148

8	In trapezoid ABCD shown here, AB is parallel to CD, and BD = AD. Angle DCB = 110° and angle CBD = 30°. What is the measure of angle ADB in degrees?  	100 [°]
9	Simplify the following expression to a reduced common fraction A/B. What is A + B? $\left(\frac{64}{729}\right)^{-\frac{2}{3}}$	97
10	The decimal number 0.375 can be expressed as a reduced common fraction A/B. What is A + B ?	11

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Key

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COLLEGE BOWL — EXTRA Qs

#	Problem	Answer
1		
2		
3		
4		
5		
6		

Proctoring Overview

You will receive a room packet envelope with the schedule and College Bowl rotations on the front. Each room packet includes:

1) the proctor instructions and the general instructions that you will be reading,
2) the proctor question/answers packet (this needs to be carefully controlled), and
3) sets of Mental Math, Individual, Multiple Choice, Team, and Pressure Round tests. (If not in the room packet, the proctor supervisor will provide blank scratch paper.)

When you receive the room packet, count to ensure that you have the correct number of tests for each event (16 Mental Math & Individual, 4 of each of the team events).

Key Points

- Act professional; focus on what you are doing.
- Your job is to proctor the students; that is, you administer tests, give time warnings, & monitor students for proper test taking behavior to ensure competition integrity and avoid issues like failing to put answers on the answer sheet.
- The proctor packet has Mental Math, Pressure Round, and College Bowl questions/ answers. Keep the packet secure! Avoid opportunities for competitors to see tests or answers.
- Student/school names and team numbers are critical on the answer sheets. Make sure that students fill out such identifying information.
- Keep track of time, and provide appropriate time warnings. Keep to the schedule as close as possible. Wait between events, if needed.
- Read & know the rules—competitors & spectators will, and they will call you on it.
- On questions that you read, read smoothly, enunciate clearly, and don't read too fast.
- You will score the Pressure Round.
- If unsure of how to deal with an issue/question/concern, flag down the proctor supervisor and ask.
- Be respectful of your classroom — leave it tidy and arranged exactly as you found it. We don't want any displeased teachers!!
- Use the quick-reference guide on the next page for room setup and key information.

Schedule

Each of the 6 events includes about 5 minutes at the start for reading instructions or rearranging the room.

3:30 - 4:00	Coaches register (Library)	6:10 - 6:40	Proctors get dinner in proctor room
4:05 - 4:15	Orientation (Gym)	6:45 - 6:55	College Bowl #1
4:15 - 4:20	Students go to testing rooms	6:55 - 7:05	College Bowl #2
4:20 - 4:35	Mental Math	7:05 - 7:15	College Bowl #3
4:35 - 5:15	Individual Test	7:15 - 7:25	College Bowl #4
5:15 - 5:35	Team M.C. Test	7:25 - 7:35	College Bowl #5
5:35 - 5:55	Team Test	7:35 - 7:45	College Bowl #6
5:55 - 6:10	Pressure Round	8:00 - 8:30	Awards Ceremony (Gym)

1. Mental Math

Configuration: Students at individual desks spread out in the classroom. Alternating desks, students not next to teammates.

Scheduled Time: 4:20-4:35 PM (read instructions & test)

Duration: 30 seconds per question maximum (beginning after the 2nd reading)

Give Time warning at: 5 seconds

Number of questions: 8 (all students do the same questions)

Proctor Actions: Read each question twice, reading clearly and not too fast. Start the 30 second clock after the 2nd reading.

Key Points: Start by reading "General Instructions" then Mental Math instructions. Make sure everyone writes their name, school & team number on the answer sheet. No talking allowed. Except for the answer, no is writing allowed. Collect answer sheets and organize by team number, then alphabetically by first name of competitor, & staple sheets for the same team together.

2. Individual Test

Configuration: Students at individual desks; same arrangement as for Mental Math.

Scheduled Time: 4:35 PM (read instructions), 4:40-5:15 (test)

Duration: 35 minutes

Give Time warning at: 5 minutes & 30 seconds

Number of questions: 40

Proctor Actions: Ensure appropriate test-taking behavior. Prep for next event (or furtively read College Bowl questions to yourself).

Key Points: Read "Individual Test" instructions. Make sure everyone writes their name, team number, school, proctor name, & room number down on the answer sheet. Collect answer sheets, organize by team, then alphabetically by first name of competitor, and staple sheets for same team together.

3. Individual Multiple Choice Test

Configuration: Students at individual desks; same arrangement as for the Individ. Test.

Scheduled Time: 5:15 PM (read instructions), 5:20-5:35 PM (test)

Duration: 15 minutes

Give Time warning at: 5 minutes & 30 seconds

Number of questions: 10

Proctor Actions: Ensure appropriate test-taking behavior. Prepare for next event.

Key Points: Read Multiple Choice instructions. This is an individual test.

4. Team Test

Configuration: Groups of 4 desks, with the groups spread out in the classroom.

Scheduled Time: 5:35 PM (read instructions), 5:40-5:55 PM (test)

Duration: 15 minutes

Give Time warning at: 5 minutes & 30 seconds

Number of questions: 10

Proctor Actions: Ensure appropriate test-taking behavior. Prepare for next event.

Key Points: Read Team Test instructions. Need to have school & team number on answer sheet. Students can talk quietly & work together.

5. Pressure Round

Configuration: Groups of 4 desks spread out in the classroom (same as Team Test).

Scheduled Time: 5:55 PM (read instructions), 6:00-6:10 PM (test)

Duration: 10 minutes (2 minutes per question)

Give Time warning at: 5 seconds before end of each 2-minutes

Number of questions: 5 (can submit answers in any order)

Proctor Actions: Ensure appropriate test-taking behavior. Score submittals as you go (without showing any answers to students).

Key Points: Students can talk quietly & work together. Proctor: keep answer sheets in order of submittal; make sure that you score the right question and give the right point value.

6. College Bowl

Configuration: Row of 9 desks (side by side) at the front of the room (CBA device on center desk).

Scheduled Time: 6:45 PM (read instructions), 6:50-7:45 PM (test)

Duration: 45 seconds per question (30 seconds per question if there is only one team, who will be only going against the clock)

Give Time warning at: 5 seconds

Number of questions: 10 per round, 6 rounds total

Proctor Actions: Read each question twice, reading clearly and not too fast. Start 45 (or 30) second clock after the 2nd full reading. Mark tally on white board as questions are answered and transfer the numeric total to the score sheets.

Key Points: Event is collaborative, talking is allowed. For a wrong answer, just say, "That is incorrect." (no verbal/visual clues that could be interpreted by the other team to arrive at an answer).

Summary of MIC Proctoring

(for proctors to read to themselves)

Pass out materials (answer sheet/test packets, scratch paper) for the current event to individuals or teams (as appropriate) so they can fill in the name, school, and team number information (very important!). Tell students to not lift the cover sheet or turn over the paper until you give the signal to start. Read the general instructions as the first item at the beginning of the competition (before Mental Math). Read the event-specific instructions just prior to each event and ask if there are any relevant questions. After reading the instructions, you can signal students to begin. Make sure one proctor is watching the time and giving appropriate time warnings (e.g., "five minutes remaining"). At the end of the event, tell competitors to stop work. Collect, sort, & staple the answer sheets (as appropriate) and keep them secure until handed off to a runner.

For the Mental Math/Individual tests, arrange students scattered throughout the classroom with **no student next to another student from their own school**. For the team tests, students will be in groups of 4 desks. College Bowl will require a line of 9 desks side-by-side across the front of the classroom.

For College Bowl, place the College Bowl apparatus (CBA) on a central desk in the line of desks at the front (4 desks on either side of the central one). One proctor will likely need to hold the CBA in place during the College Bowl rounds. Turn the apparatus on by depressing the button or flipping the dip switch. Students may try out the CBA prior to the 1st question. Note: while one light is blinking, the other light is locked out. There is no need to "reset" the device, just let the light finish blinking and it is ready to go.

Keep Pressure Round answers secure while you score the submittals because answers for all questions are on the same sheet. Do not read the answer for College Bowl when you read the question (they are both on the same page). In College Bowl, if an incorrect answer is given, simply say "That is incorrect" and do not give any other cues about the answer (e.g., don't say "sorry, you were close" or exhibit interpretable body language). If both teams fail to supply a correct answer, announce what the correct answer was.

If there is an irregularity (i.e., lack of honesty, poor sportsmanship), make a note of the circumstances, flag the answer sheet, and report the issue to the proctor supervisor.

At the end of the day, return the desks to their original arrangement, recycle any unwanted test materials & used scratch paper, erase any marks you made on the white-board, and generally make sure the classroom is tidied up. Return the CBA, the room packet envelope, the proctor instructions, the contest rules packet, the proctor packet of questions, extra scratch paper, and unused test material to the proctor supervisor.

Detailed Instructions for Proctors

Grades 9-12

NO CALCULATORS ALLOWED ON ANY TESTS!

1. Check to make sure you have everything in your packet.
   - A. ***Mental Math:***
     1. 16 - colored Mental Math answer sheets
     2. Mental Math questions with answers (in the Proctor Packet)
   - B. ***Individual Test:*** 16 individual tests, with colored answer sheets attached
   - C. ***Individual Multiple Choice Test:*** 16 individual multiple choice packets (stapled), with a colored answer sheet on top
   - D. ***Team Test:*** 4 team test packets (stapled), each containing 4 tests plus one colored answer sheet on top
   - E. ***Pressure Round:***
     1. 4 - blank answer sheet packets (with cover sheet/instructions)
     2. 4 – Pressure Round test sets
     3. Pressure Round Answer Key (in the Proctor Packet)
   - F. **College Bowl:**
     1. 4 - College Bowl score sheets
     2. College Bowl questions – 6 rounds (in the Proctor Packet)
   - G. Scratch paper (to be handed out as needed, but try not to waste it)
   - H. Electronic College Bowl Apparatus (CBA; usually distributed at dinner break)

   ALL *COLORED* ANSWER SHEETS WILL BE COLLECTED BY YOU AND WILL BE TAKEN TO THE SCORING ROOM (by RUNNERS) AS SOON AS THEY ARE FILLED OUT BY COMPETITORS (AND PERHAPS GRADED BY YOU). COMPETITORS CAN KEEP ALL OF THE WHITE SHEETS, IF THEY WOULD LIKE (OTHEWISE COLLECT THEM FOR RECYCLE).

   If you are missing anything, you can go get it before the opening ceremony. After the opening ceremony, contact the proctor supervisor/scoring room.

2. Take a photo or draw a picture on the whiteboard of how the classroom is laid out (so that it can be returned to its original configuration following the competition). Then set up the classroom desks for the first event (Mental Math).

Respect the teacher whose room you are using. Do not touch their computer or other items. Do not erase anything on their board. Leave the room tidy & in the exact original layout.

Mental Math

3. Arrange desks in a configuration suitable for individual testing (rows/grid of desks all facing forward, students in separated/alternating desks).

4. Put the Mental Math answer sheets face up on the desks such that students are spread out. Wait for students to arrive. You can fill out the proctor name and room number (and perhaps team numbers) on all blank answer sheets, if you like. Read over the questions so you will be prepared to read them out loud.

5. After students sit down, check to make sure that no one from the same team is seated next to each other (i.e., "Team xxx, raise your hands."). Ask them to move, if needed.

6. **Check to make sure that students put their full name, school name, team number, and room number on their answer sheet and that the information is legible**.

7. Read the "GENERAL INSTRUCTIONS" (in the Proctor Packet) to the students. Then, read the "MENTAL MATH" instructions (in the Proctor Packet) to the students.

8. Begin the testing. Read each of the eight Mental Math questions to all of the students in the room, per the instructions.

9. At the conclusion of Mental Math, collect the answer sheets. Organize the answer sheets by team number, then alphabetically by first name of competitor. Staple each team's set of four answer sheets together. Promptly hand the packets of answer sheets to your runner for conveyance to the scoring room.

Individual Test

10. The seating configuration will remain unchanged (no swapping seats).

11. Hand out Individual Test packets with the colored blank answer sheet facing up. **Check to make sure that students put their full name, school name, team number, and room number on their answer sheet and that the information is legible**.

12. Read the "INDIVIDUAL TEST" instructions (in the Proctor Packet) to the students and begin the testing at the appointed time.

13. While students are taking the Individual Test, monitor the students for proper test-taking behavior and watch the time to provide 5-minute and 30-second warnings. Make sure students are writing answers on the answer sheet (not the test question pages). During this time you can also get the Individual Multiple Choice tests ready, read through the rules of subsequent events, and (carefully/secretively) look ahead to review the College Bowl questions (i.e., to avoid stumbling over the wording when it comes time to read the questions aloud). You will have observers in the room watching the College Bowl rounds, so make sure you understand the rules, how timing works, etc.

14. At the conclusion of Individual Test, collect the answer sheets. Organize the answer sheets by team number, then alphabetically by first name of competitor. Staple each team's set of four answer sheets together. Promptly hand the packets of answer sheets to your runner for conveyance to the scoring room. Students may keep or recycle their test question packets.

Individual Multiple Choice

15. Keep the room in the same configuration as for the Individual Test.
16. Hand out the tests and have students fill out the top portion of the answer sheet. **Check answer sheets to make sure they are filled out correctly (school, team #, etc.).**
17. Read the "INDIVIDUAL MULTIPLE CHOICE" instructions (in the Proctor Packet) to the students and begin the testing at the appointed time.
18. Monitor the students for proper test-taking behavior (no talking permitted), watch the time, and provide 5-minute and 30-second warnings. While students are taking the Individual Multiple Choice test, get the Team Tests ready.
19. At the conclusion of the test, collect the answer sheets. Organize the answer sheets by team number, then alphabetically by first name of competitor, with the set of team answer sheets stapled together. Hand the answer sheets off to the runner.

Team Test

20. Change the room set-up to groups of 4 desks together so students can work as a team. Hand out the Team Test packets and have teams fill out the information at the top of the colored answer sheet. **Check the answer sheets to make sure they are filled out correctly (school, team #, etc.).**
21. Read the "TEAM TEST" instructions (in the Proctor Packet) to the students and begin the testing at the appointed time.
22. Monitor the students for proper test-taking behavior (talking is allowed), watch the time, and provide 5-minute and 30-second warnings. While students are taking the Team Test, get the Pressure Round tests ready.
23. At the conclusion of the test, collect the answer sheets & hand them off to the runner.

Pressure Round

24. Leave the desks in the same arrangement as the team test. Make sure that all teams can quickly and easily hand you their answer sheet every two minutes.
25. Hand out the colored half-sheet packets to each team so they can fill out their school name and team number on each sheet before testing begins.
26. Have each team tear off the first sheet and give it to you to keep score.

27. YOU WILL BE TIMING THIS EVENT FOR YOURSELF. GIVE THEM A VERBAL 5 SECOND WARNING AND TELL THEM TO HOLD THEIR ANSWER SHEETS UP IN THE AIR EVERY TWO MINUTES. Tell them when the time is up for each two-minute round and, if an answer sheet isn't up in the air all the way at this time, then collect, but score as a zero and just write "time" on the score sheet for that particular question.

28. While they are working on the next round, you need to grade the answer sheets that you just collected and score it on the score sheet. Stack each team's half-sheets in **the order that they were turned in**, keeping the score sheet on top. Remember, you are still timing while you are doing all this!

29. Read the "PRESSURE ROUND" instructions (in the Proctor Packet) to the students and begin the testing at the appointed time.

30. At the conclusion of the fifth round, staple each team's half-sheets together, with the score sheet on top. Wait for the runner to come pick up the four packets before leaving for break.

Dinner Break

31. AT BREAK — Eat dinner in the proctor room. Pick up your College Bowl apparatus (CBA) at this time. If you haven't already, you may want to read over the College Bowl questions to make sure you will be able to pronounce everything properly. Return to your room in time to place the CBA in position.

College Bowl Rounds

32. Place the CBA on the middle desk of the line at the front of the room (you may want to moisten the suction cups with a film of water). One proctor may need to hold the device down (and do timing). Do not press the button to "reset" the CBA (it's an on/off switch).

33. You will have the same teams that were previously in the room for the duration of all College Bowl rounds — if you have an extra/different team, they are in the wrong room and can be disqualified if they hear the questions! Help get them to the correct room.

34. Fill out the score sheets for each team in your room with their school name and team number. Call up the first 2 teams according to the sequence on the room envelope.

35. You will be reading Round #1 questions to two teams while the other two teams (and any spectators) wait in the back of the room out of line of sight of the competitors. Refer to the College Bowl schedule (on your room envelope) to see which two teams compete in each round. If a round only has one team, they will be competing against the clock and thus will have 30 seconds to answer, not 45 seconds. Record the final scores for each team on their score sheets (which you hold on to) after each round. Rounds 2-6 work the same way. Refer to the schedule to make sure the correct

teams are competing at the correct time. Don't get ahead of schedule (or behind, for that matter!). If you finish a round early, please wait until the appointed time to start the next round. If you have any problems (including anyone questioning the rules or a decision made by a proctor) contact the proctor supervisor.

36. Who is keeping score? Who is keeping track of the time? YOU ARE !!!
37. Read the "COLLEGE BOWL" instructions (in the Proctor Packet) to all the students (just one time), then begin the testing for each round at the appointed times.
38. If you mis-read a question, replace it with one of the extra questions.
39. If a parent/coach/student protests an answer, make a note of the situation (the test, the problem number, who answered, what their answer was, etc.) and kindly state that the coach should bring up the issue with the contest director. Proceed as normal, scoring the question based on the answer key.
40. At the conclusion of all College Bowl rounds, get the score sheets promptly to the scoring room (either yourself or via a runner).
41. Release your group to the awards ceremony no earlier than 7:45 PM to avoid causing a disruption to other rooms. Have students help re-set the room.
42. At the end of the day, return the desks to their original arrangement, collect all scratch paper, erase any marks you made on the whiteboard, and generally make sure the classroom is tidied up. Return the College Bowl apparatus, proctoring envelope, and residual material to the proctor supervisor.

General Instructions

- Good sportsmanship is expected throughout the competition by all involved (competitors and observers). Display of poor sportsmanship will result in disqualification.
- Competitors may not use calculators or any other aids on any portion of this contest.
- Unless stated otherwise:
  - Express all rational, non-integer answers as common fractions, except in problems dealing with money, where you should give the answer as a decimal rounded to the nearest cent.
  - For fifth grade and up, all fractions and ratios must be reduced to simplest form, all radicals must be simplified, and all denominators must be rationalized.
  - Do not round or approximate answers. Leave answers in terms of π or other irrational quantities (e.g., $\sqrt{2}$), where applicable.
- Units are not necessary as part of your answer, unless it is a problem that deals with time, in which case, AM or PM is required. However, if you choose to use units, they must be correct.
- Record all answers on the colored cover sheets in the answer column only.
- **Be sure that the student name, school, team number, etc. has been filled out at the top of each answer sheet.**
- Tests will be scored as a 0 if answers are not recorded correctly on the answer sheets.
- Blank answer sheets and answer sheets with no name will be scored as a 0.

Mental Math Instructions

All students in the room will concurrently be asked the same eight questions in this individual test. 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 or her pencil down, the maximum wait time is 30 seconds after completion of the second reading of the question before the next question is read. You may continue to work on a problem (in your head) while the next question is being read. The raw score is 1 point per correct answer.

Individual Test Instructions

You will have 35 minutes to work on the Individual test, which consists of 40 questions. 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 first 30 questions are worth two points each and questions 31-40 are worth 3 points each. Record your answers on the score sheet. No talking during the test. You will be given a 5 minute warning.

Individual Multiple Choice Instructions

You will have 15 minutes to answer 10 multiple choice questions. This test is taken individually, but it is part of your team score, which will be calculated by taking the mean of the top 3 scores from your team. This test is the only test where you will be penalized for incorrect responses. You will receive two points for a correct letter response, zero points for leaving it blank, and minus one point for an incorrect response. When you are prompted to begin, tear off the colored answer sheet and begin testing. **ONLY a letter response should be listed as an answer on this answer sheet.**

Team Test Instructions

You will have 15 minutes to answer 10 questions as a team. When you are prompted to begin, tear off the colored answer sheet and give a copy of the test to each of your team members and begin testing. Each problem is scored as a 1 or 0. Record all answers on this colored answer sheet.

Pressure Round Instructions

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. The problems need not be submitted in order; you can submit an answer for any of the problems, and your answer can be a guess, if you like. The maximum value of this first submitted answer is 1 point.

In another two minutes, you are expected to submit another answer to any one of the four remaining problems (you cannot submit a new answer for a previously submitted problem). The maximum value is two points for this second submittal.

This process will continue until all of the problems are answered. Each consecutive submitted answer increases in score value 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 prior to the end of each two-minute period. You will be told to hold your answer sheet up in the air for the proctor to collect. You may keep working as the answer 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.

College Bowl Instructions

Read these to the competitors before the first round:

To maintain the integrity of the competition, spectators must stay in this room during a round of College Bowl questions. Once all readings for a round have been completed, you may leave.

All competitors must be facing the front of the room in one row. Teams not competing in the current round need to be behind the front row and in front of the spectators. All spectators need to be behind the competitors at the back of the room.

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, which is retained by the proctor.

You may use scratch paper and pencil. You may talk with your team members while arriving at a solution.

An Electronic College Bowl Apparatus (CBA) will be used to identify the team who is first to have an answer.

During these rounds, each question will be read twice and a maximum time of 45 seconds after the second reading of the question is completed will be allowed for a team to answer. 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. A team is allowed only one attempt at buzzing in and answering per question. You may interrupt (buzz in) while a question is being read, however, if you do, the proctor will stop reading, and an immediate response is needed. If the correct response is given, the proctor will proceed to the next question. Otherwise, the question will be re-read for the other team, making sure it has two full readings. If an immediate response is not given after a team buzzes in, 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 after the completion of the second reading in which to buzz in. The proctor will give a 5-second time warning.

Wait to be acknowledged by the proctor before giving an answer. This avoids the situation of blurting out an answer when the other team buzzed in first.

If two students from the same team answer at the same time with different answers, the answer will be considered incorrect.

If a problem arises with one of the questions, an extra question will be asked to replace that question.

If the round finishes early, you need to stay in the room for the remaining time.

Mental Math Questions

Pressure Round Answers

College Bowl Questions/Answers