



MUSTANG MATH TOURNAMENT 2020

MOUNTING MAYHEM ROUND

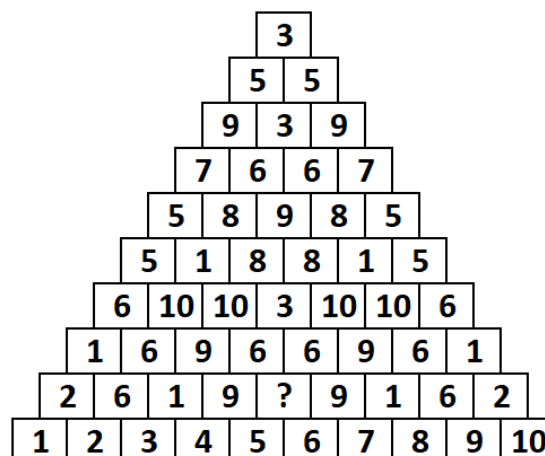
1. Insert standard operations (+, -, *, /) and any necessary parentheses to transform the left set of numbers, in any order, into the number on the right. Do NOT add any spaces or other characters. For example, an answer to 1, 7, 3 \rightarrow 28 would be "(1+3)*7" (not including the quotation marks). **2 points**

$$2, 3, 5, 5 \rightarrow 13$$

2. Insert standard operations (+, -, *, /) and any necessary parentheses to transform the left set of numbers, in any order, into the number on the right. Do NOT add any spaces or other characters. For example, an answer to 1, 7, 3 \rightarrow 28 would be "(1+3)*7" (not including the quotation marks). **2 points**

$$4, 7, 8, 25 \rightarrow 8$$

3. In the following number pyramid, a number is calculated by applying some function to the two numbers directly below it. What is the number that should go in the cell with a question mark in it? **2 points**



4. In a world where words are associated values based on the multiplication of their letters (each letter is an algebraic variable representing a numerical quantity), you are told:

*one = 1, two = 2, six = 6, seven = 7, eight = 8, nine = 9, ten = 10, sixty = 60,
seventy = 70, eighty = 80, and ninety = 90.*

What is the value of the product *twenty*? **3 points**

5. How many solutions are there to the following set of questions if each question has exactly one answer? **3 points**

1) Which is the answer to the third question:

A) **C** B) **D** C) **A** D) **E** E) **B**

2) Which is the answer to the fifth question:

D) **A** A) **C** E) **E** C) **B** B) **D**

3) Which is the answer to the second question:

B) **E** E) **D** D) **C** A) **B** C) **A**

4) Which is the answer to the first question:

E) **A** C) **D** A) **B** B) **C** D) **E**

5) Which is the answer to the fourth question:

C) **B** A) **C** B) **D** E) **E** D) **B**


6. Fed and his buddy Rob enter a duo sandwich-making competition. Fed is told what type of bread they'll use while Rob is told what the filling will be. They consult the supreme list of sandwich recipes and discover the following types of sandwiches: *Whole wheat bread with cheese, Whole wheat bread with vegetables, Whole wheat bread with spicy jalapenos, Honey oats bread with cucumbers, Honey oats bread with cheese, Flat bread with bacon, Flat bread with marmalade, Italian bread with bacon, Italian bread with cucumbers, Italian bread with spicy jalapenos.*

Fed sighs and says, "I sure have no clue what sandwich we are making but I know for sure neither does Rob."

Rob replies, "I didn't know what bread you were assigned earlier but I believe I do now."

Fed turns around: "Then I know what's in your assigned filling too!"

What sandwich were the duo assigned to make? **3 points**

7. I have a novel virus  that will take a two-digit number as input and corrupt it, returning a two digit number as an output. If the virus corrupts each number based on the same definable formula or algorithm, and the following are true, figure out the missing output. **3 points**

$$39 \rightarrow \text{virus} \rightarrow 12$$

$$98 \rightarrow \text{virus} \rightarrow 17$$

$$54 \rightarrow \text{virus} \rightarrow 92$$

$$28 \rightarrow \text{virus} \rightarrow 11$$

$$53 \rightarrow \text{virus} \rightarrow ??$$

8. In the following addition problem, each unique letter is represented by a different digit, such that the equation holds true. Solve for the value of STATUS. **4 points**

$$\begin{array}{r} \text{QUEEN} \\ + \text{KING} \\ \hline \text{STATUS} \end{array}$$

9. Yvonne is creating a riddle for Zoe. She chooses a positive whole number less than 100, and reveals this number to six students, Anne, Beth, Camille, Daisy, Eva, and Fara. Yvonne then tells each of them to describe the number to Zoe. This is what they say:

- Anne: "The number is divisible by six."
- Beth: "The number is one more than a prime number."
- Camille: "The number has twelve distinct positive factors."
- Daisy: "The digits in the number sum to nine."
- Eva: "The number leaves a remainder of six when divided by seven."
- Fara: "The number is a multiple of a cube greater than one."

There's a catch, though. Yvonne told one of the students to lie. When she reveals the identity of the dishonest girl to Zoe, Zoe says, "I know what the number is now!" Given that the remaining five students were telling the truth, and that Zoe correctly determined Yvonne's number, select the names of all the possible girls who could have been the one told to lie. **4 points**

10. In the following addition problem, each unique letter is represented by a different digit, such that the equation holds true. Solve for the value of CORONA. **5 points**

$$\begin{array}{r} \text{RISING} \\ + \text{VIRUS} \\ \hline \text{CORONA} \end{array}$$

11. 6 comrades decide to split a 1000-coin gold pot. The oldest comrade suggests how they will split the pot, and everyone votes if they agree with the plan or not. If 2 or more people vote no, the comrade who proposed the plan will be killed and get nothing. Then the next oldest comrade will propose how to split the plot, and so on down the line until a proposal is accepted. Assume that the comrades value living first, followed by maximizing their money, but they will kill their so-called “comrades” if they think their earnings won’t change. If all comrades are highly rational, how should the first oldest comrade split up the spot to maximize his earnings? Answer in the form “A:B:C:D:E:F” (not including the quotation marks), where each letter represents the number of coins each comrade gets from oldest to youngest. **5 points**
12. Every day, you go to the lake and use your buckets to collect liters of water. All buckets come in integer size. On Day 1, you bring back 1 L of water. On Day 2, you bring back 2 Ls of water. On Day X, you bring back X Ls of water. This continues for a total of 300 days. A transfer is defined as transferring water from one bucket into another. To save time, any pair of buckets can be involved in at most one transfer. Determine the minimum number of buckets you need to ensure you can bring back the exact amount of water necessary for each of the 300 days. **6 points**
13. A magic square is defined as an n -by- n grid of numbers such that the sum of the numbers in each row, column, and the two long diagonal is equal to the same number, known as the “magic sum.” Find the smallest possible magic sum in a 3-by-3 magic square such that no number in the square is composite and all the numbers are unique. **7 points**

14. You can input two tokens into a machine called the GENERATOR 9000 in exchange for a single, new token. The GENERATOR 9000 accepts two tokens with values x and y respectively and outputs both of the original tokens as well as an additional token with one of four options. The options for the additional token are $x + y$, $x - y$, $\frac{1}{x+y}$, and $\frac{1}{x-y}$, and you can change the selected option with every input. A “move” is considered any input of two tokens into the GENERATOR 9000. You are given a token with unknown value L and a token with value 1 and tasked with generating a token of value L^2 . You are only told that L is greater than 50. Determine the minimum number of moves needed to generate a token of value L^2 . **8 points**
15. You have 2 counterfeit coins and 126 gold coins. You know all gold coins weigh the same amount, all counterfeit coins weigh the same amount, but gold and counterfeit coins have different weights. You also don't know which type is heavier. You have a scale which can weigh any number of coins but only tells you which side is lighter and heavier. What is the least number of times you must use the scale to guarantee which 2 coins are counterfeit? **8 points**
16. Fill in the cross-number below with digits such that the four-digit numbers formed satisfy the clues, and submit the value of 8 ACROSS. **10 points**
- 1 DOWN: Exactly 20 divisors
 2 DOWN: $4(k^2 + k + 2)$, where k is a consonant
 3 DOWN: difference between this and 1 DOWN is odd
 4 DOWN: multiple of 275
 5 ACROSS: $5^a 7^b 13^c$, where a, b, c are integers
 6 ACROSS: product of 3 consecutive integers
 7 ACROSS: p^q , where p and q are prime
 8 ACROSS: multiple of 18.

	1	2	3	4
5				
6				
7				
8				

Problem Credit: Andy Niedermaier (FARML)