Directions: You have 30 minutes to complete these 10 problems. Rules in the Answers Conventions section do not apply. For each question, teams submit a closed range $[n, m]$, representing a lower bound n and an upper bound m for the answer. The range must be a subset of the positive reals. A correct answer means that the actual answer is within the range given; see the MMT Webpage for details on the scoring method. However, the general goal is to submit as small of a range as possible that still contains the actual answer. Groups submit answers in real time (on slips of paper) and are given live feedback on their answers. Only the last submit counts. If you do not submit for a question it will be counted as incorrectly answered. All actual answers will be positive real numbers.

1. Previously, MMT Estimation Rounds were scored as follows:

   > *Each problem is worth 100000 points (no, not for final team scoring, just for intra-round purposes). If a student's answer is an underestimation, their score for that problem is their answer divided by the exact correct answer, multiplied by 100000 and rounded down to the nearest integer. If a student's answer is an overestimation, their score for that problem is the exact correct answer divided by their answer, multiplied by 100000, and rounded down to the nearest integer. In the case of an exactly correct answer, the full 100000 points are awarded for that problem.*

   There were fifteen questions on the inaugural MMT Estimation Round. Let A be the third highest score on the examination. Find $(A/100000)^3$.

2. Find $\log_2 2^2 + \log_3 2^3 + \log_4 2^4 + \cdots + \log_{100} 2^{100}$.

3. Suppose each letter on this page is given a point value. An "a" is worth 1 point, a "b" is worth 2 points, and so on (regardless of upper/lowercase). Furthermore, each number is given the value the digit represents. All other symbols are worthless. What is the total point value of this page?

4. From 1914 to 2014, the average inflation rate in the United States was approximately 3.32% annually. However, at its worst, during the 1946 hyperinflation of the Hungarian pengo, prices doubled every 15 hours. Estimate the **monthly** inflation rate of the Hungarian pengo, assuming constant inflation. Express your answer in scientific notation.

5. Estimate the value of $e^{e+\pi}$.

6. The 2015 Nissan GTR Nismo has a 3.8L engine, 595 HP, 481 lb-ft of torque, and costs $149,990. The 2012 Ferrari 458 has a 4.5L engine, 570 HP, 398 lb-ft of torque, and costs $233,509. How much does the 2014 McLaren P1 cost, given that it has a 3.8L engine, 903 HP and 664 lb-ft of torque?

7. The U.S. interstate freeway system adapted a numbering scheme: one/two digit routes are primary routes, while three digit routes are auxiliary routes. Even number routes run east/west while odd number routes run north/south. Major east/west routes end in 0 and major north/south routes end in 5. What is the total distance of all the U.S. interstates, in kilometers?

8. In ClassicMS (2008, v62 Maplestory), you need 1,242 EXP from level 9 to 10 (1st Job Advancement), 83,720 EXP from 29 to 30 (2nd Job Advancement), 1,955,750 EXP from 69 to 70 (3rd Job Advancement), and 28,171,993 EXP from 119 to 120 (4th Job Advancement). Determine the amount of EXP you need to level from 187 to 188.

9. Determine the 100th Fibonacci number $F(100)$, where $F(1) = 1, F(2) = 1$, and $F(n) = F(n-1) + F(n-2)$ for $n \geq 3$.

10. Today marks the 9th anniversary of the discovery of the 43rd Mersenne prime! A Mersenne prime is a prime number of the form $2^n - 1$, where n is a positive integer. The 13th Mersenne prime is $2^{521} - 1$, and has 157 digits, while the 33rd Mersenne prime is $2^{859433} - 1$, and has 258716 digits. How many digits does the 43rd Mersenne prime have?