Team Name:_____

Round 1

1. What is the area of a circle with diameter 2?
2. What is the slope of the line through $(2, 1)$ and $(3, 4)$?
3. What is the units digit of $2^2 \cdot 4^4 \cdot 6^6$?

1._____ 2._____ 3._____

Team Name:_____

Round 2

1. Find the sum of the roots of $x^2 - 5x + 6$.
2. Find the sum of the solutions to $|2 - x| = 1$.
3. On April 1, 2018, Mr. Dospinescu, Mr. Phaovibul and Mr. Pohoata all go swimming at the same pool. From then on, Mr. Dospinescu returns to the pool every 4th day, Mr. Phaovibul returns every 7th day and Mr. Pohoata returns every 13th day. What day will all three meet each other at the pool again? Give both the month and the day.

1._____ 2._____ 3._____

Team Name:_____

Round 3

1. Kendall and Kylie are each selling t-shirts separately. Initially, they both sell t-shirts for \$33 each. A week later, Kendall marks up her t-shirt price by 30%, but after seeing a drop in sales, she discounts her price by 30% the following week. If Kim wants to buy 360 t-shirts, how much money would she save by buying from Kendall instead of Kylie? Write your answer in dollars and cents.
2. Richard has English, Math, Science, Spanish, History, and Lunch. Each class is to be scheduled into one distinct block during the day. There are six blocks in a day. How many ways could he schedule his classes such that his lunch block is either the 3rd or 4th block of the day?
3. How many lattice points does $y = 1 + \frac{13}{17}x$ pass through for $x \in [-100, 100]$? (A lattice point is a point where both coordinates are integers.)

1._____ 2._____ 3._____

Team Name:_____

Round 4

1. Unsurprisingly, Aaron is having trouble getting a girlfriend. Whenever he asks a girl out, there is an eighty percent chance she bursts out laughing in his face and walks away, and a twenty percent chance that she feels bad enough for him to go with him. However, Aaron is also a player, and continues asking girls out regardless of whether or not previous ones said yes. What is the minimum number of girls Aaron must ask out for there to be at least a fifty percent chance he gets at least one girl to say yes?
2. Nithin and Aaron are two waiters who are working at the local restaurant. On any given day, they may be fired for poor service. Since Aaron is a veteran who has learned his profession well, the chance of him being fired is only $\frac{2}{25}$ every day. On the other hand, Nithin (who never paid attention during job training) is very lazy and finds himself constantly making mistakes, and therefore the chance of him being fired is $\frac{2}{5}$. Given that after 1 day at least one of the waiters was fired, find the probability Nithin was fired.
3. In a right triangle, with both legs 4, what is the sum of the areas of the smallest and largest squares that can be inscribed? An inscribed square is one whose four vertices are all on the sides of the triangle.

1._____ 2._____ 3._____

Team Name:_____

Round 5

1. A triangle has lengths such that one side is 12 less than the sum of the other two sides, the semi-perimeter of the triangle is 21, and the largest and smallest sides have a difference of 2. Find the area of this triangle.
2. A rhombus has side length 85 and diagonals of integer lengths. What is the sum of all possible areas of the rhombus?
3. A drink from YAKSHAY'S SHAKE SHOP is served in a container that consists of a cup, shaped like an upside-down truncated cone, and a semi-spherical lid. The ratio of the radius of the bottom of the cup to the radius of the lid is $\frac{2}{3}$, the volume of the combined cup and lid is 296π, and the height of the cup is half of the height of the entire drink container. What is the volume of the liquid in the cup if it is filled up to half of the height of the entire drink container?

1._____ 2._____ 3._____

Team Name:_____

Round 6

Each answer in the next set of three problems is required to solve a different problem within the same set. There is one correct solution to all three problems; however, you will receive points for any correct answer regardless whether other answers are correct.

1. Let the answer to problem 2 be b. There are b people in a room, each of which is either a truth-teller or a liar. Person 1 claims "Person 2 is a liar," Person 2 claims "Person 3 is a liar," and so on until Person b claims "Person 1 is a liar." How many people are truth-tellers?
2. Let the answer to problem 3 be c. What is twice the area of a triangle with coordinates $(0, 0), (c, 3)$ and $(7, c)$?
3. Let the answer to problem 1 be a. Compute the smaller zero to the polynomial $x^2 - ax + 189$ which has 2 integer roots.

1._____ 2._____ 3._____

Team Name:_____

Round 7

1. Sir Isaac Neeton is sitting under a kiwi tree when a kiwi falls on his head. He then discovers Neeton's First Law of Kiwi Motion, which states:

   Every minute, either $\lfloor \frac{1000}{d} \rfloor$ *or* $\lceil \frac{1000}{d} \rceil$ *kiwis fall on Neeton's head, where* d *is Neeton's distance from the tree in centimeters.*

   Over the next minute, n kiwis fall on Neeton's head. Let S be the set of all possible values of Neeton's distance from the tree. Let m and M be numbers such that $m < x < M$ for all elements x in S. If the least possible value of $M - m$ is $\frac{2000}{16899}$ centimeters, what is the value of n?

   Note that $\lfloor x \rfloor$ is the greatest integer less than or equal to x, and $\lceil x \rceil$ is the least integer greater than or equal to x.

2. Nithin is playing chess. If one queen is randomly placed on an 8×8 chessboard, what is the expected number of squares that will be attacked including the square that the queen is placed on? (A square is under attack if the queen can legally move there in one move, and a queen can legally move any number of squares diagonally, horizontally or vertically.)

3. Nithin is writing binary strings, where each character is either a 0 or a 1. How many binary strings of length 12 can he write down such that 0000 and 1111 do not appear?

1._____ 2._____ 3._____

Team Name:_____

Round 8

What is the period of the fraction 1/2018? (The period of a fraction is the length of the repeated portion of its decimal representation.) Your answer will be scored according to the following formula, where X is the correct answer and I is your input.

$$\max\left\{0, \left\lceil \min\left\{13 - \frac{|I-X|}{0.1|I|}, 13 - \frac{|I-X|}{0.1|I-2X|}\right\}\right\rceil\right\}.$$

Answer:_____