GALLOP ROUND RULES

1. The Gallop Round will consist of 24 questions to be solved in 60 minutes.
2. The questions will be divided into 8 sets of 3 questions each, and you **must submit the answers to one set** before accessing the problems for the next. This means you must strategize when to submit each set (incomplete or not) to ensure you get access to as many questions as possible.
3. Once you submit the answer form for one of the sets, the password for the next set will be on the form submission screen, so make sure you note it down, otherwise you may waste valuable time getting the password from us!
4. The problems will get progressively more difficult, and later problems will be worth more points.
5. Submissions will be scored immediately and a live score of all participating teams will be available during the competition. Prepare for the adrenaline rush!

GALLOP SET 5

16 points per question

13. Evan and Kim are playing a game. When Evan receives a number, he squares it. $\frac{2}{3}$ of the time Evan will then pass the result to Kim, else, he'll keep it, square it again, and again decide whether to keep it or pass it with the same probability. When Kim receives a number, she triples it. $\frac{1}{3}$ of the time Kim will then pass the result to Evan, else, she'll keep the number, triple it again, and like Evan reevaluates whether to keep or pass the number. What is the probability that when Evan is given 2, the number becomes 144 at some point in their game?

14. A triangle is made between the points $(1, 0)$, $(3, 0)$, and $(2, 1)$. The triangle is then rotated $30°$ counterclockwise around the origin and then a reflection around the line $y = x$. The equation of the line of symmetry of the triangle after the transformations can be expressed as $y = mx + b$. Find $\frac{b}{m}$.

15. Consider a regular hexagon with a point P contained inside of it. What is the probability that P is closer to a vertex of the hexagon than its center?