

Time limit: 15 minutes.

Instructions: This tiebreaker contains 3 short answer questions. All answers must be expressed in simplest form unless specified otherwise. You will submit answers to the problem as you solve them, and may solve problems in any order. You will not be informed whether your answer is correct until the end of the tiebreaker. You may submit multiple times for any of the problems, but **only the last submission for a given problem will be graded**. The participant who correctly answers the most problems wins the tiebreaker, with ties broken by the time of the last correct submission.

No calculators.

1. A train accelerates at 10 mph/min, and decelerates at 20 mph/min. The train's maximum speed is 300 mph. What's the shortest amount of the time that the train could take to travel 500 miles, if it has to be stationary at both the start and end of its trip? Please give your answer in minutes.
2. Suppose 2 cars are going into a turn the shape of a half-circle. Car 1 is traveling at 50 meters per second and is hugging the inside of the turn, which has radius 200 meters. Car 2 is trying to pass Car 1 going along the turn, but in order to do this, he has to move to the outside of the turn, which has radius 210. Suppose that both cars come into the turn side by side, and that they also end the turn being side by side. What was the average speed of Car 2, in meters per second, throughout the turn?
3. Find $\sum_{k=0}^{672} \binom{2018}{3k+2} \pmod{3}$.