## 2 Relay Round

1-1 Compute the number of ordered pairs $(x, y)$ of positive integers satisfying $x^2 - 8x + y^2 + 4y = 5$.

1-2 Let $T$ be The Number You Will Receive (TNYWR). Let $k = 21 + 2T$. Compute the largest integer $n$ such that $2n^2 - kn + 77$ is a positive prime number.

1-3 Let $T$ be The Number You Will Receive (TNYWR). In triangle $ABC$, $BC = T$ and $m\angle B = 30°$. Compute the number of integer values of $AC$ for which there are two possible values for side length $AB$.

2-1 The rational number $r$ is the largest number less than 1 whose base-7 expansion consists of two distinct repeating digist, $r = 0.ABABAB....$ Written as a reduced fraction, $r = \frac{p}{q}$. Compute $p+q$ (in base 10).

2-2 Let $T = TNYWR$. Triangle $ABC$ has $AB = BC$. Points $M$ and $N$ lie on $\overline{BC}$ such that $\overline{AM}$ and $\overline{AN}$ trisect $\angle BAC$, with $M$ closer to $C$. If $m\angle AMC = T°$, then $m\angle ACB = U°$. Compute $U$.

2-3 Let $T = TNYWR$. At Wash College of Higher Education (Wash Ed.), the entering class has $n$ students. Each day, two of these students are selected to oil the slide rules. If the entering class had two more students, there would be $T$ more ways of selecting the two slide rule oilers. Compute $n$.