Mock ARML Relays

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Relay 1

1) If $\sqrt{34+4\sqrt{70}} = \sqrt{a} + \sqrt{b}$, compute the value of $a+b$.
2) Let $k = TNYWR$. Find the number of integers less than 2014 that are relatively prime to k.
3) Let $k = TNYWR$. Compute the largest prime divisor of $1 \cdot 2 \cdot 3 + 2 \cdot 3 \cdot 4 + ... + (k-1) \cdot k \cdot (k+1)$.

Relay 2

1) Compute the value of $\sum_{n=1}^{4027} cos(\frac{n\pi}{2014})$
2) Let $k = TNYWR$, and let $a = k + 2014$. Let a^b be the coefficient of x^a in the expansion $(x+1)^a \cdot \sum_{n=0}^{a} x^n$. Compute $a+b$.
3) Let $k = TNYWR$. Find the value of $\frac{1}{2-\frac{1}{2-\frac{1}{2-\frac{1}{2-...\frac{1}{2}}}}}$, wehre there are k 2's in the expression.

Answers

Relay 1:

1) 34

2) 1066

3) 97 (The formula is just $\frac{n\cdot(n+1)\cdot(n-1)\cdot(n+2)}{4}$)

Relay 2:

1) -1

2) 2^{2013}, so the answer if 2015

3) $\frac{2015}{2016}$