From Bob to Alice – Part 2

Below are a few results from the field of number theory. If you assume these results to be true, how does that change your answer to Question 3?

**Theorem 1.** If $a$ and $b$ are relatively prime, then there exist numbers $s$ and $t$ such that $as + bt = 1$.

**Theorem 2.** Let $p$ and $q$ be distinct primes. For any integer $a$,

$$a^{k(p-1)(q-1) + 1} \equiv a \pmod{pq}$$

where $k$ is any positive integer.

**Theorem 3.** The number of prime numbers less than or equal to $n$ is approximately equal to $\frac{n}{\ln n}$ for large values of $n$. 