

$$x = a_1 + a_2 + a_3 + \dots + a_k$$

$$a_1 \cdot a_2 \cdot a_3 \cdot a_4 \cdot \dots \cdot a_k$$

$$a_k \geq 4$$

$$\begin{aligned} 3(a_k - 3) &= 3a_k - 3 \\ &= a_k + \underbrace{(2a_k - 3)}_{>0} \\ &> a_k \end{aligned}$$

$$\begin{aligned}
 2(a_k - 2) &= 2a_k - 4 \\
 &= a_k + \underline{a_k - 4} \\
 &\geq a_k
 \end{aligned}$$

\Rightarrow if $a_k \geq 4$, make it 2, 3

\Rightarrow Thus: $X = 3 \cdot a + 2 \cdot b$
must be in this form

If $X_{\text{mod } 3} = 0 \Rightarrow X = 3 \cdot a$
 $\Rightarrow p = 3^a$

$$\text{If } x \bmod 3 = 1 \Rightarrow x = 3a + 1 \quad \begin{array}{l} \swarrow \text{assume } a \geq 1 \\ \Rightarrow \text{handle edge case} \end{array}$$

$$= 3(a-1) + 4$$

$$\Rightarrow 3^{a-1} \cdot 2^2$$

$$\text{If } x \bmod 3 = 2$$

$$\Rightarrow x = 3a + 2$$

$$= 3a + 2 - 1$$

$$\Rightarrow 3^a \cdot 2^1$$