

### Pumping Lemma - Sample Problems

Using the pumping Lemma, prove that the following languages are not regular:

1.  $L = \{a^n b^{2^n}\}$
2.  $L = \{0^n 1^m 2^n \mid n, m \geq 0\}$
3.  $L = \{a^{2^k} w \mid w \in \{a, b\}^*, |w| = k\}$
4.  $L = \{a^n b^l \mid n \leq l\}$
5.  $L = \{v a^{2^k} \mid v \in \{a, b\}^*, |v| = k\}$
6.  $L = \{ww \mid w \in \{a, b\}^*\}$
7.  $L = \{a^{n!} \mid n \geq 0\}$
8.  $L = \{a^k \mid k \text{ is a prime number}\}$