Name: _____

Directions: Show all work. No credit for answers without work.

1. **[4 parts, 1 point each]** True/False. Mark each of the following statements as "True" or "False". To avoid ambiguity, write the entire word.

   (a) No primes have Miller–Rabin witnesses, but some primes have Fermat witnesses.

   (b) If a is a Fermat witness for n, then a is also a Miller–Rabin witness for n.

   (c) If n is composite, then at least 50% of $\mathbb{Z}_n^*$ are Fermat witnesses.

   (d) If n is prime, then at least 75% of $\mathbb{Z}_n^*$ are Miller–Rabin witnesses.

2. **[2 parts, 3 points each]** Let $n = 34241$. For the given values of a, determine whether a is a Miller–Rabin witness for the compositeness of n.

   (a) $a = 4872$

   (b) $a = 24993$