

Name \_\_\_\_\_

*No aids allowed. Answer all questions on test paper. Use backs of sheets if necessary.*

Explain why classical bit multiplication of two  $n$ -bit integers takes  $O(n^2)$ , but the Divid and Conquer approach only  $O(n^{1.59})$  operations.

Hint: use the fact that  $n$  bit integers can be broken up into two  $n/2$ -bit integers, so  $z = z_1 \cdot 2^{n/2} + z_0$  where  $z$  has  $n$ -bits, while  $z_1, z_0$  have  $n/2$  bits. (Ignore issues of divisibility;  $n/2$  is really  $\lfloor n/2 \rfloor$  but overlook it for the sake of simplicity.)