

2005 Paper 1 Question 2

Discrete Mathematics

(a) State the Fermat–Euler theorem, and deduce that $p \mid (2^p - 2)$ for any prime p .
[5 marks]

(b) A composite number m that satisfies $m \mid (2^m - 2)$ is known as a *pseudo-prime*.

Show that $2^{10} \equiv 1 \pmod{11}$ and $2^{10} \equiv 1 \pmod{31}$. Deduce that 341 is a pseudo-prime.
[5 marks]