NB: Please deposit your solutions in the appropriate box **by 4 p.m. on the due date**. Late assignments or assignments placed into incorrect boxes will not be marked. Use a Mathematics Department cover sheet: these are available from outside the Resource Centre.

1. Prove that for all $n \in \mathbb{N}$,
$$3 \mid 2^{2^n} - 1.$$

2. Prove that if r, s are relatively prime integers, then so are $r + s$ and s.

3. Suppose that a, b are non-zero integers and that m is a positive common multiple of a, b. Prove that the following statements are equivalent:

(i) $m \leq c$ for every positive common multiple c of a, b.

(ii) $m \mid c$ for all common multiples c of a, b.

4. Prove that if a, b are relatively prime integers and $a \mid c$ and $b \mid c$ then $ab \mid c$.