

- (1) Find the formula for the sum  $1 \cdot 2 - 2 \cdot 3 + 3 \cdot 4 - \dots + (2n-1) \cdot (2n) - (2n) \cdot (2n+1)$  and prove it by mathematical induction.
- (2) Find the remainder when  $6^{100}$  is divided by 28.
- (3) Find the integer  $a$ ,  $0 \leq a < 37$  such that  $(34!)a \equiv 1 \pmod{37}$ .
- (4) Let  $n = pq$  where  $p, q$  are distinct odd primes. Find the remainder when  $\phi(n)!$  is divided by  $n$ .
- (5) Find all integer solutions of the equation

$$34x + 50y = 22$$

- (6) Let  $(a, m) = 1$  Prove that for any  $c$  there exists  $b$  such that  $ab \equiv c \pmod{m}$ .