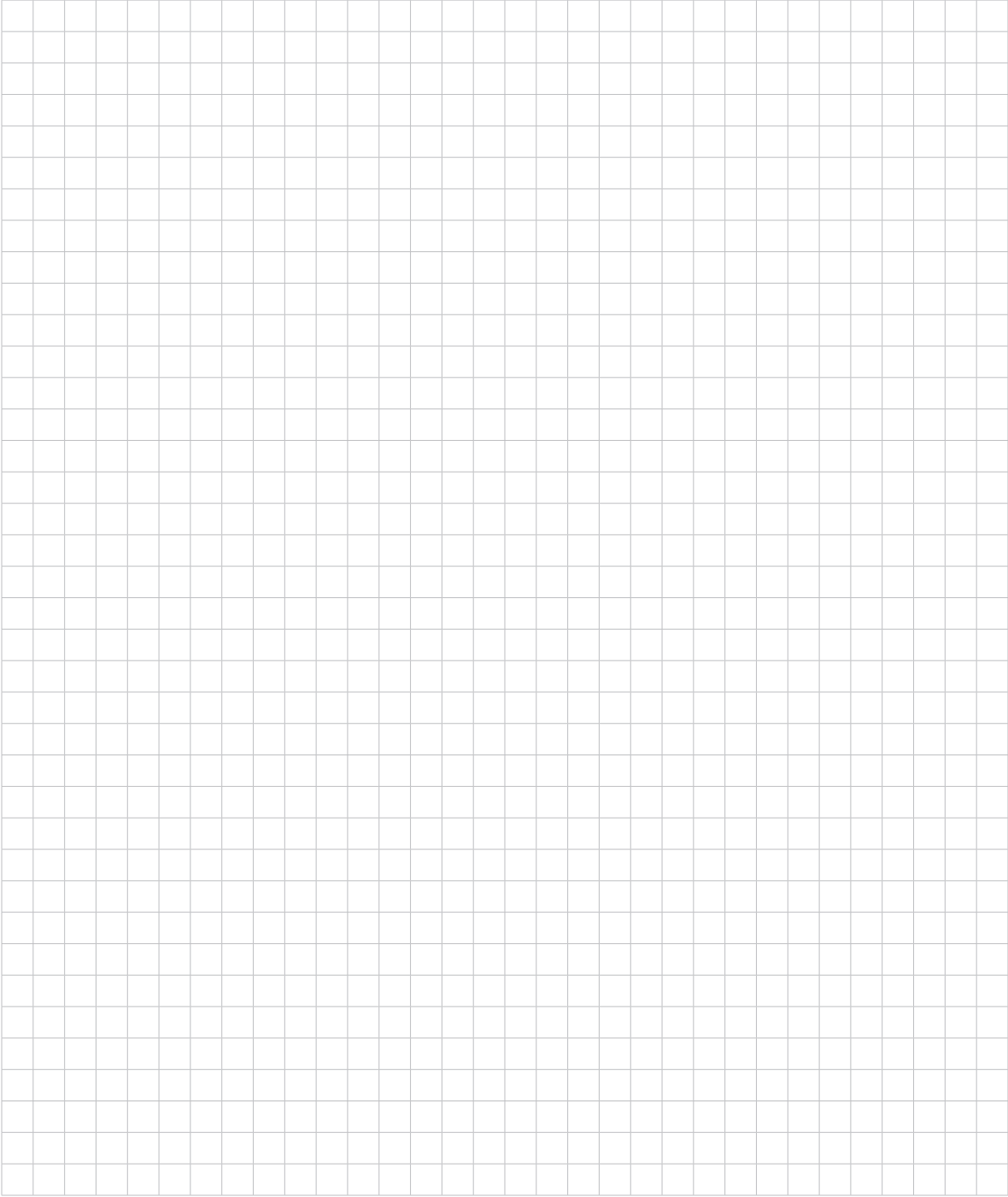


**Question 5** (8 marks)

(a) Use mathematical induction to prove that

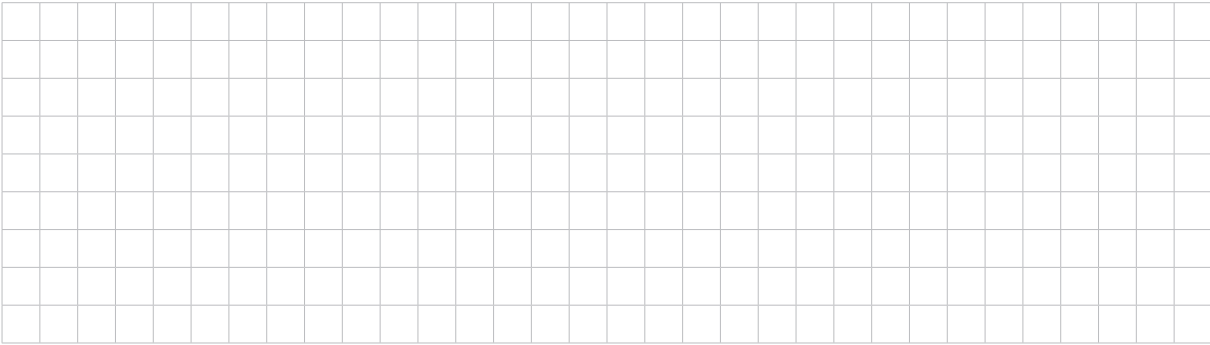
$$4 + 4^2 + 4^3 + \dots + 4^n = \frac{4}{3}(4^n - 1)$$

where  $n$  is a positive integer.



(6 marks)

(b) Hence show that  $3 + 15 + 63 + \dots + 16777215 = 22369608$ .



(2 marks)