1. Use induction to show that for $2^n > n^2$ all positive integer $n \geq 5$.

2. What is the remainder of $3^{329}$ divided by 5?

3. Let $A = \{a, b, c, d, e\}$ and $B = \{1, 2, 3, 4, 5, 6, 7\}$.
   
   (a) How many functions are there from $A$ into $B$?

   (b) How many 1-1 functions are there from $A$ into $B$?
(c) How many function are there from $A$ onto $B$?

4. In a certain game, two players take turns adding 2, 3 or 4 coins to a pile. Suppose that the pile starts with no coins and the player who adds the 100th coin wins the entire pile. Which player should win and what strategy should be used?

5. For $x, y$ real numbers, define $xRy$ iff $xy$ is a non-negative integer. Determine which of the properties of relation—reflexive, symmetric, transitive—are satisfie by $R$. Is $R$ an equivalence relation?
6. Consider a sequence $a_1, a_2, \ldots, a_{10}$ of integers. Show that there is some subset of these terms whose sum is divisible by 10.

7. Compute the number of odd divisors of 112,000.

8. On the menu of a Chinese restaurant there are 7 chicken dishes, 6 beef dishes, 6 pork dishes, 8 seafood dishes and 9 veggie dishes.
   
   • In how many ways can a family order if they choose exactly one dish of each kind?
• In how many ways can a family order if they choose at most one dish of each kind?

9. **Required for 587 students. Bonus for 387 students.** Suppose \( n + 1 \) integers are chosen between integers 1 and 2\( n \). Show that there are two integers whose sum is 2\( n + 1 \).