

1. Suppose  $A$  and  $B$  are finite sets. Prove that if there is an injection from  $A$  to  $B$  and an injection from  $B$  to  $A$ , then there is a bijection from  $A$  to  $B$ .

2. How many ways are there to distribute five balls into three different boxes, labeled by  $A$ ,  $B$  and  $C$ , if
- (a) the balls are different?
  - (b) the balls are identical?
  - (c) the balls are different and the following is satisfied: either box  $A$  is empty or box  $B$  is empty.

3. Let  $S = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ . Show that if six integers are chosen from  $S$ , then there must exist two chosen integers whose sum is 11.

4.  $A$  is a set of  $n$  elements. How many different equivalence relations on  $A$  are there with exactly  $r$  equivalent classes?