Induction for Part IA Discrete Mathematics

Note: This handout contains just a list of past papers that require a proof by induction. You may find more details and exercises in various places. For example, this handout contains several CS examples and techniques.

Past papers

- 2017p2q7 (b)
- 2017p2q9 (a)
- 2016p2q8 (b)
- 2016p2q9 (b)
- 2015p2q8 (b)
- 2014p2q9 (b), (c)
- 2013p1q3 (b) (c)
- 2006p2q6 (b)
- 1994p11q10 (c), (d)

Find the mistake

Find the mistake in the following induction argument.

Theorem 1. In any finite set all elements are equal.

*Proof.*We will prove this by induction on the size of the set. For $n = 1$, there is only one element so this holds trivially.

Assume it is true for $n = k$, then all sets of size k have equal elements. Consider a set of $n = k + 1$ elements, then consider the set with elements $X = A_1, A_2, \ldots, A_k$ (k of them). By induction hypothesis, all of these are equal. Similarly, consider the set with elements $Y A_2, A_3, \ldots, A_{k+1}$ (k of them), by induction hypothesis they are equal. Since X and Y share an element (e.g. A_2), all elements must be equal.

Hence, by the principle, of .. □

You may find more examples here.