University of
Placeholder

Induction worksheet

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Instructions

This document contains extra practice problems about induction.

Actually, it contains only one problem that is copied five times, but who cares ;)

If you wish to have your solution checked by a TA, email secret@email.nl.

Question 1.
Prove by mathematical induction that for all $n \in \mathbb{N}_0$, for all finite sets $A_1, A_2, \ldots, A_n$,

$$\left|\bigcup_{i=1}^{n} A_i\right| = \sum_{\emptyset \neq J \subseteq \{1,\ldots,n\}} (-1)^{|J|+1} \left|\bigcap_{j \in J} A_j\right|.$$

Question 2.
Prove by mathematical induction that for all $n \in \mathbb{N}_0$, for all finite sets $A_1, A_2, \ldots, A_n$,

$$\left|\bigcup_{i=1}^{n} A_i\right| = \sum_{\emptyset \neq J \subseteq \{1,\ldots,n\}} (-1)^{|J|+1} \left|\bigcap_{j \in J} A_j\right|.$$

Question 3.
Prove by mathematical induction that for all $n \in \mathbb{N}_0$, for all finite sets $A_1, A_2, \ldots, A_n$,

$$\left|\bigcup_{i=1}^{n} A_i\right| = \sum_{\emptyset \neq J \subseteq \{1,\ldots,n\}} (-1)^{|J|+1} \left|\bigcap_{j \in J} A_j\right|.$$

Question 4.
Prove by mathematical induction that for all $n \in \mathbb{N}_0$, for all finite sets $A_1, A_2, \ldots, A_n$,

$$\left|\bigcup_{i=1}^{n} A_i\right| = \sum_{\emptyset \neq J \subseteq \{1,\ldots,n\}} (-1)^{|J|+1} \left|\bigcap_{j \in J} A_j\right|.$$

Question 5.
Prove by mathematical induction that for all $n \in \mathbb{N}_0$, for all finite sets $A_1, A_2, \ldots, A_n$,

$$\left|\bigcup_{i=1}^{n} A_i\right| = \sum_{\emptyset \neq J \subseteq \{1,\ldots,n\}} (-1)^{|J|+1} \left|\bigcap_{j \in J} A_j\right|.$$