Given:

DeMorgan's Law:

$$\overline{A1 \cap A2} = \overline{A1} \cup \overline{A2}$$

Prove by induction:

$$\overline{\bigcap_{j=1}^{n} Aj} = \bigcup_{j=1}^{n} \overline{Aj}$$

where n >= 2.

Base case:

for n=2, true because of DeMorgan's Law

Inductive step:

Assume true for k:

$$\overline{\bigcap_{j=1}^{k} Aj} = \bigcup_{j=1}^{k} \overline{Aj}$$

where k >= 2.

Show true for k+1:

$$\overline{\bigcap_{j=1}^{k+1} Aj} = \bigcup_{j=1}^{k+1} \overline{Aj}$$

For k+1:

	Comments:
$\overline{\bigcap_{j=1}^{k+1} Aj} = \overline{\bigcap_{j=1}^{k} Aj \cap A_{k+1}}$	unroll last term
$\overline{\bigcap_{j=1}^{k} Aj} \cup \overline{A_{k+1}}$	split apart using DeMorgan's law
$\bigcup_{j=1}^{k} \overline{Aj} \cup \overline{A_{k+1}}$	use the inductive hypothesis
$\bigcup_{j=1}^{k+1} \overline{Aj}$	combine

Conclusion:

Since the base case was true and the inductive step was shown to be true, by induction it is true for all n>=2.