# Worksheet 5
## PRODUCT SETS
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We started this section of the course building from sets to the more general product sets.
Recall: Let $U$ be a well defined universe. Let V be the well defined universe, $\mathcal{P}(U)$. Let $U$ be a well defined universe. Let A be a set whose points, $p$ are elements from $U$. Let B be a set whose points, $b$ are elements of $V$. We defined the universe $W = U \times V$.
**Def. 12.1** : Let the universe $W = U \times V$ be defined from the well defined universes U and V such that $A \subseteq U$ whilst $B \subseteq V$. The product set A with B is the set $A \times B = \{(a, b) : a \in A, b \in B\}$.

So far this semster we have considered theorems about points, $p$, sets, $A$, power sets, $\mathcal{P}(A)$, and collections, $\Omega$. Now we have some claims about product sets to consider.

We can make our lives easy by letting $U$ be a well defined universe and let $V$ be a well defined universe. Let $W$ be the well defined universe $U \cup V$.

**Claim 12.1** : Let $M = W \times W$ Let $A, B, C, \wedge \quad D$ be non-empty sets.
It is the case that $(A \times B) \cap (C \times D) \subseteq (A \cap C) \times (B \cap D)$.

**Claim 12.2** : Let $M = W \times W$ Let $A, B, C, \wedge \quad D$ be non-empty sets.
It is the case that $(A \cap B) \times (C \cap D) \subseteq (A \times C) \cap (B \times D)$.

**Claim 12.3** : Let $M = W \times W$ Let $A, B, C, \wedge \quad D$ be non-empty sets.
It is the case that $(A \times B) \cup (C \times D) \subseteq (A \cup C) \times (B \cup D)$.

**Claim 12.4** : Let $M = W \times W$ Let $A, B, C, \wedge \quad D$ be non-empty sets.
It is the case that $(A \times B) - (C \times D) \subseteq (A - C) \times (B - D)$.

**Claim 12.5** : Let $M = W \times W$ Let $A, B, C, \wedge \quad D$ be non-empty sets.
It is the case that $(A - B) \times (C - D) \subseteq (A \times C) - (B \times D)$.

**Claim 12.6** : Let $M = W \times W$ Let $A, \wedge \quad B$ be non-empty sets.
It is the case that $(A \times B)^C = A^C \times B^C$.