Doing a Proof

$\forall x \forall y([\texttt{rational}(x) \wedge \texttt{rational}(y)] \rightarrow \texttt{rational}(xy))$

"The product of two rational numbers is rational."

DON'T just jump right in!

Look at the statement, make sure you know:

1. What every word in the statement means.
2. What the statement as a whole means.
3. Where to start.
4. What your target is.

Rational

A real number x is rational if (and only if) there exist integers p and q, with $q \neq 0$ such that $x = p/q$.

Try it!

Let $A = \{1,2,3,4,5\}$

$B = \{1,2,5\}$

Is $A \subseteq A$?

Is $B \subseteq A$?

Is $A \subseteq B$?

Is $\{1\} \in A$?

Is $1 \in A$?

Definitions

$A \subseteq B$ ("A is a subset of B") iff every element of A is also in B.

$$A \subseteq B \equiv \forall x(x \in A \rightarrow x \in B)$$

$A = B$ ("A equals B") iff A and B have identical elements.

$$A = B \equiv \forall x(x \in A \leftrightarrow x \in B) \equiv A \subseteq B \land B \subseteq A$$

What do we do with sets?

We combined propositions with $\vee, \wedge, \neg$.

We combine sets with $\cap$ [intersection], $\cup$, [union] $\bar{}$ [complement]

$A \cup B = \{x : x \in A \vee x \in B\}$

$A \cap B = \{x : x \in A \wedge x \in B\}$

$\bar{A} = \{x : x \notin A\}$

That's a lot of elements...if we take the complement, we'll have some "universe" $\mathcal{U}$, and $\bar{A} = \{x : x \in U \wedge x \notin A\}$
It's a lot like the domain of discourse.