Some old slides on unification
These were produced with SICStus Prolog; the prompts are little bit different.
The unification predicate

Consider this query:

```
| ?- x = 1.
X = 1 ?
```

This is read "unify X with 1".

Another way to read it: "X must have the value 1."

X was able to unify with 1 because X had not been previously unified with anything else—it was previously uninstantiated. The unification instantiates X with the term 1.

In contrast, consider this:

```
| ?- x = 1, x = 2.
no
```

In this case, X is unified with 1, and then, because X is already unified with 1, it can't be unified with 2—the query fails. (X must have the value 1 and X must have the value 2.)
Unification, continued

Note that the following query gets as far as the write.

$\text{| ?- X = 1, write(X), X = 2.}$

1
no

Logical variables can be unified with each other:

$\text{| ?- A = 1, B = 1, A = B.}$

A = 1,
B = 1 ?

In this case, A and B unify because they have the same value.

$\text{| ?- A = B, B = 10.}$

A = 10,
B = 10 ?

In this case, A and B unify because neither has been unified with a value yet. When B is unified with 10, A is unified with 10 because A was previously unified with B. (A and B must have the same value and B must have the value 10.)
Unification, continued

A transitive case:

\[
\begin{align*}
| & ?- A = B, B = C, A = 10. \\
A &= 10, \\
B &= 10, \\
C &= 10 \\
&?
\end{align*}
\]

*A and B must have the same value, B and C must have the same value, and A must have the value 10.*

The unification of A with 10 causes A, B, and C to all be instantiated with the term 1
The unification predicate, continued

A rule can use unification to produce a result in an argument of a rule invocation:

\[
f(X, Y, Z) :- X = 1, \ Y = 2, \ Z = 3.
\]

Usage:

\[
| \ ?- f(A, B, C).
A = 1,
B = 2,
C = 3 ?
\]

\[
| \ ?- f(1, 2, 3).
yes
\]

\[
| \ ?- f(A, B, 3).
A = 1,
B = 2 ?
\]
The unification predicate, continued

Another rule:

\[ g(X, Y, Z) \leftarrow X = Y, \ Y = Z. \]

Usage:

\[
| \ ?- \ g(1, B, C).
\]

\[
B = 1, \\
C = 1 ?
\]

\[
| \ ?- \ g(A, 10, C).
\]

\[
A = 10, \\
C = 10 ?
\]
Unification, continued

At hand:

\[ f(X, Y, Z) :- X = 1, \ Y = 2, \ Z = 3. \]

\[ g(X, Y, Z) :- X = Y, \ Y = Z. \]

\( f \) combined with \( g \):

\[ ?- f(A, B, C), \ g(C, D, E). \]

\[ A = 1, \]
\[ B = 2, \]
\[ C = 3, \]
\[ D = 3, \]
\[ E = 3 \]?