**Definition 1.7.5.**
The statement q →p is called the **converse** of the statement p →q and the statement ~p →~q is called the **inverse**.

Generally, the statement and its converse not necessary equivalent. Therefore, p ⟹ q does not mean that q ⟹ p.

**Example 1.7.6.** The statement "the triangle which has equal sides, has two equal legs" equivalent to the statement " the triangle which has not two equal legs has no equal sides".

## 1.8. Quantifiers

Recall that a formula is a statement whose truth value may depend on the values of some variables. For example,

"$x \leq 5 \wedge x > 3$" is true for $x = 4$ and false for $x = 6$.

Compare this with the statement

"For every $x$, $x \leq 5 \wedge x > 3$," which is definitely false and the statement

"There exists an $x$ such that $x \leq 5 \wedge x > 3$," which is definitely true.

**Definition 1.8.1.**

**(i)** The phrase **"for all $x$"** (**"for every $x$"**, **"for each $x$"**) is called a **universal quantifier** and is denoted by $\forall x$.

**(ii)** The phrase **"for some $x$"** (**"there exists an $x$"**) is called an **existential quantifier** and is denoted by $\exists x$.

**(iii)** A formula that contains variables is not simply true or false unless each of these variables is **bound** by a quantifier.

**(iv)** If a variable is not bound the truth of the formula is contingent on the value assigned to the variable from the universe of discourse.

**Definition 1.8.2. (The Universal Quantifier)**