A **predicate** is a sentence that contains a finite number of variables and becomes a statement when specific values are substituted for the variables. The **domain of a predicate variable** is the set of all values that may be substituted in place of the variable.

If P(x) is a predicate and x has domain D, the **truth set of P(x)** is the set of all elements of D that make P(x) true when they are substituted for x. The truth set of P(x) is denoted $\{x \in D \mid P(x)\}$.

Let Q(x) be a predicate and D the domain of x. A **universal statement** is a statement of the form "$\forall x \in D$, Q(x)." It is defined to be true if, and only if, Q(x) is true for every x in D. It is defined to be false if, and only if, Q(x) is false for at least one x in D. A value for x for which Q(x) is false is called a counterexample to the universal statement.

Let Q(x) be a predicate and D the domain of x. An **existential statement** is a statement of the form "$\exists x \in D$ such that Q(x)." It is defined to be true if, and only
if, Q(x) is true for at least one x in D. It is false if, and only if, Q(x) is false for all
x in D.