

$$p \rightarrow q \equiv \neg p \vee q$$

Sep 8-9:59 AM

Predicate Calculus  
 ↳ contains variables e.g.  $x < 10$   
 - becomes a statement when the variables get values  
 $P(x)$  is  $x < 10$   
 Domain: real numbers

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Domain: set of values  
 $A: \{1, 2, 3\}$   
 $B: \{1, 2, 3, \dots\}$   
 $x \in A$      $x$  is in  $A$   
 $x \notin A$      $x$  is not in  $A$

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Special Sets  
 $\mathbb{R}$ : real numbers  
 $\mathbb{R}^+$ : positive  
 $\mathbb{Z}$ : integers  
 $\mathbb{Q}$ : rational numbers  
 $\mathbb{C}$ : complex  
 $\mathbb{N}$ : natural numbers

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Truth set of a predicate  
 $\{x \in D \mid P(x)\}$   
 ↳ set of all  $x$  in Domain  $D$  such that  $P(x)$  is true  
 e.g.  $Q(x)$   $x$  is a factor of 4  
 Domain  $\mathbb{Z}$   $\{1, -1, 2, -2, 4, -4\}$   
 $\mathbb{N}$   $\{1, 2, 4\}$

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Universal Quantifier  $\forall$  "for all"  
 $\forall x \in C, x$  is working  
 $C$  is the set of CS computers  
 $\forall x \in D, P(x)$  is true iff  $P(x)$  is true for every element of the domain.  
 It is false iff  $P(x)$  is false for at least one  $x \in D$

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Existential Quantifier  $\exists$   
 "there exists"  
 $\exists s \in P$  such that  $s$  is a student  
 @ g.c  
 $P$ : all people  
 $\exists m \in \mathbb{Z}$  s.t.  $m = m^2$

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$P(x) \Rightarrow Q(x)$   
 $\forall x, P(x) \rightarrow Q(x)$   
 $P(x)$ :  $x$  is a Java program  
 $Q(x)$ :  $x$  contains 5 lines  
 $\forall x, P(x) \rightarrow Q(x)$   
 Every Java program has 5 lines.

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Everyone in the room is a college student.  
 $R(x)$ :  $x$  is in the room  
 $S(x)$ :  $x$  is a college student  
 $\forall x, R(x) \rightarrow S(x)$   
 $\forall x \in P, S(x)$   
 $P$ : people in the room.

There is a red flower on campus.  
 $R(f)$ :  $f$  is red  
 $L(f)$ :  $f$  is on campus  
 $\exists x \in \text{Flowers}$  s.t.  $R(x) \wedge L(x)$

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