

§1.4 Predicates and Quantifiers.

Ex. Today is Monday. = M

Today is Sunday = S

Predicate: $P(D)$ $P(M)$ = Today is Monday.

$P(T)$ = " " Tuesday.

Def. property that the subject of the statement can have.

Ex. $P(x) : x > 3$
 ↑ ↑
 predicate variable

Truth value of $P(4) = T$ $P(3) = F$ $P(2) = F$

Ex. Design an easy program to interchange the values of two variables.

x and y, and " := "
 ↑
 define.

temp := x

x := y

y := temp

$\boxed{\begin{array}{l} x := 5 \\ y := 4 \end{array}} \xRightarrow{\text{Program}} \begin{array}{l} x := 4 \\ y := 5 \end{array}$

$x := y \Rightarrow x := 4$

$y := 4$

temp := 5

x := 4

y := temp (5)

2. Quantifiers.

Ex. All students are CS major

$C(A) : A$ is CS major

$C(B) : B$ is CS major

① Universal quantifier : " \forall " "For all", "For every" "For each"

$$\forall x C(x)$$

$x \in \text{students}$

↑
belongs to

define domain

Ex. $\forall x \in \mathbb{R} \quad x^2 > 0$: $\overset{\text{Real \#s}}{\text{translate}}$ For all real numbers, x^2 is positive.

Truth value ?

False. $x=0 \quad 0 \in \mathbb{R}$
counter example.