

Discrete Mathematics --- Day 6 --- September 8, 2004

Notes

Next Homework is due on Monday.

We're going to start taking arguments out of context using Symbolic expression.

"Getting English From Symbols"

P - 29 is a prime number.

Q - 29 is the sum of two squares.

R - 29 leaves a remainder of 1 when divided by 4.

S - There is a perfect square which is 1 less than a multiple of 29.

1. $P \wedge Q$

Translation: 29 is prime and 29 is the sum of two squares.

2. $R \rightarrow S$

Translation: If 29 leaves a remainder of 1 when divided by four, then there is a perfect square which is one less than a multiple of 29.

3. $(R \wedge P) \rightarrow Q$

Translation: If 29 leaves a remainder of 1 when divided by 4, then 29 is the sum of 2 squares.

4. $R \rightarrow (P \vee \neg S)$

Translation: If 29 leaves a remainder of 1 when divided by 4, then 29 is prime or there is not a perfect square which is less than a multiple of 29.

Note: $R \rightarrow (P \vee \neg S)$ is NOT the same as $(R \rightarrow P) \vee \neg S$

$R \rightarrow (P \vee \neg S)$ Translates into "R implies P or not S"

$(R \rightarrow P) \vee \neg S$ Uses the truth value of the implication as input for the \vee .

The English meanings can sometimes be very close. Often, the only difference is where the comma is placed. Context clues, such as the word "both" are used to help specify the meaning.

"Getting English From Symbols"

$E(x)$ Bob eats x

$M(s, t)$ s has seen t

$S(t)$ Beth has seen t

$T(a, b)$ a and b are sides of the same triangle

$L(a, b)$ a and b have the same length

$B(a, t)$ a belongs to t

1. $E(\text{Tomatoes})$

Translation: Bob eats Tomatoes.

3. $M(\text{Rachel}, \text{The Princess Bride})$

Translation: Rachel has seen The Princess Bride

4. $\forall x M(\text{Rachel}, x)$

Translation: Rachel has seen every movie.

5. $\exists h \neg S(h)$

Translation: There is some movie that Beth hasn't seen. Beth hasn't seen all movies.

6. $\forall t (S(t) \rightarrow M(\text{Betty}, t))$

Translation: For all movies, if Beth has seen it, then Betty has seen it. More correct: Betty has seen all movies Beth has seen.