# Informatics Rugby and Introduction to Logic

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## 1 Informatics Rugby Team

We are recruitment secretaries for the Informatics Rugby team, a casual intramural rugby team created last year. Our aim is to provide information about our activities and hopefully recruit new members.

### 1.1 Training and Matches

We play games most Wednesdays at Peppermill and train most Sundays in the Meadows, just behind the library. Training includes a mix of contact, fitness, and skill level building, preparing us for matches against other subjects.

### 1.2 Equipment and Socials

To participate in contact training, you will need rugby boots and a gum guard. We also have socials every Wednesday and Sunday after our activities, and we encourage everyone to join us.

### 1.3 Other Sports

For those not interested in rugby, we have links to various other sports available on our Instagram page.

## 2 Introduction to Logic

In the context of our course, we began discussing binary information and the concept of bits. We utilize decision trees and yes/no questions to assign binary codes, focusing on true and false values.

### 2.1 Propositions

A proposition is a statement that can be either true or false. Examples include:

- The moon is round.
- It is raining here and now.
- That book is yellow.

The complexity of language can lead to ambiguity in these statements, which is why logic is essential for clear reasoning.

## 2.2 Logical Operators

We will explore several logical operators:

- **Conjunction (AND)**: $P \wedge Q$ is true if both $P$ and $Q$ are true.
- **Disjunction (OR)**: $P \vee Q$ is true if at least one of $P$ or $Q$ is true.
- **Negation (NOT)**: $\neg P$ is true if $P$ is false.
- **Implication (IF...THEN)**: $P \implies Q$ is true unless $P$ is true and $Q$ is false.

## 2.3 Truth Tables

Truth tables are used to define the truth values of these operators:

- For conjunction:

| $P$ | $Q$ | $P \wedge Q$ |
|---|---|---|
| $F$ | $F$ | $F$ |
| $F$ | $T$ | $F$ |
| $T$ | $F$ | $F$ |
| $T$ | $T$ | $T$ |

- For disjunction:

| $P$ | $Q$ | $P \vee Q$ |
|---|---|---|
| $F$ | $F$ | $F$ |
| $F$ | $T$ | $T$ |
| $T$ | $F$ | $T$ |
| $T$ | $T$ | $T$ |

- For negation:

| $P$ | $\neg P$ |
|---|---|
| $F$ | $T$ |
| $T$ | $F$ |

- For implication:

| $P$ | $Q$ | $P \implies Q$ |
|---|---|---|
| $F$ | $F$ | $T$ |
| $F$ | $T$ | $T$ |
| $T$ | $F$ | $F$ |
| $T$ | $T$ | $T$ |

## 2.4 Venn Diagrams

Logic can also be represented using Venn diagrams:

- $P \wedge Q$ corresponds to the intersection of sets.
- $P \vee Q$ corresponds to the union of sets.
- $\neg P$ corresponds to the complement of set $P$.

### 2.5 Predicates

A predicate is a statement that can be true or false depending on the values of its variables. For example, the predicate "is round" can be applied to different objects:

- $P(x)$: "x is round."
- $L(x, y)$: "x likes y."

### 2.6 First Order Logic

First order logic allows for more complex statements involving quantifiers:

- $\forall x\, P(x)$: "For all x, P is true."
- $\exists x\, P(x)$: "There exists an x such that P is true."

## 3 Conclusion

This lecture covered the basics of logic, including propositions, logical operators, truth tables, and predicates. Understanding these concepts is crucial for clear reasoning in computer science and mathematics.