

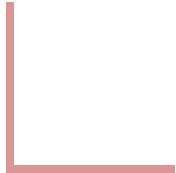
# Mathematical Foundations for Computer Applications

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## Conditional Statements

**Dr. Premalatha H M**

Department of Computer Applications



# Mathematical Foundations for Computer Applications

## Conditional Statements

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1. Let  $p$  be the statement “Maria learns discrete mathematics” and  $q$  be the statement “Maria will find a good job.” Express the statement  $p \rightarrow q$  as a statement in English.

Any of the following

1. “If Maria learns discrete mathematics, then she will find a good job.”
2. “Maria will find a good job when she learns discrete mathematics.”
3. “For Maria to get a good job, it is sufficient for her to learn discrete mathematics.”
4. “Maria will find a good job unless she does not learn discrete mathematics.”

# Mathematical Foundations for Computer Applications

## Applications of Propositional Logic

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### Translating English Sentences

1. How can this English sentence be translated into a logical expression?

“You can access the Internet from campus only if you are a computer science major or you are not a freshman.”

Let  $a$ ,  $c$ , and  $f$  represent “You can access the Internet from campus,” “You are a computer science major,” and “You are a freshman,” respectively.

This sentence can be represented as

$$a \rightarrow (c \vee \neg f).$$

# Mathematical Foundations for Computer Applications

## Applications of Propositional Logic

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### 2. Translate English sentence into a logical expression.

“You cannot ride the roller coaster if you are under 4 feet tall unless you are older than 16 years old.”

Let  $q$ ,  $r$ , and  $s$  represent “You can ride the roller coaster,” “You are under 4 feet tall,” and “You are older than 16 years old,” respectively. Then the sentence can be translated to

$$(r \wedge \neg s) \rightarrow \neg q.$$

# Mathematical Foundations for Computer Applications

## Conditional Statements

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### Other conditional statements:

- **Converse** of  $p \rightarrow q$  :  $q \rightarrow p$
- **Contrapositive** of  $p \rightarrow q$  :  $\neg q \rightarrow \neg p$
- **Inverse** of  $p \rightarrow q$  :  $\neg p \rightarrow \neg q$

# Mathematical Foundations for Computer Applications

## Problems

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1. What are the contrapositive, the converse, and the inverse of the conditional statement “The home team wins whenever it is raining?”

*Solution:* Because “ $q$  whenever  $p$ ” is one of the ways to express the conditional statement

- $p \rightarrow q$ , the original statement can be rewritten as  
“If it is raining, then the home team wins.”

# Mathematical Foundations for Computer Applications

## Problems

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“If it is raining, then the home team wins.”

- **The converse is**
  - “If the home team wins, then it is raining.”
- **The contrapositive is**
  - “If the home team does not win, then it is not raining.”
- **The inverse is**
  - “If it is not raining, then the home team does not win.”

# Mathematical Foundations for Computer Applications

## Problems

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2) I will go to the market if my cousins come

"y if x". i.e.,  $x \rightarrow y$ , where

X: My cousins come

Y: I will go to the market

**Converse** : If I will go to the market, then my cousins come.

**Contrapositive** : If I will not go to the market, then my cousins do not come.

**Inverse** : If my cousins do not come, then I will not go to the market.



# Mathematical Foundations for Computer Applications

## Problems

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3) "I go to college whenever my friends come."

"I go to college if my friends come"

i.e.,  $x \rightarrow y$ , where

**X: My friends come**

**Y: I go to college**

**Converse** : If I go to college, then my friends come.

**Contrapositive** : If I do not go to college, then my friends do not come.

**Inverse** : If my friends do not come, then I will not go to college.

# Mathematical Foundations for Computer Applications

## Problems

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4) I will give you a party only if I buy a good dress.

This statement must have the form: "**x only if y**".

i.e.,  $x \rightarrow y$ , where

**X:** I will give you a party only

**Y:** I buy a good dress

**Converse** : If I buy a good dress, then I will give you a party.

**Contrapositive** : If I do not buy a good dress, then I will not give you a party.

**Inverse** : If I will not give you a party, I do not buy a good dress.

# Mathematical Foundations for Computer Applications

## Problems

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- 1) You will get good marks only if you study hard
- 2) If there is rainy weather, then I will go outside to enjoy it
- 3) If  $3a - 2 = 10$ , then  $a = 1$ .
- 4) If the weather is sunny, then I will go to school



# THANK YOU

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**Dr. Premalatha H M**

Department of Computer Applications

**Premalatha.hm@pes.edu**

**+91 80 26721983 Extn 224**