

Mathematical Foundations for Computer Applications

Conditional Statements

Dr. Premalatha H M

Department of Computer Applications



Mathematical Foundations for Computer Applications

Conditional Statements

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.”

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Applications of Propositional Logic

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

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

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Applications of Propositional Logic

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

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

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Conditional Statements

Other conditional statements:

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

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Problems

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.”

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Problems

“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.”

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Problems

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.

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Problems

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.

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Problems

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.

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Problems

- 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

Dr. Premalatha H M

Department of Computer Applications

Premalatha.hm@pes.edu

+91 80 26721983 Extn 224