



Expressions rule logics Lecture 3

DR. Herlina Jayadianti., ST., MT

Proposition Review

- Proposition is a statement that have the value of truth : T or F or not T or F

- **Proposition Example:**

.....

.....

- **Not Proposition Example**

.....

.....

Exercise / QUIZ (20 minutes)

Write the truth table

1. $\neg(\neg A \wedge \neg B) \vee (A \wedge B)$
2. $A \vee (A \wedge \neg B)$
3. $((\neg A \vee (\neg B \wedge \neg A)) \vee (B \wedge A)) \vee (A \vee B)$
4. $(A \vee \neg B) \wedge (((\neg A \wedge B) \rightarrow \neg A) \wedge \neg B)$

Exercise / QUIZ (20 minutes)

Write the truth table

1. $\neg(\neg A \wedge \neg B) \vee (A \wedge B)$
2. $A \vee (A \wedge \neg B)$
3. $((\neg A \vee (\neg B \wedge \neg D)) \vee (B \wedge C)) \vee (A \vee B)$
4. $(A \vee \neg B) \wedge (((\neg A \wedge C) \rightarrow \neg A) \wedge \neg B)$

Exercise / QUIZ (20 minutes)

Write the truth table

1. $\neg(\neg A \wedge \neg B) \vee (C \wedge D)$
2. $A \vee (A \wedge \neg B)$
3. $((\neg A \vee (\neg B \wedge \neg D)) \vee (B \wedge C)) \vee (A \vee B)$
4. $(A \vee \neg B) \wedge (((\neg A \wedge C) \rightarrow \neg A) \wedge \neg B)$

Exercise / QUIZ (20 minutes)

Write the truth table

1. $\neg(\neg A \wedge \neg B) \vee (A \wedge B)$

2. $A \vee (A \wedge B)$

3. $A \vee A \wedge B$

4. $((\neg A \vee (\neg B \wedge A)) \vee (B \wedge A)) \vee (A \vee B)$


5. $(A \vee \neg B) \wedge (((\neg A \wedge B) \rightarrow \neg A) \wedge \neg B)$

Review - Logic Operator

Operator	Conventional notation	Zohar Manna* notation
“not”, OR “negation”	\neg	Not
“and”, OR “conjunction”	\wedge	And
“or” , OR “disjunction”	\vee	Or
“xor”, OR “exclusive or”	\oplus	
“implies”, OR “if ... then...”,	\rightarrow	If-then
“if and only if”,	\leftrightarrow	If-and-only-if
“if ... then ... else ...”	nothing	If-then-else

*) Manna, Z and Waldinger, R., 1985, “ *The logical basis for computer programming*”, Addison-Wesley Publishing Company.

Used of Logic Operator

Google 

Web Buku Gambar Berita Lainnya ▾ Alat penelusuran

Laman 2 dari sekitar 5.980.000 hasil (0,17 detik)

[Logika Matematika | Matematika Menyenangkan](#)
www.matematikamenyenangkan.com/logika-matematika/ ▾
26 Mar 2009 - Apakah **Logika** itu? Perhatikan ilustrasi berikut ini! Anda adalah seorang siswa SMK yang baru saja lulus sekolah dan langsung memulai ...

[Logika Informatika | Informatika](#)
informatika.web.id/category/logika-informatika ▾
14 Feb 2013 - Category Archives: **Logika Informatika** ... Logika adalah metode atau teknik yang diciptakan untuk meneliti ketepatan penalaran. Logika ...

[\[PDF\] MODUL LOGIKA MATEMATIKA](#)
navelmangelep.files.wordpress.com/2011/.../modul-logika-matematika.p... ▾
Modul **logika matematika** ini terdiri atas beberapa bagian Proses. Pembelajaran antara lain: 1. Pernyataan, Kalimat Terbuka, serta Ingkarannya. ➤ Pernyataan.

[ASAHI OTAK "Logika, Analisa, IQ, Matematika" | Facebook](#)
<https://www.facebook.com/Thinker.Family> ▾
... about this. Menumbuhkan pemikiran bahwa **Logika, Analisa, Matematika** adalah hal yang menyenangkan dan bermanfaat dalam peningkatan kreatifitas otak.

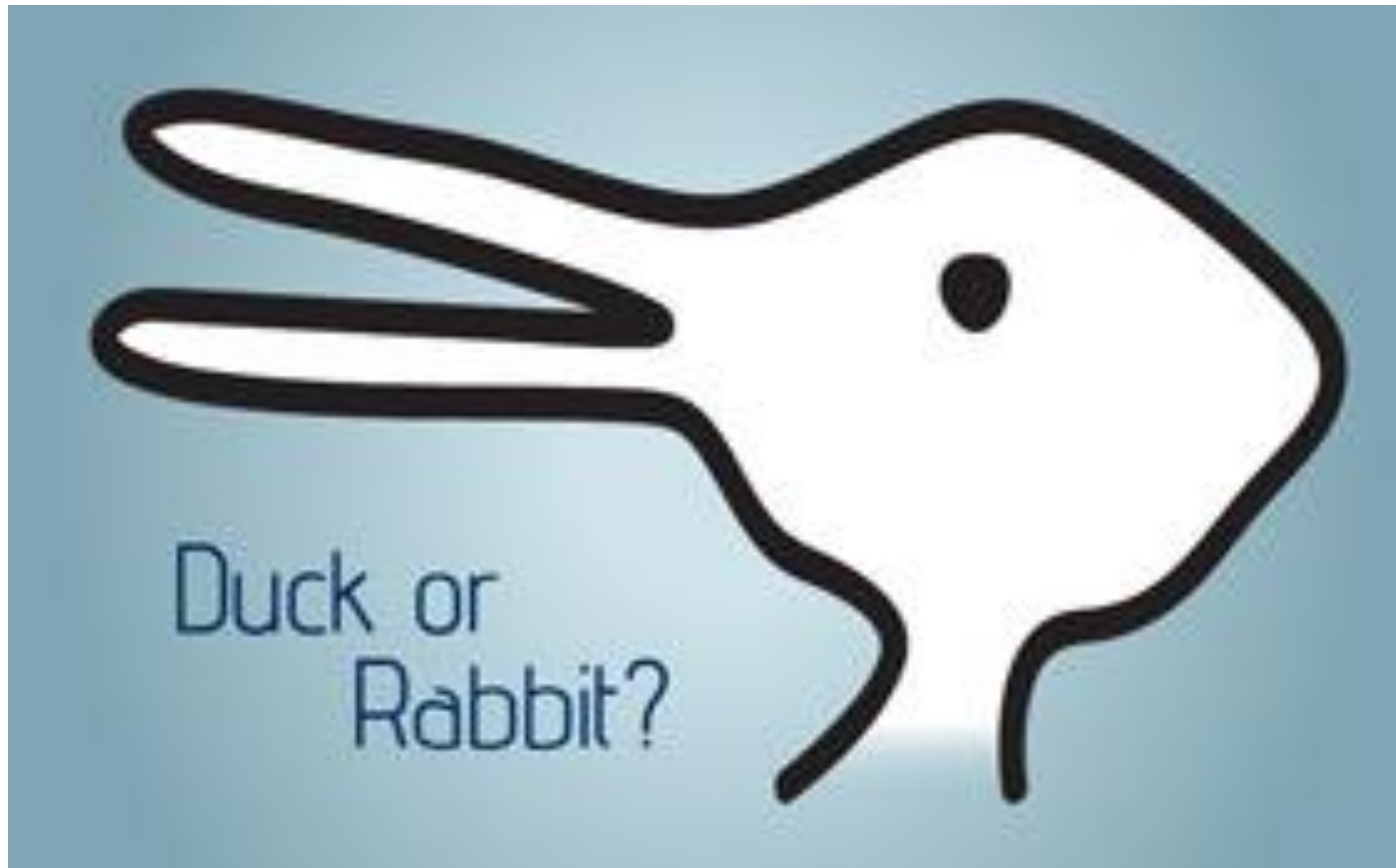
LOGIC INTERPRETATION



Referensi Rinaldi Munir

INTERPRETATION?

= PENAFSIRAN



Logic Interpretation

- *an interpretation is a compositional assignment of objects to parameters leading to a "possible" distribution of truth values among statements*

- Example:

If (A and B) then C

one of the interpretation logic :

A <- True

B <- False

C <- True

and the value of the example above is

..in Program

Function in Pascal Programming

```
function  
pass (UTS, UAS, Aktif:integer) :boolean;  
begin  
    pass := ((UTS>60 or UAS>60 ) and  
            (Aktif>70)) or ((UTS >40 and UAS>50)  
            and (Aktif  
end;
```

Determine the value of

- a. Pass (65,55,75)
- b. Pass (45,55,75)
- c. Pass (55,55,75)
- d. Pass (41,51,81)



```
function
  p(x,y,z:integer):boolean;
begin
  p := ( (x>60 or y>60 ) and
    (z>70) ) or ( (x >40 and y>50)
    and (z>80) )
end;
```

Ambiguity

If **Dewi Study hard** then **she pass the exam** and **she will get a gift**

A = Dewi Study Hard

B = Dewi Pass the exam

C = Dewi will get a gift

in Logic expresition if A then B and C

Interpretation

if A then B and C

(if A then B) and C

if A then (B and C)

Table of Truth

A	B	C	(if A then B) and C	if A then (B and C)
True	True	True	True	True
True	True	False	False	False
True	False	True	False	False
True	False	False	False	False
False	True	True	True	True
False	True	False	False	True
False	False	True	True	True
False	False	False	False	True

Ambiguity: The differences in interpretation lead to differences in the value of truth in the proposition (a compound proposition).

What is the result?

```
var
  x,y,z,hasil : integer;
begin
  x:=3;
  y:=4;
  z:=5;
  hasil:=6;
  if x>y then
    if y>z then
      hasil:=7
    else
      hasil:=8;
  writeln(hasil);
end;
```

*Terdapat 2 penafsiran
kepemilikan else*

- 1. else miliknya if $x > y$, karena terlihat dari indentasinya
Biasanya kita melihatnya dari sisi ini, sehingga hasilnya sepertinya bernilai 8*
- 2. else miliknya if $y > z$ karena berdasar aturan else milik if yang terdekat. Ini yang dilakukan komputer, sehingga hasilnya 6*

AMBIGUITY and The Solutions

- Ambiguity : The differences in interpretation lead to differences in the value of truth in the proposition (a compound proposition).
- Solution : using **Fully Parenthesized Expression**

Example: (in bhs Indonesia)

- *Jika tikus waspada dan bergerak cepat maka kucing atau anjing tidak mampu menangkapnya*

- Proposition:

A : Tikus waspada

B : Tikus bergerak cepat

C : Kucing mampu menangkap

D : Anjing mampu menangkap

if A and B then not C or not D

if (A and B) then not (C and D)

not (if (A or B) then C and D)

not (if (A and B) then (C or D))

not (if (A and B)) then (C or D)

Priority Operator

Number	Operator	Conventional notations	Zohar Manna* notation
1	“not”, OR “negasi”	\neg	Not
2	“and”, OR “konjungsi”	\wedge	And
3	“or” , OR “disjungsi”	\vee	Or
4	“xor”, OR “exclusive or”	\oplus	
5	“implies”, OR “if ... then...”,	\rightarrow	If-then
6	“if only if”,	\leftrightarrow	If-and-only-if

If you see more than one operator in the same hierarchy, then starting from the left

Logic Equivalen \equiv

- Two logical expression can be expressed equivalently when it has the same truth value.

- Example :

Dewi is pretty and kind

Dewi is kind and pretty

P = Dewi is pretty

Q = Dewi is kind

Then: P and $Q \equiv Q$ and P

P and Q equivalent with Q and P

Logic Equivalen \equiv

P	Q	P and Q	Q and P
T	T	T	T
T	F	F	F
F	T	F	F
F	F	F	F

$P \text{ and } Q \equiv Q \text{ and } P$

P and Q Equivalent with Q and P

P and Q Equal to Q and P

Logic Propotitional₁ - LAWS

Laws	Example
Identity laws	$A \text{ and True} \equiv A$ $A \text{ or False} \equiv A$
Dominiton laws	$A \text{ or True} \equiv \text{True}$ $A \text{ and False} \equiv \text{False}$
Law of contradiction	$A \text{ and not } A \equiv \text{False}$ $A \text{ or not } A \equiv \text{True}$
Idempoten law	$A \text{ and } A \equiv A$ $A \text{ or } A \equiv A$
Law of Double Negation	$\text{not} (\text{not } A) = A$

Logic Propotitional₂ - LAWS

Laws	Example
Commutative Laws	$A \text{ and } B \equiv B \text{ and } A$ $A \text{ or } B \equiv B \text{ or } A$
Associativity Laws	$(A \text{ and } B) \text{ and } C \equiv A \text{ and } (B \text{ and } C)$ $(A \text{ or } B) \text{ or } C \equiv A \text{ or } (B \text{ or } C)$
Distributivity Laws	$A \text{ and } (B \text{ or } C) \equiv (A \text{ and } B) \text{ or } (A \text{ and } C)$ $A \text{ or } (B \text{ and } C) \equiv (A \text{ or } B) \text{ and } (A \text{ or } C)$
Absorption	$A \text{ and } (A \text{ or } B) \equiv A$ $A \text{ or } (A \text{ and } B) \equiv A$
De Morgan	$\text{Not } (A \text{ and } B) \equiv \text{not } A \text{ or not } B$ $\text{Not } (A \text{ or } B) \equiv \text{not } A \text{ and not } B$

Exercise 1 *(in bahasa Indonesia)*

Change the sentences become a logical expression

- Jika saya tidak keliru, Dewi sudah diwisuda dan pacarnya atau orangtuanya berada di sampingnya
- Bowo membeli saham dan membeli properti untuk investasinya, atau dia dapat menanamkan uang di deposito bank dan menerima bunga uang.

Bowo membeli saham dan membeli properti untuk investasinya, atau dia dapat menanamkan uang di deposito bank dan menerima bunga uang.

- A : bowo membeli saham
- B : Bowo membeli properti
- C : Bowo menanamkan uang di bank
- D : Bowo memperoleh bunga bank

- (A and B) atau (C and D)
- X atau Y

Exercise 2

Inserting parentheses in logical expressions so there is no ambiguity

If A and B and C then D

answer : If ((A and B) and C) then D

If (A and (B and C)) then D

1. If ((A or B) or C) then not (D)
2. If (A or (B or C)) then not (D) asosiatif
3. If not (A and B) then not (C and D)
4. If not A or not B then not C or not D de morgan
5. If A then B **if and only if** if not C then not D
6. If A or B and C then A and B or C

1. If((A or B) or C) then not (D)
If(A or (B or C)) then not (D)
If(A or B) or (C then not (D))

1. If not (A and B) then (not (C and D))
2. If A then B if and only if if not C then not D
3. If A or B and C then A and B or C

Exercise 3

if the values of A and B are False, and the value of C and D are True, then lets find the truth value of the logical expression below:

1. *Not (A if and only If B) and (if not C then D)*
2. *If (not A and (B or not C) or (B if and only if A)) then (D and C)*
3. *(A or (if B then (C and not A))) if and only if (B or not D)*
4. *If (If A then (if not B then C) else (B and C)) then (A and not B) else (if B then not D)*

Exercise 4

Prove that the following logical expression is equivalent by using a truth table

- a) $\text{Not}(A) \text{ if and only if } B \equiv (\text{not}(A) \text{ or } B) \text{ and } (\text{not } (B) \text{ or } A)$
- b) $\text{If } A \text{ then } (\text{if not } A \text{ then } B) \equiv \text{True}$
- c) $\text{If } (A \text{ or not } B) \text{ then } C \equiv (\text{not } A \text{ and } B) \text{ or } C$
- d) $\text{If } A \text{ then } (\text{if } B \text{ then } C) \equiv \text{if } (\text{if } A \text{ then } B) \text{ then } C$
- e) $\text{If } A \text{ then } B \equiv \text{not } (A \text{ and not } B)$

Thank you
See you next week