MATEMATIKA DASAR
PENDIDIKAN BIOLOGI UPI

OLEH : UPI 0716

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2.1 PERNYATAAN

1. KELAPA TUMBUHAN MONOKOTIL.
2. ORIZA SATIVA TUMBUHAN BERAKAR TUNGGANG.
3. 18 HABIS DIBAGI 2
4. 2X + 15 = 45.

1,2 DAN 3 ADALAH CONTOH PERNYATAAN DAN 4 BUKAN PERNYATAAN, KARENA PERNYATAAN ADALAH:………………

2.2. INGKARAN (NEGASI) PERNYATAAN

NEGASI PERNYATAAN ADALAH SANGKALAN DARI PERNYATAAN YANG DIBERIKAN

NOTASI : ~

p : PREMIUM MENGANDUNG TIMBAL

~ p : Tidak benar bahwa PREMIUM MENGANDUNG TIMBAL

Bila nilai kebenaran p benar, maka nilai kebenaran ~ p salah. Sebaliknya bila p salah, maka ~ p benar.

2.3. PERNYATAAN MAJEMUK

PERNYATAAN MAJEMUK ADALAH DUA ATAU LEBIH PERNYATAAN TUNGGAL DIGABUNGKAN MENJADI SUATU

PERNYATAAN BARU YANG DIHUBUNGKAN OLEH KATA HUBUNG LOGIKA.

Kata hubung logika

Konjungsi (dan) dengan notasi "$\cap$ "

Disjungsi (atau) dengan notasi " $\cup$ "

Implikasi (jika..., maka...) dengan notasi " $\longrightarrow$ "

Biimplikasi (jika dan hanya jika) dengan notasi "$\longleftrightarrow$"

CONJUNGTION

$p \cap q$

Any two statements can be combined by the word"and" to form a composite statements which is called the conjunction of original statement. Symbolically, the conjunction of the two statements p and q is denoted by:

$$p \cap q$$

If p is true and q is true, then $p \cap q$ is true, otherwise $p \cap q$ is false

Example: (1) Bandung is in West-Java and 2 – 2 = 0

(2) Bandung is in Indonesia and 2 + 5 = 9

DISJUNGTION

$$p \cup q$$

Any two statements can be combined by the word"or"(in the sense of "and/or") to form a composite statements which is called the Disjunction of original statement. Symbolically, the conjunction of the two statements p and q is denoted by:

$$p \cup q$$

If p is true or q is true or p is true and q is true , then $p \cup q$ is true, otherwise $p \cup q$ is false

Example: (1) Padang is in West-Java and 2 – 2 = 0

(2) Bali is in Indonesia and 2 + 5 = 9

NEGATION

$\sim p$

Given any statemen p, another statement, called the negation of p, can be formed by writing"It is false that…"before p or, if possible, by inserting in p the word "not".

The negation of p is denoted by $\sim p$.

If p is true, then $\sim p$ is false; if p is false, then $\sim p$ is true

CONDITIONAL

$$p \rightarrow q$$

Many statemens are of the form “If p then q”.

Such statemens are called conditional statemens and are denoted by : $p \rightarrow q$

The conditional $p \rightarrow q$ is true unless p is true and q is False.

If Bandung is in Borneo then Medan is in Jawa (T).

If 2+9 = 18 then 18 x 2 = 36. (T).

If 9 : 3 = 3 then 3 + 3 = 9 (F)

BICONDITIONAL

$$p \leftrightarrow q$$

Another common statement is of the form “ p if and only if q” or , simply, “p iff q”.

Such statements are called biconditional statements and are denoted by

$$p \leftrightarrow q$$

If p and q have same truth value, then $p \leftrightarrow q$ is true; if p and q have opposite truth value, then $p \leftrightarrow q$ is false

TAUTOLOGIES AND CONTRADICTION

Definition: A proposition P(p,q,…) is a toutologies if P(p’,q’,…) is true for any statements p’,q’,….

Definition: A proposition P(p,q,…) is a CONTRADICTION if P(p’,q’,…) is false for any statements p’,q’,….

LOGICAL EQUIVALENCE

Two Propositions P(p,q,…) are said to be logically equivalent if their truth tables are identical. We denote the logical equivalence of P(p,q,…) and Q(p,q,…) by

$$P(p,q,\ldots) \equiv Q(p,q,\ldots)$$

Example

1. $(p \to q) \cap (q \to p) \equiv p \leftrightarrow q$
2. $p \to q \equiv \sim p \cup q$

ALGEBRA OF PROPOSITION

THEOREM		
1	$(p \cup q) \equiv p$	$(p \cap q) \equiv p$
2	$(p \cup q) \cup r \equiv p \cup (q \cup r)$	$(p \cap q) \cap r \equiv p \cap (q \cap r)$
3	$(p \cup q) \equiv q \cup p$	$(p \cap q) \equiv (q \cap p)$
4	$p \cup (q \cap r) \equiv (p \cup q) \cap (p \cup r)$	$p \cap (q \cup r) \equiv (p \cap q) \cup (p \cap r)$
5	$(p \cup f) \equiv p$	$(p \cap t) \equiv p$
6	$(p \cup t) \equiv t$	$(p \cap f) \equiv f$
7	$(p \cup \neg p) \equiv t$	$(p \cap \neg p) \equiv f$
8	$\neg\neg p \equiv p$	$\neg t \equiv f, \neg f \equiv t$
9	$\neg(p \cup q) \equiv \neg p \cap \neg q$	$\neg(p \cap q) \equiv \neg p \cup \neg q$

LOGICAL IMPLICATION

Definition:

A proposition P(p,q…) is said to *logically imply* a proposition Q (p,q,…) denoted by

P(p,q,…) $\longrightarrow$ Q(p,q,…)

1. $\neg P(p,q,\ldots) \vee Q(p,q,\ldots)$ Is a tautology or
2. $P(p,q,\ldots) \wedge \neg Q(p,q,\ldots)$ Is a contradiction or
3. $P(p,q,\ldots) \rightarrow Q(p,q,\ldots)$ Is a tautology

QUANTIFIERS

UNIVERSAL QUANTIFIER

Let p(x) be a propositional function on a set A. Then

$(\forall x \in A)(p(x)$ or $\forall_x p(x)$ or $\forall x, p(x)$

Is a statement which reads" For every element x in A, p(x) is a true statement" or, simply " For allx, p(x)".

Example

The proposition $(\forall n \in N)(n+4>3)$, where N is the set of natural numbers, is true since, $n+4>3$

EXISTENTIAL QUANTIFIER

Let p(x) be a propositional function on a set A. Then

$(\exists x \in A)\, p(x)$ or $\exists_x\, p(x)$ or $\exists x,\, p(x)$

Is a proposition which reads “there exists an x in A such that p(x) is a true statement” or, simply, “For some x, p(x)”

Example

The statement $(\exists n \in N)(n + 4 > 7)$ is true, since

$\{ n \mid n + 4 < 7 \} = \{ 1, 2 \}$