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Activity 1

p - I am learning maths.

q - I am happy

I am learning maths and I am happy.

P The sun is shining

q I am outside

$p \wedge q$ (p and q)

The sun is shining and I am outside.

$p \wedge -q$ (p and not q)

The sun is shining and I am not outside.

$-p \vee q$ (not p or q)

The sun is not shining or I am outside.

P I study 10 hours per week.

∴ q I pass the unit.

If I study 10 hours per week than I pass the unit.

I pass the unit if I studied 10 hours per week.

$q \rightarrow P$

If I pass the unit than I study 10 hours per week.

OR => v
and -> ∧

∴

$P \wedge R$

① If is cold and it is raining

② $q \vee \neg P$
If is windy or It is not cold

③ $\neg P \rightarrow S$
It is not cold if it is sunny

④ $\neg R \rightarrow (q \wedge \neg P)$

If it is not raining 'than'
It is windy and it is not cold.

$p \rightarrow q$ this means that if I study 10 hours per week than I pass the unit. It is a conditional statement that indicates that studing 10 hours per week is a sufficient condition for passing the unit.

$q \rightarrow p$ This statement means If I pass the unit, than I study 10 hours per week. It is a conditional statement.

Difference between $p \rightarrow q$ and $q \rightarrow p$

$p \rightarrow q$ is not equivalent $q \rightarrow p$

vedio example

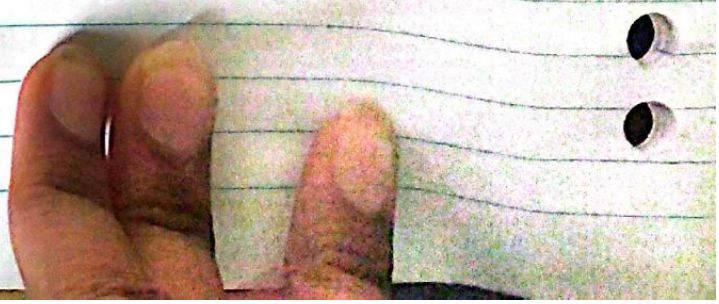
1. $p \vee s \wedge \neg q$
2. $s \wedge q \rightarrow \neg r$
3. $p \rightarrow (s \vee \neg r)$
4. $s \Leftrightarrow (q \wedge \neg r)$

Example

- p - it is cold
- q - it is windy
- r it is raining
- s - it is sunny

Translate the following Compound preposition into English phrase.

1. $p \wedge r$ - It is cold and raining
2. $q \vee \neg p$ - It is windy or not cold.
3. $\neg p \rightarrow s$ - if it is not cold than it is sunny.
4. $\neg r \rightarrow (q \wedge \neg p)$ - If it is not raining than it is windy and not sunny
5. $q \leftrightarrow \neg(s \vee r)$ - It is windy if and only if it neither sunny nor raining.
6. $[(p \vee q) \wedge \neg p] \rightarrow q$ - If it is either cold or windy but if not cold than it is windy.



Expreess the following in symbolic form.

1. It is cold or sunny $p \vee s$

(2) It is neither windy nor cold $\neg q \wedge \neg p$

(3) It is not cold or raining if it is not sunny. $\neg s \rightarrow (p \vee r)$

(4) It is not cold if and only if it is windy and not raining.

$$\neg p \Leftrightarrow (q \vee \neg r)$$

5) it is a typical melbourne weather

$$(p \vee q \vee r) \wedge (\neg p \vee \neg q \vee \neg r)$$

Truth table

Step 1: Find all the atomic propositions in the original statement and give them names:

p: You will receive pasta

q: You will receive sauce

r: You will receive cheese.

s: You will receive pizza.

Step 2: Expreess the original statement using propositional logic:

$(p \wedge (q \vee r)) \vee (s \wedge r)$

Steps: Apply the values of true or false to each atomic proposition base on the second statement and apply this to the original statement.

S = true (You receive pizza)

q = true (You receive sauce)

r = true (You receive cheese)

p = false (You donot receive pasta)

Substituting it.

$(p \wedge (q \vee r)) \vee (s \wedge r)$

(False $\wedge$ (true $\vee$ (true)) $\vee$ (true $\wedge$ true)

(false $\wedge$ true) $\vee$ (true $\wedge$ true)

false $\vee$ true

true.

Negation

P	$\neg P$
T	F
F	T

~~Congu~~

Conjunction

Truth table for 'p ∧ q'

- p ∧ q is only true when both p and q are true.

p	q	p ∧ q
T	T	T
T	F	F
F	T	F
F	F	F

Disjunction

Truth table for p ∨ q

- p ∨ q is only false when both p and q are false.

p	q	p ∨ q
T	T	T
T	F	T
F	T	T
F	F	F

Implication

Truth table for $p \rightarrow q$

p	q	$p \rightarrow q$
T	T	T
T	F	F
F	T	T
F	F	T

Exercise

Construct a truth table for the following statement

$p \wedge \neg p$

p	$\neg p$	$p \wedge \neg p$
0	1	0
1	0	0

Exercise 2

$P \wedge \neg q$

P	q	$\neg q$	$P \wedge \neg q$
0	0	1	0
0	1	0	0
1	0	1	1
0	1	1	0

$P \vee (q \wedge \neg P)$

P	q	$\neg P$	$q \wedge \neg P$	$P \vee (q \wedge \neg P)$
0	0	1	0	0
0	1	1	1	1
1	0	0	0	1
1	1	0	0	1