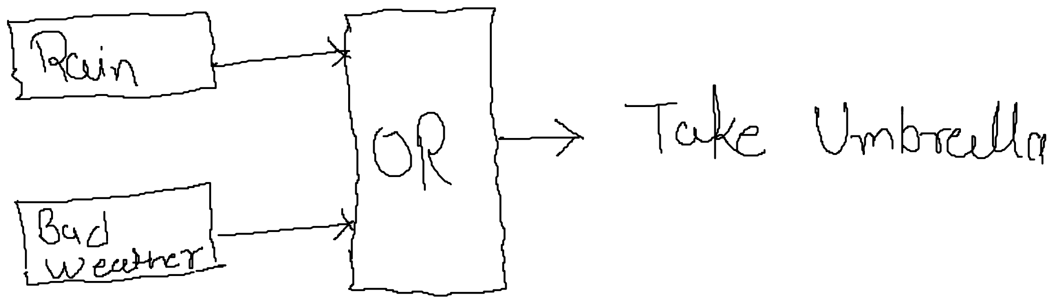
Boolean Algebra

Saturday, August 08, 2020
8:51 AM



R	W	U
F	F	F
T	F	T
F	T	T
T	T	T

BA-1.1

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AND

A	B	R
0	0	0
0	1	0
1	0	0
1	1	1

OR

A	B	R
0	0	0
0	1	1
1	0	1
1	1	1

NOT

A	R
0	1
1	0

$\neg$ NOT = Highest

$\wedge$ And

$\vee$ OR

BA-1.2 BA1.2

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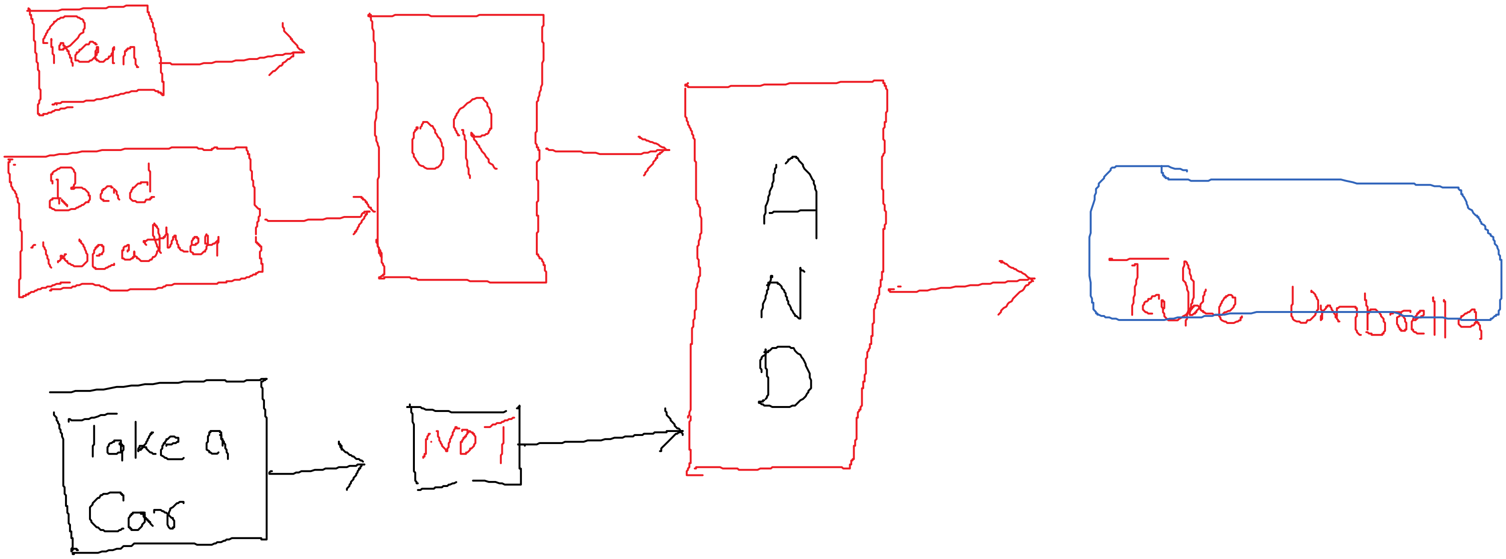


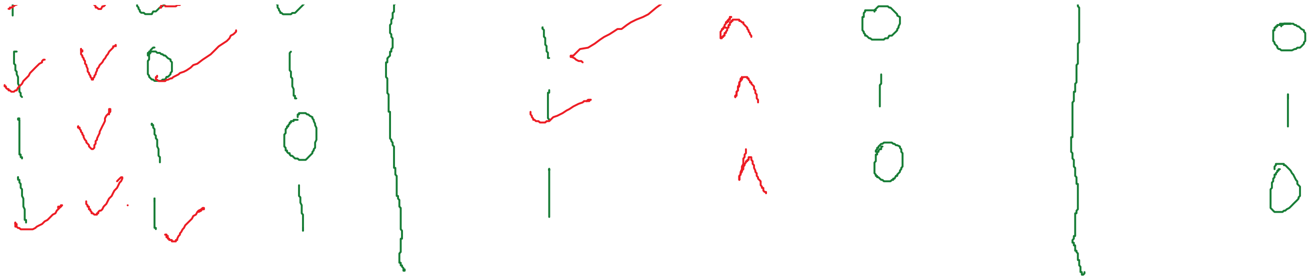
* If I don't take Car then I will take the Umbrella, If it Is Rain or weather forcast is bad.

Take Umbrella = [NOT (take Car) AND ((Bad Weather) OR (Rain))]

$$U = \underbrace{\neg C}_{x_2} \wedge \underbrace{(W \vee R)}_{x_1}$$

$\wedge$ = AND, $\vee$ = OR, $\neg$ = NOT

R		W	C	$x_1 = \boxed{R \vee W}$	$\wedge$	$x_2 = \neg C$	$U = x_1 \wedge x_2$
0	$\vee$	0	0	0	$\wedge$	1	0
0	+	0	1	0	$\wedge$	0	0
0	$\vee$	1	0	1	$\wedge$	1	1
0	+	1	1	1	$\wedge$	0	0
1	$\vee$	0	0	1	$\wedge$	1	1
1	$\vee$	0	1	1	$\wedge$	0	0



RULE

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$\neg(\neg A) = A$

$\boxed{A \wedge \neg A = 0}$ } NOT operator

$A \vee \neg A = 1$

$A = 1$

$\neg A = 0$

$1 \wedge 0 = 0$

$A \vee \neg A = 1 + 0 = 1$

Associative $(A \wedge B) \wedge C = A \wedge (B \wedge C)$

$(A \vee B) \vee C = A \vee (B \vee C)$

Commutative $A \wedge B = B \wedge A$

$A \vee B = B \vee A$

Distributive $A \wedge (B \vee C) = (A \wedge B) \vee (A \wedge C)$

$A \vee (B \wedge C) = (A \vee B) \wedge (A \vee C)$

de Morgan's theorem

$\neg(A \vee B) = \neg A \wedge \neg B$

$\neg(A \wedge B) = \neg A \vee \neg B$

Mathematical Induction

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Basic = Result is true for $n=0$ or 1

Induction Hypothesis = assume that result is True for = $n=k$

Induction Step = Prove that result is true for $n=k+1$

final step of Induction Step → Actual Proof

Prove the following series by Principal of M.I.

$$1+2+3+\ldots n = \frac{n(n+1)}{2}$$

Basic Let $n=1$

L.H.S = R.H.S.

$$1 = \frac{1(1+1)}{2}$$

$$1 = 1$$

Induction Hypothesis = We assume this result is true for $n=k$

$$1+2+3+\ldots k = \frac{k(k+1)}{2}$$

Induction Step:— we have to prove that the result is true for $n=(k+1)$

$$= \frac{(k+1)(k+1+1)}{2}$$

L.H.S

$= \frac{(k+1)(k+1+1)}{2}$

L.H.S. $= 1+2+3+ \dots k + k+1$

$\because k = \frac{k(k+1)}{2}$ from Hypothesis step

$\frac{k(k+1)}{2} + k+1$

$k(k+1) + 2k+1$

$k^2 + k + 2k + 1$

$\frac{k^2 + 3k + 2}{2}$

$\frac{(k+1)(k+2)}{2} = \frac{(k+1)(k+1+1)}{2}$

L.H.S. = R.H.S.