DISCRETE STRUCTURES – Assignment #2

Marasigan, Vem Aiensi A.
2-BSCS-2

1. **Illustrate De Morgan's Law in Boolean Algebra.**

   Based on what I know so far, De Morgan's Law works like this.

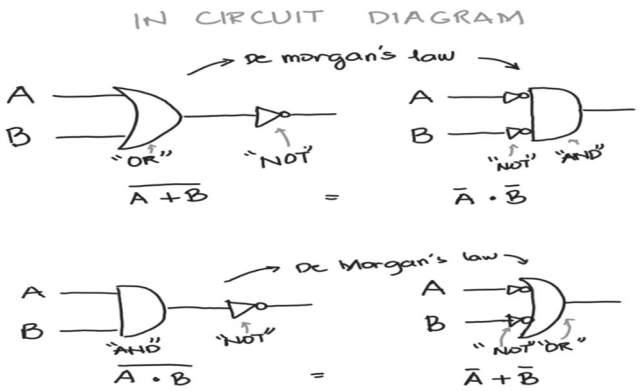
   for example we have: $\overline{A + B}$
   or in other forms it can look like: $\neg(A \vee B)$

   What De Morgan's Law do is that it simplifies the Boolean expression by distributing the negation to both variables and then change the OR (+, ∨) condition into an AND (·, ∧) condition, and vice versa.

   For example:
   $\overline{A + B} = \overline{A} \cdot \overline{B}$

   In the alternate writing
   $\neg(A \vee B) = \neg A \wedge \neg B$

   Same when: $\overline{A \cdot B} = \overline{A} + \overline{B}$
   $\neg(A \wedge B) = \neg A \vee \neg B$



As proof, here is the truth table : $\overline{A + B} = \overline{A} \cdot \overline{B}$ or $\neg(A \vee B) = \neg A \wedge \neg B$

A	B	A+B	$\overline{A + B}$	$\overline{A}$	$\overline{B}$	$\overline{A} \cdot \overline{B}$
A	B	A ∨ B	¬(A ∨ B)	¬A	¬B	¬A ∧ ¬B
1	1	1	0	0	0	0
1	0	1	0	0	1	0
0	1	1	0	1	0	0
0	0	0	1	1	1	1

Same as in : $\overline{A \cdot B} = \overline{A} + \overline{B}$ or $\neg(A \wedge B) = \neg A \vee \neg B$

A	B	A·B	$\overline{A \cdot B}$	$\overline{A}$	$\overline{B}$	$\overline{A} + \overline{B}$
A	B	A ∧ B	¬(A ∧ B)	¬A	¬B	¬A ∨ ¬B
1	1	1	0	0	0	0
1	0	0	1	0	1	1
0	1	0	1	1	0	1
0	0	0	1	1	1	1

We can notice that both results are the same.

2. **Cite real-life applications of Boolean Algebra**

As a common phenomenon these days of Online class, here is what I think that best describes the experience using Boolean Algebra.

This will show the relation of variables to be able to attend Final Exam

Considering this Boolean expression that I like: $I \cdot (L + C)$

The variables I, L, and C has these corresponding meaning

I = Internet
L = Laptop
C = Cellphone

I	L	C
1 Internet is available	**1** Laptop is working	**1** Cellphone is ready
1 Internet is available	**1** Laptop is working	**0** Low battery/No charge
1 Internet is available	**0** Laptop is broken	**1** Cellphone is ready
1 Internet is available	**0** Laptop is broken	**0** Low battery/No charge
0 No internet	**1** Laptop is working	**1** Cellphone is ready
0 No internet	**1** Laptop is working	**0** Low battery/No charge
0 No internet	**0** Laptop is broken	**1** Cellphone is ready
0 No internet	**0** Laptop is broken	**0** Low battery/No charge

L + C	$I \cdot (L + C)$
1 A device can be used	**1** Will be able to attend Exam
1 A device can be used	**1** Will be able to attend Exam
1 A device can be used	**1** Will be able to attend Exam
0 No device is available	**0** Won't be able to attend exam
1 A device can be used	**0** Won't be able to attend exam
1 A device can be used	**0** Won't be able to attend exam
1 A device can be used	**0** Won't be able to attend exam
0 No device is available	**0** Won't be able to attend exam

This concludes that you must have an **Internet Connection**, at least a **Laptop** or a Cellphone, or **both devices available** to be able to **attend the exam**, or else without having these requirements, you won't be able to attend the exam.