

HW 2 - John Akujobi - Updated

👤 Owner	👤 John Akujobi
📄 Type	Homework
🕒 Created time	@September 3, 2023 10:13 PM
📅 Due Date	@September 2, 2023 → September 6, 2023
🌟 Status	Done



Compiled using markdown with Notion
Schematics created using Circuitverse

A

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

B

A	B	C	Y
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	0

C

A	B	C	Y

0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1

For the above truth tables

1. For the above truth tables

a. Write in sigma notation

i. $A \rightarrow Y = \sum (1, 2, 3)$

ii. $B \rightarrow Y = \sum (1, 2, 3, 4, 6)$

iii. $C \rightarrow Y = \sum (1, 6, 7)$

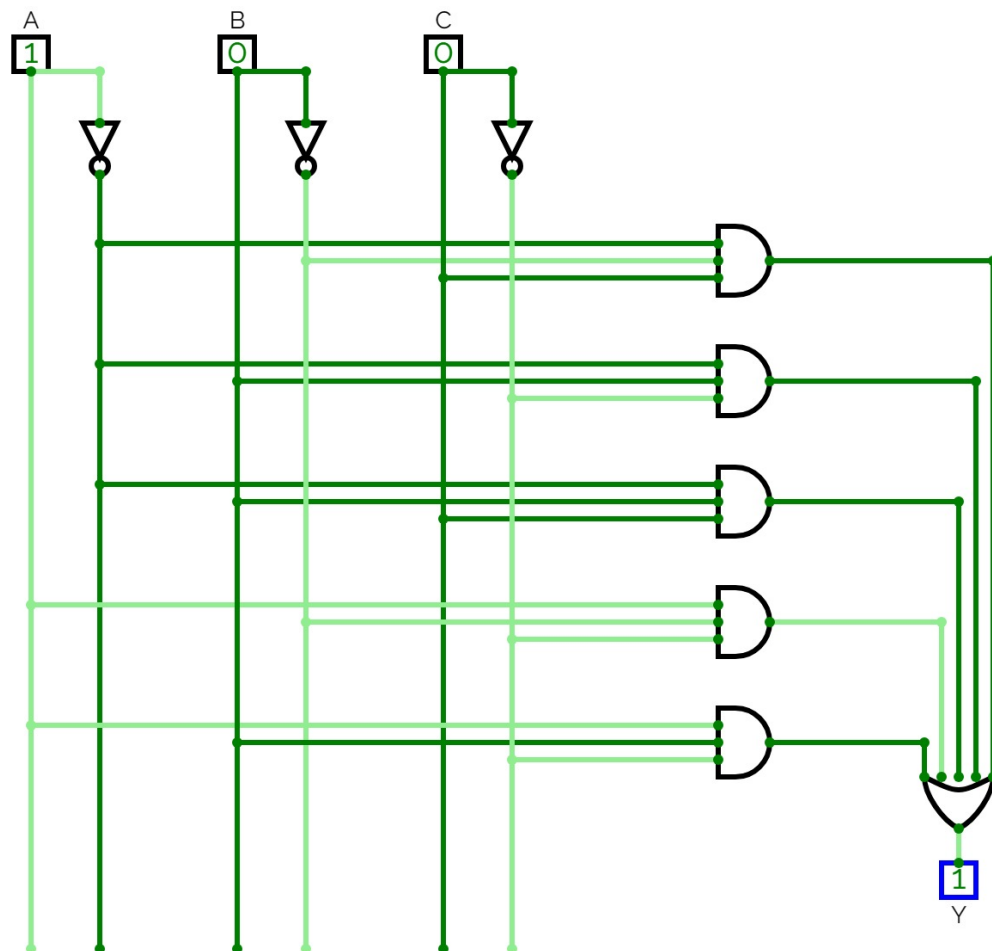
b. Write in canonical sum-of-products form

i. $A \rightarrow Y = A'B + AB' + AB$

ii. $B \rightarrow Y = A'.B'.C + A'.B.C' + A'.B.C + A.B'.C' + A.B.C'$

iii. $C \rightarrow Y = A'.B'.C + A.B.C' + A.B.C$

c. Draw the schematic for (b)



Schematic for B

2. For the above truth tables

a. Write in Pi notation

i. $A \rightarrow Y = \Pi(0)$

ii. $B \rightarrow Y = \Pi(0, 5, 7)$

iii. $C \rightarrow Y = \Pi(0, 2, 3, 4, 5)$

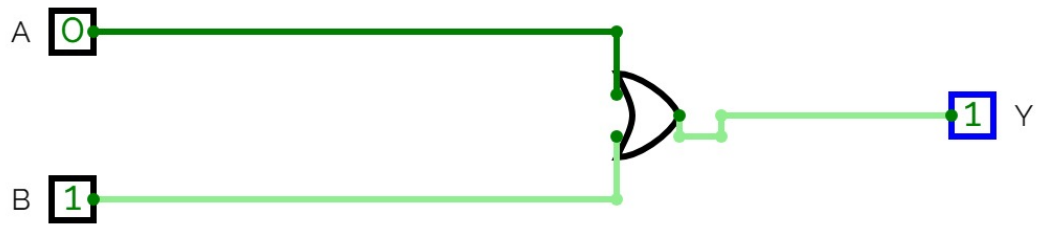
b. Write in the canonical product of sums form

i. $A \rightarrow Y = A+B$

ii. $B \rightarrow Y = (A+B+C) \cdot (A'+B+C') \cdot (A'+B'+C')$

iii. $C \rightarrow Y = (A+B+C) \cdot (A+B'+C) \cdot (A+B'+C') \cdot (A'+B+C) \cdot (A'+B+C')$

c. Draw the schematic for (a)



Schematic for A

3. For truth table c minimize using Boolean algebra theorems. Label each theorem/step used.

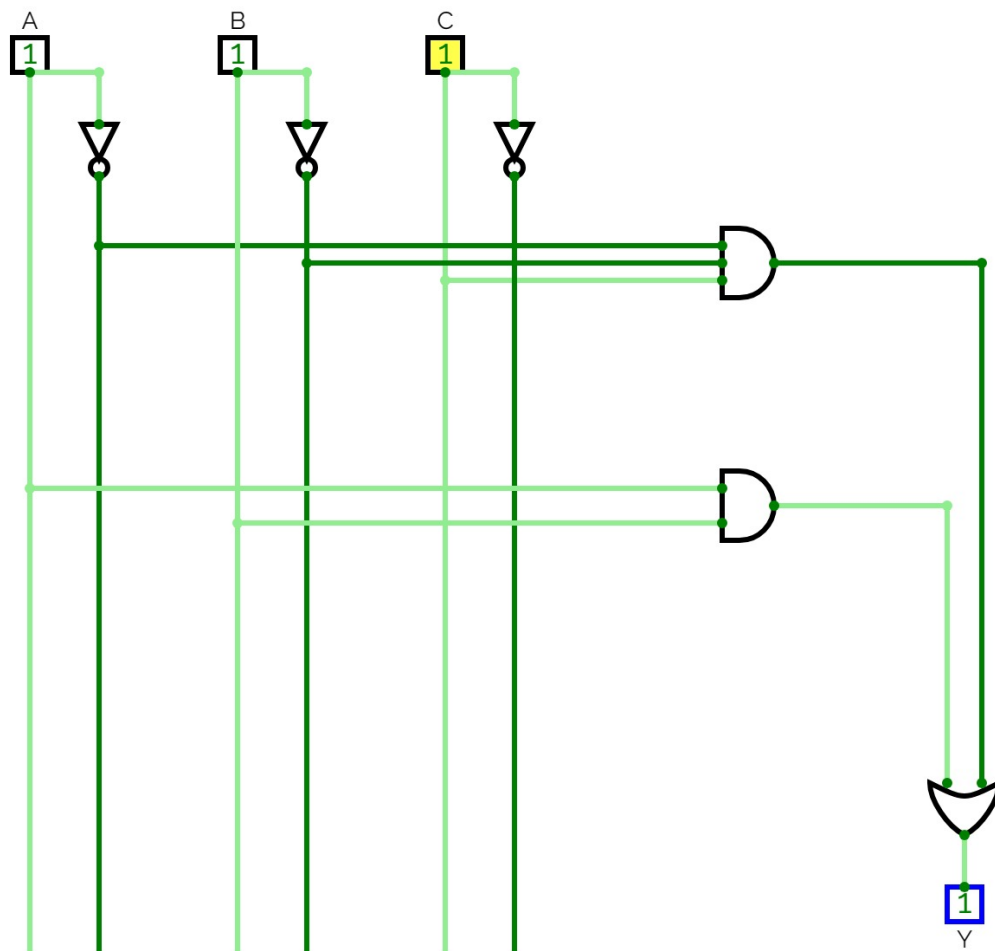
- $Y = A'.B'.C + A.B$

Group the terms with common factors:
 $Y = A'.B'.C + A.B.(C' + C)$

Identity law:
 $Y = A'.B'.C + A.B.(1)$

Simplify:
 $Y = A'.B'.C + A.B$

1. Draw the schematic

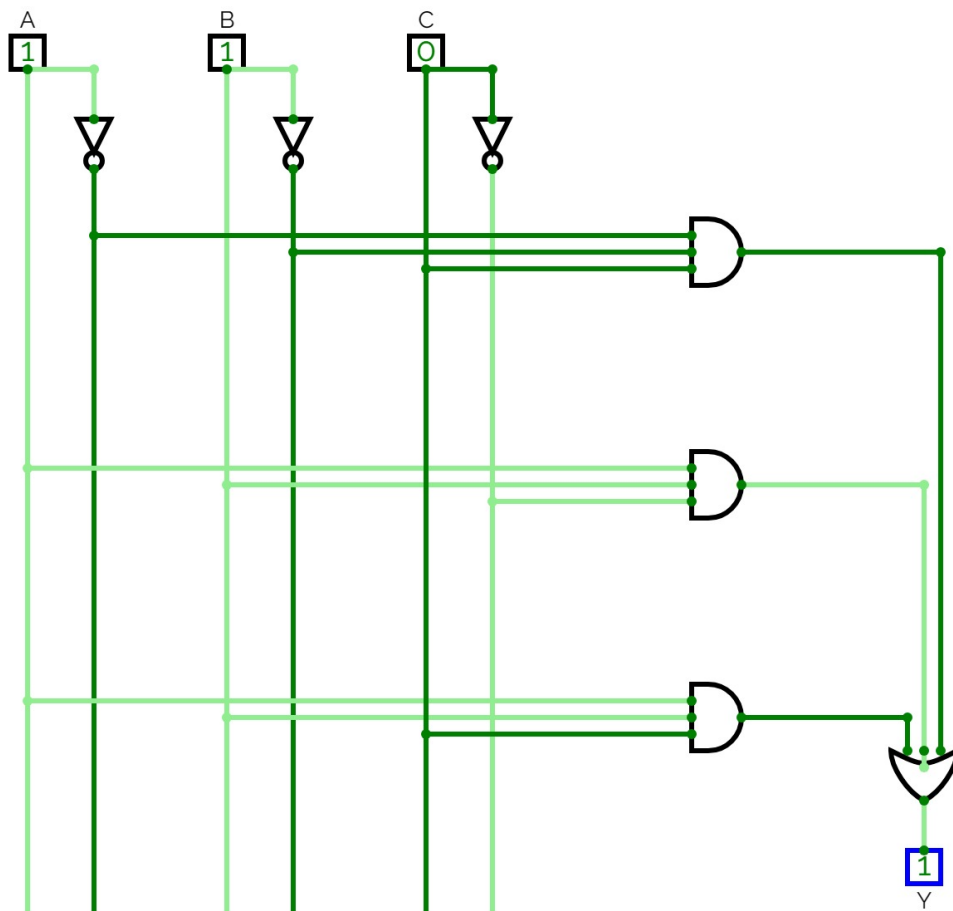


Minimized version of B

2. Compare the cost to the canonical form

a. Minimized form \Rightarrow 10

b. Original Canonical Form \Rightarrow 16



Canonical form

▼ A

A	B	Y	Min terms(SOP)	Max terms(POS)
0	0	0	$A'B'$	$A+B$
0	1	1	$A'B$	$A+B'$
1	0	1	AB'	$A'+B$
1	1	1	AB	$A'+B'$

Sigma Notation

- $Y = \sum (1, 2, 3)$
 - The rows that give $Y=1$

Canonical sum-of-products form

- $Y = A'B + AB' + AB$
 - These are the Min terms of the rows that give $Y=1$
 - And in the min terms, A is 0 while A' is 1

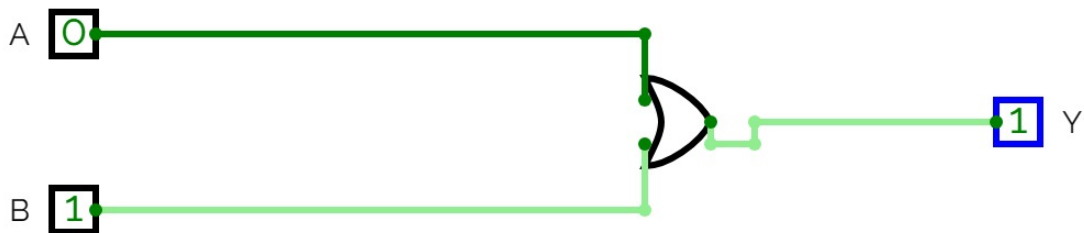
PI Notation

- $Y = \Pi(0)$
 - Since it's only the 0th row that gives $y=0$

Canonical Product of sums form

- $Y = A+B$
 - Max terms of the rows that give $Y=0$

Schematic Drawing



▼ B

A	B	C	Y	Min Terms	Max Terms
0	0	0	0	$A'.B'.C'$	$A+B+C$
0	0	1	1	$A'.B'.C$	$A+B+C'$
0	1	0	1	$A'.B.C'$	$A+B'+C$
0	1	1	1	$A'.B.C$	$A+B'+C'$
1	0	0	1	$A.B'.C'$	$A'+B+C$
1	0	1	0	$A.B'.C$	$A'+B+C'$
1	1	0	1	$A.B.C'$	$A'+B'+C$

1	1	1	0	A.B.C	A'+B'+C'
---	---	---	---	-------	----------

Sigma Notation

- $Y = \Sigma (1, 2, 3, 4, 6)$

Canonical sum-of-products form

- $Y = A' . B' . C + A' . B . C' + A' . B . C + A . B' . C' + A . B . C'$

PI Notation

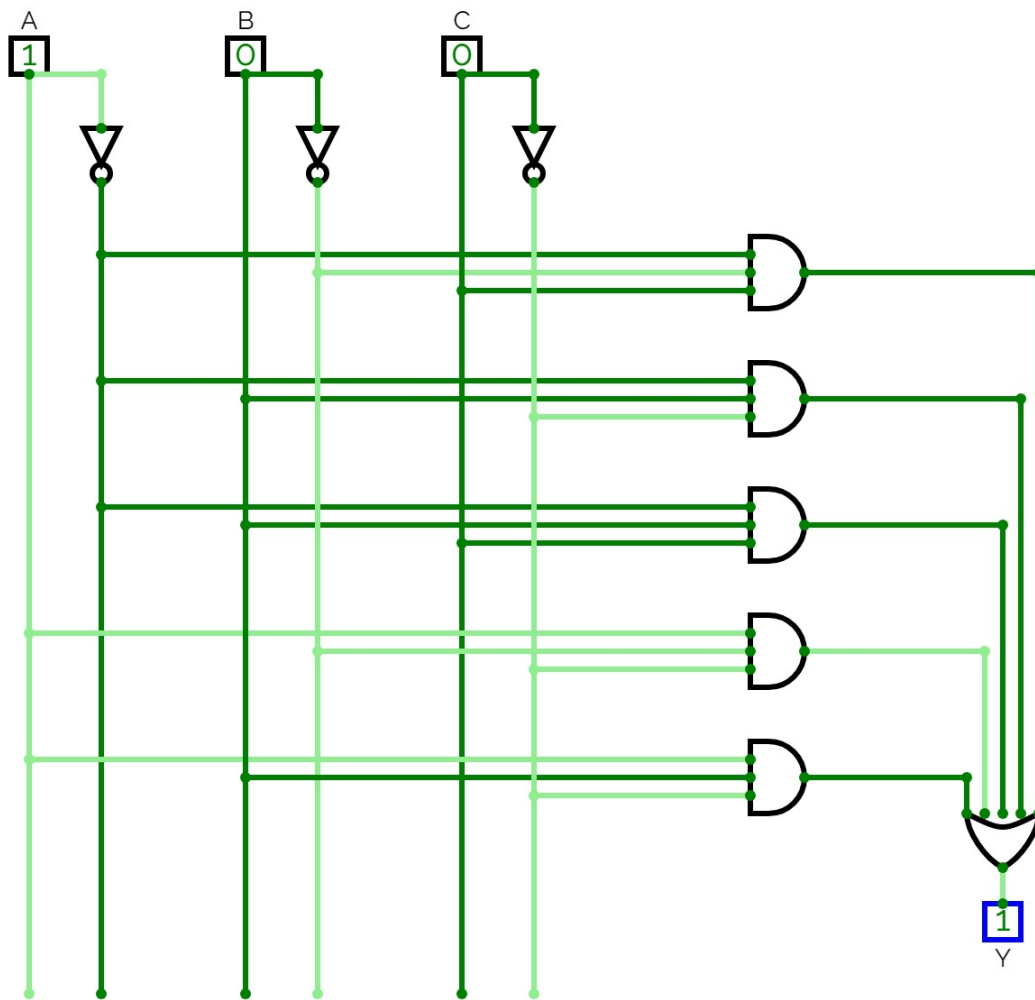
- $Y = \Pi(0, 5, 7)$

Canonical Product of sums form

- $Y = (A+B+C) . (A'+B+C') . (A'+B'+C')$

Schematic Drawing

B - Homework 1 - Digital Logic.cv



▼ C

A	B	C	Y	Min Terms	Max terms
0	0	0	0	$A'.B'.C'$	$A+B+C$
0	0	1	1	$A'.B'.C$	$A+B+C'$
0	1	0	0	$A'.B.C'$	$A+B'+C$
0	1	1	0	$A'.B.C$	$A+B'+C'$
1	0	0	0	$A.B'.C'$	$A'+B+C$
1	0	1	0	$A.B'.C$	$A'+B+C'$
1	1	0	1	$A.B.C'$	$A'+B'+C$

A	B	C	Y	Min Terms	Max terms
1	1	1	1	A.B.C	A'+B'+C'

Sigma Notation

- $Y = \Sigma (1, 6, 7)$

Canonical sum-of-products form

- $Y = A' . B' . C + A . B . C' + A . B . C$

PI Notation

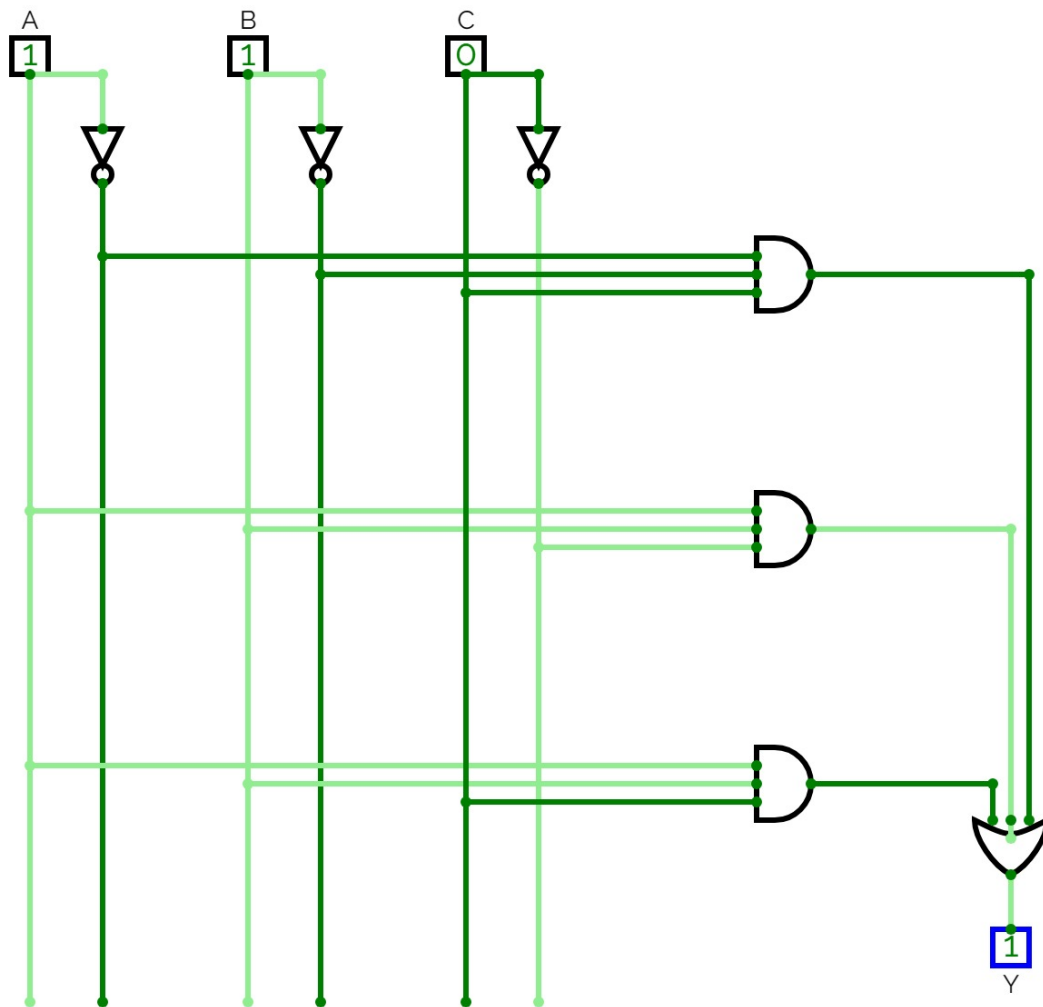
- $Y = \Pi (0, 2, 3, 4, 5)$

Canonical Product of sums form

- $Y = (A+B+C) . (A+B'+C) . (A+B'+C') . (A'+B+C) . (A'+B+C')$

Schematic Drawing

C - Digital Logic HW 1.cv



Minimized Boolean

- $Y = A'.B'.C + A.B$

Group the terms with common factors:

$$Y = A'.B'.C + A.B.(C' + C)$$

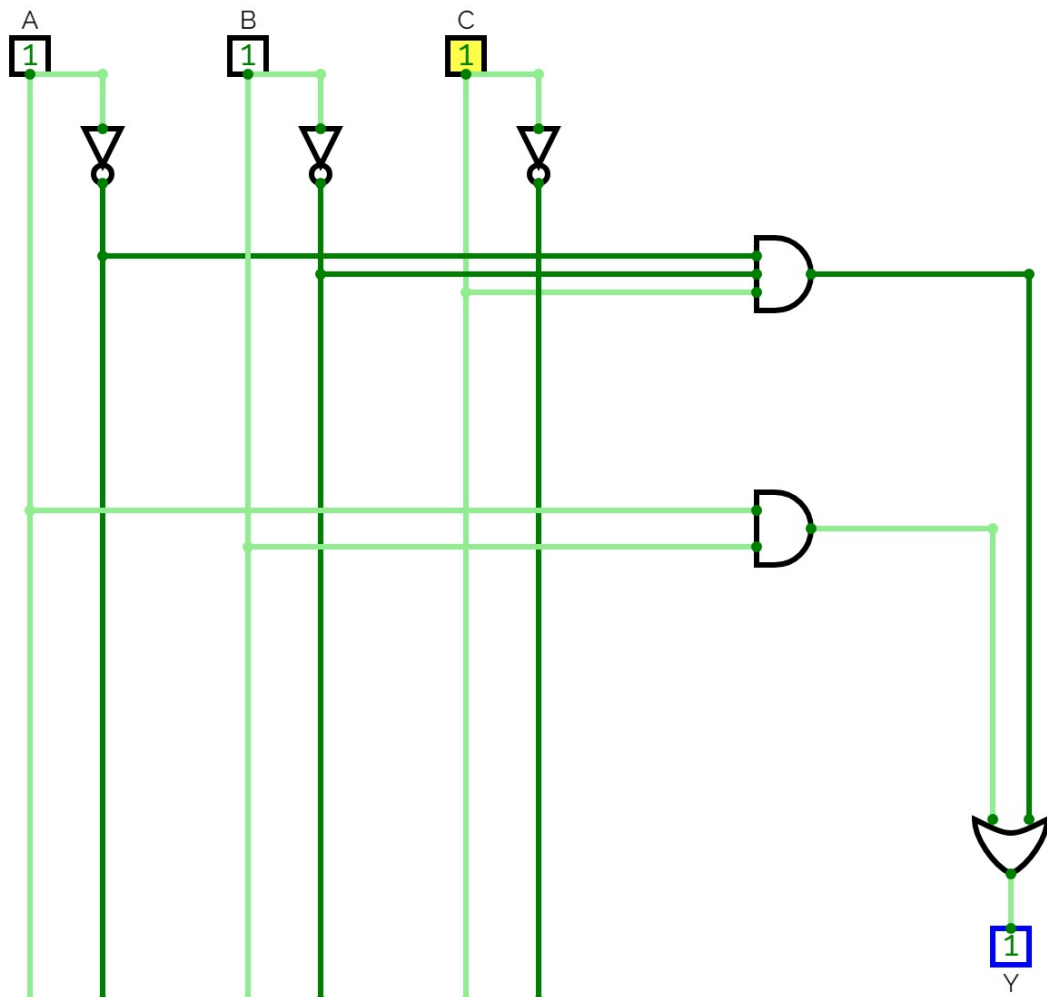
Identity law:

$$Y = A'.B'.C + A.B.(1)$$

Simplify:

$$Y = A'.B'.C + A.B$$

Minimized Boolean Schematic Diagram



Cost

- Original = 16
- Minimized Boolean Algebra = 10