Ex: Find the simplest Sum-Of-Products (SOP) form for the following Boolean expression.

$$A\overline{B} + C \oplus \left(\overline{A} + B\right)$$

SOL'N: We write the X-OR as an OR of two AND's.

$$A\overline{B} + \overline{C}(\overline{A} + B) + C(\overline{\overline{A} + B})$$

We apply De Morgan's theorem to the last term.

$$A\overline{B} + \overline{C}\overline{A} + \overline{C}B + CA\overline{B}$$

The first term makes the last term redundant.

$$A\overline{B} + \overline{C}\overline{A} + \overline{C}B$$

Put letters in alphabetical order in each term:

$$A\overline{B} + \overline{A}\overline{C} + B\overline{C}$$

Now we use the rule that $A = AB + A\overline{B}$, etc.

$$A\overline{B}C + A\overline{B}\overline{C} + \overline{A}B\overline{C} + \overline{A}\overline{B}\overline{C} + AB\overline{C} + \overline{A}B\overline{C}$$

Now we put the terms in order and eliminate duplicates.

$$\overline{A}\overline{B}\overline{C} + \overline{A}B\overline{C} + A\overline{B}\overline{C} + A\overline{B}C + AB\overline{C}$$

Now we use $A = AB + A\overline{B}$, etc., in reverse.

$$\overline{C} + A\overline{B}$$

An alternative is to use a truth table:

A	B	C	$A\overline{B}$	$\overline{A} + B$	$C \oplus (\overline{A} + B)$	$A\overline{B} + C \oplus \left(\overline{A} + B\right)$
0	0	0	0	1	1	1
0	0	1	0	1	0	0
0	1	0	0	1	1	1
0	1	1	0	1	0	0
1	0	0	1	0	0	1
1	0	1	1	0	1	1
1	1	0	0	1	1	1
1	1	1	0	1	0	0

From the truth table, we see that our previous answer is optimal.

$$\overline{C} + A\overline{B}$$