- The minterm list contains the numbers of the rows of the truth table for which the output $Q = 1$ and represents a Sum of Products of canonical form.

- The Maxterm list contains the numbers of the rows of the truth table for which the output $Q = 0$ and represents a Product of Sums of canonical form.

- The Principle of Duality states that the dual of a function is obtained by exchanging operators and identity elements, that is exchange $+$ for . and A for $\overline{A}$.

A truth table for n literals contains 2^n rows. We need a more compact format.

n	A	B	C	Q
0	0	0	0	1
1	0	0	1	0
2	0	1	0	1
3	0	1	1	0
4	1	0	0	1
5	1	0	1	0
6	1	1	0	0
7	1	1	1	1

The minterm list is then the list of the numbers of the canonical product terms for which the output is $Q = 1$.

n	A	B	C	Q
0	0	0	0	1
1	0	0	1	0
2	0	1	0	1
3	0	1	1	0
4	1	0	0	1
5	1	0	1	0
6	1	1	0	0
7	1	1	1	1

Minterm list:

$$\begin{aligned} f(ABC) &= m_0 + m_2 + m_4 + m_7 \\ &= \Sigma m(0, 2, 4, 7) \end{aligned}$$

n	A	B	C	$\overline{A}$	$+$	$\overline{B}$	$+$	$\overline{C}$	Q
0	0	0	0	1		1		1	1
1	0	0	1	1		1		0	0
2	0	1	0	1		0		1	0
3	0	1	1	1		0		0	1
4	1	0	0	0		1		1	0
5	1	0	1	0		1		0	1
6	1	1	0	0		0		1	0
7	1	1	1	0		0		0	0

Minterm list (Sum of Products) is:

$$f(ABC) = \Sigma m(0, 3, 5)$$

and the Maxterm list (Product of Sums) is:

$$f(ABC) = \Pi M(1, 2, 4, 6, 7)$$

Use DeMorgan's theorem to convert from minterm to Maxterm.

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

So that we then obtain the expression for the terms in the truth table for which the output is 0.

A noncanonical expression:

$$Q = A.B + \overline{A}.B.\overline{C}$$

is expanded by using the identities:

$$A + \overline{A} = 1 \quad \text{and} \quad A.\overline{A} = 0$$

$$\begin{aligned} Q &= A.B.1 + \overline{A}.B.\overline{C} \\ &= A.B.(C + \overline{C}) + \overline{A}.B.\overline{C} \\ &= A.B.C + A.B.\overline{C} + \overline{A}.B.\overline{C} \\ &= \Sigma m(7,6,2) = \Sigma m(2,6,7) \end{aligned}$$

Similarly a Product of Sums could be expanded:

$$
\begin{aligned}
Q &= (A+B)(\overline{A}+C) \\
&= (A+B+0)(\overline{A}+0+C) \\
&= (A+B+C.\overline{C})(\overline{A}+B.\overline{B}+C) \\
&= (A+B+C)(A+B+\overline{C}) \\
&\quad (\overline{A}+B+C)(\overline{A}+\overline{B}+C)
\end{aligned}
$$

where the expansion:

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

is obtained by the application
of P2 of Unit 9.

n	A	B	C	$\overline{A}$	$+$	$\overline{B}$	$+$	$\overline{C}$	Q
0	0	0	0	1		1		1	0
1	0	0	1	1		1		0	0
2	0	1	0	1		0		1	1
3	0	1	1	1		0		0	1
4	1	0	0	0		1		1	0
5	1	0	1	0		1		0	1
6	1	1	0	0		0		1	0
7	1	1	1	0		0		0	1

The Maxterm list is obtained from the sum terms in the Boolean product of sums and the table

$$\begin{aligned} Q &= (A+B+C)(A+B+\overline{C}) \\ &\quad (\overline{A}+B+C)(\overline{A}+\overline{B}+C) \\ &= \Pi M(0,1,4,6) \end{aligned}$$