Logic gates (`DGTL_gates_1.sqproj`)

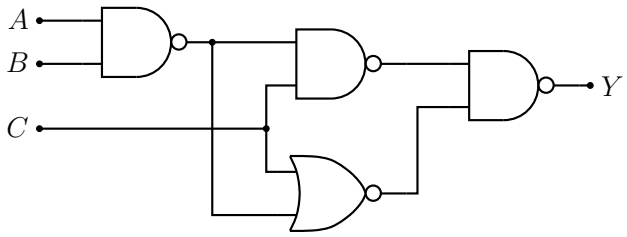

Figure 1: Logic circuit example.

Question: For the circuit shown in Fig. 1, find a logical expression for Y, and construct its truth table.

Solution:

We have $X_2 = \overline{X_1 C}$, $X_3 = \overline{X_1 + C}$ (see Fig. 2).

$\rightarrow Y = \overline{X_2 X_3} = \overline{\overline{X_1 C} \cdot \overline{X_1 + C}} = X_1 C + (X_1 + C)$, using De Morgan's theorem.

Using the identity $A + A\,B = A$, we get

$Y = (X_1 + X_1\,C) + (C + X_1\,C) = X_1 + C = \overline{A\,B} + C = \overline{A} + \overline{B} + C.$

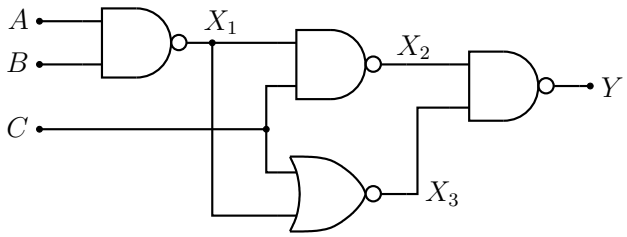

Figure 2: Logic circuit of Fig. 1, redrawn with additional variables shown.

From the above expression, we can construct the truth table for Y as given below.

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

SequelApp Exercises: For the circuit shown in Fig. 3, find a logical expression for Y, and construct its truth table.

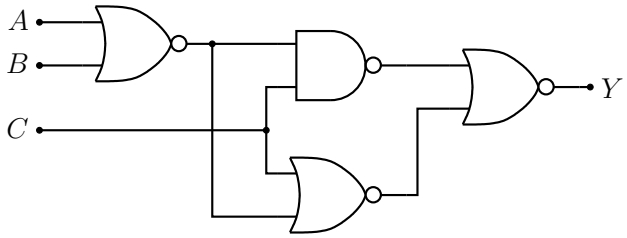

Figure 3: Logic circuit example.

Verify your answers using SequelApp.