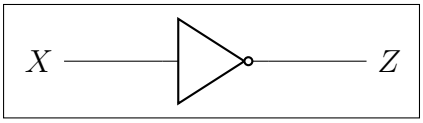
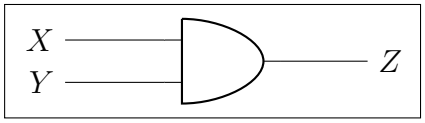
Logic Gates

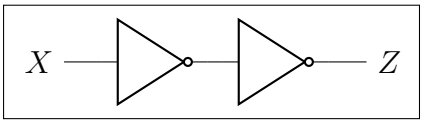
i. State the output of the following logical expression if $X = 0$ and $Y = 1$:

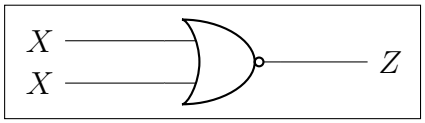
- $X \cdot Y$
- $X + Y$
- $\overline{X}$
- $X \cdot X$
- $\overline{Y \cdot X}$
- $X \oplus Y$
- $Y + Y$
- $X + (Y \cdot X)$
- $\overline{\overline{Y}}$
- $X \oplus \overline{Y}$
- $\overline{X} \cdot Y$
- $\overline{X \oplus Y}$

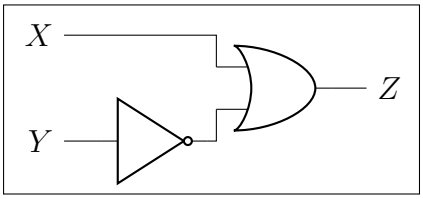
ii. State the output value (from Z) of the following logical circuits if $X =$ `true` and $Y =$ `false`:

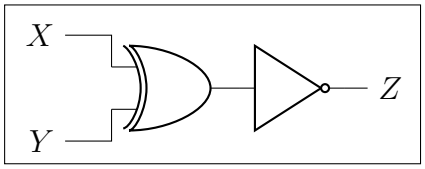


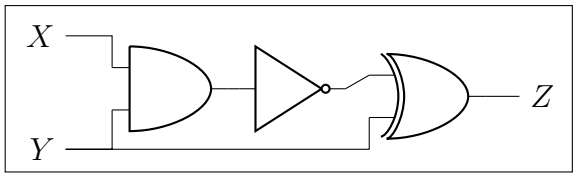












iii. A car manufacturer is constructing the logic circuit that controls the alarm system on their new model of car. The system has three inputs (from a external sensor, an alarm deactivation button and the central locking system) and one output (to the alarm itself). The circuit needs to sound the alarm if the sensor detects movement, the central locking system is activated and the deactivation button is OFF. Construct a logic gate diagram to solve this problem.