Karnaugh Map Exercise NAND Gate Answers

1.

Result from K Map simplification

$Z = C + B$

$Z = \overline{\overline{C} + \overline{B}}$ Put double NOT over expression

$Z = \overline{\overline{C} \;.\; \overline{B}}$ Change the sign and break the bar

2.

Result from K Map simplification

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

$Z = \overline{B} + \overline{\overline{(A.C)}}$ Put double NOT over right hand subexpression (no need to change sign)

$Z = \overline{\overline{B} + \overline{\overline{(A.C)}}}$ Now put double NOT over entire expression

$Z = \overline{\overline{B} \;.\; \overline{\overline{(A.C)}}}$ Change the sign and break the bar

$Z = \overline{B \;.\; \overline{(A.C)}}$ You can cancel out some (not always all) of the double NOTs

3.

Result from K Map simplification

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

$Z = \overline{\overline{C.A}} + \overline{\overline{C.B}} + \overline{\overline{\overline{A}.\overline{B}.\overline{C}}}$ Put double NOT over each subexpression. With the last subexpression, put a double NOT over the first two variables, and then another double NOT over the whole subexpression. In each subexpression there is not need to change the signs.

$Z = \overline{\overline{C.A} + \overline{C.B}} + \overline{\overline{\overline{A}.\overline{B}.\overline{C}}}$ Put a double NOT over the first two subexpressions.

$Z = \overline{\overline{C.A} \;.\; \overline{C.B}} + \overline{\overline{\overline{A}.\overline{B}.\overline{C}}}$ Deal with the first two subexpressions. Change the sign and break the bar

$Z = \overline{\overline{C.A} \;.\; \overline{C.B}} + \overline{\overline{\overline{A}.\overline{B}.\overline{C}}}$ Now put a double NOT over the whole expression

$Z = \overline{C.A} \;.\; \overline{C.B} \;.\; \overline{A.B.C}$ Deal with the whole expression. Change the sign and break the bar

$Z = \overline{C.A} \;.\; \overline{C.B} \;.\; \overline{A.B.C}$ Cancel out some, but not all, of the double NOTs.

4.

Result from K Map simplification

$Z = C.\overline{D} + \overline{A}.D$

$Z = \overline{\overline{C.D}} + \overline{\overline{A.D}}$ Put a double NOT over each subexpression. (No need to change the sign)

$Z = \overline{\overline{C.D} + \overline{A.D}}$ Put a double NOT over the whole expression

$Z = \overline{\overline{C.D}} \;.\; \overline{\overline{A.D}}$ Change the sign and break the bar

$Z = \overline{\overline{C.D}} \;.\; \overline{\overline{A.D}}$ Cancel out some of the double NOTs

5.

Result from K Map simplification

$Z = C + D$

$Z = \overline{\overline{C + D}}$ Put a double NOT over the expression

$Z = \overline{\overline{C}} \;.\; \overline{\overline{D}}$ Break the bar and change the sign

6.

Result from K Map simplification

$Z = \overline{D} + B$

$Z = \overline{\overline{D} + B}$ Put a double NOT over the expression

$Z = \overline{\overline{D}} \;.\; \overline{B}$ Break the bar and change the sign

$Z = \overline{\overline{D} \;.\; \overline{B}}$ Cancel out the double NOT