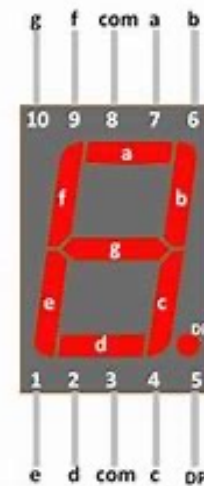


# Truth Table

Truth table

States	Inputs			Name	Outputs						
	A	B	C		a	b	c	d	e	f	g
0	0	0	0	B	1	1	1	1	1	1	1
1	0	0	1	E	1	0	0	1	1	1	1
2	0	1	0	R	1	1	1	0	1	1	1
3	0	1	1	R	1	1	1	0	1	1	1
4	1	0	0	Y	0	1	1	1	0	1	1
5	1	0	1	C	1	0	0	1	1	1	0
6	1	1	0	H	0	1	1	0	1	1	1
7	1	1	1	R	1	1	1	0	1	1	1



# Simplification

$$F_a(A, B, C) = (4, 6)$$

$$F_a = \bar{A}\bar{B}\bar{C} + \bar{A}\bar{B}C + \bar{A}B\bar{C} + \bar{A}BC + A\bar{B}\bar{C} + ABC$$
$$= \bar{A}B\bar{C}(\bar{C}+C) + \bar{A}B\bar{C}(\bar{C}+C) + AC(\bar{B}+B)$$

$$\bar{A}\bar{B} + \bar{A}B + AC$$

$$\bar{A}(\bar{B}+B) + AC$$

$$\bar{A} + AC = \bar{A} + C$$

$$\underline{\underline{F_a = \bar{A} + C}}$$

$$F_b(A, B, C) = (1, 5) =$$

$$F_b = \bar{A}\bar{B}\bar{C} + \bar{A}\bar{B}C + \bar{A}B\bar{C} + A\bar{B}\bar{C} + A\bar{B}C + ABC$$

$$= \bar{A}\bar{C}(\bar{B}+B) + BC(\bar{A}+A) + A\bar{C}(\bar{B}+B)$$

$$= \bar{A}\bar{C} + BC + A\bar{C}$$

$$= \bar{C}(\bar{A}+A) + BC = \bar{C} + BC$$

$$\underline{\underline{F_b = \bar{C} + B = F_c}}$$

$$F_d(A, B, C) = (2, 3, 7) =$$

$$F_d = \bar{A}\bar{B}\bar{C} + \bar{A}\bar{B}C + A\bar{B}\bar{C} + A\bar{B}C$$

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

$$= \bar{A}\bar{B} + A\bar{B}$$

$$= \bar{B}(\bar{A}+A)$$

$$\underline{\underline{F_d = \bar{B}}}$$

$$F_e(A, B, C) = (4)$$

$$\begin{aligned} F_e &= \bar{A}\bar{B}\bar{C} + \bar{A}\bar{B}C + \bar{A}B\bar{C} + \bar{A}BC + A\bar{B}\bar{C} + A\bar{B}C + AB\bar{C} + ABC \\ &= \bar{A}\bar{B}(\bar{C}+C) + \bar{A}B(\bar{C}+C) + A\bar{B}(\bar{C}+C) + AC(\bar{B}+B) \\ &= \bar{A}\bar{B} + \bar{A}B + AB + AC \\ &= \bar{A}(\bar{B}+B) + B(\bar{A}+A) + AC \\ &= \bar{A} + B + AC = B + \bar{A} + C \\ F_e &= \underline{\underline{\bar{A} + B + C}} \end{aligned}$$

$$F_f(A, B, C) =$$

$$\begin{aligned} F_f &= \bar{A}\bar{B}\bar{C} + \bar{A}\bar{B}C + \bar{A}B\bar{C} + \bar{A}BC + A\bar{B}\bar{C} + A\bar{B}C \\ &\quad + AB\bar{C} + ABC \\ &= \bar{A}\bar{B}(\bar{C}+C) + \bar{A}B(\bar{C}+C) + A\bar{B}(\bar{C}+C) + \\ &\quad AB(\bar{C}+C) \\ &= \bar{A}\bar{B} + \bar{A}B + A\bar{B} + AB \\ &= \bar{A}(\bar{B}+B) + A(\bar{B}+B) \\ &\quad \bar{A} + A = 1 \\ F_f &= \underline{\underline{1}} \end{aligned}$$

$$F_g(A, B, C) = (5)$$

$$\begin{aligned} F_g &= \bar{A}\bar{B}\bar{C} + \bar{A}\bar{B}C + \bar{A}B\bar{C} + \bar{A}BC + A\bar{B}\bar{C} \\ &\quad + A\bar{B}C + ABC \\ &= \bar{A}\bar{B}(\bar{C}+C) + \bar{A}B(\bar{C}+C) + A\bar{B}(\bar{C}+C) \\ &\quad + ABC(\bar{C}+C) \\ &= \bar{A}\bar{B} + \bar{A}B + A\bar{B} + AB \\ &\quad \bar{A}(\bar{B}+B) + A\bar{B} + B(\bar{A}+A) \\ &\quad \bar{A} + AC + B \\ &\quad \bar{A} + \bar{C} + B \\ F_g &= \underline{\underline{\bar{A} + B + C}} \end{aligned}$$

# K-maps

$F_a =$

$AB \backslash c$	0	1
00	1	1
01	1	1
11	0	1
10	0	1

$= \bar{A} + C$

$F_b =$

$AB \backslash c$	0	1
00	1	0
01	1	1
11	1	1
10	1	0

$= \bar{C} + B$

$F_c =$

$AB \backslash c$	0	1
00	1	0
01	1	1
11	1	1
10	1	0

$F_c = F_b = \bar{C} + B$

$F_d =$

$AB \backslash c$	0	1
00	1	1
01	0	0
11	0	0
10	1	1

$F_d = B$

$$F_d = \begin{array}{c|cc} AB \backslash C & 0 & 1 \\ \hline 00 & 1 & 1 \\ 01 & 0 & 0 \\ 11 & 0 & 0 \\ 10 & 1 & 1 \end{array}$$

$$F_d = B$$

$$F_e = \begin{array}{c|cc} AB \backslash C & 0 & 1 \\ \hline 00 & 1 & 1 \\ 01 & 1 & 1 \\ 11 & 1 & 1 \\ 10 & 0 & 1 \end{array}$$

$$= C + B + \bar{A}$$

$$F_e = \bar{A} + B + C$$

$$F_f = \begin{array}{c|cc} AB \backslash C & 0 & 1 \\ \hline 00 & 1 & 1 \\ 01 & 1 & 1 \\ 11 & 1 & 1 \\ 10 & 1 & 1 \end{array}$$

$$F_f = 1$$

$$F_g = \begin{array}{c|cc} AB \backslash C & 0 & 1 \\ \hline 00 & 1 & 1 \\ 01 & 1 & 1 \\ 11 & 1 & 1 \\ 10 & 0 & 0 \end{array}$$

$$= \bar{C} + B + \bar{A}$$

$$F_g = \bar{A} + B + \bar{C}$$

# Boolean Expressions

$$F_a = \bar{A} + C$$

$$F_b = \bar{C} + B$$

$$F_c = \bar{C} + B$$

$$F_d = B$$

$$F_e = \bar{A} + B + C$$

$$F_f = 1$$

$$F_g = \bar{A} + B + \bar{C}$$