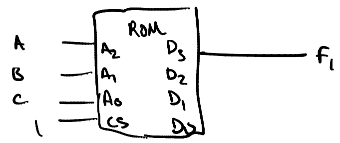
$F_1(A,B,C) = ABC$ using $8 \times 4$ ROM




Program ROM using $A_2 = A$, $A_1 = B$, $A_0 = C$
$D_3 = F_1$ as shown

| A | B | C | F |
|---|---|---|---|
| 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 |
| 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 0 |
| 1 | 0 | 0 | 0 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 1 |

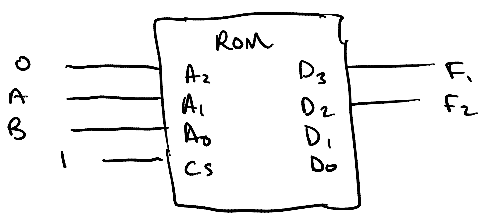
$F_1(A,B) = AB$, $F_2(A,B) = A+B$ Use $8 * 4$ ROM

| A | B | $F_1$ | $F_2$ |
|---|---|---|---|
| 0 | 0 | 0 | 0 |
| 0 | 1 | 0 | 1 |
| 1 | 0 | 0 | 1 |
| 1 | 1 | 1 | 1 |

Use $A_2 = 0$, $A_1 = A$, $A_0 = B$, $D_3 = F_1$, $D_2 = F_2$

| $A_2$ | $A_1$ | $A_0$ | $D_3$ | $D_2$ | $D_1$/$D_0$ |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | — |
| 0 | 0 | 1 | 0 | 1 | — |
| 0 | 1 | 0 | 0 | 1 | — |
| 0 | 1 | 1 | 1 | 1 | — |

All others



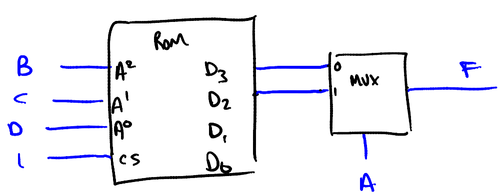

$F(A,B,C,D) = AB + BC + ABCD$ use $8 * 4$ ROM plus any additional needed logic

$F(A,B,C,D) = F_{A=0}(B,C,D)\bar{A} + F_{A=1}(B,C,D)A$

Set $A_2 = B$, $A_1 = C$, $A_0 = D$

$F_{A=0}$ in $D_3$

$F_{A=1}$ in $D_2$




| B $A_2$ | C $A_1$ | D $A_0$ | $D_3$ | $D_2$ |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 | 0 |
| 0 | 1 | 0 | 0 | 0 |
| 0 | 1 | 1 | 0 | 0 |
| 1 | 0 | 0 | 0 | 1 |
| 1 | 0 | 1 | 0 | 1 |
| 1 | 1 | 0 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 |

$F_{A=0}(B,C,D) = F(0,B,C,D) = BC = D_3$

$F_{A=1}(B,C,D) = F(1,B,C,D) = B + BC + BCD = B = D_2$

Sketch of a 5-varible problem F(A,B,C,D,E)

Use 4-to-1 Mux, uses 2 inputs