COMP 122/L
Summer 2023

Karnaugh Maps (K-Maps) (Answers)

For each truth table, you must first write the table in an equivalent sum-of-products formula. From there, you'll need to write out a K-map, draw boxes as appropriate, and write out the equivalent optimized sum-of-products formula.

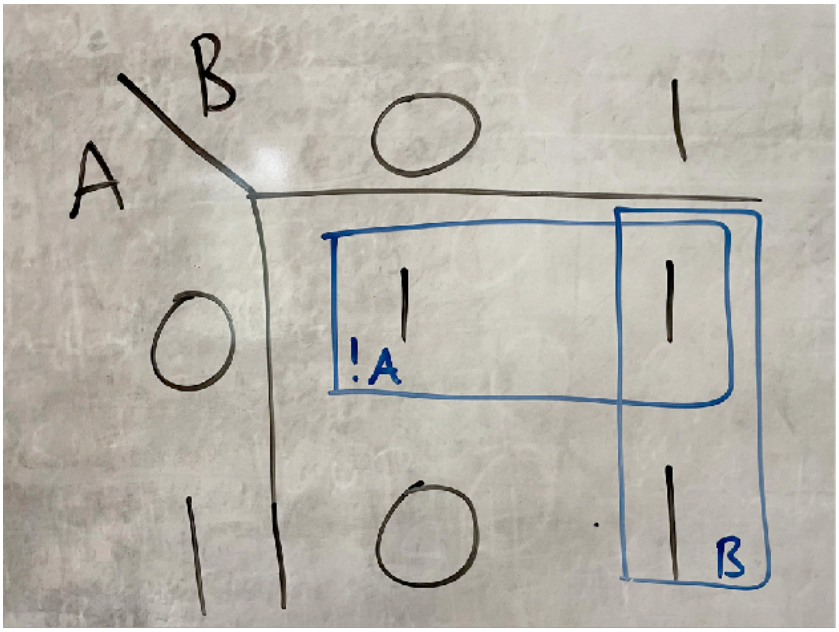
1.)

A	B	Output
0	0	1
0	1	1
1	0	0
1	1	1

1.a.) As an unoptimized sum-of-products formula:

```
Output = !A!B + !AB + AB
```

1.b.) As a K-map:



1.c.) As an optimized sum-of-products formula:

```
Output = !A + B
```

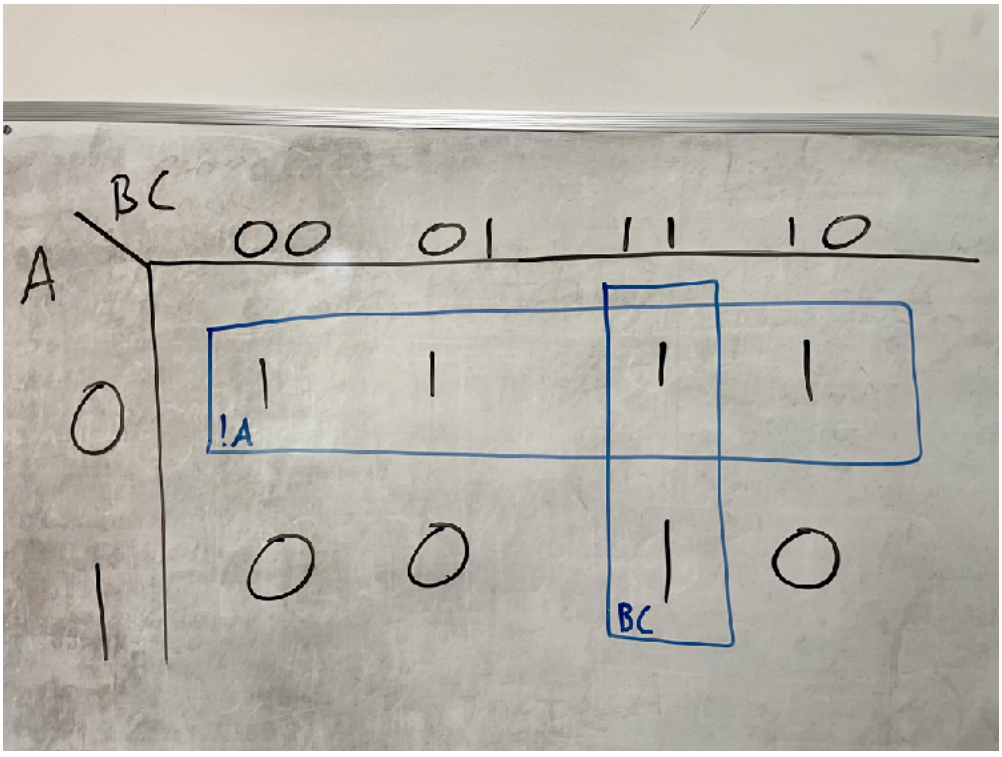
2.)

A	B	C	Output
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

2.a.) As an unoptimized sum-of-products formula:

```
Output = !A!B!C + !A!BC + !AB!C + !ABC + ABC
```

2.b.) As a K-map:



2.c.) As an optimized sum-of-products formula:

```
Output = !A + BC
```

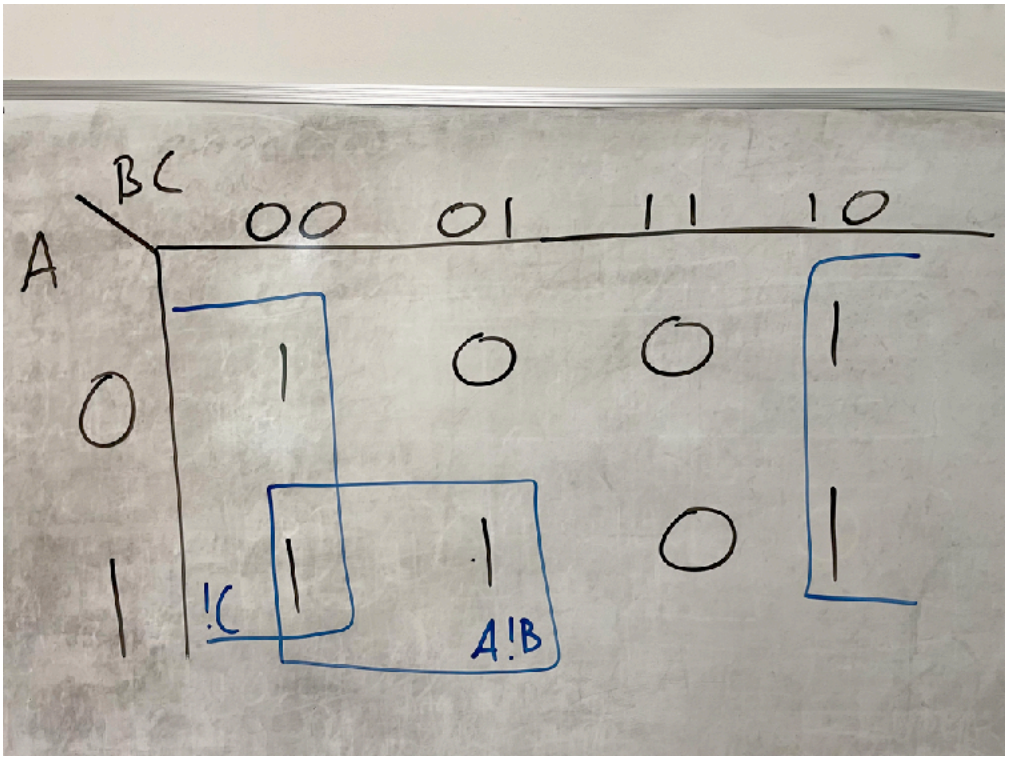
3.)

A	B	C	Output
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

3.a.) As an unoptimized sum-of-products formula:

```
Output = !A!B!C + !AB!C + A!B!C + A!BC + AB!C
```

3.b.) As a K-map:



3.c.) As an optimized sum-of-products formula:

```
Output = !C + A!B
```

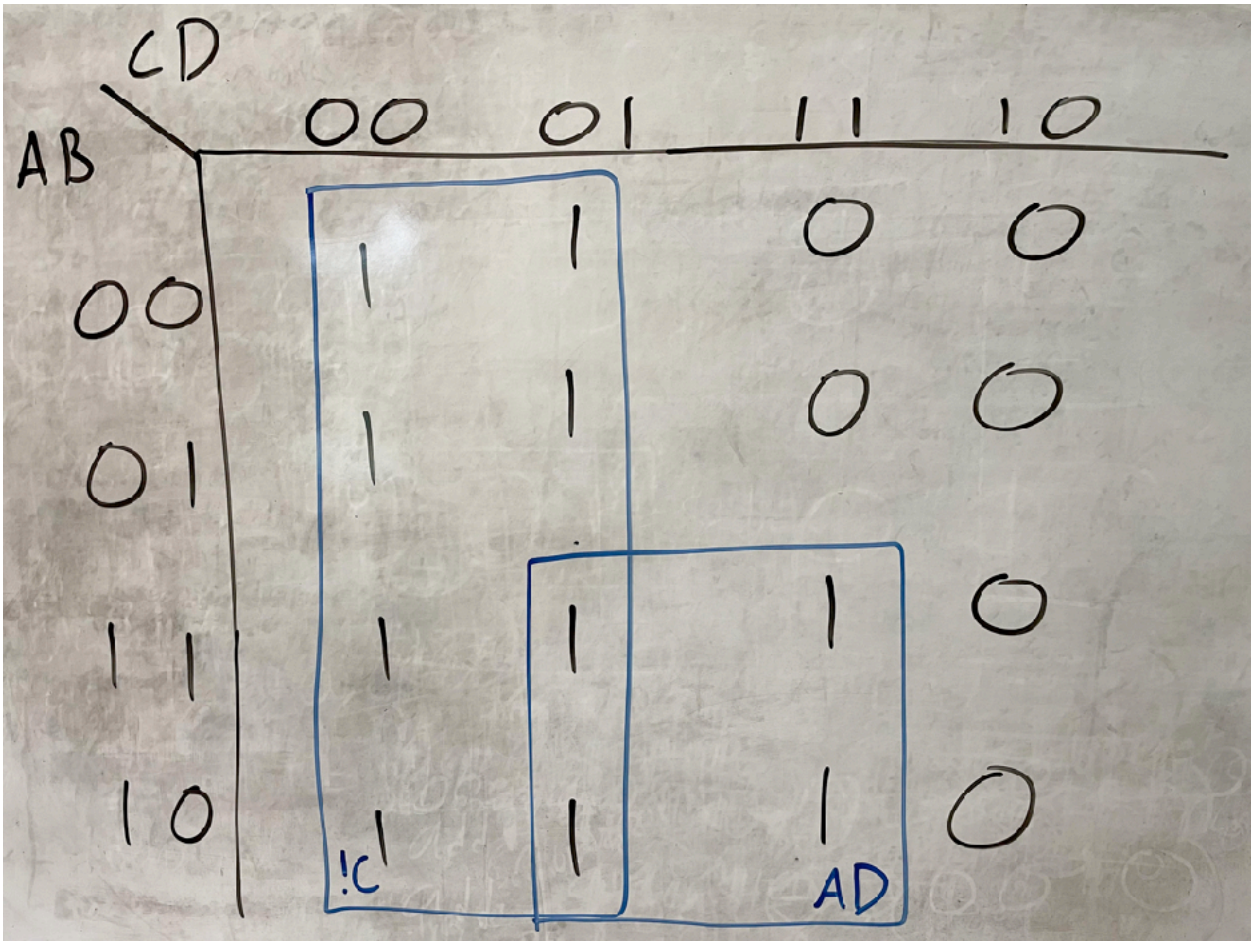
4.)

A	B	C	D	Output
0	0	0	0	1
0	0	0	1	1
0	0	1	0	0
0	0	1	1	0
0	1	0	0	1
0	1	0	1	1
0	1	1	0	0
0	1	1	1	0
1	0	0	0	1
1	0	0	1	1
1	0	1	0	0
1	0	1	1	1
1	1	0	0	1
1	1	0	1	1
1	1	1	0	0
1	1	1	1	1

4.a.) As an unoptimized sum-of-products formula:

```
Output = !A!B!C!D + !A!B!CD +
         !AB!C!D + !AB!CD +
         A!B!C!D + A!B!CD +
         A!BCD + AB!C!D +
         AB!CD + ABCD
```

4.b.) As a K-map:



4.c.) As an optimized sum-of-products formula:

```
Output = !C + AD
```

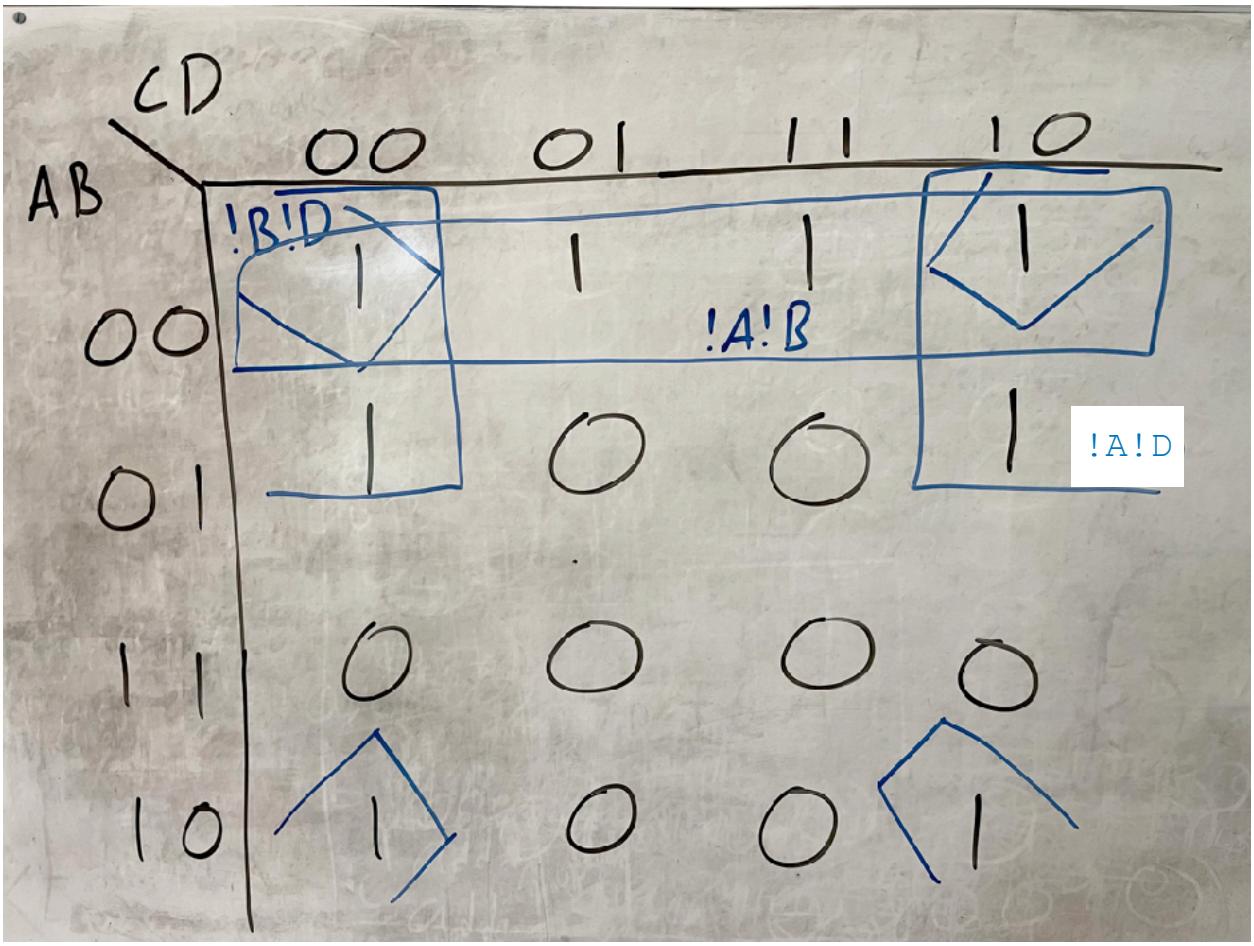
5.)

A	B	C	D	Output
0	0	0	0	1
0	0	0	1	1
0	0	1	0	1
0	0	1	1	1
0	1	0	0	1
0	1	0	1	0
0	1	1	0	1
0	1	1	1	0
1	0	0	0	1
1	0	0	1	0
1	0	1	0	1
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	0

5.a.) As an unoptimized sum-of-products formula:

```
Output = !A!B!C!D + !A!B!CD +
         !A!BC!D + !A!BCD +
         !AB!C!D + !ABC!D +
         A!B!C!D + A!BC!D
```

5.b.) As a K-map:



5.c.) As an optimized sum-of-products formula:

```
Output = !B!D + !A!B + !AD
```