

② (in exam "B", this is question 1)

52.125

$$52 \div 2 = 26 \text{ r. } 0$$

$$\div 2 = 13 \text{ r. } 0$$

$$\div 2 = 6 \text{ r. } 1$$

$$\div 2 = 3 \text{ r. } 0$$

$$\div 2 = 1 \text{ r. } 1$$

$$\div 2 = 0 \text{ r. } 1$$

110100

$$0.125 \times 2 = 0.25$$

$$\times 2 = 0.5$$

$$\times 2 = 1.00$$

001

$$(52.125)_{10} = (110100.001)_2 = (64.1)_8 = (34.2)_{16}$$

$$\underline{-10101101.101} = -(1 + 4 + 8 + 32 + 128 + 2^{-1} + 2^{-3})$$

$$= -(173 + 0.5 + 0.125) = -(173.625)_{10}$$

$$= (-255.5)_8 = (-AD.A)_{16}$$

Decimal	Binary	Octal	Hexadecimal
52.125	110100.001	64.1 64.1	34.2
-173.625	-10101101.101	-255.5 -255.5	-AD.A

3

$$\begin{array}{r}
 11010 \\
 \underline{1011} \\
 11010 \\
 \underline{11010} \\
 110100 \\
 \underline{100011110}
 \end{array}$$

$$\begin{array}{r}
 24.6 \\
 - 5.2 \\
 \hline
 17.4
 \end{array}$$

3

$$\begin{array}{r}
 1000101 \leftarrow \text{result} \\
 00101011010 \overline{) 0101} \\
 \underline{0101} \\
 000110 \\
 \underline{101} \\
 110 \\
 \underline{101} \\
 1 \leftarrow \text{rem}
 \end{array}$$

$$1F + 2 = 21$$

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$$\overline{a+b} + a\overline{b} + \overline{a}b = a + b ?$$

$$a \cdot b + a\overline{b} + \overline{a}b \quad (\text{de Morgan}),$$

$$\downarrow \overbrace{ab + a\overline{b} + \overline{a}b} \quad (\text{idempotence})$$

$$a(b+\overline{b}) + b(a+\overline{a}) \quad (\text{distributive})$$

$$a \cdot 1 + b \cdot 1 \quad (\text{complement})$$

$$a + b \quad (\text{identity})$$

several other ways (paths) are possible!

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WX YZ	F
0000	0
0001	0
0010	0
0011	0
0100	0
0101	1
0110	0
0111	1
1000	1
1001	0
1010	0
1011	0
1100	1
1101	1
1110	0
1111	0

6

		AB			
		00	01	11	10
C	0	1 ₀	1 ₂	0 ₆	1 ₄
	1	0 ₁	1 ₃	0 ₇	1 ₅

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

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		WX			
		00	01	11	10
YZ	00	1 ₁			X ₃
	01		1 ₅	1 ₁₃	
	11		1 ₇	X ₁₅	
	10	1 ₂			X ₁₄

$$F = XZ + \bar{X}\bar{Z}$$

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$$S = (\bar{A} \oplus B) \oplus C$$

Inputs: A B C

Output: S

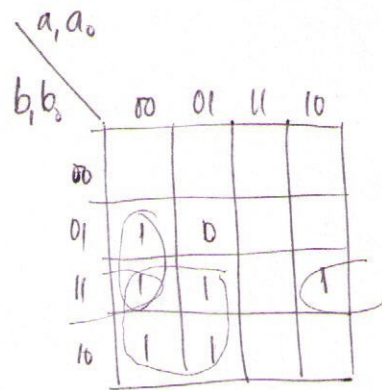
A	B	C	S
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	0

25m

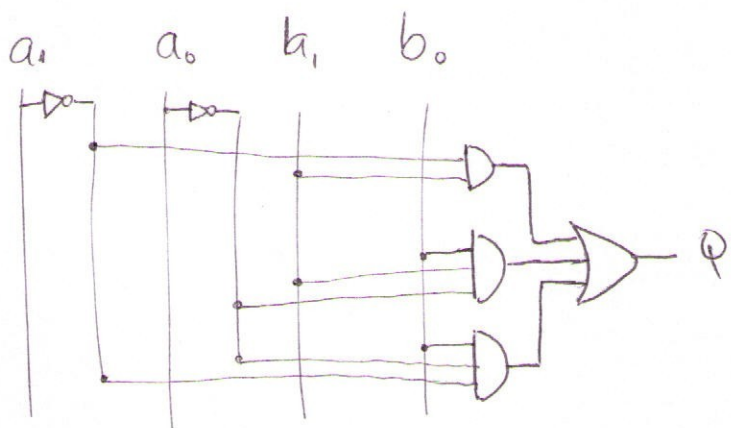
9

Inputs: a_1, a_0, b_1, b_0 . Output: Q.

a_1, a_0	b_1, b_0	Q
00	00	0
00	01	1
00	10	1
00	11	1
01	00	0
01	01	0
01	10	1
01	11	1
10	00	0
10	01	0
10	10	0
10	11	1
11	00	0
11	01	0
11	10	0
11	11	0



$$Q = \bar{a}_1 b_1 + b_1 b_0 \bar{a}_0 + b_0 \bar{a}_1 \bar{a}_0$$



10

35 min

A	B	"0"	"1"	"2"	"3"	\bar{I}_3	\bar{I}_2	\bar{I}_1	\bar{I}_0	Q_1	Q_0	F_1	F_2
0	0	1	0	0	0	0	0	0	0	1	1	0	1
0	1	0	1	0	0	0	1	0	0	1	1	1	1
1	0	0	0	1	0	1	0	0	1	1	0	1	0
1	1	0	0	0	1	1	1	1	0	0	0	0	0

~~11 (extra credit) McCluskey~~

Let's do the encoder:

