1

1.1

Buchstabe	Kodierung	"k_i/r"
L	000	$\frac{3}{13}$
E	001	$\frac{1}{13}$
O	010	$\frac{2}{13}$
	011	$\frac{2}{13}$
Ä	100	$\frac{1}{13}$
S	101	$\frac{3}{13}$
T	110	$\frac{1}{13}$

1.2

$$
\begin{aligned}
I &= -\sum_{i=1}^{n} p_i \log p_i \\
&= -\sum_{i=1}^{7} p_i \log p_i \\
&= -(\frac{1}{7} \cdot \log \frac{1}{7}) \cdot 7 = -\log \frac{1}{7} \approx 2.81
\end{aligned}
$$

1.3

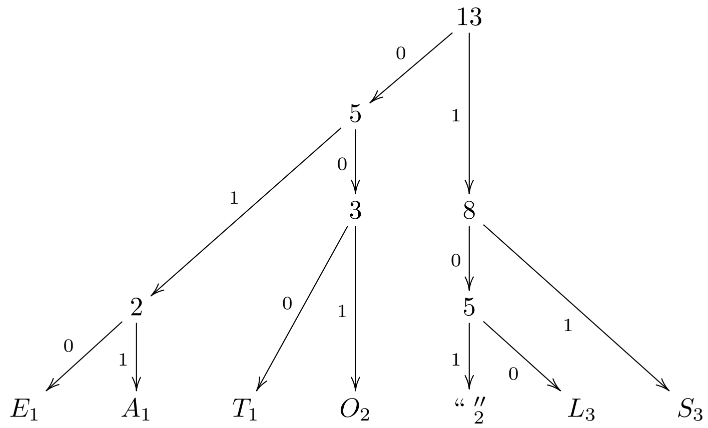
$$
\begin{aligned}
I &= -\sum_{i=1}^{n} p_i \log p_i \\
&= -(\frac{3}{13} \cdot \log \frac{3}{13} + \frac{1}{13} \cdot \log \frac{1}{13} + \frac{2}{13} \cdot \log \frac{2}{13} + \frac{2}{13} \cdot \log \frac{2}{13} \\
&+ \frac{1}{13} \cdot \log \frac{1}{13} + \frac{3}{13} \cdot \log \frac{3}{13} + \frac{1}{13} \cdot \log \frac{1}{13}) \approx 2.06
\end{aligned}
$$

2.661

1.4

Der Informationsgehalt ist um etwa 0.75 verringert.

1.5



1.6

Buchstabe	Kodierung
S	11
L	100
	101
O	001
T	000
A	011
E	010

1.7

$N = n_S + n_L + n + n_O + n_T + n_A + n_E = 3 \cdot 2 + 3 \cdot 3 + 2 \cdot 3 + 3 + 3 + 3 = 30$

1.8

$b = r \cdot I \approx 13 \cdot 2.06 = 26.78$

1.9

Der Huffman-Kode weicht um etwa 12% ab.

1.10

Der Huffman-Kode braucht $\frac{30}{13} \approx 2.31$ Zeichen, dies weicht um etwa 12% vom Informationsgehalt $I \approx 2.06$ ab.

2

2.1

c	b	a	$\neg a \vee b$	$(\neg a \vee b) \wedge \neg c)$	$(a \vee c)$	$b \wedge (a \vee c)$	$f(a,b,c)$
0	0	0	1	1	0	0	1
0	0	1	0	0	1	0	0
0	1	0	1	1	0	0	1
0	1	1	1	0	1	1	1
1	0	0	1	1	0	0	1
1	0	1	0	0	1	0	0
1	1	0	1	0	1	0	0
1	1	1	1	0	1	1	1

2.2

$(\neg a \wedge \neg b \wedge \neg c) \vee (\neg a \wedge \neg b \wedge \neg c) \vee (\neg a \wedge b \wedge c) \vee (a \wedge b \wedge \neg c) \vee (a \wedge b \wedge c) = m_0 \vee m_2 \vee m_3 \vee m_6 \vee m_7 = \sum m(0,2,3,6,7)$

2.3

$\neg y = \sum m(1,4,5)$

2.4

$\neg y = \prod M(0,2,3,6,7)$

2.5

$y = \prod M(1,4,5)$

2.6

?

3

3.1

$$f_{x_1=0} = f(0,x_2,x_3) = \underbrace{[(x_2 \vee x_3) \wedge 0]}_{0} \vee \underbrace{[(x_2 \wedge (x_2 \vee x_3) \wedge x_3) \wedge 0]}_{0} = 0$$

$$f_{x_1=1} = f(0,x_2,x_3) = \underbrace{[(x_2 \vee x_3) \wedge 1]}_{x_2 \vee x_3} \vee \underbrace{[(x_2 \wedge (x_2 \vee x_3) \wedge x_3) \wedge 1]}_{x_2 \wedge (x_2 \vee x_3) \wedge x_3} = (x_2 \vee x_3) \vee [x_2 \wedge (x_2 \vee x_3) \wedge x_3]$$

3.2

$$f_{x_1=1,x_2=0} = f(0,0,x_3) = \underbrace{(0 \vee x_3)}_{x_3} \vee \underbrace{[0 \wedge (0 \vee x_3) \wedge x_3]}_{0} = x_3$$

$$f_{x_1=1,x_2=1} = f(0,1,x_3) = \underbrace{(1 \vee x_3)}_{1} \vee \underbrace{[1 \wedge (1 \vee x_3) \wedge x_3]}_{x_3} = x_3$$

3.3

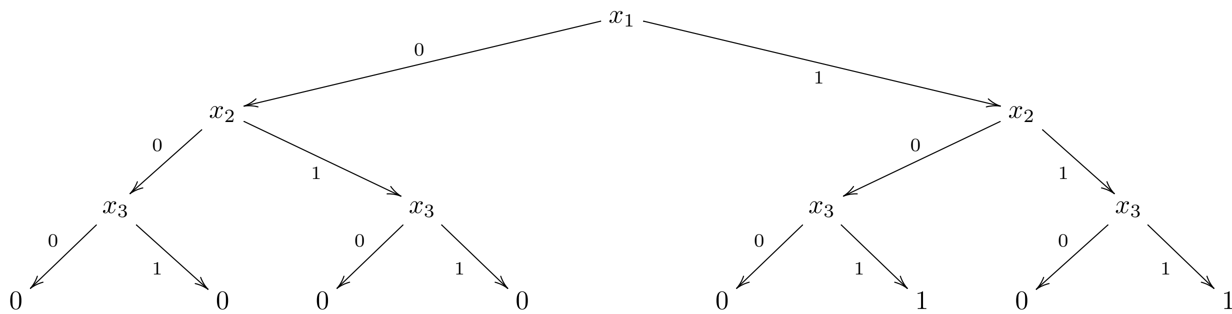
$$f_{x_1=1,x_2=1,x_3=0} = f(0,1,0) = 0$$

$$f_{x_1=1,x_2=1,x_3=1} = f(0,1,1) = 1$$

3.4

$$y = \underbrace{(x_1 \wedge \neg x_2 \wedge x_3)}_{101} \vee \underbrace{(x_1 \wedge x_2 \wedge x_3)}_{111} \vee \underbrace{(x_1 \wedge x_2 \wedge \neg x_3)}_{110} = \sum m(5,6,7)$$

3.5



3.6