1 Formal Reasoning

1.1 Truth tables

1. If I have money, then I can but a ticket and if I can buy a ticket, then I arrive on time.
2. $D \wedge \neg B \rightarrow \neg A$

1.2 Automata

1. No
2. No
3. Yes
4. No
5. Yes

2 Probability theory

$p(\text{ill}) = 0.01$

$p(\text{not ill}) = 1 - p(\text{ill}) = 1 - 0.01 = 0.99$

$p(+ \mid \text{ill}) = 0.90$

$p(+ \mid \text{not ill}) = 1 - p(+ \mid \text{ill}) = 1 - 0.90 = 0.10$

$p(+) = p(+ \mid \text{ill})p(\text{ill}) + p(+ \mid \text{not ill})p(\text{not ill})$

$p(+) = 0.90 \cdot 0.01 + 0.10 \cdot 0.99 = 0.108$

$p(\text{ill} \mid +) = \dfrac{0.99 \cdot 0.01}{0.108} \approx 0.083$

3 Programming

3.1 PC

1. 3
2. 8

3.2 PC2

1. 0 1 4 9 16 25
2. 10

4 Machine Learning

b	k_0	k_1	w_0	w_1	x	output
1	0	0	1	1	0	1
0.5	1	0	0.80	0.25	1.4	1
-0.5	1	1	0.90	0.50	0.90	1
-1	1	0	0.60	0.40	0.40	0
-1	1	1	0.70	0.25	-0.05	0

1.
2. This is not possible. Because a single layer perceptron, as the one used here, can only separate the inputs linearly. And this combination of inputs cannot be separated linearly. This becomes clear when drawing a graph with all inputs on their.
3. Such a perceptron would have at least two layers. Then the weights and bias need to be adjusted accordingly such that the perceptron resembles an NXOR-gate.