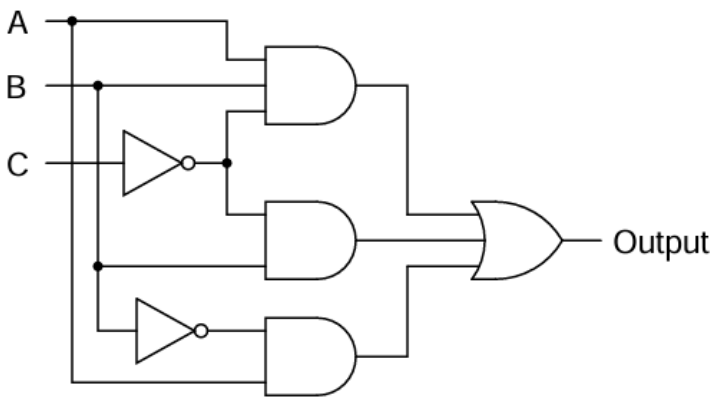
MSE Hand in 4

The assignments are to be solved in pairs. Each pair can only hand in one solution. Submission by the end of class. The assignments must be solved by hand.

Assignment 1

These are recap exercises from last week's topic.

Consider the following logic gate circuit:



(a) State the Boolean function for the gate.

(b) Use Boolean algebra to simplify the logic gate circuit.

(c) Draw the simplified logic gate circuit.

Assignment 2

Decide whether each of the following problems (a - d) involves a permutation or a combination and then work out the answer.

(a) How many 4 digit numbers can be made from the digits $2, 3, 5, 6, 7$ and 9 if no repetition of digits is allowed.

(b) A student has to answer 8 out of 10 questions in an exam. How many different choices has she?

(c) How many different car number plates can be made if each plate contains 2 different letters (A-Z) followed by 5 distinct digits (0-9)?

(d) How many ways are there of playing a game of lotto requiring you to select 7 correct numbers out of 36?

(e) Assuming you only play one game of lotto as described in (d), what is the probability of winning?

Assignment 3

The following table summarises visits to emergency departments at four hospitals in Denmark. People may leave without being seen by a physician, and those visits are denoted as LWBS. The remaining visits are serviced at the emergency department, and the visitor may or may not be admitted for a stay in the hospital

(a) Let A denote the event that a visit is to **hospital 1**, and let B denote the event that the result of the visit is LWBS (at any hospital). Find the number of outcomes in $A \cap B, A^c$, and $A \cup B$.

	Hospital				
	1	**2**	**3**	**4**	**Total**
Total	5292	6991	5640	4329	22,252
LWBS	195	270	246	242	953
Admitted	1277	1558	666	984	4485
Not admitted	3820	5163	4728	3103	16,814

(b) Now, let A denote the event that a visit is to **hospital 4**, and let B denote the event that a visit results in LWBS (at any hospital). Determine the following probabilities: $P(A \cap B)$, $P(A^c)$, $P(A \cup B)$, $P(A \cup B^c)$, $P(A^c \cap B^c)$

Assignment 4

Heart failures are due to either natural occurrences (87%) or outside factors (13%). Outside factors are related to induced substances (73%) or foreign objects (27%). Natural occurrences are caused by arterial blockage (56%), disease (27%), and infection (e.g., staph infection) (17%).

(a) Determine the probability that a failure is due to an induced substance.

(b) Determine the probability that a failure is due to disease or infection.

Assignment 5

Let A and B be two events such that:

$$P(A) = 0.4, \quad P(B) = 0.7, \quad P(A \cup B) = 0.9$$

(a) Find $P(A \cap B)$.

(b) Find $P(A^c \cap B)$.

(c) Find $P(A - B)$.

(d) Find $P(A^c - B)$.

(e) Find $P(A^c \cup B)$.

(f) Find $P(A \cap (B \cup A^c))$.

Assignment 6

Four teams A, B, C, and D compete in a tournament. Teams A and B have the same chance of winning the tournament. Team C is twice as likely to win the tournament as team D. The probability that either team A or team C wins the tournament is 0.6. Only one team can win the tournament. Find the probabilities of each team winning the tournament.