Exercise 1 (Process Axiomization): (2 points)

Let P and Q be processes for our simple Probabilistic Process Algebra.

a) Show using the axioms that

- $P \oplus_{0.7} (Q \oplus_{0.5} P) = P \oplus_{0.85} Q$.
- $P + Q + P = P + Q$.

b) Show with help of the operational semantics that given $P = P'$ the following holds:

$$P \oplus_{0.5} (P' \oplus_{0.5} Q) = P \oplus_{0.75} Q$$

Exercise 2 (Operational Semantics): (4 points)

a) Give PAs for the following three processes.

S = send.(send.S + send.nil)
T = send.(receive.T $\oplus_{0.6}$ T)
R = receive.ringbell.R

Use the operational semantics as given in the lecture.

b) Give the PA for $S||T||R$. You may do this without using the rules. Assume that all shared actions are synchroninzing.

Exercise 3 (Modelling): (4 points)

Model the following scenario using the simple Probabilistic Process Algebra from the lecture. Actions are emphasized.
A computer tries to find a yet unknown prime number. After *computing a candidate*, the number is *checked*. Either the number is a prime or it is not a prime. If it is not a prime, the computer retries. If it is a prime, then the computer *sends* this result to a news agency and waits for an acknowledgement. With probability 0.6, the news agency *receives* the big news and sends an *acknowledgement*. The *acknowledgement arrives* with probability 0.7. After the acknowledgement arrives, the computer restarts the procedure.