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# Distributed Systems, Summer Term 2020
# Exercise Sheet 6

## 1  Leader Election with Failures

Consider the leader election problem on a complete graph in the synchronous message passing model.
That is, every node has a unique ID and at end of the algorithm, every node that did not crash has
to output the ID of the leader node.

Explain how to adapt the *(f+1)-round lower bound proof for consensus* from the lecture to show that
if at most $f \leq n - 2$ processes may fail during the protocol, at least $f + 1$ rounds are needed to solve
leader election.

## 2  $k$-set agreement

A generalization of consensus is the $k$-set agreement problem: Every node has an input value and at
the end every node has to output a value such that the following properties are fulfilled:

1. Agreement: There must not be more than $k$ different output values.

2. Validity: Every node must output a value which was input of some node.

Show that on a complete graph in the synchronous message passing model with at most $f$ node failures,
the $k$-set agreement problem is solvable in $\lfloor f/k \rfloor + 1$ rounds.