# Divide And Conquor

15. juni 2014

## Definition

**Divide**
Del problemet ind i mindre delproblemer af samme form.
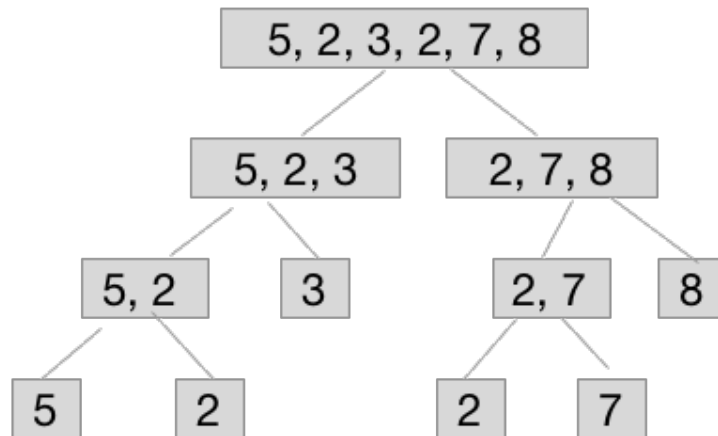
**Conquor**
Løs problemet rekursivt. Hvis problemet er småt nok, løs problemet trivielt.

**Combine**
Sammensæt delløsninger så det større problem bliver løst.

## Eksempel på mergesort

Example.png

Figur 1: Rekursionstræet for merge-sort

# Mergesort - Proof by induction

Assume that N is a power of 2

$T(N) = 2T(N/2) + N$, for $N > 1, T(1) = 0$
Claim if $T(N)$ satisfies this recurrence then $T(N) = NlgN$
Proof:

**Base case:** $N = 1, T(1) = 0$
**Inductive Hypothesis:** $T(N) = NlgN$
**Inductive Step:** $T(2N) = 2Nlg(2N)$

$$
\begin{align}
T(2) &= 2T(N) + 2N \tag{1}\\
&= 2NlgN + 2N \tag{2}\\
&= 2N(lg(2N) - 1) + 2N \tag{3}\\
&= 2Nlg(2N) \tag{4}
\end{align}
$$

1. Given

2. Inductive Hypothesis

3. Algebra

4. End of proof (QED)