Çankaya University
Department of Computer Engineering

CENG 277 - Discrete Structures

Name-Surname: 16.10.2014

ID Number:

CLASSWORK 2

Show that $2^n < \binom{2n}{n}$ for all $2 \leqslant n$.

Answer:

Let's use mathematical induction. The formula is correct for $n = 2$, because $2^2 < 6$. Suppose it is correct for $n = k$.

$$2^k < \frac{(2k)!}{k!\,k!}$$

We know that

$$2 < \frac{2k+2}{k+1}\,\frac{2k+1}{k+1}$$

Multiply these inequalities side by side to obtain:

$$2^{k+1} < \frac{(2k+2)!}{(k+1)!\,(k+1)!} = \binom{2(k+1)}{k+1}$$

So the formula is correct for all n.

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CLASSWORK 2

Show that $\binom{2n}{n} < 4^n$ for all $2 \leqslant n$.

Answer:

Let's use mathematical induction. The formula is correct for $n = 2$, because $6 < 4^2$. Suppose it is correct for $n = k$.

$$\frac{(2k)!}{k!\,k!} < 4^k$$

We know that

$$\frac{2k+2}{k+1}\,\frac{2k+1}{k+1} < 4$$

Multiply these inequalities side by side to obtain:

$$\frac{(2k+2)!}{(k+1)!\,(k+1)!} < 4^{k+1}$$

$$\binom{2(k+1)}{k+1} < 4^{k+1}$$

So the formula is correct for all n.