**4 Math exercises:**

1. Prove the following by induction:

a. 1 + 2 + 3 + . . . + n = 0.5n(n+1)

b. 12 + 22 + 32 + … + *n*2  = 1/6 *n* (*n*+1)(2*n*+1).

c. 12 + 22 + 32 + … + (*n-*1)2  < 1/3 *n*3.

d. (am)n = amn

e. $\sum\_{k=1}^{n}\left(2k-1\right)=n^{2}$

f. $\sum\_{k=1}^{n}\left(2k\right)=n^{2}+n$

g. $\sum\_{k=1}^{n}\left(3k\right)=\frac{3n^{2}}{2}+\frac{3n}{2}$

h. $\sum\_{k=1}^{n}\left(5k-1\right)= \frac{n}{2}(3+5n)$

i. $\sum\_{k=1}^{n}k^{2}=\frac{n(n+1)(2n+1)}{6}=\frac{n^{3}}{3}+\frac{n^{2}}{2}+\frac{n}{6}$

j. $\sum\_{k=1}^{n}k^{3}=(\frac{n(n+1)}{2})^{2}$ = $\frac{n^{4}}{4}+\frac{n^{3}}{2}+\frac{n^{2}}{4}$

k. $\sum\_{k=1}^{n}k^{4}=\frac{n^{5}}{5}+\frac{n^{4}}{2}+\frac{n^{3}}{3}-\frac{n}{30}$

L. $\sum\_{k=1}^{n}k^{5}=\frac{n^{6}}{6}+\frac{n^{5}}{2}+\frac{5n^{4}}{12}-\frac{n^{2}}{12}$

m. $\sum\_{k=1}^{n}k^{6}=\frac{n^{7}}{7}+\frac{n^{6}}{2}+\frac{n^{5}}{2}-\frac{n^{3}}{6}+\frac{n}{42}$

n. $\sum\_{k=1}^{n}k^{7}=\frac{n^{8}}{8}+\frac{n^{7}}{2}+\frac{7n^{6}}{12}-\frac{7n^{4}}{24}+\frac{n^{2}}{12}$

2. Find the arithmetic equivalence for each of these logical functions.

a. AND

b. inclusive OR

c. exclusive OR

d. NOT

e. tautology

f. contradiction

g. implication

h. double implication.

3. Represent each of these logical functions through AND, OR, NOT.

a. tautology

b. contradiction

c. implication

d. double implication.

4. Define predicate, argument and inference.

5. Analyze this statement:

$$\frac{sinx}{n}=six=6$$

**Deadline: 22.10.2014**