**Question B – Daniyar Nazarbayev, H00204990.**

exception NOT\_PERFECT;

exception INFINITE;

fun log2 x = if (x=1) then 0

else if (x=0) then raise INFINITE

else if (x mod 2 <> 0) then raise NOT\_PERFECT

else 1+log2(x div 2);

2.

fun sqrt (x, s) = if ( (s\*s)=x orelse (s\*s)=(x+1) orelse (s\*s)=(x-1) ) then s

else if (s\*s)<x then sqrt(x, (s+1))

else sqrt (x, (s-1));

3.

exception ZERO;

fun sumSq (n) = if n=1 then 1 else if n=0 then raise ZERO else (n\*n)+sumSq (n-1);

4.

exception ZERO;

fun sumHalf (n) = if n=1 then (1 div 2) else if n=0 then raise ZERO else (n div 2) + sumHalf (n-1);

5.

fun sumF (f,x) = if (x<>0) then f(x) + sumF(f, x-1) else 0;

fun inc x = x +1;

6.

fun sumF (f,x) = if (x<>0) then f(x) + sumF(f, x-1) else 0;

exception ZERO;

fun sumSq (n) = if n=1 then 1 else if n=0 then raise ZERO else (n\*n)+sumSq (n-1);

7.

fun sumF (f,x) = if (x<>0) then f(x) + sumF(f, x-1) else 0;

exception ZERO;

fun sumHalf (n) = if n=1 then (1 div 2) else if n=0 then raise ZERO else (n div 2) + sumHalf (n-1);