Problem-2.

5 results.

a). $x = 9$, ans = 6.

$x = 90$, ans = 6.

$x = 1000$, ans = 15

$x = 1$, ans = 1

$x = 99896$, ans = 67.

2) The method I use, is to simply calculate the factorial, and check if the input is divisble by the factorial.

for 64-bit implementation, it overflows when the factorial exceeds 20!. i.e. if the final answer is greater than 20, then it has overflowed. this is because.

$\log_2(21!) = 65.469$

and $\log_2(20!) < 64$.

so $20! < 2^{64} < 21!$

first ~~number~~ input, who's causes overflow is 23.

for 32-bit,

$\log_2(13!) = 32.535$.

$\log_2(12!) < 32$.

So if the factorial exceeds 12!, it overflows.

smallest input that causes overflow is 13.

for 16-bit.

$\log_2(8!) = 15.2$

$\log_2(9!) = 18.4$.

So overflows after 8!, (at 9!)

first input that causes overflow is 11.

for 8-bit

$\log_2(5!) = 6.9$

$\log_2(6!) = 9.5$

so, overflows after 5!. (at 6!)

Smallest input that gives oveflow is 7.