Homework - 2

① 1. For example,

$3^2 \equiv 1 \mod 8$

$5^2 \equiv 1 \mod 8$

⋮

<u>proof</u> :- all odd squares $\rightarrow (2n+1)^2$

$n \in$ whole numbers

$(2n+1)^2 = 8m+1$

$\cancel{4}n^2 + \cancel{4}n + \cancel{1} = \cancel{8}_2 m + \cancel{1}$

$n^2 + n = 2m$.

$n(n+1) = 2m$

→ If n is odd, n+1 is even

It is a factor of 2

→ If n is even, automatically we have a factor of 2

2. For example,

$2^2 \equiv \mod 8 \rightarrow 4$

$4^2 \equiv \mod 8 \rightarrow 0$

$6^2 \equiv \mod 8 \rightarrow 4$

$8^2 \equiv \mod 8 \rightarrow 0$

<u>proof</u> :- $(2n)^2 \rightarrow$ for all even squares

$$(2n)^2 = 8m+1$$
$$4n^2 = 8m+1$$

→ n belongs to whole numbers

→ when $n=0$

$0 = 8m+1$ Not possible,

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③ * **O(1):-** constant time complexity.

→ This operation does not depend on size of input data.

→ small input data (or) Large input data
↓
It takes same time to execute.

* **O(n):** Linear time complexity

→ The operation grows Linearly with the size of the input data

→ If the input data size increases, operation takes more time.

* **O(logn):** Logarithmic time complexity

→ The operation grows logarithmically with the size of input data.

→ If the input size increases, the time to complete increases at a decreasing rate.