

Q1

We can handle this problem by a divide and conquer recursion.

When we want to compute M^n , we could compute $y = M^{\lfloor \frac{n}{2} \rfloor}$. We compute $\frac{n}{2}$ by flooring. Then doing new recursion assign $\lfloor \frac{n}{2} \rfloor$ as the new N and do next recursion. If n is even, we compute $M^n = y^2$, otherwise n is odd, we do $M^n = y^2 * M$ as we do floor operation for $n/2$.

Doing those, until $n = 0$ and this is also a boundary condition. Since each recursion reduces the exponent by half, the number of recursive layers is $O(\log n)$, and the algorithm can get results in a very short time.

Q2**Q3****Q4****Q5**