$m^a \mod N.$

$m^P = 1 \pmod N$. **P : Period**

$(m^{P/2}-1)(m^{P/2}+1) = 0 \mod N.$

205 states in the 1st register

$$6, 26, 46, \cdots 4086$$

205.

$$|\Psi_3\rangle = \frac{1}{\sqrt{M}} \sum_{d=0}^{M-1} |x_0 + dP, k\rangle \hookrightarrow 9$$

x_0: 6; d: $d = 0, 204$

F.T on $\mathbb{Z}_Q$.

$$|\psi_a\rangle = \frac{1}{\sqrt{MQ}} \sum_{y=0}^{Q-1} \sum_{d=0}^{M-1} e^{2\pi i y(x_0 + dP)/Q} |y,k\rangle$$

$$= \frac{1}{\sqrt{MQ}} \sum_{y=0}^{Q-1} e^{2\pi i y x_0/Q} \left(\sum_{d=0}^{M-1} e^{2\pi i y dP/Q} \right) |y,k\rangle$$

$$z = e^{2\pi i y P/Q}$$

$$= \frac{1}{\sqrt{MQ}} \sum_{y=0}^{Q-1} e^{2\pi i y x_0/Q} \underbrace{\left(\sum_{d=0}^{M-1} z^d \right)}_{} |y,k\rangle$$

$$\sum_{d=0}^{M-1} z^d = \frac{1-z^M}{1-z}$$

$z = e^{2\pi i y P/Q}$

$$z = e^{2\pi i y P/Q}.$$

$$\left|\sum_{d=0}^{M-1} z^d\right| = \left|\frac{z^{M/2}\left(z^{-M/2} - z^{M/2}\right)}{z^{1/2}\left(z^{-1/2} - z^{1/2}\right)}\right|$$

$$= \left|\frac{\sin\left(\frac{\pi y P M}{Q}\right)}{\sin\left(\frac{\pi y P}{Q}\right)}\right|$$

$$P(y_i) = \frac{1}{MQ}\left(\frac{S_m^2\left(\frac{n y_i PM}{Q}\right)}{S_m^2\left(\frac{n y_i P}{Q}\right)}\right)$$

$$\frac{yP}{Q} = n = \text{integer}$$

↑ Significant Probability

$$P(y_i) = \frac{M^2}{MQ}$$

$$= \frac{M}{Q} = \frac{205}{409} \approx \cdot 05.$$

$$\frac{17}{47} = 0 + \frac{1}{47/17}$$

$$= 0 + \frac{1}{2 + \frac{13}{17}}$$

$$= 0 + \frac{1}{2 + \frac{1}{17/13}}$$

$$= 0 + \frac{1}{2 + \frac{1}{1 + \frac{4}{13}}} = 0 + \frac{1}{2 + \frac{1}{1 + \frac{1}{3 + \frac{1}{4}}}}$$

$$= [0, 2, 1, 3, 4]$$

$$x = [a_0\ a_1 \ldots a_M]$$

$$[a_0, a_1 \ldots a_j]$$

j^{th} convergent of x

$$\left(\frac{y}{q}\right) = \frac{n}{p}$$

$$\frac{408}{4096} = \frac{1}{10 + \frac{1}{25 + \frac{1}{2}}}$$

$10, \frac{25}{251} > N \approx \frac{n}{p}$

Stop here.

10, 20, 30, 40, 50