2 point crossed

Sym(S)

Dirac CFT sym on $\mathcal{M}$ → CFT $\mathcal{M}/G$

① Unlabeled order

② Twisted order

$A(z^{n-1})\,|\,\xi_g\rangle = \xi(g)(z)\,|\,\xi_g\rangle$

twisted order, one labelled [g]

$A(z^{n-1})\,|\,h_g\rangle = g(h)(z)\,|\,h_g\rangle$

$(\partial A)(z^{n-1})\,|\,h_g\rangle = \partial g(h)(z)\,|\,h_g\rangle$

$\mathrm{Sym}_n(X) = (X^{\times n})/S_n$ $\qquad S_n = \{\sigma : X \to X\}$

cycle decomposition

$g \in S_n$ $\quad (1\,5\,3\,2)\,(5\,4)\,|X|$ cycle decomposition

$h_{g^{-1}}$ $\quad (5\,4\,1\,2\,3\,4)\,(\ )\,|X|$

Analogy of cycle bare operator: $(n-1)!\,|X|\,|X|$

Vol of sym. $\mathbb{Z}_n$ sub gr.

$\mathrm{Sym}_n(S)$ $\quad \partial X(z) = \sum_{n=1} \alpha_n z^{-n}$ $\quad h=1$

$\partial X(z)\,\xi_g$

$\partial X^{(1)}(z^{n-1}) = \sum_{m=1} e^{2\pi i m/n}\,\partial X^{(m)}(z)$ $\quad w(z)$

$= \sum_{m=1} e^{2\pi i m/n}\,\partial T(z)$

$= \sum_{m=1} e^{2\pi i m/n}\,\partial X^{(1)}(z) = \sum_{m=1} e^{2\pi i m/n}\,\partial X^{(m)}(z)$

$\partial X^{(1)}(z) = \sum_{n \in \mathbb{Z}+\frac{1}{2}} \alpha_n^{(1)} z^{-n-1}$ $\quad \partial X^{(m)}(z) = \sum_n \alpha_n^{(m)} z^{-n-1}$

$= \sum_{n \in \mathbb{Z}+\frac{1}{2}} \alpha_n^{(1)} z^{-n-1}$

$p \in \mathbb{Z}$, $n \in$

on I contains all values of ξ

$\alpha_{\frac{n}{2}}$ $\quad n \in \mathbb{Z}$

* Find gen. α in right twisted vol $\xi = \xi\,\alpha_{\frac{n}{2}}$ $\quad \alpha_{\frac{n}{2}} \in \mathbb{Z}$

allow mode: $\alpha_{\frac{n}{2}} \cdot \alpha_{\frac{n}{2}} = \alpha_{\frac{n}{2}} \cdot \alpha_{\frac{n}{2}} \cdot \alpha_{\frac{n}{2}}$

$\alpha_{\frac{n}{2}} = \sum_n \alpha_n = \mathbb{Z}\,\alpha_1$ sub $\mathbb{Z}_n$

Gaussian sum of quantum states $\boxed{\xi_n = \frac{\xi_1 + \xi_2}{\sqrt{2}}}$

Condition: sum rule

$\langle \xi_n(z_1)\,\xi_n(z_2) \rangle$

Lattice Sphere

ξ $\quad \Gamma(\xi)$ $\quad x \in \mathbb{R}/\mathbb{Z}$ $\quad \xi = \alpha\,\xi$

$g = \alpha$

$\langle \xi_n(z_1)\,\xi_n(z_2) \rangle = \sum_{\xi \in \mathrm{sym}} \langle \xi(z_1)\,\xi(z_2) \rangle$

sublattice $g = \xi$

Riemann-Hurwitz formula $\quad L = \frac{1}{2}\sum_i (n_i - 1) + (n\,g)$ = degree of sym. sym

$(\geq$ weak$)$

$\langle\ \rangle_{\text{sub}} = \sum_{\xi \in \mathrm{sym}} \binom{N}{N_1} \cdot$

$g = \frac{1}{n}$

$= \sum_{\xi \in \mathrm{sym}} N^{1-g\,\xi} = \sum_{\xi \in \mathrm{sym}} g^{\xi}$

$g =$ genus of worldsheet

Sym sym are star

$n=4$ $\quad n=1$ $\quad L=1 \geq g \geq 1$ $\quad g=0$

$\frac{(x-y)(z-w)}{(x-z)(y-w)} = \frac{(x-w)(y-z)}{(y-z)(x-w)}$ $\quad$ if gen. symmetry

X, W $\quad$ high $\mathbb{Z}$

the analogy $w \leq 3$ not branch or $\mathbb{Z}_n$ $\mathbb{Z}$

$\pi_1(\mathbb{R}^n)$ $\quad \pi_1(\mathbb{R}^n)$

$\{p_1\}$ $\{p_1\}$

$\pi = \alpha_{\frac{n}{2}} = |\alpha\rangle$

$e^{i\alpha}$

$\mathbb{C}[(x\ \ y)] \cdot \mathbb{Z}_n \times S_{n-1}$ $\quad \sum_{\phi \in \mathbb{Z}_n}$