Title: Discussion 1

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Abstract:

Unitarity constraints

- Operators belong to unitary representations of the superconf. group
- Dimensions have different lower bounds
- Gauge invariant spin zero operators

$$D(\mathcal{O}) \geq 1, \qquad D(\mathcal{O}) = 1 \leftrightarrow P_\mu P^\mu(\mathcal{O}) = 0,$$

Central charges

- Positivity of coefficients related to the stress-energy trace anomaly
- 'a(R)' Conformal anomaly of SCFT = $U(1)_R$ 't Hooft anomalies
  [proportional to the square of the dual of the Rieman Curvature]

$$a(R) = 3\mathrm{Tr}U(1)_R^3 - \mathrm{Tr}U(1)_R$$

- 'c(R)'
  [proportional to the square of the Weyl tensor]

$$c(R) = 9\mathrm{Tr}U(1)_R^3 - 5\mathrm{Tr}U(1)_R$$

- 'b(R)'
  [proportional to the square of the flavor symmetry field strength]

$$b(R) = \mathrm{Tr}U(1)_R F^2$$

a-theorem

For any super CFT besides positivity we have, following Cardy

$$\Delta a \equiv a_{UV} - a_{IR} > 0$$

$$\Delta a = a_{\rm UV} - a_{\rm IR} = \pm \frac{1}{9} \sum_i |r_i| \left[(3R_i - 2)^2 (3R_i - 5) \right] > 0$$